BOARD MEETING DATE: June 7, 2024 AGENDA NO. 27

PROPOSAL: Determine That South Coast Air Basin Attainment Plan for 2012 Annual PM2.5 Standard Does Not Require a New Environmental Document; and Adopt South Coast Air Basin Attainment Plan for 2012 Annual PM2.5 Standard

SYNOPSIS: The South Coast Air Basin is in "serious" nonattainment for the 2012 annual PM2.5 National Ambient Air Quality Standard. A plan to attain this standard was originally submitted to U.S. EPA in 2017 but U.S. EPA delayed acting on the plan. In the meantime, near-road air quality monitoring data became eligible for inclusion in State Implementation Plan (SIP) attainment demonstrations, and the plan was withdrawn in 2023 to account for this new data and to satisfy other SIP requirements. A Draft PM 2.5 Plan was developed that demonstrates attainment of the 2012 annual PM2.5 standard by 2030 in the South Coast Air Basin. This plan also includes limited additional controls for PM2.5 and its precursors to satisfy Clean Air Act Section 188(e) requirements.

COMMITTEE: Mobile Source, October 20, 2023 and March 15, 2024, Reviewed

RECOMMENDED ACTION:
Adopt the attached Resolution:
1. Determining that the Draft South Coast Air Basin Attainment Plan for the 2012 Annual PM2.5 Standard (Draft PM2.5 Plan) is a later activity within the scope of the Final Program Environmental Impact Report (EIR) for the 2022 AQMP and the Final Program EIR for the 2016 AQMP such that no new environmental document will be required; and
2. Adopting the Draft South Coast Air Basin Attainment Plan for the 2012 Annual PM2.5 Standard and directing staff to forward the Draft PM2.5 Plan to CARB for approval and submission to U.S. EPA for inclusion in the SIP.

Wayne Nastri
Executive Officer

SR:IM:SL:EP

Background
The South Coast Air Basin (Basin) has some of the highest levels of PM2.5 in the nation. PM2.5 is either directly emitted into the atmosphere (primary particles) or formed in the atmosphere through chemical reactions (secondary particles). Primary PM2.5 includes road dust, diesel soot, combustion products, and other sources of fine particles. Secondary PM2.5 is formed from reactions with SOx, NOx, VOCs, and ammonia in the atmosphere.

Effective April 15, 2015, U.S. EPA designated the Basin as a “moderate” nonattainment area for the 2012 annual PM2.5 NAAQS with an attainment date of December 31, 2021. The 2016 AQMP concluded that attainment by 2021 was impractical and requested reclassification of the Basin to “serious” nonattainment as allowed by the Clean Air Act (CAA), which has an attainment date of December 31, 2025. Accordingly, South Coast AQMD included a serious area attainment plan in the 2016 AQMP that demonstrated attainment by 2025.

The 2016 AQMP was adopted by the Board on March 3, 2017, and staff submitted the 2016 AQMP to CARB and U.S. EPA for approval on April 27, 2017. Despite a requirement in the CAA that U.S. EPA must act on a SIP submittal within 18 months of receipt, U.S. EPA did not act on the portion of the 2016 AQMP that addresses the requirements for the 2012 PM2.5 NAAQS “serious” nonattainment area for several years. On December 9, 2020, U.S. EPA approved South Coast AQMD’s request to reclassify the Basin from moderate to serious nonattainment for the 2012 annual PM2.5 NAAQS.

Since the adoption of the 2016 AQMP, two near-road monitors established along the Interstate 710 (I-710) in Long Beach and the California State Route 60 (CA-60) in Ontario accumulated sufficient data to be considered in SIP attainment demonstrations. Based on 2020–2022 monitoring data, the CA-60 near-road monitoring site had the highest PM2.5 level in the Basin at 13.7 µg/m3. Subsequently, U.S. EPA indicated that it could not approve the submitted “serious” area plan which did not address attainment of a site showing the highest level of PM2.5 in the Basin.

In January 2023, U.S. EPA was legally challenged over its failure to act timely on the PM2.5 plan addressing “serious” nonattainment area requirements for the 2012 NAAQS. On March 29, 2023, given the concerns regarding approvability of the plan for the 2012 annual PM2.5 NAAQS, South Coast AQMD withdrew the plan via CARB. As a consequence of withdrawal, U.S. EPA issued failures to submit the required SIP elements, which triggered sanction clocks. South Coast AQMD is required to develop a new plan to address SIP requirements for the 2012 annual PM2.5 NAAQS and submit to U.S. EPA no later than December 26, 2024 to avoid sanctions.

Proposal
A Draft PM2.5 Plan has been developed to demonstrate how the Basin will attain the 2012 annual PM2.5 NAAQS and address federal CAA SIP requirements. Air quality modeling demonstrates that attainment by December 31, 2025 would be impractical and the Draft PM2.5 Plan therefore requests a five-year extension of the attainment date to December 31, 2030, as allowed by CAA Section 188(e). The Basin is expected to attain the 2012 annual PM2.5 NAAQS by 2030 by continuing to implement the 2022 AQMP NOx strategy, along with limited additional controls on direct PM2.5 and precursor emissions to satisfy U.S. EPA's stringency requirements. Overall, NOx and PM2.5 emissions are expected to decline by 54 and 6 percent, respectively, between 2018 and 2030, which will be sufficient to lead the Basin into attainment of the 2012 annual PM2.5 NAAQS.

The Draft PM2.5 Plan seeks to comply with all CAA requirements, including the requirements under CAA Section 188(e) for a five-year extension of the attainment date. Among those is a requirement to demonstrate the implementation of Most Stringent Measures (MSM), which is defined as the maximum degree of emission reduction that has been required or achieved from a source or source category in any other attainment plans or in practice in any other states. In addition to the 2022 AQMP NOx control measures, the Draft PM2.5 Plan includes South Coast AQMD's commitment to adopt and implement four control measures to satisfy MSM requirements. These measures include lowering the applicability thresholds for dairies and poultry farms to acquire permits and to reduce ammonia emissions (BCM-08), requiring composting of chipped and ground greenwaste prior to land application (BCM-10), lowering the applicability threshold for chain-driven charbroilers to install and operate catalytic oxidizer (BCM-12), and removing the low-income exemption in residential wood-burning curtailment program (BCM-18).

Public Process
Staff convened the AQMP and Scientific, Technical, and Modeling Peer Review (STMPR) Advisory Groups during development of the Draft PM2.5 Plan. The Draft PM2.5 Plan was released on March 22, 2024 and four regional public hearings were held on April 23, 24, and 25, and May 1, 2024. Overall, two written comments were received on the Draft PM2.5 Plan and responses are included in Chapter 8 of the PM2.5 Plan.

Resource Impacts
The PM2.5 Plan will have nominal impacts on South Coast AQMD resources. This is because the NOx control strategy developed for the 2022 AQMP will be sufficient to lead the Basin into attainment of the 2012 annual PM2.5 NAAQS by 2030.

California Environmental Quality Act (CEQA)
Pursuant to the CEQA, South Coast AQMD, as lead agency, reviewed the proposed project (PM2.5 Plan) and determined that: 1) the PM2.5 Plan implements a selected

suite of control measures that were previously adopted in the 2022 AQMP and the 2016 AQMP; 2) the Final Program Environmental Impact Report (EIR) for the 2022 AQMP and the Final Program EIR for the 2016 AQMP evaluated the control measures which are being relied upon for the PM2.5 Plan, and analyzed their potential environmental impacts; 3) no subsequent EIR would be required per CEQA Guidelines Section 15168 (c)(2) because there are no new or modified physical changes that would result from implementing the PM2.5 Plan which were not previously analyzed in the Final Program EIR for the 2022 AQMP and the Final Program EIR for the 2016 AQMP; and 4) the Final Program EIR for the 2022 AQMP and the Final Program EIR for the 2016 AQMP can be relied on for CEQA compliance. Thus, the PM2.5 Plan is a later activity within the scope of the program approved earlier in the 2022 AQMP and the 2016 AQMP per CEQA Guidelines 15168 (c), and the Final Program EIR for the 2022 AQMP and the Final Program EIR for the 2016 AQMP adequately describe and analyze the activities associated with implementing the PM2.5 Plan for the purposes of CEQA such that no new environmental document will be required. The analysis supporting this conclusion can be found in Appendix VIII of the PM2.5 Plan.

Socioeconomic Impact Assessment
The control measures upon which the Draft PM2.5 Plan relies were previously adopted in either the 2022 AQMP or the 2016 AQMP and there is no material change to the estimated costs previously analyzed in the respective Socioeconomic Impact Assessments. However, the health benefits for attainment year 2030 were not previously quantified. The analysis of implementing the Draft PM2.5 Plan control strategies in the 2030 attainment year indicates an additional reduction in risks from premature deaths and numerous other health effects associated with air pollution among residents in the South Coast Air Basin. The details of the Socioeconomic Impact Assessment can be found in Appendix VII of the PM2.5 Plan.

AQMP and Legal Mandates
The PM2.5 Plan is consistent with the federal CAA and the U.S. EPA's guidelines and is required as part of the SIP revision to address the federal CAA requirements for "serious" nonattainment areas.

Attachments
A. Resolution
B. Draft Final South Coast Air Basin Attainment Plan for the 2012 Annual PM2.5 Standard
C. Transcripts of the Regional Public Hearings
D. Board Presentation

ATTACHMENT A

RESOLUTION NO. 24-____

A Resolution of the South Coast Air Quality Management District (South Coast AQMD) Governing Board determining that the South Coast Air Basin Attainment Plan for the 2012 Annual PM2.5 Standard (PM2.5 Plan) qualifies as a later activity within the scope of the program approved earlier for the 2022 Air Quality Management Plan (AQMP) and the 2016 AQMP per California Environmental Quality Act (CEQA) Guidelines Section 15168 (c), and the Final Program Environmental Impact Report (EIR) for the 2022 AQMP adequately describes the activity for the purposes of CEQA such that no new environmental document is required.

A Resolution of the South Coast AQMD approving the PM2.5 Plan and directing staff to forward South Coast AQMD's PM2.5 Plan to the California Air Resources Board (CARB) for approval and submission to the United States Environmental Protection Agency (U.S. EPA) for inclusion in the State Implementation Plan (SIP).

WHEREAS, the South Coast AQMD Governing Board finds and determines that the PM2.5 Plan is considered a "project" as defined by the California Environmental Quality Act (CEQA); and

WHEREAS, the South Coast AQMD Governing Board finds and determines that: 1) the PM2.5 Plan implements a selected suite of control measures that were previously adopted in the 2022 AQMP and the 2016 AQMP; 2) the Final Program EIR for the 2022 AQMP and the Final Program EIR for the 2016 AQMP evaluated the control measures which are being relied upon for the PM2.5 Plan, and analyzed their potential environmental impacts; 3) no subsequent EIR would be required per CEQA Guidelines Section 15168 (c)(2) because there are no new or modified physical changes that would result from implementing the PM2.5 Plan which were not previously analyzed in the Final Program EIR for the 2022 AQMP and the Final Program EIR for the 2016 AQMP; and 4) the Final Program EIR for the 2022 AQMP and the Final Program EIR for the 2016 AQMP can be relied on for CEQA compliance; and

WHEREAS, the South Coast AQMD Governing Board finds and determines that the PM2.5 Plan is a later activity within the scope of the program approved earlier in the 2022 AQMP and the 2016 AQMP per CEQA Guidelines Section 15168 (c)(2), and the Final Program EIR for the 2022 AQMP and the Final Program EIR for the 2016 AQMP adequately describe the activity associated with implementing the PM2.5 Plan for the purposes of CEQA such that no new environmental document will be required; and

WHEREAS, the South Coast AQMD Governing Board finds and determines that based on substantial evidence in the record and in accordance with the noticing requirements in CEQA Guidelines Section 15168 (e), the PM2.5 Plan qualifies as a later activity within the scope of the program approved earlier for the 2022 AQMP and 2016 AQMP, and the Final Program EIR for the 2022 AQMP and the Final Program EIR for the 2016 AQMP adequately describe the activity for the purposes of CEQA; and

WHEREAS, the South Coast Air Basin is a “serious” nonattainment area for the 2012 annual PM2.5 standard with an attainment date of December 31, 2025; and

WHEREAS, a plan to attain the 2012 annual PM2.5 standard by 2025 was submitted to the U.S. EPA in 2017. However, that plan was withdrawn in 2023 due to U.S. EPA’s delay in considering the plan and subsequent availability of new near-road air quality monitoring data, triggering the need to develop a revised plan; and

WHEREAS, the PM2.5 Plan seeks a five-year extension of the attainment date to 2030, as allowed by Clean Air Act Section 188(e), to address challenges associated with near-road air quality monitors; and

WHEREAS, the South Coast Air Basin is expected to attain the 2012 annual PM2.5 standard in 2030 with the implementation of the 2022 AQMP strategy and limited additional controls to reduce PM2.5 and its precursor emissions as identified in this PM2.5 Plan; and

WHEREAS, the PM2.5 Plan includes an expeditious adoption and implementation schedule of control measures in a cost-effective, feasible, and targeted fashion; and

WHEREAS, the PM2.5 Plan addresses applicable federal CAA requirements, including the implementation of Best Available Control Measures (BACM), Most Stringent Measures (MSM), a Reasonable Further Progress (RFP) demonstration, a comprehensive emissions inventory, a control strategy, an attainment demonstration, contingency measures, quantitative milestones, a transportation conformity budget, and other “serious” nonattainment area SIP requirements; and

WHEREAS, the South Coast AQMD held three AQMP Advisory Group meetings and two Scientific, Technical, and Modeling Peer Review Advisory Group meetings; and

WHEREAS, the Draft PM2.5 Plan was released for public review and comment on March 22, 2024 with a 46-day comment period from March 22, 2024 to May 7, 2024; and

WHEREAS, four regional public hearings were held on April 23, 24, 25, and May 1, 2024 to discuss the Draft PM2.5 Plan. Notice was given of these hearings pursuant to the requirements under the Health and Safety Code Section 40466; and

WHEREAS, the Draft Socioeconomic Impact Assessment for the PM2.5 Plan, provided in Appendix VII of the PM2.5 Plan, was prepared and released for public review and comment on May 2, 2024; and

WHEREAS, the South Coast AQMD Governing Board has considered the Socioeconomic Impact Assessment for the PM2.5 Plan and has made a good faith effort to minimize any adverse impacts; and

WHEREAS, the public hearing has been properly noticed in accordance with all provisions of Health and Safety Code Section 40466 and Code of Federal Regulations Title 40, Part 51, Section 51.102; and

WHEREAS, the South Coast AQMD Governing Board has held a public hearing in accordance with all provisions of law; and

WHEREAS, the South Coast AQMD specifies the Planning and Rules Manager of the PM2.5 Plan as the custodian of the documents or other materials which constitute the record of proceedings upon which the adoption of the PM2.5 Plan is based, which are located at the South Coast AQMD, 21865 Copley Drive, Diamond Bar, California; and

NOW, THEREFORE BE IT RESOLVED, that the South Coast AQMD Governing Board does hereby determine, pursuant to the authority granted by law, that the PM2.5 Plan qualifies as a later activity within the scope of the program approved earlier for the 2022 AQMP and the 2016 AQMP per CEQA Guidelines 15168 (c), and the Final Program EIR for the 2022 AQMP and the Final Program EIR for the 2016 AQMP adequately describe the activity for the purposes of CEQA such that no new environmental document will be required. This information was presented to the South Coast AQMD Governing Board, whose members exercised their independent judgement and reviewed, considered, and approved the information therein prior to acting on the proposed project; and

BE IT FURTHER RESOLVED, that the South Coast AQMD will develop, adopt, submit, and implement applicable control measures in Tables 4-2 and 4-3 of Chapter 4 in the PM2.5 Plan as expeditiously as possible in order to meet or exceed the commitments identified in Table 4-12 of the PM2.5 Plan to attain the 2012 annual PM2.5 standard, and to substitute any other measures as necessary to make up any emission reduction shortfall; and

BE IT FURTHER RESOLVED, that the proposed commitment for emission reductions is for total aggregate emissions reductions that may be achieved through the measures identified in the PM2.5 Plan, alternative measures, incentive programs, and actual emission decreases; and

BE IT FURTHER RESOLVED, that the South Coast AQMD Governing Board, whose members reviewed, considered and approved the information contained in the documents listed herein, adopts the PM2.5 Plan dated June 7, 2024 consisting of the document entitled South Coast Air Basin Attainment Plan for the 2012 Annual PM2.5 Standard as amended by the final changes, if applicable, set forth by the South Coast AQMD Governing Board; and

BE IT FURTHER RESOLVED, that the South Coast AQMD Governing Board directs the Executive Officer to work with CARB and the U.S. EPA and take appropriate action to resolve any completeness or approvability issues that may arise regarding the SIP submission; and

BE IT FURTHER RESOLVED, that the Executive Officer is hereby directed to forward a copy of this Resolution and the PM2.5 Plan to CARB for approval and subsequent submittal to the U.S. EPA for inclusion in the SIP.

DATE: ________________ ________________________________

CLERK OF THE BOARDS

South Coast AQMD

DRAFT FINAL SOUTH COAST AIR BASIN ATTAINMENT PLAN

for the 2012 Annual PM2.5 Standard

CONTRIBUTORS

South Coast Air Quality Management District
(South Coast AQMD)

Wayne Nastri
Executive Officer

Susan Nakamura
Chief Operating Officer

Sarah L. Rees, Ph.D.
Deputy Executive Officer
Planning, Rule Development, and Implementation

Ian MacMillan
Assistant Deputy Executive Officer
Planning, Rule Development, and Implementation

Michael Krause
Assistant Deputy Executive Officer
Planning, Rule Development, and Implementation

Sang-Mi Lee, Ph.D.
Planning and Rules Manager
Planning, Rule Development, and Implementation

Authors

Eric Praske, Ph.D. – Program Supervisor
Jong Hoon Lee, Ph.D. – Air Quality Specialist
Kayla Jordan – Air Quality Specialist
Marc Carreras Sospedra, Ph.D. – Program Supervisor
Rui Zhang, Ph.D. – Senior Staff Specialist
Elham Baranizadeh, Ph.D. – Air Quality Specialist
Cui Ge, Ph.D. – Air Quality Specialist
Jonathan Zhong Liu, Ph.D. – Air Quality Specialist
Li (Alex) Zhang, Ph.D. – Air Quality Specialist (resigned)
Scott Epstein, Ph.D. – Planning and Rules Manager
Ranil Dhammapala, Ph.D. – Senior Meteorologist
Nico Shulte, Ph.D. – Air Quality Specialist
Qijing (Emily) Bian, Ph.D. – Air Quality Specialist
Melissa Maestas, Ph.D. – Air Quality Specialist
Sarady Ka – Program Supervisor
Sergio Torres Callejas – Assistant Air Quality Specialist
Michael Laybourn – Program Supervisor
Yunnie Osias – Air Quality Specialist
Henry Pourzand – Program Supervisor
Tony Tian, Ph.D. – Program Supervisor

Isabelle Shine – Program Supervisor
Joshua Ewell – Assistant Air Quality Specialist
Charlene Nguyen, Ph.D. – Program Supervisor
Yanrong Zhu – Program Supervisor
Emily Yen – Assistant Air Quality Specialist
Brian Choe – Program Supervisor
Ricky Lai – Air Quality Specialist
Jeff Inabinet – Senior Staff Specialist
Lane Garcia – Program Supervisor
Laurence Brown – Air Quality Specialist
Shawn Wang – Program Supervisor
Lizabeth Gomez – Supervising Air Quality Engineer
Rodolfo Chacon – Program Supervisor
James McCreary – Air Quality Specialist
Melissa Gamoning – Air Quality Specialist
Nicole Silva – Program Supervisor
Kevin Ni – Program Supervisor
David Lam – Air Quality Specialist
Jivar Afshar – Air Quality Specialist
Dan Penoyer – Air Quality Specialist
~~Tony Tian – Air Quality Specialist~~

Contributors

Eugene Kang – Planning and Rules Manager
Elaine Shen, Ph.D. – Planning and Rules Manager
Heather Farr – Planning and Rules Manager
Barbara Radlein – Planning and Rules Manager
Ariel Fideldy – Manager (CARB)
Scott King, Ph.D. – Air Pollution Specialist (CARB)

Michael Morris – Planning and Rules Manager
Kalam Cheung, Ph.D. – Planning and Rules Manager
Vicki White – Planning and Rules Manager
Sylvia Vanderspek – Branch Chief (CARB)
Rongsheng Luo – Program Manager II (SCAG)

Reviewers

Barbara Baird, J.D. – Chief Deputy Counsel
Daphne Hsu, J.D. – Principal Deputy District Counsel
Kathryn Roberts, J.D. – Senior Deputy District Counsel ~~II~~

Production

Sally Egan – Graphic Arts Illustrator II
Jack Chin – Supervising Graphic Arts Illustrator
South Coast AQMD Print Shop

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EXECUTIVE SUMMARY

- **Despite great strides in cleaning the air over the past several decades, the Los Angeles area still has among the highest levels of fine particulate matter (PM2.5) pollution in the nation.**

- **The South Coast Air Basin fails to meet the 2012 annual PM2.5 national ambient air quality standard and is classified as a "serious" nonattainment area.**

- **South Coast AQMD submitted a plan to attain the 2012 annual PM2.5 standard by 2025 in 2017; however, the U.S. EPA failed to take timely action on that plan. Due to unforeseen challenges, that plan would no longer provide a path to attaining the standard.**

- **South Coast AQMD developed a new plan to meet the 2012 annual PM2.5 standard. To address the unforeseen challenges, this plan seeks an extension of the attainment date to 2030 as allowed by the Clean Air Act.**

- **The new plan requires accelerated implementation of control measures from the 2022 AQMP as well as limited additional measures to reduce ammonia and direct PM2.5 emissions.**

- **With the emission reductions expected from the strategy listed above, the South Coast Air Basin is expected to meet the 2012 annual PM2.5 standard by 2030.**

Overview

The 17 million residents of the greater Los Angeles area have suffered from some of the worst air quality in the nation. While air quality has improved greatly over the past decade, more needs to be done. The region has the worst levels of ground-level ozone (smog) and among the highest levels of fine particulate matter (PM2.5). PM2.5 is an air pollutant that is either directly emitted into the atmosphere (primary particles) or formed in the atmosphere through chemical reactions (secondary particles). Primary PM2.5 includes road dust, diesel soot, combustion products, and other sources of fine particles. Secondary PM2.5 products, such as sulfates, nitrates, and complex organic compounds, are formed from reactions with oxides of sulfur (SOx), oxides of nitrogen (NOx), volatile organic compounds (VOCs), and ammonia.

The PM2.5 air pollution levels in the region exceed both National and California Ambient Air Quality Standards. High levels of air pollution cause respiratory and cardiovascular disease, exacerbate asthma, and can lead to premature death. We also know that our Environmental Justice (EJ) communities experience the brunt of adverse health effects from air pollution. Approximately 42 percent of the South Coast Air Basin (Basin) residents live in EJ communities.

The United States Environmental Protection Agency (U.S. EPA) requires areas that do not meet a National Ambient Air Quality Standard (NAAQS or standard) to develop and implement strategies to reduce emissions so that healthy levels of air quality can be achieved in a timely manner. The strategy, along with other supporting elements, must be submitted to U.S. EPA for its review and approval into the State Implementation Plan (SIP). Regions must develop SIPs to attain NAAQS by specific dates or face the possibility of sanctions by the federal government and other consequences under the Clean Air Act (CAA). This can result in increased permitting fees, stricter restrictions for permitting new projects, and the loss of federal highway funds.

This document addresses the planning requirements for the 2012 annual PM2.5 NAAQS. The Basin fails to meet this~~e NAAQS for the 2012 annual PM2.5~~ standard and is currently classified as a "serious" nonattainment area. As such, the South Coast AQMD is required by the Clean Air Act to develop a plan to meet the NAAQS. This document is the plan that provides the strategy and the underlying technical analysis for how the Basin will meet the 2012 annual PM2.5 NAAQS as expeditiously as practicable, but no later than December 31, 2030. This Plan does not address the Coachella Valley as that area already attains the 2012 annual PM2.5 NAAQS.

Challenges and Need for a New PM2.5 Plan

Effective April 15, 2015, the U.S. EPA designated the Basin as a "moderate" nonattainment area for the 2012 annual PM2.5 NAAQS.[1] The 2016 Air Quality Management Plan (AQMP) contained the original plan to meet the 2012 annual PM2.5 NAAQS. In that plan, staff concluded that attainment by the "moderate" area deadline of December 31, 2021 was not achievable. As provided for under the Clean Air Act, staff requested that the U.S. EPA reclassify the Basin to "serious" nonattainment, which provided for additional time to attain the standard. Accordingly, a "serious" area attainment plan, demonstrating attainment by December 31, 2025, was also included in the 2016 AQMP.

Despite the 2016 AQMP submittal, U.S. EPA did not act on the PM2.5 "serious" area plan for several years. On December 9, 2020, U.S. EPA reclassified the Basin from "moderate" to "serious" nonattainment for the 2012 annual PM2.5 NAAQS with an attainment deadline by December 31, 2025.[2] U.S. EPA simultaneously raised concerns regarding data from near-road monitors which were established in 2015. These monitors are located along the Interstate 710 (I-710) in Long Beach and the California State Route 60 (CA-60) in Ontario. At the time of 2016 AQMP adoption, neither of these monitors had collected enough data to be considered in plans. By January 1, 2020, however, these monitors had accumulated sufficient data to be considered in SIP attainment demonstrations. Based on 2020–2022 monitoring data, the CA-60 near-road monitoring site had the highest PM2.5 level in the Basin at 13.7 μg/m^3. U.S. EPA indicated that it could not approve the "serious" area plan included in the 2016 AQMP since, at the time the reclassification request was approved, the near-road monitors were now eligible to be considered in attainment demonstrations. U.S. EPA subsequently requested a supplemental attainment demonstration for the near-road monitors.

On January 12, 2023, U.S. EPA was sued over its failure to take timely action on the "serious" area plan in the 2016 AQMP. To avoid potential disapproval of the plan by U.S. EPA, which would have triggered sanction clocks, South Coast AQMD withdrew the "serious" area plan. As a consequence of withdrawal, South Coast AQMD is required to develop a new plan to address attainment of the 2012 annual PM2.5 NAAQS.

While the 2016 AQMP had predicted attainment of the 2012 annual PM2.5 NAAQS by 2025, this PM2.5 Plan requests an attainment date extension to December 31, 2030 as allowed under CAA Section 188(e). There are multiple factors contributing to the extension of the attainment date. The addition of the near-road monitors, which were not considered in the 2016 AQMP, is one of the primary reasons for the longer timeframe needed for attainment. In addition, due to a lack of action at the federal level, sources such as interstate trucks, ships, locomotives, and aircraft have not been controlled sufficiently, which has resulted

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1 Air Quality Designations for the 2012 Primary Annual Fine Particle ($PM_{2.5}$) National Ambient Air Quality Standards (NAAQS), 80 Fed. Reg. 2206 (Jan. 15, 2015)

2 Approval and Promulgation of Implementation Plans; Designation of Areas for Air Quality Planning Purposes; California; South Coast Moderate Area Plan and Reclassification as Serious Nonattainment for the 2012 PM2.5 NAAQS, 85 Fed. Reg. 71264 (Nov. 9, 2020)

in emission reduction shortfalls for attainment of ozone standards. Other unforeseen challenges that have complicated attainment include unfavorable meteorology, wildfires, and increases in emissions in the goods movement sector during the COVID-19 pandemic.

Control Measures and Attainment Strategy

U.S. EPA requires PM2.5 plans to address directly-emitted PM2.5 and the gases that form PM2.5 in the atmosphere. These gases are known as precursors, and they include SOx, NOx, VOCs, and ammonia. While the main sources of NOx are on-road and off-road mobile sources, direct PM2.5 emissions are driven by stationary area sources, such as cooking and resuspended particles from paved roads. Ammonia emissions are driven by both area and mobile sources. Control measures for VOCs and SOx are not included in the attainment strategy as these precursors have an insignificant contribution to PM2.5 in the Basin.

The reductions needed to meet the 2012 annual PM2.5 NAAQS will come from three categories.

1) **Already adopted rules and programs.** Rules and programs that have already been adopted by the South Coast AQMD will continue to bring emission reductions of PM2.5 and its precursors. These reductions are already reflected in the baseline (i.e., Business-As-Usual) emissions. Under baseline conditions, NOx and direct PM2.5 emissions are expected to decline by 45 percent and 4 percent from 2018 to 2030, respectively.

2) **Actions from the 2022 AQMP.** The NOx strategy committed in the 2022 AQMP to attain the 2015 8-hour ozone NAAQS by 2037 is expected to reduce both NOx and direct PM2.5 emissions by 2030. Among the control measures included in the 2022 AQMP, those that can be implemented by 2030 were identified and included in this Plan. Both NOx emission reductions and concurrent PM2.5 reductions from 2022 AQMP NOx control measures were quantified in this PM2.5 Plan.

3) **Limited additional reductions of ammonia and direct PM2.5**. These additional reductions will be pursued to satisfy U.S. EPA's stringency requirements. This PM2.5 Plan is required to satisfy U.S. EPA's requirements including Best Available Control Measures (BACM) and Most Stringent Measures (MSM). Demonstrating BACM and MSM is independent of attainment and therefore some control measures, which are surplus to the attainment strategy, are included. For details on the BACM and MSM requirements and analysis, refer to Appendix III.

South Coast AQMD proposes a total of 38 control measures for the PM2.5 Plan. Out of the 38 proposed control measures, 23 measures target reductions from stationary sources and the remaining 15 measures target reductions from mobile sources. The stationary source measures are grouped into the following categories: NOx measures, direct PM2.5 measures, ammonia measures, co-benefits from energy and climate change programs, and other measures. Meanwhile, the mobile source measures are grouped into the following categories: emission growth management measures, facility-based mobile source measures, on-road and off-road measures, incentive-based measures, and other measures. Overall, emissions of

NOx and PM2.5 will reduce by 207.7 tons per day and 3.4 tons per day, respectively, between 2018 and 2030.

Attainment Demonstration

Air quality modeling is used to demonstrate future attainment of the PM2.5 standard and is an integral part of the planning process. Modeling shows the connection between emission reductions and a path to attainment. It reflects updated emissions estimates, new technical information, enhanced air quality modeling techniques, updated attainment demonstration methodology, and the control strategy.

The modeling platform consists of a suite of modeling tools that calculate air pollutant emissions, meteorological conditions that drive the transport of pollutants, and chemical transformation of pollutants to predict the concentrations of PM2.5 and its precursors. The modeling setup is an upgrade from the modeling platform used in the 2022 AQMP and incorporates new versions of the Weather Research Forecast (WRF) meteorological model and the Community Multiscale Air Quality (CMAQ) model. Emissions modeling incorporates detailed information from satellite observations, vehicle traffic sensor data, and communication platforms for aircraft and ocean-going vessels, to refine emissions spatial and temporal distribution.

For the first time in a South Coast Air Basin PM2.5 plan, the design site for the annual PM2.5 standard is a near-road monitor. That site is the near-road monitor that is located by the CA-60 freeway in Ontario. Modeling the air quality in this site presents challenges to regional air quality models commonly used in attainment demonstrations. The U.S. EPA modeling guidance for attainment demonstrations[3] recognizes the limitations of regional models to represent the steep gradients in PM2.5 around near-road sites and acknowledges that demonstrating attainment at near-road sites may require different treatment compared to other monitors. This PM2.5 plan employs a hybrid approach that combines traditional regional modeling with dispersion modeling around the near-road site. The hybrid modeling helps characterize the contribution of near-road sources to measured PM2.5 at the near-road monitor to better quantify the benefits of emission controls on on-road sources. Other than the near-road monitor at Ontario CA-60, the traditional regional modeling approach was employed to demonstrate attainment at all stations in the Basin.

With the proposed control measures and emissions reductions, the attainment strategy in this Plan will result in meeting the 2012 annual PM2.5 standard by 2030 at all the stations in the Basin.

[3] Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5, and Regional Haze, U.S. EPA, Office of Air Quality Planning and Standards. Available at: https://www.epa.gov/sites/default/files/2020-10/documents/o3-pm-rh-modeling_guidance-2018.pdf

Health Benefits

A Socioeconomic Impact Assessment, which includes quantification of public health benefits, is being prepared and will be released for public review at least 30 days prior to the Public Hearing.

Collaboration, Public Process, and Outreach

The development of the PM2.5 Plan has been a regional, multi-agency effort that includes South Coast AQMD, CARB, the Southern California Association of Governments, and the U.S. EPA. The PM2.5 Plan also incorporates collaborative efforts by a wide range of stakeholders such as businesses, environmental and health organizations, community groups, and academia. As shown in Figure ES-1, development of the PM2.5 Plan involved numerous types of public meetings to promote collaboration and public participation. Meeting materials for the regional public hearings ~~will be~~were translated to Spanish and ~~will~~ all hearings ~~featured~~were provided with ~~–~~ live Spanish translation. Agendas and presentations for each meeting will be forthcoming.

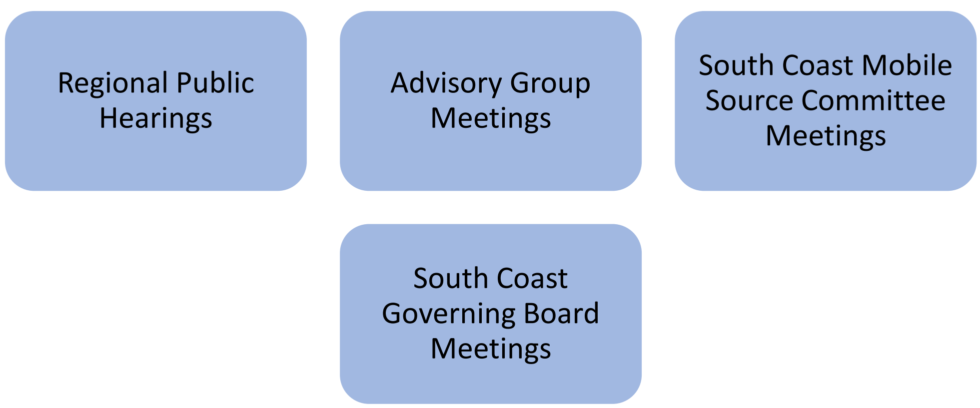


FIGURE ES-1
VENUES ACCOMMODATING STAKEHOLDER PARTICIPATION

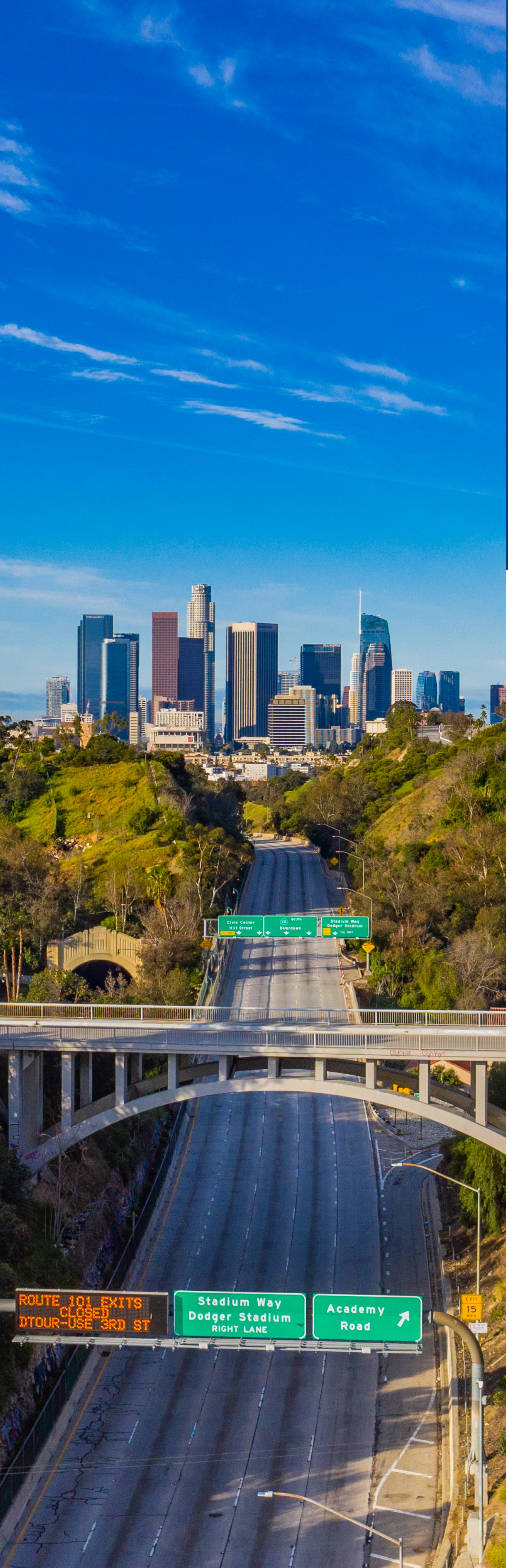
Implications of a New PM2.5 Standard for the Basin

U.S. EPA recently revised the annual PM2.5 standard from its current level of 12 $\mu g/m^3$ to 9.0 $\mu g/m^3$.[4] The new standard is the result of an extensive scientific review conducted by U.S. EPA's Clean Air Scientific

[4] Reconsideration of the National Ambient Air Quality Standards for Particulate Matter, 89 Fed. Reg. 16202 (Mar. 6, 2024)

Advisory Committee (CASAC), which found that the 12 μg/m^3 standard does not sufficiently protect public health.

This PM2.5 Plan, together with the 2022 AQMP, serves as a steppingstone for attaining the 2024 PM2.5 NAAQS. However, even after implementing the control strategy of this Plan, air quality modeling predicts that the 2030 design value will be 11.7 μg/m^3, significantly higher than the new 9.0 μg/m^3 standard. Preliminary results suggest that even implementation of the 2022 AQMP strategy, which targets attainment of the 2015 8-hour ozone NAAQS by 2037, will be insufficient to lower the design value to 9.0 μg/m^3. Substantial emission reductions especially of direct PM2.5 will therefore be required to meet the new standard. South Coast AQMD commits to develop the optimal attainment strategy that considers stakeholder feedback while ensuring expeditious attainment of the 2024 PM2.5 standard.



CHAPTER 1

Introduction

- **PM2.5 levels have improved dramatically in the South Coast Air Basin (Basin) over the past several decades, yet the region still experiences among the highest PM2.5 levels in the nation, leading to significant health issues.**

- **The Basin is in "serious" nonattainment of the 2012 annual PM2.5 standard and the Clean Air Act requires South Coast AQMD to develop and implement an emission reduction strategy to meet the standard.**

- **This document is the plan to meet the 2012 annual PM2.5 standard in the Basin by December 31, 2030.**

- **The emission reductions to be achieved through implementing this plan will assist the Basin in meeting the 2024 annual PM2.5 standard.**

Purpose

The greater Los Angeles area experiences some of the worst air pollution in the nation. While tremendous progress has been made in reducing levels of air pollution over that past several decades, the region still has the highest levels of ozone, and among the highest levels of fine particulate matter (PM2.5) in the country. These air pollutants cause substantial health impacts, including respiratory and cardiovascular disease, worsening asthma symptoms, and premature death.

The federal Clean Air Act (CAA or Act) requires areas that do not meet the health-based National Ambient Air Quality Standards (NAAQS or standards) to develop and implement an emission reduction strategy to attain healthy levels of air quality in a timely manner. The South Coast Air Basin (Basin) fails to meet the 2012 annual PM2.5 NAAQS and is currently classified as a "serious" nonattainment area for that standard. The South Coast Air Basin Attainment Plan for the 2012 Annual PM2.5 Standard (PM2.5 Plan or Plan) provides the strategy and the underlying technical analysis for how the region will meet the 2012 annual PM2.5 NAAQS in the Basin as expeditiously as practicable, but no later than December 31, 2030. This Plan does not address the Coachella Valley as that area already meets the 2012 annual PM2.5 NAAQS. It also does not address attainment of other NAAQS as those are addressed in the 2016 and 2022 Air Quality Management Plans (AQMPs).[1,2]

Federal 2012 Annual PM2.5 Standard

On December 14, 2012, the U.S. EPA strengthened the primary annual NAAQS for PM2.5 to 12 micrograms per cubic meter ($\mu g/m^3$).[3] Under the CAA, there are two tiers of nonattainment for areas that fail to meet PM2.5 standards; "moderate" and "serious." Nonattainment areas are classified by the U.S. EPA into one of these two tiers based on the levels of PM2.5 in the region. Effective April 15, 2015, the U.S. EPA designated the South Coast Air Basin (Basin) as a "moderate" nonattainment area for the 2012 annual PM2.5 NAAQS.[4] Pursuant to Clean Air Act (CAA) Section 189(a)(2)(B), "moderate" nonattainment areas must submit a plan showing how the region will meet the standard by the date required by the CAA.no later than 18 months from the date of designation. "Moderate" nonattainment areas are required to meet the 2012 annual PM2.5 standard as expeditiously as practicable, but no later than the end of the sixth calendar year after the designation (i.e., December 31, 2021) and "serious" nonattainment areas are required to attain the standard as expeditiously as practicable, but no later than the end of the tenth calendar year after the designation (i.e., December 31, 2025). Under CAA Section 188(e), "serious"

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[1] Final 2016 Air Quality Management Plan, https://www.aqmd.gov/home/air-quality/clean-air-plans/final-2016-aqmp

[2] 2022 Air Quality Management Plan, https://www.aqmd.gov/home/air-quality/clean-air-plans/air-quality-mgt-plan

[3] National Ambient Air Quality Standards for Particulate Matter, 78 Fed. Reg. 3086 (January 15, 2013)

[4] Air Quality Designations for the 2012 Primary Annual Fine Particle ($PM_{2.5}$) National Ambient Air Quality Standards (NAAQS), 80 Fed. Reg. 2206 (Jan. 15, 2015)

nonattainment areas may request an attainment date extension to no later than the end of the fifteenth calendar year after the designation (i.e., December 31, 2030).

California Annual PM2.5 Standard

The California Clean Air Act (CCAA),[5] enacted in 1988, provides a framework for air quality planning and established a legal mandate for CARB to achieve health-based state air quality standards for ozone, carbon monoxide, sulfur dioxide, and nitrogen dioxide at the earliest practicable date. Although not required by the CCAA, state standards for particulate matter are contained in Title 17 of the California Code of Regulations (CCR).[6] In June 2002, CARB promulgated the state annual average PM2.5 standard of 12 $\mu g/m^3$ for which the Basin is designated nonattainment. The CCAA specifies multiple requirements for ozone plans, such as requiring plans to be reviewed every three years, demonstrating plan effectiveness, implementing all feasible measures, reducing population exposure, and ranking control measures by cost-effectiveness.[7] However, these CCAA requirements do not directly apply to PM2.5 plans and no requirements were specified for PM2.5.

2016 AQMP

The South Coast AQMD developed the 2016 AQMP as the comprehensive blueprint for how the region will attain five NAAQS – three ozone standards (1979 1-hour, 1997 8-hour and 2008 8-hour), the 2006 24-hour PM2.5 standard and the 2012 annual PM2.5 standard. The 2016 AQMP concluded that attainment by the "moderate" area deadline of December 31, 2021, was impractical and requested reclassification of the Basin to "serious" nonattainment for the 2012 annual PM2.5 standard as provided in the CAA. Accordingly, South Coast AQMD included a "serious" area attainment plan in the 2016 AQMP that demonstrated attainment by December 31, 2025. The 2016 AQMP was adopted by the South Coast AQMD Governing Board on March 3, 2017, and submitted to U.S. EPA for approval on April 27, 2017, via the California Air Resources Board (CARB).

The CAA requires U.S. EPA to determine the completeness of any State Implementation Plan (SIP) submittal within 6 months of receipt and take final action on the submitted SIP by approving or disapproving, either in full or in part, within 12 months of the date the submittal has been deemed complete.[8] Despite the SIP being deemed complete by operation of law on October 27, 2017, U.S. EPA did not act on the PM2.5 "serious" area plan for several years. On December 9, 2020, U.S. EPA reclassified the Basin from "moderate" to "serious" nonattainment for the 2012 annual PM2.5 NAAQS per South Coast

[5] Health and Safety Code Sections 40910 et seq.

[6] CCR Title 17, § 70200

[7] Health and Safety Code Sections 40913, 40914, 40920, 40922, and 40925

[8] 42 U.S.C. § 7410(k)(1)–(4)

AQMD's previous request, establishing an attainment deadline of December 31, 2025.[9] U.S. EPA committed to evaluate and act on the PM2.5 "serious" area plan through subsequent rulemakings.

U.S. EPA's Concerns with the Annual PM2.5 Plan in the 2016 AQMP

Since the adoption of the 2016 AQMP, new challenges emerged that were not considered in the "serious" area plan. In 2015, two near-road monitors were established in the Basin, along the Interstate 710 (I-710) in Long Beach and the California State Route 60 (CA-60) in Ontario. When the U.S. EPA strengthened the annual PM2.5 NAAQS to 12 µg/m^3 on December 14, 2012, it added a requirement to monitor near the most heavily trafficked roadways in large urban areas. Particle pollution is expected to be higher along these roadways as a result of direct emissions from cars and heavy-duty diesel trucks and buses. The South Coast AQMD installed the two required PM2.5 monitors before January 1, 2015. The locations are I-710, located at Long Beach Blvd. in Los Angeles County near Compton and Long Beach; and CA-Route 60, located west of Vineyard Avenue near Ontario, Mira Loma and Upland. –At the time of 2016 AQMP adoption, these monitors had not collected sufficient data to establish valid design values, which requires three years of valid data. As a result, the data from the near-road monitors were excluded from the attainment demonstration. By January 1, 2020, these monitors had accumulated sufficient data to establish design values, allowing them to be considered in SIP attainment demonstrations.

Based on 2020–2022 monitoring data, the CA-60 near-road monitoring site had the highest PM2.5 level in the Basin at 13.7 µg/m^3. This is above the 2012 annual standard of 12 µg/m^3. U.S. EPA indicated that it could not approve the "serious" area attainment demonstration included in the 2016 AQMP since, at the time the reclassification request was approved, the near-road monitors were eligible to be considered in attainment demonstrations. U.S. EPA subsequently requested a supplemental attainment demonstration that included data from the near-road monitors.

Need for a New PM2.5 Plan

On January 12, 2023, the Center for Biological Diversity sued U.S. EPA over its failure to act on the "serious" area plan in the 2016 AQMP by the statutory due date. As U.S. EPA indicated that the 2016 plan was no longer approvable, South Coast AQMD submitted a request via CARB on March 29, 2023, to withdraw the 2016 AQMP "serious" area plan for the 2012 annual PM2.5 NAAQS. As a consequence of withdrawal, South Coast AQMD is required to develop a new plan to address attainment of the 2012 annual PM2.5 NAAQS.

[9] Approval and Promulgation of Implementation Plans; Designation of Areas for Air Quality Planning Purposes; California; South Coast Moderate Area Plan and Reclassification as Serious Nonattainment for the 2012 $PM_{2.5}$ NAAQS, 85 Fed. Reg. 71264 (November 9, 2020)

While the 2016 AQMP had predicted attainment of the 2012 annual PM2.5 NAAQS by 2025, this PM2.5 Plan requests an attainment date extension to December 31, 2030, as allowed under CAA Section 188(e). There are multiple factors contributing to the extension of the attainment date. The addition of the near-road monitors, which were not considered in the 2016 AQMP, is one of the primary reasons for the longer timeframe needed for attainment due to the high levels of PM2.5 at those monitors. In addition, the attainment strategy in the 2016 AQMP relied on co-benefits from measures to attain the 1997 8-hour ozone standard by 2023 and the 2008 8-hour ozone standard by 2031. Since the submittal of the 2016 AQMP, South Coast AQMD has implemented control measures and achieved emission reductions reflected in the 2016 AQMP attainment demonstration. However, a transition to low emission technologies did not occur across all sources, primarily due to a lack of action at the federal level to address emissions from aircraft, ships, trains, portions of heavy-duty trucks, and off-road equipment. These heavy-duty mobile sources contribute most of the pollution in the region and are subject to federal regulatory authority with limited ability for local regulation. Additional challenges that were not foreseen at the time of 2016 AQMP adoption include unfavorable meteorology, wildfires, increases in emissions in the goods movement sector during the COVID-19 pandemic, and the addition of the near-road monitors.

This PM2.5 Plan reviews the current status of PM2.5 air quality from all monitors in the region, develops a new strategy to attain the 2012 annual PM2.5 NAAQS as expeditiously as practicable, but no later than December 31, 2030, and satisfies all applicable “serious” area requirements.

Format of This Document

This document is organized into seven chapters, each addressing a specific topic. Each of the chapters is summarized here.

Chapter 1, “Introduction,” includes background on the annual PM2.5 standard, 2016 AQMP, U.S. EPA’s concerns with the annual PM2.5 plan in the 2016 AQMP, and the need for a new plan to address the standard.

Chapter 2, “Air Quality,” discusses the Basin’s current PM2.5 air quality in comparison with federal and State health-based air pollution standards and exceptional events.

Chapter 3, “Emissions Inventory,” summarizes the emissions inventory, estimates current emissions by source, and projects future emissions.

Chapter 4, “Control Strategy,” presents the control strategy, specific control measures for stationary and mobile sources, and implementation schedules to attain the 2012 annual PM2.5 standard by the specified attainment date.

Chapter 5, “Attainment Demonstration,” describes the air quality modeling approach used in the PM2.5 Plan.

Chapter 6, “Federal Clean Air Act Requirements,” discusses requirements associated with the request to extend the attainment date, the motor vehicle emissions budget, Reasonable Further Progress, quantitative milestones, and contingency measures.

Chapter 7, “Environmental Justice Communities,” describes air quality impacts experienced in environmental justice communities and outlines some of the steps South Coast AQMD is taking to address localized impacts.

Chapter 8, “Public Process and Participation,” describes South Coast AQMD’s public outreach effort associated with development of the PM2.5 Plan.

CHAPTER 2

Air Quality

- PM2.5 concentrations were measured at 22 sites throughout the South Coast Air Basin in 2022 and have decreased significantly over the past two decades.

- PM2.5 levels are strongly influenced by meteorology, emissions of primary PM2.5 as well as the emissions of secondary PM2.5 precursors.

- While the 2022 annual PM2.5 design value exceeded the 2012 PM2.5 federal standard, the South Coast Air Basin reported the lowest annual average PM2.5 concentration in 2022 since PM2.5 monitoring began.

Introduction

In this chapter, ambient fine particulate matter (PM2.5) as monitored by South Coast AQMD is summarized for the year 2022 and prior year trends in the South Coast Air Basin (Basin). The factors influencing PM2.5 concentrations are also discussed. South Coast AQMD's recent air quality is compared to the NAAQS and to the California Ambient Air Quality Standards (CAAQS or State standards). Data presented indicate the current attainment or nonattainment status for the various NAAQS and CAAQS PM2.5 standards, showing the progress made to date and assisting the South Coast AQMD in planning for future attainment.

The South Coast AQMD began regular monitoring of PM2.5 in 1999 following the U.S. EPA's adoption of the national PM2.5 standards in 1997. In 2022, ambient PM2.5 concentrations were monitored at 22 locations throughout the South Coast Air Basin, including two near-road sites. Two types of PM2.5 sampling methods are used in the region. Federal Reference Method (FRM) samplers pull ambient air through a filter over a 24-hour period. The filter is then removed and weighed to determine ambient PM2.5 concentrations during the sampling period. The PM2.5 NAAQS are defined based on FRM measurements. The Federal Equivalent Method (FEM) samplers used by South Coast AQMD are Beta Attenuation monitors that report hourly PM2.5 concentrations continuously, which are averaged over a 24-hour period to determine daily averages. Because FRM data is the reference data for NAAQS purposed, FEM monitors undergo annual assessments by the U.S. EPA to determine their eligibility for NAAQS comparison.[1] While measurements from these two techniques produce similar concentrations, there still is some variation, with FEM samplers typically reading higher than collocated FRM samplers. ~~The PM2.5 NAAQS are defined based on FRM measurements.~~

Of the 22 monitoring stations in our region, f~~F~~ilter-based FRM PM2.5 sampling was employed at 14 of these stations. Seven of the FRM measurement stations, including the two near-road sites, were sampled daily to improve temporal coverage beyond the required 1-in-3-day sampling schedule. Eighteen stations, including two near-road sites, employed continuous PM2.5 monitors and ten of these were collocated with FRM measurements. Among the 18 stations with continuous PM2.5 monitors, seven stations utilize FEM monitors, while three stations use special purpose monitors (SPM) for continuous PM2.5 measurement. ~~FEM monitors undergo annual assessments by the U.S. EPA to determine their eligibility for NAAQS~~ In 2021,[2] all FEM monitors, except for the one at the Los Angeles-North Main Street station, successfully passed the comparability assessment. Therefore, the daily averages from these monitors can be used to supplement FRM measurements on days with missing data. The SPM monitors are newly established FEM monitors that have not collected three years of data required for the NAAQS-

[1] The continuous PM2.5 monitors deployed by South Coast AQMD are FEM-designated Beta Attenuation Monitor (BAM) instruments. The U.S. EPA waiver from NAAQS compliance for the continuous samplers is re-evaluated annually as part of the South Coast AQMD Annual Air Quality Monitoring Network Plan [http://www.aqmd.gov/home/air-quality/clean-air-plans/monitoring-network-plan]

[2] At the time when this plan was drafted, the latest PM2.5 continuous monitor comparability assessment waiver approved by the U.S. EPA was for the design value period of 2019-2021

comparability assessment. They are eligible for comparison to NAAQS after they have been operated for more than 24 months unless a waiver has been granted by U.S. EPA. The continuous data is used for forecasting, real-time air quality alerts, predictive air quality advisories, and for evaluating hour-by-hour variations. Figure 2-1 provides the location of all regulatory PM2.5 monitors within the Basin.

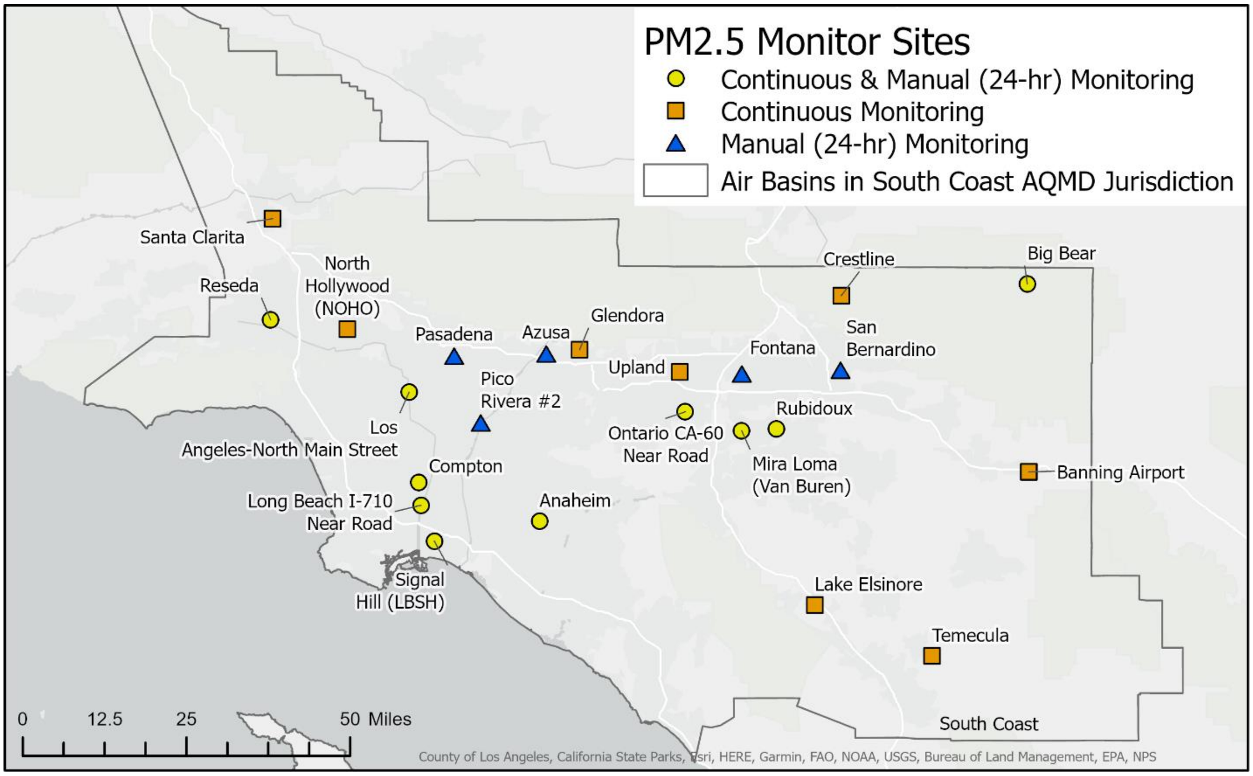

FIGURE 2-1

LOCATION OF ALL REGULATORY MONITORS IN THE SOUTH COAST AIR BASIN

Inhalation of fine particulate matter has been associated with a wide variety of health effects, including premature death. Other health impacts include exacerbation of symptoms in patients with respiratory or cardiovascular disease, decline in pulmonary function in children, increased risk of lung cancer, and potentially may be linked to adverse reproductive and cognitive effects. Some of the impacts of these health effects may be seen in increased asthma-related hospital admissions, increased school absences and lost workdays. Elevated PM2.5 concentrations also impair visibility. Detailed health effects information can be found in Appendix I: Health Effects in the 2022 AQMP[3] or in the U.S. EPA NAAQS documentation at https://www.epa.gov/naaqs.

Factors that Influence PM2.5 Concentrations

The South Coast Air Basin's air pollution problems are a consequence of the combination of emissions from the nation's second largest urban area, meteorological conditions that limit~~adverse to~~ the dispersion of those emissions, and mountainous terrain surrounding the Basin that traps pollutants as they are pushed inland with the sea breeze. PM2.5 is a suspension of solid or liquid particles that are less than 2.5 micron in diameter. There are two forms of PM2.5 - primary and secondary. Primary PM2.5 particles are directly emitted by combustion sources such as vehicles, industrial processes, cooking, or fires. Secondary PM2.5 is formed in the atmosphere through a series of complex chemical reactions of PM2.5 precursors such as volatile organic compounds (VOCs), oxides of nitrogen (NOx), and ammonia (NH_3) (Figure 2-2). The precursors that form PM2.5 are from mobile, point and area sources, with the largest portion resulting from fuel combustion. Both directly emitted PM2.5 and secondary PM2.5 that is formed in the atmosphere contribute to measured PM2.5 concentrations, but in the South Coast Air Basin, secondary PM2.5 formation is responsible for approximately two thirds of the total PM2.5 mass (Figure 2-3). Because secondary PM2.5 is a substantial portion of overall PM2.5 levels in the region, control strategies to reduce PM must address both sources of direct emissions as well as the PM2.5 precursors.

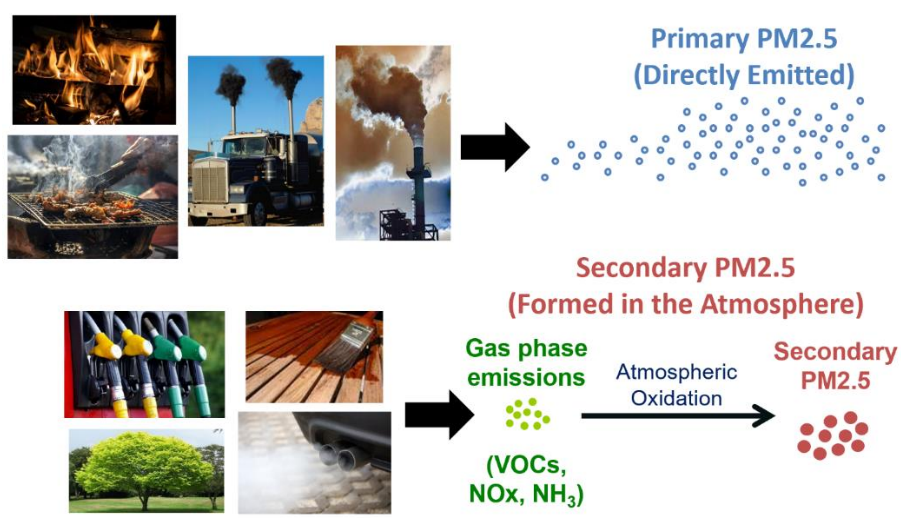

FIGURE 2-2

[3] Available at www.aqmd.gov/2022aqmp

PM2.5 FORMATION MECHANISMS

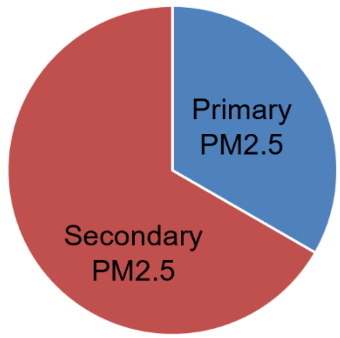

FIGURE 2-3
APPROXIMATE CONTRIBUTION OF SECONDARY AND PRIMARY PM2.5 IN THE SOUTH COAST AIR BASIN[4]

Most sources of PM2.5 and PM2.5 precursors have regular patterns of emissions that may vary by time of day, day of the week or by season. However, episodes of elevated PM2.5 can be caused by emission sources that occur infrequently such as wildfires, fireworks, or residential wood combustion. Wildfires are an important source of PM2.5 and PM2.5 precursors and can lead to multiple days of high PM2.5 levels, especially during the summer and fall months when fire activity is likely. Fireworks, either from commercial displays or personal use, are a significant source of PM2.5 on July 4th and 5th each year; concentrations recorded on these days are typically the highest measured in the entire year. Residential wood combustion is also an important source of PM2.5 and PM2.5 precursors, predominantly during the months of November through February. Residents are more likely to burn wood on cool nights, on the weekends, and during holiday periods. The spatial heterogeneity in PM2.5 emissions and micro meteorology lead to significant differences in PM2.5 measurements throughout the Basin.

While long term trends in PM2.5 concentrations are largely driven by changes in emissions, the observed day to day variations in PM2.5 concentrations are primarily the result of meteorological changes except on days with elevated atypical emissions such as fireworks, wildfires, or residential wood combustion. Elevated PM2.5 concentrations can occur in the Basin throughout the year but occur most frequently in

[4] Fractions of primary and secondary PM were estimated using the PM2.5 speciation data measured at the Los Angeles-North Main street from June 2012 to July 2018. The total mass of the elemental carbon and metals was assigned as primary PM2.5. The total mass of inorganic ions was assigned as secondary PM2.5. For organic aerosols, we referred to Figure V-6-20 in the Appendix V of the South Coast AQMD's 2016 Air Quality Management Plan (AQMP) and assigned 30 percent of the organic aerosol as primary PM2.5 and 70% to the secondary PM2.5 fraction. Appendix V of the 2016 AQMP is available at https://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2016-air-quality-management-plan/final-2016-aqmp/appendix-v.pdf?sfvrsn=10

fall and winter. This is mainly due to the unfavorable meteorological conditions that are more common in those months. Figure 2-4 summarizes the meteorological factors that influence PM2.5 concentrations.

FIGURE 2-4
IMPORTANT FACTORS THAT INFLUENCE PM2.5 CONCENTRATIONS

The average wind speed for Los Angeles is the lowest of the nation's 10 largest urban areas, resulting in reduced dispersion throughout the region. In addition, the summertime daily maximum mixing heights[5] in Southern California are the lowest, on average, due to strong temperature inversions in the lower atmosphere that effectively trap pollutants–both primary PM2.5 and the PM2.5 precursors–near the surface. Southern California also has abundant sunshine, which drives the photochemical reactions that form secondary PM2.5. Periods of fog or high humidity can also lead to elevated PM2.5 concentrations as chemistry in fog droplets can increase fine particle mass.

Weather disturbances and rainstorms, which predominantly occur during the winter months, are effective in reducing ambient PM2.5 concentrations. Enhanced ventilation and the breakup of elevated inversion layers facilitate atmospheric mixing. Rainfall is extremely effective in reducing PM2.5 concentrations in the atmosphere. The frequency of these disturbances can strongly influence both the 98th percentile highest daily average concentrations and the annual average concentrations, which are the key parameters to determine attainment of the 24-hour PM2.5 standard and the annual PM2.5 standard, respectively.

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[5] The maximum mixing height is an index of how well pollutants can be dispersed vertically in the atmosphere. The greater the mixing height, the greater the ventilation, and the more that pollutants are dispersed

Ambient Air Quality Standards

Federal and State Standards

Ambient air quality standards have been set by both the federal government and the State of California for fine particulate matter. In this chapter, statistics capturing the number of days exceeding federal standards are presented along with concentration trends and design values calculated from measurement data. Exceedance metrics are instructive regarding trends and control strategy effectiveness. However, it should be noted that an exceedance of the concentration level of a federal standard does not necessarily mean that the NAAQS was violated or that it would cause nonattainment. The form of the standard must also be considered. For example, for 24-hour PM2.5, the form of the standard is the annual 98th percentile measurement of all the 24-hour PM2.5 daily samples at each station. At a station with daily measurements, this corresponds to the 8th highest daily PM2.5 measurement.

For PM2.5 NAAQS attainment/nonattainment decisions, the most recent three years of data are considered along with the form of the standard, to calculate a *design value* for each station.[6] Design values are the statistical metrics used to compare with the NAAQS to determine attainment. The overall design value for an air basin is the highest design value of all the stations in that basin. The California State air quality standards are values not to be exceeded, typically evaluated over a three-year period, and the data is evaluated in terms of a *State Designation Value*, which allows for some statistical data outliers and exceptional events. Attainment deadlines for the State standards are 'as soon as practicable.'

[6] Note that for modeling attainment demonstrations, the U.S. EPA modeling guidance recommends a 5-year weighted average for the design value instead of the 3-year

TABLE 2-1
NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS) AND DESIGN VALUE REQUIREMENTS FOR FINE PARTICULATE MATTER

Averaging Time**	NAAQS Level	Design Value Form of NAAQS*
24-Hour (2006)	**35 µg/m^3**	**Three-year average of the annual 98th percentile of daily 24-hour concentration**
24-Hour (1997) ***	65 µg/m^3	
Annual (2012)	**12.0 µg/m^3**	**Annual average concentration, averaged over three years** *(annual averages based on average of 4 quarters)*
Annual (1997) ***	15.0 µg/m^3	
Annual (2024)****	9.0 µg/m^3	

Bold text denotes the current and most stringent NAAQS.
* The NAAQS is attained when the design value (form of concentration listed) is equal to or less than the level of the NAAQS.
** Year of U.S. EPA NAAQS update review shown in parenthesis and revoked or revised status in brackets; for revoked or revised NAAQS, areas may have continuing obligations until that standard is attained.
*** On July 25, 2016 U.S. EPA finalized a determination that the Basin attained the 1997 annual (15.0 µg/m^3) and 24-hour PM2.5 (65 µg/m^3) NAAQS, effective August 24, 2016.
**** On March 6, 2024, U.S. EPA strengthened the annual PM2.5 NAAQS, effective May 6, 2024.

TABLE 2-2

CALIFORNIA AMBIENT AIR QUALITY STANDARDS (CAAQS) AND DESIGNATION VALUE REQUIREMENTS FOR FINE PARTICULATE MATTER

Averaging Time**	CAAQS Level	Designation Value Form of CAAQS*
Annual (2012)	12.0 µg/m^3	Annual average of the daily 24-hour concentrations. Maximum value in a three-year

* The CAAQS is attained when the designation value (form of concentration listed) is equal to or less than the level of the CAAQS.

Under the Exceptional Events Rule,[7] U.S. EPA allows certain air quality data to not be considered for NAAQS attainment status when that data is influenced by exceptional events that meet strict evidence requirements, such as high winds, wildfires, volcanoes, or some cultural events (such as Independence Day or New Year's fireworks). An exceptional event meets the following criteria:

- The event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation;
- The event was not reasonably controllable or preventable; and
- The event was caused by human activity that is unlikely to recur at a particular location or was a natural event.

For a few PM measurements in the Basin between 2016 and 2022, the South Coast AQMD applied the U.S. EPA Exceptional Events Rule to flag these PM2.5 data due to wildfires and fireworks on Independence Day. All of the PM exceptional event flags through 2022 have been submitted with the affected data to U.S. EPA's Air Quality System (AQS) database. PM2.5 attainment designation for the South Coast Air Basin will likely depend upon U.S. EPA's concurrence with the exceptional event flags and the analysis demonstrating that exceedances were caused by wildfire smoke and/or Independence Day fireworks.

Attainment Status of the Annual PM2.5 Standard

The 2022 PM2.5 annual federal design values are summarized in Table 2-3. Data likely to be approved as exceptional events by U.S. EPA are removed from this analysis. The highest 2022 PM2.5 federal annual design value of 13.7 μg/m^3 was measured in the Ontario CA-60 Near Road air monitoring station. The next highest 2022 PM2.5 federal annual design value was 13.4 μg/m^3, measured in the Metropolitan Riverside County area at the Mira Loma air monitoring station.

TABLE 2-3
2020–2022 ANNUAL FEDERAL DESIGN VALUES BY COUNTY*

County	2020–2022 PM2.5 Annual Design Value (μg/m^3)	Percent of Current (2012) PM2.5 NAAQS (12.0 μg/m^3)	Area of Design Value Max
Los Angeles	13.1	109	South San Gabriel Valley
Orange	10.9**	91	Central Orange County
Riverside	13.4	112	Metropolitan Riverside County
San Bernardino	13.7	114	Ontario CA-60 Near Road

* Data likely to be approved as exceptional events by U.S. EPA removed from analysis.
** Mission Viejo in the Saddleback Valley does not have a valid design value because measurements do not meet data completeness requirements.

[7] The Final 2016 U.S. EPA Exceptional Events Rule is available at https://www.epa.gov/air-quality-analysis/final-2016-exceptional-events-rule-supporting-guidance-documents-updated-faqs

The 2022 PM2.5 annual state designation values are summarized in Table 2-4. The 2022 PM2.5 annual state designation values measured in Los Angeles, Riverside, and San Bernardino Counties exceed the state standard of 12 μg/m^3. The highest 2022 PM2.5 state annual designation value of 18 μg/m^3 was measured at the Ontario CA-60 Near Road air monitoring station. State Designation Values are based on the maximum annual average recorded in the most recent three-year period, and therefore, they are less responsive to year-to-year changes in concentrations. Exceptional events were not removed when calculating these state designation values.

TABLE 2-4
2020–2022 ANNUAL STATE DESIGNATION VALUES BY COUNTY

County	2020–2022 PM2.5 Annual State Designation Value (μg/m^3)	Percent of Current PM2.5 CAAQS (12 μg/m^3)	Area of Designation Value Max
Los Angeles	16	142	East San Fernando Valley
Orange	12	100	Central Orange County
Riverside	16	142	Metropolitan Riverside County
San Bernardino	18	133	Ontario CA-60 Near Road

Figure 2-5 illustrates the spatial trend of the 2022 PM2.5 annual design values at all FRM PM2.5 stations in the South Coast Air Basin.[8] Data likely to be approved as exceptional events by U.S. EPA are removed from Figures 2-5 and 2-6. The highest PM2.5 annual averages are in the inland valley areas of Riverside and San Bernardino Counties and the southern portion of Los Angeles County.

[8] FEM PM2.5 data measured at Anaheim, Long Beach I-710 Near Road, Mira Loma, Ontario CA-60 Near Road, and Rubidoux stations were used to supplement missing FRM measurements

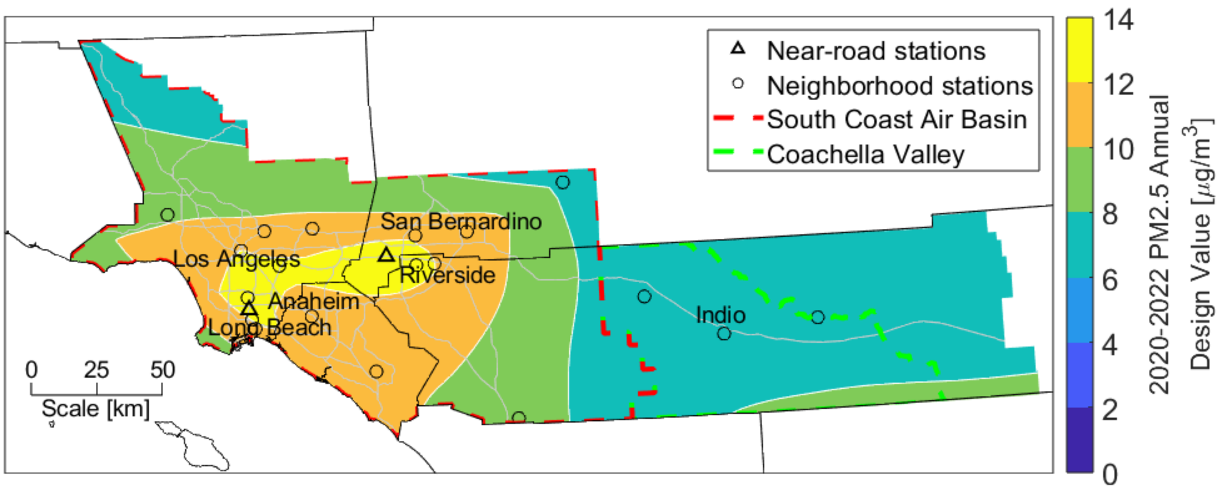

FIGURE 2-5
ALL FRM PM2.5 STATIONS IN THE SOUTH COAST AIR BASIN.
NEAR-ROAD STATIONS ARE SHOWN AS TRIANGLES, WHILE OTHER STATIONS ARE SHOWN AS CIRCLES. THE COLORS REPRESENT THE 2020-2022 ANNUAL PM2.5 DESIGN VALUE

2022 PM2.5 annual design values measured at all stations with regulatory PM2.5 data that meet U.S. EPA completeness criteria in the South Coast Air Basin are presented in Figure 2-6. As shown in the Figure, the 2022 PM2.5 annual design value exceeded the federal standard at six stations: Ontario CA-60 Near Road, Mira Loma, Compton, Long Beach I-710 Near Road, Pico Rivera, and Los Angeles-North Main St., with design values of 13.7 μg/m^3, 13.4 μg/m^3, 13.1 μg/m^3, 12.7 μg/m^3, 12.5 μg/m^3, and 12.1 μg/m^3, respectively. These correspond to 114, 112, 109, 106, 104, and 101 percent of the annual NAAQS, respectively.

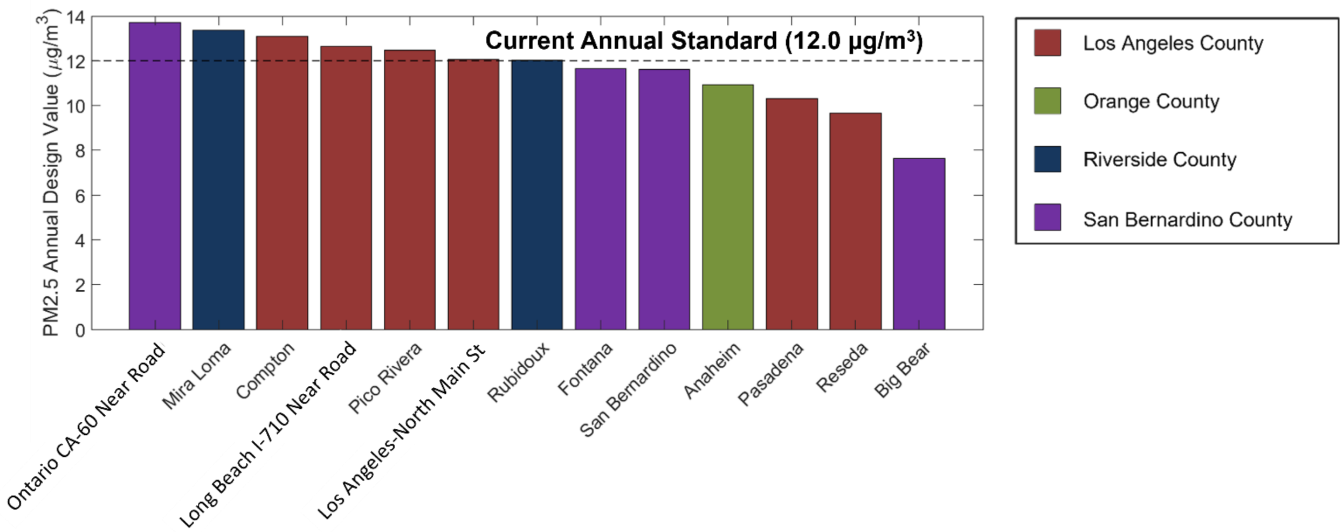

FIGURE 2-6
2020-2022 ANNUAL PM2.5 DESIGN VALUES MEASURED AT ALL STATIONS WITH COMPLETE DATA IN THE SOUTH COAST AIR BASIN. DATA LIKELY TO BE APPROVED AS EXCEPTIONAL EVENTS BY U.S. EPA REMOVED FROM ANALYSIS[9]

In summary, in 2022, the South Coast Air Basin failed to~~does not~~ attain both the annual PM2.5 NAAQS and CAAQS. The highest PM2.5 annual design values for both NAAQS and CAAQS were measured at the Ontario CA-60 Near Road air monitoring station. In general, the PM2.5 annual averages measured in the inland valley areas of Riverside and San Bernardino Counties and the southern portion of Los Angeles County are higher than other parts of the South Coast Air Basin.

Attainment Status of the 24-hour PM2.5 Standard

The 2022 PM2.5 24-hour design values are summarized in Table 2-2. Data likely to be approved as exceptional events by U.S. EPA are removed from this analysis. The highest 2022 PM2.5 24-hour design value of 35 µg/m^3 was measured in the South Central LA County area at the Compton air monitoring station and the Ontario CA-60 Near Road station. The next highest 2022 PM2.5 24-hour design value was 34 µg/m^3, measured in the Metropolitan Riverside County area at the Mira Loma air monitoring station. All 2022 PM2.5 24-hour design values were equal or below the 24-hour NAAQS (35 µg/m^3).

[9] Long Beach (North). Long Beach (South), Azusa, and Mission Viejo stations do not have complete data in 2022 due to site closure or modification

TABLE 2-5
2020–2022 24-HOUR PM2.5 DESIGN VALUES BY COUNTY*

County	2020–2022 PM2.5 24-Hour Design Value ($\mu g/m^3$)	Percent of Current (2006) PM2.5 NAAQS (35 $\mu g/m^3$)	Area of Design Value Max
Los Angeles	35**	100	South Central LA County
Orange	30***	86	Central Orange County
Riverside	34	97	Metropolitan Riverside County
San Bernardino	35	100	Ontario CA-60 Near Road

* Data likely to be approved as exceptional events by U.S. EPA removed from analysis.
** Subject to U.S. EPA approval of a waiver to only consider more accurate filter-based measurements at Compton by excluding measurements from a continuous instrument that does not meet performance goals. In the unlikely event that U.S EPA does not approve the waiver, the 2022 value at Compton is 37 $\mu g/m^3$.
*** Mission Viejo in the Saddleback Valley area does not have a valid design value because measurements do not meet data completeness requirements.

2022 PM2.5 24-hour design values measured at all stations in the South Coast Air Basin are presented in Figure 2-7. ~~There is no state 24-hour PM2.5 standard.~~ After removing data likely to be approved as exceptional events by U.S. EPA, all stations in the South Coast Air Basin met the 24-hour federal standard by 2022. The design value at Compton is subject to U.S. EPA approval of a waiver to only consider more-accurate filter-based measurements at Compton by excluding measurements from a continuous instrument that does not meet performance goals. In the unlikely event that U.S. EPA does not approve the waiver, the 2022 design value at Compton is 37 $\mu g/m^3$.

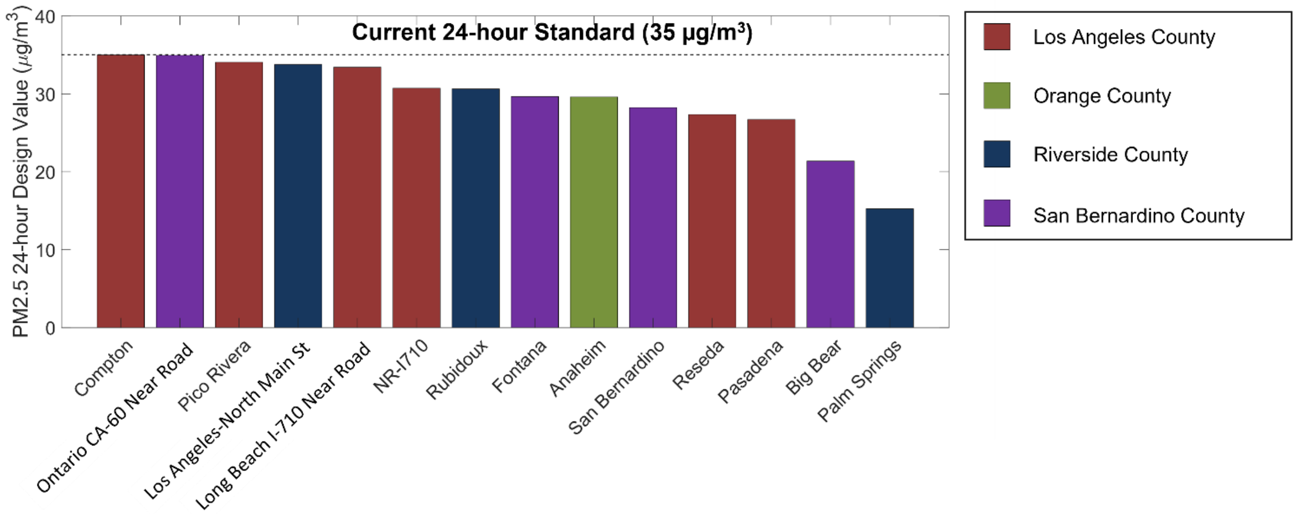

FIGURE 2-7

2020-2022 24-HOUR PM2.5 DESIGN VALUE MEASURED AT ALL STATIONS IN THE SOUTH COAST AIR BASIN. DATA LIKELY TO BE APPROVED AS EXCEPTIONAL EVENTS BY U.S. EPA REMOVED FROM ANALYSIS[10]

Figure 2-8 presents the number of days when the 24-hour PM2.5 exceed the 24-hour federal PM2.5 standard (35 µg/m^3)[11] in each month of 2022 at each FRM PM2.5 station in the South Coast Air Basin. As shown in the Figure, with the exception of exceedances recorded on the fourth and fifth of July due to Independence Day fireworks, all exceedances in 2022 occur in the months of October through January. Exceedances in the winter months are predominantly caused by cold and humid weather conditions that favor the formation of secondary PM2.5 and emissions of residential wood smoke. Limited ventilation in the atmosphere during winter months contributes to the elevated levels of PM2.5 as well. Year 2022 has less PM2.5 24-hour NAAQS exceedance days during the winter months (November-February) than past winter months.

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[10] Long Beach (North). Long Beach (South), Azusa, and Mission Viejo stations do not have complete data in 2022 due to site closure or modification

[11] Due to rounding conventions, the threshold to meet the 24-hour PM2.5 NAAQS is 35.4 µg/m^3

Fairly clean period compared to past winter months.

July 4th and 5th Fireworks

Fairly clean period compared to past winter months.

2022	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Compton	2	0	0	0	0	0	1	0	0	0	1	2
Pico Rivera #2	0	0	0	0	0	0	1	0	0	0	0	0
Ontario CA-60 Near Road	0	0	0	0	0	0	1	0	0	0	0	0
Rubidoux	0	0	0	0	0	0	1	0	0	0	0	0
San Bernardino	1	0	0	0	0	0	0	0	0	1	0	0
Long Beach I-710 Near Road	0	0	0	0	0	0	0	0	0	0	0	1
Fontana	0	0	0	0	0	0	0	0	0	1	0	0
Los Angeles-North Main Street	0	0	0	0	0	0	0	0	0	0	0	0
Reseda	0	0	0	0	0	0	0	0	0	0	0	0
Pasadena	0	0	0	0	0	0	0	0	0	0	0	0
Anaheim	0	0	0	0	0	0	0	0	0	0	0	0
Palm Springs	0	0	0	0	0	0	0	0	0	0	0	0
Mira Loma (Van Buren)	0	0	0	0	0	0	0	0	0	0	0	0
Big Bear	0	0	0	0	0	0	0	0	0	0	0	0

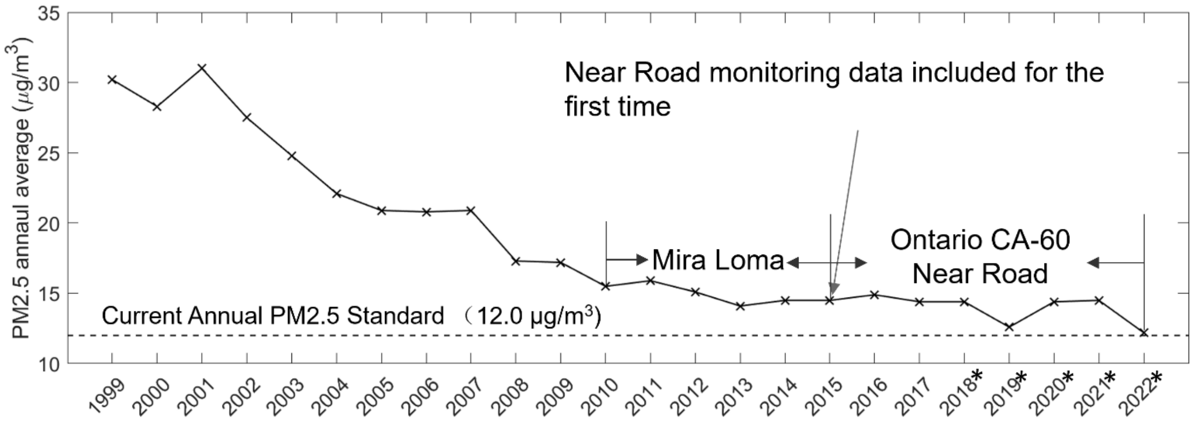
FIGURE 2-8

THE NUMBER OF DAYS WHEN THE 24-HOUR PM2.5 EXCEEDED THE 24-HOUR FEDERAL PM2.5 STANDARD (35 MG/M^3) IN EACH MONTH AT EACH FRM PM2.5 STATION IN THE SOUTH COAST AIR BASIN IN 2022. THE RED BOXES ARE EXCEPTIONAL EVENTS THAT ARE LIKELY TO BE APPROVED BY U.S. EPA

Historical Trends in Air Quality

Annual Standard

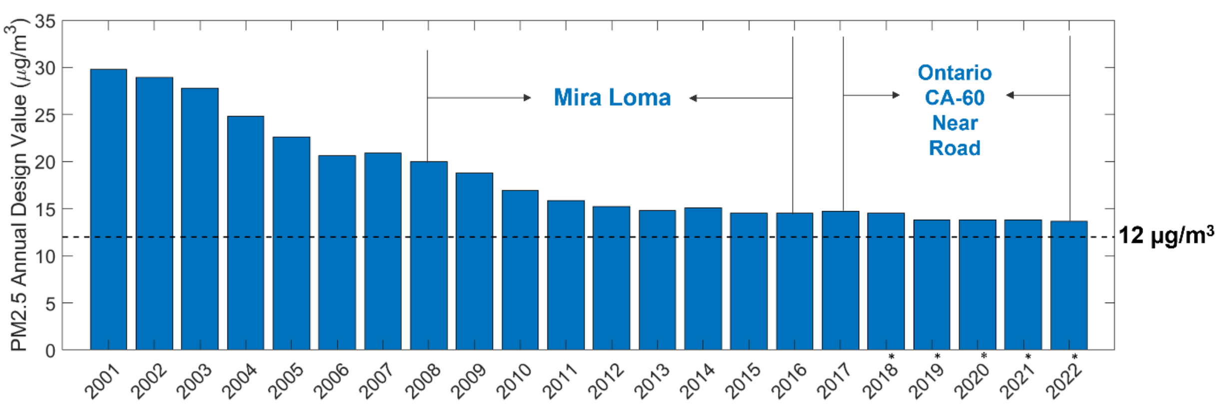
The historical trend of the annual average PM2.5 concentration measured in the South Coast Air Basin is presented in Figure 2-9. This parameter is an important metric for tracking progress towards clean air goals as the three-year average of the single year averages at each station represents the design value. As shown in the figure, the basin-maximum annual average PM2.5 has decreased significantly over the past two decades. The annual average recorded in 2022, which is the lowest on record, has decreased 60 percent compared with the value recorded in 2000, from 30.2 µg/m^3 to 12.2 µg/m^3. Between 2010 and 2015, the highest annual average PM2.5 concentration was recorded in Mira Loma. However, annual averages recorded at the Ontario CA-60 Near Road station exceed averages in Mira Loma since that monitor was established.



* Data likely to be approved as exceptional events by U.S. EPA removed from analysis.

FIGURE 2-9
BASIN-MAXIMUM ANNUAL AVERAGE PM2.5 CONCENTRATIONS MEASURED IN THE SOUTH COAST AIR BASIN FROM 1999-2022

Historical trends in the annual PM2.5 design values measured in the South Coast Air Basin are shown in Figure 2-10. The annual PM2.5 design value has decreased significantly over the past two decades. Compared with the design value in 2001, the annual PM2.5 design value in 2022 decreased by 54 percent, from 29.8 μg/m^3 to 13.7 μg/m^3. The Ontario CA-60 Near Road station currently has the highest annual design value. By the end of 2022, the annual PM2.5 design value in the South Coast Air Basin is 1.7 μg/m^3 higher than the 2012 annual PM2.5 federal standard. However, the 2022 design value is the lowest on record.



* Data likely to be approved as exceptional events by U.S. EPA removed from analysis.

FIGURE 2-10
ANNUAL AVERAGE PM2.5 DESIGN VALUE IN THE SOUTH COAST AIR BASIN FROM 2000-2022

24-hour Standard

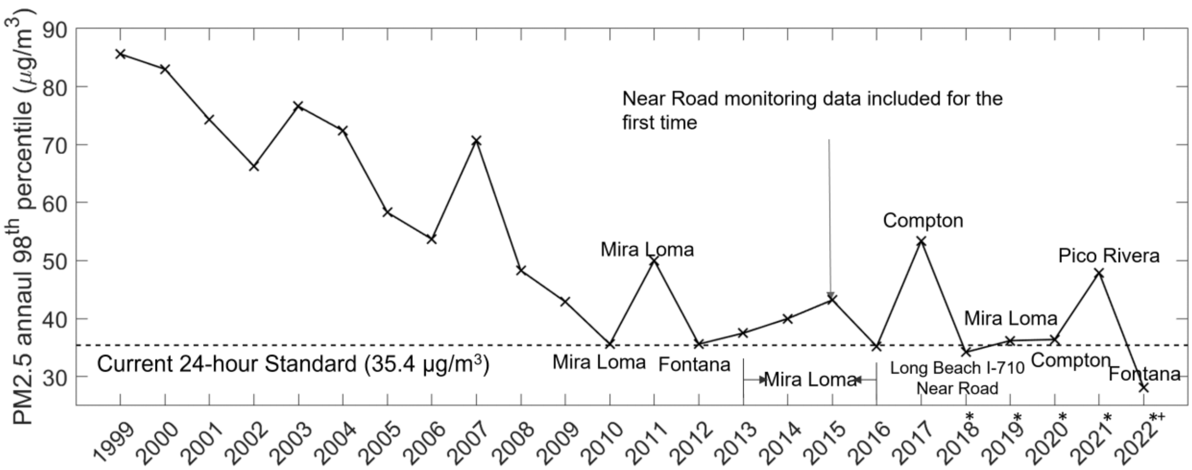
Over the past two decades, the number of 24-hour PM2.5 exceedance days have decreased significantly. The number of days when the basin-maximum 24-hour PM2.5 exceeded the 24-hour NAAQS in each month from 2000 to 2022 are shown in Figure 2-11. Among all past years on record, 2022 has the lowest number of 24-hour PM2.5 exceedance days. Compared with data collected in 2000, the number of days exceeding the standard in 2022 decreased by 92 percent, from 109 days to 9 days. In the early 2000s, exceedance days were recorded in every month. However, in recent years, the 24-hour standard is exceeded typically only in the colder months, from November to February, with the exception of exceedances resulting from Independence Day fireworks or wildfires.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2000	16	5	8	10	13	4	6	2	9	12	9	15	109
2001	12	1	15	8	21	7	7	7	12	19	18	11	138
2002	12	9	2	8	6	6	7	10	7	22	11	13	113
2003	13	2	7	0	12	12	4	0	14	18	4	8	94
2004	14	3	14	4	0	11	2	1	4	10	6	4	73
2005	4	0	5	1	2	2	3	1	3	8	8	13	50
2006	4	9	0	2	11	2	2	0	0	5	8	3	46
2007	1	4	5	5	6	1	2	0	0	5	16	2	47
2008	4	1	2	0	1	0	2	0	2	2	8	4	26
2009	4	2	3	0	4	0	1	4	1	0	6	5	30
2010	1	4	0	1	0	0	1	0	0	2	1	2	12
2011	0	1	0	0	0	0	1	0	0	5	3	5	15
2012	2	0	0	0	0	0	1	0	0	1	7	6	17
2013	1	3	1	0	0	0	0	0	0	4	2	1	12
2014	8	0	0	0	1	0	0	0	0	0	0	2	11
2015	13	10	3	3	0	0	1	0	0	0	0	0	30
2016	3	1	1	0	0	0	1	0	0	1	0	3	10
2017	1	0	1	0	1	0	2	0	0	1	5	8	19
2018	6	0	0	0	0	0	2	0	0	2	5	4	19
2019	2	0	0	0	0	0	2	0	0	0	7	1	12
2020	4	1	0	0	0	0	2	1	6	7	3	4	28
2021	2	1	0	0	0	0	2	0	1	0	9	8	23
2022	3	0	0	0	0	0	2	0	0	1	1	2	9

FIGURE 2-11

THE NUMBER OF DAYS WHEN THE BASIN-MAXIMUM 24-HOUR PM2.5 CONCENTRATIONS EXCEEDED THE 24-HOUR PM2.5 STANDARD (35 MG/M^3) IN EACH MONTH FROM 2000 TO JUNE 2022 IN THE SOUTH COAST AIR BASIN

The historical trend of the basin-maximum 98th percentile 24-hour PM2.5 measured in the South Coast Air Basin is presented in Figure 2-12. This parameter is an important metric for tracking progress towards clean air goals as the three-year average of the 98th percentile concentration at each station represents the design value. In addition, the annual 98th percentile concentrations better capture year-to-year variations in PM2.5 levels. As shown in the figure, the basin maximum 98th percentile 24-hour PM2.5 values have declined significantly over the past two decades. The value recorded in 2019 has decreased by 67 percent compared with the value recorded in 2000, from 85.6 μg/m³ to 28.1 μg/m³. With the exception of 2012, Mira Loma has had the highest 98th percentile value at all years pre-2017. Compton had the highest 98th percentile value in 2017 due to three anomalous measurements. The highest 98th percentile in the Basin in 2021 and 2022 was recorded at Pico Rivera and Fontana, respectively. However, the basin-maximum 98th percentile 24-hour PM2.5 measured in 2022 is the lowest on record.

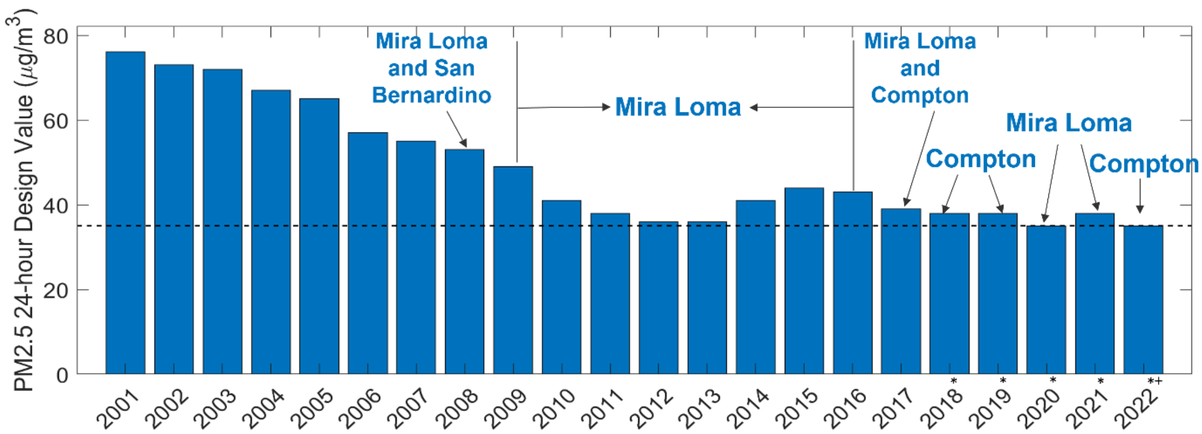


* Data likely to be approved as exceptional events by U.S. EPA removed from analysis.

+ Subject to U.S. EPA approval of a waiver to only consider more accurate filter-based measurements at Compton by excluding measurements from a continuous instrument that does not meet performance goals. In the unlikely event that U.S. EPA does not approve the waiver, the 2022 value is 37 μg/m³ measured at Compton.

FIGURE 2-12
BASIN-MAXIMUM 98TH PERCENTILE 24-HOUR PM2.5 CONCENTRATIONS MEASURED IN THE SOUTH COAST AIR BASIN FROM 1999-2022

The historical trend of the 24-hour basin-maximum PM2.5 design value measured in the South Coast Air Basin is shown in Figure 2-13. After removing exceptional events occurring in 2020, the 24-hour PM2.5 design meets the 24-hour PM2.5 federal standard (35 μg/m³) subject to U.S. EPA approval of a waiver to only consider more accurate filter-based measurements at Compton by excluding measurements from a continuous instrument that does not meet performance goals. Compared with the design value in 2001, the 24-hour PM2.5 design value has declined by 54 percent, from 76 μg/m³ in 2001 to 35 μg/m³ in 2022. From 2009 to 2016, the highest design value was recorded in Mira Loma. However, since 2018, except 2020 and 2021, Compton has replaced Mira Loma as the station with highest 24-hour PM2.5 design value. The elevated 24-hour PM2.5 design values in 2014 are due in large part to extreme drought conditions experienced in Southern California and the associated lack of periodic storm events in the winter months that facilitate dispersion and washout of pollutants.[12]



* Data likely to be approved as exceptional events by U.S. EPA removed from analysis.
+ Subject to U.S. EPA approval of a waiver to only consider more accurate filter-based measurements at Compton by excluding measurements from a continuous instrument that does not meet performance goals. In the unlikely event that U.S. EPA does not approve the waiver, the 2022 value is 37 μg/m^3 measured at Compton.

FIGURE 2-13
24-HOUR PM2.5 DESIGN VALUE IN THE SOUTH COAST AIR BASIN FROM 2001-2022

PM2.5 Speciation

Analysis of major chemical components of PM2.5 provides insight into the composition and sources of fine particulate matter in the Basin. These chemical components are measured through PM2.5 speciation samplers. Currently, PM2.5 speciation samplers are deployed at four representative locations in each of the Basin's counties. They are Anaheim, Fontana, Los Angeles, and Rubidoux stations. Integrated 24-hour filter samples are collected every six days and analyzed at the South Coast AQMD Laboratory. The speciation analysis presented in this chapter uses a different approach than the speciation analysis for the modeling attainment demonstration and therefore, should not be used for future projection of PM2.5 design values. FRM measurements that the NAAQS are based upon do not retain all the PM2.5 that is measured by chemical speciation samplers. Therefore, for the modeling attainment demonstration, an adjustment technique is used to estimate the species composition as measured on FRM filters to allow for

[12] 2016 South Coast AQMD Air Quality Management Plan. Available at https://www.aqmd.gov/home/air-quality/clean-air-plans/final-2016-aqmp

the projection of base year measurements into the future.[13] However, the speciation analysis in this chapter uses established techniques for analyzing measured PM2.5 speciation data and provides valuable insight on current and past PM2.5 species fractions.

Figure 2-14 shows trends in average annual concentrations of six PM2.5 component species: elemental carbon (EC), organic matter, sulfate, nitrate, ammonium ion, and crustal material from 2010-2022. Note that data from 2020 were not included due to a 3-month hiatus in PM2.5 speciation sampling at the beginning of the COVID-19 pandemic. EC, sulfate, nitrate, and ammonium ion were measured directly, while organic and crustal components were calculated from measurements of organic carbon (OC) and metal concentrations, respectively, according to guidance for the U.S. EPA Chemical Speciation Network (CSN).[14]

Organic Matter = 1.4 × Organic Carbon

Crustal Material = 2.2 × Aluminum + 2.49 × Silicon + 1.63 × Calcium + 2.42 × Iron + 1.94 × Titanium

Annual median field blank organic carbon concentrations across the four sites were subtracted from OC measurement data to account for the well-documented positive sampling artifact caused by absorption of gas-phase OC onto filters. This correction method is similar to the current OC artifact correction method used by the Interagency Monitoring of Protected Visual Environments (IMPROVE) network and CSN, except annual field blank median concentrations were used instead of monthly medians to increase the pool of available field blank data. Furthermore, it is important to note that there is considerable uncertainty in the conversion factor between measured organic carbon and organic matter, which can range from just above 1 for organic matter with a composition close to pure carbon to greater than 2 for highly oxidized organic matter. Thus, the trend shown in Figure 2-14 is an approximation assuming the average composition of organic matter in the Basin is relatively constant.

Reported concentrations below analytical detection limits also add some uncertainty to annual average concentrations, as the true concentration for a measurement below the detection limit may range from zero to the detection limit. To account for uncertainty in non-detect concentrations, annual means for each component were calculated by substituting zero and minimum detection limit concentrations for non-detects to calculate lower and upper limit means, respectively. As shown in Figure 2-14, crustal material was the only component that was significantly affected by non-detect concentration uncertainty.

Annual mean concentrations of most components show a generally decreasing trend over the ten-year period from 2010-2022 with more muted changes from 2015-2022. The largest decrease is observed for the EC component, with average concentrations dropping by more than 50 percent at all sites from 2010 to 2022. This reduction in EC concentrations reflects the continued success of regulatory efforts to control

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[13] See https://www.epa.gov/sites/default/files/2020-10/documents/draft-o3-pm-rh-modeling_guidance-2014.pdf for details

[14] https://www.epa.gov/amtic/chemical-speciation-network-csn

diesel emissions and other sources of EC in the Basin. In contrast to other components, average crustal concentrations remained largely similar at all sites throughout this period. Crustal material is primarily derived from windblown soil and anthropogenic sources of dust (fugitive dust, road dust, construction, etc.). These sources are generally more difficult to control and may be exacerbated by drought and other meteorological conditions. The increase of the crustal materials, EC, and organic matter in 2020 was due to the increase of wildfire activities in 2020.

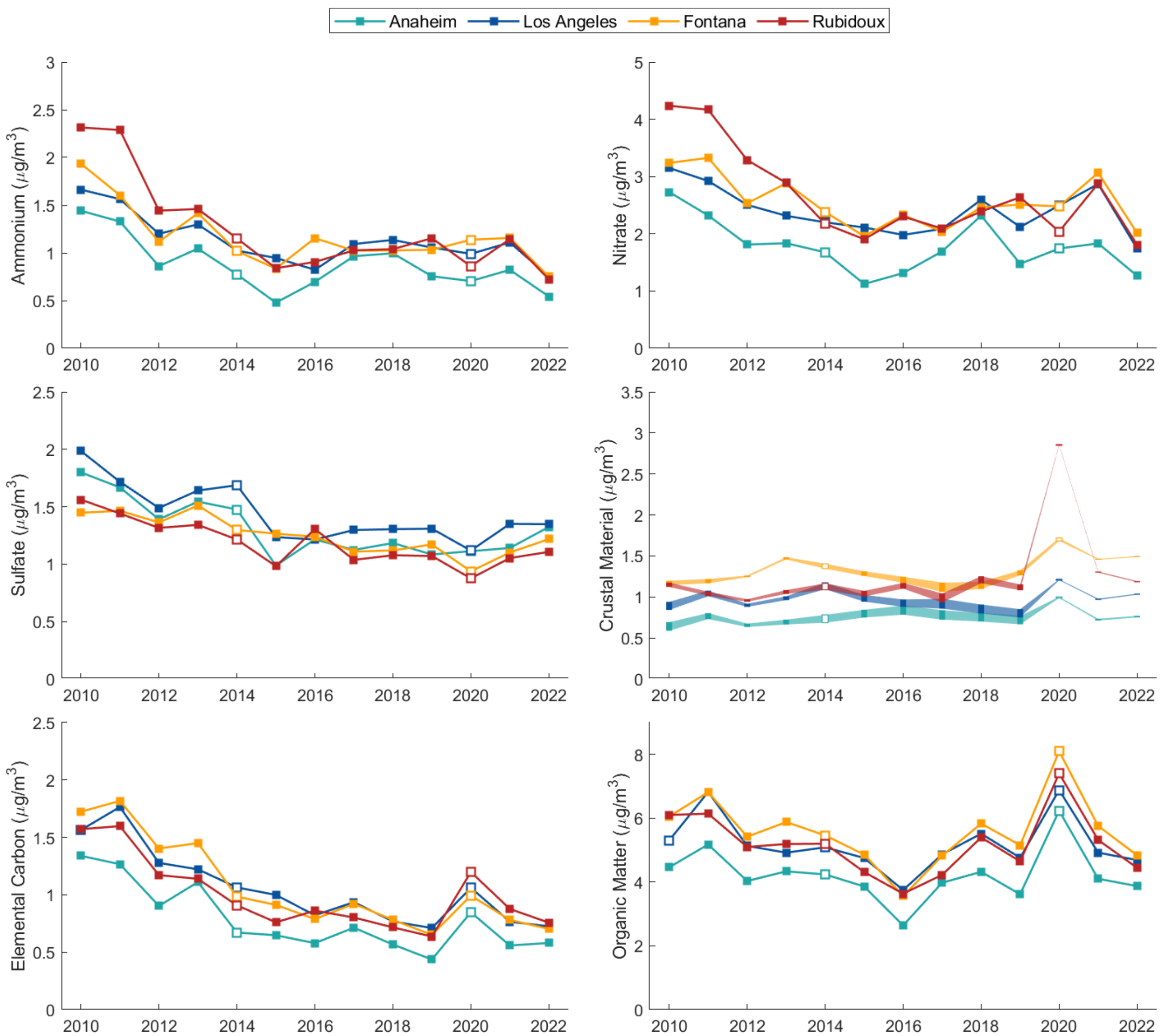

FIGURE 2-14

SOUTH COAST AIR BASIN PM2.5 SPECIATION NETWORK ANNUAL AVERAGE CONCENTRATION TRENDS, 2010–2022[15]

[15] Open symbols represent years with <75 percent data completeness (67-74 percent). The uncertainty associated with concentrations below analytical detection limits is represented with shading and different sized markers for the crustal component. For all other components, this uncertainty is negligible

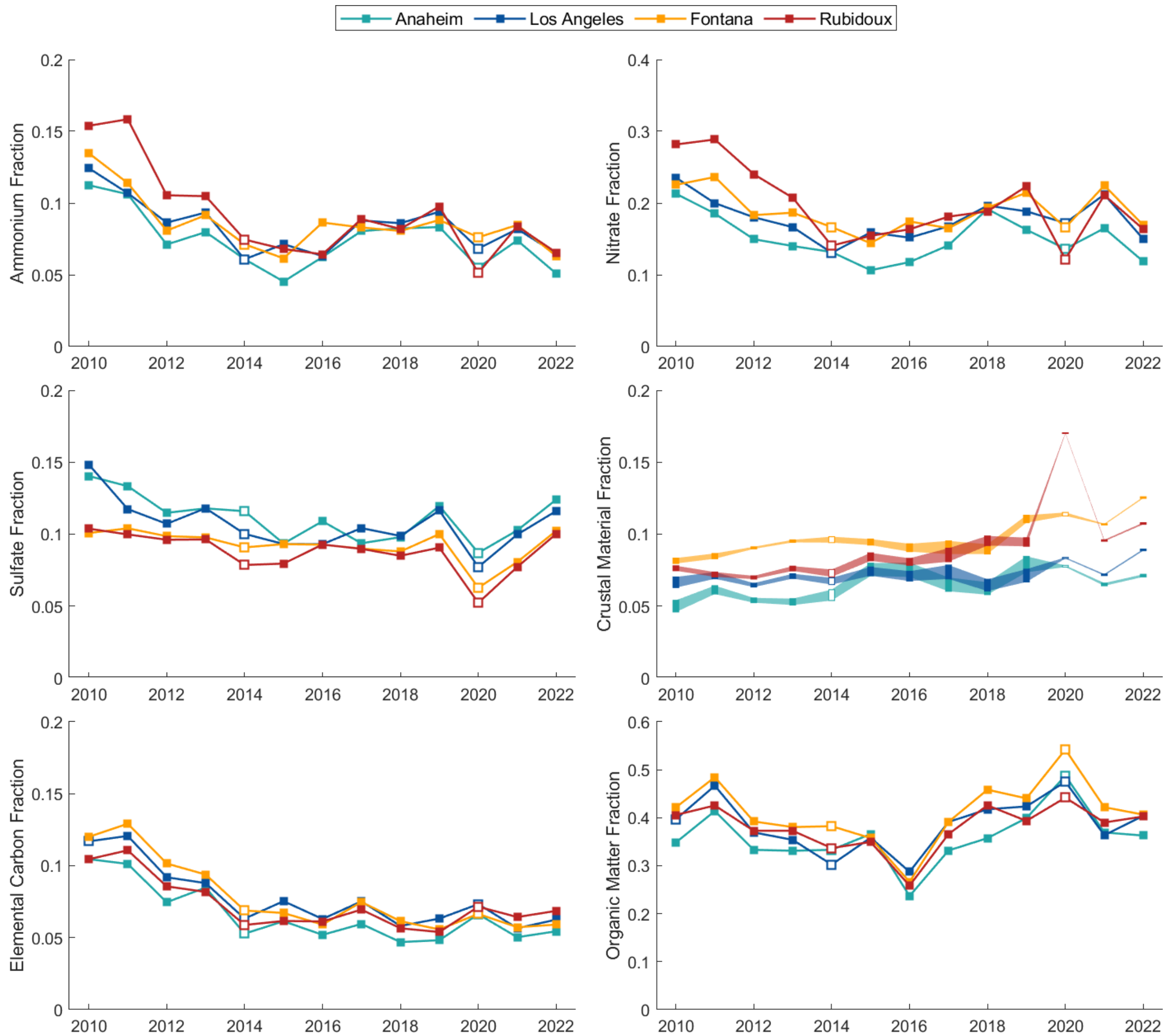

FIGURE 2-15
SOUTH COAST AIR BASIN PM2.5 SPECIATION NETWORK WEIGHTED ANNUAL AVERAGE RELATIVE CONTRIBUTION TRENDS OF RELATIVE CONTRIBUTION TO MASS, 2010–2022[16]

[16] Open symbols represent years with <75 percent data completeness (67-74 percent). The uncertainty associated with concentrations below analytical detection limits is represented with shading and marker size for the crustal component. For all other components, this uncertainty is negligible.

Figure 2-15 shows the annual mean contribution of each component to measured PM2.5 mass, weighted by total mass (i.e., days with higher PM2.5 have more influence on annual average). Organic matter was the dominant fraction at all sites from 2010-2022, with estimated contributions ranging from 24-54 percent of total mass. Ammonium ion and nitrate contributions to PM2.5 mass have generally increased from 2015-2019 after reaching their lowest levels around 2014-2015. This increasing trend is driven by both slight increases in absolute nitrate and ammonium ion concentrations as well as decreasing contributions from other species such as EC. Sulfate and crustal material contributions to total mass generally show muted changes from 2010-2022, with slight increases in crustal contributions and slight decreases in sulfate contributions observed at some sites. Due to the influence of increased wildfire activities, the fractions of crustal material, EC, and organic matter increased in 2020, while the fraction of ammonia, nitrate, and sulfate decreased compared to previous years. In 2021 and 2022, fractions of all PM2.5 species were similar to what was measured between 2016 and 2019.

Average seasonal concentrations of PM2.5 components across all sites from 2015-2022 are shown in Figure 2-16. Organic matter was the dominant component in all seasons. Both nitrate and EC concentrations and relative mass contributions peaked in the winter, while sulfate concentration and mass contribution peaked in the summer. These seasonal trends are consistent with meteorological impacts on secondary ion formation and particulate accumulation, as well as changes in seasonal PM2.5 emissions (i.e., residential wood burning). Other components showed more complex seasonal patterns, reflecting the competing influences of meteorology, atmospheric chemical processes, and emission patterns.

The ratio of organic carbon to elemental carbon (OC/EC) can provide further insight into the sources of organic matter in the Basin, with lower OC/EC ratios associated with primary combustion sources (e.g., diesel and gasoline combustion) and higher ratios with secondary organic formation and other OC sources. As shown in Figure 2-17, annual median OC/EC ratios show a generally increasing trend from 2010-2022, which is consistent with the steady decline in EC concentrations during this period. This trend suggests that contributions of secondary and other sources of organic matter are becoming increasingly important as diesel emissions decrease.

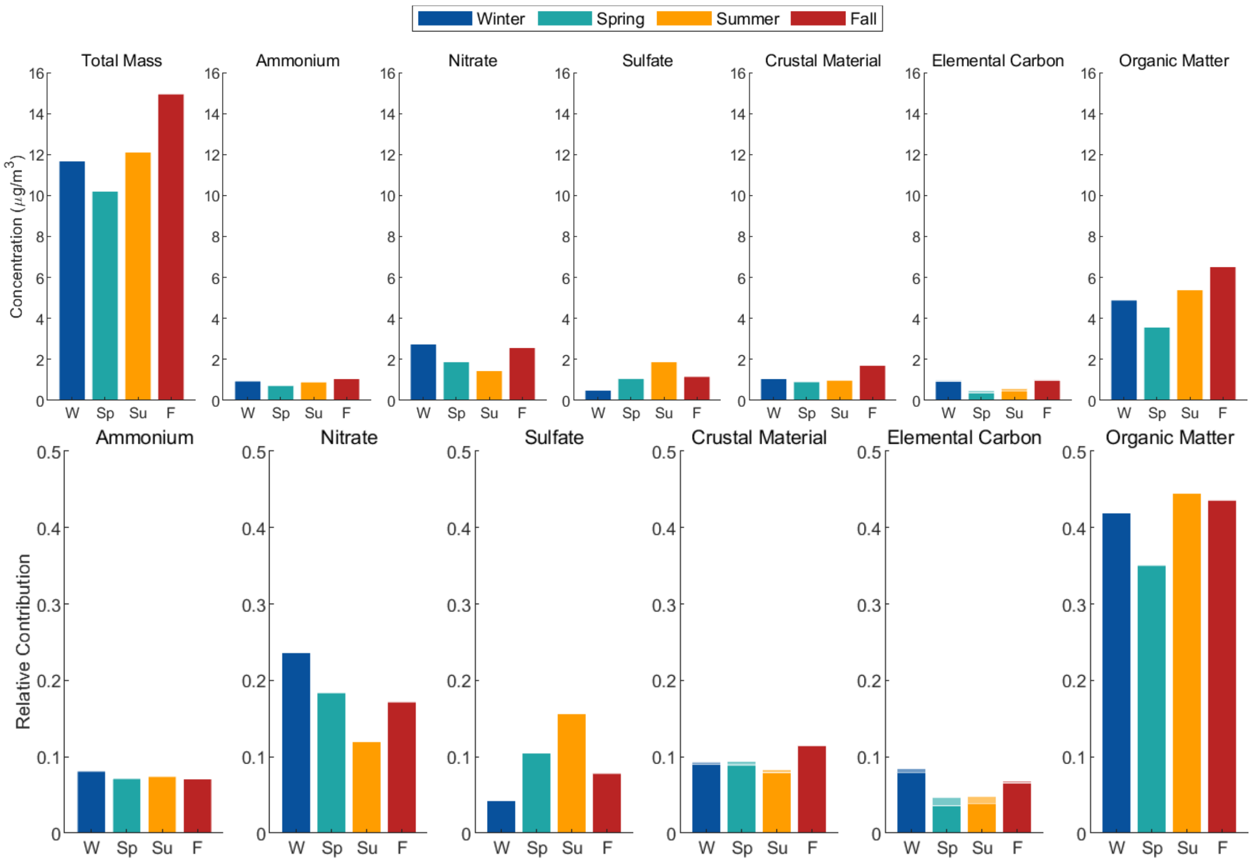

FIGURE 2-16

SEASONAL VARIATION IN CONCENTRATIONS OF PM2.5 COMPONENTS (TOP) AND RELATIVE CONTRIBUTION OF PM2.5 COMPONENTS TO TOTAL MASS (BOTTOM), 2015-2022[17]

[17]Winter, spring, summer, and fall are defined as DEC-FEB, MAR-MAY, JUN-AUG, SEP-NOV, respectively. The uncertainty associated with concentrations below analytical detection limits is represented with hatched shading at the top of each bar

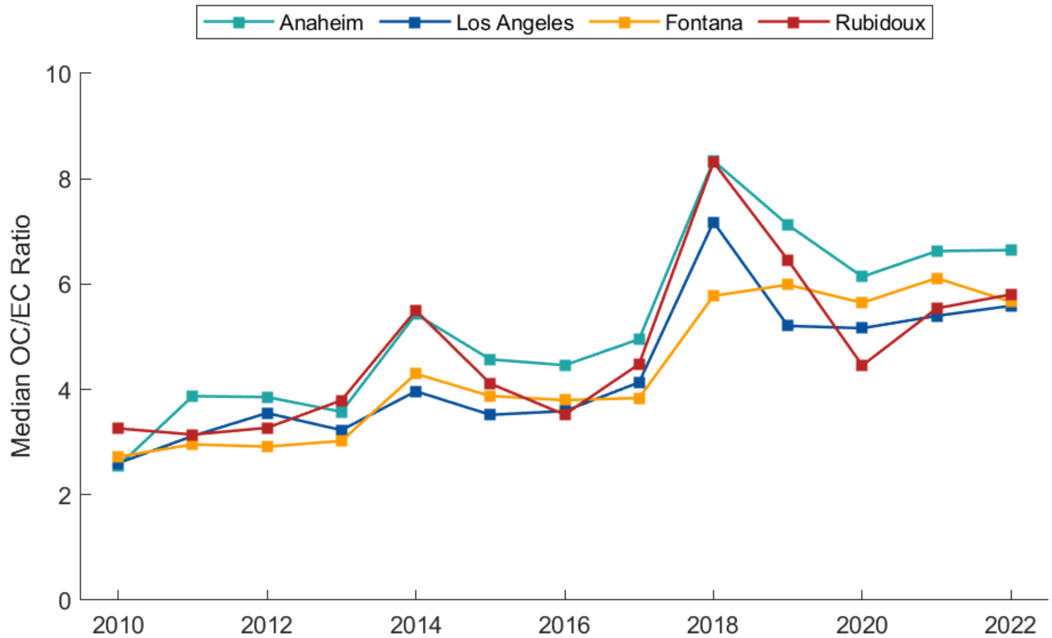

FIGURE 2-17
TRENDS OF SOUTH COAST AIR BASIN PM2.5 ORGANIC CARBON (OC) TO ELEMENTAL CARBON (EC) RATIO, 2010–2022[18]

Summary

PM2.5 concentrations have declined considerably since monitoring began in the early 2000s. PM2.5 levels are a strong function of meteorology, emissions of primary PM2.5 and emissions of PM2.5 precursors. The 2022 24-hour PM2.5 design value meets the federal standard subject to removal of likely exceptional events and U.S. EPA approval of a waiver to only consider more accurate filter-based measurements at Compton by excluding measurements from a continuous instrument that does not meet performance goals. In addition, the 98th percentile PM2.5 values measured in 2022 were the lowest on record. While the annual PM2.5 design values are still above the annual standard, 2022 saw the cleanest maximum annual average PM2.5 level ever recorded in the South Coast Air Basin.

18 Annual median blank-corrected organic carbon to elemental carbon ratio at each site. Note that median ratios were calculated to limit effect of outliers associated with very low EC concentrations

References

South Coast Air Quality Management District. (2016). *2016 Air Quality Management Plan (AQMP).*

South Coast Air Quality Management District. (2022). *2022 Air Quality Management Plan (AQMP).*

CHAPTER 3

Emissions Inventory

- With currently adopted regulations in place, direct PM2.5 emissions are projected to decline 4 percent from 2018 to 2030 in the South Coast Air Basin.

- Emissions of NOx, a PM2.5 precursor, are projected to decline by 45 percent, while ammonia emissions are expected to rise by 6 percent from 2018 to 2030.

- Top sources of directly emitted PM2.5 are from area sources and include commercial cooking, paved road dust and residential fuel combustion.

- Mobile sources continue to be the largest contributor to NOx emissions in both 2018 and 2030.

- Ammonia emissions are forecasted to increase due to factors such as population growth and widespread use of selective catalytic reduction in heavy-duty vehicles and catalysts in light-duty vehicles.

Introduction

The South Coast Air Basin (Basin) is classified as a "serious" nonattainment area for the 2012 Annual PM2.5 standard and needs to attain the standard no later than 2030. This chapter summarizes criteria pollutant emissions from an emissions inventory in the Basin for the 2018 base year as well as projected emissions for the 2030 attainment year. A more detailed description of emissions and methodologies is presented in Appendix I.

The inventory provided here is derived from the emissions inventory developed for the 2022 Air Quality Management Plan. Major updates were introduced in on-road emissions due to the transition from EMFAC2017 to EMFAC2021, along with a minor adjustment made to construction equipment within the off-road category. This ~~Draft~~ PM2.5 Plan also includes emission estimates for filterable and condensable PM2.5 emissions. The 2018 base year emissions inventory reflects reported emissions from large facilities and estimated emissions for all other sources. The future baseline emissions inventory is based on economic projections and implementation of adopted regulations with both current and future compliance dates. A list of the South Coast Air Quality Management District (South Coast AQMD) rules and regulations that are part of the base year and future year baseline emissions inventories is presented in Appendix I. The South Coast AQMD continues to implement rules that are incorporated into the ~~Draft~~ PM2.5 Plan future baseline emissions inventories.

The emissions inventory is divided into two major source classifications: stationary and mobile sources. Stationary sources include point sources and area sources. The 2018 base year point source emissions are based principally on reported data from facilities subject to the South Coast AQMD's Annual Emissions Reporting (AER) Program. Area source emissions are estimated jointly by CARB and the South Coast AQMD using established inventory methods. Mobile sources include on-road emissions and off-road emissions. On-road emissions are calculated using CARB's EMFAC2021 model and travel activity data provided by the Southern California Association of Governments (SCAG) from their adopted 2020 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS). CARB provides emissions inventories for off-road sources, which include construction and mining equipment, industrial and commercial equipment, lawn and garden equipment, agricultural equipment, ocean-going vessels (OGV), commercial harbor craft, locomotives, cargo handling equipment, pleasure craft, recreational vehicles, and fuel storage and handling. Aircraft emissions are based on an updated analysis by the South Coast AQMD developed in conjunction with commercial airports in the region.

Future emissions forecasts are primarily based on demographic and economic growth projections provided by SCAG as well as the energy consumption projections by Southern California Gas Company (SoCalGas). In addition, emission reductions resulting from the South Coast AQMD's regulations amended or adopted by October 2020 and Rule 1109.1 and CARB regulations adopted by December 2021 are included in the future baseline projections. The South Coast AQMD's Rule 1109.1, Emissions of Oxides of Nitrogen from Petroleum Refineries and Related Operations, was adopted in November 2021. The cutoff dates for regulations included in the baseline emissions are the same as in the 2022 AQMP. Heavy-Duty Inspection and Maintenance (HD I/M) and Small Off-Road Engines (SORE) regulations were adopted by CARB in December 2021[1][2] and are reflected in the baseline emissions as well. South Coast AQMD rules that have been adopted after the cutoff dates and have NOx and PM2.5 emission reductions by 2030 are provided in Table 3-1. While these reductions are not reflected in the baseline, the reductions are included in the attainment demonstration presented in this Plan.

TABLE 3-1
RULES ADOPTED AFTER THE CUT-OFF DATE OF THE ~~DRAFT~~ PM2.5 PLAN FOR NON-RECLAIM SOURCES AND NOT REFLECTED IN THE BASELINE EMISSIONS

Adoption Date	District Rule	Implementation Schedule		Net SIP Reduction by 2030* (tpd)
		Start Year	End Year	
9/1/2023	Rule 1111 – Reduction of NOx Emissions from Natural-Gas-Fired, Fan-Type Central Furnaces	2012	2050	-0.07**
5/6/2022	Rule 1147 – NOx Reductions from Miscellaneous Sources	2024	2059	0.28
8/6/2021	Rule 1147.1 - NOx Reductions from Aggregate Dryers	2025	2057	0.01
4/1/2022	Rule 1147.2 – NOx Reductions from Metal Melting and Heating Furnaces	2026	2057	0.06
2/5/2021	Rule 1150.3 – Emissions of Oxides of Nitrogen from Combustion Equipment at Landfills	2021	2031	0.04
8/4/2023	Rule 1153.1 – Emissions of Oxides of Nitrogen from Commercial Food Ovens	2024	2036	0.02
11/4/2022	Rule 1168 - VOC reductions from adhesive and sealant applications	2017	2028	-0.14**

~~*~~ *Net SIP Reduction represents changes in emissions with respect to the baseline inventory presented in the 2022 AQMP. Reductions by 2030 for each rule are calculated with SIP baseline inventory and associated control factors based on rule-specific implementation schedules.

**The amendment allowed more time to comply with the rule requirements, which resulted in less reductions in 2030 than the earlier version. Negative values indicate the changes from the previous version reflected in the 2022 AQMP.

1 Heavy-Duty Inspection and Maintenance Regulation. Information available at: https://ww2.arb.ca.gov/rulemaking/2021/hdim2021

2 Small Off-Road Engines regulations. Information available at: https://ww2.arb.ca.gov/rulemaking/2021/sore2021

This chapter summarizes the major components of base year and future baseline inventories. More detailed information, such as growth factors, and demographic trends, are presented in Appendix I. In addition, the top source categories contributing to the 2030 emissions inventories are described in this chapter. Understanding the highest emitting source categories assists identifying potentially more effective control strategies for improving air quality in the basin.

Emission Inventory

The inventory presented here represents annual average day emissions for the base year and future milestone years. Detailed information regarding the emissions inventory development for base and future years and emissions by major source category for the base and future milestone years are presented in Appendix I. In an emissions inventory, base year is the year from which the future emissions are projected. Pollutants reported in the inventory include volatile organic compounds (VOCs), nitrogen oxides (NOx), carbon monoxide (CO), sulfur oxides (SOx), ammonia (NH3), total particulate matter (PM) and particulate matter with a diameter equal to or smaller than 2.5 microns (PM2.5). Attachments A and B to Appendix I list annual average~~ and summer planning~~ emissions by major source category for 2018, 2025, 2028, 2030, and 2031. Attachment C to Appendix I lists the top VOC, NOx, SOx, NH3 and PM2.5 point source facilities that emitted greater than or equal to 10 tons per year in 2018. Attachment D to Appendix I contains on-road emissions by vehicle class and pollutant. Attachment E to Appendix I shows emissions associated with diesel fuel internal combustion engines for various source categories. Attachment F to Appendix I provides a summary of road construction dust emissions in the South Coast Air Basin. Attachment G to Appendix I includes the contribution of condensable and filterable PM2.5 to total PM2.5 emissions.

Stationary Sources

Stationary sources are divided into two major subcategories: point sources and area sources. Point sources are permitted facilities with one or more emission sources at an identified location (e.g., power plants, refineries, and industrial processes factories) and subject to AER. These facilities generally have annual emissions of 4 tons or more of either VOCs, NOx, SOx, or PM, or annual emissions of over 100 tons of CO. Facilities are required to report their emissions of criteria pollutants and selected air toxics pursuant to Rule 301 to the South Coast AQMD on an annual basis, subject to audit, if any of these thresholds are exceeded. Point sources include emissions from the Regional Clean Air Incentives Market (RECLAIM) program, which mainly include fuel combustion emissions from power plants, oil and gas production, petroleum refining, and large facilities in manufacturing and industrial and service sectors. The 2018 annual reported emissions are used to update the stationary source inventory.

Area sources consist of many small emission sources (e.g., residential water heaters, architectural coatings, consumer products, and permitted sources that are smaller than the above thresholds) which are distributed across the basin and are not required to individually report their emissions. CARB and the South Coast AQMD jointly develop emission estimates for approximately 400 area source categories. Emissions from these sources are estimated using latest activity information and representative emission factors if available. Activity data are usually obtained from survey data or scientific reports, e.g., U.S. Energy Information Administration (EIA) reports for fuel consumption other than natural gas fuel, natural gas consumption data from Southern California Gas Company (SoCalGas), and solvent, sealant and architectural coatings sales reports required under the South Coast AQMD Rules 314, 1113 and 1168. Some activity data, such as population, housing, and vehicle miles travelled (VMT), as well as a large portion for area sources are from SCAG. Emission factors are based on rule compliance factors, source tests, manufacturer's product or technical specification data, default factors (mostly from AP-42, the U.S. EPA's published emission factor compilation), or weighted emission factors derived from point source facilities' annual emissions reports. Additionally, emissions over a given area may be calculated using socioeconomic data, such as population, number of households, or employment in different industry sectors.

Mobile Sources

Mobile sources consist of two subcategories: on-road sources and off-road sources. On-road vehicle emissions were calculated with CARB's EMFAC2021 model and travel activity data provided by SCAG from their adopted 2020 RTP/SCS. Off-road emissions were calculated using CARB's category-specific inventory models.

On-Road

CARB's EMFAC2021 model has undergone extensive revisions from the previous version (EMFAC2017). With EMFAC2021, CARB has completed the transition from Fortran coding to Python and MySQL with the aim of maximizing user-friendliness and flexibility, allowing incorporation of larger amounts of data demanded by current regulatory and planning processes. For end users, EMFAC2021 includes a new web-based platform that includes all the features of previous EMFAC databases alongside new Project Analysis and Scenario Analysis features.

The U.S. EPA approved the EMFAC2021 emissions model for SIP and conformity purposes in November 2022.[3] EMFAC2021 calculates exhaust and evaporative emission rates by vehicle type for different vehicle speeds and environmental conditions. Temperature and humidity profiles are used to produce monthly, annual, and episodic inventories. Emission rate data in EMFAC2021 is collected from various sources, such as individual vehicles in a laboratory setting, tunnel studies, and certification data. The EMFAC2021 model interface and overall design have not significantly changed as compared to EMFAC2017, however, EMFAC2021 includes more state-of-the-art information to better represent the real-world emissions from on-road sources. Major improvements include:

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[3] https://www.federalregister.gov/documents/2022/11/15/2022-24790/official-release-of-emfac2021-motor-vehicle-emission-factor-model-for-use-in-the-state-of-california

- New modules accounting for Plug-in Hybrid Electric Vehicles, vehicle energy consumption;
- Emission factors for NH_3;
- New methodologies for brake and tire wear and evaporative emissions;
- New data and significant methodology changes for motor vehicle emission calculations and revisions to implementation data for control measures;
- Updated emission factors and activity data for cars and trucks, including emission reductions associated with new regulations on heavy-heavy duty diesel trucks and buses. New emission factors were developed based on data from U.S. EPA's In-Use Vehicle Program, CARB's Vehicle and Truck and Bus Surveillance Programs, CARB's Portable Emissions Measurement Systems (PEMS) and Transit Bus testing, dynamometer and Portable Emission Measurement Systems Data;
- Expanded heavy-duty truck categories;
- New approaches to light-duty activity forecasting, using up-to-date modeling approaches from academic and government agencies to assess historic trends in multiple economic indicators to forecast future vehicle activity;
- Additional novel forecasting frameworks for heavy-duty VMT and light duty ZEV sales;
- Updated transit bus emission factors using additional data from CARB transit bus testing, and Integrated Bus Information Systems of West Virginia, and the Federal Transit Administration; and
- Updates to the motor vehicle fleet age, vehicle types, and vehicle population based on 2013-2019 California Department of Motor Vehicle (DMV) data, International Registration Plan (IRP) data, Truck Regulation Upload, Compliance, and Reporting System (TRUCRS) data, Port Vehicle Identification Number (VIN) data, California Highway Patrol School Bus Inspections, and National Transit Database information. Each of these changes affect emission factors for each area in California.

The updates in vehicle population, emission factors, and forecasting parameters included in EMFAC2021 affect the on-road emission estimates for both the 2018 base year and future years. The factors that have the greatest effect on emissions changes from EMFAC2017 to EMFAC2021 are the increase in in-use emission factors for some vehicle classes, the updated vehicle age distribution for medium-heavy duty trucks that estimates an older fleet mix with respect to EMFAC2017, and the update on brake wear emission factors based on updated measurements. More detailed information on the changes incorporated in EMFAC2021 can be found in EMFAC2021's technical documentation.[4] The EMFAC2021 model incorporates recently adopted regulations, such as Advanced Clean Trucks (ACT),[5] and Heavy-Duty Low NOx Omnibus Regulations.[6] EMFAC2021 does not incorporate Heavy-Duty Inspection and Maintenance (I/M) Regulation, because this regulation was approved after the development of

[4] EMFAC2021 Volume III Technical Document Version 1.0.1, April 2021. Available at: https://ww2.arb.ca.gov/sites/default/files/2021-08/emfac2021_technical_documentation_april2021.pdf

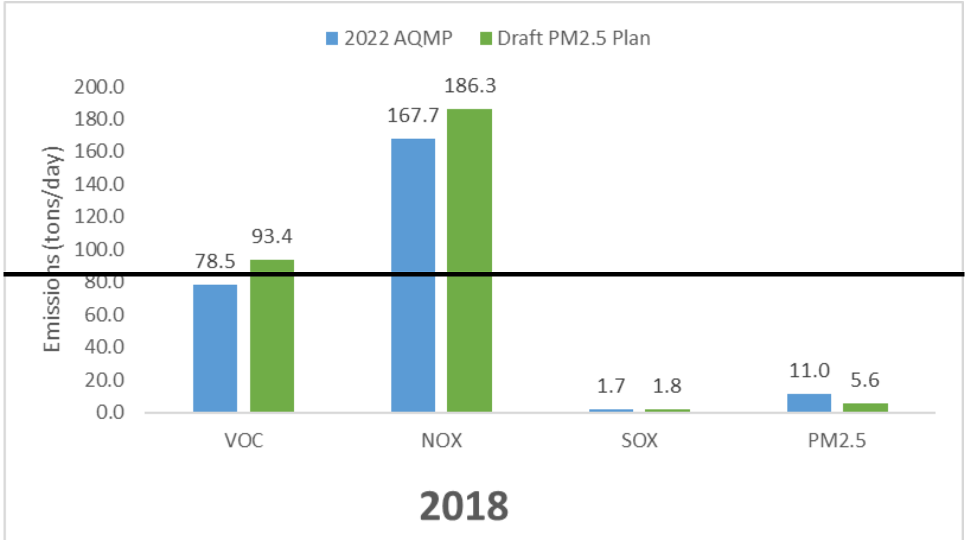
[5] Advanced Clean Trucks, https://ww2.arb.ca.gov/our-work/programs/advanced-clean-trucks.

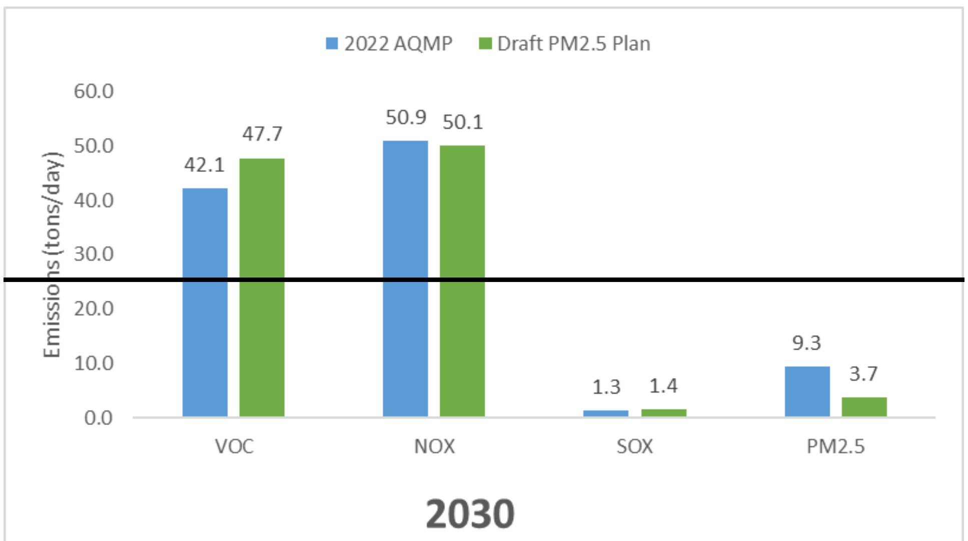
[6] Heavy-Duty Low NOx Omnibus Regulations, Available at: https://ww2.arb.ca.gov/rulemaking/2020/hdomnibuslownox.

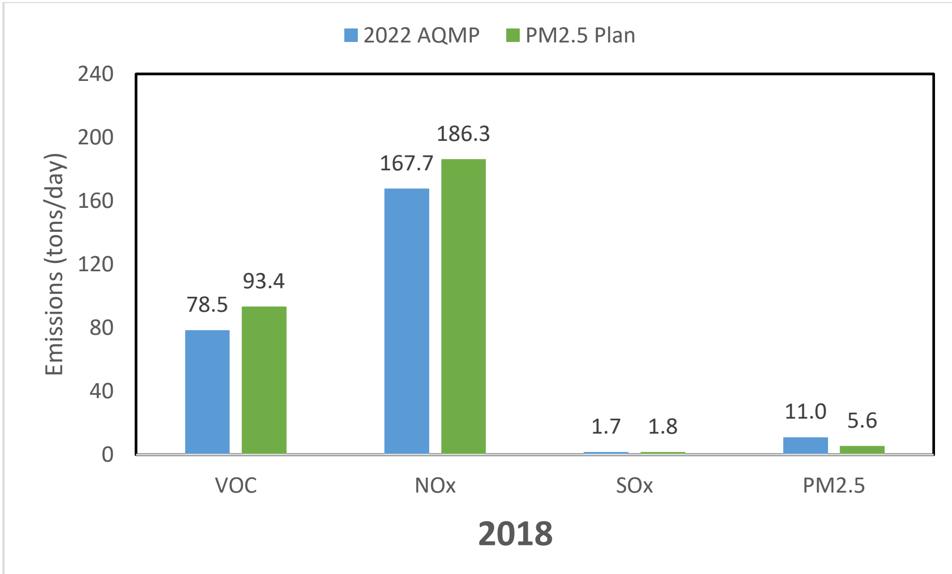
EMFAC2021. However, the effect of Heavy Duty I/M is incorporated in this plan as an external adjustment to EMFAC2021 emissions.

Figure 3-1 compares 2018 (top) and 2030 (bottom) on-road emissions estimates between the 2022 AQMP calculated using EMFAC2017 (blue) and the ~~Draft~~ PM2.5 ~~plan~~Plan calculated using EMFAC2021 (green). Both estimates include the same vehicle regulations, either included in either EMFAC version, or applied as an external adjustment. For year 2018, EMFAC2021 estimates notably higher VOC and NOx emissions, and lower emissions of PM2.5 than EMFAC2017. Estimates of NOx and VOC in EMFAC2021 are higher than in EMFAC2017 because newer vehicle test data show that light-duty vehicles have higher exhaust emissions, and updated DMV data for 2018 indicate that medium heavy-duty trucks are older than what was assumed in EMFAC2017. PM2.5 emissions are substantially reduced in EMFAC2021 with respect to EMFAC2017, as a result of updates on emissions and speed correction factors for brake wear obtained from newer emission testing. The differences in VOC and PM2.5 emissions are propagated through 2030, whereas ~~NOx emissions only differ slightly between EMFAC2017 and EMFAC2021~~the differences in NOx emissions reverse in the future, showing NOx emissions estimated by EMFAC2021 slightly lower than the estimates from EMFAC2017. This reverse is because EMFAC2021 estimates higher emissions from heavy-duty vehicles in 2018 that are increasingly targeted by heavy-duty vehicle regulations in future years, resulting in steeper emission reductions by 2030. As a result, EMFAC2021 estimates lower emissions from heavy-duty vehicles compared to the estimates by EMFAC2017.

As shown on Figure 3-1 (bottom), both estimates from the 2022 AQMP using EMFAC2017 and from the PM2.5 Plan using EMFAC2021 project significantly lower emissions in the year 2030, which are attributable to the ongoing implementation of regulations and programs such as CARB's 2010 Truck and Bus rule, Advanced Clean Cars Program, Federal Phase 2 GHG Standards, Advanced Clean Truck (ACT~~)~~), and Heavy-Duty (HD) Omnibus ~~low NOx requirements. Despite~~. Accordingly, despite growth in vehicular activities, emissions from on-road mobile sources are expected to decrease in future years. Specifically, vehicle emissions under the ~~Draft~~ PM2.5 ~~plan~~Plan calculated using EMFAC2021 are projected to decline from 2018 to 2030 by 49, 73, 19, and 34 percent for VOC, NOx, SOx, and PM2.5 emissions, respectively.


2022 AQMP
Draft PM2.5 Plan
Emissions (tons/day)
200.0
180.0
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
78.5
93.4
167.7
186.3
1.7
1.8
11.0
5.6
VOC
NOX
SOX
PM2.5
2018


2022 AQMP
Draft PM2.5 Plan
Emissions (tons/day)
60.0
50.0
40.0
30.0
20.0
10.0
0.0
42.1
47.7
50.9
50.1
1.3
1.4
9.3
3.7
VOC
NOX
SOX
PM2.5
2030



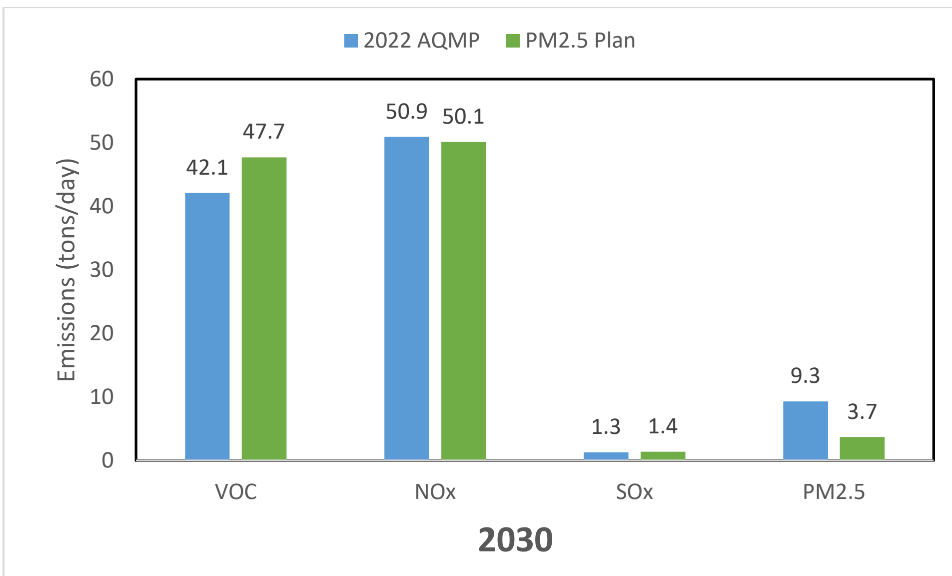
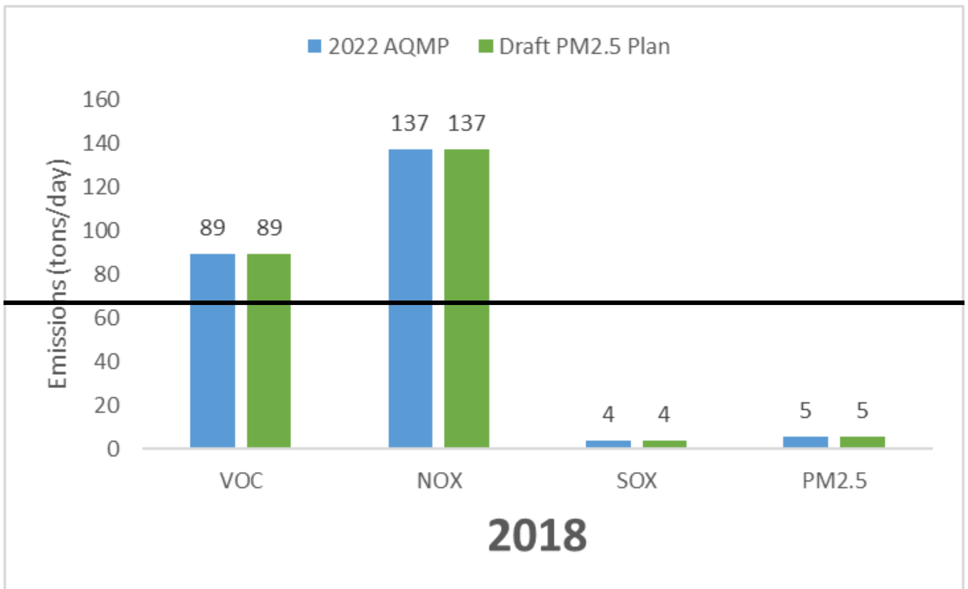


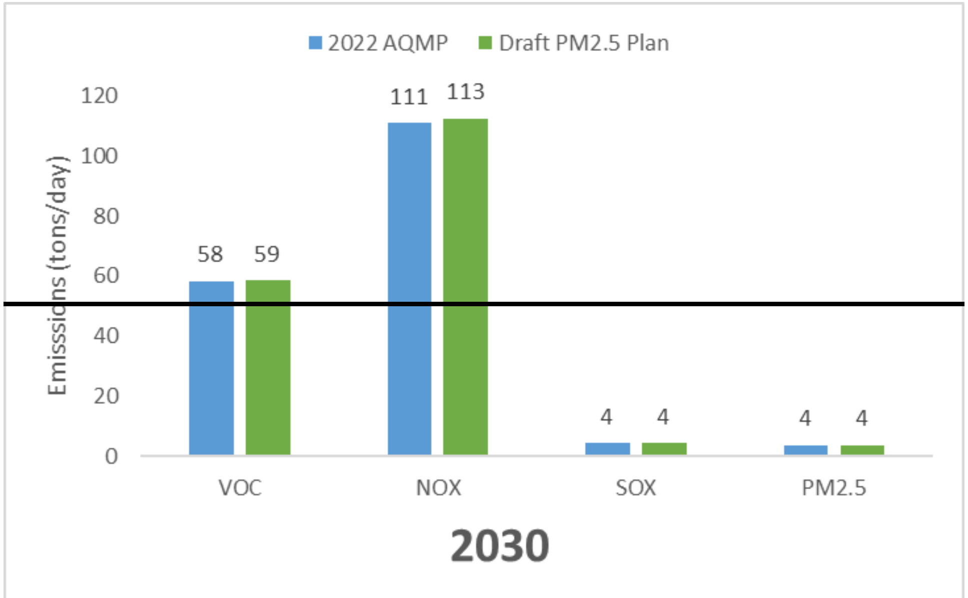
FIGURE 3-1
COMPARISON OF ON-ROAD EMISSIONS INCLUDED IN THE 2022 AQMP AND THE ~~DRAFT~~ PM2.5 PLAN.

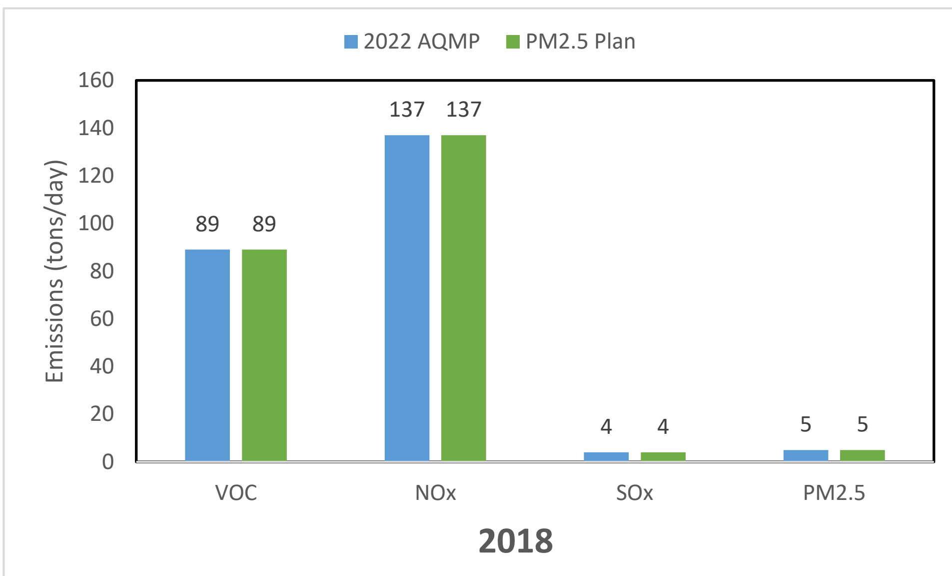
Off-Road

Emissions from off-road vehicle categories are primarily based on estimated activity levels and emission factors using a suite of category-specific models or, where a new model was not available, the OFFROAD2007 model. Separate models have been developed for estimating emissions from different categories of off-road mobile sources.[7] The emissions presented here are consistent with the off-road emissions developed for the 2022 AQMP, except for a small change in construction equipment emissions. After the development of the 2022 AQMP, an error was discovered in the emission allocations for in-use emissions from off-road construction equipment in Riverside County. This error only affected future year emissions and is now corrected in this ~~Draft~~ PM2.5 Plan. As Figure 3-2 shows emissions from off-road sources in this ~~Draft~~ PM2.5 Plan remain unchanged in 2018 with respect to the 2022 AQMP, whereas there is a slight increase in emissions of VOC and NOx in 2030.



[7] More information on the models for offroad sources can be found in the following link: https://ww3.arb.ca.gov/msei/msei.htm


2022 AQMP
Draft PM2.5 Plan
Emissions (tons/day)
120
100
80
60
40
20
0
58
59
111
113
4
4
4
4
VOC
NOX
SOX
PM2.5
2030


2022 AQMP
PM2.5 Plan
Emissions (tons/day)
160
140
120
100
80
60
40
20
0
89
89
137
137
4
4
5
5
VOC
NOx
SOx
PM2.5
2018

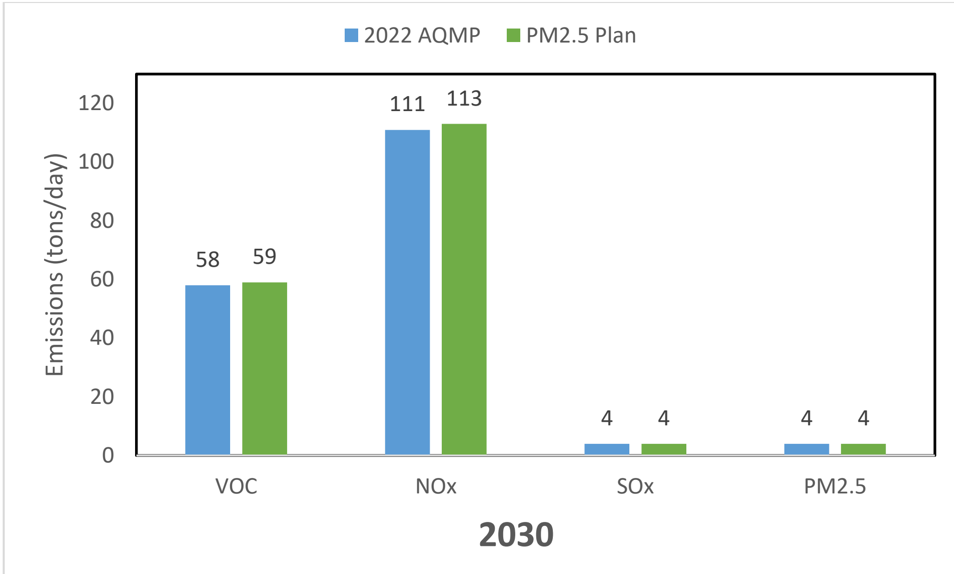


FIGURE 3-2

COMPARISON OF OFF-ROAD EMISSIONS BETWEEN 2022 AQMP AND ~~DRAFT~~ PM2.5 ~~PLAN~~PLAN

Uncertainties in the Emissions Inventory

An effective AQMP and SIP development relies on a complete and accurate emissions inventory. Methods for quantifying different emission sources continue to improve, allowing for development of more effective control measures. Increased use of continuous monitoring and source testing has contributed to improved point source inventories. Technical assistance to facilities and auditing of reported emissions have also improved the accuracy of the emissions inventory. Area source inventories that rely on average emission factors and regional activities have inherent uncertainty. Industry-specific surveys and source-specific studies during rule development have provided much-needed refinement to these emissions estimates. Emission factors for many area sources are adapted from the U.S. EPA's AP-42, but some categories have not been updated for extended periods of time, posing additional uncertainties in estimated emissions. Mobile source inventories are also continuously updated and improved. As described earlier, many improvements are included in the on-road mobile source model EMFAC2021, which estimates emissions from trucks, automobiles, and buses. Overall, the ~~Draft~~ PM2.5 Plan is based on the most current data and methodologies, resulting in the most accurate inventory available.

There are many challenges inherent in making accurate projections based on future growth, such as where vehicle trips will occur, the distribution between various modes of transportation (such as trucks and trains), as well as estimates for population growth and the number and type of jobs. Forecasts are made with the best information available; nevertheless, there is uncertainty in emissions projections. AQMP/SIP updates are generally developed every three to four years, thereby allowing for frequent updates and improvements to the inventories.

Gridded Emissions

The air quality modeling domain extends to southern Kern County in the north, the Arizona and Nevada borders to the east, northern Mexico to the south and more than 100 miles offshore to the west. The modeling domain is divided into a grid system comprised of 4 km by 4 km grid cells. Both stationary and mobile source emissions are allocated to individual grid cells within this system. In general, emissions are modeled as total daily emissions. Variations in temperature, hours of operation, speed of motor vehicles, or other factors are considered in developing gridded motor vehicle emissions. The "gridded" emissions data used for the PM2.5 attainment demonstration differ from the annual average day inventory emission data in several ways: (1) the modeling region covers larger geographic areas than the Basin, (2) emissions represent day-specific instead of annual average conditions, and (3) emissions are adjusted with daily meteorological conditions such as temperature and humidity.

Base Year Emissions

2018 Emission Inventory

Table 3-2 compares the annual average emissions in the ~~Draft~~ PM2.5 Plan, and the emissions estimated in the 2022 AQMP for all PM2.5 precursors. As described above, the major differences between the 2022 AQMP and the ~~Draft~~ PM2.5 Plan was caused by the switch from EMFAC2017 to EMFAC2021 for on-road sources. The error in construction equipment category did not affect the base year emissions.

Overall, base year 2018 emissions of VOC, NOx and SOx in the ~~Draft~~ PM2.5 Plan are higher than in the 2022 AQMP by 4 percent, 5 percent and 1 percent, respectively. Conversely, overall PM2.5 emissions in the ~~Draft~~ PM2.5 Plan are 9 percent lower than in the 2022 AQMP.

Table 3-3 shows the 2018 annual average emissions inventory by major source category. Stationary sources are subdivided into point sources (e.g., petroleum production and electric utilities) and area sources (e.g., architectural coatings, residential water heaters, consumer products, and permitted sources smaller than the emission reporting threshold – generally 4 tons per year). Mobile sources consist of on-road (e.g., passenger cars and heavy-duty trucks) and off-road sources (e.g., locomotives and ships).

Figure 3-3 illustrates the relative contribution of each source category to the 2018 inventory. VOC and NH3 emissions are both largely driven by area sources, though specific area sources differ for the two pollutants. For VOC emissions, over half of area sources emissions are from architectural coatings and consumer products. For NH3 emissions, humans and pets contribute to half of all area source emissions. Mobile sources, stationary point source, and stationary area source categories are the top respective contributors to NOx, SOx, and PM2.5 emissions. Overall, total mobile source emissions account for almost 45 percent of VOC emissions and 85 percent of NOx emissions. The on-road mobile category alone contributes over 23 percent and 49 percent of VOC and NOx emissions, respectively. For directly emitted PM2.5, tailpipe and non-tailpipe emissions from mobile sources represent 18 percent of total emissions with an additional 15 percent from vehicle-related entrained dust from paved and unpaved roads. Stationary sources are responsible for most of the SOx emissions in the Basin, with the point source category (larger facilities subject to AER requirements) contributing 49 percent of total SOx emissions. Non-vehicle related area sources, such as commercial cooking and residential fuel combustion are the predominant source of directly emitted PM2.5 emissions, contributing 46 percent of total emissions.

Figure 3-4 shows the fraction of the 2018 inventory by responsible agency. The U.S. EPA, CARB, and South Coast AQMD split regulatory authority over these pollutants, with the U.S. EPA and CARB primarily responsible for mobile sources. Specifically, the U.S. EPA's authority applies to aircraft, locomotives, OGVs, military harbor craft, and other mobile categories, including California international registration plan (CAIRP) and out-of-state (OOS) medium- and heavy-duty trucks and pre-empt off-road equipment with less than 175 horsepower. CARB regulates other mobile sources, consumer products, and portions of area sources related to fuel combustion, and petroleum production and marketing. The South Coast AQMD has limited authority over mobile sources, which it exercises via fleet rules and facility-based mobile source measurements. On the other hand, it exercises authority over most area sources and all point sources.

Figure 3-4 illustrates agency responsibility as it pertains to VOC, NOx, SOx, NH3, and directly emitted PM2.5 emissions. VOC, NOx, SOx, NH3 are PM2.5 precursors, forming secondary PM2.5 once emitted into the atmosphere. NOx and VOCs are important precursors to ozone and PM2.5 formation. As shown, most NOx and VOC emissions in the Basin are from sources that fall under the primary jurisdiction of the U.S. EPA or CARB. For example, 84 percent of NOx and 74 percent of VOC emissions are from sources primarily under CARB and the U.S. EPA control. Conversely, 61 percent of SOx emissions, 76 percent of NH3 emissions and 81 percent of directly emitted PM2.5 emissions are from sources under the South Coast AQMD control. This illustrates that actions at all levels of regulatory authorities including State, and federal level are necessary to ensure that the region attains the federal ambient air quality standards.

TABLE 3-2

COMPARISON OF THE 2018 BASE YEAR EMISSIONS

BETWEEN THE 2022 AQMP AND THE ~~DRAFT~~ PM2.5 PLAN (TONS PER DAY)

	On-Road Vehicles	Total Emissions
VOC		
2022 AQMP	78.5	387.0
~~Draft~~ PM2.5 Plan	93.4	401.9
% Change	19	4
NOx		
2022 AQMP	167.7	364.7
~~Draft~~ PM2.5 Plan	186.3	383.2
% Change	11	5
SOx		
2022 AQMP	1.7	14.3
~~Draft~~ PM2.5 Plan	1.8	14.4
% Change	6	1
PM2.5		
2022 AQMP	11	61.5
~~Draft~~ PM2.5 Plan	5.6	56.0
% Change	-49	-9
NH3		
2022 AQMP	16.3	74.5
~~Draft~~ PM2.5 Plan	16.4	74.6
% Change	1	0

TABLE 3-3
SUMMARY OF EMISSIONS BY MAJOR SOURCE CATEGORY: 2018 BASE YEAR IN ~~DRAFT~~ PM2.5 PLAN (TONS PER DAY[1])

Source Category	PM2.5 PLAN				
	VOC	NOx	SOx	PM2.5	NH3
Fuel Combustion	5.4	21.1	2.1	5.3	7.8
Waste Disposal	14.7	1.4	0.4	0.3	5.7
Cleaning and Surface Coatings	36.9	0.0	0.0	1.4	0.1
Petroleum Production and Marketing	19.6	0.3	0.3	0.9	0.1
Industrial Processes	10.2	0.1	0.1	4.7	8.7
Misc. Processes					
Residential fuel combustion	8.9	19.1	0.3	6.8	0.1
Cooking	1.1	0.0	0.0	11.4	0.0
Paved & Unpaved Road Dust	0.0	0.0	0.0	10.3	0.0
Others	2.6	0.2	0.1	4.1	34.3
Solvent Evaporation	120.0	0.0	0.0	0.0	1.2
RECLAIM Sources		17.8	5.5		
Total Stationary Sources	**219.4**	**59.9**	**8.8**	**45.2**	**58.0**
On-Road Vehicles	93.4	186.3	1.8	5.6	16.4
Off-Road Vehicles	89.2	137.1	3.8	5.2	0.2
Total Mobile Sources	**182.6**	**323.3**	**5.6**	**10.8**	**16.5**
TOTAL	**401.9**	**383.3**	**14.4**	**56.0**	**74.6**

[1] Values may not sum due to rounding

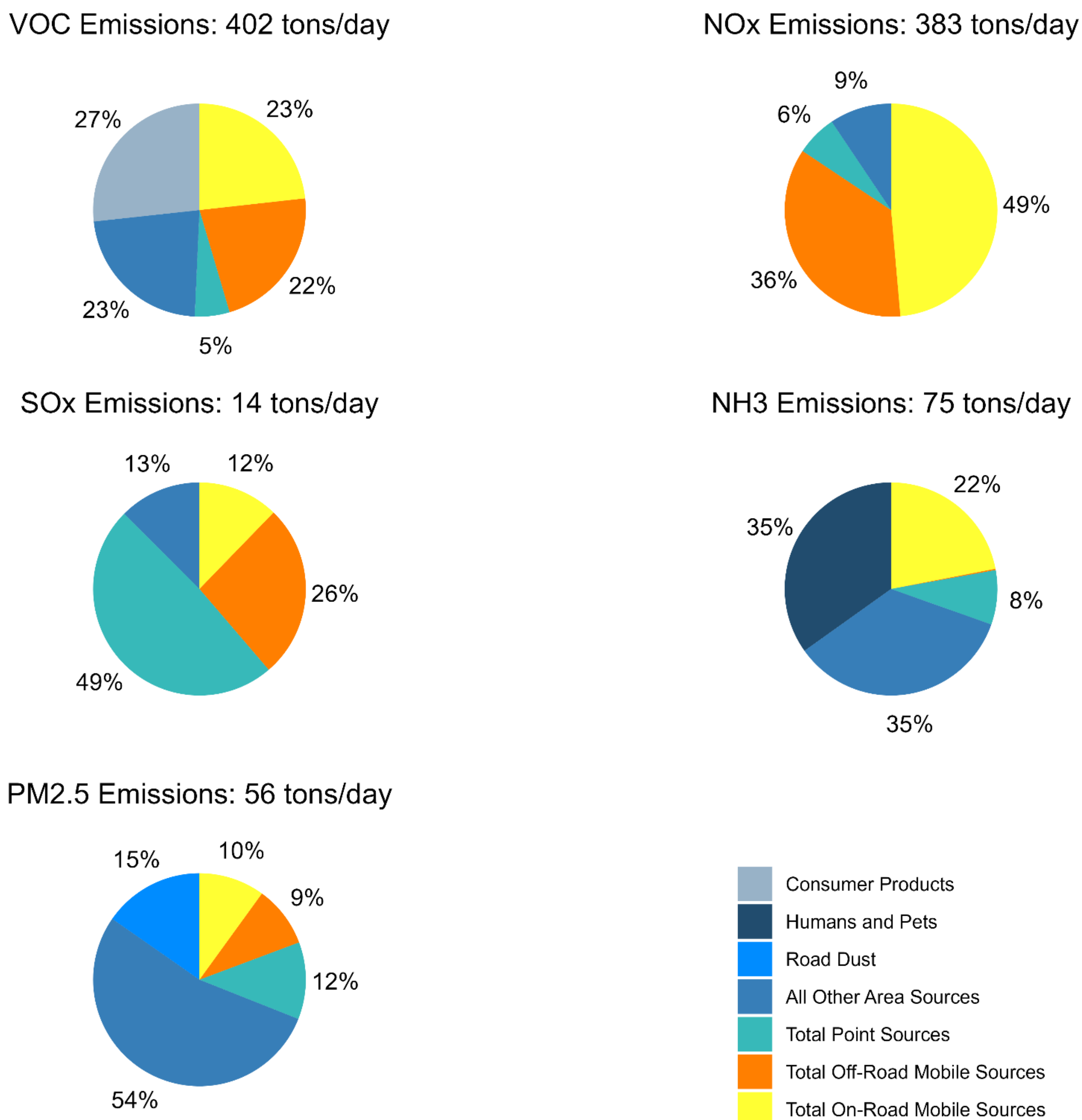


FIGURE 3-3

RELATIVE CONTRIBUTION BY MAJOR SOURCE CATEGORY TO 2018 EMISSIONS INVENTORY (ANNUAL AVERAGE, VALUES ARE ROUNDED AND MAY NOT SUM DUE TO ROUNDING)

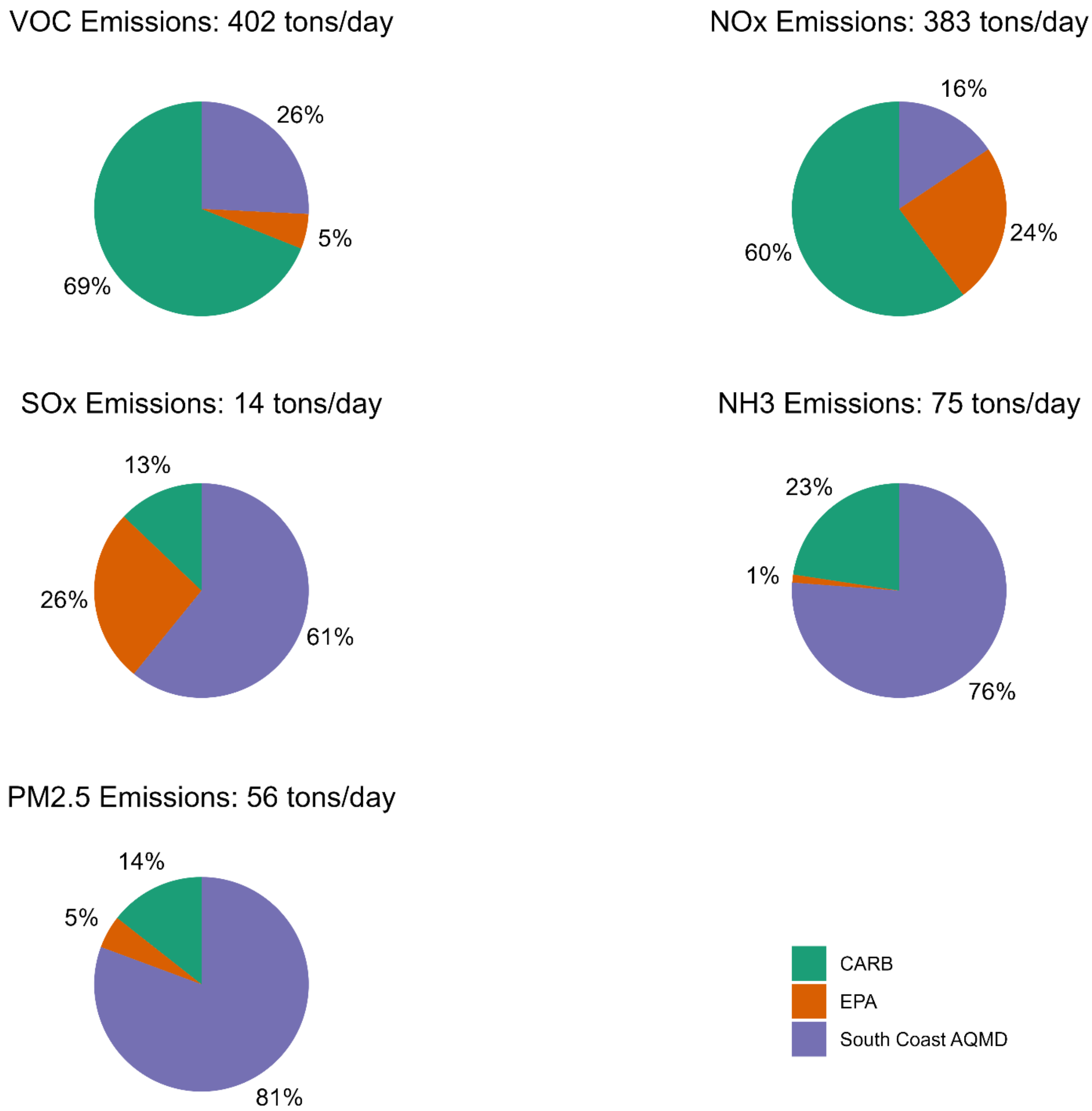


FIGURE 3-4
2018 EMISSION INVENTORY AGENCY PRIMARY RESPONSIBILITY
(ANNUAL AVERAGE, VALUES ARE ROUNDED TO NEAREST INTEGER AND MAY NOT SUM DUE TO ROUNDING)

Future Emissions

Inventory Development

Inventories were developed for 2018, the base year, 2030, the attainment year for the 2012 annual PM2.5 standard of 12 µg/m^3, and milestone years – 2025 and 2028– to demonstrate Reasonable Further Progress (RFP) and post attainment year, 2031. Detailed emissions inventories for all the milestone years are provided in Appendix I.

Future-year emissions were derived using: (1) emissions from the 2018 base year, (2) expected controls after implementation of the South Coast AQMD rules adopted by October 2020 and Rule 1109.1 and CARB regulations adopted by December 2021, and (3) activity growth in various source categories between the base and future years. CARB's H/D I & M was reflected in the baseline emissions as off-model adjustments as well.

Since the development of the 2022 AQMP, additional regulations pertaining to stationary sources have been implemented. These regulations affecting non-RECLAIM sources are detailed in Table 3-1, while those affecting RECLAIM sources are outlined in Table 3-4. Some regulations apply to both RECLAIM and non-RECLAIM sources, and thus, are listed in both tables. Notably, the regulations listed in Table 3-4 include those adopted prior to the October 2020 cutoff date for the 2022 AQMP. The reductions attributed to the non-shave portion of Rule 1109.1, which amount to 3.94 and 4.65 tons per day by 2030 and 2037, respectively, are already reflected in the baseline emissions (and not included in Table 3-4).

In accordance with the CMB-05 of the 2016 AQMP, multiple regulations targeting NOx emissions were enacted to transition the RECLAIM program into a traditional command-and-control regulatory framework. A portion of the emission reductions resulting from these regulations overlapped with the RECLAIM shave, reducing the allocation cap as stipulated in Rule 2002, which was adopted in December 2015. However, the 2022 AQMP did not incorporate the reductions from the landing rules, which were intended to phase out the RECLAIM program in favor of a command-and-control structure. At the time of the 2022 AQMP development, many of these rules were still in progress, and it was uncertain whether the reductions would be considered part of the RECLAIM shave. To prevent double counting, the reductions from the landing rules were assumed to be included in the RECLAIM shave in the 2022 AQMP. Subsequently, the majority of the landing rules have been adopted, and they are expected to achieve reductions exceeding the requirements of the RECLAIM shave over a longer timeframe. As of September 2023, 11 rules have been adopted, as listed in Table 3-4, and they are anticipated to reduce NOx emissions by 0.61 and 3.47 tons per day by 2022 and 2030, respectively. The 2022 reductions include only the rules adopted and implemented prior to 2022.

Given the maturity of the RECLAIM shave in 2022, any reductions in excess of the 2022 reductions are considered new reductions. Consequently, the net NOx reductions from landing rules beyond the shave are projected to be 2.86 and 3.01 tons per day by 2030 and 2037, respectively. The reductions from non-

RECLAIM rules listed in Table 3-1 are 0.34 and 1.14 tons per day by 2030 and 2037, respectively. While these additional reductions are not reflected in the baseline emissions, they have been factored into the attainment and Reasonable Further Progress (RFP) demonstrations.

Furthermore, adjustments have been made to the sunset timeline for RECLAIM emissions. In the 2022 AQMP, it was assumed that 2025 and 2026 would mark the initial years without RECLAIM programs for NOx and SOx, respectively, based on the best available information at the time of plan development. However, during the development of the landing rules, the sunset timeline was revised, delaying the sunset of the NOx RECLAIM program by one year and placing the sunset of the SOx RECLAIM program on hold to accommodate operational requirements and stakeholder feedback. Consequently, for this PM2.5 plan, 2026 is considered the first year without the NOx RECLAIM program, while the SOx RECLAIM program remains in effect. To maintain transparency and consistency with emissions included in previous AQMPs and SIPs, NOx emissions from former RECLAIM sources are provided as line-item information under “former-RECLAIM” for post-RECLAIM years.

Activity growth factors for future years are the same as the ones adopted for the 2022 AQMP. Future growth projections were based on demographic growth forecasts for various socioeconomic categories (e.g., population, housing, employment by industry) developed by SCAG for their 2020 RTP/SCS. Industry growth factors for 2030 were also provided by SCAG. Table 3-5 summarizes key socioeconomic parameters used in the ~~Draft~~ PM2.5 Plan emissions inventory development. Appendix I provides further detail on growth surrogates for different source sectors.

TABLE 3-4
RECLAIM LANDING RULES ADOPTED IN 2017 AND AFTERWARDS BUT NOT REFLECTED IN THE BASELINE EMISSIONS OF THE ~~DRAFT~~ PM2.5 PLAN

Adopted/ Amended Date	District Rule	Implementation Schedule		Total Reductions from RECLAIM Sources in 2030 (tpd)	2030 Reduction in excess of 2022 reductions (tpd)
		Start Year	End Year		
11/1/2019	Rule 1110.2 – Control of Emissions from Gaseous- and Liquid-fueled Engines	2020	2029	0.25	0.21
1/4/2019	Rule 1118.1 – Control of Emissions from Non-Refinery Flares	2022	2025	0.03	0.03
4/5/2019	Rule 1134 – Emissions of Oxides of Nitrogen from Stationary Gas Turbines	2024	2027	1.66	1.66
11/2/2018	Rule 1135 – Electricity Generating Facilities	2020	2025	0.30	0.18
12/7/2018	Rule 1146 & 1146.1 – Emissions of Oxides of Nitrogen from Industrial, Institutional, Commercial Boilers, Steam Generators, and Process Heaters	2019	2033	0.36	0.08
12/7/2018	Rule 1146.2 – Emissions of Oxides of Nitrogen from Large Heaters and Small Boilers and Process Heaters	2022	2023	0.002	0.002
5/6/2022	Rule 1147 – NOx Reductions from Miscellaneous Sources	2024	2059	0.40	0.40
8/6/2021	Rule 1147.1 – NOx Reductions from Aggregate Dryers	2025	2057	0.01	0.01
4/1/2022	Rule 1147.2 – NOx Reductions from Metal Melting and Heating Furnaces	2026	2057	0.49	0.36
8/4/2023	Rule 1153.1 – Emissions of Oxides of Nitrogen from Commercial Food Ovens	2024	2036	0.02	0.02
Cumulative reductions from the landing rules listed above*				3.47	2.86

* Reductions are calculated for each rule individually. Because some sources are affected by more than one rule, the compounded emission reductions are slightly lower than the sum of reductions from individual rules.

TABLE 3-5
BASELINE DEMOGRAPHIC FORECASTS FOR THE SOUTH COAST AIR BASIN EMPLOYED IN THE ~~DRAFT~~ PM2.5 PLAN

Category	2018	2030	% Growth from 2018 to 2030
Population (Millions)	16.7	18.0	7.9
Housing Units (Millions)	5.3	6.0	11.7
Total Employment (Millions)	7.7	8.3	7.3
Daily VMT (Millions)	388	395	1.8

Current forecasts indicate that this region will experience population growth of 7.9 percent between 2018 and 2030, with a 1.8 percent increase in VMT. Housing units show the largest change of the socioeconomic indicators with a projected 11.7 percent increase from 2018 to 2030.

Summary of Future Baseline Emissions

To illustrate trends in future baseline annual average inventories, emissions by source category and by pollutant for 2030 are presented in Table 3-6. Baseline inventories are projected future emissions that reflect already adopted regulations and programs but do not incorporate additional controls proposed in this ~~Draft~~ PM2.5 Plan. The 2018 base year emission inventory, which captures actual 2018 emissions, is used as the basis for future projections.

Even without any additional control measures, VOC and NOx emissions are expected to decrease due to existing South Coast AQMD and CARB regulations and programs, such as controls for on- and off-road equipment, new vehicle standards, and Rule 1109.1 for refinery emissions. For VOC and NOx, these updated regulations result in 15 and 46 percent lower emissions in 2030 than 2018. These decreases are not uniform across sources; per Figures 3-3 and 3-5, mobile source contributions to VOC emissions decline by 45 percent but area sources, including consumer products, continue to be a significant source of VOC emissions. For NOx emissions, amidst an overall decrease in emissions from 2018 to 2030, relative contributions change dramatically, where on-road contributions decrease from 49 to 24 percent while contributions from off-road sources increase from 36 to 54 percent. On-going implementation of adopted regulations contributes to the changes. For example, controls on heavy-duty vehicles are expected to reduce NOx emissions significantly but could lead to increased NH3 emissions due to ammonia slip. The contribution of on-road vehicle emissions to NH3 increases from 22% in 2018 to 27% in 2030.

Similarly, projected economic growth results in a corresponding 3 percent projected increase in SOx emissions. Stationary sources are projected to remain the predominant source of SOx, with point sources contributing almost half of total SOx emissions in 2030. However, OGVs are significant source of SOx emissions in the Basin, and growing shipping and OGV activity in future years is expected to increase SOx emissions at a faster rate than growth in point source emissions, driving the 3 percent increase. The highest-ranking source categories in the 2018 and 2030 inventories are discussed in a later section.

For directly emitted PM2.5, mobile sources account for 14 percent of total emissions in the 2030 inventory, a 4 percent decrease from the total mobile source contribution in 2018. This estimate excludes entrained paved/unpaved road dust sources, which shows a modest increase from 15 percent in the 2018 inventory to 17 percent in the 2030 inventory. Area sources excluding entrained paved/unpaved road dust sources are projected to remain the predominant source of directly emitted PM2.5, contributing 54 percent of emissions in 2018 and 57 percent in 2030. This is mainly due to the increases in population, VMT and economic activities.

Figure 3-6 shows the fraction of the 2030 inventory by responsible agency for VOC, NOx, SOx, NH3 and directly emitted PM2.5 emissions. In 2030, slightly larger fractions of NOx and VOC emissions will fall under the South Coast AQMD control (31 percent for VOC and 23 percent for NOx) due to different relative rates of emission reductions among sources controlled by the three agencies. Despite changes, the majority of VOC and NOx emissions will remain primarily under CARB and U.S. EPA jurisdiction. NOx sources under federal control, such as OGVs (33 tons per day), locomotives (18 tons per day), aircraft (24 tons per day), out-of-state and international heavy-duty trucks (4 tons per day), military portion of commercial harbor craft (1 ton per day), and pre-empted off-road equipment (4 tons per day) contribute ~~36~~40 percent of total NOx emissions in the Basin in 2030, compared to ~~25~~24 percent in 2018, indicating growing disparity between regulations on federal sources and sources under State and local control. VOC emissions from consumer products, which are regulated by CARB, are projected to reach 122 tons per day in 2030, representing 39 percent of total VOC emissions in the Basin. This increase in emissions, which mostly originate from the use of personal care, hygiene, and cleaning products, reflects projected population growth in the region. The fraction of SOx emissions that falls under the South Coast AQMD regulatory authority will remain largely unchanged from the 2018 base year inventory.

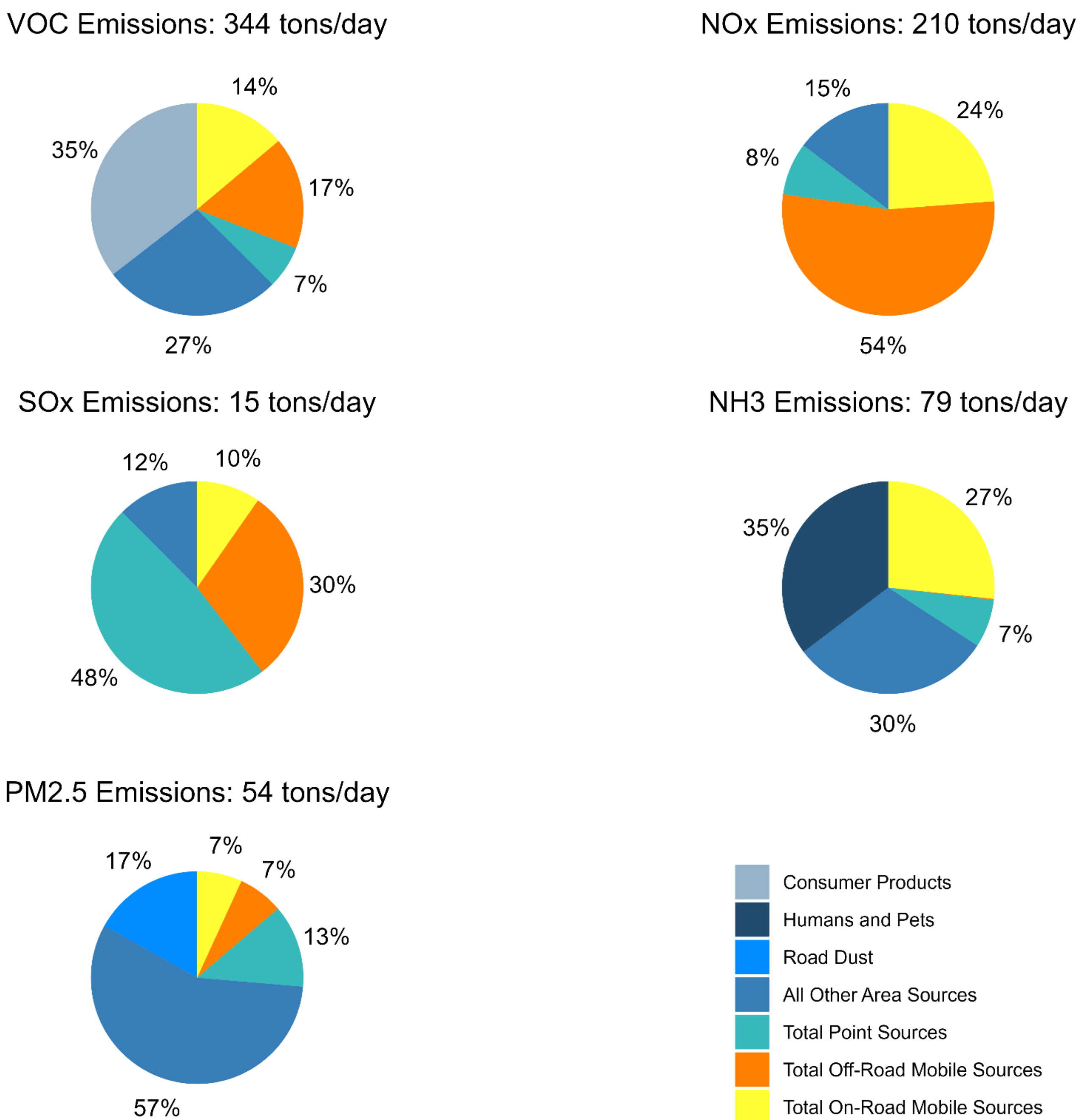


FIGURE 3-5

RELATIVE CONTRIBUTION BY SOURCE CATEGORY TO 2030 EMISSIONS INVENTORY (ANNUAL AVERAGE, VALUES ARE ROUNDED AND MAY NOT SUM DUE TO ROUNDING)

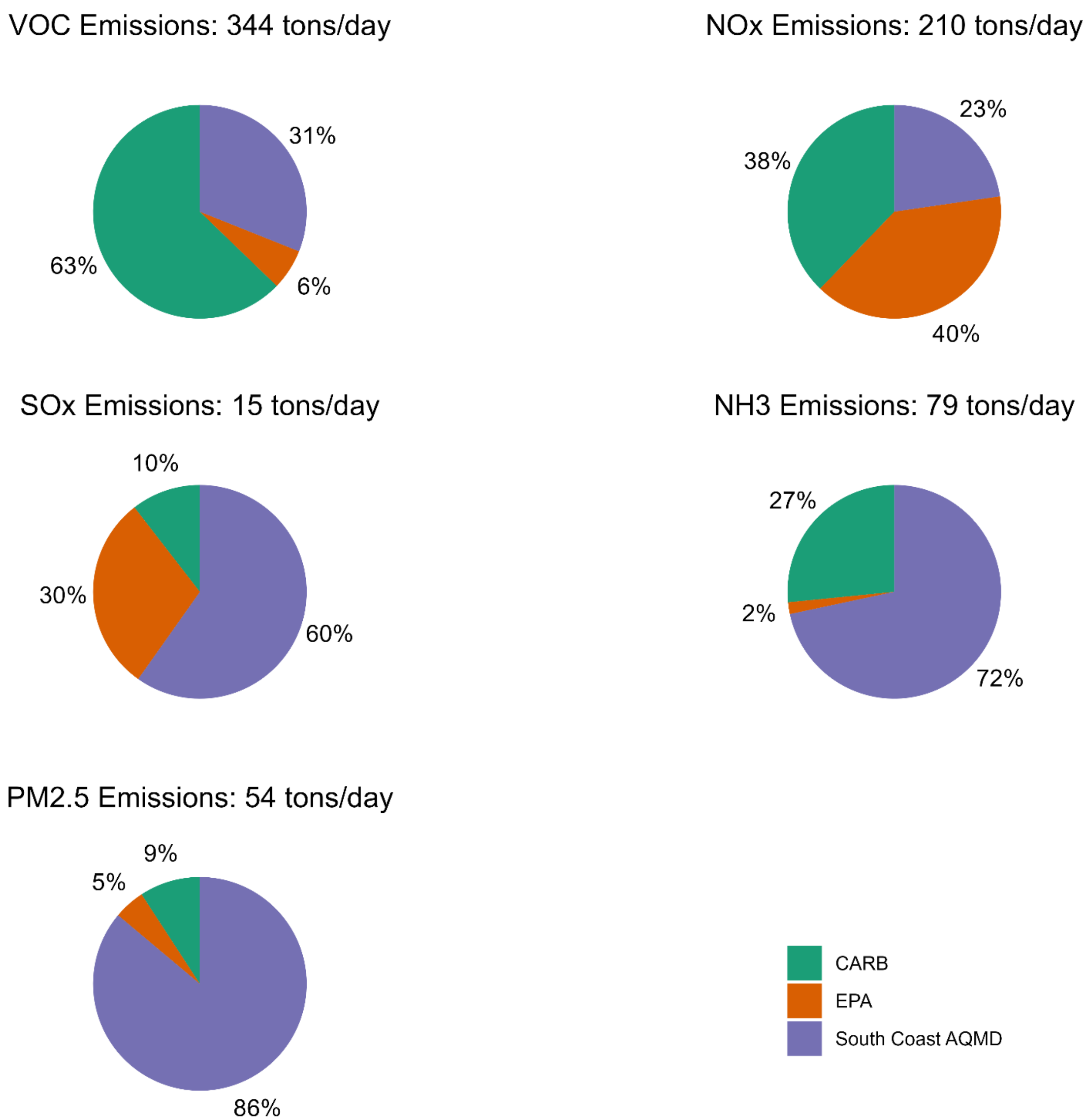


FIGURE 3-6
2030 EMISSIONS INVENTORY AGENCY RESPONSIBILITY
(ANNUAL AVERAGE, VALUES ARE ROUNDED TO NEAREST INTEGER AND MAY NOT SUM DUE TO ROUNDING)

TABLE 3-6
SUMMARY OF EMISSIONS BY MAJOR SOURCE CATEGORY: 2030 BASELINE
~~DRAFT~~ PM2.5 PLAN (TONS PER DAY[1])

Source Category	~~DRAFT~~ PM2.5 PLAN					
	VOC	NOx	CO	SOx	PM25	NH3
Fuel Combustion	5.4	29.4	75.3	6.1	5.2	7.3
Waste Disposal	15.7	1.6	0.7	0.5	0.3	6.4
Cleaning and Surface Coatings	39.2	0.0	0.1	0.0	1.6	0.2
Petroleum Production and Marketing	18.7	0.6	2.6	1.5	0.9	0.1
Industrial Processes	10.7	0.8	0.8	0.6	5.4	8.7
Misc. Processes						
Residential fuel combustion	8.9	15.2	47.4	0.3	6.6	0.1
Cooking	1.2	0.0	0.0	0.0	12.3	0.0
Paved & Unpaved Road Dust	0.0	0.0	0.0	0.0	11.6	0.0
Others	1.59	0.2	5.9	0.0	3.5	34.2
Solvent Evaporation	136.0	0.0	0.0	0.0	0.0	1.2
Total Stationary Sources	**237.4**	**47.8**	**132.7**	**9.0**	**46.6**	**58.0**
On-Road Vehicles	47.7	50.1	438.1	1.4	3.7	21.2
Off-Road Vehicles	58.6	112.6	595.7	4.4	3.7	0.1
Total Mobile Sources	**106.3**	**162.7**	**1033.8**	**5.8**	**7.4**	**21.3**
TOTAL	**343.7**	**210.4**	**1166.5**	**14.8**	**54.1**	**79.3**

[1] Values are rounded to nearest integer and may not sum due to rounding

Impact of Growth

The ~~Draft~~ PM2.5 Plan forecasts the 2030 emissions inventories ‘‘with growth’’ through a detailed consultation process with SCAG. The region is projected to see 8 percent growth in population, 12 percent growth in housing units, 7 percent growth in employment, and 2 percent growth in VMT between 2018 and 2030. To illustrate the impact of demographic growth on emissions, “no growth” emissions were estimated by removing the growth factors from 2030 baseline emissions. Table 3-7 presents a comparison of projected 2030 emissions with and without growth. The growth impacts to 2030 VOC, NOx, SOx, NH3 and directly emitted PM2.5 emissions are 27.5, 30.0, 1.0, 5.4, and 3.3 tons per day, respectively.

While economic growth is beneficial for the region, it presents a challenge to air quality improvement efforts as projected growth could offset the progress made in reducing VOC, NOx, SOx, and PM2.5 emissions through adopted regulations from the South Coast AQMD and CARB. Meeting the U.S. EPA’s current 2012 Annual PM2.5 standard of 12 $\mu g/m^3$ and other NAAQS will require continued emission reduction efforts with shared responsibility from all levels of government.

TABLE 3-7
GROWTH IMPACT TO 2030 EMISSIONS IN TONS PER DAY

With Growth	VOC	NOX	SOX	PM2.5	NH3
Stationary Point and Area	237.4	47.8	9.0	35.8	58.0
Road Dust	0.0	0.0	0.0	10.8	0.0
On-Road	47.7	50.1	1.4	3.7	21.2
Off-Road	58.6	112.6	4.4	3.7	0.1
Total	**343.7**	**210.4**	**14.8**	**54.1**	**79.3**
No Growth	**VOC**	**NOX**	**SOX**	**PM25**	**NH3**
Stationary Point and Area	217.6	47.4	8.8	34.0	56.1
Road Dust	0.0	0.0	0.0	10.3	0.0
On-Road	45.4	38.1	1.3	3.3	17.8
Off-Road	53.2	94.9	3.8	3.2	0.1
Total	**316.2**	**180.4**	**13.9**	**50.8**	**74.0**
Impact of Growth	**VOC**	**NOX**	**SOX**	**PM25**	**NH3**
Stationary Point and Area[1]	19.8	0.4	0.2	1.9	1.9
Road Dust	0.0	0.0	0.0	0.5	0.0
On-Road	2.3	11.9	0.2	0.4	3.4
Off-Road	5.4	17.7	0.6	0.5	0.0
Total	**27.5**	**30.0**	**1.0**	**3.3**	**5.4**

[1] Overall growth in Electric Utilities is projected as a composite factor of employment growth, efficiency improvements and renewable portfolio standards. For this analysis, the growth portion is based on employment growth alone, which is the surrogate for overall electricity demand growth. Proposed control measures promoting zero emissions technology will increase electricity demand significantly, beyond what these baseline projections suggest.

Top Ten Source Categories in 2018 and 2030

The top ten source contributors to 2018 and 2030 annual average emissions inventories for VOC, NOx, SOx, directly emitted PM2.5 and NH3 for years 2018 and 2030 are shown in Figures 3-7 to 3-14 and briefly discussed in this section.

Figures 3-7 to 3-8 provide the top ten source categories for VOC emissions in 2018 and 2030. These top ten categories account for approximately 82.8 and 81.5 percent of the total VOC inventories in 2018 and 2030, respectively. Consumer products, Light and Medium Duty Vehicles, and Off-Road Equipment are the three highest-emitting categories in both years. Emissions from Light and Medium Duty Vehicles and Off-Road Equipment decline substantially, which reflects the effect of regulations on vehicles and off-road equipment. On the other hand, emissions from Consumer Products, Coatings and Related Processes, and Architectural Coatings and Related Solvents emissions continue to rise due to increase in population and industrial activities.

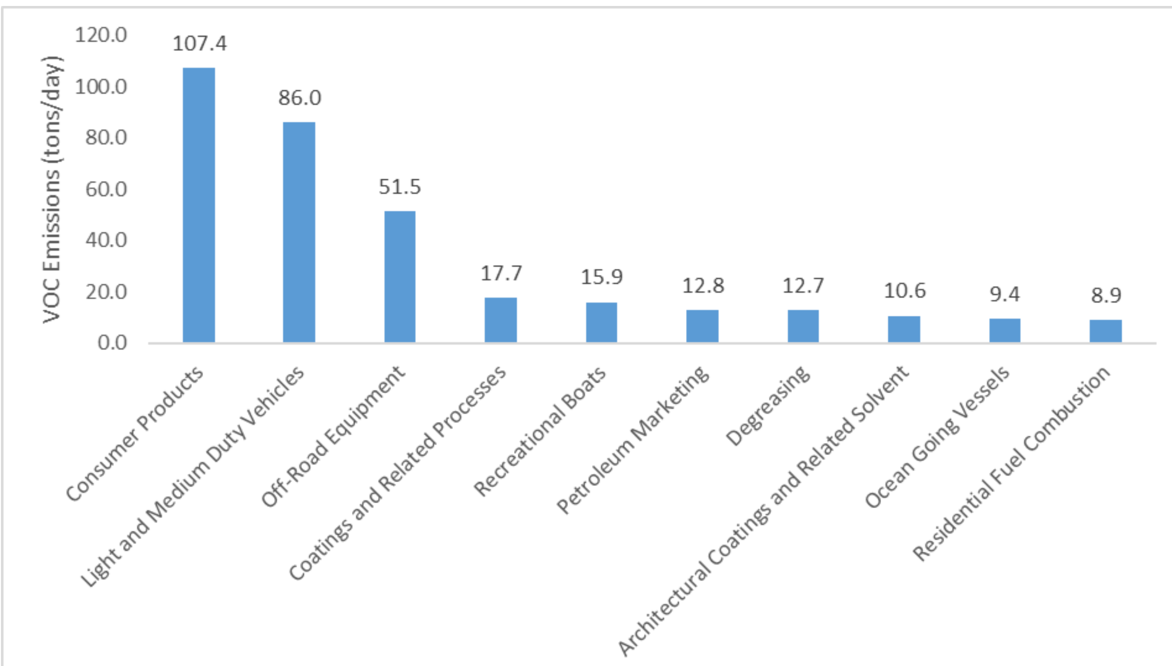


FIGURE 3-7
TOP TEN EMITTER CATEGORIES FOR VOC IN 2018
(ANNUAL AVERAGE)

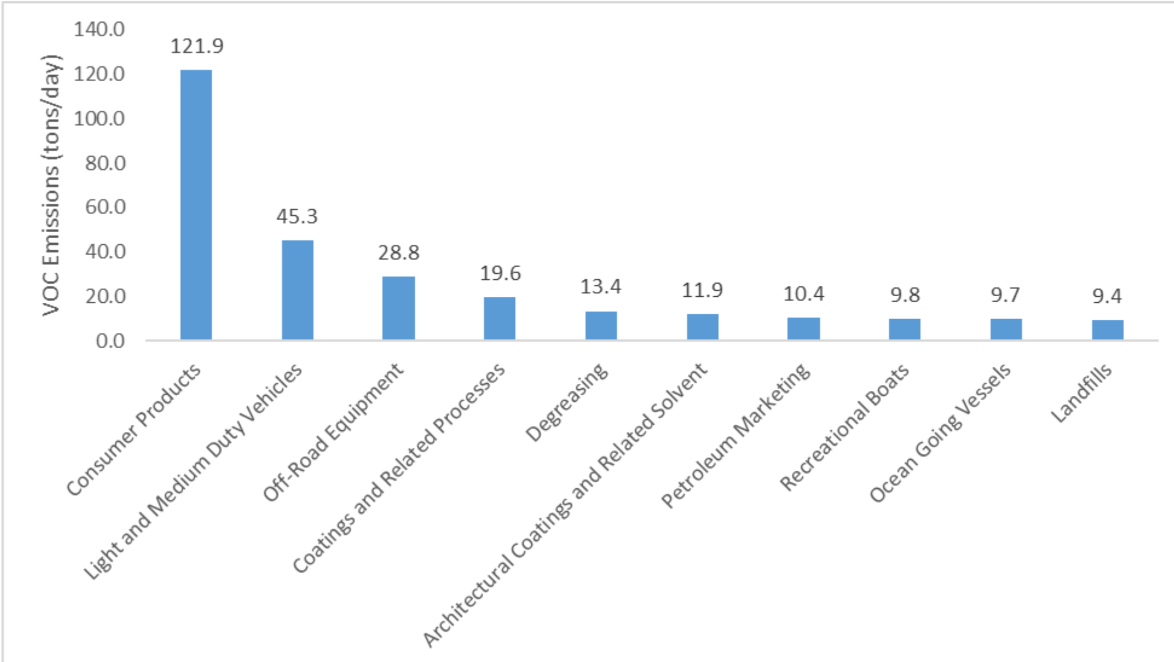


FIGURE 3-8
TOP TEN EMITTER CATEGORIES FOR VOC IN 2030
(ANNUAL AVERAGE)

Figures 3-9 to 3-10 show the top ten categories for NOx emissions in base year 2018 and future attainment year 2030. The top ten categories account for 90.8 percent of the total NOx inventory in 2018 and 89.6 percent in 2030. Mobile source categories remain the predominant contributor to NOx emissions. Heavy-Duty Trucks, Light and Medium Duty Vehicles, Off-road equipment, and OGVs are the top emitters in 2018. Heavy-Duty Trucks is the top source in 2018 but their emissions are projected to decrease substantially through 2030 because of emission regulations. Other sources that are projected to decline due to regulations include Light and Medium Duty Vehicle, Off-Road Equipment and Residential Fuel Combustion. On the contrary, emissions from OGV, Aircrafts and Trains are projected to increase through 2030 driven by increases activities in those sectors.

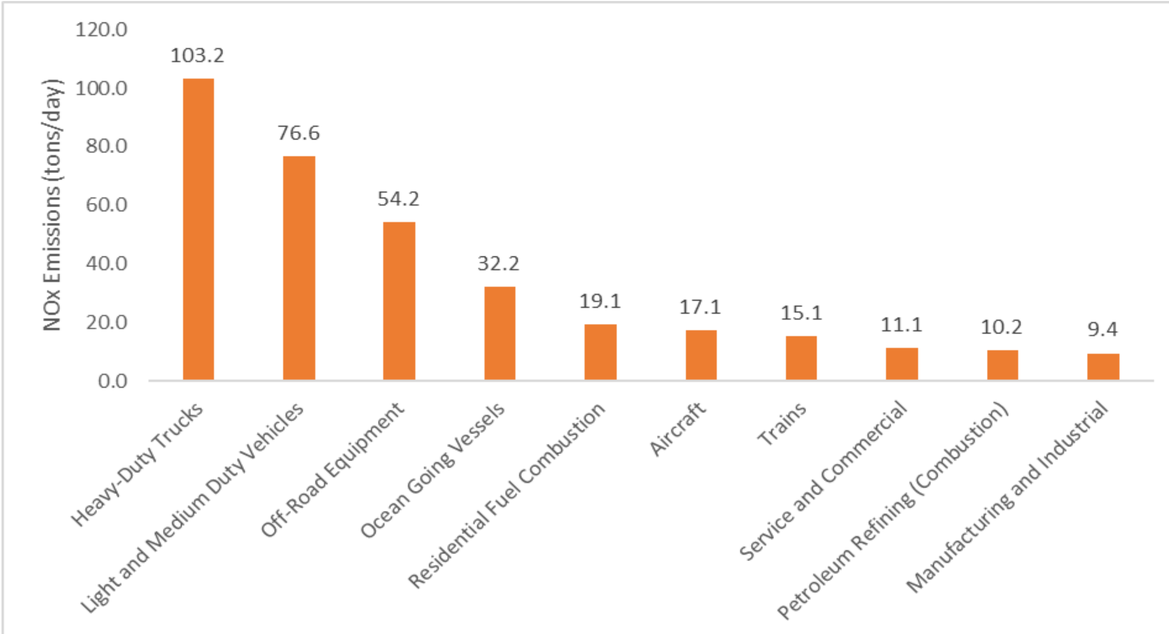


FIGURE 3-9
TOP TEN EMITTER CATEGORIES FOR NOx IN 2018
(ANNUAL AVERAGE)

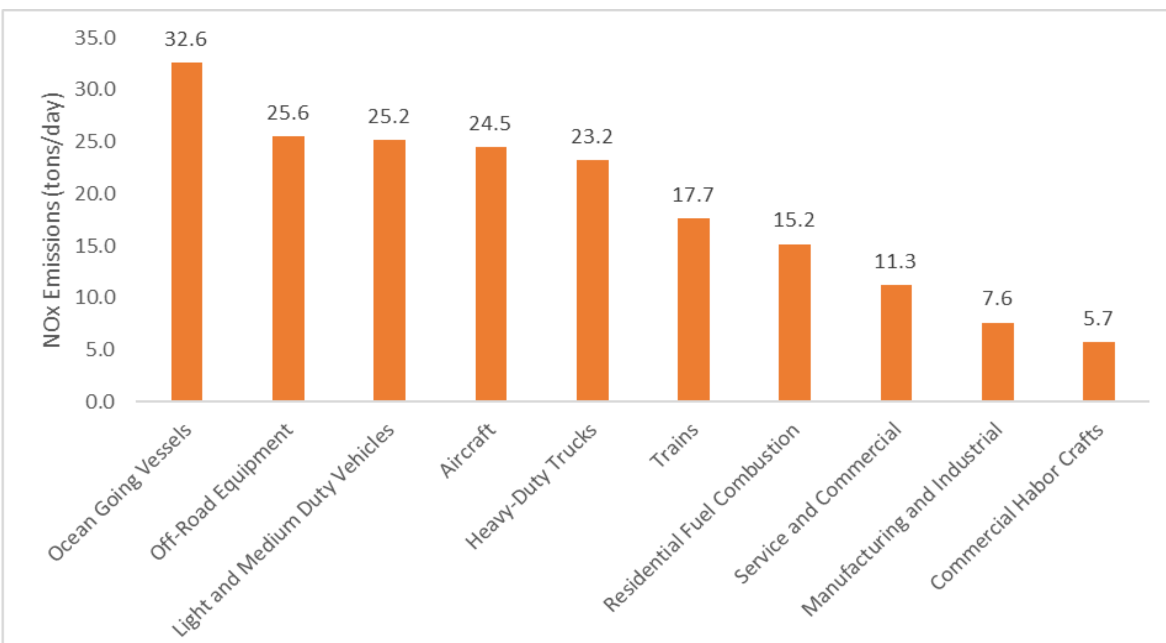


FIGURE 3-10
TOP TEN EMITTER CATEGORIES FOR NOx IN 2030
(ANNUAL AVERAGE)

Figures 3-11 to 3-12 show the top source categories for SOx emissions in 2018 and 2030. The top ten categories represent approximately 92 percent of total SOx inventory in 2018 and 2030. SOx emissions are projected to not change substantially from 2018 to 2030. Combustion in Petroleum Refining is the largest source in the Basin in both 2018 and 2030. OGV and Aircraft are the only sources that are expected to grow due to the expected increase in activity on those sectors and the limited regulations applicable to those sources. On the other hand, regulations and turnover to cleaner vehicles result in a marginal reduction in SOx from Light and Medium Duty Vehicles.

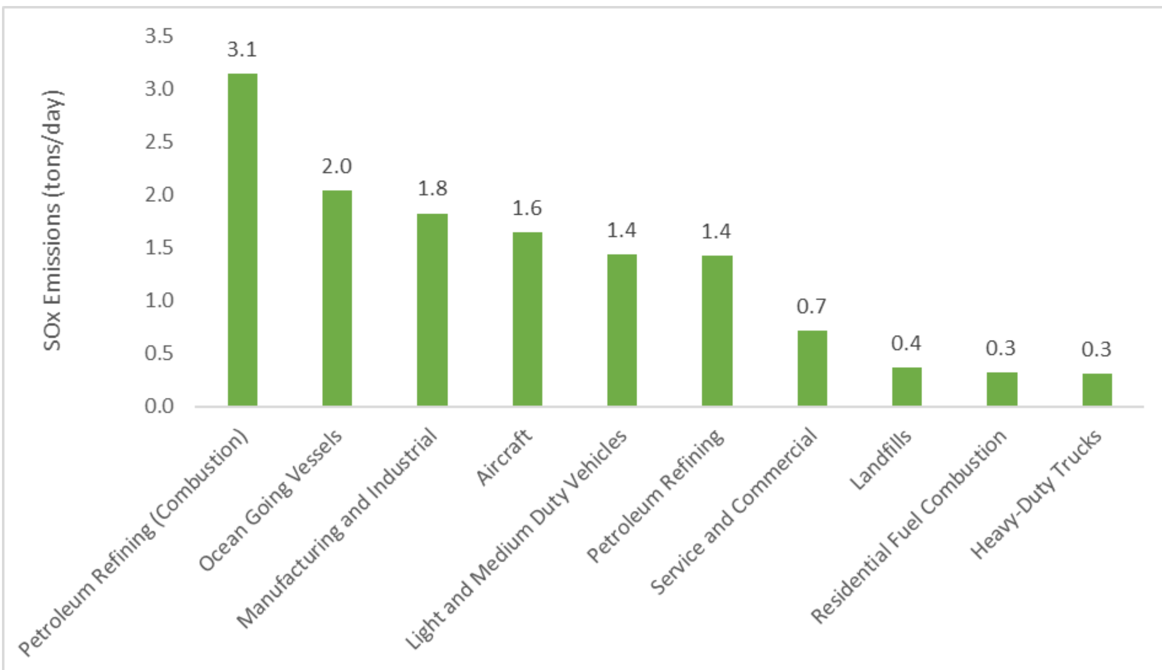


FIGURE 3-11
TOP EMITTER CATEGORIES FOR SOx IN 2018
(ANNUAL AVERAGE)

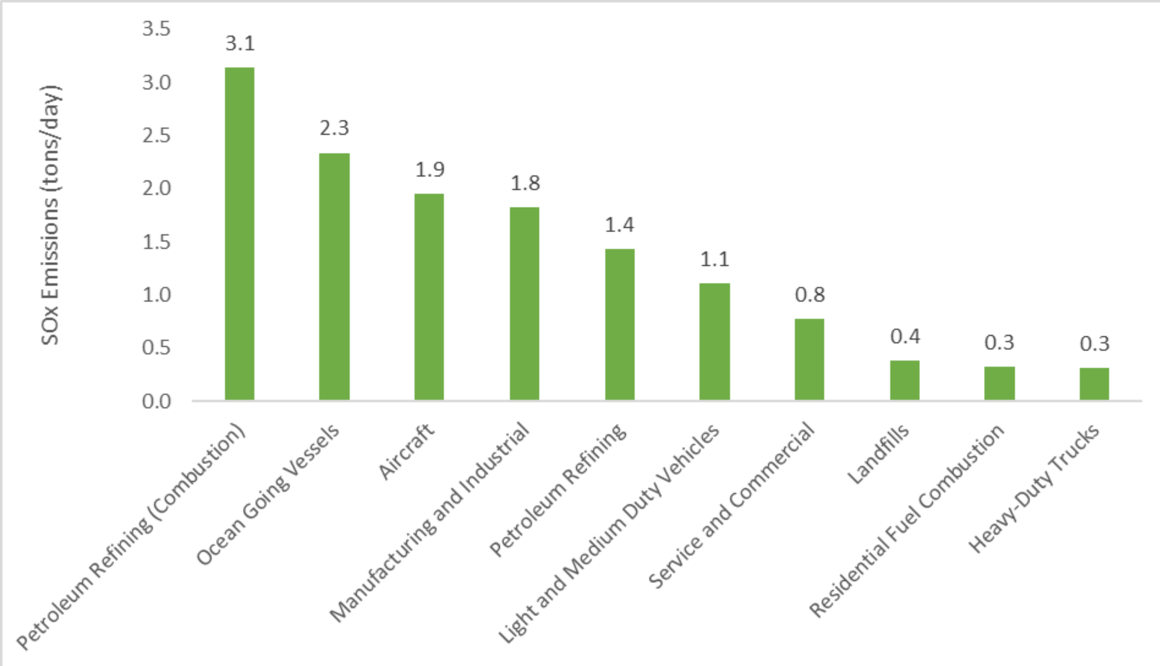


FIGURE 3-12
TOP EMITTER CATEGORIES FOR SOx IN 2030
(ANNUAL AVERAGE)

Figures 3-13 to 3-14 show the top ten source categories for annual average directly emitted PM2.5 in 2018 and 2030. The top 10 categories represent 76.4 percent of the total directly emitted PM2.5 inventory in 2018 and 78.6 percent in 2030. Commercial cooking, paved road dust, and residential fuel combustion are the largest contributors to total direct PM2.5 emissions. Emissions from cooking and paved road dust are projected to grow through 2030 because of the increase in population and vehicle activity. On the other hand, tailpipe emissions from vehicles are expected to decline due to vehicle emission regulations, despite the increase in vehicle miles traveled, however non-tailpipe emissions such as tire and break ware emissions are expected to grow due to increased VMT. Emissions from residential fuel combustion are also projected to decline through 2030 due to efficiency improvements and emissions regulations, despite the increase in population. Emissions from wood and paper industries, and from construction and demolition are among the top ten sources and are expected to grow through 2030 due to the projected increase in industrial activity in those sectors.

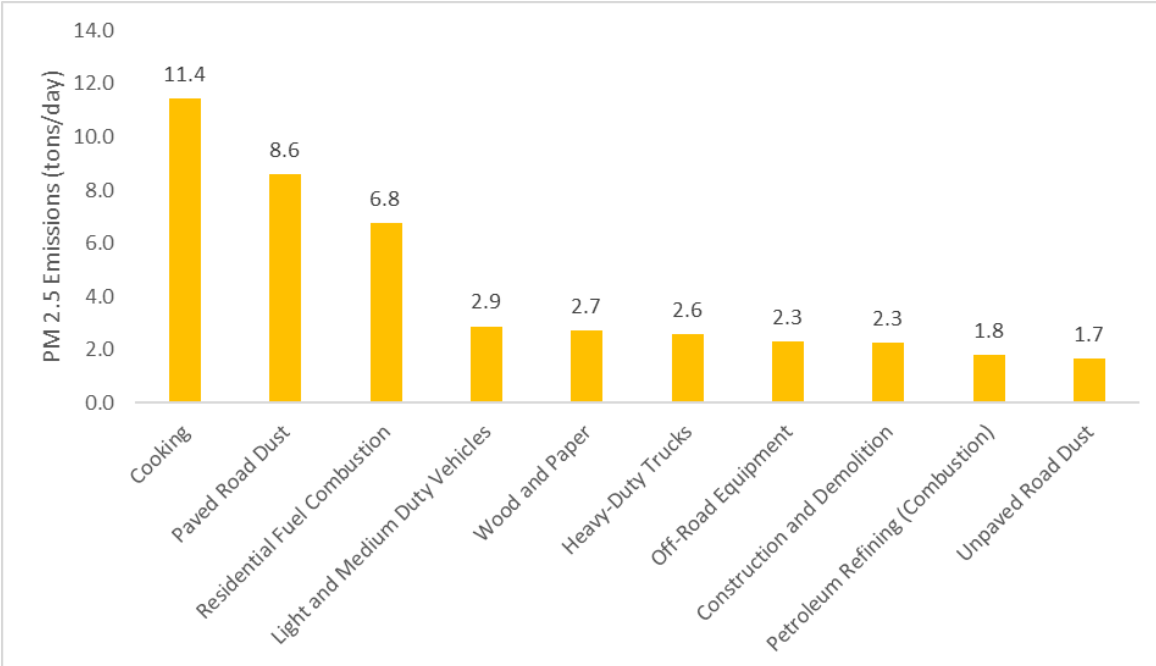


FIGURE 3-13
TOP TEN EMITTER CATEGORIES FOR DIRECTLY EMITTED PM2.5 IN 2018
(ANNUAL AVERAGE)

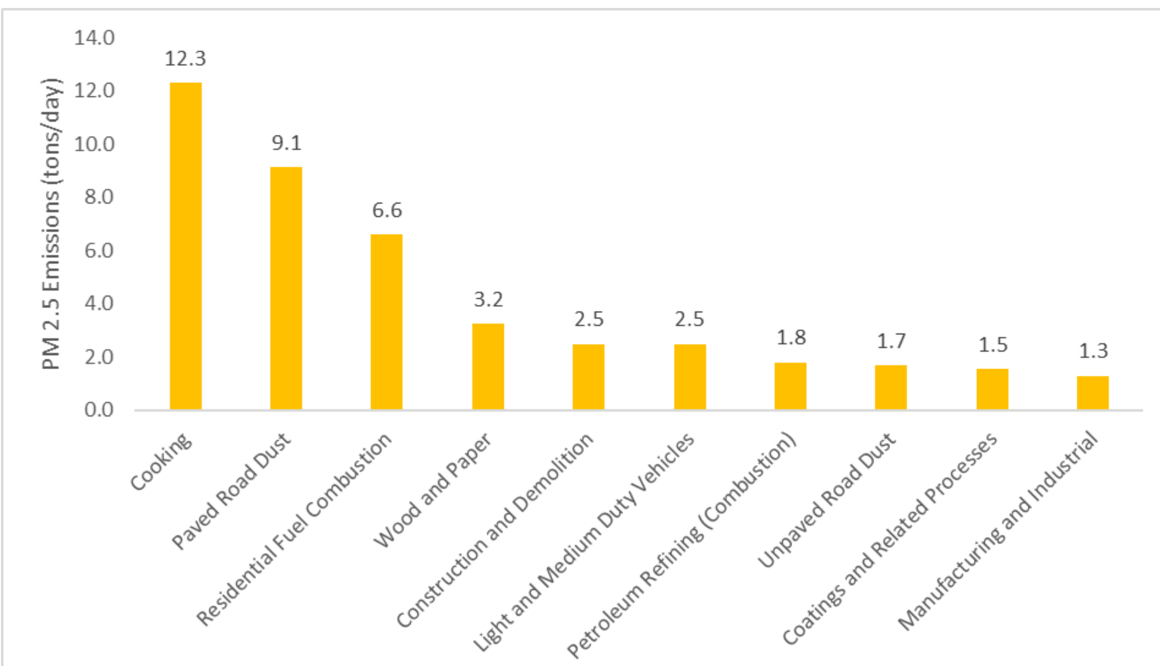


FIGURE 3-14
TOP TEN EMITTER CATEGORIES EMITTED PM2.5 IN 2030
(ANNUAL AVERAGE)

Figures 3-15 to 3-16 show the top ten source categories for NH3 emissions in 2018 and 2030. The largest source of ammonia is a group of miscellaneous sources that include human and pet perspiration. This source is expected to grow through 2030 as population grows in the basin. Emissions from vehicles are expected to grow through 2030 as well. Emissions of NH3 from gasoline vehicles are produced as a reaction in the catalytic converter. NH3 emitted by heavy-duty diesel trucks originates from the use of selective catalytic reactors to control NOx emissions from diesel vehicles.[8] The projected increase in vehicle activity for light-, medium- and heavy-duty vehicles leads to the increase in NH3 emissions. On the other hand, emissions from farming operations are projected to decline over the years as it is projected that some farming will gradually move away from the basin.[9]

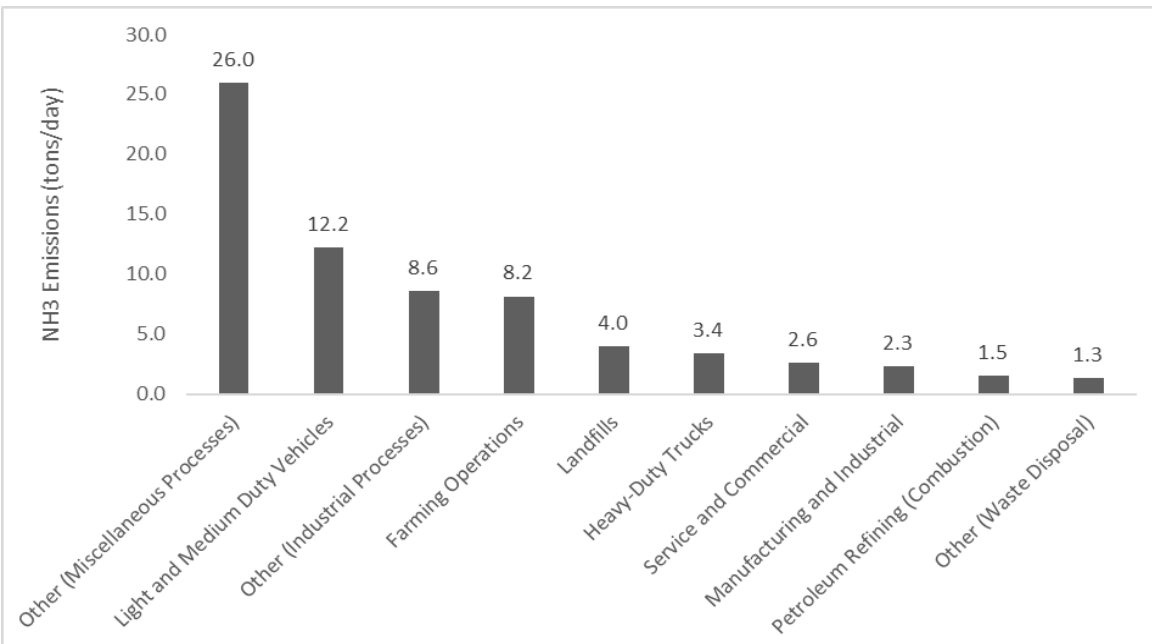


FIGURE 3-15
TOP TEN EMITTER CATEGORIES EMITTED NH3 IN 2018
(ANNUAL AVERAGE)

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[8] Ammonia emissions from Selective Catalytic Reaction (SCR) systems is generally referred to as *ammonia slip*. SCR technology reduces NOx emissions by converting them into harmless nitrogen and water vapor through a reaction with ammonia. However, if the SCR system injects more ammonia than required for the NOx reduction process, or if the catalyst becomes inefficient, unreacted ammonia can escape into the exhaust stream.

[9] Farming operations include emissions from livestock operations, with dairy cattle being the largest source in the basin. Cattle emissions are primarily based on the 2012 Census of Agriculture. Historical trends from the Santa Ana Water Control Board show a 39% decrease in the number of cows in the basin from 2008 to 2018. Growth profiles are based on CARB's projections of Census of Agriculture's historical livestock population trends, 2012. Additional information on CARB's methodology for farming operations is available at: https://ww2.arb.ca.gov/carb-miscellaneous-process-methodologies-farming-operations

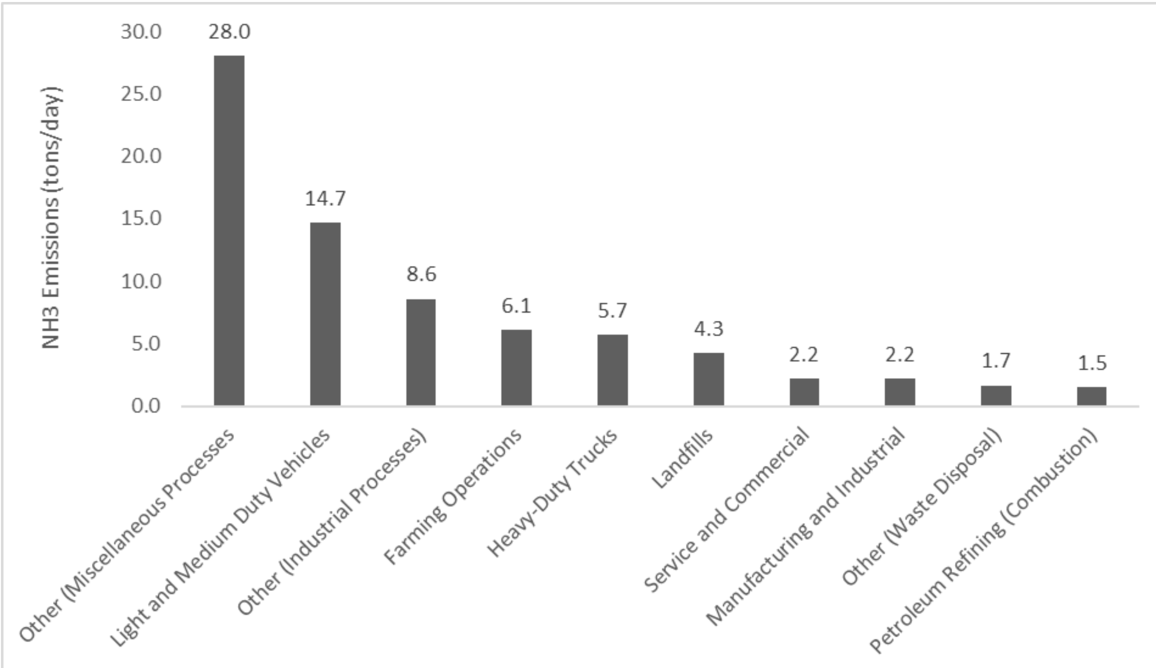

FIGURE 3-16
TOP TEN EMITTER CATEGORIES EMITTED NH3 IN 2030
(ANNUAL AVERAGE)

Condensable and Filterable Portions of PM2.5 Emissions

Per PM2.5 NAAQS final implementation rule,[10] the SIP emissions inventory is required to identify the condensable and filterable portions of PM2.5 separately, in addition to primary PM2.5 emissions. Primary PM emissions consist of condensable and filterable portions. Condensable PM is the material that is in vapor phase in stack conditions~~.~~ which then condenses to PM after cooling. Filterable PM comprises "particles that are directly emitted by a source as a solid or liquid [aerosol] at stack or release conditions." The U.S. EPA's Air Emissions Reporting Requirements (AERR) requires states to report annual emissions of filterable and condensable components of PM2.5 and PM10, "as applicable," for large sources for every inventory year and for all sources every third inventory year, beginning with 2011.[11] Subsequent

[10] 40 CFR 51.1008(a)(1)(iv).

[11] 40 CFR §51.15(a)(1) and §51.30(b)(1).

emissions inventory guidance[12] from the U.S. EPA clarifies the meaning of the phrase "as applicable" by providing a list of source types "for which condensable PM is expected by the AERR."

Category specific conversion factors developed by CARB and used in the Imperial County 2018 SIP[13] were applied in the current analysis to estimate condensable PM and then filterable PM was calculated by subtracting the condensable from the total PM2.5 primary emissions. This approach is consistent with South Coast AQMD's South Coast PM2.5 Plan for 2006 PM2.5 Standard.[14] The baseline 2018, future attainment year 2030 are included in the analysis. Figure 3-17 shows the annual average emissions of primary (or direct), condensable, and filterable PM2.5 emissions for 2018 and 20230. Details on the condensable and filterable PM2.5 emissions are provided in Appendix I of this Plan.

As shown on Figure 3-17, total primary PM2.5 emissions increase between base and future years from 45.2 tons per day in 2018 to 46.6 tons per day in 2030. The increase in total primary PM2.5 appears in both condensable and filterable portions with 0.8 tons per day and 0.6 tons per day increase, respectively, between 2018 and 2030. These increases can be attributed to the growth in population and economic activities in the Basin.

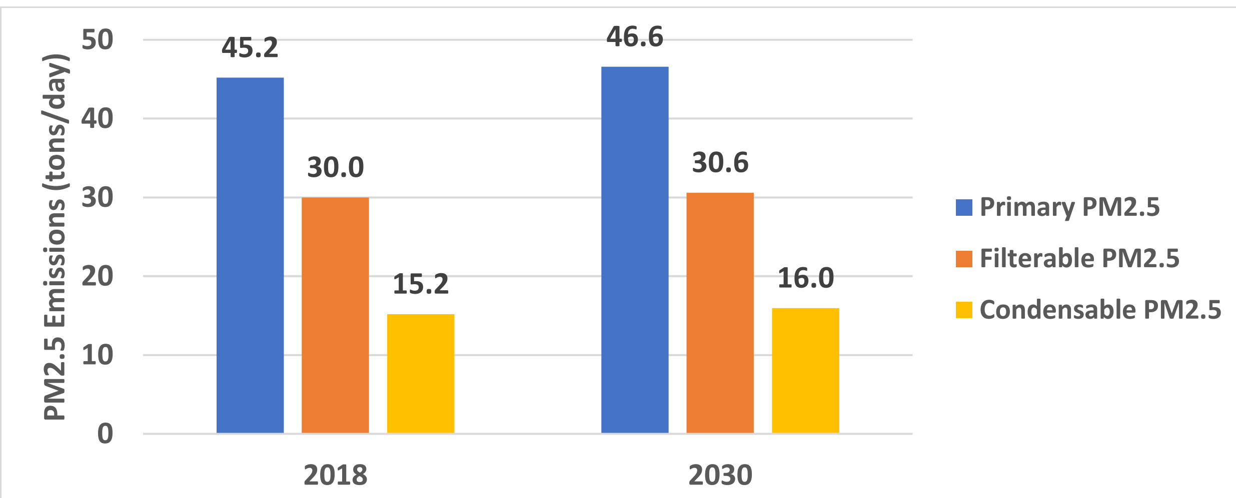

FIGURE 3-17
ANNUAL AVERAGE PRIMARY, FILTERABLE AND CONDENSABLE PM2.5 EMISSIONS FROM STATIONARY SOURCES

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[12] USEPA. 2017. Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations. Available at: https://www.epa.gov/sites/production/files/2017- 7/documents/ei_guidance_may_2017_final_rev.pdf.

[13] Imperial County 2018 Annual Particulate Matter less than 2.5 microns in Diameter State Implementation Plan, April 2018. Available at https://ww3.arb.ca.gov/planning/sip/planarea/imperial/final_2018_ic_pm25_sip.pdf.

[14] Available at http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2022-air-quality-management-plan/2-final-attainment-plan-for-2006-24-hour-pm2-5-standard-for-the-south-coast-air-basin.pdf?sfvrsn=6

Table 3-8 presents the top five source categories for condensable PM2.5 in 2018 and future milestone years. The majority of condensable PM2.5 is emitted from the "Cooking" category, which accounts for 75.1 percent and 76.8 percent of the total condensable PM2.5 in 2018 and 2030, respectively. The sum of the top five condensable PM2.5 categories represents 95.7 percent and 95.9 percent of the total condensable PM2.5 both in 2018 and 2030, respectively. Table 3-9 shows the top five categories for filterable PM2.5. The "Paved Road Dust" source category is the top emitter of filterable PM2.5. The top five filterable PM2.5 emissions categories account for approximately 70.7 percent (2018) and 72.9 percent (2030) of the total filterable PM2.5 emissions. This points to a marginally higher contribution of top five filterable categories to total filterable PM2.5 emissions in future years. Detailed emissions by major source category are included in Appendix I of this Plan.

TABLE 3-8
TOP 5 CATEGORIES EMITTING CONDENSABLE PM2.5 (TONS PER DAY)

Category	2018	2030
Cooking	11.41	12.27
Petroleum Refining (Combustion)	1.00	1.00
Residential Fuel Combustion	0.79	0.77
Manufacturing and Industrial	0.75	0.72
Service and Commercial	0.61	0.57

TABLE 3-9
TOP 5 CATEGORIES EMITTING FILTERABLE PM2.5 (TONS PER DAY)

Category	2018	2030
Paved Road Dust	8.59	9.11
Residential Fuel Combustion	5.98	5.82
Wood and Paper	2.70	3.23
Construction and Demolition	2.27	2.49
Unpaved Road Dust	1.67	1.67

CHAPTER 4

Control Strategy

- The bulk of the emission reductions needed to attain the 2012 annual PM2.5 standard will come from continued implementation of already adopted rules and regulations.

- The PM2.5 Plan advocates for a control strategy aimed at expediting implementation of 2022 AQMP NOx measures, leveraging PM2.5 co-benefits from these NOx measures, and reducing ammonia and direct PM2.5 emissions through selected controls mandated by the U.S. EPA.

- The control strategy complies with U.S. EPA's requirements including Best Available Control Measures and Most Stringent Measures.

Introduction

The control strategy in the South Coast Air Basin Attainment Plan for the 2012 Annual PM2.5 Standard provides the path to achieving the emission reductions needed to meet the 2012 annual PM2.5 NAAQS. Implementation of the PM2.5 Plan will be based on a series of control measures and strategies that vary by source type (i.e., stationary or mobile) as well as by pollutant, i.e., NOx, ammonia (NH3), or direct PM2.5. This chapter outlines the proposed control strategy and the schedules to adopt and implement the PM2.5 Plan to meet the 2012 annual PM2.5 standard in the South Coast Air Basin (Basin). The PM2.5 Plan control strategy includes a variety of implementation approaches such as regulation, accelerated deployment of available cleaner technologies, best management practices, co-benefits from existing programs (e.g., climate and energy efficiency), and incentives. Table 4-1 provides an overview of the criteria used in evaluating and selecting feasible control measures.

TABLE 4-1
CRITERIA FOR EVALUATING THE PM2.5 PLAN CONTROL MEASURES (LISTED ALPHABETICALLY)

Criteria	Description
Cost-Effectiveness	The cost of a control measure per reduction of emissions of a particular pollutant (cost includes purchasing, installing, operating, and maintaining the control technology).
Emission Reduction Potential	The total amount of pollution that a control measure can reduce.
Enforceability	The ability to ensure compliance with a control measure.
Legal Authority	Ability of the South Coast AQMD or other adopting agency to legally implement the measure.
Public Acceptability	The likelihood that the public will approve or cooperate in the implementation of a control measure.
Rate of Emission Reduction	The time it will take for a control measure to reduce a certain amount of air pollution.
Technological Feasibility	The likelihood that the technology for a control measure is or will be available.

Overall Strategy

The PM2.5 Plan relies primarily on previously adopted control measures from the 2022 AQMP and the 2022 State SIP Strategy. The Plan also relies on limited new controls for directly-emitted PM2.5 and key precursor pollutants, including NOx and NH3. By 2030, directly-emitted PM2.5 needs to be reduced by 6 percent from 2018 levels and NOx needs to be reduced by 54 percent. Although emissions of NH3 will increase by 2 percent over this timeframe, the Basin is still expected to meet the standard by 2030.

NOx is the primary precursor that will have the most impact on reducing PM2.5 levels in the Basin between 2018 and 2030. Approximately 383 tons per day of Basin total NOx emissions in 2018 need to be reduced to 176 tons per day by 2030. Continued implementation of adopted rules and regulations (i.e., baseline measures) are already projected to decrease emissions to 210 tons per day by the 2030 attainment year. Control measures included in this Plan are projected to reduce an additional 10 tons per day of NOx by 2030 and recently adopted regulations not included in the baseline will further reduce NOx emissions by 25 tons per day.

The 2022 AQMP and 2022 State SIP strategy were focused on reducing ozone levels, and its control measures therefore maximized NOx emission reductions. The~~se Plans'~~ overall approach of these plans requires~~d~~ broad adoption of zero emission technologies across all emission sources when cost-effective and feasible, and low NOx emission technologies where zero emission technologies are not yet feasible – all with a goal of achieving federal ozone standard by 2037. Selected 2022 AQMP and 2022 State SIP Strategy measures with potential NOx emission reductions that can be achieved by 2030 are included in the PM2.5 Plan and directly-emitted PM2.5 co-benefits have been quantified.

The PM2.5 Plan also includes limited strategies to reduce directly-emitted PM2.5 and NH3 emissions to assist with attainment and to fulfill CAA requirements. If only baseline measures are considered, directly-emitted PM2.5 emissions are projected to decrease from 56 tons per day in 2018 to 54 tons per day in 2030 while NH3 emissions are projected to increase from 75 tons per day in 2018 to 79 tons per day in 2030. Recently adopted regulations not included in the baseline will reduce directly-emitted PM2.5 and NH3 emissions by 0.83 tons per day and 2.96 tons per day, respectively, by 2030. Control measures proposed in this Plan seek to lower directly-emitted PM2.5 and NH3 emissions by an additional 0.54 tons per day and 0.25 tons per day, respectively, by 2030.

In addition to implementing a control strategy for attainment, the PM2.5 Plan is required to satisfy U.S. EPA's requirements including Best Available Control Measures (BACM) and Most Stringent Measures (MSM). Demonstrating compliance with BACM and MSM requirements is independent of attainment and therefore some control measures are included which are not needed for attaining the standard. For details on the BACM and MSM requirements and analysis, refer to Appendix III.

South Coast AQMD Proposed Annual PM2.5 Strategy

South Coast AQMD's proposed annual PM2.5 attainment strategy consists of two parts: stationary source measures and mobile source measures. In this PM2.5 Plan, the South Coast AQMD is proposing a total of 38 control measures. Only one of these measures is new and not carried over from the 2022 AQMP or the 2016 AQMP. Out of the 38 proposed control measures, 23 measures target reductions from stationary sources and the remaining 15 measures target reductions from mobile sources.

South Coast AQMD Proposed Stationary Source Measures

A control measure is a set of specific technologies and methods identified for potential implementation to reduce emissions to attain an air quality standard. The proposed stationary source PM2.5 measures are designed to assist with attainment of the 2012 annual PM2.5 standard primarily through NOx emission reductions with concurrent NH3 and direct PM2.5 reductions. Co-benefits from GHG emission reduction policies and other measures are included as well.

Stationary source measures include Best Control Measures (BCM) that seek to reduce NOx emissions from residential and large industrial combustion sources, NH3 emissions from livestock waste and greenwaste disposal, and direct PM2.5 emissions from combustion and non-combustion sources. Some of the NOx measures pursue co-benefits from Energy and Climate Change Programs (ECC) measures and from other BCM measures. While all control measures seek to reduce emissions, not all measures have quantified reductions. The majority of stationary source measures are anticipated to be developed in the next several years and implemented in whole or in part prior to 2030.

Table 4-2 provides a list of the South Coast AQMD proposed PM2.5 measures for stationary sources along with anticipated emission reductions in 2030. The following sections provide a brief description of the proposed stationary source measures. Detailed descriptions of the measures are provided in Appendix IV-A.

TABLE 4-2
SOUTH COAST AQMD PROPOSED STATIONARY SOURCE MEASURES

Number	Title [Pollutant]	Previous Plan Measure Was Included	Emission Reductions (2030) (tons per day)
South Coast AQMD Stationary Source NOx Measures:			
BCM-01	Emission Reductions from Replacement with Zero Emission or Low NOx Appliances – Residential Water Heating* [PM2.5, NOx]	2022 AQMP (R-CMB-01)	TBD
BCM-02	Emission Reductions from Replacement with Zero Emission or Low NOx Appliances – Residential Space Heating* [PM2.5, NOx]	2022 AQMP (R-CMB-02)	TBD
BCM-03	Emission Reductions from Residential Cooking Devices [PM2.5, NOx]	2022 AQMP (R-CMB-03)	TBD
BCM-04	Emission Reductions from Replacement with Zero Emission or Low NOx Appliances – Residential Other Combustion Sources [PM2.5, NOx]	2022 AQMP (R-CMB-04)	TBD

Number	Title [Pollutant]	Previous Plan Measure Was Included	Emission Reductions (2030) (tons per day)
BCM-05	Emission Reductions from Emergency Standby Engines [PM2.5, NOx]	2022 AQMP (L-CMB-04)	0.04 [PM2.5] 0.36 [NOx]
BCM-06	Emission Reductions from Diesel Electricity Generating Facilities [NOx]	2022 AQMP (L-CMB-06)	0.16
BCM-07	Emission Reductions from Incinerators [NOx]	2022 AQMP (L-CMB-09)	0.81
	Total Quantified PM2.5 and NOx Reductions		**0.04 [PM2.5]** **1.33 [NOx]**
South Coast AQMD Co-Benefits from Energy and Climate Change Programs Measures:			
ECC-01	Co-benefits from Existing and Future Greenhouse Gas Programs, Policies, and Incentives [All Pollutants]	2022 AQMP (ECC-01)	TBD
ECC-02	Co-benefits from Existing and Future Residential and Commercial Building Energy Efficiency Measures [All Pollutants]	2022 AQMP (ECC-02)	TBD
ECC-03	Additional Enhancements in Reducing Existing Residential Building Energy Use [All Pollutants]	2022 AQMP (ECC-03)	TBD
South Coast AQMD NH3 Measures:			
BCM-08	Emission Reductions from Livestock Waste at Confined Animal Facilities* [NH3]	2016 AQMP (BCM-04)	0.27
BCM-09	Ammonia Emission Reductions from NOx Controls [NH3]	2016 AQMP (BCM-05)	TBD
BCM-10	Emission Reductions from Direct Land Application of Chipped and Ground Uncomposted Greenwaste* [NH3]	2016 AQMP (BCM-10)	0.08
BCM-11	Emission Reductions from Organic Waste Composting [NH3]	2016 AQMP (BCM-10)	TBD
	Total Quantified NH3 Reductions		**0.35**
South Coast AQMD Direct PM2.5 Measures:			
BCM-12	Further Emission Reductions from Commercial Cooking* [PM2.5]	2016 AQMP (BCM-01)	TBD

Number	Title [Pollutant]	Previous Plan Measure Was Included	Emission Reductions (2030) (tons per day)
BCM-13	Emission Reductions from Cooling Towers [PM2.5]	2016 AQMP (BCM-02)	TBD
BCM-14	Further Emission Reductions from Paved Road Dust Sources [PM2.5]	2016 AQMP (BCM-03)	TBD
BCM-15	Emission Reductions from Abrasive Blasting Operations [PM2.5]	2016 AQMP (BCM-06)	TBD
BCM-16	Emission Reductions from Stone Grinding, Cutting and Polishing Operations [PM2.5]	2016 AQMP (BCM-07)	TBD
BCM-17	Emission Reductions from Prescribed Burning for Wildfire Prevention [PM2.5]	2022 AQMP (MCS-02)	TBD
BCM-18	Further Emission Reductions from Wood-Burning Fireplaces and Wood Stoves* [PM2.5]	2016 AQMP (BCM-09)	~~TBD~~0.33
BCM-19	Emission Reductions from Unpaved Road Dust Sources [PM2.5]	New	TBD
	Total Quantified Direct PM2.5 Reductions		**0.33~~TBD~~**
South Coast AQMD Other Measures:			
BCM-20	Application of All Feasible Measures [All Pollutants]	2022 AQMP (MCS-01)	TBD

* These measures are included to satisfy MSM requirements.
Note: TBD are reductions to be determined once the measure is further evaluated, the technical assessment is complete, and inventories and cost-effective control approaches are identified, and are not relied upon for attainment demonstration purposes.

South Coast AQMD Stationary Source NOx Measures

There are seven NOx measures as listed below:

- BCM-01: Emission Reductions from Replacement with Zero Emission or Low NOx Appliances – Residential Water Heating
- BCM-02: Emission Reductions from Replacement with Zero Emission or Low NOx Appliances – Residential Space Heating

- BCM-03: Emission Reductions from Residential Cooking Devices
- BCM-04: Emission Reductions from Replacement with Zero Emission or Low NOx Appliances – Residential Other Combustion Sources
- BCM-05: Emission Reductions from Emergency Standby Engines
- BCM-06: Emission Reductions from Diesel Electricity Generating Facilities
- BCM-07: Emission Reductions from Incinerators

BCM-01: EMISSION REDUCTIONS FROM REPLACEMENT WITH ZERO EMISSION OR LOW NOX APPLIANCES – RESIDENTIAL WATER HEATING: This control measure, based on 2022 AQMP control measure R-CMB-01, seeks to reduce NOx emissions from residential building water heating sources that are subject to Rule 1121 – Control of Oxides of Nitrogen (NOx) from Residential Type, Natural Gas-Fired Water Heaters. The measure proposes to: (1) develop a rule to require zero emission water heating units for installations in both new and existing residences; and (2) allow low NOx technologies as a transitional alternative when installing a zero emission unit is determined to be infeasible (e.g., colder climate zones, or architecture design obstacles). This control measure would include incentive funds to facilitate the transition to zero emission technologies and promote further emission reductions earlier than required.

BCM-02: EMISSION REDUCTIONS FROM REPLACEMENT WITH ZERO EMISSION OR LOW NOX APPLIANCES – RESIDENTIAL SPACE HEATING: This control measure, based on 2022 AQMP control measure R-CMB-02, seeks to reduce NOx emissions from residential space heating sources regulated by Rule 1111 – Reduction of NOx Emissions from Natural-Gas-Fired, Fan-Type Central Furnaces. The measure proposes to: (1) develop a rule to require zero emission space heating units for installations in both new and existing residences; and (2) allow low NOx technologies as a transitional alternative when installing a zero emission unit is determined to be infeasible. This control measure would also provide incentive funds to facilitate adoption of zero emission technologies that would promote further emission reductions earlier than required.

BCM-03: EMISSION REDUCTIONS FROM RESIDENTIAL COOKING DEVICES: This control measure, based on 2022 AQMP control measure R-CMB-03, seeks to reduce NOx emissions from residential cooking devices including stoves, ovens, griddles, broilers, and others in new and existing buildings. Replacing the existing gas burners with electric cooking devices, induction cooktops, or low NOx gas burner technologies will reduce NOx emissions. NOx reductions will be pursued through a combination of regulatory approaches and incentives, and/or efficiency standards. Proposed method of control consists of two steps. Step one includes a technology assessment of emissions testing of various cooking devices to establish emissions rates. Once emissions rates are defined, step two supports future rule development and incentive programs. The rule would apply to manufacturers, distributors, and installers establishing emission limits. The incentive programs would provide funds to encourage and promote adoption of zero and low NOx emission technologies.

BCM-04: EMISSION REDUCTIONS FROM REPLACEMENT WITH ZERO EMISSION OR LOW NOX APPLIANCES – RESIDENTIAL OTHER COMBUSTION SOURCES: This control measure, based on 2022 AQMP control measure R-CMB-04, seeks to reduce NOx emissions from residential combustion sources that are not water heating (See BCM-01), space heating (See BCM-02) and cooking equipment (See BCM-03). BCM-04 sources are miscellaneous, but primarily comprised of natural gas and liquified petroleum gas (LPG) fired swimming pool heaters, laundry dryers, and barbecue grills. The measure proposes to: (1) develop a rule to require zero emission technologies for some emission sources in both new and existing residences; and (2) allow low NOx technologies as an alternative for the rest of emission sources. Mitigation fees may be required for certain lower NOx technology applications which will be evaluated during the future rulemaking process. During the rulemaking, staff will assess the universe of equipment. Incentive funds will be considered to facilitate adoption of zero emission technologies that would promote further emission reductions earlier than required.

BCM-05: EMISSION REDUCTIONS FROM EMERGENCY STANDBY ENGINES: South Coast AQMD regulations require permits for stationary Internal Combustion Engines (ICEs) rated over 50 brake horsepower. The permits currently limit emergency standby ICE usage to less than 200 hours per year which includes a limit of 20 to 50 hours for maintenance and testing purposes. Rule 1470 requires the use of CARB diesel fuel for all diesel-fueled ICEs rated over 50 brake horsepower. This control measure, based on 2022 AQMP control measure L-CMB-04, seeks to maximize PM2.5 and NOx emission reductions by requiring the use of renewable diesel as a drop-in replacement for CARB diesel fuel for all emergency standby ICEs that are not equipped with Tier 4 Final controls.

BCM-06: **EMISSION REDUCTIONS FROM DIESEL ELECTRICITY GENERATING FACILITIES:** This control measure, based on 2022 AQMP control measure L-CMB-06, seeks to reduce NOx emissions from electric generating units regulated by Rule 1135 – Emissions of Oxides of Nitrogen from Electricity Generating Facilities. This measure proposes to implement low NOx and zero emission technologies and to require the use of renewable diesel in engines used for backup power. The target of this approach is to replace existing diesel internal combustion engines with lower-emitting technologies and utilize renewable diesel for fueling the remaining diesel engines used for backup power.

BCM-07: EMISSION REDUCTIONS FROM INCINERATORS: This control measure, based on 2022 AQMP control measure L-CMB-09, seeks emission reductions of NOx by replacement or retrofits with low NOx emission technologies on incinerators and other combustion equipment associated with incinerators and better control of NH_3 injection used to control NOx. The South Coast AQMD has adopted a series of rules to promote clean, lower emission technologies, while encouraging economic growth and providing compliance flexibility. Burner technologies and combustion controls are utilized to reduce NOx emissions. The target of this approach is to reduce ammonia emissions by utilizing a closed loop feed-forward control system and reduce NOx emissions with improved burner technologies.

South Coast AQMD Co-Benefits from Energy and Climate Change Programs Measures

There are three energy and climate change programs co-benefit measures as listed below:

- ECC-01: Co-Benefits from Existing and Future Greenhouse Gas Programs, Policies, and Incentives
- ECC-02: Co-Benefits from Existing and Future Residential and Commercial Building Energy Efficiency Measures
- ECC-03: Additional Enhancements in Reducing Existing Residential Building Energy Use

ECC-01: CO-BENEFITS FROM EXISTING AND FUTURE GREENHOUSE GAS PROGRAMS, POLICIES, AND INCENTIVES: This control measure, based on 2022 AQMP control measure ECC-01, seeks to quantify and take credit for the criteria pollutant co-benefits associated with programs to reduce GHG emissions. The processes that emit criteria pollutants and their precursors also typically emit GHGs. Mandates and programs that reduce GHG emissions will therefore also reduce criteria pollutant emissions. Significant efforts are currently being planned and implemented to reduce GHG emissions under State programs such as California Governor Executive Order B-55-18 and SB 100 (California Renewables Portfolio Standard Program: Emissions of Greenhouse Gases), which established reduction goals for 2030, 2045, and 2050.

ECC-02: CO-BENEFITS FROM EXISTING AND FUTURE RESIDENTIAL AND COMMERCIAL BUILDING ENERGY EFFICIENCY MEASURES: This control measure, based on 2022 AQMP control measure ECC-02, seeks to quantify and take credit for criteria pollutant co-benefits resulting from the implementation of energy efficiency mandates such as California's Title 24 program. In addition, there are multiple programs that provide incentives, rebates, and loans for residential and commercial building efficiency projects. Improvements in weatherization and other efficiency measures provide emission reductions through reduced energy use for heating, cooling, lighting, cooking, and other needs. South Coast AQMD staff will work with agencies, utilities, and other stakeholders to implement innovative measures that provide energy savings along with emission reductions.

ECC-03: ADDITIONAL ENHANCEMENTS IN REDUCING EXISTING RESIDENTIAL BUILDING ENERGY USE: This control measure, based on 2022 AQMP control measure ECC-03, seeks to provide incentive funding to enhance the objectives of ECC-02. Incentives will be used to further promote programs reducing energy use associated with space heating, water heating, and other large residential energy sources, achieving emission reductions beyond the levels expected from program mandates. Residential incentive programs would be developed to facilitate weatherization, replace older appliances with highly efficient technologies and encourage renewable energy adoption. Incorporating efficient appliance technologies, improving weatherization, and encouraging renewables such as solar thermal and photovoltaics will reduce energy demand and provide additional emission reductions within the residential sector. The South Coast AQMD will collaborate with utilities, agencies, and organizations to help leverage funding and coordinate incentives with existing programs.

South Coast AQMD Stationary Source NH3 Measures

There are four NH3 measures as listed below:

- BCM-08: Emission Reductions from Livestock Waste at Confined Animal Facilities
- BCM-09: Ammonia Emission Reductions from NOx Controls
- BCM-10: Emission Reductions from Direct Land Application of Chipped and Ground Uncomposted Greenwaste
- BCM-11: Emission Reductions from Organic Waste Composting

BCM-08: EMISSION REDUCTIONS FROM LIVESTOCK WASTE AT CONFINED ANIMAL FACILITIES: This control measure seeks to reduce NH3 emissions from livestock waste at large Confined Animal Facilities (CAFs). The first approach aims to lower the applicability thresholds in South Coast AQMD Rule 223 to align with the more stringent thresholds in San Joaquin Valley Air Pollution Control District (SJVAPCD) Rule 4570 – Confined Animal Facilities. The second approach aims to introduce additional mitigation measures to reduce ammonia emissions at CAFs.

BCM-09: AMMONIA EMISSION REDUCTIONS FROM NOX CONTROLS: This control measure seeks to reduce NH3 emissions from NOx controls such as Selective Catalytic Reduction (SCR) and Selective Non-Catalytic Reduction (SNCR). These systems are capable of effectively reducing NOx emissions from combustion sources. However, their use also results in potential emissions of NH3 that “slip” past the control equipment and into the atmosphere. Upgraded SCRs can be tuned/optimized by improving the Ammonia Injection Grid (AIG) to achieve the required NOx limits and simultaneously reduce the NH3 slip.

BCM-10: EMISSION REDUCTIONS FROM DIRECT LAND APPLICATION OF CHIPPED AND GROUND UNCOMPOSTED GREENWASTE: This control measure seeks reductions in NH3 emissions from direct land application (DLA) of chipped and ground uncomposted greenwaste to agricultural land, public land for erosion control or roadway management, and consumers’ properties for gardening or landscaping purposes. This control measure proposes to require composting of chipped and ground greenwaste, in accordance with the Best Management Practices (BMP) requirements of Rule 1133.3, prior to DLA.

BCM-11: EMISSION REDUCTIONS FROM ORGANIC WASTE COMPOSTING: This control measure seeks emission reductions of NH3 from the processing of organic waste materials including foodwaste, greenwaste, and agricultural waste. Control approaches include foodwaste co-digestion and integration of anaerobic digestion (AD) with composting. If foodwaste is the only feedstock input to AD, the resulting digestate could be included into greenwaste composting where emission control is governed by Rule 1133.3. This control measure proposes to expand the applicability of Rules 1133.2 and 1133.3 to regulate the co-digestion of foodwaste with biosolids and the integration of foodwaste digestate with greenwaste composting for further emission reductions. An integrated AD-composting system will result in less overall waste and a more useful product.

South Coast AQMD Stationary Source Direct PM2.5 Measures

There are eight direct PM2.5 measures as listed below:

- BCM-12: Further Emission Reductions from Commercial Cooking
- BCM-13: Emission Reductions from Cooling Towers
- BCM-14: Further Emission Reductions from Paved Road Dust Sources
- BCM-15: Emission Reductions from Abrasive Blasting Operations
- BCM-16: Emission Reductions from Stone Grinding, Cutting and Polishing Operations
- BCM-17: Emission Reductions from Prescribed Burning for Wildfire Prevention
- BCM-18: Further Emission Reductions from Wood-Burning Fireplaces and Wood Stoves
- BCM-19: Emission Reductions from Unpaved Road Dust Sources

BCM-12: FURTHER EMISSION REDUCTIONS FROM COMMERCIAL COOKING: This control measure seeks emission reductions from commercial cooking by lowering the applicability threshold for chain-driven charbroilers in Rule 1138. Other actions may be pursued such as revising the emissions inventory for charbroilers and evaluating the feasibility of under-fired control technology. The current emissions inventory for this category is based on a restaurant survey conducted in 1998, indicating the need for an update. A charbroiler registration program and/or survey may be considered to assist with revising the inventory. Additionally, projects to develop economically viable under-fired charbroiler control technology and pilot studies to test the efficacy of such control technologies will be considered.

BCM-13: EMISSION REDUCTIONS FROM INDUSTRIAL COOLING TOWERS: This control measure seeks reductions of PM emissions from industrial process cooling towers with drift eliminator technologies used for a variety of industrial operations including power plants, petroleum refineries, petrochemical plants, and natural gas processing plants. Prior to developing a policy to implement controls, an emissions inventory and an equipment universe must be established. Registration submittals collected through Rule 222 – Filing Requirements for Specific Emission Sources Not Requiring a Written Permit Pursuant to Regulation II, may be used as a starting point to develop an equipment universe.

BCM-14: FURTHER EMISSION REDUCTIONS FROM PAVED ROAD DUST SOURCES: Existing South Coast AQMD regulations implement paved road dust controls based on U.S. EPA guidance through both preventative and mitigative controls such as street sweeping. Mandating increased street sweeping frequencies has unknown impacts on PM2.5 levels and studies that examine the effect of street sweeping on ambient PM2.5 levels are scarce. A pilot project along with a comprehensive atmospheric measurement campaign would be needed to assess the effectiveness of street sweeping as a method to reduce ambient PM2.5.

BCM-15: EMISSION REDUCTIONS FROM ABRASIVE BLASTING OPERATIONS: This control measure seeks to reduce PM2.5 emissions from abrasive blasting operations. This control measure proposes voluntary applications of a portable blasting enclosure/booth with a dust collection system by providing incentives, primarily focusing on dry abrasive blasting operations conducted in open areas using portable blasting equipment with or without a South Coast AQMD permit.

BCM-16: EMISSION REDUCTIONS FROM STONE GRINDING, CUTTING AND POLISHING OPERATIONS: South Coast AQMD Rule 401 – Visible Emissions, prohibits from discharging of air contaminant that exceeds Ringelmann Chart No. 1 (equivalent to a 20 percent opacity) and Rule 403 – Fugitive Dust, prohibits fugitive dust emissions from any onsite mechanical activities such as cutting from being visible beyond the property line of the emission source. Various control measures to reduce the fugitive emissions are required as well. Rule 403 also prohibits the dust emissions from exceeding a 20 percent opacity limit, if dust emissions are the result of movement of a motorized vehicle. This control measure seeks to reduce PM emissions from stone grinding, cutting and polishing operations which are not regulated in Rule 401 or Rule 403. Moreover, Rule 219 – Equipment Not Requiring a Written Permit Pursuant to Regulation II, does not require permits for machining equipment exclusively used for polishing, cutting, surface grinding, etc. Both dry and wet dust control options are available to reduce dust emissions from such operations. Wet systems involve spraying water onto the rotating cutting disc to reduce dust emissions. Dry cutting emissions can be controlled at the point of operation using a portable dust collector, air scrubber and negative air machine to prevent dust from being released into the atmosphere. Financial incentives will be considered to exchange existing dry/wet equipment with new equipment that includes integrated add-on controls.

BCM-17: EMISSION REDUCTIONS FROM PRESCRIBED BURNING FOR WILDFIRE PREVENTION: This control measure, based on 2022 AQMP control measure MCS-02, seeks particulate matter emission reductions and property defensible space enhancements from fuel reduction efforts via hand-thinning, mechanical thinning, and the use of chipping equipment (chipping) to mitigate excess fuels at properties located in the residential urban-wild-interface (UWI) areas of the San Bernardino National Forest (SBNF). The proposed method of control is to coordinate with other agencies to provide funding for chipping operations for the remaining untreated area in the Mountain Rim Fire Safe Council's UWI. With the chipping program in place, homeowners in the UWI are much more compliant and engaged with assisting with fuel load reduction by trimming and removing excess hazardous vegetation, such as dead trees and leaf litter, for chipping than without the program.

BCM-18: FURTHER EMISSION REDUCTIONS FROM WOOD-BURNING FIREPLACES AND WOOD STOVES: This control measure seeks additional emission reductions from residential wood burning activities. Staff analysis determined that the wood burning curtailment program in Rule 445 is potentially less stringent compared to similar programs in other districts. In order to satisfy U.S. EPA's stringency requirements, this control measure proposes to lower the curtailment threshold from 29 μg/m^3 to 25 μg/m^3 ~~retain the sole-source of heat exemption~~ and remove the low-income exemption in Rule 445. ~~South Coast AQMD may also consider lowering the Basin-wide curtailment threshold if future analyses demonstrate that this would be needed to maintain the stringency of Rule 445.~~The sole-source of heat exemption in Rule 445 would be retained.

BCM-19: EMISSION REDUCTIONS FROM UNPAVED ROAD DUST SOURCES: This control measure seeks to evaluate the potential to reduce PM2.5 emissions from well-traveled unpaved lots, roads, shoulders, and other surfaces by applying paving materials. There are approximately 1,900 miles of unpaved roads in the Basin. However, not all of these roads are well-traveled or highly used and therefore, the suitability for paving will be determined on a case-by-case basis. Vehicle miles traveled, proximity to AB 617 communities, whether the road exists in natural or protected lands, and the effects of paving on climate-related drought conditions and heatwaves will be taken into account in determining the suitability for paving.

South Coast AQMD Stationary Source Other Measures

There is one proposed measure in this category, BCM-20: Application of All Feasible Measures.

BCM-20: APPLICATION OF ALL FEASIBLE MEASURES: This control measure, based on 2022 AQMP control measure MCS-01, seeks to explore all feasible measures that achieve criteria pollutant reductions. Existing rules and regulations reflect current Best Available Retrofit Control Technology (BARCT). However, BARCT continually evolves as new technology becomes available that is feasible and cost-effective. South Coast AQMD staff would continue to review new emission limits or controls introduced through federal, State or local regulations to determine if South Coast AQMD regulations remain equivalent or more stringent than rules in other regions. If not, a rulemaking process will be initiated to perform a BARCT analysis and potential rule amendments if deemed feasible. In addition, the South Coast AQMD will consider adopting and implementing new retrofit technology control standards, based on research and development and other information, that are feasible and cost-effective.

South Coast AQMD Proposed Mobile Source Measures

While the bulk of the authority to regulate mobile sources rests with CARB and the federal government, the South Coast AQMD also has a role in achieving emission reductions from these sources. The proposed South Coast AQMD mobile source measures are based on a variety of control technologies that are commercially available and/or technologically feasible to implement prior to the attainment year of 2030. The focus of these measures includes accelerated retrofits or replacement of existing vehicles or equipment, acceleration of vehicle turnover through voluntary vehicle retirement programs, and greater use of cleaner fuels in the near-term. The measures will encourage greater deployment of low NOx and zero emission vehicle and equipment technologies such as plug-in hybrids, battery-electric, and fuel cells to the maximum extent feasible as such technologies are commercialized and become available.

The South Coast AQMD proposes a total of 15 mobile source measures which are categorized into five groups – emission growth management, facility-based mobile sources, on-road and off-road, incentives, and other (see Table 4-3). Two emission growth management measures (EGM-01 and EGM-02) are proposed to identify actions to help mitigate and potentially provide emission reductions due to new development and redevelopment projects. Four facility-based mobile source measures (FBMSMs) (MOB-01 to MOB-04) seek to identify actions that will result in additional emission reductions at commercial marine ports, rail yards, warehouse distribution centers, and commercial airports. FBMSMs for marine ports and rail yards are currently undergoing a process to develop Indirect Source Rules. Six on-road and off-road mobile measures focus on on-road light/medium/heavy-duty vehicles, international shipping vessels, passenger locomotives and small off-road engines. Additionally, incentive-based measures such as MOB-11 will use established protocols such as Carl Moyer Program guidelines and report to the Governing Board periodically. MOB-12, Pacific Rim Initiative for Maritime Emission Reductions (PRIMER) seeks NOx emission reductions from partnership with local, State, federal and international entities. One other measure (MOB-13) focuses on fleet vehicle mitigation options and the development of a work plan to support and accelerate the deployment of zero emission infrastructure needed for the widespread adoption of zero emission vehicles and equipment that is described in more detail in Appendix IV-A.

TABLE 4-3
SOUTH COAST AQMD PROPOSED MOBILE SOURCE MEASURES

Number	Title [Pollutant]	Previous Plan Measure Was Included	Emission Reductions by 2030 (tons per day)
South Coast AQMD Emission Growth Management Measures:			
EGM-01	Emission Reductions from New Development and Redevelopment [All Pollutants]	2022 AQMP (EGM-01)	TBD
EGM-02	Emission Reductions from Clean Construction Policy [All Pollutants]	2022 AQMP (EGM-03)	TBD
South Coast AQMD Facility-Based Measures:			
MOB-01	Emission Reductions at Commercial Marine Ports [NOx, PM]	2022 AQMP (MOB-01)	TBD
MOB-02	Emission Reductions at New and Existing Rail Yards [NOx, PM]	2022 AQMP (MOB-02A & B)	TBD
MOB-03	Emission Reductions at Warehouse Distribution Centers [NOx, PM2.5]	2022 AQMP (MOB-03)	TBD
MOB-04	Emission Reductions at Commercial Airports	2022 AQMP (MOB-04)	TBD
South Coast AQMD On-Road and Off-Road Measures:			
MOB-05	Accelerated Retirement of Light-Duty and Medium-Duty Vehicles [NOx, PM]	2022 AQMP (MOB-05)	TBD
MOB-06	Accelerated Retirement of On-Road Heavy-Duty Vehicles [NOx, PM]	2022 AQMP (MOB-06)	TBD

Number	Title [Pollutant]	Previous Plan Measure Was Included	Emission Reductions by 2030 (tons per day)
MOB-07	On-Road Mobile Source Emission Reduction Credit Generation Program [NOx, PM]	2022 AQMP (MOB-07)	TBD
MOB-08	Small Off-Road Engine Equipment Exchange Program [VOCs, NOx, PM]	2022 AQMP (MOB-08)	TBD
MOB-09	Further Emission Reductions from Passenger Locomotives [NOx, PM]	2022 AQMP (MOB-09)	TBD
MOB-10	Off-Road Mobile Source Emission Reduction Credit Generation Program [NOx, PM]	2022 AQMP (MOB-10)	TBD
South Coast AQMD Incentive-Based Measures:			
MOB-11	Emission Reductions from Incentive Programs [NOx, PM]	2022 AQMP (MOB-11)	TBD
MOB-12	Pacific Rim Initiative for Maritime Emission Reductions [NOx, PM]	2022 AQMP (MOB-12)	TBD
South Coast AQMD Other Mobile Source Measures:			
MOB-13	Rule 2202 – On-Road Motor Vehicle Mitigation Options [NOx, PM2.5]	2022 AQMP (MOB-14)	TBD

South Coast AQMD Mobile Source Emission Growth Management Measures

There are two proposed control measures within this category:

- EGM-01: Emission Growth Management from New Development and Redevelopment
- EGM-02: Emission Reductions from Clean Construction Policy

EGM-01: EMISSION GROWTH MANAGEMENT FROM NEW DEVELOPMENT AND REDEVELOPMENT: The goal of this measure is to identify emission reduction opportunities and to mitigate and, where appropriate, reduce emissions from new development or redevelopment projects such as residential, commercial, and industrial projects that are otherwise not included in other FBMSMs identified in the 2022 AQMP. This proposed control measure, based on 2022 AQMP control measure EGM-01, seeks PM2.5 co-benefit emission reductions primarily from project construction activities by increasing the deployment of zero emission and low NOx emission technologies for on-road and off-road mobile sources. South Coast AQMD staff has held three Working Group meetings for the development of EGM-01. South

Coast AQMD staff will continue soliciting stakeholders' input towards the development of a method of control for EGM-01. Emission reductions and their SIP creditability will be determined dependent on the final method of control to be implemented.

EGM-02: EMISSION REDUCTIONS FROM CLEAN CONSTRUCTION POLICY: The purpose of this control measure is to identify potential approaches to mitigate and control emissions from construction activities in the South Coast Air Basin. This control measure, based on 2022 AQMP control measure EGM-03, will seek to develop a Clean Construction Policy (CCP) which can be utilized for reference and voluntary implementation by local municipalities and public agencies. The South Coast AQMD will work in collaboration with local municipalities, construction industry, and other affected stakeholders to develop such a policy and will consider existing control measures and best management practices that are currently being implemented by entities throughout California.

South Coast AQMD Facility-Based Measures

FBMSMs are derived from the 2022 AQMP and are included in the PM2.5 Plan for the purpose of evaluating whether their implementation can be accelerated. FBMSMs are aimed at reducing the emissions from indirect sources – facilities that do not emit much air pollution directly, but instead attract mobile sources which contribute significant emissions. There are four proposed control measures within this category:

- MOB-01: Emission Reductions at Commercial Marine Ports
- MOB-02: Emission Reductions at New and Existing Rail Yards
- MOB-03: Emission Reductions at Warehouse Distribution Centers
- MOB-04: Emission Reductions at Commercial Airports

MOB-01: EMISSION REDUCTIONS AT COMMERCIAL MARINE PORTS: This measure seeks to reduce NOx, VOC, and PM emissions related to on-road heavy-duty vehicles, ocean going vessels, cargo handling equipment, locomotives, and harbor craft that go to and from the Ports of Los Angeles and Long Beach (Ports). As a follow up to implementation of MOB-01 from the 2016 AQMP, the South Coast AQMD is working on a variety of measures, including Proposed Rule 2304, to address emissions from marine ports. Through a public process, rule concepts and other measures will be proposed to address emissions from these sources. Rule development will continue to focus on deploying the cleanest technologies possible and supporting zero emissions fueling charging infrastructure as quickly as feasible. Incentive funding that supports the transition to cleaner technologies will also continue to be pursued to assist in implementing this measure.

MOB-02: EMISSION REDUCTIONS AT NEW AND EXISTING RAIL YARDS: This measure seeks to reduce NOx and PM emissions related to on-road heavy-duty vehicles, off-road equipment, and locomotives at new and existing rail yards. Through a public process, the South Coast AQMD will assess and identify potential actions that could result in further emission reductions at new facilities. This measure may include voluntary measures as well as additional actions which could include development of a rule as well as pursuit of incentive funding that can achieve and/or facilitate additional emission reductions. Emission reductions may also be achieved if new regulations are developed and implemented at the state or federal level.

MOB-03: EMISSION REDUCTIONS AT WAREHOUSE DISTRIBUTION CENTERS: The goal of this measure to reduce NOx and PM emissions related to mobile sources and other equipment associated with warehouses. The strategy utilizes a menu-based point system in Rule 2305 (adopted in May 2021) to implement MOB-03 from the 2016 AQMP, where warehouses subject to the rule must annually earn points based on the amount of truck traffic at their facility. The menu includes actions that warehouse operators can take to reduce emissions, or to facilitate emission reductions from their operations. Required actions result in emission reductions when compared to conventional diesel technology, assist in implementation of other related measures, promote the demand for zero emission and low NOx technology, foster early action of compliance, and infrastructure installation to support new or emerging zero emission technologies. Implementation of this measure will include ensuring that applicable warehouses comply with Rule 2305, quantifying the air quality benefits of Rule 2305 as they occur and seeking to incorporate those benefits as SIP-creditable emission reductions, evaluating the state of technology every five years and recommending if Rule 2305 should potentially be amended.

MOB-04: EMISSION REDUCTIONS AT COMMERCIAL AIRPORTS: The Facility-Based Mobile Source Measure for Commercial Airports, which controls non-aircraft mobile sources at commercial airports, was adopted by the South Coast AQMD on December 6, 2019. The measure consists of Memoranda of Understanding (MOUs) between the South Coast AQMD and five commercial airports in the Basin to develop and implement air quality improvement plans. The MOUs were executed with Los Angeles International Airport, John Wayne Orange County Airport, Hollywood Burbank Airport, Ontario International Airport, and Long Beach Airport. Each MOU contains performance targets for cleaner ground support equipment, airport shuttle buses, and heavy-duty trucks. Based on the measures in the MOUs, the South Coast AQMD committed to achieve 0.52 and 0.37 tons per day NOx reductions in 2023 and 2031, respectively. Implementation of this measure will include ensuring that applicable airports comply with the performance targets in the MOUs. South Coast AQMD will encourage airports to accelerate implementation of the MOU measures ahead of 2031 so that emission reductions in 2030 can be quantified.

South Coast AQMD On-Road and Off-Road Measures

A total of six on-road and off-road mobile source measures derived from the 2022 AQMP are proposed to be included in the PM2.5 Plan as listed below.

- MOB-05: Accelerated Retirement of Light-Duty and Medium-Duty Vehicles
- MOB-06: Accelerated Retirement of On-Road Heavy-Duty Vehicles
- MOB-07: On-Road Mobile Source Emission Reduction Credit Generation Program
- MOB-08: Small Off-Road Engine Equipment Exchange Program
- MOB-09: Further Emission Reductions from Passenger Locomotives
- MOB-10: Off-Road Mobile Source Emission Reduction Credit Generation Program

MOB-05: ACCELERATED RETIREMENT OF LIGHT-DUTY AND MEDIUM-DUTY VEHICLES: The purpose of this control measure is to achieve emission reductions by accelerating retirement of older gasoline- and diesel-powered vehicles with up to 8,500 lbs. gross vehicle weight rating (GVWR). These vehicles include passenger cars, sports utility vehicles, vans, and light-duty pick-up trucks. The South Coast AQMD has been implementing the Replace Your Ride (RYR) Program since 2015 which provides a rebate to low- and moderate-income applicants for replacing their existing cars with newer, cleaner conventionally powered vehicles, plug-in hybrid electric vehicles or dedicated zero emission vehicles. This measure seeks to retire up to 2,000 light- and medium-duty vehicles annually through continued implementation of the RYR Program with incentives up to $12,000 for residents in a Disadvantaged Community (DAC) zip code. For plug-in hybrid and battery electric vehicles, an additional incentive of up to $2,000 is also provided for the installation of electric vehicle charging equipment.

MOB-06: ACCELERATED RETIREMENT OF ON-ROAD HEAVY-DUTY VEHICLES: This proposed control measure seeks additional emission reductions from existing heavy-duty vehicles with GVWR greater than 8,500 lbs through an accelerated vehicle replacement program with zero or low NOx emission vehicles. One of the options being considered is a plus-up program to leverage existing incentive programs such as Carl Moyer and Prop 1B or other grant funding opportunities by providing supplemental funding to help truck owners and fleets with the purchase of cleaner engine vehicles, including zero emission trucks. This type of program would be especially helpful for individual operators and owners with limited financial resources to purchase or lease zero emission trucks which are still relatively costly compared to conventional vehicles.

MOB-07: ON-ROAD MOBILE SOURCE EMISSION REDUCTION CREDIT GENERATION PROGRAM: This proposed measure seeks to develop mechanisms to incentivize the early deployment of low NOx and zero emission on-road heavy-duty trucks through the generation of mobile source emission reduction credits (MSERCs) which can be used as an alternative means of compliance with certain South Coast AQMD regulations. These MSERCs will be used only by entities affected by the 2022 AQMP control measures MOB-01 through MOB-04, EGM-01, and EGM-03. South Coast AQMD staff will develop amendments to South Coast AQMD Rules 1612 and/or 1612.1 to provide greater flexibility, such as expanding the eligibility of vehicle types and projects as well as providing more flexibility in the application and use of MSERCs, for accelerated deployment of low NOx and zero emission heavy-duty vehicles in the Basin and Coachella Valley.

MOB-08: SMALL OFF-ROAD ENGINE EQUIPMENT EXCHANGE PROGRAM: This measure seeks to reduce NOx emissions by promoting the accelerated turn-over of in-use small off-road engines and other engines, such as those used in larger diesel-powered lawn and garden equipment, through expanded voluntary exchange programs. Since 2003, the South Coast AQMD has sponsored a lawn mower exchange programs for residential users of old lawn mowers which is now known as the Electric Lawn Mower Rebate Program. Since its inception, this program has replaced approximately 59,000 high polluting gasoline-powered lawn mowers with electric lawn mowers. The South Coast AQMD also launched the Commercial Electric Lawn and Garden Equipment Incentive and Exchange Program (Commercial L&G Equipment Program) in 2018 to accelerate the replacement of old gasoline- or diesel-powered commercial lawn and garden equipment with zero emission, battery electric technology. This program provides a point-of-sale discount of up to 75 percent off the purchase price of a variety of new electric equipment including lawn mowers (ride-on, stand-on and walk-behind mowers), handheld trimmers, chainsaws, and pruners in addition to backpack and handheld leaf blowers. More recently, the South Coast AQMD has also started a new battery rebate program for commercial lawn and garden equipment that funds up to 75 percent of the rechargeable battery cost with a maximum limit of three batteries per equipment. Moving forward, the South Coast AQMD will increase the number of outreach and exchange events as well as continue to seek additional funding opportunities and resources to expand the scope and types of equipment and engines that can be funded by these programs.

MOB-09: FURTHER EMISSION REDUCTIONS FROM PASSENGER LOCOMOTIVES: This measure seeks to promote earlier and cleaner replacement or upgrade of existing passenger locomotives with Tier 4 or cleaner locomotives. The South Coast AQMD is continuing to work collaboratively with other stakeholders to explore the feasibility of zero and low NOx emission locomotive technologies such as battery electric or fuel cell engine-driven systems. For example, the South Coast AQMD has been actively participating in the development and demonstration of zero emission battery-operated switcher locomotives in CARB-funded projects in the San Pedro Bay Ports since 2018. Through this measure, the South Coast AQMD will continue to not only promote earlier replacement or upgrade of existing passenger trains with Tier 4 locomotives, but also support the development and adoption of zero or low NOx emission technologies.

MOB-10: OFF-ROAD MOBILE SOURCE EMISSION REDUCTION CREDIT GENERATION PROGRAM: This measure seeks to develop mechanisms to incentivize the early deployment of Tier 4, low NOx, and zero off-road mobile combustion equipment, where applicable, through the generation of MSERCs. These MSERCs will be used only by entities affected by the 2022 AQMP control measures MOB-01 through MOB-04, EGM-01, and EGM-02; and cannot be used to offset emissions from stationary sources. These MSERCs will be discounted to provide additional emission reductions to help meet air quality standards. South

Coast AQMD staff seeks to amend Rule 1620 to provide greater flexibility for entities to initiate projects to accelerate the deployment of zero and low NOx emission off-road mobile equipment in the South Coast Air Basin and Coachella Valley.

South Coast AQMD Incentive-Based Measures

Two incentive-based mobile source measures are also included:

- MOB-11: Emission Reductions from Incentive Programs
- MOB-12: Pacific Rim Initiative for Maritime Emission Reductions

MOB-11: EMISSION REDUCTIONS FROM INCENTIVE PROGRAMS: This control measure seeks to apply the administrative mechanism, as initially proposed in the 2016 AQMP and revisited in the 2022 AQMP, to quantify and take credit for the emission reductions achieved through the implementation of South Coast AQMD-administered incentive programs for SIP purposes. The South Coast AQMD has been implementing a variety of incentive programs including, but not limited to, Carl Moyer Memorial Air Quality Standards Attainment Program, Proposition 1B, Lower Emission School Bus, Community Air Protection Program, and Volkswagen Environmental Mitigation Trust. Examples of projects funded by these programs include heavy-duty vehicle/equipment replacements, installation of retrofit units, and engine repowers. The emission reductions from these incentive programs will be calculated in two parts. First, the actual emission reductions associated with existing projects that were funded by 2021 with the remaining project life through 2030 are quantified. Second, potential reductions that are projected from the implementation of future projects to be funded through these incentive programs are quantified. These reductions will be estimated based on the projected level of funding for the programs and average emission reductions achieved by past projects, discounted by control factors for future years.

MOB-12: PACIFIC RIM INITIATIVE FOR MARITIME EMISSION REDUCTIONS: This measure, initially developed in the 2022 AQMP, seeks to reduce emissions from OGV through an incentive-based program to encourage the deployment of cleaner OGV to the Ports. This approach includes collaborating with international port authorities and shipping lines to establish common goals to reduce criteria pollutants from OGV. Incentives could be monetary (e.g., a per-visit payment for cleaner ships) or non-monetary (e.g., preferred berthing for cleaner ships). The cleanest commercially available OGV currently meet Tier III emission standards, however this class of vessels is not expected to be widely deployed for many years, in part due to the high cost of constructing new vessels and the difficulty in retrofitting existing vessels to Tier III standards. This measure would quicken the return on investment for these cleaner vessels by ensuring that shipping lines receive a benefit for every clean ship visit to a port with an incentive program. Clean ships could include Tier III vessels, retrofitted vessels that surpass Tier II standards, and eventually zero emissions shipping when it becomes available.

South Coast AQMD Other Mobile Source Measures

There is one proposed other mobile source measure, MOB-13: Rule 2202 – On-Road Motor Vehicle Mitigation Options, which is based on 2022 AQMP control measure MOB-14.

MOB-13: RULE 2202 – ON-ROAD MOTOR VEHICLE MITIGATION OPTIONS: This control measure proposes to reduce emissions by evaluating potential amendments to Rule 2202. Rule 2202 has been developed to reduce emissions associated with work commute trips. Specifically, larger employers in the region with more than 250 employees are required to mitigate employee commute trips into the worksite. Rule 2202 provides employers with a menu of options to select from to implement a combination of emission reduction strategies to meet an emission reduction target (ERT) for their worksite. During the Coronavirus (COVID-19) pandemic in 2020 and 2021, many Rule 2202 regulated employers (where applicable) incorporated widespread telecommuting practices which further reduced emissions by reducing commute trips into the worksite. Based on conditions observed and reported during the time-period, Rule 2202 was amended on August 4, 2023. The amended Rule 2202 includes two phases. The first phase (adopted August 4, 2023) focused on data collection and reporting that will be used to inform a potential second phase of rulemaking. Specifically, the first phase requires new limited reporting for all regulated worksites, including the reporting of telecommute activity, VMT data, and business type/classification for all worksites. The second phase will consider using VMT as an option to evaluate travel patterns, re-assess rule targets, explore multiple compliance options for zero emission vehicles and infrastructure, evaluate options to continue the use of credit, and consider modifying rideshare options. The new option will include placing a larger focus on telecommuting strategies.

Summary of South Coast AQMD Control Strategy

The PM2.5 Plan primarily requires NOx emission reductions to meet the 2012 annual PM2.5 standard. The pathway to achieving the standard involves accelerated implementation of the 2022 AQMP and 2022 State SIP Strategy, with a limited control strategy for NH3 and direct PM2.5 sources.

The control strategies in the PM2.5 Plan include both regulations and incentive programs. The control strategy is described in greater detail in Appendix IV-A. Tables 4-4 and 4-5 list emission reductions by 2030 and proposed adoption/implementation dates of the stationary source control measures and mobile source control measures, respectively. South Coast AQMD will develop, adopt, submit, and implement the control measures in Tables 4-4 and 4-5 as expeditiously as possible in order to meet or exceed the commitments needed to attain the 2012 annual PM2.5 standard, and to substitute any other measures as necessary to make up any emission reduction shortfall.

TABLE 4-4
EMISSION REDUCTIONS AND ADOPTION AND IMPLEMENTATION SCHEDULE OF STATIONARY SOURCE CONTROL MEASURES

Number	Title [Pollutant]	Emission Reductions by 2030 (tons per day)	Proposed Adoption Date	Proposed Implementation Timeframe
South Coast AQMD NOx Measures:				
BCM-01	Emission Reductions from Replacement with Zero Emission or Low NOx Appliances – Residential Water Heating [PM2.5, NOx]	TBD	2024	2029
BCM-02	Emission Reductions from Replacement with Zero Emission or Low NOx Appliances – Residential Space Heating [PM2.5, NOx]	TBD	2024	2029
BCM-03	Emission Reductions from Residential Cooking Devices [PM2.5, NOx]	TBD	2027	2029
BCM-04	Emission Reductions from Replacement with Zero Emission or Low NOx Appliances – Residential Other Combustion Sources [PM2.5, NOx]	TBD	2027	2029
BCM-05	Emission Reductions from Emergency Standby Engines [PM2.5, NOx]	0.04 [PM2.5] 0.36 [NOx]	2025	2030
BCM-06	Emission Reductions from Diesel Electricity Generating Facilities [NOx]	0.16	2027	2030
BCM-07	Emission Reductions from Incinerators [NOx]	0.81	2024	2029
South Coast AQMD Co-Benefits from Energy and Climate Change Programs Measures:				
ECC-01	Co-benefits from Existing and Future Greenhouse Gas Programs, Policies, and Incentives [PM2.5, NOx]	TBD	N/A	N/A
ECC-02	Co-benefits from Existing and Future Residential and Commercial Building Energy Efficiency Measures [PM2.5, NOx]	TBD	N/A	N/A

Number	Title [Pollutant]	Emission Reductions by 2030 (tons per day)	Proposed Adoption Date	Proposed Implementation Timeframe
ECC-03	Additional Enhancements in Reducing Existing Residential Building Energy Use [PM2.5, NOx]	TBD	N/A	N/A
South Coast AQMD NH3 Measures:				
BCM-08	Emission Reductions from Livestock Waste at Confined Animal Facilities* [NH3]	~~TBD~~0.27	2025	2030
BCM-09	Ammonia Emission Reductions from NOx Controls [NH3]	TBD	N/A	N/A
BCM-10	Emission Reductions from Direct Land Application of Chipped and Ground Uncomposted Greenwaste* [NH3]	~~TBD~~0.08	2026	2030
BCM-11	Emission Reductions from Organic Waste Composting [NH3]	TBD	N/A	N/A
South Coast AQMD Direct PM2.5 Measures:				
BCM-12	Further Emission Reductions from Commercial Cooking* [PM2.5]	TBD	2027	2030
BCM-13	Emission Reductions from Cooling Towers [PM2.5]	TBD	N/A	N/A
BCM-14	Further Emission Reductions from Paved Road Dust Sources [PM2.5]	TBD	N/A	N/A
BCM-15	Emission Reductions from Abrasive Blasting Operations [PM2.5]	TBD	N/A	N/A
BCM-16	Emission Reductions from Stone Grinding, Cutting and Polishing Operations [PM2.5]	TBD	N/A	N/A
BCM-17	Emission Reductions from Prescribed Burning for Wildfire Prevention [PM2.5, NOx]	TBD	N/A	N/A
BCM-18	Further Emission Reductions from Wood-Burning Fireplaces and Wood Stoves* [PM2.5]	~~TBD~~0.33	2026	2030

Number	Title [Pollutant]	Emission Reductions by 2030 (tons per day)	Proposed Adoption Date	Proposed Implementation Timeframe
BCM-19	Emission Reductions from Unpaved Road Dust Sources [PM2.5]	TBD	N/A	N/A
South Coast AQMD Other Measures:				
BCM-20	Application of All Feasible Measures [PM2.5, NOx]	TBD	N/A	N/A

* These measures are included to satisfy MSM requirements.

TABLE 4-5
EMISSION REDUCTIONS AND ADOPTION AND IMPLEMENTATION SCHEDULE OF MOBILE SOURCE CONTROL MEASURES

Number	Title [Pollutant]	Emission Reductions by 2030 (tpd)	Proposed Adoption Date	Proposed Implementation Timeframe
South Coast AQMD Emission Growth Management Measures:				
EGM-01	Emission Reductions from New Development and Redevelopment [All Pollutants]	TBD	2025	2025-2030
EGM-02	Emission Reductions from Clean Construction Policy [All Pollutants]	TBD	2025	2025-2030
South Coast AQMD Facility-Based Measures:				
MOB-01	Emission Reductions at Commercial Marine Ports [PM2.5, NOx]	TBD	2024	2025-2030
MOB-02	Emission Reductions at New and Existing Rail Yards [PM2.5, NOx]	TBD	2024	2025-2030
MOB-03	Emission Reductions at Warehouse Distribution Centers [PM2.5, NOx]	TBD	Adopted 2021 (Reassess every three years)	2022-2030
MOB-04	Emission Reductions at Commercial Airports [PM2.5, NOx]	TBD	Adopted 2019	2020-2030
South Coast AQMD On-Road and Off-Road Measures:				
MOB-05	Accelerated Retirement of Light-Duty and Medium-Duty Vehicles [PM2.5, NOx]	TBD	N/A	Ongoing
MOB-06	Accelerated Retirement of On-Road Heavy-Duty Vehicles [PM2.5, NOx]	TBD	N/A	Ongoing
MOB-07	On-Road Mobile Source Emission Reduction Credit Generation Program [PM2.5, NOx]	TBD	TBD	TBD
MOB-08	Small Off-Road Engine Equipment Exchange Program [PM2.5, NOx]	TBD	N/A	Ongoing

Number	Title [Pollutant]	Emission Reductions by 2030 (tpd)	Proposed Adoption Date	Proposed Implementation Timeframe
MOB-09	Further Emission Reductions from Passenger Locomotives [PM2.5, NOx]	TBD	N/A	Ongoing
MOB-10	Off-Road Mobile Source Emission Reduction Credit Generation Program [PM2.5, NOx]	TBD	TBD	TBD
South Coast AQMD Incentive-Based Measures:				
MOB-11	Emission Reductions from Incentive Programs [PM2.5, NOx]	TBD	N/A	Ongoing
MOB-12	Pacific Rim Initiative for Maritime Emission Reductions [PM2.5, NOx]	TBD	N/A	Ongoing
South Coast AQMD Other Mobile Source Measures:				
MOB-13	Rule 2202 – On-Road Motor Vehicle Mitigation Options [PM2.5, NOx]	TBD	2023	2023-2030

Proposed CARB Commitment for the South Coast

Overview of Commitment

SIPs may contain enforceable commitments to achieve the level of emissions necessary to meet federal air quality standards, as defined by the attainment demonstration. CARB's 2022 State Strategy for the State Implementation Plan[1] (2022 State SIP Strategy) lists new SIP measures for which potential emissions reduction SIP commitments for the South Coast in 2030 are now estimated based on the measures identified and quantified to date. Adoption of the 2022 State SIP Strategy and the measure schedule by the CARB Board on September 22, 2022, formed the basis of the commitments for emission reductions by the 2030 attainment deadline for South Coast that will be proposed for CARB Board consideration alongside the 2024 South Coast PM2.5 SIP. The commitments consist of two components:

[1] https://ww2.arb.ca.gov/sites/default/files/2022-08/2022_State_SIP_Strategy.pdf

1. A commitment to bring an item to the CARB Board for defined new measures or take other specified actions within CARB's authority; and

2. A commitment to achieve aggregate emission reductions by specific dates.

As part of each SIP needing emission reductions from the State, the total aggregate emission reductions and the obligation to make certain proposals to the CARB Board or take other actions within CARB's authority specified in the 2022 State SIP Strategy would become enforceable upon approval by U.S. EPA. While the 2022 State SIP Strategy discusses a range of measures and actions, those measures and actions are still subject to CARB's formal approval process and would not be final until the CARB Board takes action.

Commitment to Act on Measures

For each of the SIP measures shown in Table 4-6, CARB committed in the 2022 State SIP Strategy to address each measure as described. For each measure committed to, CARB staff would undertake the actions detailed for each measure. In the instance of measures that involve the development of a rule under CARB's regulatory authority, CARB committed to bring a publicly noticed item before the CARB Board that is either a proposed rule, or is a recommendation that the CARB Board direct staff to not pursue a rule covering that subject matter at that time. This recommendation would be based on an explanation of why such a rule is unlikely to achieve the relevant emission reductions in the relevant timeframe, and would include a demonstration that the overall aggregate commitment will be achieved despite that rule not being pursued. This public process and CARB hearing would provide additional opportunity for public and stakeholder input, as well as ongoing technology review, and assessments of costs and environmental impacts.

The measures, as proposed by staff to the CARB Board or adopted by the CARB Board, may provide more or less than the initial emission reduction estimates. In addition, action by the CARB Board may include any action within its discretion.

TABLE 4-6
2022 STATE SIP STRATEGY MEASURES AND SCHEDULE

Measure	Agency	Action	Implementation Begins
On-Road Heavy-Duty			
Advanced Clean Fleets Regulation	CARB	2023	2024
Zero -Emissions Trucks Measure	CARB	2028	2030
On-Road Light-Duty			
Clean Miles Standard	CARB	2021	2023
Off-Road Equipment			
Tier 5 Off-Road Vehicles and Equipment	CARB	2025	2029
Amendments to the In-Use Off-Road Diesel-Fueled Fleets Regulation	CARB	2022	2024
Transport Refrigeration Unit Regulation Part 2	CARB	2026	2028
Commercial Harbor Craft Amendments	CARB	2022	2023
Cargo Handling Equipment Amendments	CARB	2027	2030
Other			
Zero -Emission Standard for Space and Water Heaters	CARB	2025	2030
Primarily-Federally and Internationally Regulated Sources – CARB Measures			
In-Use Locomotive Regulation	CARB	2023	2024

Commitment to Achieve Emission Reductions

The following section describes the estimated emission reduction and potential commitment from the SIP measures identified and quantified to date for the South Coast. The aggregate commitment of emissions reductions from State sources to be proposed for CARB Board consideration will be found in CARB's staff report for the 2024 South Coast PM2.5 SIP when it is brought to the CARB Board and is summarized below.

While CARB includes estimates of the emission reductions in 2030 from each of the individual new measures, CARB's overall commitment is to achieve the total emission reductions necessary from State-regulated sources to attain the federal air quality standards, reflecting the combined reductions from the existing control strategy and new measures. Therefore, if a particular measure does not get its expected emission reductions, the State's overall commitment to achieving the total aggregate emission reductions still exists. If actual emission decreases occur that exceed the projections reflected in the current emission inventory, CARB will submit an updated emissions inventory to U.S. EPA as part of a SIP revision. The SIP revision would outline the changes that have occurred and provide appropriate tracking to demonstrate that aggregate emission reductions sufficient for attainment are being achieved through enforceable emission reduction measures. CARB's emission reduction commitments may be achieved through a combination of actions including but not limited to the implementation of control measures; the expenditure of local, State or federal incentive funds; or through other enforceable measures.

Emission Reductions

CARB's control programs, including the measures in the 2022 State SIP Strategy provide emission reduction benefits throughout the State. Although the existing control program will provide mobile source emission reductions necessary to meet the attainment needs of many areas of the State, the new measures in the 2022 State SIP Strategy are needed to provide further reductions to achieve the 12 $\mu g/m^3$ PM2.5 annual standard in the South Coast and enhance statewide air quality progress towards the 9 $\mu g/m^3$ annual PM2.5 standard promulgated in 2024.

Emission Reductions from Current Programs

Table 4-7 provides the mobile source emissions under CARB and district current programs for the South Coast. Ongoing implementation of current control programs is projected to reduce mobile source emissions of direct PM2.5 and NOx by 3.3 tpd and 160.6 tpd in the South Coast in 2030 compared to 2018 levels, respectively. Although the current mobile source baseline shows an increase in ammonia (NH3) emissions in 2030 compared to 2018 levels, this baseline does not reflect emissions reductions from a number of recently-adopted CARB regulations identified in Table 4-5. When taking these reductions taken into account, NH3 emissions are projected to only increase by 1.8 tpd in 2030 compared to 2018 levels. Achieving the benefits projected from the current control program will continue to require significant efforts for implementation and enforcement and thus represents an important element of the overall strategy.

TABLE 4-7
SOUTH COAST BASELINE MOBILE SOURCE EMISSIONS[2]

Pollutant	2018 Emissions (tpd)	2030 Emissions (tpd)	Change
PM2.5	10.8	7.4	-31%
NOx	323.3	162.6	-50%
NH3	16.5	21.3	29%

[2] Source: MSC_NAA_CEPAM_v101B; does not reflect emissions reductions from recently-adopted CARB regulations identified in Table 5

Although most of the 2016 State SIP Strategy measure commitments have been adopted, there remains the Zero-Emission Forklift measure which will be acted upon by the CARB Board in 2024. Table 4-8 below shows the timeline and anticipated emission reductions for this measure.

TABLE 4-8
SOUTH COAST REDUCTIONS FROM REMAINING 2016 STATE SIP STRATEGY MEASURE[3]

Measure	Action	Implementation Begins	2030 NOx (tpd)	2030 PM2.5 (tpd)	2030 NH3 (tpd)
Zero-Emission Forklift	2024	2026	0.8	<0.1	NYQ*

* Not yet quantified.

Emission Reductions from 2022 State SIP Strategy Measures

In addition to controlling direct PM2.5, air quality modeling has determined that NOx and ammonia are significant precursors for the 12 μg/m^3 annual PM2.5 standard in the South Coast, and that ammonium nitrate contributes 20 to 35 percent of total PM2.5 in the region, varying by season and location. Further, modeling indicates that total NOx emissions from all sources in the South Coast will need to decrease by approximately 55 percent from 2018 levels in order to attain the 12 ug/m^3 annual PM2.5 standard in 2030. A significant fraction of the needed reductions will come from the existing control program already in the baseline emission inventory. In addition, as described above, one measure commitment included in the 2016 State SIP Strategy has not yet been acted upon, and a number of measure commitments included in both the 2016 and 2022 State SIP Strategies were very recently adopted and are thus not yet in the baseline emissions inventory, as outlined in Table 4-8 above and Table 4-9 below.

The measures contained in the 2022 State SIP Strategy commitment reflect a variety of State actions across on-road and off-road vehicle and appliance sectors. Collectively, emissions reductions from CARB's current control program, reductions from the 2016 and 2022 State SIP Strategy measures adopted but not yet in the baseline, reductions from the remaining 2016 State SIP Strategy measure, and reductions estimated from the future measures identified in the 2022 State SIP Strategy and quantified below will provide the reductions needed from State sources to support attainment of the 12 μg/m^3 annual PM2.5 standard in the South Coast. Table 4-9, 4-10, and 4-11 summarize the reductions from the identified and quantified measures. In Table 4-9, the reductions estimated from the remaining 2016 State SIP Strategy measure and future measures identified in the 2022 State SIP Strategy are described as the "potential CARB aggregate emissions reductions commitment" until staff proposes and the CARB Board adopts the aggregate emissions reductions commitment for the year 2030. The reductions in Table 4-9 are needed

[3] Numbers may not add up due to rounding

to demonstrate reasonable further progress (RFP) towards attainment. More details can be found in Chapter 6 of this Plan.

TABLE 4-9
2030 SOUTH COAST EMISSIONS REDUCTIONS FROM CARB PROGRAMS[4]

CARB Programs in South Coast	NOx (tpd)	PM2.5 (tpd)	NH3 (tpd)
Current Control Program[5]	172.8	1.9	-4.7[6]
2016 and 2022 State SIP Strategy Measures Adopted (Not yet in baseline inventory)	20.5	0.8	2.9
Potential CARB Aggregate Emissions Reductions Commitment	9.1	0.5	0.2
2016 State SIP Strategy Measure Remaining	0.8	<0.1	NYQ*
2022 State SIP Strategy Measures Remaining	8.2	0.5	0.2
Total Reductions	**202.4**	**3.2**	**-1.4**

* Not yet quantified.

Table 4-10 reflects the 2016 and 2022 State SIP Strategy measure commitments that the CARB Board has recently adopted. The associated emissions reductions from these recently adopted measures are not yet all accounted for in the baseline emissions inventory. Nonetheless, CARB measure commitments are achieving emissions reductions and will contribute towards attainment of the 12 µg/m^3 annual PM2.5 standard in South Coast in 2030.

[4] Numbers may not add up due to rounding

[5] Current Control Program represents the current baseline emissions out to 100 nautical miles with adopted CARB and district measures excluding those recently-adopted CARB regulations identified in Table 5 (Source: MSC_NAA_CEPAM_v101B)

[6] Negative number indicates growth in emissions

TABLE 4-10
SOUTH COAST EXPECTED EMISSIONS REDUCTIONS FROM 2016 AND 2022 STATE SIP STRATEGY RECENTLY ADOPTED MEASURES

2016 and 2022 State SIP Strategy Measures	2030 NOx (tpd)	2030 PM2.5 (tpd)	2030 NH3 (tpd)
On-Road Heavy-Duty			
Advanced Clean Fleets Regulation	4.7	<0.1	0.8
Total On-Road Heavy-Duty Reductions	4.7	<0.1	0.8
On-Road Light-Duty			
Advanced Clean Cars II	1.4	0.1	2.1
Clean Miles Standard	<0.1	<0.1	<0.1
Total On-Road Light-Duty Reductions	1.5	0.1	2.1
Off-Road Equipment			
Amendments to the In-Use Off-Road Diesel-Fueled Fleets Regulation	1.9	0.1	NYQ*
Commercial Harbor Craft Amendments	2.0	<0.1	NYQ
Transport Refrigeration Unit Part I	0.3	<0.1	NYQ
Total Off-Road Equipment Reductions	4.3	0.3	NYQ
Primarily-Federally and Internationally Regulated Sources – CARB Measures			
In-Use Locomotive Regulation	9.9	0.2	NYQ
Total Primarily-Federally and Internationally Regulated Sources – CARB Measures Reductions	9.9	0.2	NYQ
Emissions Reductions	**20.5**	**0.8**	**2.9**

* Not yet quantified.

TABLE 4-11
SOUTH COAST EXPECTED EMISSIONS REDUCTIONS FROM THE REMAINING 2022 STATE SIP STRATEGY MEASURES[7]

2022 State SIP Strategy Measures	2030 NOx (tpd)	2030 PM2.5 (tpd)	2030 NH3 (tpd)
On-Road Heavy-Duty			
Zero-Emissions Trucks Measure	2.9	<0.1	0.2
Total On-Road Heavy-Duty Reductions	2.9	<0.1	0.2
Off-Road Equipment			
Tier 5 Off-Road Vehicles and Equipment	0.2	<0.1	NYQ*
Transport Refrigeration Unit Regulation Part 2	1.7	<0.1	NYQ
Cargo Handling Equipment Amendments	0.7	<0.1	NYQ
Total Off-Road Equipment Reductions	2.7	<0.1	
Other			
Zero-Emission Standard for Space and Water Heaters[8]	2.5	0.4	<0.1
Total Other Reductions	2.5	0.4	<0.1
Emissions Reductions	**8.2**	**0.5**	**0.2**

* Not yet quantified.

Title VI of the Civil Rights Act of 1964

Title VI of the Civil Rights Act of 1964 (Title VI) provides that no person in the United States shall, on the basis of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance. As a recipient of federal funds, CARB must ensure it complies with Title VI and U.S. EPA's Title VI implementation regulations in its relevant programs and policies. In developing the 2022 State SIP Strategy's robust suite of control measures, CARB staff engaged in a thorough public process that addresses the requirements of Title VI. CARB will continue to address the requirements of Title VI in

[7] Numbers may not add up due to rounding

[8] Reductions may be achieved through CARB and/or complementary South Coast AQMD control measures for this sector

implementation of the 2022 State SIP Strategy and related Clean Air Act implementation activities. Written guidance from U.S. EPA is needed to provide additional detail on Title VI requirements and expectations and support for effective implementation efforts.

Many low-income and disadvantaged communities in nonattainment areas, and across the State, continue to experience disproportionately high levels of air pollution and the resulting detrimental impacts to their health. Research shows large disparities in exposure to pollution between disadvantaged communities and other communities. There are disparities between white and non-white populations in California, with Black and Latino populations experiencing significantly greater air pollution impacts than white populations. Mobile source pollution exposures show some of the highest disparities. Mobile sources are the largest sources of pollution exposure disparity for Black populations and disadvantaged community residents, when compared to the average population in California. Specifically, mobile sources accounted for 45 percent of exposure disparity for the Black population, and 37 % of exposure disparity for people in disadvantaged communities. While significant progress has been made in reducing mobile and stationary source pollution in California through regulatory and other program activities, disparities in the location of pollution and cumulative exposures continue.

In 2023, CARB adopted the following Vision for Racial Equity to guide our external work, including the implementation of the Community Air Protection Program: CARB commits to just social change by working at all levels within the organization and externally to address environmental injustices and advance racial equity in the achievement of its mission. CARB works toward a future where all Californians breathe healthy and clean air, benefit from actions to address climate change, and where race is no longer a predictor of life outcomes. In working to realize this vision, CARB prioritizes environmental justice, uses tools to operationalize racial equity, and conducts meaningful community engagement in its policy and planning efforts and programs to address the longstanding environmental and health inequities from elevated levels of toxic air contaminants, criteria pollutants, and secondary impacts of climate change. It is imperative to optimize California’s control programs to maximize emissions reductions and provide targeted near-term benefits in those communities that continue to bear the brunt of poor air quality. Specific efforts include a commitment to apply a racial equity lens in considering benefits and burdens of CARB’s programs and policies, including regulatory actions. A racial equity lens is a set of questions to estimate impacts and benefits on the basis of race, ethnicity or other relevant categories, and considering alternatives.

Using a racial equity lens also requires a commitment to meaningful community engagement. In support of this commitment, CARB recently contracted with a number of community experts to vet and refine a model framework for community engagement. As noted above, while significant progress has been made to address air pollution statewide and in local communities, ensuring all Californians have access to healthy air quality is imperative.

In addition to these important efforts, the 2022 State SIP Strategy measures such as the Advanced Clean Fleets and In-Use Locomotive Regulations will reduce mobile source emissions from heavy-duty trucks and other sources around warehouses, railyards, and ports, as well as reducing other emissions, which in turn will reduce corresponding health risk in California's most impacted communities.

CARB prioritized public participation as an essential part of developing the measures included in the 2022 State SIP Strategy. CARB initiated the public process with a workshop in July 2021. After the workshop, CARB staff reached out to and met with a number of community-based organizations who provided input on the potential control measures. CARB released the 2022 State SIP Strategy: Draft Measures document which considered the input from the community-based organizations and comments during the first workshop.

CARB staff held a second workshop discussing the Draft Measures document in October 2021 and received additional input from a broad array of interested parties. The workshop presented a detailed discussion on the potential measures and allowed for the public and interested parties to comment on every facet of each potential measure. CARB staff also participated in the South Coast measure workshops as part of their SIP development process. CARB staff released the Draft 2022 State SIP Strategy in January 2022, prior to a third workshop, and presented an informational update to the Board at the Board Meeting in February 2022 to discuss and obtain public feedback. The input from numerous interested parties and community-based organizations framed the control measures in the Strategy such as the Zero-Emissions Trucks and Pesticide Measures.

These workshops and Board updates provided forums in both English and Spanish and afforded any special accommodations if requested to facilitate discussing the proposed measures in a public setting and to provide additional opportunity for public feedback, input, and ideas. And finally, CARB released the Proposed 2022 State SIP Strategy and hosted our 4th workshop in August 2022, prior to the CARB Board adopting the 2022 State SIP Strategy in September 2022. The workshops were well attended by a wide range of interested parties including community-based organizations. CARB staff listened to interested parties, evaluated their recommendations, and included some of these recommendations as measures that were appropriate for the 2022 State SIP Strategy. In order for a public suggestion to be included as a SIP measure, it needed to meet U.S. EPA-required integrity elements. SIP measures are required to be quantifiable, enforceable, surplus, and permanent. Measures suggested by the public that were ultimately adopted in the 2022 State SIP Strategy include a regulation to reduce emissions of reactive organic gas from pesticides in collaboration with the California Department of Pesticide Regulation and a zero-emission truck measure to help ensure that smaller trucking companies have more consistent access to zero-emission truck incentives.

Following the Board's approval of the 2022 State SIP Strategy, the public processes continue as each measure within the strategy goes through its own public process to engage with impacted communities and interested parties to further develop the measures prior to being brought to the Board for consideration as a regulation or other program. As development and implementation of these measures progress, CARB staff will continue to identify and implement opportunities to mitigate air pollution associated with racial inequities and meaningfully engage and partner with communities most impacted to address long standing disparities and challenges. As CARB cannot do this alone, CARB will also continue to partner with other authorities such as air districts including the South Coast AQMD, other State agencies, and the federal government to ensure emissions reduction are achieved.

These connected efforts, as well as interagency efforts, will provide additional pathways to address Title VI requirements and support achieving the goal where zip code or race does not predict air pollution exposures. CARB has reviewed U.S. EPA and U.S. Department of Justice resources for Title VI and environmental justice policies, and looks forward to written guidance from U.S. EPA to address Clean Air Act section 110(a)(2)(E) as the State develops future clean air plans.

Civil Rights Policy and Discrimination Complaint Process

Under CARB's written Civil Rights Policy and Discrimination Complaint process (Civil Rights Policy), CARB has a policy of nondiscrimination in its programs and activities and implements a process for discrimination complaints filed with CARB, which is available on CARB's website. The Civil Rights Officer coordinates implementation of CARB's nondiscrimination activities, including as the Equal Employment Opportunity (EEO) Officer for employment purposes, and who can be reached at *EEOP@arb.ca.gov*, or (279) 208-7110.[9]

The Civil Rights Policy and Discrimination Complaint Process provides the following information about the nondiscrimination policy and its applicability:

> It is CARB policy to provide fair and equal access to the benefits of a program or activity administered by CARB. CARB will not tolerate discrimination against any person(s) seeking to participate in, or receive the benefits of, any program or activity offered or conducted by CARB. Members of the public who believe they were unlawfully denied full and equal access to a CARB program or activity may file a civil rights complaint with CARB under this policy. This non-discrimination policy also applies to people or entities, including contractors, subcontractors, or grantees that CARB utilizes to provide benefits and services to members of the public. [. . .]

As described in the Civil Rights Policy and Discrimination Complaint Process, the Civil Rights Officer coordinates implementation of nondiscrimination activities:

> CARB's Executive Officer will have final authority and responsibility for compliance with this policy. CARB's Civil Rights Officer, on behalf of the Executive Officer, will coordinate this policy's implementation within CARB, including work with the Ombudsman's Office, Office of Communications, and the staff and managers within a program or activity offered by CARB. The Civil Rights Officer coordinates compliance efforts, receives inquiries concerning non-discrimination requirements, and ensures CARB is complying with state and federal reporting

[9] CARB. California Air Resources Board and Civil Rights. *https://ww2.arb.ca.gov/california-air-resources-board-and-civil-rights*, Civil Rights Policy and Discrimination Compliant Process. November 1, 2016. *https://ww2.arb.ca.gov/sites/default/files/2023-01/2016-11-03%20CARB%20Civil%20Rights%20Policy%20Revised%20Final.pdf*

and record retention requirements, including those required by Code of Federal Regulations, Title 40, Section 7.10 et seq.

The Civil Rights Policy and Discrimination Complaint Process also describes in detail the complaint procedure, as follows:

> A Civil rights complaint may be filed against CARB or other people or entities affiliated with CARB, including contractors, subcontractors, or grantees that CARB utilizes to provide benefits and services to members of the public. The complainant must file his or her complaint within one year of the alleged discrimination. This one-year time limit may be extended up to, but no more than, an additional 90 days if the complainant first obtained knowledge of the facts of the alleged violation after the expiration of the one-year time limit. [. . .]
>
> The Civil Rights Officer will review the facts presented and collected and reach a determination on the merits of the complaint based on a preponderance of the evidence. The Civil Rights Officer will inform the complainant in writing when CARB has reached a determination on the merits of the discrimination complaint. Where the complainant has articulated facts that do not appear discriminatory but warrants further review, the Civil Rights Officer, in his or her discretion, may forward the complaint to a party within CARB for action. The Civil Rights Officer will inform the complainant, either verbally or in writing, before facilitating the transfer. [. . .]
>
> CARB will not tolerate retaliation against a complainant or a participant in the complaint process. Anyone who believes that they have been subject to retaliation in violation of this policy may file a complaint of retaliation with CARB following the procedures outlined in this policy.

There is a Civil Rights Complaint Form available[10] on the webpage, which should be used by members of the public to file a complaint of discrimination against CARB that an individual believes occurred during the administration of its programs and services offered to the public. As described on CARB's webpage, for all complaints submitted, the Civil Rights Officer will review the complaint to determine if there is a prima facie complaint (which means, if all facts alleged were true, would a violation of the applicable policy exist). If the Civil Rights Officer identifies a prima facie complaint in the jurisdiction of the Civil Rights Office, the Civil Rights Office will investigate and determine whether there is a violation of the policy.

The laws and regulations that CARB implements through this policy include:

- Code of Federal Regulations, Title 40 Parts 5 and 7;
- Title VI of the U.S. Civil Rights Act of 1964, as amended;
- Section 504 of the Rehabilitation Act of 1973;

[10] CARB. Civil Rights Complaint Form. July 2019. https://ww2.arb.ca.gov/sites/default/files/2023-01/eo_eeo_033_civil_rights_complaints_form.pdf

- Age Discrimination Act of 1975;
- Title IX of the Education Amendments of 1972;
- California Government Code, Title 2, Division 3, Part 1, Chapter 2, Article 9.5, *Discrimination*, Section 11135 et seq.; and
- California Code of Regulations, Title 2, Section 10000 et seq.

As part of its overarching civil rights and environmental justice efforts, CARB is in the process of updating its Civil Rights Policy and will make those publicly available once complete. These updates will reflect available U.S. EPA and U.S. Department of Justice resources for Title VI and environmental justice policies. CARB encourages U.S. EPA to issue additional guidance to further clarify Title VI requirements and expectations to assist state implementation efforts.

CARB's Mobile Source Measures

On-Road Heavy-Duty

Advanced Clean Fleets Regulation

The Advanced Clean Fleets Regulation was adopted by CARB on April 27, 2023. This measure accelerates zero-emission vehicle (ZEV) adoption in the medium- and heavy-duty sectors by setting zero-emission requirements for fleets and a 100 percent ZEV sales requirement in California for manufacturers of Class 2b through 8 vehicles starting in 2036. The Advanced Clean Fleets Regulation focuses on strategies that ensure the cleanest vehicles are deployed by government, business, and other entities in California while meeting their transportation needs. The requirements are phased-in on varying schedules for different fleets including drayage trucks, high priority private and federal fleets, and state and local government fleets. All drayage trucks operating at seaports and intermodal railyards are required to be zero-emission by 2035. Drayage trucks also have new registration and reporting requirements, starting in 2023. High priority private and federal fleets must only add ZEVs or near-zero-emission vehicles with minimum all electric range to the California fleet starting January 1, 2024. However, to provide flexibility, these fleets may opt into the ZEV milestone schedule which is a ZEV phase-in as a percentage of the California fleet and targets vehicles that are well suited for electrification starting in 2025. State and local government fleets are required to phase-in a ZEV purchase requirement starting at 50 percent of new purchases in 2024 and 100 percent starting in 2027 or these fleets may opt into the ZEV milestone schedule.

Zero-Emission Trucks Measure

This measure would increase the number of ZEVs and require cleaner engines to achieve emissions reductions from fleets that are not affected by the Advanced Clean Fleets Regulation. This would include potential zero-emissions zone concepts around warehouses and sensitive communities if CARB is given new authority to enact indirect source rules in combination with strategies to upgrade older trucks to newer and cleaner engines. This would be a transitional strategy to achieve zero-emissions medium- and heavy-duty vehicles everywhere feasible by 2045.

On-Road Light-Duty

Clean Miles Standard

The Clean Miles Standard was adopted by CARB on May 20, 2021. The primary goals of this measure are to reduce GHG emissions from ride-hailing services offered by transportation network companies (TNCs) and promote electrification of the fleet by setting an electric vehicle mile target, while achieving criteria pollutant co-benefits. TNCs would be required to achieve zero grams CO_2 emissions per passenger mile traveled and 90 percent electric VMT by 2030.

Off-Road Equipment

Tier 5 Off-Road Vehicles and Equipment

This measure would reduce NOx and particulate matter (PM) emissions from new off-road compression-ignition (CI) engines by adopting more stringent exhaust standards for all power categories, including those that do not currently utilize exhaust aftertreatment such as diesel particulate filters and selective catalytic reduction. This measure would be more stringent than required by current CARB, U.S. EPA and European Stage V nonroad regulations and would require the latest generations of emission control technologies.

For this measure, CARB staff would develop and propose standards for new off-road CI engines including the following: lower PM standards for engines less than 19 kilowatt (kW) (25 horsepower [hp]), lower NOx and PM standards for engines greater than or equal to 19 kW (25 hp) and less than 56 kW (75 hp), and more stringent aftertreatment-based PM and NOx standards for engines greater than or equal to 56 kW (75 hp). Other possible elements include new manufacturer-based in-use testing requirements, proposing more representative useful life periods, and developing a low load certification test cycle. It is expected that this comprehensive offroad Tier 5 regulation would rely heavily on technologies that manufacturers are developing to meet the recently approved low NOx standards and enhanced in-use requirements for on-road heavy-duty engines.

Amendments to the In-Use Off-Road Diesel-Fueled Fleets Regulation

The amendments to the In-Use Off-Road Diesel-Fueled Fleets Regulation were adopted by CARB on November 17, 2022. This measure further reduces NOx and PM emissions from the in-use off-road diesel equipment sector by adopting more stringent requirements that target the oldest and dirtiest equipment that were previously allowed to operate indefinitely.

The amendments include a phase out schedule for most Tier 0, 1, and 2 engines between 2024 and 2036. This will allow a 12-year phase out of these oldest engines. Along with the engine tier phase out, adding vehicle provisions in the current regulation are extended to phase in a restriction on the adding of vehicles with Tier 3 and Tier 4 interim engines to fleets. The amendments also include new requirements for fleets to use renewable diesel (with some limited exemptions), new contracting requirements for prime contractors and public works awarding bodies to increase the enforceability and awareness of the regulation, and two optional flexibility provisions for fleet adoption of zero-emission vehicles. Additional modifications include clarifications to implementation, sunset of year-by-year low use, the addition of flexibility to permanent low-use, and the sunset of a provision that would have allowed small fleets to continue to operate vehicles that could not be retrofitted with a verified diesel emission control strategy indefinitely.

Transport Refrigeration Unit Regulation Part 2 (Non-Truck TRUs)

This measure is the second part of a two-part rulemaking to transition diesel-powered transport refrigeration units (TRUs) to zero-emission technologies. This measure would require zero-emission equipment for non-truck TRUs (trailer TRUs, domestic shipping container TRUs, railcar TRUs, and TRU generator sets).

Commercial Harbor Craft Amendments

The amendments to the Commercial Harbor Craft Regulation were adopted by CARB on March 24, 2022. The amended regulation requires that starting in 2023 and phasing in through 2031, most commercial harbor crafts (CHCs) (except for commercial fishing vessels and categories listed below) are required to meet the cleanest possible standard (Tier 3 or 4) and retrofit with diesel particulate filters (DPFs) based on a compliance schedule. The prior regulated CHC categories are ferries, excursion, crew and supply, tug/tow boats, barges, and dredges. The amendments impose in-use requirements on the rest of vessel categories except for commercial fishing vessels, including workboats, pilot vessels, commercial passenger fishing, and all barges over 400 feet in length or otherwise meeting the definition of an ocean-going vessel. The amendments require engines on new build commercial fishing vessels to meet the most stringent marine standards (Tier 3 or Tier 4) or Tier 4 Final off-road emission standards. The amendments also remove the exemption for engines less than 50 hp.

The regulation also requires that, starting in 2025, all new and newly acquired excursion vessels to be plug-in hybrid vessels that are capable of deriving 30 percent or more of combined propulsion and auxiliary power from a zero-emission tailpipe emission source. Starting in 2026, all new, newly acquired and in-use short run ferries are required to be zero-emission; and starting in 2030 and 2032, all in-use commercial fishing vessels would need to meet a Tier 2 standard at minimum.

Cargo Handling Equipment Amendments

This measure would start transitioning Cargo Handling Equipment (CHE) to full zero-emission by 2030, with over 90 percent penetration of ZE equipment by 2036. Based on the current state of zero-emission

CHE technological developments, the transition to zero-emission would most likely be achieved largely through the electrification of CHE. This assumption about aggressive electrification is supported by the fact that currently some electric RTG cranes, electric forklifts, and electric yard tractors are already commercially available. The zero-emission phase-in schedule will be determined by technology feasibility determinations and discussions with public stakeholders during the rulemaking process.

Other

Zero-Emission Standard for Space and Water Heaters

For this measure, CARB would develop and propose zero-emission GHG standards for new space and water heaters sold in California; CARB could also work with air districts to further tighten district rules to drive zero-emission technologies. This measure would not mandate retrofits in existing buildings, but some buildings would require retrofits to be able to use the zero-emission technology that this measure would require. Beginning in 2030, 100 percent of sales of new space and water heaters (for either new construction or replacement of burned-out equipment in existing buildings) would need to meet zero-emission standards. It is expected that this regulation would rely heavily on heat pump technologies currently being sold to electrify new and existing buildings.

Primarily-Federally and Internationally Regulated Sources – CARB Measures

In addition to reducing emissions from the above sources, it is critical to achieve emissions reductions from sources that are primarily regulated at the federal and international level. It is imperative that the federal government and other relevant regulatory entities act decisively to reduce emissions from these primarily-federally and internationally regulated sources of air pollution. CARB and the air districts in California have taken actions to not only petition federal agencies for action, but also to directly reduce emissions using programmatic mechanisms within our respective authorities. CARB continues to explore additional actions, many of which may require a waiver or authorization under the Clean Air Act, as described below.

In-Use Locomotive Regulation

The In-Use Locomotive Regulation was adopted by CARB April 27, 2023. This measure uses mechanisms available under CARB's regulatory authority to accelerate the adoption of advanced, cleaner technologies, and include zero-emission technologies, for locomotive operations. The In-Use Locomotive Regulation applies to all locomotives operating in the State of California with engines that have a total rated power of greater than 1,006 horsepower, excluding locomotive engines used in training of mechanics, equipment designed to operate both on roads and rails, and military locomotives. The measure reduces emissions by increasing use of cleaner diesel locomotives and zero-emission locomotives through a spending account, in-use operational requirements, and by an idling limit. By July 1, 2024, a spending account is established for each locomotive operator. Funds in the account is only to be used toward Tier 4 or cleaner locomotives until 2030, and at any time toward zero-emission locomotives, zero-emission pilot or demonstration projects, or zero-emission infrastructure.

For the in-use operational requirements, beginning January 1, 2030, only locomotives built after January 1, 2007, may operate in California. Each year after January 1, 2030, only locomotives less than 23 years old may operate in California. Additionally, under the in-use operational requirements, starting January 1, 2030, all switch, industrial, and passenger locomotives operating in California with an original engine build date 2030 or newer will be required to be zero-emission. Starting January 1, 2035, all freight line haul locomotives operating in California with an original engine build date 2035 or newer must be zero-emission. Locomotives equipped with automatic engine stop/start systems are to idle no more than 30 minutes unless an exemption applies. Also, locomotive operators would report locomotive engine emissions levels and activity on an annual basis.

U.S. EPA's Clean Trucks Rule

Effective March 27, 2023, the U.S. EPA adopted a final rule titled "Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards."[11] This rule is part of the U.S. EPA's Clean Trucks Plan (CTP) that aims to reduce ozone and PM2.5 air pollution from heavy-duty trucks and buses. The rule applies to manufacturers of heavy-duty engines and vehicles. It will result in lower NOx emissions from new heavy-duty vehicles beginning in model year (MY) 2027 by setting more stringent emission standards that cover a wider range of heavy-duty engine operating conditions and require those standards to be met for a longer period of time of when these engines operate on the road. The rule also changes key provisions of the existing heavy-duty vehicle emission control program, such as the test procedures, regulatory useful life, emission-related warranty, and other requirements. U.S. EPA's CTP will result in emission benefits by 2030 and South Coast AQMD includes those benefits as a line item adjustment to the baseline emissions in this PM2.5 Plan (see Table 4-12).

SCAG's Regional Transportation Plan/Sustainable Communities Strategy and Transportation Control Measures

The PM2.5 Plan includes Transportation Control Measures (TCMs) from Southern California Association of Government's (SCAG) Regional Transportation Plan/Sustainable Communities Strategy to address attainment of the 2012 annual PM2.5 standard in the South Coast Air Basin. The TCMs are based on SCAG's Final 2020–2045 Regional Transportation Plan/Sustainable Communities Strategy (2020 RTP/SCS, also known as Connect SoCal) and 2023 Federal Transportation Improvement Program (FTIP), as amended.

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[11] Control of Air Pollution From New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards, 88 Fed. Reg. 4296 (January 24, 2023)

The RTP/SCS and FTIP were developed in consultation with federal, state and local transportation and air quality planning agencies and other stakeholders. The four County Transportation Commissions (CTCs) in the South Coast Air Basin, namely Los Angeles County Metropolitan Transportation Authority, Riverside County Transportation Commission, Orange County Transportation Authority and the San Bernardino County Transportation Authority, were actively involved in the development of the regional transportation measures of this Appendix. While SCAG will soon adopt the 2024 RTP/SCS, this PM2.5 Plan is based on the 2020 RTP/SCS as it was the latest approved RTP/SCS at the time of plan development. Refer to Appendix IV-B for more details.

SIP Emission Reduction Commitment

The SIP emission reduction commitment in the PM2.5 Plan reflects the estimated emission reductions from adopted rules and proposed measures. These are the emission reductions that we use to show progress in reducing emissions in an expeditious manner, and how the region will be able to meet the 2012 annual PM2.5 standard. Not all emission reductions that occur are SIP-creditable – meaning they do not count for purposes of showing how an area will be able to meet federal air quality standards. To be SIP-creditable, emission reductions must meet specific U.S. EPA criteria (e.g., integrity elements) to provide confidence that the emission reductions relied upon to meet the standards will occur. The following sections first describe the methodology for calculating SIP emissions and SIP-creditable reductions, then describe what procedures will be followed to ensure fulfillment of the commitment.

SIP Emission Reduction Tracking

For purposes of tracking progress in emission reductions, the baseline annual average emissions for the year 2030 will be used, regardless of any subsequent new inventory information that may reflect more recent knowledge. This is to ensure that the same "currency" is used in measuring progress as was used in designing the AQMP and that there is an "apples to apples" comparison in evaluating emissions.

Any emission reductions achieved beyond the existing South Coast AQMD regulations are creditable only if there is also a mechanism to ensure that the commitments to achieve those emission reductions are enforceable. Therefore, in certain instances, the South Coast AQMD may have to adopt regulations to reflect the existing industry practices in order to claim SIP reduction credit, with the understanding that there may not be additional reductions beyond what has already occurred. Exceptions can be made where reductions are real, quantifiable, surplus to the baseline inventory, and enforceable through other State and/or federal regulations. Further, any emission inventory revisions, which have gone through a peer review and public review process, can also be SIP creditable.

The PM2.5 Plan includes emission reductions from voluntary incentive measures to help meet the 2012 annual PM2.5 standard. With reliance on voluntary incentive measures to achieve attainment of the federal PM2.5 standard and for those measures to be SIP-approved, the South Coast AQMD must design programs such that the emission reductions from these incentive measures are proven to be real, quantifiable, surplus, enforceable, and permanent.

There are key components required of a SIP submittal in order to rely on discretionary incentive programs to satisfy the CAA emission reduction requirements. These components include a demonstration addressing the "integrity elements" (the five requirements listed above), federally enforceable "backstop" commitments, technical support, funding, legal authority, public disclosure and provisions to track results that are common among the various voluntary incentive programs. The "backstop" commitments include a requirement to monitor emission reductions achieved by the voluntary incentive measures and to report annually to the U.S. EPA the amount of reductions achieved. If the U.S. EPA determines that insufficient progress has been made, then substitute measures must be implemented to rectify the shortfall prior to the statutory implementation deadline. The South Coast AQMD is committed to developing detailed guidelines for voluntary incentive programs for individual incentive measures in accordance with the U.S. EPA's economic incentive programs guidelines. The following section describes the necessary criteria that will be included in each of the incentive measures.

Integrity Elements to Ensure Emission Reductions from Incentive Programs

To be SIP-creditable, emission reductions from voluntary incentive measures must meet the U.S. EPA's integrity elements. The emission reductions must be real, quantifiable, surplus, enforceable, and permanent. This demonstration must include project type(s); project life; applicable incentive program guidelines by title and year; and analysis of applicable incentive program guidelines for consistency with the integrity elements. For the purposes of this demonstration, the following defines and provides examples of the key elements:

Quantifiable

Emission reductions are quantitatively measurable, supported by existing and acceptable technical data. The quantification should use well-established, publicly available, and approved emission factors and accepted calculation methodology. There must be procedures to evaluate and verify over time the level of emission reductions that are actually achieved.

Surplus

Emission reductions must be above and beyond all current and known future District, State, or federal regulations already included in the SIP. Annual tracking will account for any potential overlapping future regulations that could conflict with the surplus reductions. Emission reductions used to meet air quality attainment requirements are surplus as long as they are not otherwise relied on in the SIP, SIP-related requirements, and other State air quality programs adopted but not in the SIP, a consent decree, or federal rules that focus on reducing criteria pollutants or their precursors. In the event that a voluntary incentive program's emission reductions are already relied on to meet air quality-related program requirements, they are no longer surplus. In addition, the emission reductions are available only for the remaining useful life of the equipment being replaced (e.g., if the equipment being replaced had a remaining useful life of five years, the additional emission reductions from the new equipment are available for SIP or conformity purposes under this guidance only for five years).

Enforceable

The South Coast AQMD will be responsible for assuring that the emission reductions credited in the SIP will occur. Emission reductions and other required actions are enforceable if:

a. They are independently verifiable;

b. Program violations are defined;

c. Those liable for emission reductions can be identified;

d. The South Coast AQMD and the U.S. EPA maintain the ability to apply penalties and secure appropriate corrective action where applicable;

e. The general public has access to the emissions-related information obtained from the source;

f. The general public can file suits against sources for violations (with the exception of those owned and operated by Tribes); and

g. They are practically enforceable in accordance with other U.S. EPA guidance on practicable enforceability.

Actual emission reductions, for example, can be assured through replacement equipment registration, recordkeeping and reporting, and inspections (initial inspection after installation and subsequent inspections on a regular basis thereafter, if needed) throughout the term of project. Specific enforcement mechanisms will be addressed in the guidelines for the individual incentive measures.

Permanent

The emission reductions are permanent if they occur over the duration of the voluntary incentive program, and for as long as they are relied on in the SIP. For example, those awarded incentives would need to ensure the projects are properly implemented and the reductions are occurring and will continue to occur. Recipients of the incentive awards would therefore agree to contract provisions, such as recordkeeping and reporting to track reductions and agreements that newly installed equipment would not be removed without concurrence of the South Coast AQMD (i.e., permanent placement) and the proof that the replaced equipment would be destroyed or at least not be operated in the Basin (e.g., pictures, certification). Detailed procedures to ensure permanent reductions will be described in the guidelines for the individual incentive measures.

Reductions from South Coast AQMD Control Measures

For purposes of implementing an approved SIP, the South Coast AQMD is committed to adopt and implement control measures that will achieve, in aggregate, emission reductions to demonstrate expeditious progress toward meeting the federal 2012 annual PM2.5 standard. The South Coast AQMD is committed to adopt the control measures in Tables 4-2 and 4-3 unless these measures or a portion thereof are found infeasible, and other substitute measures that can achieve equivalent reductions in the same adoption or implementation timeframes are adopted. Findings of infeasibility will be made at a regularly scheduled meeting of the South Coast AQMD Governing Board with proper public notification. For purposes of the SIP commitment, infeasibility means that the proposed control technology is not reasonably likely to be available by the implementation date in question, or achievement of the emission reductions by that date is not technically or economically feasible. The reductions in Tables 4-2 and 4-3 are committed only to the extent needed to achieve attainment by the 2030 attainment deadline. If any substitution is needed, the alternative measures will need to achieve the same emission reductions or air quality benefit. The aggregate emission reduction commitments, along with the anticipated specific control measures to meet that reduction commitment are made with the understanding that if there is a shortfall in the individual measures for a particular year, emission reductions from other control measures could be substituted. The South Coast AQMD acknowledges that this commitment is enforceable under CAA section 304(f). The U.S. EPA will not credit SIP reductions unless the control measures are adopted and approved into the SIP at the time the U.S. EPA takes action on the plan.[12]

Reductions from CARB Control Measures

The CARB proposed control measures presented in Table 4-6, combined with ongoing implementation of current control programs, will provide further reductions to enhance air quality progress and achieve the 2012 annual PM2.5 standard.

Overall Emission Reductions

Table 4-12 identifies projected reductions for the South Coast Air Basin based on the annual inventory for NOx and direct PM2.5 emissions for 2030 and Table 4-13 summarizes total reductions from 2018 base year to 2030 attainment.~~.~~ These reductions reflect the emission reductions associated with implementation of control measures under State and local jurisdiction. Table 4-12 also includes emission reductions from recently adopted regulations as line item adjustments. South Coast AQMD and CARB commit to reduce NOx and PM2.5 emissions by 9.99 tpd and 0.53 tpd, respectively, beyond the 2030 baseline emissions through control measures proposed in this PM2.5 Plan. This enforceable commitment represents 5 percent and 16 percent, respectively, of the overall NOx and PM2.5 reductions that will occur between 2018 and 2030. Both the enforceable commitment and attainment demonstration exclude emission reductions from control measures that are needed to satisfy MSM requirements, as these requirements are independent of attainment.

[12] U.S. EPA has in the past allowed about 10 percent of required reductions to be in the form of "enforceable commitments"

TABLE 4-12
EMISSION REDUCTIONS FOR 2030 BASED ON ANNUAL EMISSIONS INVENTORY (TONS PER DAY)

	NOx	PM2.5
Year 2030 Baseline	210.31	54.05
Emission Reductions:		
South Coast AQMD Stationary Source Measures	1.33	0.04
CARB Stationary Source Measure	2.58	0.41
CARB Mobile Source Measures	6.08	0.09
U.S. EPA's Clean Trucks Plan^	0.61	-
Stationary ~~and Mobile~~ Source Line Item Adjustments^	~~24.34~~3.20	~~0.83~~0.00
Mobile Source Line Item Adjustments^	21.14	0.83
Total Reductions	**34.94**	**1.36**
2030 Remaining Emissions	**175.37**	**52.69**

^ Includes stationary and mobile source baseline emissions inventory line item adjustments. For a complete list of adopted regulations included as line item adjustments, refer to Appendix I.

TABLE 4-13
EMISSION REDUCTIONS FROM 2018 TO 2030 ATTAINMENT BASED ON ANNUAL EMISSIONS INVENTORY (TONS PER DAY)

	NOx	**PM2.5**
2018 Base Year Emissions	383.02	56.04
2030 Baseline Emissions	210.31	54.05
2030 Attainment Scenario Emissions	175.37	52.69
Baseline Reductions from 2018 to 2030	172.71	1.99
Line Item Adjustments^	24.95	0.83
Reductions from the Proposed Control Measures	9.99	0.53
Total Reductions from 2018 to Attainment	**207.65**	**3.35**

^ Includes reductions from stationary and mobile source line item adjustments as well as reductions from U.S. EPA's Clean Trucks Plan

CHAPTER 5

Future Air Quality

- **Modest additional emission reductions are required for the Basin to attain the 2012 annual PM2.5 standard in 2030.**

- **The emissions of direct PM2.5, NOx, and ammonia must be reduced by 1.4, 34.9, and 3.2 tons per day respectively, beyond the 2030 baseline levels to attain the standard in 2030.**

- **The control strategy discussed in Chapter 4 provides a path to attain the standard by 2030, with a design value at our highest monitoring site of 12.0 µg/m³.**

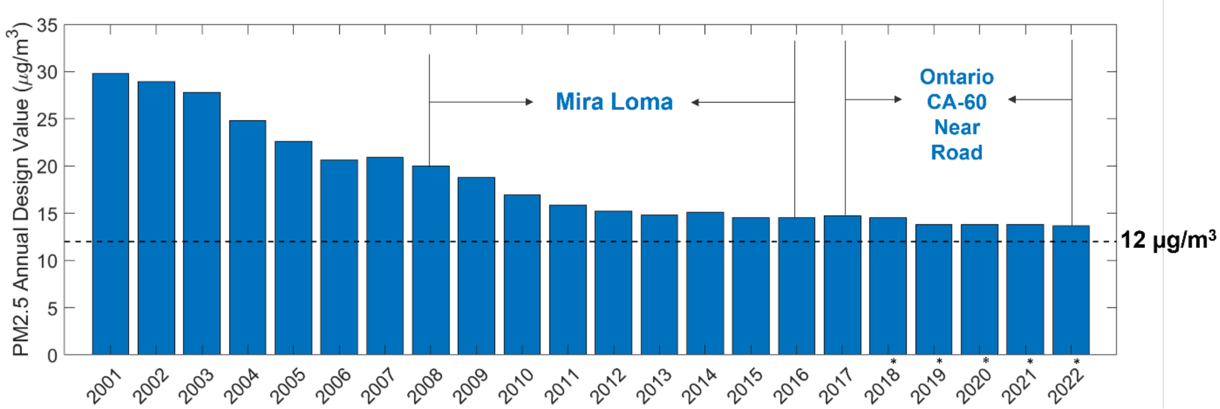
- **With the control strategy outlined in Chapter 4 of this Plan, it is anticipated that annual PM2.5 levels in all areas of the Basin will be below 12.0 µg/m³ by 2030.**

Introduction

The primary objective of the 2024 PM2.5 Plan is to address attainment of the federal 2012 annual average PM2.5 standard, set at 12 μg/m^3. Air quality modeling to demonstrate future attainment of the PM2.5 standard is an integral part of the planning process to achieve clean air. Attainment demonstration is the modeling exercise that shows how emission reductions will result in lower concentrations of air pollutants, presenting the path to attainment. The demonstration reflects updated emissions estimates, new technical information, enhanced air quality modeling techniques, updated attainment demonstration methodology, and the control strategy.

Base Design Value

A design value is a statistical metric used to show whether a region is in attainment with the NAAQS. The base design value is the starting point of the modeling analysis to show the pathway to attainment. U.S. EPA guidance recommends the use of multiple year averages of design values where appropriate in establishing the base design value. This approach helps mitigate the impacts of single-year anomalies on air quality trends, which may arise due to factors including exceptional or adverse meteorological conditions or radical changes in local emissions profiles. The trend in the Basin's annual PM2.5 design values, determined from routine Federal Reference Method (FRM) samples, from 2001 through 2022 reveal substantial reductions in concentrations over this timeframe (see Figure 5-1). However, it's noteworthy that the rate of decrease in annual design values has decelerated since 2012.



*Data likely to be approved as exceptional events by U.S. EPA removed from analysis.

FIGURE 5-1

SOUTH COAST AIR BASIN ANNUAL PM2.5 DESIGN VALUES FROM 2001 TO 2022

Overall, since 2001, the annual PM2.5 design values have decreased by over 50%, from 30 μg/m^3 in 2001 to 13.7 μg/m^3 in 2022. The deceleration in PM2.5 reduction in recent years can be attributed to a variety of factors, including meteorology, increased activities at ports, and additional sources of PM2.5 precursors. Additionally, in January 2015, two new near-road monitors started operating and providing valid data: the Ontario CA-60 and the Long Beach I-710 near-road monitors. PM2.5 concentrations are often higher at near road monitors, reflecting higher levels of resuspended dust, vehicle exhaust and brake and tire wear. Since 2017, the Ontario CA-60 near-road station has served as the design site in the basin.

Modeling Base Design Value Calculation

The PM2.5 annual design value for a specific year is determined by averaging the annual PM2.5 concentrations over a three-year period that includes the given year and the two preceding years. However, U.S. EPA guidance on modeling the attainment demonstration[1] recommends using a 5-year weighted design value centered on the base year selected for the attainment demonstration as the modeling Base Design Value (DVB). This 5-year weighted average approach recommended by EPA is to reduce year-to-year variability compared to a single 3-year design value. In the context of this plan, the DVB for each monitoring station is calculated as the average of the design values for 2018 through 2020 (denoted as DV 2018, DV 2019, and DV 2020 in Figure 5-2). This calculation covers a 5-year period from 2016 through 2020, centered at the base year 2018. Under certain circumstances, the U.S. EPA allows modification of DVB calculation, such as in the case of exceptional events. Figure 5-2 presents the U.S. EPA-recommended DVB calculation on the left. The 2020 DV calculation includes the year 2020, which was marked by several extraordinary events that significantly altered PM2.5 concentrations in the basin. These events include the COVID-19 pandemic and associated changes in human activity, and record-setting wildfires. More details on the exceptionality of 2020 are discussed in Chapter 5 of Appendix II. To address this anomalous year this PM2.5 plan uses a modified DVB for 2018 that excludes the 2020 DV from DVB calculations and replaces it with the average of 2018 and 2019 annual means (Figure 5-2, right). In addition, exceptional events on July 4 and 5 due to Fourth of July fireworks are also excluded. Justification to exclude these days from DVB calculations is included in Appendix II.

[1] Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5, and Regional Haze, U.S. EPA, November 2018. Available at: https://www.epa.gov/sites/default/files/2020-10/documents/o3-pm-rh-modeling_guidance-2018.pdf

2018 Base Design Value (DVB)

DV 2018	DV 2019	DV 2020
2016-2018	2017-2019	2018-2020

Average = DVB =

$$\frac{(DV\ 2018) + (DV\ 2019) + (DV\ 2020)}{3}$$

2018 Base Design Value (DVB)

DV 2018	DV 2019	DV Modified
2016-2018	2017-2019	2018-2019

Average = DVB =

$$\frac{(DV\ 2018) + (DV\ 2019) + \left(\frac{Avg2018 + Avg2019}{2}\right)}{3}$$

FIGURE 5-2
PM2.5 5-YEAR WEIGHTED AVERAGE FOR 2018 BASE DESIGN VALUE.
U.S. EPA'S DEFAULT METHODOLOGY (LEFT PANEL) AND MODIFIED METHODOLOGY TO EXCLUDE YEAR 2020 (RIGHT PANEL). DV REFERS TO A 3-YEAR DESIGN VALUE.

Table 5-1 shows the annual 2018 DVB values for all monitoring stations within the Basin, and it includes the 2012 DVB presented in the 2016 AQMP. Notably, the Ontario CA-60 near-road monitor has the highest design value in 2018 (13.98 $\mu g/m^3$) making it the designated design site for this PM2.5 plan. Mira Loma was the design site in the 2016 AQMP before data from the Ontario CA-60 near-road was available, but its DVB in 2018 is the second highest, with a decline from 14.87 $\mu g/m^3$ in 2012 to 13.53 $\mu g/m^3$. In general, the stations reported in the 2016 AQMP experienced a decrease in DVB from 2012 to 2018. While the DVB values for 2012 included the exceptional events of Fourth of July fireworks, which might amplify the reductions in DVB from 2012 to 2018 slightly, trends show that the annual PM2.5 concentrations keep improving.

TABLE 5-1
WEIGHTED ANNUAL PM2.5 DESIGN VALUES FOR 2012 FROM THE 2016 AQMP AND FOR 2018 CALCULATED FOR THE ~~DRAFT~~ PM2.5 PLAN (μg/m^3)

Monitoring Site	Annual 2012 DVB from the 2016 AQMP	Annual 2018 DVB*
Anaheim-Pampas Lane	10.57	10.55
Azusa	-	10.13
Big Bear	-	6.35
Los Angeles-North Main Street	12.43	11.97
Compton-700 North Bullis Road	-	12.25
Fontana-Arrow Highway	12.60	11.35
Long Beach-Route 710 Near Road	-	12.28
North Long Beach	-	10.53
Mira Loma Van Buren	14.87	13.53
Mission Viejo-26081 Via Pera	-	7.94
Ontario- Route 60 Near Road	-	13.98
Pasadena-S Wilson Avenue	-	9.68
Pechanga	-	6.36
Pico Rivera-4144 San Gabriel	-	11.87
Reseda	-	9.74
Riverside-Rubidoux	13.13	12.13
South Long Beach	-	10.58
San Bernardino-4th Street	-	10.87

* Calculated based on the modified methodology illustrated in Figure 5-2

PM2.5 Speciation

PM2.5 species profiles for the base year are required to project future design values of PM2.5. The PM2.5 species required in the calculation of future design values are the following: sulfate (SO4), nitrate (NO3), ammonium (NH4), elemental carbon (EC), sea salts (Salt), crustal species, organic carbon (OC), particle-bound water (PBW), and a blank. There are a total of four monitoring stations from the Chemical Speciation Network (CSN) that routinely measure PM2.5 speciation data in the Basin. These CSN monitors are collocated where their corresponding FRM monitors are located. With one site in each county, the four CSN sites are strategically located to represent aerosol characteristics in the four counties within the Basin. Historically, Riverside-Rubidoux served as the design site, a location with the highest annual PM2.5 concentration in the Basin. Fontana and Anaheim experienced elevated concentrations within their respective counties, and the Central Los Angeles site was intended to capture the characteristics of an emission source area.

The measurements of individual species obtained from the CSN sites may differ from the retained mass of a specific species in the FRM filter, due to the inherent differences in the measurement techniques. To reconcile the expected differences between speciated and FRM measurements, species are adjusted following the SANDWICH method[2], which is described in the U.S. EPA modeling guidance.[3] This adjustment results in reduced nitrates (relative to the amount measured by routine speciation networks), higher mass associated with sulfates and nitrates (reflecting water included in gravimetric FRM measurements), and an estimate of organic carbonaceous mass, which is derived from the difference between FRM-measured PM2.5 and the sum of all components except measured organic carbon. EPA's mas balance method sets a ceiling for OC mass (OCM) to be 80 percent of the total PM2.5 mass. However, based on scientific literature on PM2.5 speciation data taken in the greater Los Angeles area,[4,5] this ceiling was set as the 50 percent of PM2.5 FRM mass. EPA's guidance also sets a floor value for OCM to be the measured OC value. However, the sum of individual species measured from CSN is sometimes larger than the FRM mass. Under this condition, the measured OC as floor would erroneously exaggerate the OC fraction while reducing the other species, therefore, the OC floor was scaled by the ratio of FRM mass divided by the total CSN mass.

Directly measured ammonium (associated with nitrate and sulfate) at CSN stations, which is equivalent to particulate ammonium retained on FRM filters, was used for the speciation profiles. These measurements, however, were capped with fully neutralized ammonium, which is calculated as follows:

$$Ammonium\ ceiling = 0.375 \times sulfate + 0.29 \times retained\ nitrate$$

PBW was estimated using a polynomial regression equation fitted to the equilibrium model Aerosol Inorganic Matter (AIM) as a function of sulfate, nitrate, and adjusted ammonium concentrations. Most

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[2] Frank, Neil. (2006). Retained Nitrate, Hydrated Sulfates, and Carbonaceous Mass in Federal Reference Method Fine Particulate Matter for Six Eastern U.S. Cities. Journal of the Air & Waste Management Association (1995). 56. 500-11. 10.1080/10473289.2006.10464517.

[3] Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5, and Regional Haze, U.S. EPA, November 2018. Available at: https://www.epa.gov/sites/default/files/2020-10/documents/o3-pm-rh-modeling_guidance-2018.pdf

[4] Hayes et al., 2013. Organic aerosol composition and sources in Pasadena, California, during the 2010 CalNex campaign. Journal of Geophysical Research, 118, 9233-9257

[5] Shirmohammadi et al., 2016. Fine and Ultrafine Particulate Organic Carbon in the Los Angeles Basin: Trends in Sources and Composition. Science of Total Environment, 541, 1083-1096

FRM monitors in the Basin lack a co-located CSN monitor. Thus, as recommended by EPA guidance[6], the individual speciation components from nearby CSN monitors were interpolated to the locations of FRM monitors that do not have a co-located CSN monitor using Inverse Distance Squared Weights. The interpolated speciated component at a given unmonitored location in the Basin is calculated using a weighted average of CSN monitor values, with weights of a monitor calculated as a function of the inverse squared distance from said monitor.

Figure 5-3 and Figure 5-4 compare PM2.5 speciation fraction profiles estimated for the 2016 AQMP and the current ~~Draft~~ PM2.5 Plan at the Central LA and Riverside-Rubidoux monitoring stations, respectively. Speciated monitor data from 2017 through 2019 was used for the ~~Draft~~ PM2.5 Plan speciation fraction profile, while the 2016 AQMP speciation profile was calculated using the data collected in 2012. Generally, nitrate, elemental carbon (EC), and ammonium fractions have declined between the 2016 AQMP and the ~~Draft~~ PM2.5 Plan across all seasons. This reduction reflects the effect of existing rules and regulations aimed at reducing primary PM2.5 and its precursor emissions.

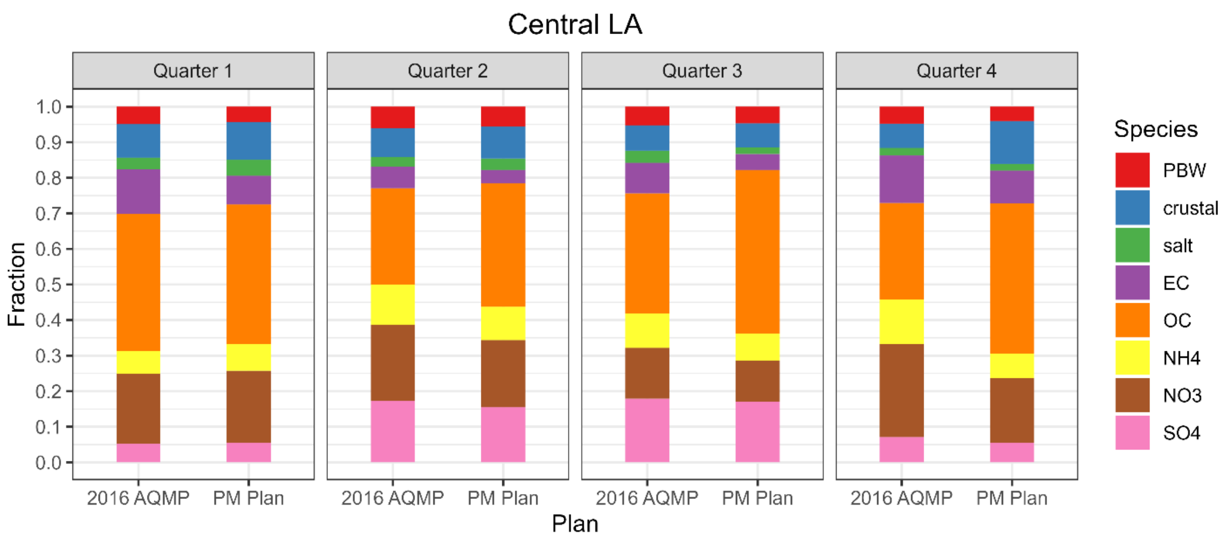

FIGURE 5-3

COMPARISON OF CENTRAL LA PM2.5 SPECIATION FRACTION PROFILE INCLUDED IN THE 2016 AQMP AND THE ~~DRAFT~~ PM2.5 ~~PLAN~~PLAN

[6] Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5, and Regional Haze, U.S. EPA, November 2018. Available at: https://www.epa.gov/sites/default/files/2020-10/documents/o3-pm-rh-modeling_guidance-2018.pdf

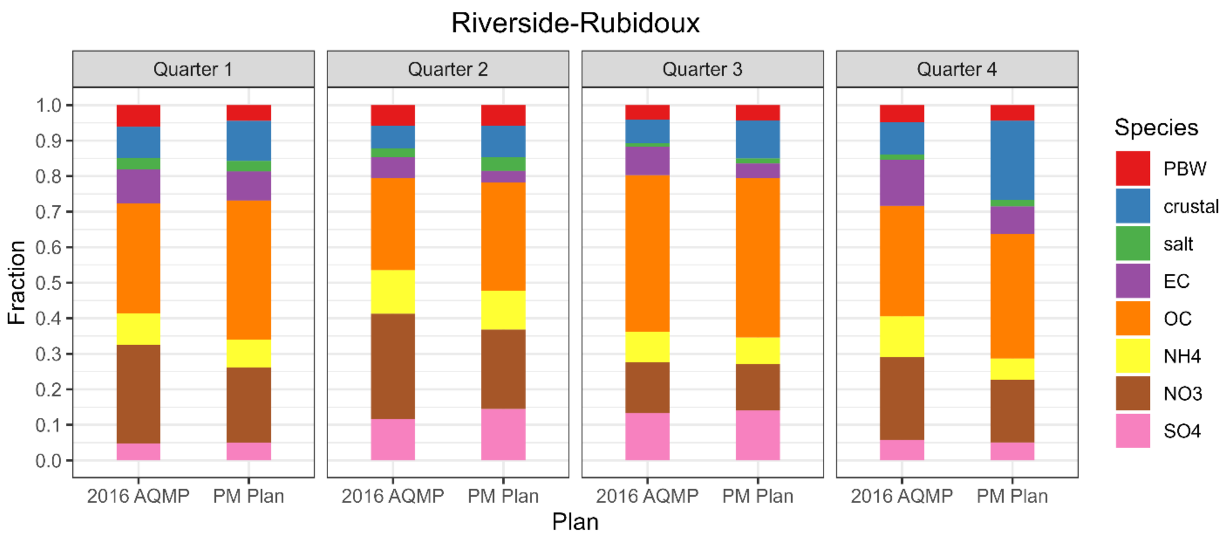

FIGURE 5-4
COMPARISON OF RIVERSIDE PM2.5 SPECIATION FRACTION PROFILE INCLUDED IN THE 2016 AQMP AND THE ~~DRAFT~~ PM2.5 PLAN

Annual PM2.5 Modeling Approach

Simulations for PM2.5 concentrations were conducted for the 2018 base year and the 2030 attainment year. CMAQ simulations covered the entire year of 2018 (from January 1st to December 31st). These simulations encompassed 8,760 consecutive hours from which daily 24-hour average PM2.5 concentrations were calculated. PM2.5 is divided into primary particles – which are directly emitted into the atmosphere – and secondary particles – which are formed from precursor gases. Sources of primary PM2.5 include but are not limited to road dust, diesel soot, and combustion products. Secondary products, such as sulfates, nitrates, and complex organic carbon compounds, are formed through chemical reactions involving oxides of sulfur (SOx), oxides of nitrogen (NOx), VOCs, and ammonia (NH3). The following section summarizes the PM2.5 modeling approach adopted for this Plan. The comprehensive modeling system used for this Plan includes photochemical reactions involved in the formation of PM2.5, horizontal and vertical transport, and removal mechanisms such as deposition. More detailed information on the PM2.5 modeling is presented in Appendix II.

Meteorology, Emissions, and Air Quality Model Configuration

The emissions inventory and meteorological conditions were developed for 2018, which was selected as the base year for emissions and meteorology. U.S. EPA requires the base year to be one of the three years of which DV was used in designation/re-classification,[7] and 2018 was the year that U.S. EPA relied on to re-classify the Basin from "moderate" to "serious" non-attainment area.[8] In addition, the Multiple Air Toxics Exposure Study V (MATES V)[9] conducted during 2018 involved comprehensive monitoring and numerical modeling. This effort contributed to the development of a robust dataset to evaluate modeling performance and to improve capabilities for modeling year 2018.

The PM2.5 Plan attainment demonstration framework is an upgrade from the modeling platform used in the 2022 AQMP and more recent SIP revisions. The framework uses the U.S. EPA-supported CMAQ modeling platform (version 5.3.3), incorporating the Statewide Air Pollution Research Center (SAPRC) 07 chemistry, and uses meteorological fields from the Weather Research and Forecasting Model (WRF). The modeling platform tracks primary pollutants, including precursors of ozone and particulate matter (PM2.5) as well as the formation of secondary pollutants like ozone and particles that result from chemical reactions occurring in the atmosphere. The simulations were conducted over an area with a western boundary over 100 miles west of the Ports of Los Angeles and Long Beach. The eastern boundary extends slightly beyond the Colorado River, while the northern and southern boundaries of the domain extend to the San Joaquin Valley and the Northern portions of Mexico, respectively. CMAQ was performed at a 4 km by 4 km grid resolution. For the PM2.5 Plan, WRF was updated to the most recent version (4.4.2) available at the time of protocol preparation. The WRF simulations were initialized using National Centers for Environmental Prediction (NCEP) re-analysis data[10] and run for three-day increments with four-dimensional data assimilation (FDDA).

Spatial and temporal allocation of emissions followed the same methodology used in the 2022 AQMP. Point source emissions were extracted from the South Coast AQMD's Annual Emissions Reporting Program and were allocated to specific days of the year using temporal allocation factors developed by CARB. On-road mobile source emissions were calculated using CARB's EMFAC2021 emissions model, incorporating vehicle travel activity data provided by Southern California Association of Governments (SCAG). Vehicle emissions accounted for meteorological effects on operational and evaporative emissions (temperature and relative humidity effects) which were derived from daily meteorological variables predicted with WRF. In addition, hourly vehicle activity profiles based on the California Department of Transportation (Caltrans) Performance Measurement System (PeMS) were used to refine the temporal variation of vehicle emissions. Spatial and temporal allocation of emissions from area sources and most off-road emissions sources were calculated using the latest spatial and temporal surrogates developed by CARB, which were released in January 2021. In addition, ocean-going vessel emissions were spatially allocated using data from the Automated Identification System (AIS), and aircraft emissions from major airports within the basin were allocated using aircraft location information data derived from the Aircraft Communication Addressing and Reporting System (ACARS). Gridded hourly biogenic emissions were calculated using the Model of Emissions of Gases and Aerosols from Nature version 3.0 (MEGAN3.0)

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[7] 40 CFR 51.1008
[8] 85 FR 40026
[9] http://www.aqmd.gov/docs/default-source/planning/mates-v/mates-v-final-report-9-24-21.pdf?sfvrsn=6.
[10] NCEP Reanalysis data provided by the NOAA/OAR/ESRL PSL, Boulder, Colorado, USA, from their Web site at: https://psl.noaa.gov/data/gridded/data.narr.html.

driven by the meteorological inputs from WRF. More details on the modeling approach, data retrieval, model development and enhancement, model application, emissions inventory development, and interpretation of results is presented in Appendix II.

Design Values and Relative Response Factors (RRF)

To bridge the gap between air quality model predictions and measurements, U.S. EPA guidance[11] has recommended the use of relative response factors (RRFs). In this approach, future year concentration predictions require two elements: base year design values and RRFs. The RRF is simply a ratio of the future year predicted air quality to the simulated air quality in the base year, representing the model predicted change in air quality in response to predicted emissions changes. For the annual PM2.5 attainment demonstration, base year and future modeled concentrations are calculated as a quarterly average of a 3-by-3 grid centered at each station for each specific component. The ratio of base to future year quarterly mean concentrations for each component is the RRF for that component. Individual RRFs are calculated for NH4, NO3, SO4, EC, OC, salt, and a combined grouping of crustal compounds and metals (Others). Future year design values were calculated by multiplying species- and site-specific RRFs by the corresponding quarterly design values. Once the future values for NH4, NO3 and SO4 are calculated using RRFs, future PBW quarterly values are computed using the same polynomial fitting used in the SANDWICH method. The total future quarterly values at each site are then calculated by adding all the individual components and the blank. The four quarterly average concentrations are then averaged at each site to determine the future annual design values.

Model Performance Evaluation

The U.S. EPA recommends operational evaluations to assess how accurately the model predicts observed concentrations. The basis for this recommendation is that if the model can characterize base year PM2.5, then greater confidence can be placed in the model-prediction of future concentrations. Figure 5-5 depicts the modeled and measured daily PM2.5 concentrations at stations of Los Angeles, Compton, Mira Loma, and Ontario CA-60 near-road during January 1 through December 31 of 2018. PM2.5 mass was measured every day for all stations in this Figure, except Compton at which PM2.5 was measured every three days. CMAQ predicts daily PM2.5 mass and seasonal variation of PM2.5 reasonably well with overestimation in winter months and underestimation in summer months. A comprehensive model performance evaluation for PM2.5, NH4, NO3, SO4, organic matter (OM), EC, and crustal species concentrations is presented in Appendix II.

Figure 5-6 shows the modeled (orange) and measured (blue) annual PM2.5 species concentrations at Anaheim, Central Los Angeles, Fontana, and Riverside in 2018. The model tends to overestimate

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[11] Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, PM and Regional Haze. Available at: https://www.epa.gov/sites/default/files/2020-10/documents/draft-o3-pm-rh-modeling_guidance-2014.pdf

concentrations at Central Los Angeles, which is near major sources of emissions. Conversely, the model tends to underestimate PM2.5 species concentrations at inland stations in Fontana and Riverside. Overall, the model predicts NH4 ion, SO4, nitrate, EC, and OM concentrations reasonably well. Model results accurately capture the relative contributions of PM2.5 species and show that nitrate and OM are the largest contributors to total PM2.5.

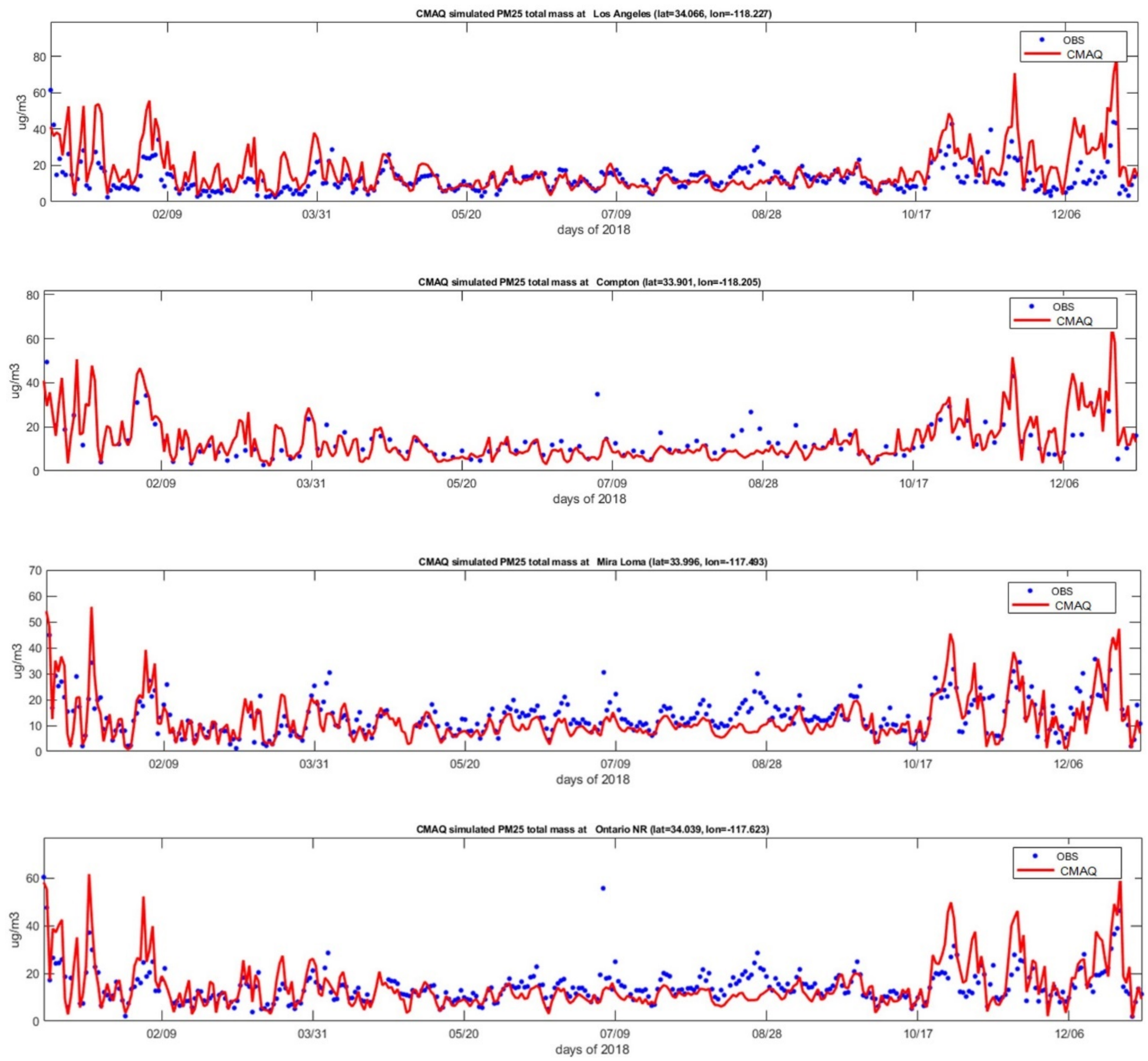

FIGURE 5-5

MODELED AND OBSERVED DAILY PM2.5 CONCENTRATIONS AT (TOP TO BOTTOM) LOS ANGELES, COMPTON, MIRA LOMA, ONTARIO NEAR-ROAD DURING JAN 1 THROUGH DEC 31, 2018

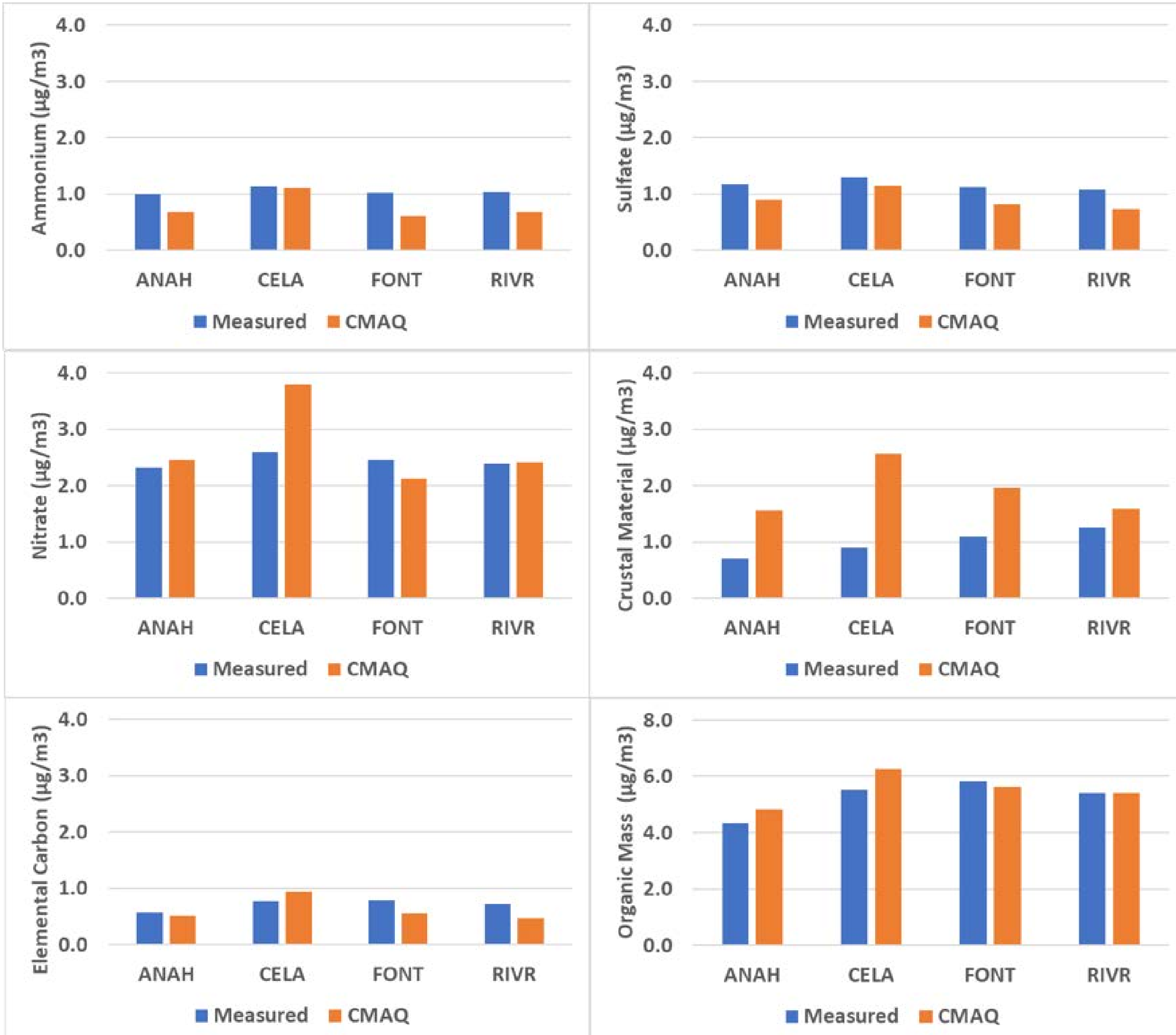

FIGURE 5-6

MODELED (ORANGE) AND OBSERVED (BLUE) ANNUAL PM2.5 SPECIES CONCENTRATIONS IN ANAHEIM (ANAH), CENTRAL LOS ANGELES (CELA), FONTANA (FONT), RIVERSIDE (RIVR) DURING 2018

Figure 5-7 shows the modeled (orange) and observed (blue) seasonal variation of nitrate and OM concentrations at Anaheim, Central Los Angeles, Fontana, and Riverside in 2018. The model predicts the seasonality of nitrate (top) and OM (bottom), accurately capturing peak nitrate and OM concentrations during winter months, and their subsequent drops during the summer. This is due to increased humidity, cooler temperatures, and frequent nocturnal inversions, conditions which favor the formation of ammonium nitrate, a significant component of secondary PM2.5. Summer months, in contrast, increase the volatility of nitrate, leading to relatively lower pollutant concentrations.

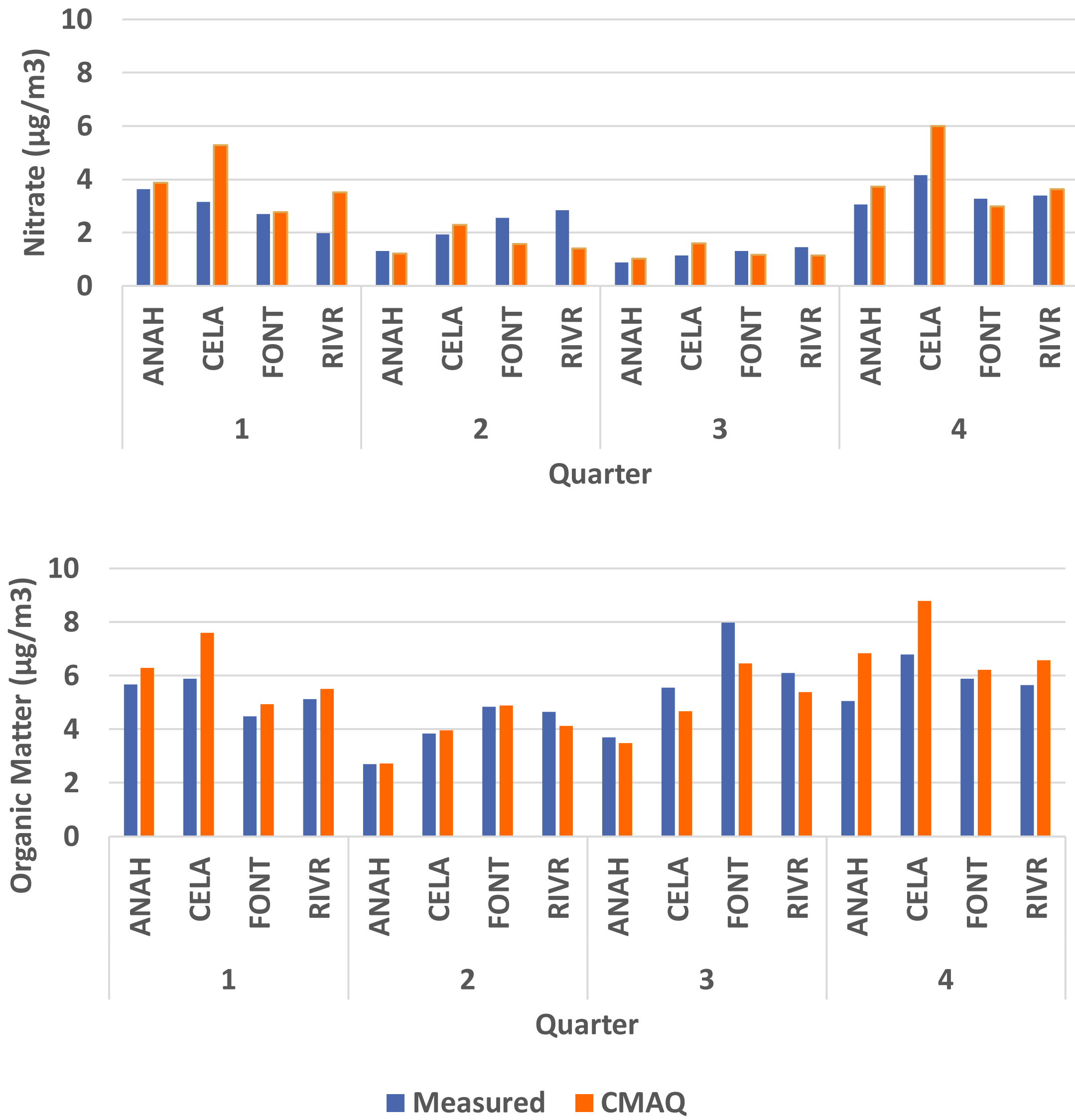

FIGURE 5-7

MODELED AND OBSERVED SEASONAL VARIATION OF NITRATE AND ORGANIC MATTER AT ANAHEIM (ANAH), CENTRAL LOS ANGELES (CELA), FONTANA (FONT), RIVERSIDE (RIVR) IN 2018

CMAQ performance evaluation segments the modeling domain into several sub-regions or zones. Table 5-2 lists the station locations and their assigned performance evaluation zone used to assess base-year simulation performance. Figure 5-8 maps the location of each station in the Basin. The "Urban Source" region typically has the highest emissions of PM2.5 and its precursors in the Basin, whereas the "Urban Receptor" region tends to experience high concentrations of secondary pollutants. Table 5-3 shows the model performance for daily PM2.5 in 2018 in each zone. While CMAQ underestimates PM2.5 mass in the San Fernando region and overestimates PM2.5 in over the Foothills and Urban Source regions, it shows the best model performance over the Urban Receptor region, which includes the Basin's design site.

TABLE 5-2
STATION INFORMATION OF PERFORMANCE EVALUATION ZONES

Station Location	Performance Evaluation Zone
Long Beach	Coastal
Mission Viejo	Coastal
South Long Beach	Coastal
Azusa	Foothills
Pasadena	Foothills
Reseda	San Fernando
Fontana	Urban Receptor
Mira Loma	Urban Receptor
Ontario Near Road	Urban Receptor
Riverside	Urban Receptor
San Bernardino	Urban Receptor
Anaheim	Urban Source
Compton	Urban Source
Los Angeles	Urban Source
Pico Rivera	Urban Source

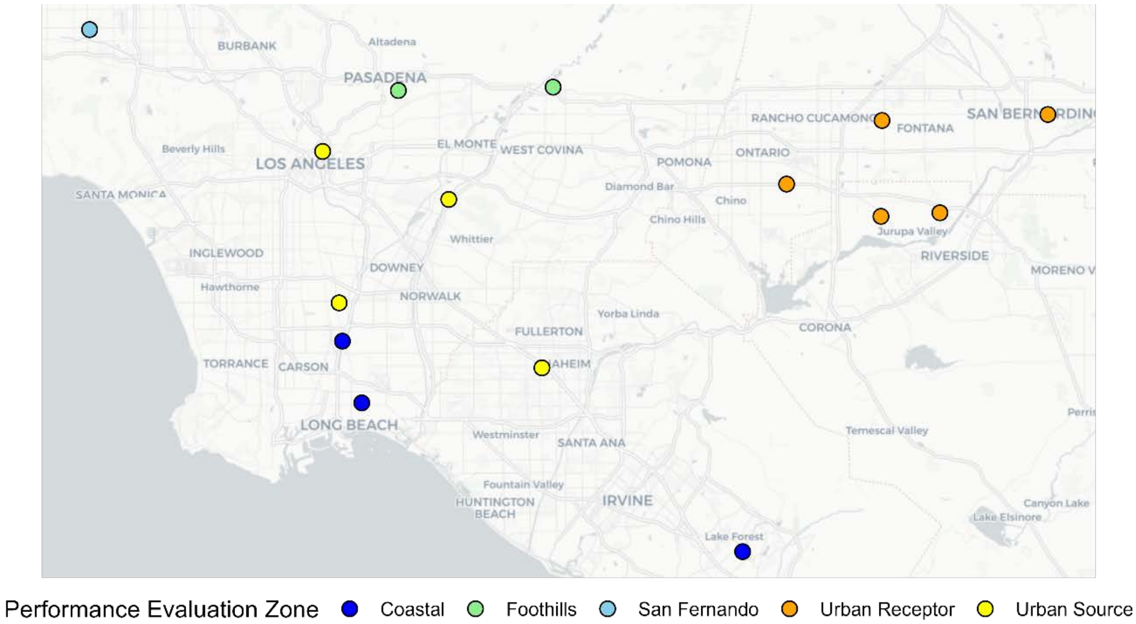

FIGURE 5-8
MAP OF PERFORMANCE EVALUATION ZONES

TABLE 5-3
MODEL PERFORMANCE FOR DAILY PM2.5 OF 2018

	Observation ($\mu g/m^3$)	Simulation ($\mu g/m^3$)	Correlation R2	Normalized Mean Bias (%)	Normalized Mean Error (%)
Coastal	10.5	11.4	0.66	7.8	43.0
San Fernando	10.5	10.1	0.53	-3.5	33.1
Foothills	10.6	15.1	0.49	38.5	56.8
Urban Source	12.7	14.4	0.68	12.4	41.4
Urban Receptor	12.7	12.9	0.68	0.6	33.8

Future PM2.5 Air Quality

Annual concentrations of PM2.5 were simulated for the base year 2018 and two future milestone years: 2025 and 2030. Both baseline and control scenarios were analyzed for 2030, the future attainment year. The outcomes are detailed in Figure 5-9 and Table 5-4.

The CA-60 Ontario near-road monitor is the base year's design site with a value of 13.98 $\mu g/m^3$ and is predicted to maintain the highest PM2.5 concentrations in the basin based on the baseline simulations for 2025 and 2030 (Figure 5-9). The projected design values at that site for 2025 is 13.09 $\mu g/m^3$, failing to meet the standard of 12 $\mu g/m^3$. Similarly, Mira Loma is projected to exceed the standard in 2025, with a design value of 12.62 $\mu g/m^3$. This demonstrates that the basin requires additional time beyond 2025 to meet the annual PM2.5 standard.

The simulation of the 2030 baseline also indicates that Ontario CA-60 near-road and Mira Loma will still exceed the annual PM2.5 standard. The 2030 baseline includes emission reductions of 173 tons per day of NOx, 58 tons per day of VOC, and 2 tons per day of PM2.5 with respect to 2018 base year emissions. As shown in Table 5-4, CA-60 Ontario near-road remains with the highest design value of 12.88 $\mu g/m^3$ under the 2030 baseline scenario. Additionally, the Mira Loma site is projected to exceed the 2012 annual PM2.5 standard with a design value of 12.48 $\mu g/m^3$. As a result, the 2030 baseline scenario falls short of demonstrating attainment, underscoring the need of additional emission reductions.

The strategy to attain the annual PM2.5 standard by 2030 is provided in Chapter 4 and Table 4-12, which includes co-benefits from the ozone strategy in the 2022 AQMP, as well as other proposed control measures within this PM2.5 Plan. However, the ozone strategy outlined in the 2022 AQMP includes 182(e)(5) measures that are permitted in the SIP/AQMP for ozone 'extreme' non-attainment status, but that are not permitted in this PM2.5 Plan. Thus, the 2030 attainment scenario outlined in this PM2.5 Plan relies on defined control measures and excludes 182(e)(5) measures from the 2022 AQMP, such as reductions from ocean-going vessels by 2030. Reflecting control measures presented in Chapter 4, emissions of NOx, NH3, and PM2.5 decrease by 17%, 4% and 3%, respectively.

Measures targeting mobile source emissions are the primary drivers of NOx emissions reductions as over 80% of the NOx in the Basin are from these sources. Reductions of PM2.5 are equally attributable to measures directed at reducing stationary and mobile source emissions. See Table 4-12 for the emission reductions of NOx and PM2.5 included in the attainment scenario. Detailed descriptions of control measures and their expected reductions are also outlined in Chapter 4 and Appendix II. These reductions guarantee attainment of the 2012 federal annual PM2.5 standard by 2030 at all stations except CA-60 Ontario. The demonstration of attainment at the Ontario CA-60 near-road monitor requires a specific methodology that better represents the impact of on-road emissions on the near-road monitor. This novel methodology for the attainment demonstration at near-road sites is summarized in the following section.

We explored whether attaining the standard earlier would be possible with 2029 baseline emissions. Assuming a linear progress in the emission reductions resulting from the measures in this Plan between milestone years 2028 and 2030, the approximate emissions reductions with respect to the 2029 baseline would be 24 and 0.9 tons per day of NOx and PM2.5, respectively. These reductions are from linear interpolation, not a commitment by either South Coast AQMD or CARB. Actual reductions from a rule or control measure often occur as stepwise function, not in a linear context. Our modeling system indicates that a change of one ton per day in NOx and PM2.5 emissions corresponds to roughly 0.006 $\mu g/m^3$ and 0.121 $\mu g/m^3$ changes in the annual PM2.5 design value at Mira Loma. Applying this response rate and the expected emission reductions in 2029, the design value at Mira Loma is projected to be 12.15 $\mu g/m^3$ in 2029. This demonstrates that the earliest attainment of the annual PM2.5 standard would be in 2030.

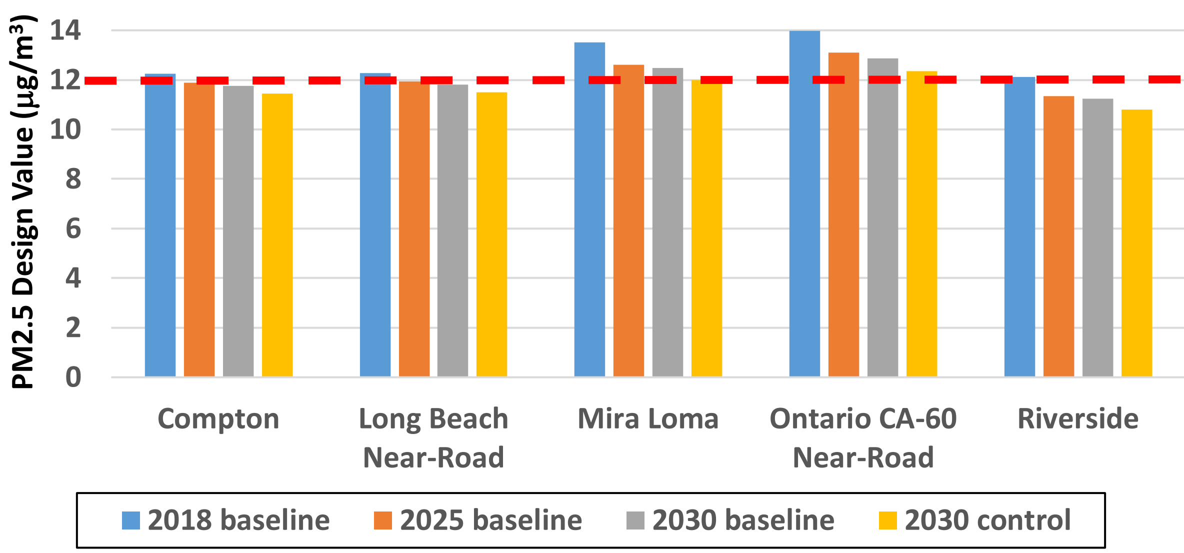

FIGURE 5-9
ANNUAL PM2.5 DESIGN VALUES. THE 2012 ANNUAL PM2.5 NAAQS IS DENOTED WITH A HORIZONTAL RED DASHLINE

TABLE 5-4

RRF-BASED ANNUAL PM2.5 DESIGN VALUES FOR BASE AND ~~FUTUER~~FUTURE YEARS (µg/m^3)

Station	2018	2025 Baseline	2030 Baseline	2030 Attainment Scenario
Anaheim	10.54	10.22	10.15	9.90
Azusa	10.13	9.7	9.54	9.23
Big Bear	6.34	5.87	5.86	5.67
Los Angeles	11.96	11.48	11.36	11.02
Compton	12.25	11.89	11.75	11.44
Fontana	11.35	10.66	10.51	10.04
Long Beach near-road	12.28	11.95	11.81	11.51
Long Beach	10.53	10.25	10.14	9.90
Mira Loma	13.52	12.62	12.48	11.98
Mission Viejo	7.95	7.61	7.51	7.31
Ontario Near-road	13.98	13.09	12.88	11.59*
Pasadena	9.68	9.31	9.22	8.95
Pico Rivera	11.87	11.48	11.32	10.99
Reseda	9.73	9.06	9.01	8.73
Riverside	12.13	11.35	11.24	10.80
South Long Beach	10.57	10.31	10.21	9.96
San Bernardino	10.88	10.12	10.00	9.56

*Design Value from the hybrid approach for the Ontario Near-Road monitor. If the CMAQ based RRF is used, the future DV would be 12.35 µg/m^3

Attainment Demonstration for the Near-Road Monitor

The current design site in the basin is the near-road monitor located by CA-60 freeway in Ontario. The monitor is sited just 16 meters away from the freeway, as shown in Figure 5-10, and is heavily influenced by the emissions released from vehicles as well as resuspended particles caused by moving traffic. The Ontario CA-60 near-road monitor was established before 2015 and the monitored data became available for regulatory purposes since 2015. Since then, the station recorded the highest annual average PM2.5 concentration in the basin. This monitor surpassed the concentrations at the previous design site in Mira Loma, which is located approximately 12 km eastward. However, the differences in annual PM2.5 concentrations between Mira Loma and CA-60 near-road have narrowed since 2015, as shown in Figure 5-11. This trend can be attributed to the fact that emissions from on-road sources have decreased substantially more than all other sources in the basin (see Figure 5-12), and as a result, PM2.5 concentrations at near-road monitors are decreasing faster than concentrations at regional monitors that represent air quality of wider areas.

FIGURE 5-10
LOCATION OF THE ONTARIO CA-60 NEAR-ROAD MONITOR

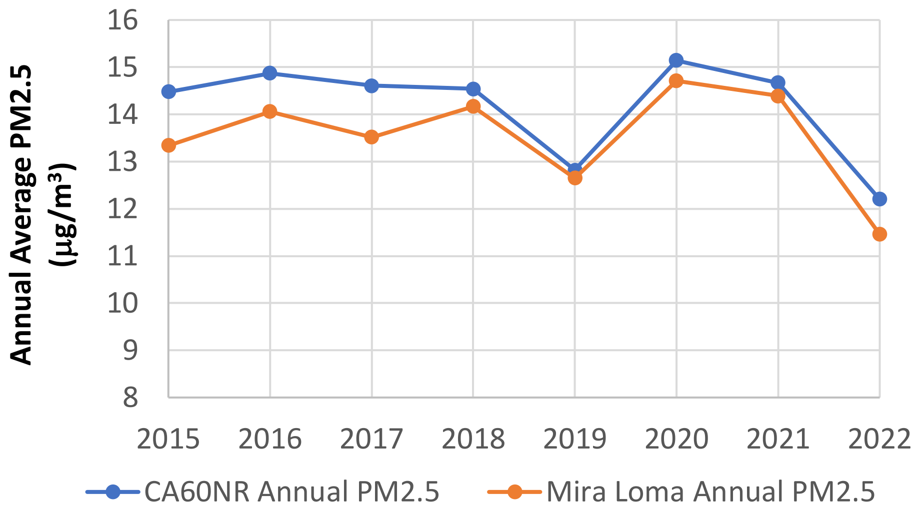

FIGURE 5-11

ANNUAL AVERAGE PM2.5 CONCENTRATIONS AT THE CA-60 NEAR-ROAD AND MIRA LOMA MONITORS SINCE THE DEPLOYMENT OF THE CA-60 NEAR-ROAD MONITOR

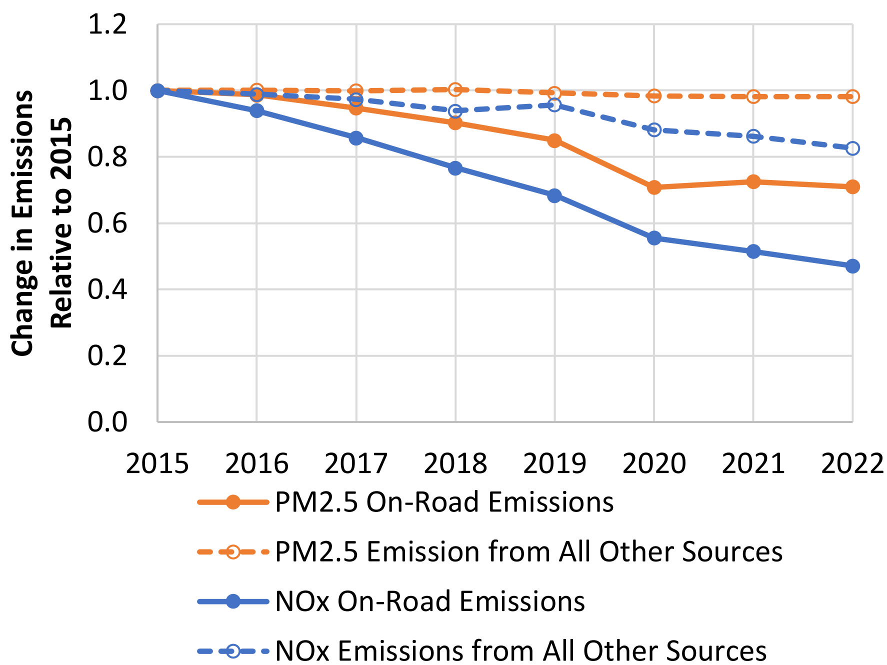

FIGURE 5-12

TRENDS IN EMISSIONS OF DIRECT PM2.5 AND NOX FROM ON-ROAD COMPARED TO THE REST OF EMISSION SOURCES FROM 2015 TO 2022

Regional chemical transport modeling is designed to calculate air quality that is representative at the grid resolution of the model. This attainment demonstration uses a model resolution of 4 km by 4 km grid, and thus, should model concentration at monitors that are representative of a similar area. Near-road sites are heavily impacted by near-road sources and thus, are not representative of the overall grid. For monitors affected by localized sources like the CA-60 Ontario near-road site, the U.S. EPA modeling guidance suggests additional modeling techniques that would support the attainment demonstration. These techniques include increasing model resolution to a finer grid or using dispersion modeling to assess the impact of primary PM2.5 emissions from near sources on the monitor.

Approach to Model the Effect of Near-road Sources

As the modeling guidance suggests, a regional chemical transport model may not be sufficient to represent the large gradients in PM2.5 concentrations at near-road monitors. As depicted in Figure 5-13, measurements at the near-road monitor observe a large contribution from near-road sources, whereas a regional model only observes those near-road impacts averaged over the entire area of the modeling grid. Thus, regional modeling is used to represent the air quality resulting from all regional sources plus the grid-average impacts of the near-road sources, whereas dispersion modeling is used to represent the near-road increment (NRI) that is the result from the monitor being next to freeway CA-60. Because of the proximity of the monitor to the freeway, it is reasonable to assume that the NRI is primarily due to direct PM2.5 emissions and that contribution of secondary PM2.5 to this NRI is negligible.

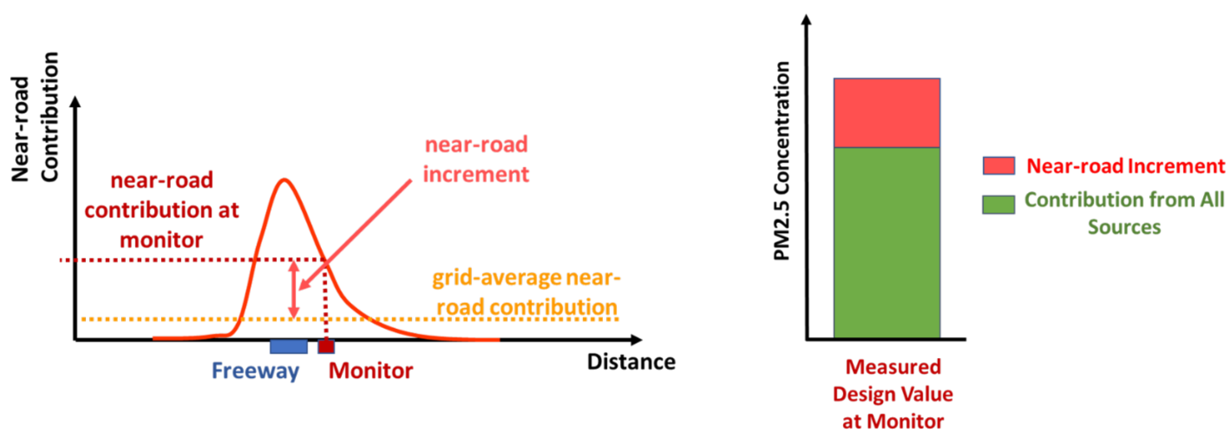

FIGURE 5-13
ILLUSTRATION OF THE NEAR-ROAD INCREMENT MODELED BY DISPERSION MODELING

The dispersion modeling is conducted using AERMOD, which is one of the official EPA dispersion models recommended for State Implementation Plan (SIP) revisions for existing sources and for New Source Review (NSR) and Prevention of Significant Deterioration (PSD) programs.[12] The modeling set-up only includes the emission sources along freeway CA-60 and its on- and off-ramps. Emission sources are grouped into 10 groups so that each category is modeled using distinctive emissions temporal and chemical profiles that can be tracked throughout the modeling. These emissions are derived from SCAG's vehicle activity dataset, which is also used in the regional modeling set-up. SCAG's dataset includes vehicle activity for 5 different vehicle classes: light and medium duty vehicles, light heavy-duty trucks, medium heavy-duty trucks, heavy heavy-duty trucks, and buses. EMFAC 2021 is used to calculate an aggregated emissions factor on a per-mile basis for these 5 groupings that includes exhaust, and tire and brake wear emissions. In addition, road dust emissions are estimated by using SCAG's vehicle activity and road information dataset and by using the road dust methodology described in Attachment H of Appendix III from the 2022 AQMP. In total, five vehicle categories and two emission processes per vehicle class for a total of ten sources of emissions are modeled using AERMOD. Detailed description of the AERMOD modeling setup is presented in Chapter 6 of Appendix II of this plan.

The estimated contributions of the near-road sources to annual PM2.5 at the CA60NR monitor determined by AERMOD for both 2018 and the 2030 attainment case are presented in Figure 5-14, by individual PM2.5 species. The annual average contribution of near-road sources at the monitor calculated using AERMOD in the 2018 base year is 3.13 $\mu g/m^3$, which represents 22% of the base year design value. The contribution of near-road sources in the 2030 attainment case is projected to be 2.32 $\mu g/m^3$, which corresponds to an overall 26% decrease from 2018. These results are used to determine the RRF for each PM2.5 species for the portion of the base year design value associated to the NRI.

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[12] Air Quality Dispersion Modeling - Preferred and Recommended Models, Support Center for Regulatory Atmospheric Modeling (SCRAM), U.S. EPA, https://www.epa.gov/scram/air-quality-dispersion-modeling-preferred-and-recommended-models

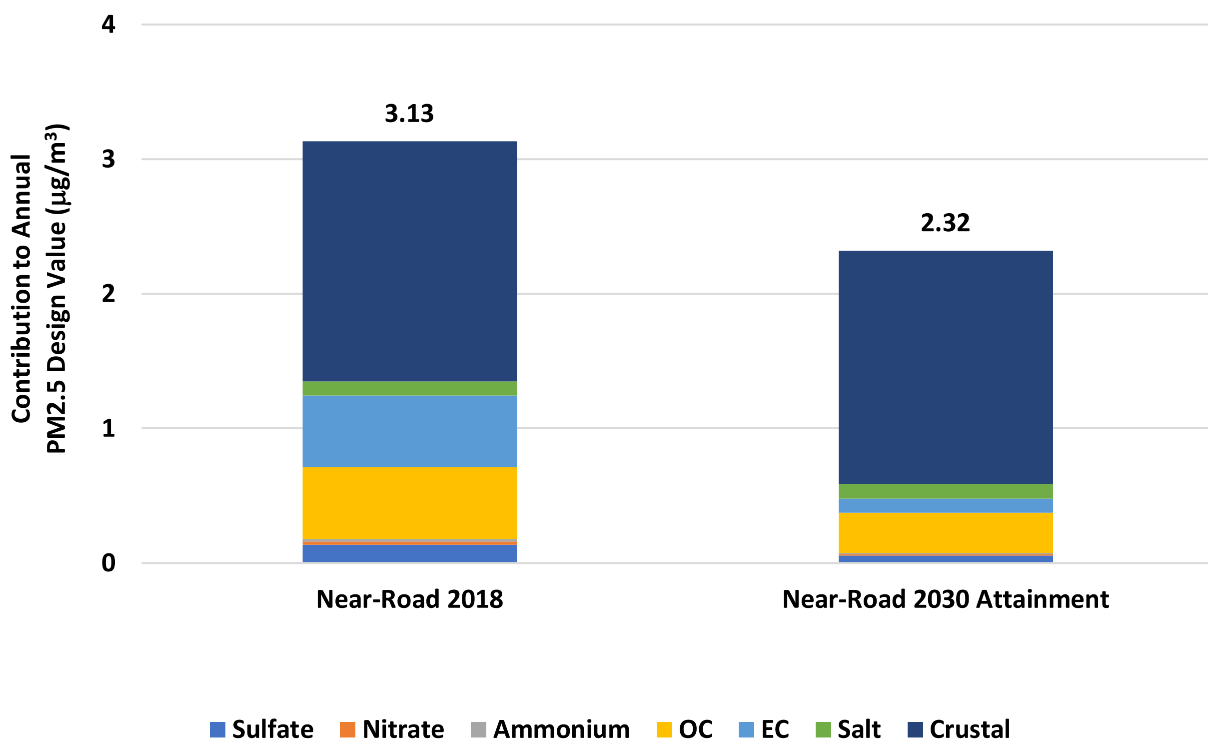

FIGURE 5-14
AERMOD ESTIMATED CONTRIBUTIONS FROM NEAR-ROAD SOURCES FOR 2018 AND THE 2030 ATTAINMENT CASE

The NRI is calculated using the concentration at the monitor estimated with AERMOD and the grid cell average contribution of near road sources determined by modeling PM2.5 concentrations with CMAQ. The near-road contribution averaged over the CMAQ grid cell where the monitor is located at is 0.15 $\mu g/m^3$, which subtracted from the near-road source contribution at the monitor (3.13 $\mu g/m^3$) results in an annual average NRI of 2.98 $\mu g/m^3$. Alternative approaches to determine the NRI are discussed in Chapter 6 of Appendix II of this Plan. More conservative estimates for NRI lower the values down to 1.64 $\mu g/m^3$.

Once the NRI is disaggregated from the regional air quality impacts contribution, the future design value can be estimated by applying two differentiated RRF values to these two components. As illustrated in Figure 5-15, the regional air quality impacts are projected using the quarterly RRF calculated from regional air quality modeling, and the NRI portion is projected using the quarterly RRF calculated using the dispersion modeling results. The resulting design value for Ontario CA-60 using this hybrid approach is 11.59 $\mu g/m^3$. The future design value calculated using this hybrid approach is sensitive to the magnitude of NRI. Because emissions from on-road sources are expected to decline faster than the overall emissions in the basin, the NRI portion is projected to decline faster than the overall design value. With more conservative estimates of NRI, the projected design value calculated using this hybrid modeling tends to be higher. Using the most conservative NRI of 1.64 μg/m^3, the resulting DV at Ontario CA-60 is projected to be 11.91 μg/m^3, still demonstrating attainment of the annual PM2.5 standard. A more comprehensive description of the hybrid modeling methodology and calculation of design values using this novel approach is described in Chapter 6 of Appendix II.

Unlike the conventional modeling method, which suggests that the CA-60 near-road monitor would not meet the standard under the 2030 control scenario, this hybrid approach, specifically tailored to account for the sharp PM2.5 concentration gradients around the freeway, indicates that the projected annual PM2.5 concentration will remain below 12 μg/m^3.

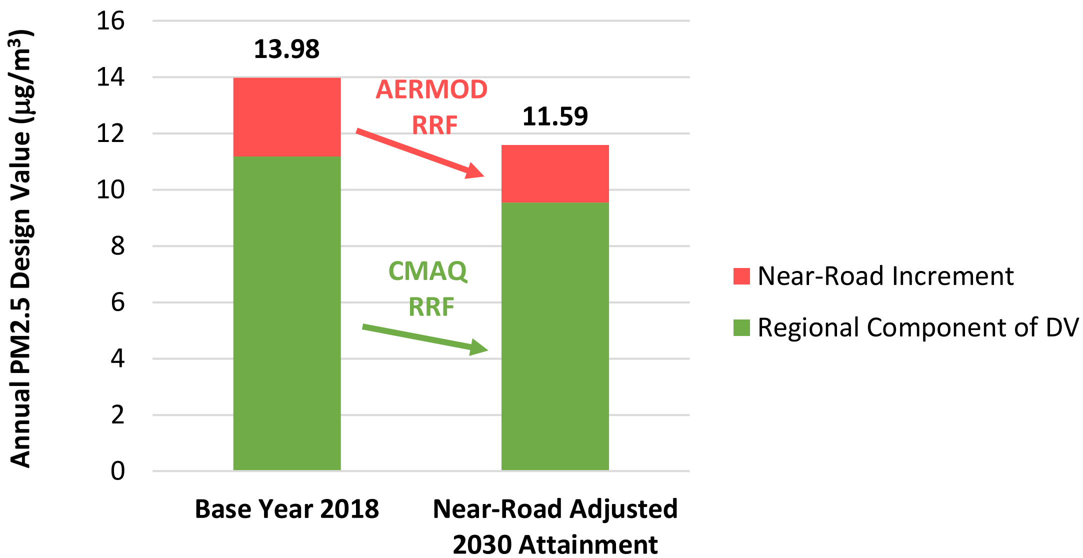

FIGURE 5-15
COMPARISON OF DESIGN VALUE PROJECTIONS BETWEEN THE TRADITIONAL APPROACH AND THE HYBRID APPROACH TO ADJUST FOR NEAR-ROAD SOURCES

Spatial Projections of Annual PM2.5 Design Values

Figure 5-16 shows the Basin-wide spatial distribution of annual PM2.5 design values in the base year 2018 calculated based on interpolated design values using inverse distance-weighting of monitored DVs and model gradient-adjustment. Figures 5-17 and 5-18 show the Basin-wide spatial distribution of RRF-based annual PM2.5 design values for both the 2030 baseline and 2030 attainment scenario, respectively. By 2030 under baseline conditions (business-as-usual, Figure 5-17), design values exceeding the 12 $\mu g/m^3$ federal standard are confined to a small region surrounding the Mira Loma and Ontario CA-60 monitoring stations in the northwestern boundary of Riverside and San Bernardino Counties. With the PM2.5 precursors reductions associated with the control measures proposed in this PM2.5 plan (Figure 5-18), the Basin is expected to meet the federal PM2.5 standard throughout the Basin.

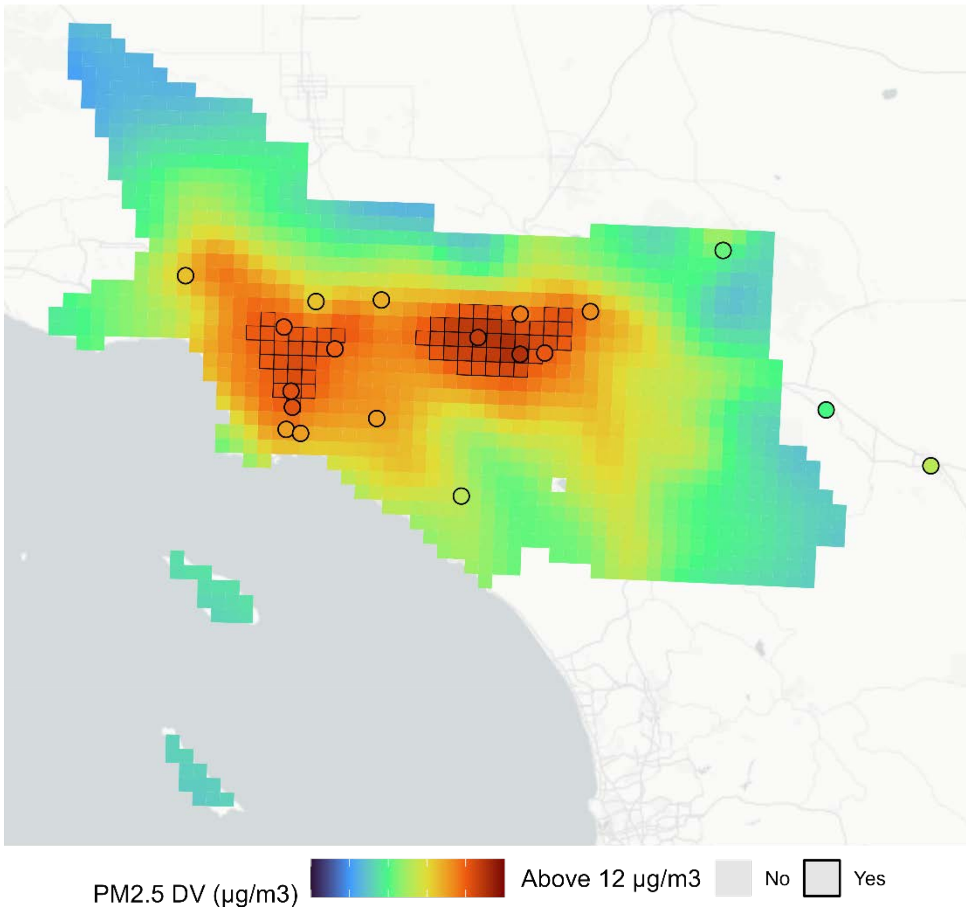

FIGURE 5-16

ANNUAL PM2.5 DESIGN VALUES (µg/m^3) FROM THE 2018 BASELINE SCENARIO. CELLS EXCEEDING 12 µg/m^3 ARE OUTLINED IN BLACK.

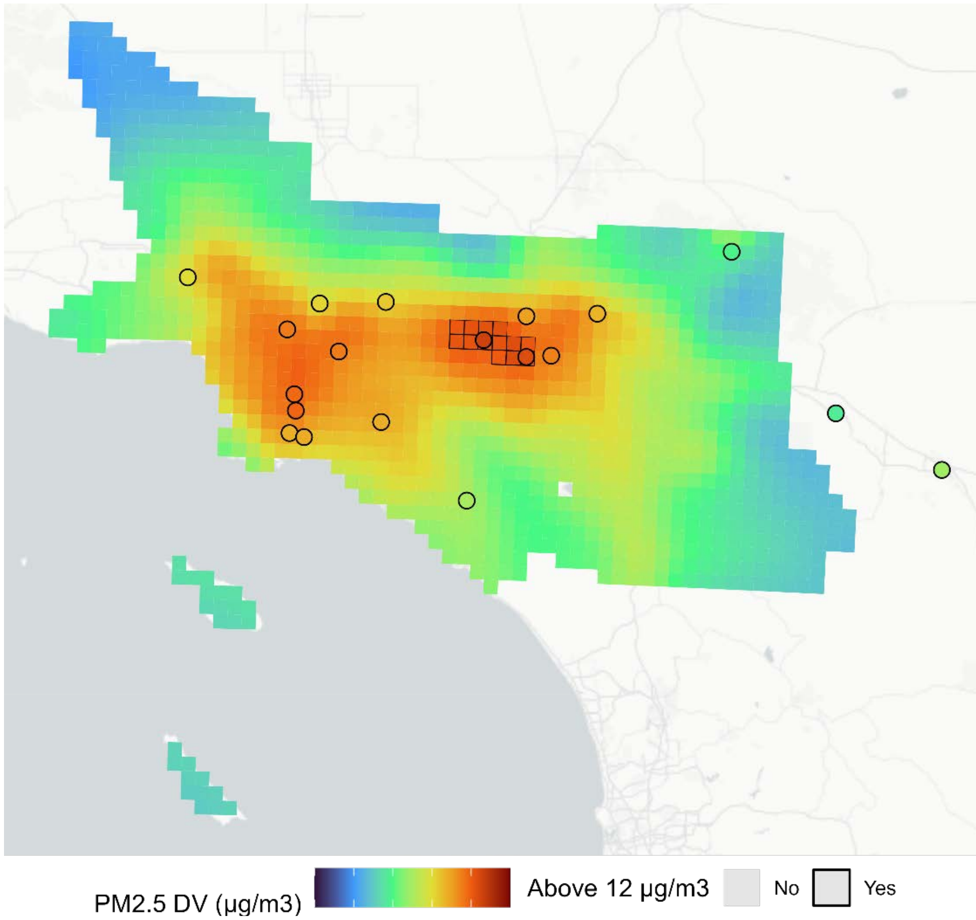

FIGURE 5-17
ANNUAL PM2.5 DESIGN VALUES (µg/m³) FROM THE 2030 BASELINE SCENARIO. CELLS EXCEEDING 12 µg/m³ ARE OUTLINED IN BLACK.

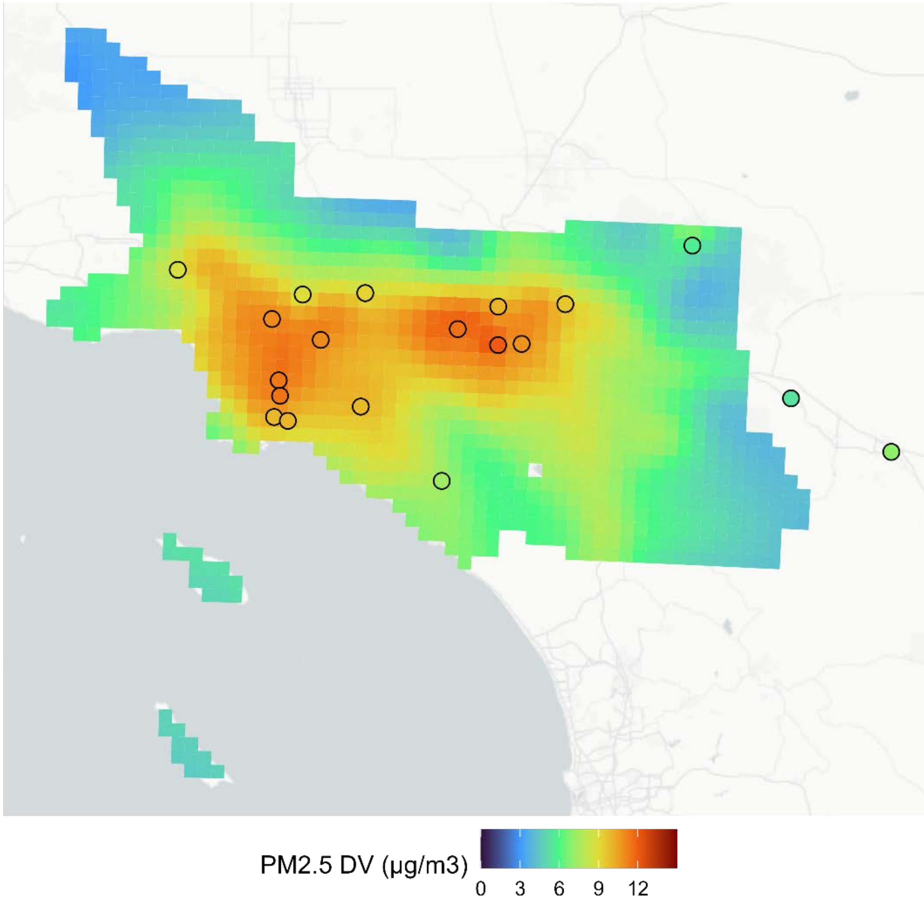

FIGURE 5-18
2030 ATTAINMENT ANNUAL PM2.5 RRF DESIGN VALUE CONCENTRATIONS.

Summary and Conclusions

Figure 5-19 presents the 2018 observed and 2030 projected future design values for annual PM2.5. Mira Loma and Ontario CA-60 near-road stations are expected to exceed the annual PM2.5 standard under the 2030 baseline scenario. This 2030 baseline scenario projects emissions based on the rules that are in place by the cutoff date of this plan and represents a 'business-as-usual' projection. The emissions reductions beyond the baseline emission levels proposed in this Plan would enable the Basin to meet the 2012 annual PM2.5 standard. Table 5-5 summarizes the design values at the Mira Loma and Ontario CA-60 monitors, the two stations with the highest PM2.5 annual levels in the 2018 base year and the 2030 attainment year. Based on the design values for 2030 and model sensitivity analyses, the design value for 2029 at Mira Loma is projected to be above 12.04 µg/m^3, exceeding the 2012 annual PM2.5 standard. Therefore, the earliest that the PM2.5 standard can be met in the South Coast Air Basin is projected to be 2030.

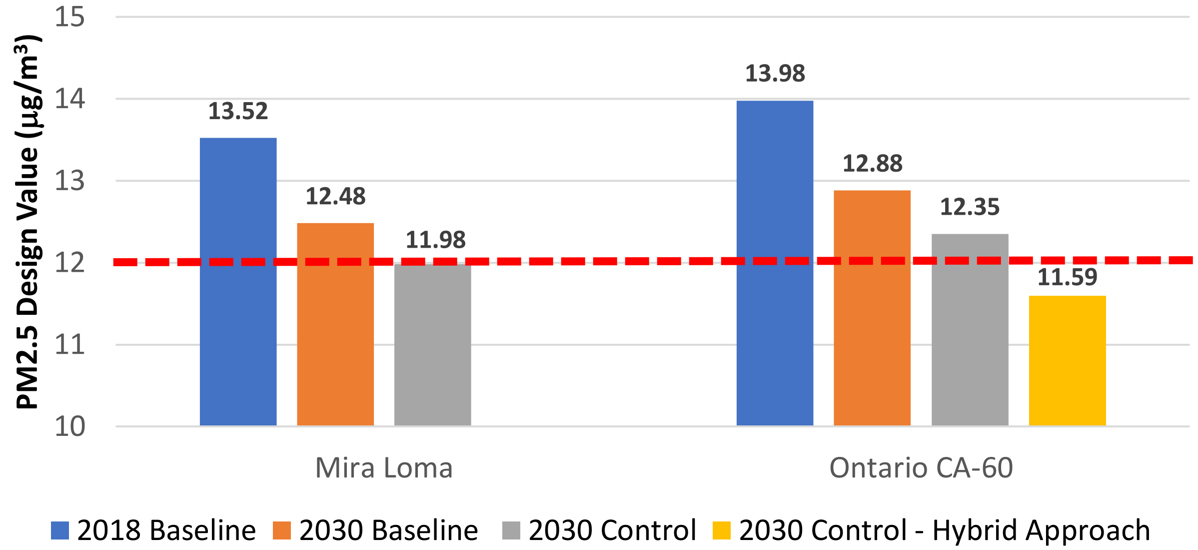

FIGURE 5-19
PROJECTION OF FUTURE ANNUAL PM2.5 AIR QUALITY IN THE BASIN IN COMPARISON WITH 2012 FEDERAL ANNUAL PM2.5 STANDARDS

TABLE 5-5
FUTURE DESIGN VALUES OF ANNUAL AVERAGE PM2.5 AT MIRA LOMA AND ONTARIO CA-60 (in µg/m³)

	Mira Loma		Ontario CA-60	
Calendar Year	Baseline	with Controls	Baseline	with Controls
2025	12.6	--	13.1	--
2030	12.5	12.0	12.9	11.6

CHAPTER 6

Federal Clean Air Act Requirements

- Due to unforeseen challenges such as adverse meteorology and high levels of PM2.5 recorded at near road monitors, it is impractical to attain the 2012 annual PM2.5 standard by the statutory "serious" area attainment date, December 31, 2025.

- This Plan requests an extension of the attainment date to December 31, 2030, as allowed by the Clean Air Act Section 188(e). With the control strategy proposed in this Plan, the South Coast Air Basin is expected to attain the 2012 annual PM2.5 standard by 2030.

- The PM2.5 Plan complies with SIP planning requirements including, but not limited to, reasonable further progress, quantitative milestones, a comprehensive emissions inventory, the implementation of best available control measures and most stringent measures, control strategies, contingency measures, transportation conformity, motor vehicle emissions budget, and new source review.

Other Federal Clean Air Act Requirements

This Plan addresses all "serious" PM2.5 nonattainment area Clean Air Act (CAA) planning requirements as shown in Table 6-1. Chapters 3 to 5 of this Plan fulfill the requirements related to the updated emissions inventory, control strategy, and attainment demonstration. This chapter addresses other CAA requirements.

TABLE 6-1

FEDERAL CLEAN AIR ACT REQUIREMENTS FOR THE 2012 PM2.5 NAAQS

Requirement	CAA Section	Definition	Location in Plan
Emissions Inventory	172(c)(3)	A comprehensive, accurate, current inventory of actual emissions from all sources of the relevant pollutant or pollutants.	Chapter 3
BACM/BACT	189(b)(1)(B)	Provisions to assure that the Best Available Control Measures (BACM) for the control of PM2.5 shall be implemented no later than 4 years after the date the area is reclassified as a "serious" nonattainment area. BACM includes Best Available Control Technology (BACT).	Chapter 4, Appendix III, Appendix IV
Attainment Demonstration	189(b)(1)(A), 188(e)	Attainment date shall be as expeditiously as practicable but no later than the end of the fifteenth calendar year after designation as nonattainment.	Chapter 5
Extension of Attainment Date for Serious Areas	188(e)	Demonstrations that 1) attainment by the statutory "serious" area attainment date is impracticable, 2) the State has complied with all requirements and commitments pertaining to the area in the SIP, and 3) the State demonstrates that the Plan includes the ~~m~~Most ~~s~~Stringent ~~m~~Measures (MSM) feasible for the area.	Chapter 6, Appendix III
Reasonable Further Progress	172(c)(2)	Plan provisions shall require ~~r~~Reasonable ~~f~~Further ~~p~~Progress (RFP).	Chapter 6
Transportation	176(c)	Plan provisions addressing transportation	Chapter 6

Requirement	CAA Section	Definition	Location in Plan
Conformity		conformity, including motor vehicle emissions budgets for RFP milestone years and the attainment year.	
Quantitative Milestones	189(c)	The Plan shall contain quantitative milestones which are to be achieved every three years until the area is redesignated attainment and which demonstrate reasonable further progress toward attainment by the applicable attainment date.	Chapter 6
Nonattainment New Source Review	189(a)(1)(A), 189(b)(3), 189(e)	A permit program requiring permits for the construction and operation of new and modified major stationary sources of PM. Control requirements applicable to major stationary sources of PM2.5 shall also apply to major stationary sources of PM2.5 precursors.	Chapter 6
Contingency Measures	172(c)(9)	Fully adopted rules or control measures that are ready to be implemented, should U.S. EPA issue a final rule that the Basin failed to meet a regulatory requirement necessitating implementation of a contingency measure. Contingency measures must take effect without significant additional action by the state or local agency or by U.S. EPA.	Chapter 6, Appendix V

Request for Extension of Attainment Date to 2030

Through this plan, South Coast AQMD is formally requesting an extension of the attainment deadline from December 31, 2025 to December 31, 2030 as allowed under CAA Section 188(e). U.S. EPA requires that additional elements accompany the attainment deadline extension request in order to consider it. First, an impracticability demonstration must be provided, showing that the area cannot practicably attain by the end of the tenth calendar year following designation of the area. Second, the State Implementation Plan (SIP) must provide for the implementation of ~~Most Stringent Measures (~~MSM~~)~~. Finally, a demonstration of compliance with all requirements and commitments in the applicable SIP must be included.

Impracticability Demonstration

The 2016 AQMP included a strategy to attain the 2012 annual PM2.5 standard by the 2025 attainment year. The strategy primarily relied on co-benefits from the measures to attain the 1997 8-hour ozone standard by 2023 and the 2008 8-hour ozone standard by 2031. Since the submittal of the 2016 AQMP, South Coast AQMD has implemented control measures and achieved emission reductions reflected in the 2016 AQMP attainment demonstration. However, progress in achieving the needed emission reductions was hampered by a variety of circumstances. These include a lack of action at the federal level for sources such as aircraft, ships, trains, interstate trucks, and offroad equipment. Such sources are the dominant source of nitrogen oxides (NOx) emissions in the region and are subject to federal regulatory authority. Additionally, the region experienced unforeseen challenges including unfavorable meteorology, wildfires, increases in emissions in the goods movement sector during the COVID-19 pandemic, and the addition of the near-road monitors. All of these factors resulted in higher than expected PM2.5 concentrations.

Prior to the submittal of the 2016 AQMP, U.S. EPA established a requirement to monitor PM2.5 levels at near-road locations. Two near-road monitoring stations along the Interstate 710 (I-710) in Long Beach and the California State Route 60 (CA-60) in Ontario began PM2.5 measurements in 2015. At the time of 2016 AQMP adoption, neither of these monitors had sufficient data to be considered in the attainment demonstration. By January 1, 2020, however, these monitors had accumulated sufficient data to be considered in attainment demonstrations and the CA-60 monitor was measuring the highest PM2.5 levels in the Basin. The 2022 design value at the CA-60 monitor was 13.7 $\mu g/m^3$.

U.S. EPA did not act on the submitted plan for a few years and, by the time the South Coast Air Basin was reclassified to “serious” nonattainment in 2020, U.S. EPA stated that near-road monitors must now be included in a supplemental attainment demonstration. South Coast AQMD subsequently determined that demonstrating attainment by 2025, especially at the CA-60 monitor, was impractical.

Currently, model-predicted design values for 2025, the statutory “serious” area attainment year, are well above 12.0 $\mu g/m^3$ at multiple monitors (see Chapter 5, Table 5-4). This scenario reflects baseline emissions with adopted regulations and programs by South Coast AQMD and CARB. Another scenario, presented in Chapter 5, is also considered. In this scenario, emission reductions from recently adopted regulations not yet in the baseline are considered. Even with those additional reductions, attainment by 2025 is impractical. It is impractical and infeasible to implement additional reductions beyond already adopted regulations by December 31, 2024, given the amount of time needed to adopt and implement rules and regulations. The control strategy also requires that South Coast AQMD undertake multiple rulemakings, each with its own extensive public process. The proposed attainment year, 2030, reflects the challenges and complexities associated with this plan while balancing expeditious attainment and the time needed to adopt a SIP revision, develop rules, and achieve emission reductions.

Implementation of MSM

Appendix III presents a comprehensive BACM demonstration which also serves to demonstrate MSM. U.S.

EPA interprets MSM to mean the maximum degree of emission reduction that has been required or achieved from a source or source category in any other attainment plans or in practice in any other states and that can feasibly be implemented in the area seeking the extension. In Appendix III, potential control measures identified via MSM evaluation are assessed for technological and economic feasibility and incorporated as control measures if they are feasible. If potential MSM are rejected as infeasible, a reasoned justification is provided.

Compliance With the Applicable SIP

The final element that is required to accompany an attainment date extension request is a demonstration of compliance with commitments made in the applicable SIP. In this case, the applicable SIP is the "moderate" area plan for the 2012 annual PM2.5 standard which was submitted as part of the 2016 AQMP. U.S. EPA approved all but the contingency measure element of the 2016 AQMP as meeting applicable "moderate" area requirements.[1] With respect to the contingency measure element, U.S. EPA granted conditional approval based on South Coast AQMD's commitment to adopt and submit a contingency measure for approval. In response, Rule 445 was amended twice in 2020 to add PM2.5 and ozone contingency provisions. Rule 445 was subsequently approved by U.S. EPA, excluding paragraph (g) (Ozone Contingency Measures) and paragraph (k) (Penalties), as fulfilling the commitment to adopt a contingency measure for PM2.5.[2]

With respect to the Reasonably Available Control Measures (RACM)/Reasonably Available Control Technology (RACT) analysis, the "moderate" area plan in the 2016 AQMP concluded that South Coast AQMD's existing rules were generally equivalent to, or more stringent than, those developed by other air districts. Thus, there were no control measures identified as RACM/RACT and no commitments were made in the "moderate" area plan.~~. There were, however, four control measures in the 2016 AQMP identified as additional reasonable measures with full or partial implementation by 2020 (see Table 6-2). U.S. EPA approved these additional reasonable measures including CMB-02, CMB-03, BCM-04, and BCM-10.[3]~~

[1] Approval and Promulgation of Implementation Plans; Designation of Areas for Air Quality Planning Purposes; California; South Coast Moderate Area Plan and Reclassification as Serious Nonattainment for the 2012 PM2.5 NAAQS, 85 Fed. Reg. 71264 (Nov. 9, 2020)

[2] Air Plan Approval; California; Los Angeles — South Coast Air Basin, 87 Fed. Reg. 12866 (March 8, 2022)

~~[3] Approval and Promulgation of Implementation Plans; Designation of Areas for Air Quality Planning Purposes; California; South Coast Moderate Area Plan and Reclassification as Serious Nonattainment for the 2012 PM2.5 NAAQS, 85 Fed. Reg. 40026 (July 2, 2020)~~

~~**TABLE 6-2**~~

~~**SUMMARY OF ADDITIONAL REASONABLE MEASURES FOR ANNUAL PM2.5 IN THE 2016 AQMP**~~

~~CM Number~~	~~Title~~	~~Adoption~~	~~Implementation Period~~	~~Commitment Satisfied?~~
~~**CMB-02**~~	~~Emission Reductions from Replacement with Zero or Near-Zero NOx Appliances in Commercial and Residential Applications [NOx]~~	~~2018~~	~~2020-2031~~	~~Yes, Rule 1111~~
~~**CMB-03**~~	~~Emission Reductions from Non-Refinery Flares [NOx, VOC]~~	~~2018~~	~~2020~~	~~Yes, Rule 1118.1~~
~~**BCM-04**~~	~~Emission Reductions from Manure Management Strategies [NH3]~~	~~2019~~	~~2020~~	~~Yes, substitute reductions achieved~~
~~**BCM-10**~~	~~Emission Reductions from Greenwaste Composting [NH3]~~	~~2019~~	~~2020~~	~~Yes, substitute reductions achieved~~

As shown in Table 6-2, the 2016 AQMP also included a number of control measures (CMs) to reduce PM2.5 and PM2.5 precursor emissions. However, these control measures were associated with “serious” area plan commitments. Since the “serious” area plan was withdrawn, South Coast AQMD is not required to demonstrate compliance with those commitments.

TABLE 6-2*
SUMMARY OF CONTROL MEASURES IN THE WITHDRAWN "SERIOUS" AREA PLAN FOR ANNUAL PM2.5 IN THE 2016 AQMP

CM Number	Title	Adoption	Implementation Period	Emission Reductions by 2025 (tpd)
BCM-01	Further Emission Reductions from Commercial Cooking [PM]	2018	2025	3.3
BCM-02	Emission Reductions from Cooling Towers [PM]	TBD	TBD	TBD
BCM-03	Further Emission Reductions from Paved Road Dust Sources [PM]	TBD	TBD	TBD
BCM-04	Emission Reductions from Manure Management Strategies [NH3]	2019	2020	0.2
BCM-05	Ammonia Emission Reductions from NOx Controls [NH3]	TBD	TBD	TBD
BCM-06	Emission Reductions from Abrasive Blasting Operations [PM]	TBD	TBD	TBD
BCM-07	Emission Reductions from Stone Grinding, Cutting and Polishing Operations [PM]	TBD	TBD	TBD
BCM-08	Further Emission Reductions from Agricultural, Prescribed and Training Burning [PM]	TBD	TBD	TBD
BCM-09	Further Emission Reductions from Wood-Burning Fireplaces and Wood Stoves [PM]	TBD	TBD	TBD
BCM-10	Emission Reductions from Greenwaste Composting [NH3]	2019	2020	0.1

* Reproduced with slight modifications from Table 4-7 in the 2016 AQMP.

South Coast AQMD evaluated its commitments included in the withdrawn "serious" area plan to track progress in PM2.5 and its precursors' reductions. ~~fulfilled CMB-02 and CMB-03 commitments through amendments to Rule 1111 and adoption of Rule 1118.1, respectively, while~~Specifically, the following discussion surrounds the 2016 AQMP control measures BCM-04 and BCM-10, which have not yet been adopted as rules. However, the quantified reductions from these measures are less than 0.5 percent of all ammonia emissions. The air quality benefit of the surplus nitrogen oxides (NOx) and PM reductions achieved in 2022, discussed in detail later, is expected to greatly exceed the potential benefit of the relatively small ammonia reductions from BCM-04 and BCM-10. Additionally, updated analysis conducted for the PM2.5 Plan shows that ammonia emissions from livestock are considerably lower than those assumed in the 2016 AQMP. Total ammonia emissions for dairy cattle, poultry layers, and swine are 1.2 tons per day lower than the projected emissions for the 2025 attainment year in the 2016 AQMP (see Table 6-3). Therefore, the reductions achieved in practice far exceed the reductions sought by BCM-04 and BCM-10.

TABLE 6-3

COMPARISON OF 2030 LIVESTOCK AMMONIA EMISSIONS IN THE 2016 AND 2022 AQMPS

		NH3 emissions (tpd)	
CES	Category Description	2016 AQMP	2022 AQMP
89516	LIVESTOCK HUSBANDRY - DAIRY CATTLE	4.55	5.08
89557	LIVESTOCK HUSBANDRY - LAYERS	1.92	0.28
89573	LIVESTOCK HUSBANDRY - SWINE	0.15	0.02
Total		**6.62**	**5.38**

Implementation of certain control measures not only depends on South Coast AQMD, but also on state actions. South Coast AQMD determined that state legislation has achieved many of the same objectives as BCM-10 and this control measure has therefore been implemented statewide. The BCM-10 proposed control methods included potential emission reductions to be achieved through increased diversion of foodwaste from landfills to anaerobic digestion (AD), along with pollution control technology, and restricted direct land application (DLA) of chipped and ground uncomposted greenwaste.

BCM-10 was tied with implementation of AB 341 (Chesbro, Chapter 476, Statutes of 2011) and AB 1826 (Chesbro, Chapter 727, Statutes of 2014). AB 341 required mandatory commercial recycling, composting, or source reduction of 75 percent by 2020. AB 1826 introduced organic waste recycling requirements for businesses starting April 1, 2016, depending on the amount of waste they generate per week. For the purpose of AB 1826, organics were meant to include foodwaste, greenwaste, landscape/pruning waste, nonhazardous wood, and food-soiled paper waste mixed with foodwaste. Organics accounted for 34 percent of California's disposed waste stream in 2014.[4] While AB 341 established a 75 percent recycling target by 2020, the actual statewide recycling rate (through source reduction, recycling, and composting) was only 42 percent in 2020.[5] AB 1826 had phased-in requirements for businesses over time. In September

[4] https://calrecycle.ca.gov/Recycle/Commercial/Organics/ ~~Mandatory Commercial Organics Recycling - CalRecycle Home Page~~

[5] ~~CalRecycle, State of Disposal and Recycling in California for Calendar Year 2020. 2021~~CalRecycle, State of Disposal and Recycling in California for Calendar Year 2020. 2021: https://www2.calrecycle.ca.gov/Publications/Download/1754

2020, CalRecycle reduced the threshold to 2 cubic yards of solid waste (the total of trash, recycling, and organics) generated by covered businesses.

More recently, other legislation has been enacted to decrease emissions from landfills. SB 1383 (Lara, Chapter 395, Statutes of 2016) is the most significant landfill waste reduction mandate adopted in California. Its goal is to reduce organic waste landfill disposal by 50 percent from 2014 levels by 2020 and 75 percent by 2025. However, implementation of SB 1383 has faced challenges. In 2020, organic waste in landfills increased by a million tons above the 2014 baseline.[6] The reasons for this increase may include: 1) residential organic waste separation and collection were not fully in effect until January 2022, and 2) more residential foodwaste was generated because of COVID-19. Due to restaurants shifting from dine-in to take-out and customers buying groceries in bulk, the generation of foodwaste increased as did the associated packaging waste.[7]

Since January 2022, approximately 72 percent of California communities have implemented residential organic waste collection, while 126 out of 615 jurisdictions (~20 percent) have requested more time to reach compliance.[8] Rural and low population jurisdictions have waivers and exemptions from organic waste collection requirements. Data on the effectiveness of the residential organic waste collection program in achieving emission reductions is lacking.

In BCM-10, AD was one of the proposed control methods to handle the increased diversion of organic waste (mostly foodwaste) from landfills, resulting in emission reductions. State laws have been enacted to achieve the intent of BCM-10 since the adoption of the 2016 AQMP. While implementation of those laws has not proceeded as envisioned, the legal requirement to increase diversion of waste from landfills exists. Therefore, staff concludes that state actions have fulfilled the BCM-10 commitment.

Quantitative milestones provide another means to demonstrate continued compliance with the applicable SIP. CAA Section 189(c) requires that quantitative milestones must be achieved every 3 years until the area is redesignated attainment which demonstrate ~~Reasonable Further Progress (~~RFP~~)~~ toward attainment. South Coast AQMD submitted the 2022 Quantitative Milestone Report (QMR) to U.S. EPA demonstrating continued compliance with all applicable commitments for the 2012 annual PM2.5 standard.[9] The 2016 AQMP projected that 7 tpd of surplus NOx reductions would be needed to meet the 2022 RFP target, while all other pollutants would meet RFP based on baseline measures. Total surplus reductions were determined to be 15.90 tpd NOx and 0.51 tpd PM2.5, significantly exceeding the 7 tpd of NOx reductions needed for RFP.

A significant portion of the reductions came from mobile source incentive measures. The 2016 AQMP included MOB-14 – Emission Reductions from Incentive Programs and provided a mechanism to ensure

[6] Little Hoover Commission, Reducing California's Landfill Methane Emissions: SB 1383 Implementation, Report #274, June 2023: https://lhc.ca.gov/sites/lhc.ca.gov/files/Reports/274/Report%20274.pdf

[7] CalRecycle, Analysis of the Progress Toward the SB 1383 Organic Waste Reduction Goals. August 18, 2020

[8] California's Climate Progress on SB 1383: https://calrecycle.ca.gov/organics/slcp/progress/ ~~California's Climate Progress on SB 1383 - CalRecycle Home Page~~

[9] Submitted to U.S. EPA via CARB on June 7, 2023

that emission reductions were SIP creditable. The incentive programs include the Carl Moyer Program, Proposition 1B – Air Quality Improvement Fund, Lower-Emission School Bus Program (LESBP), and the Community Air Protection Program (CAPP). The Carl Moyer Program funds projects that reduce NOx, volatile organic compound (VOC) and PM caused by the combustion of diesel and gasoline in on-road vehicles and off-road engines. The program also funds after-treatment devices such as diesel oxidation catalysts and PM filters. The emission reductions from Proposition 1B are the result of the deployment of cleaner locomotives and heavy-duty trucks. Since 2018, LESBP has funded the replacement of 201 school buses with newer, cleaner models and CAPP incentives have resulted in emission reductions from locomotives, heavy-duty trucks, cargo handling equipment, harbor craft, and other sources that impact disadvantaged communities. Table 6-4 summarizes the emission reductions from these incentive programs.

TABLE 6-4
SURPLUS NOX AND PM2.5 REDUCTIONS IN 2022 FROM MOBILE SOURCE INCENTIVE PROGRAMS

Program	Source Category	NOx (tpd)	PM2.5 (tpd)
Carl Moyer	Metrolink[10]	3.00	Not Quantified
	Harbor Craft	3.32	0.128
	Off-road	3.80	0.139
	On-road	0.17	0.003
	Locomotives	0.11	0.002
Prop 1B	Freight Locomotives	0.61	0.023
	On-road HD Trucks	0.38	0.000
LESBP	School Buses	0.10	0.005
CAPP	Harbor Craft	0.27	0.012
	Off-road	1.41	0.041
	On-road	0.14	0.000
	Locomotives	0.67	0.023
	Total	**13.99**	**0.377**

[10] Funded with Carl Moyer and other programs. Since February 2013, South Coast AQMD awarded Metrolink a total of $101.85 million for the replacement of 37 Tier 0 & Tier 2 locomotives with Tier 4 locomotives and the new purchase of three Tier 4 locomotives. As of April 2021, 39 Tier 4 locomotives had been delivered to Metrolink and delivery of a final Tier 4 locomotive was expected by June 2021. Beginning in fiscal year 2022, Metrolink

The 2022 QMR quantified additional reductions resulting from the unused portion of the general conformity set-aside account. Pursuant to Clean Air Act Section 176(c) (42 U.S.C. 7506) and the U.S. EPA's implementing regulations (40 CFR Part 93, Subpart B and 40 CFR Part 51, Subpart W), general conformity is required for NAAQS nonattainment and maintenance areas. The intent of general conformity is to prevent the air quality impacts of a proposed federal action, under Title 23 U.S.C., from causing or contributing to new violations of the air quality standards, exacerbating existing violations, or interfering with the purpose of the applicable implementation plan.

In order to streamline a conformity evaluation process, SIP set-aside accounts were allocated in the 2016 AQMP. The revised set-aside account to accommodate projects subject to general conformity included a balance of: 2.0 tpd of NOx and 0.5 tpd of VOC each year from 2017 to 2030, and 0.5 tpd of NOx and 0.2 tpd of VOC in 2031. Emissions from general conformity projects are tracked by South Coast AQMD and debited from the account on a first-come-first-serve basis. In 2022, the set-aside account had a remaining balance of 1.15 tpd NOx and 0.32 tpd VOC since approved projects had not consumed the entire allocation.

A summary of the overall NOx reductions quantified as part of the 2022 QMR is presented in Table 6-5. In addition to the incentive measures and general conformity set-aside account, the Regional Clean Air Incentives Market (RECLAIM) shutdown credit, Rule 445, and Rule 1179.1 reductions are considered.

The RECLAIM shutdown incorporates reductions from the decommissioning of a coke calciner in 2022 by Marathon Petroleum Corporation. The reductions from Rule 445 - Wood Burning Devices - stem from the June 2020 amendment which established PM2.5 contingency provisions that would be automatically triggered in the event that the U.S. EPA determines that the Basin failed to meet any RFP requirement, meet any quantitative milestone, submit a quantitative milestone report, or attain applicable PM2.5 NAAQS by the attainment date. The amendment also expanded the curtailment to the entire Basin instead of using a source receptor area approach. The South coast Air Basin failed to attain the 2006 24-hour PM2.5 standard by the statutory attainment date, December 31, 2019, which triggered a contingency measure in Rule 445 and lowered the curtailment threshold to 29 $\mu g/m^3$ in 2020.[11] Overall, the amendment resulted in a total of 0.13 tpd of PM2.5 reductions. Finally, Rule 1179.1 - Emission Reductions from Combustion Equipment at Publicly Owned Treatment Works Facilities - was adopted in October 2020 and established NOx emission limits for boilers, process heaters and engines burning digester gas or those units capable of burning digester and natural gas.

anticipated operating 40 trainsets serviced by a fleet of 48 to 52 locomotives. The emission reductions from the Tier 4 conversions and the purchase of the new Tier 4 locomotives, which are surplus to the 2016 AQMP inventory, are estimated to be 3 tpd in 2022

[11] Finding of Failure To Attain the 2006 24-Hour Fine Particulate Matter Standards; California; Los Angeles- South Coast Air Basin, 85 Fed. Reg. 57733 (Sept. 16, 2020)

TABLE 6-5
SURPLUS REDUCTIONS IN 2022 BASED ON REGULATIONS AND INCENTIVES

Regulation/Incentive	Surplus NOx Reduction in 2022 (tpd)	Surplus PM2.5 Reduction in 2022 (tpd)
Rule 445	Not Quantified	0.13
Rule 1179.1	0.05	Not Quantified
RECLAIM Shutdown Credit (Rule 1109.1)	0.71	Not Quantified
Mobile Source Incentive Programs	13.99	0.38
General Conformity Set-Aside Credit	1.15	N/A
Total	**15.90**	**0.51**

In summary, South Coast AQMD determined that, although BCM-04 and BCM-10 were not adopted as rules, substitute reductions were achieved. ~~all annual PM2.5 "moderate" area plan commitments have been fulfilled. The additional reasonable measures identified in the 2016 AQMP have either been implemented or substitute reductions have been achieved~~These reductions exceed the level of reductions committed by the measures in the withdrawn "serious" area plan. BCM-04 and BCM-10 have been incorporated into the control strategy of this plan (as BCM-08 and BCM-10) and South Coast AQMD commits to adopt the measures to satisfy MSM requirements.

~~In the 2016 AQMP, South Coast AQMD committed to achieve emission reductions in aggregate to accommodate necessary changes during rulemaking, during which emission reduction commitments of individual control measures are adjusted to reflect stakeholder's needs, technological maturity, commercial availability and other economic needs. The reductions quantified as part of the 2022 QMR, which are surplus to the 2016 AQMP baseline and count towards the aggregate reduction commitment, exceed the level of reductions needed to demonstrate RFP. Therefore, South Coast AQMD concludes that commitments to adopt control measures and meet RFP targets have been achieved.~~

Reasonable Further Progress and Quantitative Milestones

Reasonable Further Progress

The CAA requires that SIPs for most nonattainment areas demonstrate ~~Reasonable Further Progress (~~RFP~~)~~ towards attainment through emission reductions phased in from the base year until the attainment date. Per CAA Section 171(1), RFP is defined as:

> *"such annual incremental reductions in emissions of the relevant air pollutant as are required by this part or may reasonably be required by the Administrator for the purpose of ensuring attainment of the applicable national ambient air quality standard by the*

applicable date."

Emission reductions required under an RFP plan for PM2.5 are directly emitted PM2.5 and applicable precursors. Appendix VI of this Plan presents a precursor demonstration to exclude VOCs and sulfur oxides (SOx) from certain planning requirements including the RFP demonstration. Therefore, this RFP demonstration focuses on NOx, direct PM2.5, and ammonia (NH3) as the pollutants with a significant impact on PM2.5 levels.

To determine RFP for the attainment date, U.S. EPA guidance states that the plan should rely only on emission reductions achieved from sources within the nonattainment area. Section 172(c)(2) of the CAA requires that attainment plans show ongoing annual incremental emission reductions toward attainment, which is commonly expressed in terms of target emission levels to be achieved by certain interim milestone years.

For PM2.5 nonattainment areas, in addition to the RFP requirements, CAA Section 189(c)(1) requires states to achieve quantitative milestones, which are designed to track RFP to ensure expeditious attainment. U.S. EPA requires that all "serious" area PM2.5 attainment plans define appropriate quantitative milestones to be achieved 7.5 years from the original designation of the area and every 3 years thereafter until the area is re-designated as attainment.[12] The South Coast Air Basin was originally designated nonattainment for the 2012 annual PM2.5 NAAQS effective April 15, 2015.[13] Therefore, the first "serious" area quantitative milestone occurred on October 15, 2022. The 2022 Quantitative Milestone Report was submitted to U.S. EPA to address compliance with this milestone.

U.S. EPA requires that RFP plans contain projected emissions for each calendar year in which quantitative milestones must be met. Since the first "serious" area quantitative milestone is in the past (October 15, 2022), the first quantitative and RFP milestone year considered in this plan is 2025. The quantitative milestones recur every 3 years and continue through 2031, the post-attainment milestone year.

As described in Chapter 3 – Base-Year and Future Emissions, the base year of this Plan is 2018, which also serves as the base year for the purposes of tracking RFP. Alignment of the RFP and modeling base year is clarified in U.S. EPA's implementation rule for PM2.5 NAAQS:[14]

> "Because the statute does not clearly establish the applicable baseline year from which to begin calculating annual emissions reductions for purposes of demonstrating RFP, the EPA is finalizing a requirement that states use the same year as the base year inventory used for developing the control strategy and associated air quality modeling demonstrating that the area will attain expeditiously."

[12] CFR §51.1013(a)(2)(i)

[13] Air Quality Designations for the 2012 Primary Annual Fine Particle (PM2.5) National Ambient Air Quality Standards (NAAQS), 80 Fed. Reg. 2206 (Jan. 15, 2015)

[14] Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements, 81 Fed. Reg. 58009 (Aug. 24, 2016)

U.S. EPA requires that all SIPs contain RFP projected emissions and that those emissions demonstrate either: (i) Generally linear progress toward the projected attainment date; or (ii) stepwise progress toward the projected attainment date with proper justification.[15] This analysis demonstrates generally linear RFP for NOx and direct PM2.5 and stepwise RFP for ammonia.

Stepwise RFP Justification

The RFP demonstrations for NOx and PM2.5 were conducted following the generally linear approach, while RFP for ammonia was demonstrated using the stepwise approach. This is due to the nature of ammonia emissions in the Basin, technologies anticipated to bring ammonia reductions, and the timeline to develop and implement rules to achieve reductions.

Attainment of the 2012 annual PM2.5 NAAQS requires NOx and PM2.5 emissions reductions of 54 percent and 6 percent, respectively, from 2018 to 2030. While portions of the needed reductions come from continued implementation of already adopted rules and regulations, new reductions from the proposed control measures are necessary for attainment. In Chapter 4, Tables 4-4 and 4-5 present South Coast AQMD's commitment to adopt and implement the proposed control measures. CARB's commitments are provided in Tables 4-6 and 4-11, which includes adoption and implementation dates for each measure. The adoption and implementation dates are as expeditious as possible and reflect best estimates of the time required to develop and implement each proposed measure. Table 4-9 summarizes emission reductions in the South Coast Air Basin in 2030 from CARB programs. In Table 4-9, the reductions estimated from the remaining 2016 State SIP Strategy and future measures identified in the 2022 State SIP Strategy are described as the "potential CARB aggregate emissions reductions commitment" until the CARB Board adopts the aggregate emissions reductions commitment for the year 2030. These reductions are needed to demonstrate RFP.

In addition, the nature of ammonia emissions needs to be considered. The South Coast Air Basin is a highly urbanized area with limited agricultural activities and dairy operations. The majority of ammonia emissions come from area sources such as humans and pets in the Basin. Other large sources include on-road vehicles, industrial processes, and farming. Area source emissions are expected to grow in the future due to increases in the population of humans and pets. While the ammonia emissions from mobile or stationary point sources can be controlled by transitioning to zero emissions, ammonia from humans and pets cannot be controlled with current technology. Although there are limited ammonia controls proposed in control measures BCM-08 through BCM-11, the majority of ammonia reductions are anticipated from the deployment of zero emission vehicles. This contrasts with the widespread availability of control technologies targeting NOx and PM2.5 from combustion sources. For NOx, Selective Catalytic Reduction (SCR) and low-NOx burners are available and, for PM2.5, Diesel Particle Filters are available for certain applications. Such controls are already required by adopted regulations and will continue to lower NOx and PM2.5 emissions to meet generally linear progress toward attainment. However, such NOx and PM2.5 control technologies often do not reduce ammonia concurrently and transition to zero emissions

[15] CFR § 51.1012(a)(4)

technologies is often the only pathway to achieve significant amount of ammonia reductions. Although the deployment of zero emission technologies is complex and requires more time to implement, ammonia emissions will be sufficiently controlled to attain the 2012 annual PM2.5 standard in 2030.

In summary, it is necessary to rely on a stepwise RFP demonstration for ammonia. Generally linear progress is not feasible due to the type of control technologies relied on for attainment, and time required to develop and implement rules.

Adoption Dates

The committed adoption dates in Table 4-4, Table 4-5, and Table 4-6 are based on the best estimate of the amount of time required to develop a measure. Time spent in this developmental phase is influenced by the level of interest from stakeholders and conflicts of interest, if any, among stakeholders. Maturity of technology, market capacity for at-scale deployment, infrastructure to support the new technology, and cost effectiveness determine the timeline to develop a proposed control measure to a rule/regulation. In addition, once the proposed measure has been developed, it must be adopted through a public process, which entails procedural requirements with their own timing.

Implementation Dates

The committed implementation dates in Table 4-4, Table 4-5, and Table 4-6 are based on the best estimate of the amount of time required for measure adoption and procedural elements as well as the implementation phase. For example, CARB regulations, once adopted, undergo a prescribed review process by the State Office of Administrative Law (OAL) to ensure compliance with California's Administrative Procedure Act before the measure can be codified in the California Code of Regulations. The effective date of an OAL-approved regulation can be a year or more from the date of CARB adoption. Following development and adoption, in all cases, the implementation schedule of a measure must account for the time needed by the affected entities to comply with the requirements in the measure. This includes planning for, and investing in, the resources to implement the required controls—to change, buy, or install new technology, if applicable. Specific challenges related to the timing of implementation of innovative South Coast AQMD and CARB measures are described in further detail below.

South Coast AQMD Stationary Source Measures

As outlined in Table 4-4, South Coast AQMD has committed to adopt stationary source control measures beginning in 2024, and not later than 2027. Implementation is set to begin as expeditiously as possible for each measure. For example, for BCM-10 - Emission Reductions from Direct Land Application of Chipped and Ground Uncomposted Greenwaste, is scheduled to adopt in 2026 but will be implemented starting in 2030. This is to allow composting facilities sufficient lead time to expand their operations to accommodate the increased demand for greenwaste composting.

Further understanding of the applicability of control technologies, the cost-effectiveness of controls, and the socioeconomic impacts of potential regulations are necessary before regulations can be adopted. The market availability of control equipment capable of reducing emissions further than the already stringent limits required by South Coast AQMD's technology-forcing rules is an additional consideration in implementing new regulatory requirements.

Time after rule adoption will be necessary for manufacturers and vendors to make available compliant equipment, and for facility operators to source, purchase, and install new units or compliant retrofit equipment. Dependent on the source category, construction of controls may include engineering, site preparation and infrastructure upgrades, unit installation, and operator training on proper operation. Potential control technologies have significant costs to affected facilities, and these operations will also require time to plan for these investments. Based on these challenges, rule implementation is not expected to be feasible prior to the implementation date listed in Table 4-4.

Considering the factors mentioned earlier, the emission reductions resulting from the proposed control measures are projected to materialize around 2030 rather than in the immediate future. This necessitates a stepwise RFP demonstration for ammonia. The expeditious implementation of some measures, where feasible, may result in emission reductions that occur before 2030. South Coast AQMD commits to demonstrate and discuss any early emission reductions achieved in Quantitative Milestone Reports.

Zero Emission Mobile Source Measures

Mobile sources are responsible for approximately 25 percent of the NH3 emissions in the South Coast; NH3 can be emitted as a byproduct during the use of control technologies designed to lower the emissions of NOx, the dominant precursor of both ozone and PM2.5 pollution. In engines fueled by Compressed Natural Gas (CNG), NH3 is formed as a byproduct of a three-way catalyst that converts NOx to nitrogen (N2). In diesel engines, Selective Catalytic Reduction controls use NH3 as a catalyst to convert NOx to N2 and water. Unreacted NH3 can be emitted as part of in this process, referred to as an ammonia slip.

CARB programs that drive mobile sources to zero-emission vehicles and engines will provide ammonia emission reduction benefits in 2030 in the South Coast, in addition to significant NOx and PM2.5 reductions; these programs include adopted regulations such as the Advanced Clean Cars, Advanced Clean Trucks, Advanced Clean Fleets, and the Transport Refrigeration Unit (Part I) Regulations, and proposed measures such as the Zero-Emissions Truck Measure, Transport Refrigeration Unit (Part II) Regulation, and Cargo Handling Equipment Amendments. CARB's adoption and implementation schedules are as expeditious as possible, but like many stationary source control measures, sufficient time is needed for both regulatory development and for development, manufacture, and purchase of control technologies prior to emissions reductions being achieved from these programs. Based on these challenges, rule implementation is not expected to be feasible prior to the implementation date listed in Table 4-8. Considering all of the factors mentioned, the majority of emission reductions resulting from the proposed control measures are projected to be achieved by 2030 rather than in the near-term years.

RFP Demonstration

This analysis demonstrates generally linear RFP for NOx and direct PM2.5 emissions and stepwise RFP for ammonia emissions. Table 6-6 presents the baseline emissions of NOx, direct PM2.5, and ammonia including line item adjustments reflecting adopted regulations for the RFP milestone years. The regulations included in the line item adjustments are provided in Table 6-7. RFP is demonstrated using reductions from three categories: adopted regulations already reflected in the baseline emissions, regulations adopted since the development of the 2022 AQMP, and control measures proposed in this Plan. The second category includes South Coast AQMD’s rules adopted during November 2020 to September 2023 and CARB’s regulations adopted in 2022 and afterwards. The projected emissions account for all of these reductions. However, in some years, the RFP target is higher than the projected emissions. This is because the projected emissions are below the level needed to demonstrate linear progress. RFP is expected to be met for all milestone and attainment years as presented in detail for each pollutant in subsequent sections. The 2031 post-attainment year target is assumed to have same amount of reductions as the attainment scenario. However, in reality, 2031 emissions are expected to be below the RFP target levels due to continued implementation of the control strategies required to meet the 2008 and 2015 ozone NAAQS by 2031 and 2037, respectively.

TABLE 6-6
REASONABLE FURTHER PROGRESS CALCULATIONS FOR MILESTONE YEARS

	Pollutant	2018	2025	2028	2030	2031
Baseline Emissions	NOx	383.02	239.40	219.29	210.31	207.17
	PM2.5	56.04	54.01	54.11	54.05	54.06
	NH3	74.54	77.79	78.91	79.31	79.48
Line Item Adjustments	NOx	-	3.26	10.06	24.34	24.34
	PM2.5	-	0.14	0.47	0.83	0.83
	NH3	-	0.10	1.40	2.96	2.96
Control Measure Reductions	NOx	-	0	0	10.60	10.60
	PM2.5	-	0	0	0.54	0.54
	NH3	-	0	0	0.24	0.24
Projected Emissions	NOx	-	236.14	209.23	175.37	172.23
	PM2.5	-	53.87	53.64	52.68	52.69
	NH3	-	77.69	77.51	76.11	76.28
Generally Linear RFP Target	NOx	-	261.89	209.98	175.37	172.23
	PM2.5	-	54.08	53.64	52.68	52.69
Stepwise RFP Target	NH3	-	77.69	77.51	76.11	76.28

TABLE 6-7
REGULATIONS INCLUDED IN THE LINE-ITEM ADJUSTMENTS FOR RFP DEMO

Adopted Measure	Adoption Date	2025			2028			2030			2031		
		NOx	PM2.5	NH3	NOx	PM2.5	NH3	NOx	PM2.5	NH3	NOx	PM2.5	NH3
Advanced Clean Cars II	Nov. 2022	0.00	0.00	0.00	0.67	0.12	0.94	1.49	0.18	2.12	1.49	0.18	2.12
Clean Miles Standard	Mar. 2022	0.01	0.00	0.00	0.03	0.01	0.00	0.04	0.00	0.00	0.04	0.00	0.00
EPA Clean Trucks Plan	Dec. 2022	0.00	0.00	0.00	0.23	0.00	0.00	0.61	0.00	0.00	0.61	0.00	0.00
Advanced Clean Fleets	Oct. 2023	1.10	0.01	0.10	2.99	0.04	0.46	4.79	0.09	0.84	4.79	0.09	0.84
In-use Locomotive Regulation	Oct. 2023	0.69	0.01	0.00	2.78	0.06	0.00	9.90	0.24	0.00	9.90	0.24	0.00
Commercial Harbor Craft Amendments	Dec. 2022	1.06	0.06	0.00	1.58	0.08	0.00	2.06	0.09	0.00	2.06	0.09	0.00
Amendments to the In-Use Off-Road Diesel-Fueled Fleets Regulation	Nov. 2022	0.31	0.02	0.00	1.53	0.10	0.00	1.91	0.12	0.00	1.91	0.12	0.00
Transport Refrigeration Unit Phase 1	Feb. 2022	0.09	0.04	0.00	0.25	0.07	0.00	0.33	0.10	0.00	0.33	0.10	0.00
Non-RECLAIM Rules adopted/amended after 2022 AQMP cut-off date	Sep. 2023	0.00	0.00	0.00	0.00	0.00	0.00	0.34	0.00	0.00	0.34	0.00	0.00
RECLAIM landing rules adjustment	Sep. 2023	0.00	0.00	0.00	0.00	0.00	0.00	2.86	0.00	0.00	2.86	0.00	0.00
Total Benefit (tpd)		3.26	0.14	0.10	10.06	0.47	1.40	24.34	0.83	2.96	24.34	0.83	2.96

Table 6-8 summarizes the total reductions needed from the 2018 baseline emissions inventory that must be achieved to reach attainment in 2030.

TABLE 6-8
TOTAL REDUCTIONS NEEDED FOR ATTAINMENT (TPD)

Pollutant	2018 Base Year Emissions	2030 Attainment Scenario Emissions	Total Reductions Needed
NOx	383.02	175.37	207.65
PM2.5	56.04	52.68	3.36
NH3	74.54	76.11	-1.57*

*Negative reductions reflect increase in emissions from 2018 to 2030

NOx

NOx emissions are expected to decrease in a generally linear fashion from the base year to the attainment scenario, as shown in Figure 6-1. The NOx emission reductions anticipated from the baseline reductions and line item adjustments are sufficient to meet or exceed the RFP targets. Therefore, NOx is determined to meet the RFP requirements.

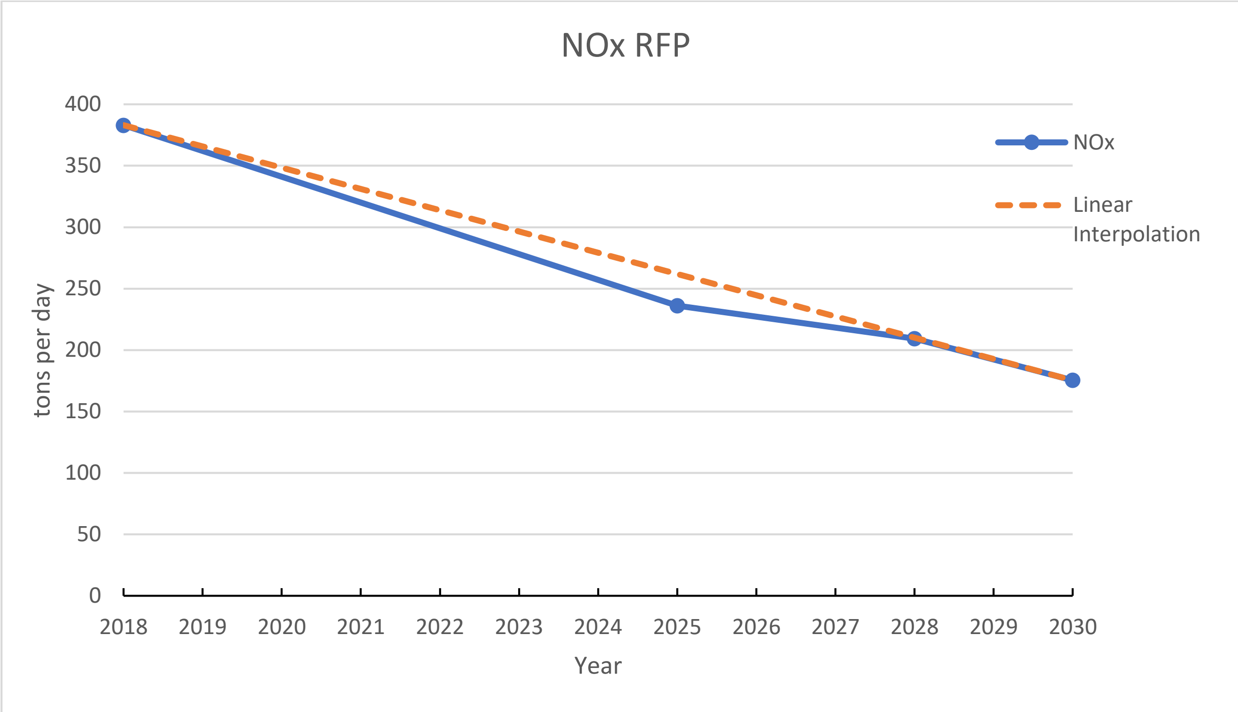

FIGURE 6-1
NOX RFP TOWARD ATTAINMENT:
ORANGE DASHED LINE PRESENTS THE LINEAR INTERPOLATION FROM BASE YEAR TO ATTAINMENT SCENARIO EMISSIONS AND BLUE SOLID LINE PRESENTS ANTICIPATED PROGRESS TOWARD ATTAINMENT

PM2.5

Direct PM2.5 emissions are expected to decrease in a generally linear fashion from the base year to the attainment scenario, as shown in Figure 6-2. The direct PM2.5 emission reductions anticipated from the baseline reductions and line item adjustments are sufficient to meet or exceed the RFP targets. Therefore, direct PM2.5 is determined to meet the RFP requirements.

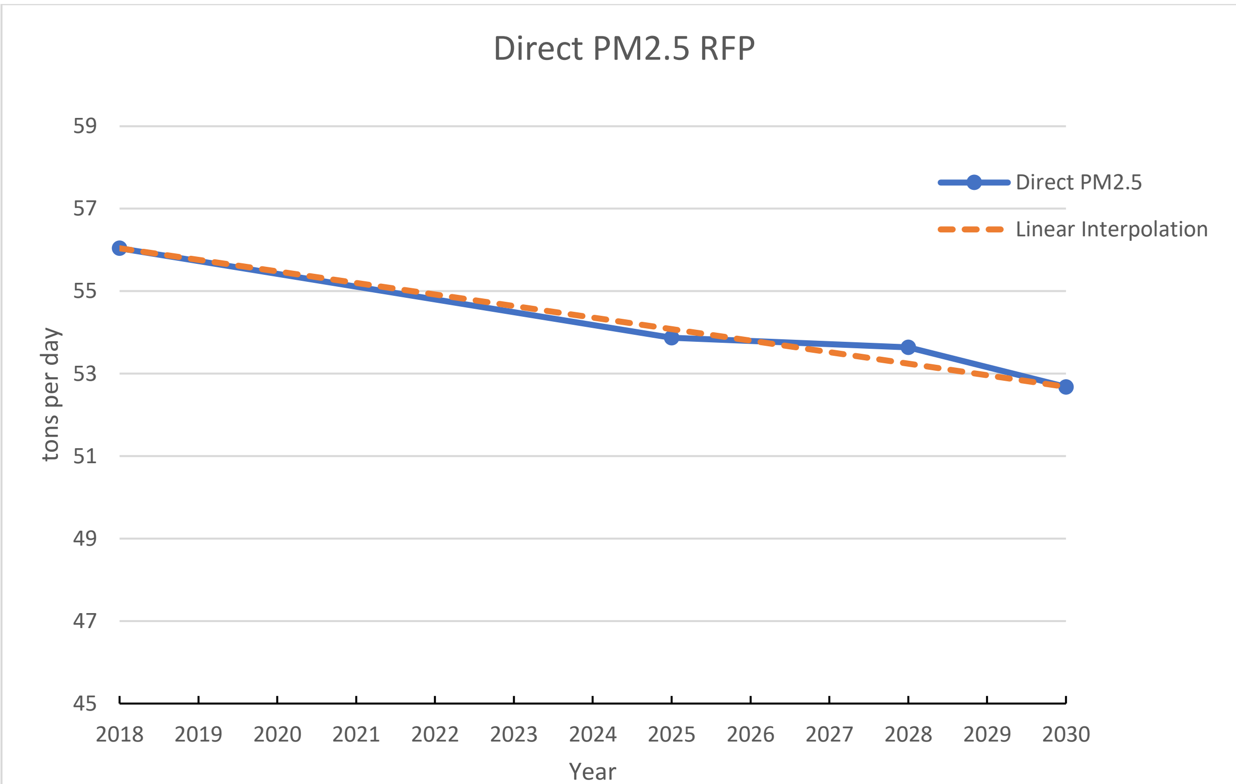

FIGURE 6-2
DIRECT PM2.5 RFP TOWARD ATTAINMENT:
ORANGE DASHED LINE PRESENTS THE LINEAR INTERPOLATION FROM BASE YEAR TO ATTAINMENT SCENARIO EMISSIONS AND BLUE SOLID LINE PRESENTS ANTICIPATED PROGRESS TOWARD ATTAINMENT

Ammonia

RFP for ammonia utilizes a stepwise approach as justified earlier in this chapter. Figure 6-3 illustrates a parabolic ammonia trend. As explained in the stepwise justification, the projected growth in ammonia emissions between 2018 and 2025 is mainly driven by increases in the human and pet population that outpace emission reductions. However, the pace of ammonia emission reductions accelerates after 2025 due to increasing penetration of zero emission technologies especially in the on-road sector. CARB regulations such as Advanced Clean Cars II and Advanced Clean Fleets contribute to these emission reductions. The control strategy also includes South Coast AQMD's ammonia measures, BCM-08 through BCM-11, and CARB's Zero Emissions Truck Measure which are expected to further reduce ammonia emissions. In 2028 and 2030, these regulations result in ammonia reductions that outpace increases due to population growth. While 2030 is projected to have higher emissions than 2018, this marginal increase will not hinder attainment of the 2012 annual PM2.5 NAAQS in 2030. In addition, the implementation of zero emission vehicles and technologies will continue beyond 2030 and lower ammonia emissions even further. Therefore, ammonia is determined to meet the RFP requirements.

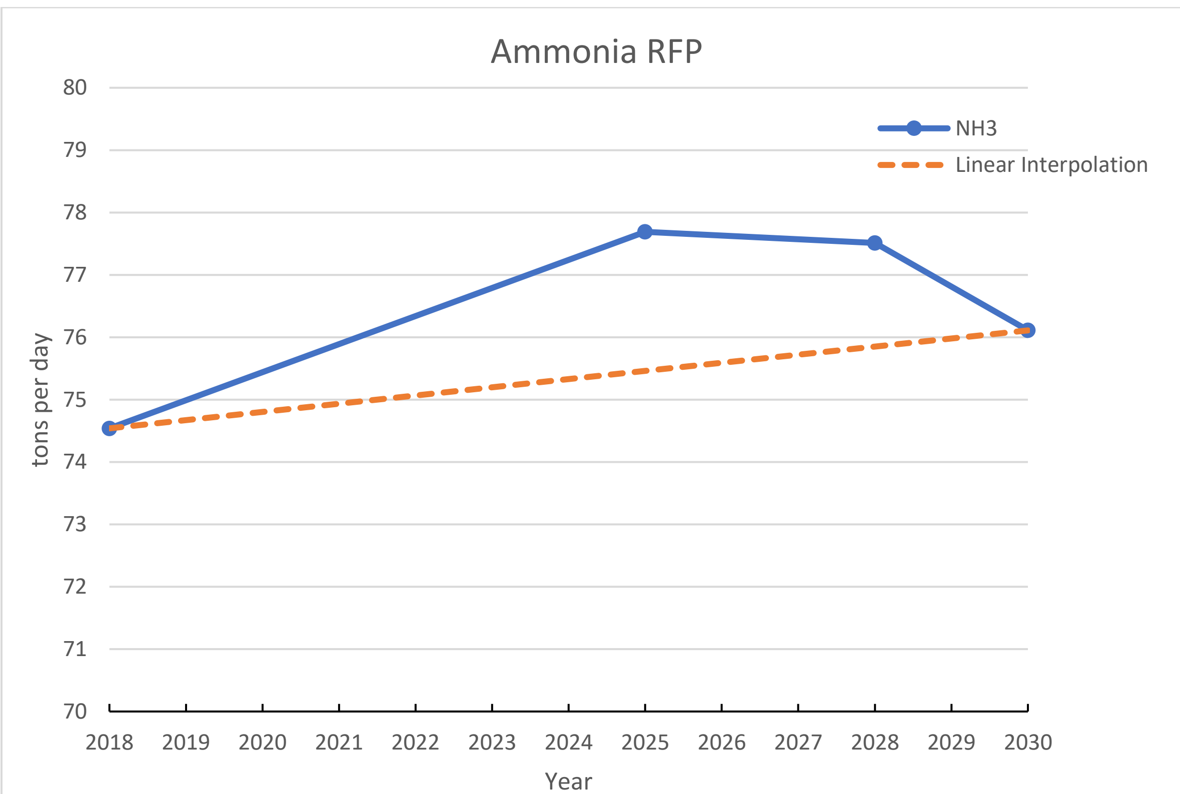

FIGURE 6-3

AMMONIA RFP TOWARD ATTAINMENT:

ORANGE DASHED LINE PRESENTS THE LINEAR INTERPOLATION FROM BASE YEAR TO ATTAINMENT SCENARIO EMISSIONS AND BLUE SOLID LINE PRESENTS ANTICIPATED PROGRESS TOWARD ATTAINMENT

Quantitative Milestones for South Coast AQMD Stationary Source Regulations

The RFP and quantitative milestone demonstrations in this Plan rely, in part, on NOx reductions from South Coast AQMD rules, the most significant of which is Rule 1109.1. South Coast AQMD will also report on the adoption and implementation of stationary source measures as specified in Chapter 4.

The applicable quantitative milestone years for the 2012 12 μg/m^3~~3~~ annual PM2.5 standard are 2025, 2028, and 2031.

For the 2025 milestone year, South Coast AQMD will report on the following:

- Implementation from 2022 through 2025 of Rule 1109.1, which establishes NOx and CO emission limits for combustion equipment at petroleum refineries and facilities with operations related to petroleum refineries.
- Adoption and implementation of applicable PM2.5 Plan measures according to the schedule specified in Chapter 4.

For the 2028 milestone year, South Coast AQMD will report on the following:

- Implementation from 2026 through 2028 of Rule 1109.1, which establishes NOx and CO emission limits for combustion equipment at petroleum refineries and facilities with operations related to petroleum refineries.
- Adoption and implementation of applicable PM2.5 Plan measures according to the schedule specified in Chapter 4.

For the 2031 milestone year, South Coast AQMD will report on the following:

- Implementation from 2029 through 2031 of Rule 1109.1, which establishes NOx and CO emission limits for combustion equipment at petroleum refineries and facilities with operations related to petroleum refineries.
- Adoption of applicable PM2.5 Plan measures since the 2028 milestone year.
- Demonstration of implementation of all PM2.5 Plan measures with committed adoption and implementation schedules.
- Demonstration that the aggregate emission reduction commitment was achieved for the 2030 attainment year.

Quantitative Milestones for State Mobile Source Regulations

CARB will work closely with South Coast AQMD to report on the milestones identified in this Plan for the applicable milestone years. CARB will report on milestones for implementation of mobile source measures that contribute significant emissions reductions included in the reasonable further progress demonstration through the 2031 milestone year. These regulations were originally set forth as measure commitments in the 2016 State Strategy for the State Implementation Plan (2016 State SIP Strategy) and the 2022 State Strategy for the State Implementation Plan (2022 State SIP Strategy).

For the 2025 milestone year, CARB is reporting on the following three milestones:

- Implementation from 2022 through 2025 of the Clean Truck Check Program, previously known as the Heavy-Duty Vehicle Inspection and Maintenance Program, which ensures that vehicles' emissions control systems are properly functioning when traveling on California's roadways;
- Implementation from 2022 through 2025 of the Advanced Clean Fleets Regulation which focuses on strategies to ensure that the cleanest vehicles are deployed by government, business, and other entities in California to meet their transportation needs; and
- Implementation from 2022 through 2025 of the In-Use Off-Road Diesel-Fueled Fleets Regulation which requires fleets operating in-use off-road diesel equipment to meet an annual fleet average emissions target that decreases over time.

For the 2028 milestone year, CARB is reporting on the following three milestones:

- Implementation from 2026 through 2028 of the Heavy-Duty Vehicle Inspection and Maintenance Program, also known as Clean Truck Check, which ensures that vehicles' emissions control systems are properly functioning when traveling on California's roadways;
- Implementation from 2026 through 2028 of the Advanced Clean Fleets Regulation which focuses on strategies to ensure that the cleanest vehicles are deployed by government, business, and other entities in California to meet their transportation needs; and
- Implementation from 2026 through 2028 of the In-Use Off-Road Diesel-Fueled Fleets Regulation which requires fleets operating in-use off-road diesel equipment to meet an annual fleet average emissions target that decreases over time.

For the 2031 milestone year, CARB is reporting on the following milestone:

- The status of new CARB SIP measures adopted between 2024 and 2030 per the schedule included in the adopted South Coast 12 $\mu g/m^3$ annual PM2.5 Plan that provide for attainment of the 12 $\mu g/m^3$ PM2.5 annual standard in 2030.

Transportation Conformity

CAA Section 176(c) establishes transportation conformity requirements which are intended to ensure that transportation activities do not interfere with air quality progress. The CAA requires that transportation plans, programs, and projects that obtain federal funds or approvals conform to applicable SIPs before being approved by a Metropolitan Planning Organization (MPO). –Conformity to a SIP means that proposed activities must not:

(1) Cause or contribute to any new violation of any standard;
(2) Increase the frequency or severity of any existing violation of any standard in any area; or
(3) Delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.

A SIP that analyzes the region's total emissions inventory from all sources is necessary for purposes of demonstrating RFP and attainment. The portion of the total emissions inventory from on-road highway and transit vehicles in these analyses becomes the Motor Vehicle Emissions Budget (MVEB).[16] Budgets are set for each criteria pollutant or its applicable precursor(s), for all RFP milestone years and the attainment year. Subsequent transportation plans and programs produced by transportation planning agencies are required to conform to the SIP by demonstrating that the emissions from the proposed plan, program, or project do not exceed the MVEB.

PM2.5 Requirements for Conformity

The U.S. EPA has promulgated separate rules addressing the PM2.5 emission categories and precursors that must be considered in PM2.5 transportation conformity determinations.

PM2.5 Motor Vehicle Emission Category Requirements

Guidance on the motor vehicle emission categories that must be considered in transportation conformity determinations can be found in the July 1, 2004, Final Rule amending the Transportation Conformity Rule to implement criteria and procedures for the 8-hour ozone and PM2.5 standards:[17]

> [A]ll regional emissions analyses in PM2.5 nonattainment and maintenance areas [must] consider directly emitted PM2.5 motor vehicle emissions from the tailpipe, brake wear, and tire wear…Sections IX. and X. [of the Final Rule] provide information on when re- entrained

[16] Federal transportation conformity regulations are found in 40 CFR Part 51, subpart T – Conformity to State or Federal Implementation Plans of Transportation Plans, Programs, and Projects Developed, Funded or Approved Under Title 23 U.S.C. of the Federal Transit Laws. Part 93, subpart A of this chapter was revised by the EPA in the August 15, 1997 Federal Register.

[17] Transportation Conformity Rule Amendments for the New 8-hour Ozone and PM2.5National Ambient Air Quality Standards and Miscellaneous Revisions for Existing Areas; Transportation Conformity Rule Amendments: Response to Court Decision and Additional Rule Changes, 69 Fed. Reg. 40004 (July 1, 2004)

road dust and construction-related dust must also be included in PM2.5 conformity analyses…[T]he analysis for direct PM2.5 must include:

- tailpipe exhaust particles,
- brake and tire wear particles,
- re-entrained road dust, if before a SIP is submitted to U.S. EPA or the state air agency has made a finding of significance or if the applicable or submitted SIP includes re-entrained road dust in the approved or adequate budget, and
- fugitive dust from transportation-related construction activities, if the SIP has identified construction emissions as a significant contributor to the PM2.5 problem.[18]

PM2.5 Motor Vehicle Emission Precursor Requirements

Following the July 1, 2004, Final Rule identifying the motor vehicle emission categories that must be considered in transportation conformity determinations, U.S. EPA issued the May 6, 2005, Final Rule[19] amending the Transportation Conformity Regulation. In this Final Rule, U.S. EPA identifies four transportation-related precursors that result in PM2.5 formation—~~nitrogen oxides (~~NOx~~)~~, ~~volatile organic compounds (~~VOCs~~)~~, ~~sulfur oxides (~~SOx~~)~~,[20] and ~~ammonia (~~NH3~~)~~—for consideration in the conformity process in PM2.5 nonattainment and maintenance areas.[21] Of these PM2.5 precursors, NOx must be included in the regional transportation conformity determination unless it is found to be an insignificant contributor to the formation of PM2.5 in the region, per Section 93.102(b)(2)(iv) of the Conformity Regulation. Conversely, VOCs, SOx, and NH3 are not required unless these precursors are found to be significant contributors to the formation of PM2.5 in the region or are included in the RFP demonstration.[22] In this plan, NH3 emissions are considered in the MVEB as NH3 emissions are included in the RFP demonstration.

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[18] 69 FR 40331-40333. Codified in Sections 93.102(b)(1) and (3) and Section 93.122(f) of the Conformity Regulation.

[19] Transportation Conformity Rule Amendments for the New PM2.5 National Ambient Air Quality Standard: PM2.5 Precursors, 70 Fed. Reg. 24280 (June 1, 2005)

[20] U.S. EPA revised the transportation conformity rule to revise PM2.5 precursors from SOx~~X~~ to SO2 for consistency with the broader PM2.5 implementation strategy. (Transportation Conformity Rule Amendments To Implement Provisions Contained in the 2005 Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA–LU), 73 Fed. Reg. 4435 (Jan. 24, 2008))

[21] Transportation Conformity Rule Amendments for the New PM2.5 National Ambient Air Quality Standard: PM2.5 Precursors, 70 Fed. Reg. 24282 (June 1, 2005)

[22] 40 CFR 93.102(b)(2)(v)

Conformity Budgets

Introduction

The California Air Resources Board (CARB) has prepared the ~~motor vehicle emissions budget (~~MVEB~~)~~[23] for the South Coast Attainment Plan for the 2012 Annual PM2.5 National Ambient Air Quality Standard (NAAQS).[24] The MVEB is the maximum allowable emissions from motor vehicles within a nonattainment area and is used to determine whether transportation plans and projects conform to the applicable state implementation plan (SIP).

Transportation conformity is the federal regulatory procedure for linking and coordinating the transportation and air quality planning processes through the MVEB established in the SIP. Under section 176(c) of the Clean Air Act (Act), federal agencies may not approve or fund transportation plans and projects unless they are consistent with the regional SIP. In addition, conformity with the SIP requires that transportation activities do not (1) cause or contribute to new air quality violations, (2) increase the frequency or severity of any existing violation, or (3) delay the timely attainment of NAAQS. Therefore, quantifying on-road motor vehicle emissions and comparing those emissions with a budget established in the SIP determine transportation conformity between air quality and transportation planning.

The MVEBs are set for each criteria pollutant or its precursors for each milestone year and the attainment year of the SIP. Subsequent transportation plans and programs produced by transportation planning agencies must demonstrate that the emissions from the proposed plan, program, or project do not exceed the MVEBs established in the applicable SIP. The MVEBs established in this SIP apply as a "ceiling" or limit on transportation emissions for the Southern California Association of Governments (SCAG) for the years in which they are defined and for all subsequent years until another year for which a different budget is specified, or until a SIP revision modifies the budget. For the South Coast Air Quality Management District's (District) annual PM2.5 attainment plan, the milestone years, attainment year of the SIP, and post-attainment milestone years (also referred to as the plan analysis years) are 2025, 2028, 2030, and 2031.

Methodology

The MVEB for the South Coast annual PM2.5 attainment plan is established based on guidance from the U.S. EPA on the motor vehicle emission categories and precursors that must be considered in transportation conformity determinations as found in the transportation conformity regulation and final rules as described below. The MVEB must be clearly identified, precisely quantified, and consistent with

[23] Federal transportation conformity regulations are found in 40 CFR Part 51, subpart T – Conformity to State or Federal Implementation Plans of Transportation Plans, Programs, and Projects Developed, Funded or Approved Under Title 23 U.S.C. of the Federal Transit Laws. Part 93, subpart A of this chapter was revised by the EPA in the August 15, 1997 Federal Register.

[24] National Ambient Air Quality Standards for PM, https://www.epa.gov/pm-pollution/national-ambient-air-quality-standards-naaqs-pm#rule-summary

applicable Act requirements. Further, it should be consistent with the South Coast PM2.5 Attainment Plan's emission inventory and control measures.

The South Coast annual PM2.5 attainment plan establishes the MVEB only for primary emissions of PM2.5 from motor vehicle exhaust, tire and brake wear, and paved and unpaved road dust, as well as for the precursors of NOx and NH3. This section discusses budgets that have been set for annual average daily emissions in the analysis years 2025, 2028, 2030, and 2031. The MVEB presented below uses emission rates from California's motor vehicle emission model, EMFAC2021 (V.1.0.2),[25] with South Coast activity data (Vehicle Miles Traveled, i.e., VMT, and speed distributions), along with California Emissions Projection Analysis Model (CEPAM) 2022v1.01. The activity data are from the region's 2020 Regional Transportation Plan (RTP).[26] Thus, they are consistent with the attainment demonstration for the SIP.

On November 15, 2022, the U.S. EPA approved EMFAC2021 for use in SIPs and demonstrating transportation conformity.[27] The EMFAC model estimates emissions from two combustion processes (running and start exhaust) and four evaporative processes (hot soak, running losses, diurnal, and resting losses). Further, the estimated emissions were adjusted for the Heavy-Duty Inspection and Maintenance (HD I/M) Program,[28] the Advanced Clean Fleets (ACF) program,[29] the Advanced Clean Cars II (ACCII) program,[30] and the Clean Trucks Plan.[31]

The MVEB for the South Coast annual PM2.5 attainment plan was developed to be consistent with the on-road emissions inventory[32] and attainment demonstration using the following method:

(1) Used the EMFAC2021 model to produce the on-road motor vehicle emissions totals (average annual day) for the appropriate pollutants (NOx, NH3, and PM2.5)33 using the 2020 RTP activity data.
(2) Applied the off-model adjustments (HD I/M, ACF, ACCII, and Clean Trucks Plan) to account for recently adopted regulations.
(3) Used CEPAM2022 model to estimate on-road construction dust, paved road dust, and unpaved road dust for PM2.5.
(4) Rounded the totals for NOx, NH3, and PM2.5 to the nearest ton.

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[25] More information on data sources can be found in the EMFAC technical support documentation at: https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/msei-road-documentation

[26] SCAG 2020 RTP, https://scag.ca.gov/read-plan-adopted-final-connect-socal-2020

[27] U.S. EPA approval of EMFAC2021 can be found at 87 FR 68483: federalregister.gov

[28] Heavy-Duty Engine and Vehicle Omnibus Regulations, https://ww2.arb.ca.gov/rulemaking/2020/hdomnibuslownox

[29] Advanced Clean Fleet, https://ww2.arb.ca.gov/our-work/programs/advanced-clean-fleets

[30] Advanced Clean Cars II, https://ww2.arb.ca.gov/our-work/programs/advanced-clean-cars-program/advanced-clean-cars-ii

[31] Clean Trucks Plan, https://www.epa.gov/system/files/documents/2021-08/420f21057.pdf

[32] More information about the on-road motor vehicle emission budgets can be found in Chapter 3 of the plan

[33] More information about the significance of these pollutants can be found in Appendix VI of the plan

Motor Vehicle Emissions Budget

The MVEB in Table 6-9~~1~~ was established according to the methodology outlined above and in consultation with SCAG, the District, U.S. EPA, Federal Highway Administration (FHWA), and Federal Transit Administration (FTA). The MVEB is consistent with the emission inventories and control measures in the PM2.5 attainment plan. This budget will be effective once U.S. EPA determines it is adequate or approved.

Table 6-9 contains the Summary MVEB for the South Coast Air Basin. It includes pollutants of NOx, NH3, and PM2.5 emissions for milestone and attainment years using the EMFAC2021 model and 2020 RTP activity data.

TABLE 6-9
SUMMARY MVEB FOR THE SOUTH COAST PM2.5 ATTAINMENT PLAN (TONS PER DAY)

	2025			2028			2030			2031		
	NOx	NH3	PM2.5	NOx	NH3	PM2.5	NOx	NH3	PM2.5	NOx	NH3	PM2.5
Vehicular Exhaust (including brake/tire wear for PM10)	86.7	20.2	4.0	74.8	21.0	3.9	68.5	21.2	3.9	65.9	21.2	3.8
Construction Road Dust	-	-	0.3	-	-	0.3	-	-	0.3	-	-	0.3
Paved Road Dust	-	-	8.9	-	-	9.1	-	-	9.1	-	-	9.1
Unpaved Road Dust	-	-	1.2~~7~~	-	-	1.2~~7~~	-	-	1.2~~7~~	-	-	1.2~~7~~
Reductions from HD I/M[a]	14.2	0.0	0.1	17.5	0.0	0.2	18.5	0.0	0.2	18.8	0.0	0.2
Reductions from Advanced Clean Fleets	1.1	0.1	0.0	3.0	0.5	0.0	4.8	0.8	0.1	4.8	0.8	0.1
Reductions from ACCII	-	-	-	0.7	0.9	0.1	1.5	2.1	0.2	1.5	2.1	0.2
Reductions from Clean Trucks Plan	-	-	-	0.2	0.0	0.0	0.6	0.0	0.0	0.6	0.0	0.0
Total[a~~b~~]	71.36	20.14	14.29~~73~~	53.36	19.58	14.24~~69~~	43.10	18.25	14.01~~46~~	40.24	18.29	~~14.44~~13.99
Motor Vehicle Emission Budget[b]	72	21	15	54	20	15	44	19	15	41	19	~~15~~14

[a] Values may not add up due to rounding.
[b] Motor Vehicle Emission Budgets calculated are rounded up to the nearest ton.
Source: EMFAC2021 v1.02 and CEPAM2022 v1.01

Fulfillment of New Source Review Requirements

CAA Section 172(c) requires permits for the construction and operation of new or modified major stationary sources. New Source Review (NSR) for major and in some cases minor sources of PM2.5 and its precursors is presently addressed through South Coast AQMD's NSR and RECLAIM programs (Regulations XIII and XX, respectively). Both programs are applicable to sources located in the South Coast AQMD jurisdiction, including the South Coast Air Basin and the Coachella Valley. Regulation XIII establishes the federal and State mandated pre-construction review program for new, modified, or relocated sources. The NSR program is a critical component of South Coast AQMD's attainment strategy and ensures that all new and modified sources install BACT and their emission increases are fully offset with creditable emission reductions.

The components of South Coast AQMD's NSR program are contained within Regulation XIII. Rule 1325 was adopted June 3, 2011 to incorporate the U.S. EPA's requirements for PM2.5 and its precursors into Regulation XIII. The rule mirrors federal requirements which include the definition of major source, significant emissions rate, offset ratios, and the applicability requirements of Lowest Achievable Emission Rate (LAER), facility compliance, offsets, and control of PM2.5 precursors. In 2021, U.S. EPA approved Rule 1325 as meeting all applicable NSR requirements.[34]

RECLAIM facilities are currently not subject to emission offsets for NOx and SOx under Regulation XIII, however, these facilities are instead subject to NOx and SOx emission offsets under Regulation XX. Under existing NSR in Regulation XIII and RECLAIM programs in Regulation XX, major stationary sources of NOx and SOx are already subject to emission offsets. The 2016 AQMP included a control measure, CMB-05 - Further NOx Reductions from RECLAIM Assessment, to achieve an additional five tons per day of NOx emissions as soon as practicable, but no later than 2025, and to transition RECLAIM to a command-and-control regulatory structure. The transition will include requiring former RECLAIM sources to be subject to Regulation XIII for NOx and SOx as applicable. Regulation XIII will be updated to reconcile the program with U.S. EPA's 2002 NSR Reform.[35]

VOC and ammonia emissions are also subject to BACT under existing NSR. VOC emissions are required to be offset when a new or modified source has the potential to emit 4 tons per year or more of VOC. Ammonia emission sources have not historically been subject to NSR offset requirements. However, for permitted ammonia sources, Rule 1303 (NSR Requirements) requires denial of "the Permit to Construct for any relocation, or for any new or modified source which results in an emission increase of any nonattainment air contaminant, any ozone depleting compound, or ammonia, unless BACT is employed for the new or relocated source or for the actual modification to an existing source." BACT shall be at least as stringent as LAER as defined in CAA Section 171(3); therefore, South Coast AQMD's current regulations requiring BACT

[34] Air Plan Approval; California; South Coast Air Quality Management District; Stationary Source Permits, 86 Fed. Reg. 58592 (Oct. 22, 2021)

[35] Prevention of Significant Deterioration (PSD) and Nonattainment New Source Review (NSR): Baseline Emissions Determination, Actual-to-Future-Actual Methodology, Plantwide Applicability Limitations, Clean Units, Pollution Control Projects, 67 Fed. Reg. 80186 (Dec. 31, 2002)

comply with the federal LAER requirements.

Major Source Threshold

The NSR permitting program relies on emissions thresholds to determine when certain requirements apply to new stationary sources and to modifications of existing stationary sources. If a new or modified facility will emit PM2.5 or PM2.5 precursor emissions greater than the major source threshold, the facility is considered a major source. Under a “serious” nonattainment classification, the major source threshold is defined as a potential to emit 70 or more tons per year of PM2.5 or PM2.5 precursors. To comply with federal requirements for “serious” nonattainment areas, Rule 1325 was amended on November 4, 2016 to update the Major Polluting Facility definition to align the associated major source emission threshold at 70 tons per year for PM2.5 and PM2.5 precursors. VOC and ammonia were added to the Rule 1325 definition of “precursors” and a VOC and ammonia threshold at 40 tons per year was added as part the definition of “significant” which is used in the determination of a “major modification.” The SOx major polluting facility threshold defined in Rule 1302 was also lowered from 100 to 70 tons per year. While the 2016 amendment expanded the definition of “precursors,” it did not expand the definition of “regulated NSR pollutant” to explicitly reference VOC and NH3 as PM2.5 precursor. For this reason, U.S. EPA conditionally approved Rule 1325 based on a commitment to amend Rule 1325 to expand the definition of “regulated NSR pollutant.”[36] South Coast AQMD subsequently amended Rule 1325 on January 4, 2019 to correct this deficiency and U.S. EPA approved the amendment into the SIP.[37]

PM Precursor Requirement in Nonattainment NSR

CAA Section 189(e) states that control requirements applicable to plans in effect for major stationary PM sources shall also apply to major stationary sources of PM precursors, except where such sources do not contribute significantly to PM levels which exceed the standard in the area. A state is required to conduct a Nonattainment NSR (NNSR) precursor demonstration, which evaluates the sensitivity of PM2.5 levels to an increase in emissions of a precursor, to exempt the precursor from NSR requirements.[38] This differs from a comprehensive precursor demonstration, which evaluates the sensitivity of PM2.5 levels to a decrease in emissions of a precursor. South Coast AQMD has not conducted an NNSR precursor demonstration and is not seeking to exempt precursors from NSR requirements. Therefore, Rule 1325 satisfies CAA Section 189(e) by addressing all precursors of PM2.5 including NOx, VOC, ammonia, and SOx.

[36] Revisions to California State Implementation Plan; South Coast Air Quality Management District; Stationary Source Permits, 83 Fed. Reg. 61551 (Nov. 30, 2018)
[37] Air Plan Approval; California; South Coast Air Quality Management District; Stationary Source Permits, 86 Fed. Reg. 58592 (Oct. 22, 2021)
[38] Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements, 81 Fed. Reg. 58010 (Aug. 24, 2016)

Contingency Measures

Clean Air Act Section 172(c)(9) requires a SIP to provide for the implementation of specific measures to be undertaken if the nonattainment area fails to make RFP, or to attain the NAAQS by the applicable attainment date. Such contingency measures need to take effect within 60 days in any such case without further action by South Coast AQMD. Furthermore, contingency measures must achieve ~~their full~~ emission reductions within 2 years of being triggered. The U.S. EPA provides further details in its Draft Contingency Measures Guidance.[39]

Rule 445 (Wood-Burning Devices)

To comply with PM2.5 contingency requirements, South Coast AQMD amended Rule 445 (Wood-Burning Devices) on June 5, 2020 to include multiple triggers for contingency measures. Rule 445 was subsequently approved by U.S. EPA, excluding paragraph (g) (Ozone Contingency Measures) and paragraph (k) (Penalties), as fulfilling PM2.5 contingency measure requirements.[40] Rule 445 contains four PM2.5 contingency measures, each of which impose lower curtailment thresholds upon any of U.S. EPA's findings of failure to comply or attain as specified in 40 CFR §51.1014(a). The first Rule 445 contingency measure was triggered upon U.S. EPA's finding of failure to attain the 2006 24-hour PM2.5 standard.[41] As a result, Rule 445 wood burning curtailment applies to the entire Basin when PM2.5 is forecast to be higher than 29 μg/m^3~~3~~ on any day during the wood-burning season.

~~Each subsequent finding by the U.S. EPA will trigger increasingly stringent requirements by lowering the curtailment threshold in the rule. The PM2.5 reductions for imposing the remaining thresholds of 28, 27, and 26 μg/m3 are expected to be 20.9, 13.9 and 19.1 tpy, respectively. If future amendments to Rule 445 modify the curtailment threshold, South Coast AQMD commits to consider retaining the existing structure for contingency measures.~~Control measure BCM-18 proposes to lower the Basin-wide curtailment threshold in Rule 445 from 29 μg/m^3 to 25 μg/m^3. To satisfy contingency measure requirements, South Coast AQMD proposes to further lower the curtailment threshold to 23 μg/m^3 upon any of the applicable triggering events described earlier.

One Year's Worth of Emission Reductions

The reductions from contingency measures are required to satisfy U.S. EPA's definition of one year's worth (OYW) of reductions, which is given by the following equation:

[39] U.S. EPA DRAFT: Guidance on the Preparation of State Implementation Plan Provisions that Address the Nonattainment Area Contingency Measure Requirements for Ozone and Particulate Matter, https://www.epa.gov/system/files/documents/2023-03/CMTF%202022%20guidance%203-17-23.pdf

[40] Air Plan Approval; California; Los Angeles — South Coast Air Basin, 87 Fed. Reg. 12866 (March 8, 2022)

[41] Finding of Failure To Attain the 2006 24-Hour Fine Particulate Matter Standards; California; Los Angeles- South Coast Air Basin, 85 Fed. Reg. 57733 (Sept. 16, 2020)

$$\frac{(base\ year\ EI - attainment\ year\ EI)}{(attainment\ year - base\ year)} \div base\ year\ EI \times attainment\ year\ EI$$

Thus, OYW of reductions represents the average emission reductions expected per year over the planning timeline, expressed as a percentage of the base year emission inventory (EI), applied to the attainment year EI. Table 6-10 provides the calculated OYW of reductions for PM2.5 and NOx. Ammonia is omitted from Table 6-10 as its emissions increase between 2018 and 2030 and it would be unreasonable to propose a contingency measure that results in an emissions increase.

TABLE 6-10
OYW OF PM2.5 AND APPLICABLE PRECURSOR REDUCTIONS BASED ON 2018 BASE YEAR AND 2030 ATTAINMENT YEAR EI (TPD)

	NOx	PM2.5
2018 Base Year EI	383.02	56.04
2030 Attainment Year EI	175.37	52.68
OYW of Reductions	7.92	0.26

The PM2.5 Plan includes two contingency measures – further lowering the curtailment threshold in Rule 445 and CARB's Smog Check Contingency Measure. The Rule 445 contingency measure only quantified reductions for PM2.5 emissions as concurrent reductions of NOx are expected to be small. A comparison of the emission reductions achieved by these contingency measures to OYW of reductions is provided in Table 6-11.

TABLE 6-11
EMISSION REDUCTIONS PROVIDED BY CONTINGENCY MEASURES AND COMPARISON TO OYW (TPD)

	NOx	PM2.5
Rule 445	0.0	0.32
CARB's Smog Check Contingency Measure	0.30	0.0
Percentage of OYW of Reductions	3.8	123

While Rule 445 achieves OYW of PM2.5 reductions, CARB's Smog Check Contingency Measure achieves less than OYW of NOx reductions. If contingency measures are unable to provide OYW of reductions, U.S. EPA requires that agencies provide a reasoned justification for achieving a lesser amount of reductions. T~~While~~ ~~t~~he Draft Contingency Measures Guidance outlines a process for developing such a justification, however, the guidance has not yet been finalized and is therefore subject to revision. Nevertheless, based on the Draft Contingency Measures Guidance and currently available information, staff developed a justification for achieving less than OYW of NOx reductions and included it in Appendix V. The justification includes evaluation of potential contingency measures for all sources of PM2.5, ammonia, and NOx emissions in the Basin. South Coast AQMD includes feasible ammonia measures in the control strategy; as such, these measures are ineligible for consideration as contingency measures. Similarly, no further contingency measures that achieve

NOx reductions were identified. Finally, since Rule 445 provides OYW of PM2.5 reductions, additional contingency measures for PM2.5 are not needed.

~~Reductions from the remaining contingency triggers in Rule 445 are compared to OYW's of reductions in Table 6-11. The difference between the cumulative reductions of all contingency triggers and OYW of reductions is also displayed for comparison.~~

~~TABLE 6-11~~

~~RULE 445 CONTINGENCY MEASURE REDUCTIONS (TPY)~~

~~Pollutant~~	~~Rule 445 Curtailment Threshold~~			~~Difference [OYW Reductions – Cumulative Reductions]~~
	~~28 µg/m³~~	~~27 µg/m³~~	~~26 µg/m³~~	
~~PM2.5~~	~~20.9~~	~~13.9~~	~~19.1~~	~~42.2~~
~~NOx~~	~~0~~	~~0~~	~~0~~	~~2,890.8~~

~~While Rule 445 satisfies the triggering mechanism requirement and results in PM2.5 reductions, it does not achieve OYW of reductions as required by U.S. EPA. Concurrent reductions of other pollutants are expected to be small and were not quantified. If contingency measures are unable to provide OYW of reductions, U.S. EPA requires that agencies provide a reasoned justification for achieving a lesser amount of reductions. While the Draft Contingency Measures Guidance outlines a process for developing such a justification, the guidance has not yet been finalized and is therefore subject to revision. Nevertheless, based on the Draft Contingency Measures Guidance and currently available information, staff developed a justification for achieving less than OYW of reductions and included it in Appendix V.~~

South Coast AQMD's Opportunities for Contingency Measures

The South Coast Air Basin faces some of the most difficult air quality challenges in the nation and, accordingly, South Coast AQMD has one of the most stringent stationary source control programs in the country. South Coast AQMD recently expanded its regulatory activities to mobile sources using innovative approaches such as indirect source rules, voluntary Memoranda of Understanding, and incentive measures. Due to the stringency of those existing requirements, further opportunities for a triggered contingency measure that can be implemented by South Coast AQMD and result in OYW of emission reductions within two years of triggering are non-existent. Even if there were measures capable of achieving this level of emission reductions, they would not be withheld for contingency purposes. Instead, they would be adopted to improve air quality in furtherance of the obligation to meet the NAAQS as soon as feasible. As demonstrated in Appendix V, staff did not identify any other feasible measures that satisfy contingency measure criteria.

Conclusion

The PM2.5 Plan complies with all federal CAA requirements. The most significant CAA requirements, including the emissions inventory, control strategy, and attainment demonstration, are discussed in Chapters 3 through 5. This chapter demonstrates compliance with other CAA requirements. Further details showing compliance with control strategy and contingency measure requirements are provided in Appendices III, IV and V.

CHAPTER 7

Environmental Justice

- The impacts of air pollution are not distributed equitably throughout the South Coast Air Basin, with some communities bearing much higher air pollution burdens.

- The Draft PM2.5 Plan includes control measures to reduce the levels of PM2.5, a regional pollutant in the entire Basin to meet the annual PM2.5 NAAQS. South Coast AQMD, however, addresses disproportionate impacts of local air pollution in disadvantaged communities through the AB 617 program.

- Environmental Justice (EJ) communities typically experience higher PM2.5 levels and higher cancer risks from toxic air pollutants than other regions in the Basin.

- Measures associated with the Draft PM2.5 Plan will help reduce air pollution in disproportionately impacted areas.

- In the implementation of both existing and future incentive programs, South Coast AQMD will continue to prioritize EJ areas to address the issues of the most disadvantaged communities.

Introduction

Environmental Justice (EJ) communities are disproportionately impacted by various types of pollution and experience health, social, and economic inequities. These inequities can also make residents of EJ communities more vulnerable to the effects of environmental pollution. These communities are often located near multiple air pollution sources including both mobile sources and commercial and industrial facilities. For example, communities adjacent to ports, rail yards and warehouses are exposed to higher levels of emissions from the associated ships, trains, and trucks, including diesel particulate matter, a carcinogen. Communities near refineries and other industries can also suffer from higher levels of air pollution.

The California Office of Environmental Health Hazard Assessment (OEHHA) developed the California Communities Environmental Health Screening Tool (CalEnviroScreen) to identify disadvantaged communities across California based on pollution exposure and population characteristics. This information can be used to advise and assist South Coast AQMD in protecting and improving public health in the most impacted communities through the reduction and prevention of air pollution. While there is no universal definition for what constitutes an EJ community, one that is commonly used is the Senate Bill (SB) 535 definition of disadvantaged communities (DACs)[1]. These are defined as:

1. Census tracts receiving the highest 25 percent of overall scores in CalEnviroScreen 4.0 (1,984 tracts).
2. Census tracts lacking overall scores in CalEnviroScreen 4.0 due to data gaps, but ~~receiving~~that receive the highest 5 percent of CalEnviroScreen 4.0 cumulative pollution burden scores (19 tracts).
3. Census tracts identified in the 2017 DAC designation as disadvantaged, regardless of their scores in CalEnviroScreen 4.0 (307 tracts).
4. Lands under the control of federally recognized Tribes.

All calculations and maps in this section that refer to EJ communities are consistent with this definition. The map of EJ communities alongside major roads within the Basin are presented in Figure 7-1.

[1] Monserrat, Laurie. “SB 535 Disadvantaged Communities.” OEHHA, 20 Nov. 2015, https://oehha.ca.gov/calenviroscreen/sb535.

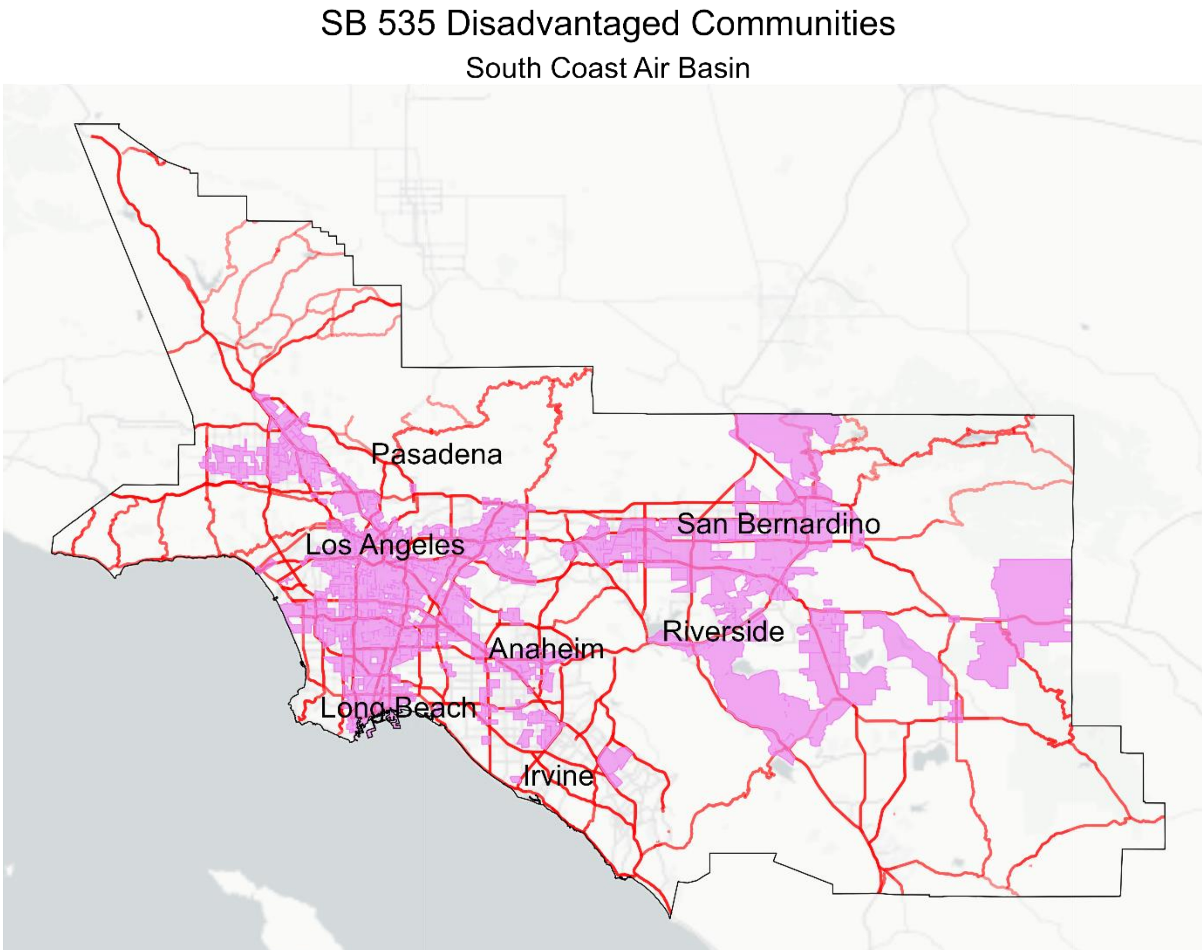

FIGURE 7-1
MAP OF ENVIRONMENTAL JUSTICE COMMUNITIES (VIOLET) WITHIN THE SOUTH COAST AIR BASIN. PRIMARY AND SECONDARY ROADS ARE IN RED

The PM2.5 Plan focuses on steps needed to attain the 2012 annual PM2.5 standard. As further described in this chapter, environmental justice communities typically experience worse levels of PM2.5 than other areas in the Basin. The control strategy proposed in this Plan, which includes transitioning to zero emission technologies where feasible and the cleanest available technologies where zero emission technologies are not feasible, will substantially reduce PM2.5 emissions. This includes diesel particulate matter, a powerful cancer-causing pollutant, and other mobile source pollutants that go on to form PM2.5, such as nitrogen oxides. As shown in Figure 7-2 below, the highest levels of air toxics risk are around our ports, rail yards, and major transportation corridors, where many of our EJ communities are located. About 88 percent of those risks are from pollutants associated with mobile sources, with diesel particulate matter alone accounting for about half of those risks. Cleaning up emissions from truck, ship, locomotive, and aircraft fleets will therefore substantially reduce health risks from air pollution in impacted communities, while also putting the region on a path to meet federal air quality standards.

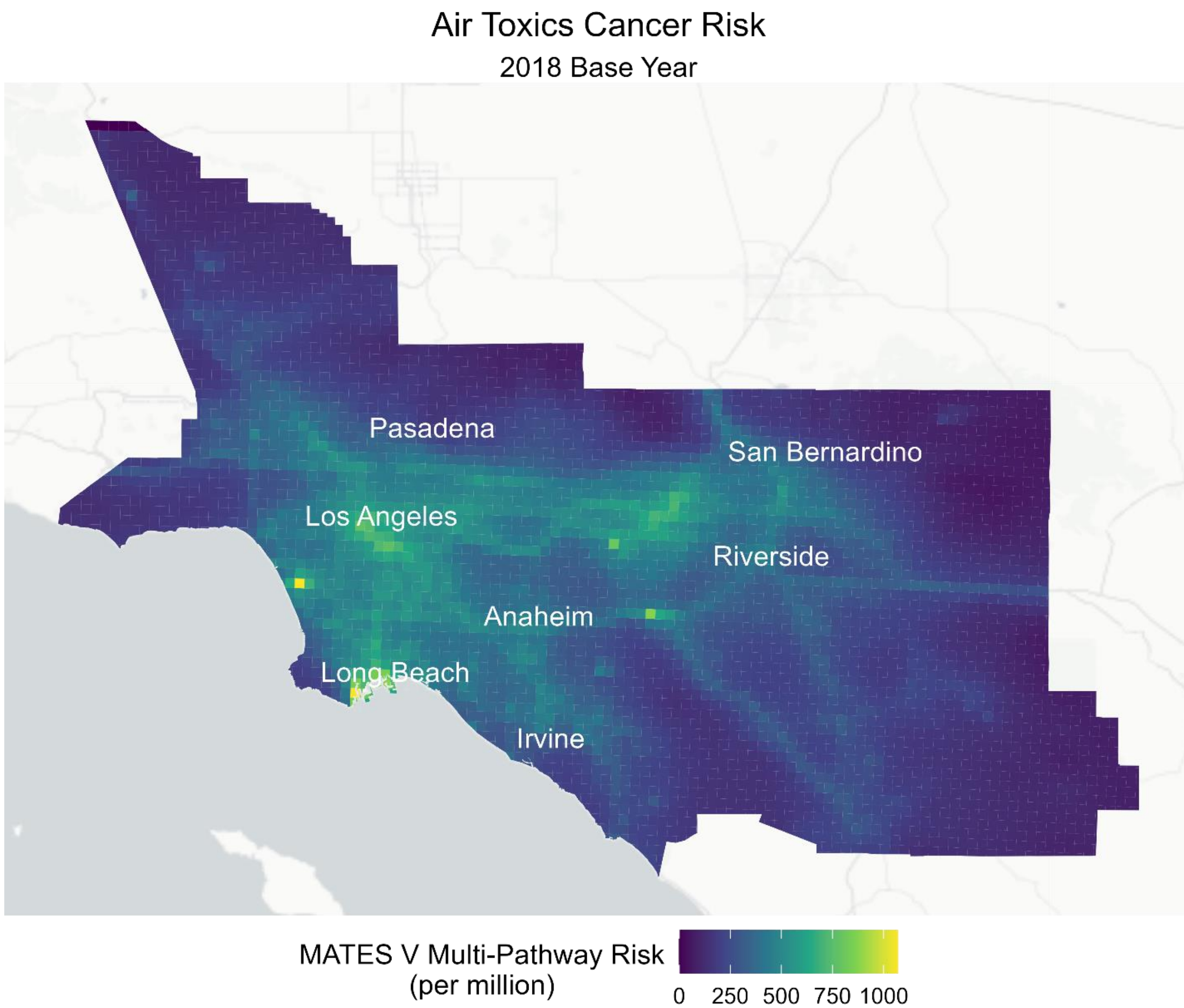

FIGURE 7-2
MODELED MULTI-PATHWAY AIR TOXICS CANCER RISK FROM MATES V IN THE SOUTH COAST AIR BASIN[2]

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[2] South Coast AQMD. Multiple Air Toxics Exposure Study in South Coast AQMD. South Coast Air Quality Management District, Aug. 2021, https://www.aqmd.gov/docs/default-source/planning/mates-v/mates-v-final-report-9-24-21.pdf?sfvrsn=6.

The purpose of this chapter is to describe air quality impacts experienced in EJ communities and projected future air quality and attainment of the 2012 annual PM2.5 standard. While the work described in this chapter will help reduce localized impacts, South Coast AQMD understands that work is ongoing, and much more will need to be done to address historic environmental injustice. South Coast AQMD is committed to continuing work with impacted communities, listening to their concerns, and to the greatest extent possible, addressing their concerns. Environmental justice principles center the importance of public participation in decision-making. To that end, as highlighted in chapter 8, public participation and outreach are critical to the development of the PM2.5 Plan. Relevant stakeholders in the development of the PM2.5 Plan include environmental justice organizations, environmental advocacy groups, and members of the public. Outreach occurs in-person and remote participation at Advisory Group Meetings, South Coast AQMD Governing Board Meetings, and Regional Public Hearings. For these programs, South Coast AQMD releases Spanish-language versions of meeting notices, agendas, and presentations alongside live Spanish translation.

Environmental Justice Communities

Environmental Justice, or "EJ" has been defined by South Coast AQMD as "equitable environmental policymaking and enforcement to protect the health of all residents, regardless of age, culture, ethnicity, gender, race, socioeconomic status, or geographic location, from the health effects of air pollution." While there are many approaches for identifying EJ communities, throughout this ~~Draft PM~~PM2.5 Plan, we consider EJ communities as the disadvantaged communities defined under SB 535.[3] By that definition, approximately 42 percent of South Coast Air Basin residents are in EJ communities. Race and ethnicity are not included in the CalEnviroScreen population indicators, but as discussed in the OEHHA Analysis of Race/Ethnicity and CalEnviroScreen results,[4] people of color disproportionately reside in highly impacted communities in California. These disparities are also clear in the South Coast Air Basin, reflecting the impact of institutional and structural racism that has created unequal pollution burdens and health impacts for different groups (Figure 7-3). Mental and physical disabilities are not considered in this analysis since they are not accounted for in the CalEnviroScreen.

[3] Refer the 2nd paragraph of this chapter for the definition of EJ community

[4] OEHHA. Analysis of Race/Ethnicity and CalEnviroScreen 4.0 Scores. California Office of Environmental Health Hazards Assessment, Oct. 2021.

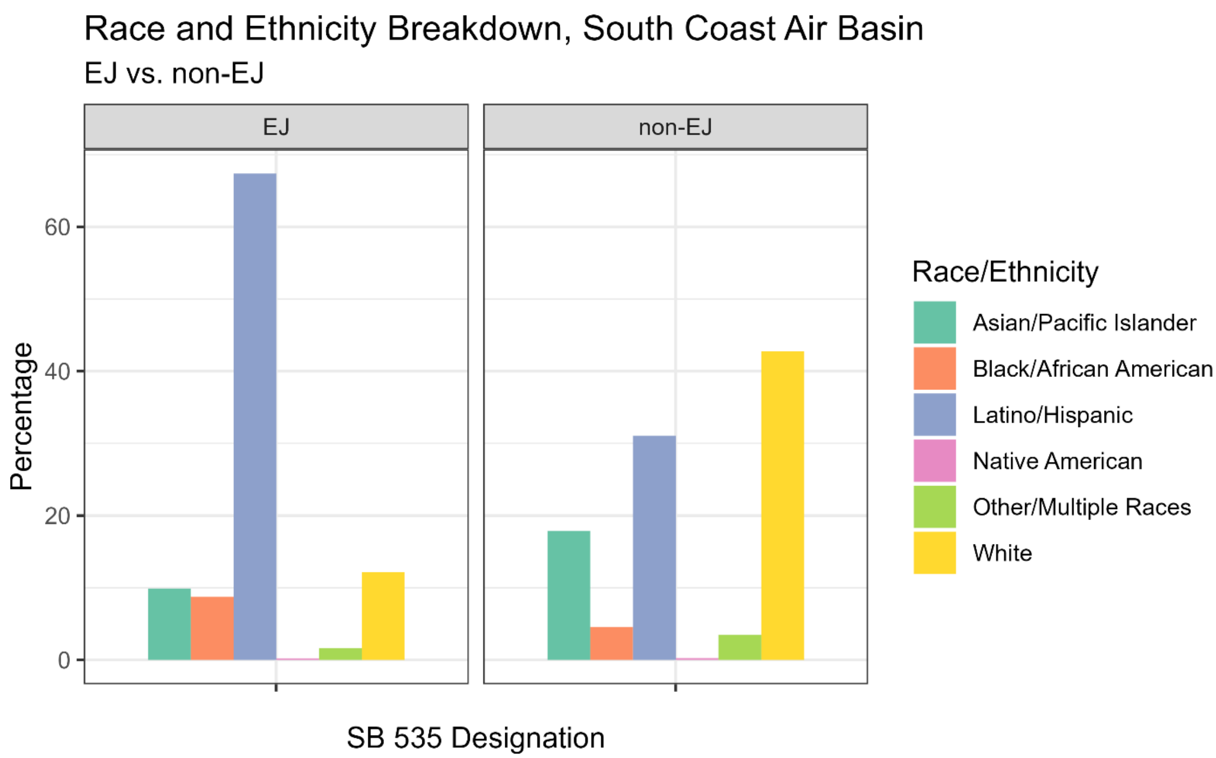

FIGURE 7-3
RACIAL AND ETHNIC MAKEUP OF EJ AND NON-EJ COMMUNITIES IN SOUTH COAST AIR BASIN (2021)

Assembly Bill 617

The PM2.5 Plan is designed to address regional air pollution, however, South Coast AQMD recognizes there is still much work to be done to reduce local exposures within EJ communities. Statewide and South Coast AQMD environmental justice efforts, such as the Assembly Bill 617 (AB 617)[5] program, seek to collaboratively address environmental challenges in communities that are disproportionately impacted by pollution and more vulnerable to the health effects of pollution.

[5] California Health and Safety Code § 44391.2

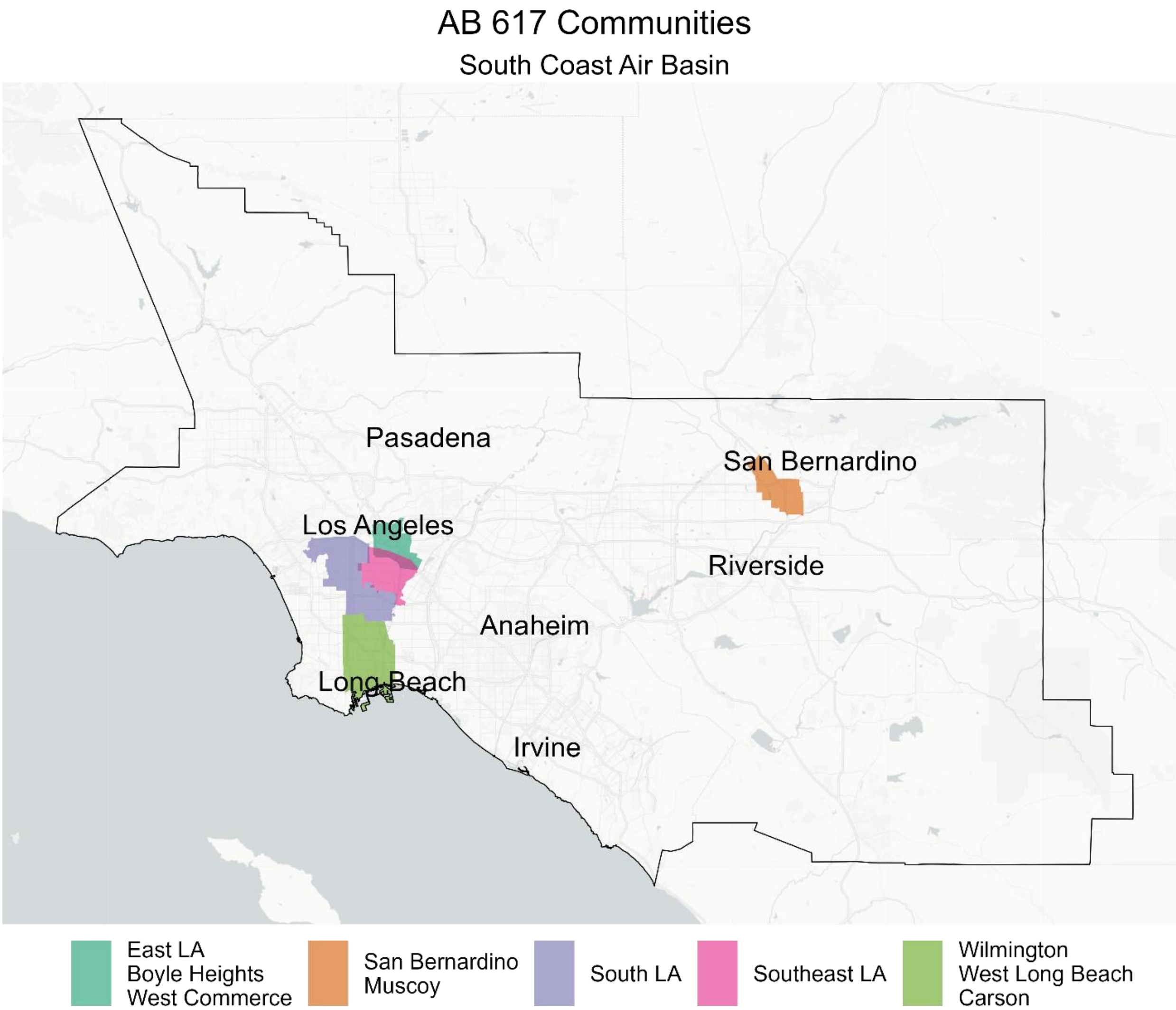

FIGURE 7-4
MAP OF AB 617 COMMUNITIES WITHIN THE SOUTH COAST AIR BASIN

AB 617 was signed into California law on July 26, 2017, and focused on addressing disproportionate impacts of local air pollution in EJ communities. The AB 617 program requires local air districts and California Air Resources Board (CARB) to reduce air pollution in disproportionately burdened communities, improve accountability and transparency, and promote collaborative partnerships with community stakeholders. AB 617 communities are designated by CARB, and they specify the plan(s) for the community as either an emission reduction program, air monitoring program, or both.

To meet the emission reduction program requirements, South Coast AQMD works with the communities to develop and implement Community Emission Reduction Plans (CERPs). CERPs are specific to each AB 617 community and are intended to address air quality related impacts in those communities. Similarly, for the air monitoring program requirements, South Coast AQMD works with the communities to develop and deploy Community Air Monitoring Plans (CAMPs). Both the measures associated with the PM2.5 Plan and the elements of AB 617 CERPs will help reduce air pollution in disproportionately impacted areas. More detail on the AB 617 program can be found on South Coast AQMD's AB 617 Community Air Initiatives webpage.[6]

To date, there are six designated AB 617 communities in the South Coast AQMD jurisdiction. These communities are the East Los Angeles/Boyle Heights/West Commerce (ELABHWC) community, San Bernardino/Muscoy community (SBM) and Wilmington/Carson/West Long Beach community (WCWLB) designated in 2018; the Southeast Los Angeles community (SELA) and Eastern Coachella Valley (ECV) designated in 2019; and the South Los Angeles community (SLA) designated in 2020. All of these communities, with the exception of ECV are located within the South Coast Air Basin and shown in Figure 7-4.

Air Quality in Environmental Justice Communities

The impacts of air pollution are not distributed equitably throughout South Coast AQMD jurisdiction, with some communities bearing much higher air pollution burdens. In this section, results from the recently released CalEnviroScreen 4.0 are used to show the distribution of air pollution across the South Coast Air Basin.

Figure 7-5 shows levels of PM2.5 concentrations in AB 617 communities, in EJ and non-EJ areas in the South Coast Air Basin, and the overall basin-wide levels. As described in the CalEnviroScreen 4.0 report, average annual PM2.5 concentrations in each census tract were calculated using 2015-2017 ambient air monitoring data combined with satellite observations in a land-use regression model. For AB 617 communities, estimates were generated using the census tracts in each community. Boxes indicate the interquartile range (25th to 75th percentile), and the bold line indicates the median concentration (50th percentile). The two ends of the whiskers represent 1.5 multiplied by the interquartile range added and

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[6] South Coast AQMD. "AB 617 Community Air Monitoring." South Coast AQMD, https://www.aqmd.gov/nav/about/initiatives/environmental-justice/ab617-134/ab-617-community-air-monitoring. Accessed 2 Jan. 2024.

subtracted to the median. The dashed line represents the 12 µg/m^3 standard. The dotted line represents the basin median (11.9 µg/m^3) concentration. Colors of the bars for each AB617 community correspond to map locations illustrated in Figure 7-4. While estimated annual average PM2.5 concentrations span a wide range of concentrations in EJ and non-EJ areas, PM2.5 concentrations are generally higher in EJ areas and some AB 617 communities in the South Coast Air Basin. The observed disparities within the basin are likely driven by local sources of directly emitted PM2.5 such as freeways and industrial facilities, that tend to be concentrated in disadvantaged communities. These sources also contribute to higher levels of diesel particulate matter, a powerful air toxic, in EJ communities.

Importantly, PM2.5 is one of the many air pollution challenges that these communities face. All five communities contain census tracts that rank in the CalEnviroScreen 4.0 top 25 percent most impacted tracts across California. Estimated PM2.5 concentrations for three EJ communities in the Basin are above the median concentration of 11.9 µg/m^3 of all Basin tracts, as estimated by CalEnviroScreen.

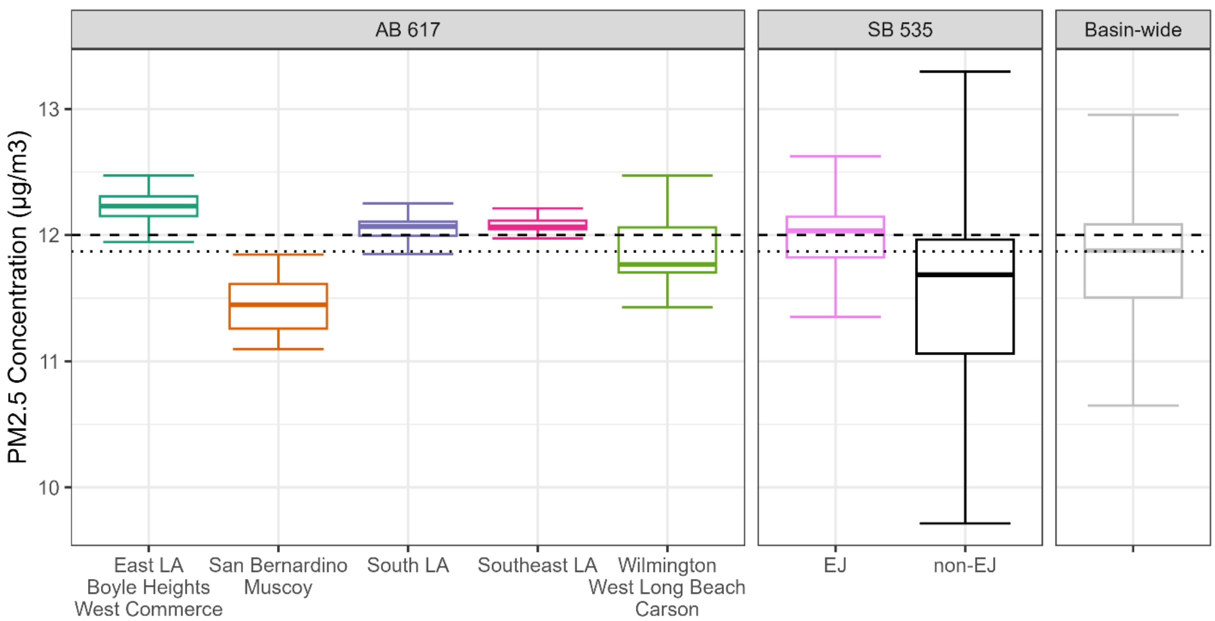

FIGURE 7-5
ESTIMATED PM2.5 CONCENTRATIONS IN AB 617 COMMUNITIES (LEFT) AND SB 535-DEFINED EJ COMMUNITIES (MIDDLE) AND OVERALL PM2.5 CONCENTRATIONS (2021) IN THE SOUTH COAST AIR BASIN (RIGHT)

Exposure to air toxics is also an important driver of health risks in AB 617 communities. The Multiple Air Toxics Exposure Study V (MATES V)[7] found a substantial decrease in estimated cancer risk in each of the AB 617 communities from 2012 to 2018[8]. Figure 7-6 shows the air toxic risk in the AB617 communities, and in EJ and non-EJ communities. Boxes indicate the interquartile range (25th to 75th percentile), and the bold line indicates the median concentration (50th percentile). The two ends of the whiskers represent 1.5 multiplied by the interquartile range added and subtracted to the median. Colors of the bars for the AB617 communities correspond to map locations illustrated in Figure 7-4.

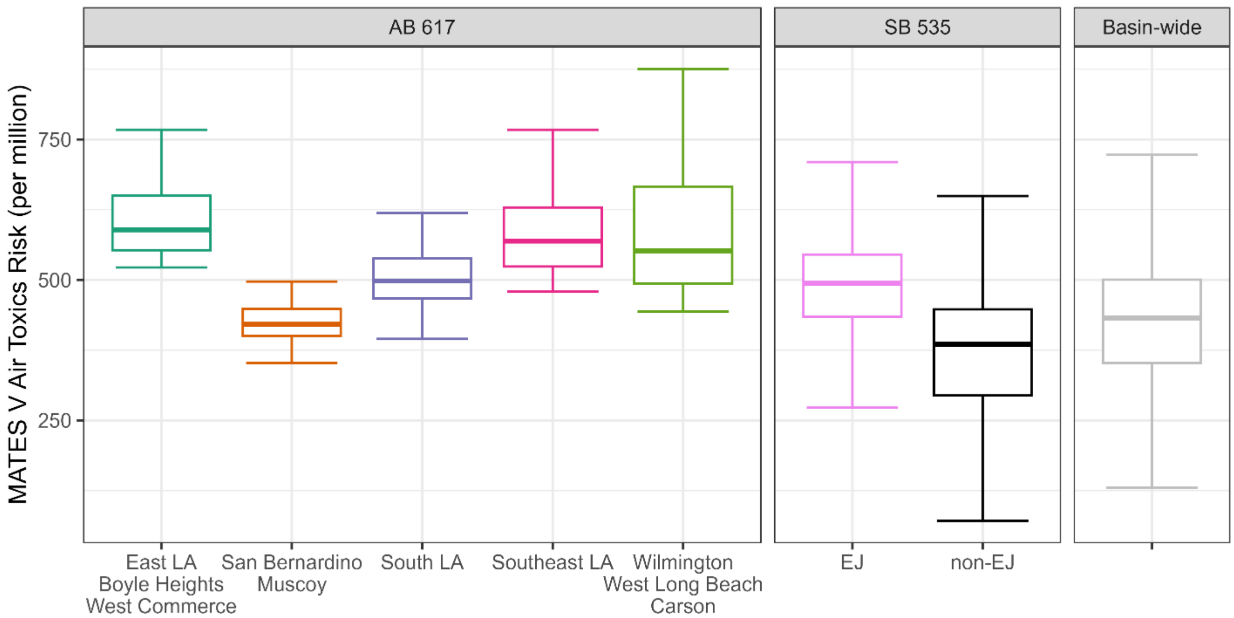

FIGURE 7-6
MATES AIR TOXIC RISK IN AB 617 COMMUNITIES (LEFT) AND SB 535-DEFINED EJ COMMUNITIES (CENTER) AND OVERALL AIR TOXIC RISK IN THE SOUTH COAST AIR BASIN, PER MATES V (2021) (RIGHT)

[7] South Coast AQMD. Multiple Air Toxics Exposure Study in South Coast AQMD. South Coast Air Quality Management District, Aug. 2021, https://www.aqmd.gov/docs/default-source/planning/mates-v/mates-v-final-report-9-24-21.pdf?sfvrsn=6.

[8] South Coast AQMD. Multiple Air Toxics Exposure Study in South Coast AQMD. South Coast Air Quality Management District, Aug. 2021, https://www.aqmd.gov/docs/default-source/planning/mates-v/mates-v-final-report-9-24-21.pdf?sfvrsn=6.

As shown in Figure 7-6, non-EJ areas have the lowest toxics air risk as modeled in MATES V. In comparison, the median air toxic risk among AB 617 communities and EJ areas is higher than the median risk for non-EJ areas. This is likely due to these communities' proximity to air toxics sources. As shown on Figure 7-4, there is a significant toxics risk hotspot near the ports of Los Angeles and Long Beach. This is due to the activity associated with shipping, handling and transporting cargo in the region. The related activity extends up the 710 freeway, where many of the AB 617 communities are located. In addition to freeways and shipping activity, some AB 617 communities, such as Wilmington/West Long Beach/Carson, East Los Angeles/Boyle Heights/West Commerce, and Southeast LA are homes to heavy industry that contribute to higher air toxic risk. Consequently, AB 617 communities suffer the highest concentrations of cancer-causing pollutants, such as diesel particulates, due to the proximity of AB617 communities to sources of these pollutants. South Coast AQMD plans to conduct MATES VI in near future to assess the progress in air quality improvement in recent years.

Annual PM2.5 Attainment in AB 617 and Environmental Justice Communities

Air quality simulations to demonstrate future attainment of the PM2.5 standard are an integral part of the planning process to achieve clean air. These simulations evaluate the changes in PM2.5 concentrations over time and in response to various emissions and development scenarios. Figure 7-7 summarizes the results of the PM2.5 simulations in each of South Coast AQMD's AB 617 communities for the 2018, 2030 baseline, and 2030 attainment scenarios. In this analysis, model simulations were run across the entire South Coast Air Basin domain. Model results were then cropped to the boundaries illustrated in Figure 7-1 (DACs) and Figure 7-4 (AB 617 communities). Within each community, we calculated a distribution of PM2.5 levels in the future that would result after the implementation of the Plan. We compared these summary statistics to the 2012 annual PM2.5 standard of 12 $\mu g/m^3$, which is marked in Figure 7-7 by the dotted line.

As shown in Figure 7-7, all AB617 communities and EJ areas have higher mean PM2.5 concentrations than the basin-wide average, and the maximum annual PM2.5 concentrations occur in EJ communities. While parts of the Basin that include portions of AB617 and EJ communities were not in attainment in 2018 and are not expected to be in attainment under the 2030 baseline conditions, all the AB 617 communities and EJ areas will attain the standard when the Plan is fully implemented.

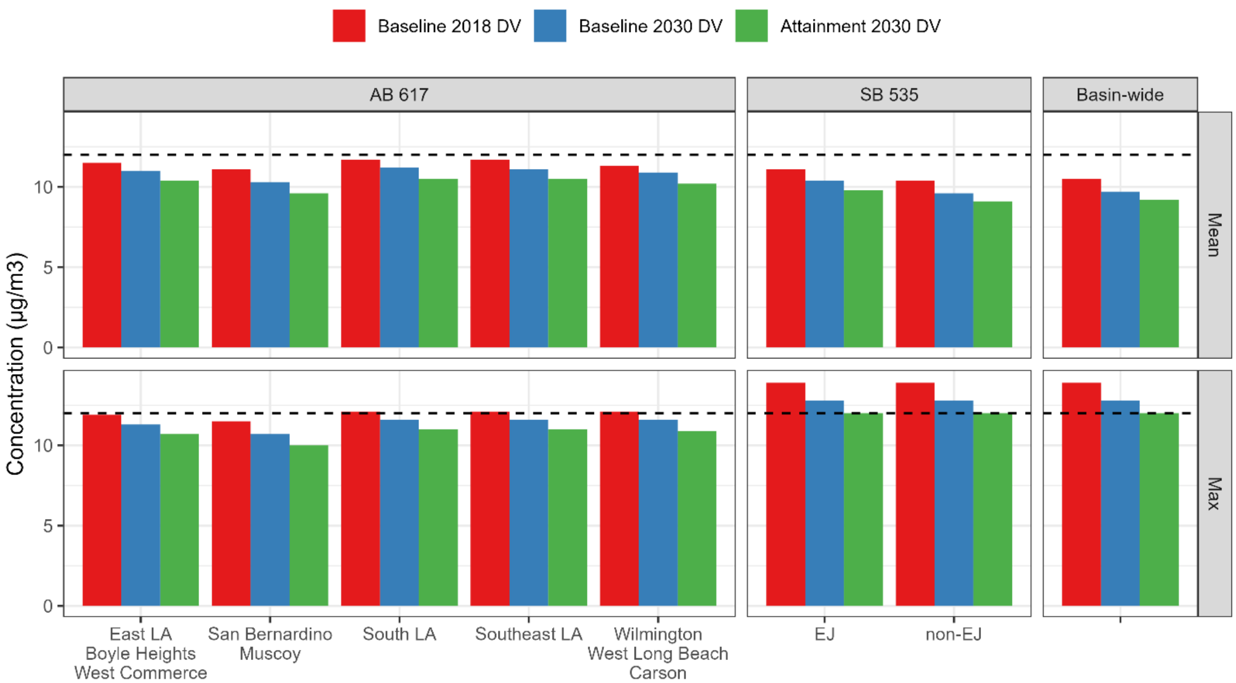

FIGURE 7-7
MODEL-PREDICTED MEAN (TOP) AND MAXIMUM (BOTTOM) ANNUAL DESIGN VALUES IN SOUTH COAST AQMD'S AB 617 (LEFT) AND SB 535-DESIGNATED EJ AND NON-EJ COMMUNITIES (CENTER), AND BASIN-WIDE (RIGHT)

Design values are calculated under three scenarios: 2018 baseline (red), 2030 baseline (blue), and 2030 attainment (green). The dashed line represents the 12 µg/m^3 standard.

Incentives and Funding in Environmental Justice Communities

Incentives and funding will continue to be a critical component in implementing the control strategies in the PM2.5 Plan. Among the 2022 AQMP control measures required to attain the 2015 8-hour ozone standard by 2037, this PM2.5 Plan included selected measures that can be implemented and achieve emission reductions prior to 2030. The 2022 AQMP commits both traditional regulatory and incentive funding-based approaches to achieve emission reductions needed to meet the federal ozone standard. Incentives and funding for EJ communities will be pursued to implement both the 2022 AQMP and this PM Plan commitments.

Incentive funding can be used to subsidize low-emitting or zero emission equipment purchases and help promote deployment of clean technologies for both stationary and mobile sources. For mobile sources, incentive funds can facilitate the replacement of older, high-emitting vehicles and equipment with the cleanest vehicles and equipment commercially available. South Coast AQMD has been implementing a number of incentive programs to accelerate the deployment of clean technologies with a particular emphasis on benefits to EJ communities. For example, under the Lower-Emission School Bus Program, the Carl Moyer Program and other diesel mitigation programs, not less than 50 percent of the funds appropriated are expended in a manner that directly reduces air contaminants and/or associated public health risks in disadvantaged and low-income communities. Notably, programs may employ different definitions of disadvantaged in their implementation. The Lower-Emission School Bus Program allows individual agencies to develop their own individual criteria in consultation with CARB, but by default recommends uses the percentage of students in a public school district participating in the free and reduced-lunch meal program.[9] South Coast AQMD frequently uses SB 535 to define disadvantaged communities. In their implementation of the Lower-Emission School Bus Program, they include an additional low-income criterion.[10] The Carl Moyer program uses a combination of racial and ethnic composition alongside income in their definition of disadvantaged.[11] In implementing existing incentive programs and for the development of future programs, South Coast AQMD will continue to prioritize incentive funding in EJ areas and seek opportunities to expand funding to benefit the most disadvantaged communities, which is frequently defined using the DACs under SB535.

For stationary sources, incentives can help promote the transformation to zero emission technologies for small commercial and residential combustion sources such as water heaters and furnaces. Incentive programs will be of particular importance for measures regarding zero emission buildings. Programs to change out gas appliances, heaters and boilers may be cost-effective, but not necessarily affordable. First, there is the cost of replacing the appliances themselves – which would not be insignificant for many smaller businesses or residential households. Second, many buildings will likely need additional electrical panel upgrades and other infrastructure to support the increased electrical load needed to power the replacement appliances. These infrastructure upgrades can be far more costly than the cost of replacing gas appliances. These issues are further magnified in economically disadvantaged communities, where switching from gas to electrical appliances may be cost-prohibitive unless a substantial portion of those costs are covered by other programs.

Existing rebate programs, such as South Coast AQMD’s Clear Air Furnace program, funded by Rule 1111 mitigation fees, provides rebates to those installing a residential electric heat pump to replace a natural gas furnace. In addition, a specific percentage of the funding was dedicated to those applying from a disadvantaged community. This program can be further funded to enhance the existing rebate program or expanded to include other building appliances such as water heaters. In addition, partnerships with other organizations, such as Technology and Equipment for Clean Heating (TECH) Clean California or

[9] CARB. 2008 Lower-Emission School Bus Program Guidelines. California Air Resources Board, 15 Apr. 2008, https://ww2.arb.ca.gov/sites/default/files/2022-02/2008_LESBP_Guidelines-with-Advisories.pdf.

[10] South Coast AQMD. Issue Program Announcement for Lower School Bus Emissions Program, Oct 2020. https://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2020/2020-oct2-006.pdf?sfvrsn=2

[11] Legislature, Cal. Cal. Health & Safety Code § 43023.5. https://california.public.law/codes/ca_health_and_safety_code_section_43023.5. Accessed 2 Jan. 2024.

Southern California Edison, with similar programs and directives could assist in providing more rebate money to further incentivize early deployment of cleaner technologies. Therefore, evaluating funding needs and sourcing funding to support control measures associated with zero emission building measures will be critical. But a much larger issue will be structuring incentive/rebate programs in a way that is equitable and does not leave economically disadvantaged communities behind. Stationary source control measures (BCM-01, BCM-02, BCM-03, BCM-04, ECC-02 and ECC-03, see Table 7-1) target emission reductions from residential buildings and include incentive components as part of the proposed control approach.

TABLE 7-1
SELECTED SOUTH COAST AQMD PROPOSED STATIONARY SOURCE MEASURES

Number	Title [Pollutant]
BCM-01	Emission Reductions from Replacement with Zero Emission or Low NOx Appliances – Residential Water Heating [PM2.5, NOx]
BCM-02	Emission Reductions from Replacement with Zero Emission or Low NOx Appliances – Residential Space Heating [PM2.5, NOx]
BCM-03	Emission Reductions from Residential Cooking Devices [PM2.5, NOx]
BCM-04	Emission Reductions from Replacement with Zero Emission or Low NOx Appliances – Residential Other Combustion Sources [PM2.5, NOx]
ECC-02	Co-benefits from Existing and Future Residential and Commercial Building Energy Efficiency Measures [All Pollutants]
ECC-03	Additional Enhancements in Reducing Existing Residential Building Energy Use [All Pollutants]

In addition, mitigation fees will be considered where appropriate under BCM-04. The mitigation fee collected would be utilized as incentives to accelerate the adoption of zero emission units or utilized to assist in panel upgrades or infrastructure at residences in disadvantaged communities. In developing these incentive programs, South Coast AQMD will seek community input and evaluate ways to prioritize distribution of funding to benefit the most disadvantaged communities. South Coast AQMD will ensure that environmental justice areas are able to access advanced technologies while benefiting from the transition to zero emission technologies.

Summary

PM2.5 air pollution and air toxics risk impact residents in the South Coast Air Basin disproportionately. EJ communities often contend with higher PM2.5 concentrations, elevated cancer risks from toxic air pollutants, and exposure to multiple pollution sources than the average levels in the Basin. The ~~Draft~~ PM2.5 Plan incorporates control measures aimed at reducing PM2.5 levels in the entire South Coast Air Basin and meeting the federal 2012 annual PM2.5 standard. These measures will help reduce air pollution in disproportionately impacted areas as well.

Efforts to address environmental injustices extend beyond the ~~Draft~~ PM2.5 Plan, with initiatives like the AB 617 program which focuses on reducing local air pollution exposure, promoting transparency, accountability, and community engagement. Collaborative partnerships, emission reduction programs, and air monitoring initiatives are integral components of AB 617, aiming to reduce air pollution and improve public health outcomes in disproportionately impacted areas.

Incentives and funding mechanisms are pivotal in facilitating the implementation of control measures, ensuring accessibility to clean technologies, and promoting the transition to zero emission solutions. South Coast AQMD is committed to prioritizing EJ areas in existing and future incentive programs, striving for equitable distribution of resources and fostering community engagement. Ongoing collaboration with impacted communities, coupled with community input and evaluation, will guide the development of inclusive incentive programs, ensuring that economically disadvantaged communities are not left behind. Moving forward, South Coast AQMD remains dedicated to addressing historic environmental injustices, improving public health, and creating a more equitable and sustainable future for all residents.

CHAPTER 8

Public Process

- PM2.5 Plan development has been a multi-agency effort including the California Air Resources Board, Southern California Association of Governments and U.S. Environmental Protection Agency.

- The PM2.5 Plan was developed through a robust and transparent process. Specific outreach efforts included:

  - Convening the AQMP Advisory Group and the Scientific, Technical, and Modeling Peer Review Advisory Group;

  - Holding regional public hearings;

  - Briefing the South Coast AQMD Mobile Source Committee and Governing Board on PM2.5 Plan development;

  - Providing meeting materials in Spanish and conducting public meetings in both English and Spanish languages; and

  - Conducting public meetings in both in-person and virtual formats, scheduled during both regular business hours and evening hours.

- Two written comments were received on the Draft PM2.5 Plan

Introduction

Development of the PM2.5 Plan has been a regional multi-agency effort including South Coast Air Quality Management District (South Coast AQMD), California Air Resource Board (CARB), Southern California Association of Governments (SCAG), U.S. EPA and other entities. Staff conducted robust public outreach efforts to engage the public and interested stakeholders, solicit feedback, and ensure transparency in the development of the Plan. The following describes specific outreach activities conducted by staff regarding the PM2.5 Plan.

Outreach Program

As a public agency, South Coast AQMD is committed to transparency and public participation during the development of State Implementation Plan (SIP) revisions. Outreach for the PM2.5 Plan aimed to achieve multiple goals including ensuring greater transparency in the process, reaching a broader and more diverse audience, and facilitating participation and engagement. The outreach program has been designed to inform the policy discussion by helping to ensure that all stakeholders have access to a common set of facts. Public awareness of federal requirements for PM2.5 SIPs and having appropriate background information are vital to engaging in a meaningful dialogue on the PM2.5 Plan.

Clean air goals cannot be achieved solely by the decisions and actions of South Coast AQMD. Stakeholder engagement is critical to the development of a successful plan. Stakeholders include community groups, businesses, environmental organizations, academia, and local, regional, state, and federal government entities. Table 8-1 lists specific stakeholder groups participating in PM2.5 Plan development.

TABLE 8-1
STAKEHOLDERS PARTICIPATING IN PM2.5 PLAN DEVELOPMENT

Stakeholder Category	Agency/Stakeholder Group
Public Agencies	• CARB • U.S. EPA
Local/Regional Government	• SCAG • Councils of government/associated governments • Transportation commissions
Special Districts	• Sanitation districts • Water/power districts
Community/Health/Environmental Groups	• Public health departments/associations • Environmental justice organizations • Environmental advocacy groups
Academia/Research	• Universities

Stakeholder Category	Agency/Stakeholder Group
	• National laboratories
General Public	• Residents • Interested parties
Business	• Energy industry (electricity, petroleum production and refining, natural gas, biofuels, renewables, etc.) • Goods movement and logistics (warehousing, trucking, railroads, ports/shipping/freight) • Printing/coating industry • Airport/airline operations • Chambers of commerce/business councils • Trade associations • Labor organizations • Small businesses

Advisory Group Meetings

Staff convened the AQMP and Scientific, Technical, and Modeling Peer Review (STMPR) Advisory Groups to provide feedback and recommendations on the development of the PM2.5 Plan. Advisory Group meetings were conducted in a hybrid format with in-person participation required for Advisory Group members, while members of the public were allowed to provide comment in-person or remotely. Special accommodations were offered to those with disabilities or those requiring translation. Both Advisory Groups met periodically throughout PM2.5 Plan development as shown in Table 8-2.

The AQMP Advisory Group represents a diverse cross-section of stakeholders, such as large and small businesses, labor associations, government agencies, environmental and community groups, and academia. Together, the Advisory Groups reviewed the overall aspects of the PM2.5 Plan and made recommendations concerning emissions inventories, modeling, control measures, and socioeconomic impacts, including:

- Reviewing and providing comments on: (a) studies relevant to advancing scientific and technical knowledge in support of AQMP preparation; (b) emissions inventory development and modeling approaches; (c) the development of new and revised control measures; and (d) socioeconomic data and evaluations;

- Fostering coordinated approaches toward overall attainment strategies; and

- Assisting in resolving key technical issues.

The STMPR Advisory Group consists of experts in the field of socioeconomic modeling, air quality modeling, and atmospheric science. The duties of this advisory group included reviewing and providing feedback on air quality modeling, socioeconomic modeling techniques and making recommendations for and comments on proposed modeling approaches for attainment demonstration, precursor analysis, near-road attainment approach and emissions inventory.

TABLE 8-2
ADVISORY GROUP MEETINGS FOR THE PM2.5 PLAN

Date	Meeting
5/25/2023	AQMP Advisory Group Meeting
7/13/2023	AQMP Advisory Group Meeting
8/3/2023	STMPR Advisory Group Meeting
10/11/2023	STMPR Advisory Group Meeting
11/8/2023	AQMP Advisory Group Meeting

South Coast AQMD Governing Board Meetings

Before South Coast AQMD makes decisions that affect local residents and businesses, ideas and comments from the public must be considered. The opportunity to comment begins weeks prior to public workshops and ends with a public hearing by the South Coast AQMD Governing Board, where the Governing Board may vote to adopt a plan as proposed or with changes. Anyone may testify or present written comments. Holding public workshops, recording oral and written comments, responding to those comments, publishing draft plans, holding public hearings and voting publicly are all based on set procedures. Documenting the process is necessary to ensure public participation, fairness, and an accurate account to which interested parties can refer to in the future. The Governing Board meets at South Coast AQMD's Diamond Bar headquarters on the first Friday of each month. In addition, select members from the South Coast AQMD Governing Board are also members of the Mobile Source Committee, which periodically reviewed PM2.5 Plan development. South Coast AQMD released the Draft PM2.5 Plan on March 22, 2024. Table 8-3 lists the South Coast AQMD Governing Board and Mobile Source Committee meetings in which PM2.5 Plan development was or will be discussed.

TABLE 8-3
SOUTH COAST AQMD GOVERNING BOARD ACTIVITIES FOR THE PM2.5 PLAN

Date	Meeting
3/17/2023	South Coast AQMD Mobile Source Committee
10/20/2023	South Coast AQMD Mobile Source Committee
3/15/2024	South Coast AQMD Mobile Source Committee
4/5/2024	South Coast AQMD Governing Board Meeting
6/7/2024	South Coast AQMD Governing Board Meeting

Regional Public Hearings

Regional public hearings are held prior to taking a proposed plan or other significant action to the South Coast AQMD Governing Board to allow public input before Governing Board members vote on plans. Regional public hearings for the PM2.5 Plan ~~will be~~were held in April – May 2024 as shown in Table 8-4. Meeting materials for the regional public hearings ~~will be~~were translated to Spanish and ~~there will be one~~all ~~meeting~~hearings ~~that features~~ were provided with live Spanish translation.

TABLE 8-4
SOUTH COAST AQMD REGIONAL PUBLIC HEARINGS SCHEDULE FOR THE PM2.5 PLAN

Date	Meeting
4/23/2024	PM2.5 Plan Regional Public Hearing – San Bernardino County
4/24/2024	PM2.5 Plan Regional Public Hearing – Riverside County
4/25/2024	PM2.5 Plan Regional Public Hearing – Orange County
5/1/2024	PM2.5 Plan Regional Public Hearing – Los Angeles County

Language Accommodations

According to the U.S. Census Bureau, almost 51~~%~~ percent of the population in the counties under South Coast AQMD jurisdiction speaks a language other than English.[1] The Spanish language is the second most common language spoken after English, where about 35~~%~~ percent of the population in the counties under South Coast AQMD jurisdiction speaks Spanish.[2] To facilitate greater participation and engagement of the public, including Spanish-speaking community members, South Coast AQMD staff posts a Spanish

[1] 2022 American Community Survey:
https://data.census.gov/table?q=language&g=050XX00US06037,06059,06065,06071
[2] Ibid.

version of meeting notices, agendas, and presentations for key public meetings on the South Coast AQMD meeting webpages. Key public meetings include Regional Public Hearings and Governing Board meetings. Live Spanish translation will be provided at these meetings. Translation services are offered upon request for all other public meetings. In addition, most meetings are conducted via videoconferencing and closed captioning is available for deaf audiences.

Written Comments and Responses to Comments

Two written comments were received on the Draft PM2.5 Plan. Responses to these comments are provided below.

Comment Letter #1

From: Dave Hall <bittermelondave@gmail.com>
Sent: Sunday, March 24, 2024 9:14 PM
To: AQMPTeam <AQMPteam@aqmd.gov>
Subject: [EXTERNAL] Draft Plan Comments-South Coast Air Basin Attainment Plan for the 2012 Annual PM2.5 Standard

Dear AQMD:

After reviewing the Environmental Justice Plan, Chapter 7 of the Draft document, I was dismayed that only a few examples of ways to reduce emissions in West Long Beach where I live were suggested. Primarily the document only focused on reducing school bus emissions in Chapter 7. Couldn't many other methods be used to reduce air pollution in the port communities and other areas with high emissions. Chapter 7 is lacking real tangible ways to address environmental justice and is cursory at best. Comment 1-1

Respectfully,

DAVE HALL
1047 Chestnut Avenue
Long Beach, CA 90813-2921

Response to Comment 1-1: South Coast AQMD recognizes the importance of reducing pollution in port communities and has designated the area of Wilmington, Carson, and West Long Beach (WCWLB) as an AB-617 community. AB-617 is a state program that addresses the disproportionate impacts of local air pollution in disadvantaged communities. South Coast AQMD is implementing a Community Emission

Reduction Plan for WCWLB and is committed to prioritizing incentives and rulemaking efforts to reduce pollution in these communities.[3]

While Chapter 7 of this Plan describes air quality impacts experienced in environmental justice communities and outlines some of the steps South Coast AQMD is taking to address localized impacts, Chapter 4 and Appendix IV-A present the specific emission reduction measures that will be needed to attain the 2012 annual PM2.5 standard by 2030. Control measure MOB-01: Emission Reductions at Commercial Marine Ports seeks to reduce emissions from port-related sources through a rule, incentives, and/or other voluntary programs. MOB-01 seeks to reduce air pollution from some or all port-related sources (e.g., on-road heavy-duty trucks, cargo handling equipment, harbor craft, marine vessels, locomotives, and stationary equipment), to the extent that cost-effective and feasible strategies are available. The goal of this measure is to assist in achieving the committed emission reductions described in the State Implementation Plan Strategy related to on-road heavy-duty vehicles, off-road equipment, and federal and international sources that operate in and out of the Ports of Los Angeles and Long Beach. South Coast AQMD encourages all interested stakeholders to participate in the public process associated with MOB-01.[4]

[3] https://www.aqmd.gov/docs/default-source/ab-617-ab-134/steering-committees/wilmington/cerp/final-cerp-wcwlb.pdf?sfvrsn=8

[4] https://www.aqmd.gov/home/rules-compliance/rules/scaqmd-rule-book/proposed-rules/rule-2304

Comment Letter #2

ONTARIO INTERNATIONAL AIRPORT
So Cal. So Easy.

Ontario International Airport Administration Offices

1923 E. Avion Street, Ontario, CA 91761

May 6, 2024

Dr. Sang-Mi Lee, Planning and Rules Manager
South Coast Air Quality Management District
21865 Copley Drive
Diamond Bar, CA 91765-4178

Dear Dr. Lee,

The Ontario International Airport Authority (OIAA) has submitted this comment letter on the Draft South Coast Air Basin Attainment Plan for the 2012 Annual $PM_{2.5}$ Standard (Draft $PM_{2.5}$ Plan) to request that the Draft $PM_{2.5}$ Plan be updated to accurately reflect Ontario International Airport's (ONT) forecasted aviation-related activity data and corresponding emissions.

According to the Draft $PM_{2.5}$ Plan, the emissions inventory for all sources was derived from the emissions inventory developed for the 2022 Air Quality Management Plan (2022 AQMP).[1] The primary differences in the emissions inventories between the 2022 AQMP and the Draft $PM_{2.5}$ Plan are: (1) the switch from EMFAC2017 to EMFAC2021 for on-road sources, and (2) a small change in construction equipment emissions for off-road sources.[2] As we understand it, there have been no updates to the aircraft emissions in the Draft $PM_{2.5}$ Plan (i.e., none since the 2022 AQMP).

As discussed in our prior comment letter (dated July 5, 2022) on the then-draft 2022 AQMP, the aircraft emissions analysis in that regional planning document was not indicative of future operations at ONT. Indeed, the aircraft fleet mix

Comment 2-1

[1] South Coast Air Quality Management District. 2022. Air Quality Management Plan. https://www.aqmd.gov/home/air-quality/air-quality-management-plans/air-quality-mgt-plan

[2] The Draft $PM_{2.5}$ Plan states that "after the development of the 2022 AQMP, an error was discovered in the emission allocations for in-use emissions from off-road construction equipment in Riverside County. This error only affected future year emissions and is now corrected in this Draft $PM_{2.5}$ Plan."

used in the 2022 AQMP's analysis is not indicative of the aircraft fleet mix using ONT today. Since the aircraft emissions assumptions remain unchanged from the 2022 AQMP to the Draft $PM_{2.5}$ Plan, the Draft $PM_{2.5}$ Plan erroneously continues to underrepresent the potential emissions at ONT for future years.

OIAA began a review of ONT's activity forecasts in late 2021, due to the ongoing COVID recovery trends and anticipated projects at ONT. In the process of that review, OIAA discovered that aviation forecast data for ONT previously provided to AQMD was inaccurate and outdated. These inaccurate assumptions led to a significant underrepresentation of aircraft emissions for ONT in the 2022 AQMP. In order to align the Draft $PM_{2.5}$ Plan with the anticipated future aviation-related operations at ONT, OIAA is requesting the forecast and fleet mix assumptions for ONT be updated in the Draft $PM_{2.5}$ Plan. OIAA is happy to provide more accurate aircraft fleet mix data for ONT, both current and forecast, for your use.

Comment 2-1 Con't

OIAA looks forward to working with AQMD to resolve this issue that currently exists in the Draft $PM_{2.5}$ Plan. We believe it is imperative that AQMD's regional plans more accurately reflect ONT's forecasted aviation activity data and related emissions for purposes of addressing both air quality issues in the South Coast Air Basin and ONT's continued ability to operate to provide important services for the benefit of the region. Please do not hesitate to contact me to facilitate further discussions on this important topic.

Sincerely,

Karen G Kavanagh

Karen Kavanagh
Interim Chief Capital Development Officer
Ontario International Airport

Response to Comment 2-1: South Coast AQMD appreciates Ontario International Airport Authority's (OIAA) concerns regarding the aircraft emissions inventory for Ontario Airport. Please refer to response to comment 61-1 for the 2022 Air Quality Management Plan (AQMP).[5] The 2022 AQMP aircraft emissions inventory was developed through an extensive public process that began in May 2020 and included multiple Aircraft Mobile Source Working Group Meetings. The PM2.5 Plan emissions inventory is based on that of the 2022 AQMP with only minor changes and updates reflected. Although the PM2.5 Plan does not revise the aircraft emissions inventory, South Coast AQMD anticipates that the next major emissions inventory update will occur during development of the attainment plan for the 2024 annual PM2.5 standard. OIAA is encouraged to participate in the public process for that plan and work with staff to incorporate changes in the fleet mix and growth projections at Ontario Airport.

[5] https://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2022-air-quality-management-plan/final-2022-aqmp/responses-to-comments-volume-i.pdf?sfvrsn=6

Glossary

AAQS (Ambient Air Quality Standards): Health and welfare based standards for clean outdoor air that identify the maximum acceptable average concentrations of air pollutants during a specified period of time. (See NAAQS.)

Acute Health Effect: An adverse health effect that occurs over a relatively short period of time (e.g., minutes or hours).

Aerosol: Particles of solid or liquid matter that can remain suspended in air for long periods of time because of their small size and light weight.

Air Pollutants: Amounts of foreign and/or natural substances occurring in the atmosphere that may result in adverse effects on humans, animals, vegetation, and/or materials.

Air Quality Simulation Model: A computer program that simulates the transport, dispersion, and transformation of compounds emitted into the air and can project the relationship between emissions and air quality.

Air Toxics: A generic term referring to a harmful chemical or group of chemicals in the air. Typically, substances that are especially harmful to health, such as those considered under U.S. EPA's hazardous air pollutant program or California's AB 1807 toxic air contaminant program, are considered to be air toxics. Technically, any compound that is in the air and has the potential to produce adverse health effects is an air toxic.

Alternative Fuels: Fuels such as methanol, ethanol, hydrogen, natural gas, and liquid propane gas that are cleaner burning and help to meet mobile and stationary emission standards.

Ambient Air: The air occurring at a particular time and place outside of structures. Often used interchangeably with "outdoor" air.

ATCM (Airborne Toxic Control Measure): A type of control measure, adopted by the CARB (Health and Safety Code Section 39666 et seq.), which reduces emissions of toxic air contaminants from nonvehicular sources.

APCD (Air Pollution Control District): A county agency with authority to regulate stationary, indirect, and area sources of air pollution (e.g., power plants, highway construction, and housing developments) within a given county, and governed by a district air pollution control board composed of the elected county supervisors and in most cases, representatives of cities within the district.

AQMD (Air Quality Management District): A group or portions of counties, or an individual county specified in law with authority to regulate stationary, indirect, and area sources of air pollution within the region and governed by a regional air pollution control board comprised mostly of elected officials from within the region.

AQMP (Air Quality Management Plan): A Plan prepared by an APCD/AQMD, for a county or region designated as a nonattainment area, for the purpose of bringing the area into compliance with the requirements of the national and/or California Ambient Air Quality Standards. AQMPs designed to attain national ambient air quality standards are incorporated into the SIP.

Area-wide Sources (also known as "area" sources): Smaller sources of pollution, including permitted sources smaller than the district's emission reporting threshold and those that do not receive permits (e.g., water heaters, gas furnace, fireplaces, woodstoves, architectural coatings) that often are typically associated with homes and non-industrial sources. The California Clean Air Act requires districts to include area sources in the development and implementation of the AQMPs.

Atmosphere: The gaseous mass or envelope surrounding the earth.

Attainment Area: A geographic area which is in compliance with the National and/or California Ambient Air Quality Standards (NAAQS or CAAQS).

Attainment Plan: In general, a plan that details the emission reducing control measures and their implementation schedule necessary to attain air quality standards. In particular, the federal Clean Air Act requires attainment plans for nonattainment areas; these plans must meet several requirements, including requirements related to enforceability and adoption deadlines.

AVAPCD (Antelope Valley APCD): The Antelope Valley Air Pollution Control District.

BAAQMD (Bay Area AQMD): The San Francisco Bay Area Air Quality Management District.

BACM (Best Available Control Measure): The maximum degree of emission reduction achievable from a source or source category which is determined on a case-by-case basis, considering energy, economic and environmental impacts and other costs, which includes Best Available Control Technology. (see BACT.)

BACT (Best Available Control Technology): The most up-to-date methods, systems, techniques, and production processes available to achieve the greatest feasible emission reductions for given regulated air pollutants and processes. BACT is a requirement of NSR (New Source Review) and PSD (Prevention of Significant Deterioration). BACT as used in federal law under PSD applies to permits for sources of attainment pollutants and other regulated pollutants is defined as an emission limitation based on the maximum degree of emissions reductions allowable taking into account energy, environmental & economic impacts and other costs. [(CAA Section 169(3)]. The term BACT as used in state law means an emission limitation that will achieve the lowest achievable emission rates, which means the most stringent of either the most stringent emission limits contained in the SIP for the class or category of source, (unless it is demonstrated that the limitation is not achievable) or the most stringent emission limit achieved in practice by that class in category of source. "BACT" under state law is more stringent than federal BACT and is equivalent to federal LAER (Lowest Achievable Emissions Rate) which applies to nonattainment NSR permit actions.

BAR (Bureau of Automotive Repair): An agency of the California Department of Consumer Affairs that manages the implementation of the motor vehicle Inspection and Maintenance Program.

BARCT (Best Available Retrofit Control Technologies): an emission limitation that is based on the maximum degree of reduction achievable, taking into account environmental, energy, and economic impacts by each class or category of source.

Basin (South Coast Air Basin): Area bounded by the Pacific Ocean to the west and the San Gabriel, San Bernardino, and San Jacinto Mountains to the north and east. It includes all of Orange County and the non-desert portions of Los Angeles, Riverside, and San Bernardino Counties.

Carrying Capacity: Amount of allowable regional emissions that would still meet health-based air quality standards.

CAA (Clean Air Act): A federal law passed in 1970 and amended in 1977 and 1990 which forms the basis for the national air pollution control effort. Basic elements of the Act include national ambient air quality standards for major air pollutants, air toxics standards, acid rain control measures, and enforcement provisions.

CAAQS (California Ambient Air Quality Standards): Standards set by the State of California for the maximum levels of air pollutants which can exist in the outdoor air without unacceptable effects on human health or the public welfare, which are often more stringent than NAAQS.

CARB (California Air Resources Board): The State's lead air quality agency, consisting of a nine-member Governor-appointed board. It is responsible for attainment and maintenance of the State and federal air quality standards, and is primarily responsible for motor vehicle pollution control. It oversees county and regional air pollution management programs.

CCAA (California Clean Air Act): A California law passed in 1988 which provides the basis for air quality planning and regulation independent of federal regulations. A major element of the Act is the requirement that local APCDs/AQMDs in violation of state ambient air quality standards must prepare attainment plans which identify air quality problems, causes, trends, and actions to be taken to attain and maintain California's air quality standards by the earliest practicable date.

CEQA (California Environmental Quality Act): A California law which sets forth a process for public agencies to make informed decisions on discretionary project approvals. The process aids decision makers to determine whether any environmental impacts are associated with a proposed project. It requires significant environmental impacts associated with a proposed project to be identified, disclosed, and mitigated to the maximum extent feasible.

Chronic Health Effect: An adverse health effect which occurs over a relatively long period of time (e.g., months or years).

CMAQ (Community Multiscale Air Quality Model): A computer modeling system designed to address air quality as a whole by including state-of-the-science capabilities for modeling multiple air quality issues, including tropospheric ozone, fine particles, toxics, acid deposition, and visibility degradation.

Conformity: Conformity is a process mandated in the federal Clean Air Act to insure that federal actions do not impede attainment of the federal health standards. General conformity sets out a process that requires federal agencies to demonstrate that their actions are air quality neutral or beneficial. Transportation conformity sets out a process that requires transportation projects that receive federal funding, approvals or permits to demonstrate that their actions are air quality neutral or beneficial and meet specified emissions budgets in the SIP.

Congestion Management Program: A state mandated program (Government Code Section 65089a) that requires each county to prepare a plan to relieve congestion and reduce air pollution.

Consumer Products: Products for consumer or industrial use such as detergents, cleaning compounds, polishes, lawn and garden products, personal care products, and automotive specialty products which are part of our everyday lives and, through consumer use, may produce air emissions which contribute to air pollution.

Contingency Measure: Contingency measures are statute-required back-up control measures to be implemented in the event of specific conditions. These conditions can include failure to meet interim milestone emission reduction targets or failure to attain the standard by the statutory attainment date. Both State and federal Clean Air Acts require that District plans include contingency measures.

CTG (Control Techniques Guidelines): Documents issued by U.S. EPA to provide recommendations for state and local air agencies on how to control the emissions of VOCs from certain types of sources in areas with smog problems. CTGs are not regulations, but they help states and areas meet the RACT requirements under the CAA. CTGs provide information on the available control technologies and their respective cost-effectiveness for reducing VOC emissions from these sources. States and areas can use the CTGs as guidance to develop their own RACT rules or standards that are appropriate for their specific circumstances.

Electric Vehicle: A motor vehicle which uses a battery-powered electric motor as the basis of its operation. Such vehicles emit virtually no air pollutants. Hybrid electric motor vehicles may operate using both electric and gasoline powered motors. Emissions from hybrid electric motor vehicles are also substantially lower than conventionally powered motor vehicles.

EMFAC: The EMission FACtor model used by CARB to calculate on-road mobile vehicle emissions. The Coachella Valley Contingency Measure SIP Revision is based on the version of EMFAC2017.

Emission Inventory: An estimate of the amount of pollutants emitted from mobile and stationary sources into the atmosphere over a specific period such as a day or a year.

Emission Offset (also known as an emission trade-off): A regulatory requirement whereby approval of a new or modified stationary source of air pollution is conditional on the reduction of emissions from other existing stationary sources of air pollution or banked reductions. These reductions are required in addition to reductions required by BACT.

Emission Standard: The maximum amount of a pollutant that is allowed to be discharged from a polluting source such as an automobile or smoke stack.

FIP (Federal Implementation Plan): In the absence of an approved State Implementation Plan (SIP), a plan prepared by the U.S. EPA which provides measures that nonattainment areas must take to meet the requirements of the Federal Clean Air Act.

Fugitive Dust: Dust particles which are introduced into the air through certain activities such as soil cultivation, off-road vehicles, or any vehicles operating on open fields or dirt roadways.

Goods Movement: An event that causes movement of commercial materials or stock typically at ports, airports, railways, highways, including dedicated truck lanes and logistics centers.

GHGs (Greenhouse Gases): A gas in an atmosphere that absorbs long-wave radiant energy reflected by the earth, which warms the atmosphere. GHGs also radiate long-wave radiation both upward to space and back down toward the surface of the earth. The downward part of this long-wave radiation absorbed by the atmosphere is known as the “greenhouse effect.”

HEV (Hybrid Electric Vehicles): Hybrids commercially available today combine an internal combustion engine with a battery and electric motor.

Hydrocarbon: Any of a large number of compounds containing various combinations of hydrogen and carbon atoms. They may be emitted into the air as a result of fossil fuel combustion, fuel volatilization, and solvent use, and are a major contributor to smog. (Also see VOCs.)

HFCV (Hydrogen Fuel Cell Vehicles): Vehicles that produce zero tailpipe emissions and run on compressed hydrogen fed into a fuel cell "stack" that produces electricity to power the vehicle.

ICAPCD (Imperial County APCD): The County of Imperial Air Pollution Control District.

Incentives: Tax credits, financial rebates/discounts, or non-monetary conveniences offered to encourage further use of advanced technology and alternative fuels for stationary and mobile sources.

Indirect Source: Any facility, building, structure, or installation, or combination thereof, which generates or attracts mobile source activity that results in emissions of any pollutant (or precursor). Examples of indirect sources include employment sites, shopping centers, sports facilities, housing developments, airports, commercial and industrial development, and parking lots and garages.

Indirect Source Control Program: Rules, regulations, local ordinances and land use controls, and other regulatory strategies of air pollution control districts or local governments used to control or reduce emissions associated with new and existing indirect sources.

Inspection and Maintenance Program: A motor vehicle inspection program implemented by the BAR. It is designed to identify vehicles in need of maintenance and to assure the effectiveness of their emission control systems on a biennial basis. Enacted in 1979 and strengthened in 1990. (Also known as the "Smog Check" program.)

LAER (Lowest Achievable Emission Rate): The more stringent rate of emissions for any source based on the following: the most stringent emissions limitation in which is contained in the implementation plan of any State for such class or category of sources, unless the owner or operator of the proposed source demonstrates that such limitations are not achievable; or the most stringent emissions limitation which is achieved in practice by such class or category of stationary sources. This limitation, when applied to a modification, means the lowest achievable emissions rate for the new or modified emissions units whin or stationary source. In no event shall the application of this term permit a proposed new or modified source to emit any pollutant in excess of the amount allowable under applicable new source standards of performance.

LEV (Low Emission Vehicle): A vehicle which is certified to meet the CARB 1994 emission standards for low emission vehicles.

Low NOx Technologies: Refers to NOx emissions approaching zero and will be delineated for individual source categories through the process of developing the Air Quality Management Plan/State Implementation Plan and subsequent control measures.

Maintenance Plan: In general, a plan that details the actions necessary to maintain air quality standards. In particular, the federal Clean Air Act requires maintenance plans for areas that have been redesignated as attainment areas.

MCAQD (Maricopa County Air Quality Department): The Maricopa County Air Quality Department in Arizona.

MDAQMD (Mojave Desert AQMD): The Mojave Desert Air Quality Management District.

Mobile Sources: Moving sources of air pollution such as automobiles, motorcycles, trucks, off-road vehicles, boats and airplanes.

Model Year: Model year refers to the actual annual production period (year) as determined by the manufacturer.

MSM (Most Stringent Measures): The maximum degree of emission reduction that has been required or achieved from a source or source category in any other attainment plans or in practice in any other states and that can feasibly be implemented in the area seeking the extension. "Serious" nonattainment areas can request an extension of the attainment date under CAA Section 188(e) and are required to demonstrate that the attainment plan includes the MSM. In some cases it may be possible for the MSM requirement to result in no more controls and no more emissions reductions in an area than result from the implementation of BACM and BACT.

MVEB (Motor Vehicle Emissions Budget): The portion of the total allowable emissions allocated to highway and transit vehicles and is defined in the SIP for the purpose of demonstrating Reasonable Further Progress (RFP) for interim milestone years and attainment of the NAAQS.

NAAQS (National Ambient Air Quality Standards): Standards set by the federal U.S. EPA for the maximum levels of air pollutants which can exist in the outdoor air without unacceptable effects on human health or the public welfare.

NOx (Nitrogen Oxides, Oxides of Nitrogen): A general term pertaining to compounds of nitric acid (NO), nitrogen dioxide (NO_2), and other oxides of nitrogen. Nitrogen oxides are typically created during combustion processes, and are major contributors to smog formation and acid deposition. NO_2 is a criteria air pollutant, and may result in numerous adverse health effects; it absorbs blue light, resulting in a brownish-red cast to the atmosphere and reduced visibility.

Nonattainment Area: A geographic area identified by the U.S. EPA and/or CARB as not meeting either NAAQS or CAAQS for a given pollutant.

NSR (New Source Review): A program used in development of permits for new or modified industrial facilities which are in a nonattainment area, and which emit nonattainment criteria air pollutants. The two major requirements of NSR are Best Available Control Technology and Emission Offsets.

Ozone: A strong smelling reactive toxic chemical gas consisting of three oxygen atoms. It is a product of the photochemical process involving the sun's energy. Ozone exists in the upper atmosphere ozone layer as well as at the earth's surface. Ozone at the earth's surface causes numerous adverse health effects and is a criteria air pollutant. It is a major component of smog.

Ozone Precursors: Chemicals such as hydrocarbons and oxides of nitrogen, occurring either naturally or as a result of human activities, which contribute to the formation of ozone, a major component of smog.

PCAPCD (Placer County APCD): The County of Placer Air Pollution Control District.

Permit: Written authorization from a government agency (e.g., an air quality management district) that allows for the construction and/or operation of an emissions generating facility or its equipment within certain specified limits.

PEV (Plug-in Electric Vehicle): Vehicles that can be recharged from any external source of electricity and the electricity is stored in a rechargeable battery pack to drive or contribute to drive the wheels.

PHEV (Plug-in Hybrid Electric Vehicle): Vehicles similar to traditional hybrids but are also equipped with a larger, more advanced battery that allows the vehicle to be plugged in and recharged in addition to refueling with gasoline. This larger battery allows the car to drive on battery alone, gasoline alone, or a combination of electric and gasoline fuels.

PM (Particulate Matter): Solid or liquid particles of soot, dust, smoke, fumes, and aerosols.

PM Precursors: Chemicals such as volatile organic compounds, oxides of nitrogen, and ammonia, occurring either naturally or as a result of human activities, which contribute to the formation of particulate matter.

PM10 (Particulate Matter less than 10 microns): A major air pollutant consisting of tiny solid or liquid particles of soot, dust, smoke, fumes, and aerosols. The size of the particles (10 microns or smaller, about 0.0004 inches or less) allows them to easily enter the air sacs in the lungs where they may be deposited, resulting in adverse health effects. PM10 also causes visibility reduction and is a criteria air pollutant.

PM2.5 (Particulate Matter less than 2.5 microns): A major air pollutant consisting of tiny solid or liquid particles, generally soot and aerosols. The size of the particles (2.5 microns or smaller, about 0.0001 inches or less) allows them to easily enter the air sacs deep in the lungs where they may cause adverse health effects, as noted in several recent studies. PM2.5 also causes visibility reduction and is a criteria air pollutant.

PSD (Prevention of Significant Deterioration): A program used in development of permits for new or modified industrial facilities in an area that is already in attainment. The intent is to prevent an attainment area from becoming a nonattainment area. This program, like require BACT as defined in the Clean Air Act and, if an AAQS is projected to be exceeded, Emission Offsets.

Public Consultation: A consultation held by a public agency for the purpose of informing the public and obtaining its input on the development of a regulatory action or control measure by that agency.

Public Workshop: A workshop held by a public agency for the purpose of informing the public and obtaining its input on the development of a regulatory action or control measure by that agency.

PZEV (Partial Zero Emission Vehicle): A vehicle emissions rating within California's exhaust emission standards. Cars that are certified as PZEVs meets the Super Ultra Low Emission Vehicle exhaust emission standard and has zero evaporative emissions from its fuel system.

RACM (Reasonably Available Control Measures): An area-specific analysis focusing on area, mobile and non-major point sources. It considers measures that are readily implemented, are economically and technologically feasible, and contribute to the advancement of attainment in a manner that is "as expeditious as practicable.

RACT (Reasonably Available Control Technology): The lowest emission limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility.

RFP (Reasonable Further Progress): Annual incremental reductions in emissions of the relevant air pollutant as are required by this part or may reasonably be required by the Administrator for the purpose of ensuring attainment of the applicable national ambient air quality standard by the applicable date, as defined in CAA Section 171(1). The goal of the RFP requirements is for areas to achieve generally linear progress toward attainment. To determine RFP for the attainment date, EPA guidance states that the plan should rely only on emission reductions achieved from sources within the nonattainment area.

RTP (Regional Transportation Plan): The long-range transportation plan developed by the Southern California Association of Governments that provides a vision for transportation investments throughout the South Coast region. The RTP considers the role of transportation in the broader context of economic, mobility, environmental, and quality-of-life goals for the future, identifying regional transportation strategies to address regional mobility needs.

SBCAPCD (Santa Barbara County APCD): The County of Santa Barbara Air Pollution Control District.

SCM (Suggested Control Measure): A model rule developed by CARB that local air districts can adopt for their architectural coatings rule. The SCM was last updated in 2020.

SCS (Sustainable Communities Strategy): Planning element in the RTP that integrates land use and transportation strategies that will achieve CARB's GHG emissions reduction targets.

SDAPCD (San Diego County APCD): The County of San Diego Air Pollution Control District.

SIP (State Implementation Plan): A document prepared by each state describing existing air quality conditions and measures which will be taken to attain and maintain national ambient air quality standards. (see AQMP.)

SJVAPCD (San Joaquin Valley APCD): The San Joaquin Valley Air Pollution Control District.

SMAQMD (Sacramento Metro AQMD): The Sacramento Metropolitan Air Quality Management District.

Smog: A combination of smoke, ozone, hydrocarbons, nitrogen oxides, and other chemically reactive compounds which, under certain conditions of weather and sunlight, may result in a murky brown haze that causes adverse health effects. The primary source of smog in California is motor vehicles. (See Inspection and Maintenance Program.)

Smoke: A form of air pollution consisting primarily of particulate matter (i.e., particles). Other components of smoke include gaseous air pollutants such as hydrocarbons, oxides of nitrogen, and carbon monoxide. Sources of smoke may include fossil fuel combustion, agricultural burning, and other combustion processes.

SO_2 (Sulfur Dioxide): A strong smelling, colorless gas that is formed by the combustion of fossil fuels. Ocean-going vessels, which may use oil high in sulfur content, can be major sources of SO2. SO2 and other sulfur oxides contribute to ambient PM2.5. SO2 is also a criteria pollutant.

SSAB (Salton Sea Air Basin): Area comprised of a central portion of Riverside County (the Coachella Valley) and Imperial County. The Riverside County portion of the SSAB is bounded by the San Jacinto Mountains in the west and spans eastward up to the Palo Verde Valley.

Stationary Sources: Non-mobile sources such as power plants, refineries, and manufacturing facilities which emit air pollutants; can include area sources depending on context.

SULEV (Super Ultra Low Emission Vehicle): A vehicle emissions rating within California's LEV 1 and LEV 2 exhaust emission standards.

TAC (Toxic Air Contaminant): An air pollutant, identified in regulation by the CARB, which may cause or contribute to an increase in deaths or in serious illness, or which may pose a present or potential hazard to human health. TACs are considered under a different regulatory process (California Health and Safety Code Section 39650 et seq.) than pollutants subject to CAAQS. Health effects due to TACs may occur at extremely low levels, and it is typically difficult to identify levels of exposure which do not produce adverse health effects.

TCM (Transportation Control Measure): Under Health & Safety Code Section 40717, any control measure to reduce vehicle trips, vehicle use, vehicle miles traveled, vehicle idling, or traffic congestion for the purpose of reducing motor vehicle emissions. TCMs can include encouraging the use of carpools and mass transit. Under federal law, includes, but is not limited to those measures listed in CAA Section 108(f).

UFP (Ultrafine Particles): Particles with a diameter less than 0.1 mm (or 100 nm).

ULEV (Ultra Low Emission Vehicle): Vehicles with low emission ratings within California's LEV 1 or LEV 2 exhaust emission standards. The LEV 1 emission standards typically apply to cars from 1994–2003. The LEV 2 emission standards were adopted in 1998 and typically apply to cars from 2004–2010.

U.S. EPA (United States Environmental Protection Agency): The federal agency charged with setting policy and guidelines, and carrying out legal mandates for the protection of national interests in environmental resources.

VCAPCD (Ventura County APCD): The Ventura County Air Pollution Control District.

VMT (Vehicle Miles Traveled): Total vehicle miles traveled by all or a subset of mobile sources.

VOCs (Volatile Organic Compounds): Hydrocarbon compounds that exist in the ambient air. VOCs contribute to the formation of smog and/or may themselves be toxic. VOCs often have an odor, and some examples include gasoline, alcohol, and the solvents used in paints.

Zero Emission Technologies: Advanced technology or control equipment that generates zero end-use emissions from stationary or mobile source applications.

ZEV (Zero Emission Vehicle): A vehicle that produces no emissions from the on-board source of power.

Attachment C

Transcripts of the Regional Public Hearings

1. Transcript of the Regional Public Hearing for San Bernardino County on April 23, 2024
2. Summary of Public Comment Received at the Regional Public Hearing for Riverside County on April 24, 2024 (in lieu of transcript)
3. Transcript of the Regional Public Hearing for Orange County on April 25, 2024
4. Transcript of the Regional Public Hearing for Los Angeles County on May 1, 2024

Audio Transcription

South Coast AQMD

Regional Public Hearing

April 23, 2024

South Coast Air Basin Attainment Plan

for the 2012 Annual PM2.5 Standard

AUDIO TRANSCRIPTION

SOUTH COAST AQMD

REGIONAL PUBLIC HEARING FOR

SOUTH COAST AIR BASIN ATTAINMENT PLAN

FOR THE 2012 ANNUAL PM2.5 STANDARD

APRIL 23, 2024

Transcribed by:
Diana Sasseen
CSR No. 13456

Job No. 10141370

IAN MacMILLAN: Good morning, everybody. We'll get started in just a couple minutes here.

Okay. Good morning, everybody. My name is Ian MacMillan. I'm an assistant deputy executive officer in the Planning Division here at South Coast AQMD.

Before we get started today, I just want to go through some housekeeping remarks. This is something that we do before every meeting.

So again, good morning. Thank you for participating in the first of four regional public hearings for the PM2.5 Plan. This first meeting is focused on San Bernardino County. We're going to do our best to facilitate a smooth meeting with public participation. We have two formats for participation. The Zoom web application as well as teleconference.

Before we begin, I want to review some guidelines and general instructions for the meeting.

First, please silence your other communication devices such as your cell or desk phone. This will ensure that we're not hearing any feedback or causing interruption during the meeting. This meeting is being translated in Spanish. To watch or listen to this meeting in the language of your choice, click on the globe icon labeled "Interpretation" at the bottom of your screen. From there, select the language of your choice. After you select your language, if you hear both languages at the same time, please click "Mute original audio."

For those participating by phone, if you wish to hear the meeting in Spanish, please use the phone number and meeting I.D. number posted on the agenda. I'm going to pause right now for the translators to come in and repeat some of this relevant information.

(Translator speaking in Spanish.)

IAN MacMILLAN: Thank you.

Okay. So to continue, all participants on Zoom, except for panelists, will be placed on mute by the host. You will not be able to mute or unmute your line manually.

After each agenda item, I will ask if there are any clarifying questions, but we would like to reserve public comments for the end of the meeting after all presentations.

For those on Zoom, if you would like to make public comment on the Zoom screen, please click on the raise hand button. For those calling in by phone, you can dial star 9 to signal you would like to comment. Your name or part of your phone number will be called when it is your turn to comment, and the host will unmute your line automatically.

Please note you can hang up and/or leave the Zoom meeting at any time. As always, please treat others with courtesy, civility, and respect. Failure to do so can result in your mic being muted or you being dropped from the meeting.

Lastly, please be aware that this video conference meeting is being recorded. By participating in this meeting hosted by South Coast AQMD, you agree to authorize recording of audio and visual content presented during the live event and consent to subsequent use of the recording in the public domain by South Coast AQMD.

At this time I'll ask if there are any board members or board member consultants who would like to be placed on the panel, please raise your hand and staff will move you over.

And then finally, as far as introductions, I'll ask every presenter to introduce themselves as they -- right before they give their presentation.

With that, let's go ahead and get started. We have four presentations today to go through. So let's go ahead and get started.

The first one is going to be an overview of the PM2.5 Plan itself.

And, Eric, if you want to go ahead, take it away.

ERIC PRASKE: Thanks, Ian. I'll just wait for the slides to come up here.

All right. So I'm Eric Praske. I supervise the State Implementation Plan development here at South Coast AQMD. And as Ian mentioned, I'll be presenting a general overview of the South Coast Air Basin Attainment Plan for the 2012 Annual PM2.5 Standard.

Next slide, please.

So the South Coast Air Quality Management District is the local air pollution control agency responsible for the South Coast Air Basin and Coachella Valley. Our jurisdiction encompasses all of Orange County as well as portions of L.A., San Bernardino, and Riverside counties. We are the largest of 35 local air agencies in California as well as across the rest of the nation, and over 17 million residents are in our jurisdiction.

In terms of responsibilities, we regulate emissions primarily from stationary sources with limited authority over mobile sources. We develop and implement plans to meet national air quality standards. We permit and inspect over 28,000 businesses and administer over $100 million of incentive funding annually.

Next slide, please.

So as many of you are likely aware, our region has historically suffered from some of the worst air quality in the United States. Despite significant process that's been made over the past several decades, our residents still suffer from breathing the worst ozone in the nation and among the worst fine particulate matter, or PM2.5 levels in the nation.

Next slide, please.

In this presentation I'll be providing background on PM2.5 as well as air quality trends in the South Coast Air Basin. Next I'll discuss the proposed control strategy to meet the 2012 annual PM2.5 Standard. Then I'll be providing an overview on the attainment demonstration; essentially how we demonstrate the implementation of that control strategy will lead us into attainment. And then I'll be discussing -- wrapping up with next steps and the public process.

Next slide, please.

So PM2.5 is defined as particulate matter less than 2.5 microns in diameter. This is very small. It's so small in fact that you can't see PM2.5. By comparison, a fine grain of beach sand is about 90 microns in diameter, and the width of a human hair is about 50 to 70 microns. And because PM2.5 is so small, it is able to penetrate our body's defenses, end up deep in our lungs, and then eventually cross over into the bloodstream and even cross the blood-brain barrier.

So because it is able to penetrate our body's defenses, it is linked to a number of very serious health effects, including premature death, asthma, and lung cancer. There's even evidence to link it to metabolic diseases, cognitive diseases such as Alzheimer's disease. And because exposure to PM2.5 is so toxic, it actually drives the majority of public health costs due to air pollution in our region.

Next slide, please.

So as the title of the presentation suggested, I'll be discussing the 2012 Annual PM2.5 Standard. The level of that standard is 12 micrograms per cubic meter. The South Coast Air Basin is classified as a serious non-attainment area with an attainment date of December 2025. There are also a few other PM2.5 standards that I'll go over just briefly for information purposes.

So there's the 1997 annual standard at 15 micrograms per cubic meter. The South Coast Air Basin attains this standard; it actually has attained the standard since 2013. In addition, there's the 2006 24-hour standard at 35 micrograms per cubic meter. We're also in serious non-attainment of this standard with an attainment date of December of last year.

Some good news, we actually have reviewed the monitoring data from last year, and we believe that we met the standard by the attainment date.

And then some of you may have heard of a new PM2.5 Standard that EPA recently set; that's the 2024 annual PM2.5 Standard. They lowered the level from 12 down to 9 micrograms per cubic meter.

We currently don't have any planning requirements for this standard; however, we do expect that EPA will designate us as a non-attainment area in 2026. And as far as the attainment plan goes, we would likely be looking at an attainment date in 2036 with a potential to extend to 2041.

Next slide, please.

So this graph is showing the trend in PM2.5 levels in the South Coast Air Basin over the past two decades. As you can see, clearly significant progress has been made, however, there has been a bit of a leveling off over the past several years. Shown in the horizontal lines are the levels of the various annual PM2.5 standards. So there's the 1997 standard. Recall that I mentioned we're in attainment of this standard, so our levels are below that line. And then the subject of today's presentation, the 2012 standard, is shown in the orange line. And right now we're about 2 micrograms per cubic meter over that standard, 1.5 to 2 micrograms per cubic meter over.

And then there is the 2024 standard shown in the dashed yellow line. And as is evident from this graph, we have a significant ways to go to meet that standard. We'll encounter substantial challenges associated with that, as will many other air districts throughout California as well as across the rest of the nation.

Next slide, please.

Okay. So I'll be discussing the 2012 PM2.5 Standard in today's presentation.

For PM2.5 there are two classifications for non-attainment areas. There's moderate and serious. And the South Coast Air Basin is in serious non-attainment. Essentially what that means is it allows us the most amount of time to meet the standard.

The Coachella Valley is in attainment of the 2012 PM2.5 standards, so I won't be discussing Coachella Valley in this presentation.

Next slide.

So South Coast AQMD initially developed an attainment plan for the 2012 PM2.5 Standard as part of the 2016 Air Quality Management Plan. The 2016 AQMP was submitted to EPA in 2017; however, EPA did not act on that plan for several years, and during that time some new monitoring data at near-road monitors became available and eligible for consideration and attainment demonstration starting in 2020. So when EPA finally got around to acting on our plan in December of 2020, they requested a supplemental attainment demonstration for these near-road monitors.

Due to challenges and concerns associated with the near-road monitors, the submitted plan was withdrawn in 2023 to avoid potential disapproval by EPA. That withdrawal triggered the need to develop a revised attainment plan, and that plan needs to be submitted to EPA before December of this year to avoid stationary source permitting sanctions.

Next slide, please.

So the proposed control strategy to attain the 2012 PM2.5 Standard is based on the continued implementation of the control measures to reduce ozone that were adopted as part of the 2022 Air Quality Management Plan. In addition we are required to satisfy EPA stringency requirements, and so there are some limited new control measures to reduce direct PM2.5 as well as ammonia emissions, and those are included in this plan.

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So the measures from the 2022 AQMP, just a broad overview of them, so we have the stationary source measures which seek to transition to zero emission wherever feasible while allowing the lowest alternative emission source technology wherever zero emission is infeasible. We are also proposing to include our mobile source incentive measures and facility-based mobile source measures. In the next presentation you'll be hearing from CARB about the specific measures that they'll be continuing to implement as part of the State SIP Strategy.

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So I mentioned EPA stringency requirements. Chief among those is that of Most Stringent Measures, or MSM, the reason we need to implement MSM in this plan is because we are requesting a five-year extension of the attainment date. So recall from earlier that the current statutory serious attainment date is set December 2025. We're requesting a five-year extension as part of this plan to demonstrate attainment by 2030.

So MSM is a requirement that we demonstrate that our rules are at least as stringent as those in any other air district or state. And so as part of the MSM analysis we developed four measures that will need to be implemented by December 2029.

The first measure involves Rule 445. This is our Check Before You Burn program. We are proposing to remove the low income exemption while retaining the sole source of heat exemption.

Next is -- our next MSM is Rule 1138. This is our commercial cooking rule. We are proposing to lower the threshold to require catalytic oxidizers for chain-driven charbroilers.

The third measure involves Rule 223. This is a permitting rule for large, contained animal facilities, and we are proposing to lower the thresholds for dairy and poultry farms to match the thresholds in San Joaquin Valley.

The fourth measure is to require composting of chipped and ground green waste prior to land application.

Next slide, please.

Okay. So now I'll segue into the attainment demonstration component of this presentation, but first a little bit of background or what an attainment demonstration is and how we conduct the attainment demonstration.

So we begin by developing a comprehensive emissions inventory of all stationary and mobile sources in our jurisdiction. We then feed those emissions into our air quality model which is able to simulate PM2.5 concentrations. And so we run this process for a base year. In this case the base year is 2018.

Then we develop a control strategy for our attainment year. So that would be 2030 in the case of this plan. And so we apply those controls to select sources in the emissions inventory, and then we rerun the air quality model with those reduced emissions and we look at essentially the change in PM2.5 levels from the base to the future year and we use that ratio and apply it to the base year PM2.5 levels to project future air quality.

Next slide, please.

So here you can see that our control strategy is calling for a 54 percent reduction in NOx emissions from 2018 to our 2030 attainment year. In addition, we will be reducing PM2.5 emissions by about 3 tons per year -- 3 tons per day between 2018 and 2030. And so when we run our air quality model with these 2030 attainment scenario emissions, we are able to demonstrate attainment at all locations across the South Coast Air Basin.

Next slide, please.

So here we're seeing the base year, 2018 design values at monitors that exceed the 2012 annual PM2.5

Standard. The highest standard is on -- the highest measured design value or level of PM2.5 is at the Ontario near-road monitor at 14 micrograms per cubic meter. This is actually -- this is a measured design value.

And then recall that we apply the ratio from the air quality model of the future to the base year projected air quality, and then we're able to determine and apply that ratio to the level to determine whether we'll be in attainment of the standard. And so when we do that we will actually come out with a design value of 11.6 micrograms per cubic meter at the Ontario near-road monitor well in attainment of the 2012 PM2.5 Standard.

The next highest site in the 2018 base year is Mira Loma at 13.5 micrograms per cubic meter. Mira Loma is expected to be in attainment by 2030 with a design value at 12 micrograms per cubic meter.

So shown here are the other monitors that exceeded the standard in the base year. So Long Beach near road, Compton, and Riverside. And all of these monitors are expected to be in attainment by 2030.

Next slide, please.

So we began the process to develop this plan in spring of last year when we convened our advisor groups. Those advisor groups met periodically between spring and fall. We then continued to develop the draft plan, and we actually just released the draft plan on March 22nd for public review and comment. We're currently in the public review stage for the plan, and that's why we're hold our regional public hearings. Within another week or so we'll be releasing the Draft Socioeconomic Impact Assessment.

And then the public hearing for board consideration of the PM2.5 Plan will be held on June 7th. Should the board choose to adopt the PM2.5 Plan, it will be submitted to CARB for approval and subsequent transmittal to EPA for incorporation into the State Implementation Plan.

Next slide.

Okay. So there's -- recall there's the new 2024 annual PM2.5 Standard in which EPA lowered the level from 12 to 9 micrograms per cubic meter. We are expecting that the South Coast Air Basin will be designated as a non-attainment area in 2026, and we will be looking at an attainment year of 2036 with the potential to request an extension to 2041. That plan will need to be adopted and submitted to EPA by August of 2027.

We do know that the AQMP NOx strategy, the 2022 AQMP NOx strategy alone will not be sufficient to meet this standard, and achieving the new standard will require substantial additional controls, especially on direct PM2.5 sources.

Next slide, please.

So as Ian mentioned, we have four regional public hearings. We're currently holding the first hearing for San Bernardino County. Tomorrow we will be switching to an in-person format at CARB headquarters in Riverside. Then we will be going back to the virtual format for Orange County on Thursday. And next Wednesday we will be at the Dollarhide Community Center in Compton for the L.A. County public hearing.

Next slide, please.

All supporting documents as well as this presentation and PM2.5 Plan chapters and appendices are available on our web site. You can also point your camera here at the QR code to be taken directly to that site.

Next slide, please.

So the written comment deadline for the PM2.5 Plan is Tuesday, May 7th. You can submit all written comments via e-mail to AQMPteam@AQMD.gov. If you have specific inquiries related to PM2.5 Plan, please contact Dr. Sang-Mi Lee, and for inquiries specific to CEQA and socioeconomic impacts, please contact Barbara Radlein.

Next slide, please.

So the PM2.5 Plan in summary, the PM2.5 Plan has been developed to demonstrate attainment of the 2012 PM2.5 Standard in the South Coast Air Basin by 2030. The PM2.5 Plan is based on continued implementation of the 2022 AQMP NOx strategy with limited additional controls to satisfy EPA stringency requirements. The public hearing will be on June 7th. And obviously we'll need to be developing a new plan for the -- to attain the 2024 PM2.5 Standard.

Next slide, please.

All right. So we encourage you to sign up for our newsletter at the web site shown here, and make sure to tic the box for AQMP/SIP interested parties.

That concludes my presentation, and I'll hand it back over to Ian.

IAN MacMILLAN: Hey there, everybody. I apologize for that. My Zoom just quit. I apologize. Hopefully, can everybody hear me?

ERIC PRASKE: We can hear you, Ian.

IAN MacMILLAN: Okay. I'm sorry about that.

So the question I think was from Mary V. asking about San Bernardino data. We did show some data on one of the slides, and here -- no, I think we were just showing some of the key sites that are important for this PM2.5 Plan. But within the plan itself there's a lot more information about all the sites that we collect PM2.5 data as well as on our web site. So we can provide some more information on that. Feel free to reach out to us if there are any further questions there.

For now, we're going to go ahead and move on to our next presentation. This is going to be from CARB.

And so, Ariel, if you're available, feel free to introduce yourself and take it away.

ARIEL FIDELDY: Thanks, Ian.

Hi, everybody. Yeah, while we're bring up the slides, I'll just say my name is Ariel Fideldy. I am a manager at the California Air Resources Board over the team that works really closely with South Coast on developing SIPs and the control strategies that are needed. At the state level, my team does lead our development, what is known as the State SIP Strategy. So I will be walking through today, once we get the slides up, kind of the CARB side of the control strategy that's going into this PM2.5 Plan.

All right. Why don't you go ahead, next slide, please.

Thank you.

So like AQMD, CARB's reductions in the PM2.5

Plan are based on measures in our 2022 State SIP Strategy which was focused on the 70 parts per billion ozone standard. This strategy that we developed over a few years through a robust public process, it identified the level of action needed to meet air quality standards and improve public health. It was, you know, really a document that identified a bunch of new control measures from CARB that are going to be driving the pace and scale of our rule makings at CARB through the end of this decade really.

Our board approved the state measure commitments that were in that document, the State SIP Strategy, in September of 2022. And this strategy is what we've utilized for the PM plan. We've basically taken these measures, estimated the emission reductions in 2030 that can help support attainment of the PM2.5 Standard.

Next slide.

This figure here identifies the list of these measures that CARB is pursuing, you know, included in the State SIP Strategy, but these are the ones specifically that are going to support attainment of the PM2.5 Standard in the South Coast. Some of the measures on this slide, they have already been adopted as regulations by the CARB board. Those are the ones that are identified with the asterisk on the slide here.

Specifically I want to mention our Advanced Clean Fleets and in use locomotive regulations. Those programs were both adopted last year and they were really monumental regulation, of course, first of their kind. Our Advanced Clean Fleets regulation, you know, is going to require fleets, heavy duty truck fleets specifically to turn over to zero emission vehicles over the next decade. And the in use locomotive regulation sets in use requirements, but it uses mechanisms under our available authority to accelerate the adoption of advanced cleaner locomotive technologies, including zero emission locomotives.

There are many other regulations listed here. These measures that are currently undergoing their regulatory process, so they're under development right now, including another thing I wanted to mention specifically, our zero emission standards for space and water heaters, which are listed under the other box here on this slide.

We are also pursuing a number of off road equipment measures, including setting a new standard, a tier 5 standard for off road equipment as well as zero emission requirements for certain manufacturers and for other sources like cargo handling equipment at ports and things like that that are really going to contribute to reductions in the South Coast.

We are also continuing to pursue additional measures beyond our Advanced Clean Fleets and our prior Advanced Clean Trucks program for heavy duty trucks, heavy duty vehicles on road with our zero emission truck measure which we'll be developing over the next few years.

Next slide.

So this is that same list of measures you just saw, but it's showing their currently planned schedules for adoption and the beginning of their implementation. So the measures that have been adopted already, they're shown with purple stars. And the ones that are still under development, we have the planned adoption schedules shown in gold stars here on this slide. And then the dark blue box on each one of these lines here represents the implementation begins -- well, the time line for which we expect implementation to begin for the program.

Next slide.

So this table shows again that suite of measures, but these are the ones specifically that have already been adopted and the emission reductions we have quantified that are being -- contributing to the attainment demonstration for this PM plan. And these -- I just want to mention that this does include measures from this 2022 State SIP Strategy which, of course, the bulk of the measures there, but there is also one or two recently adopted measures from the -- that were originally commitments in our 2016 State SIP Strategy a few years back. That's also included in this list. And so we have the NOx, the direct PM2.5, and the ammonia emission reductions quantified here.

These reductions, you know, these programs have all, as I mentioned, been adopted, but they are going to provide significant emission reductions in the South Coast. And they've not yet been accounted for in the baseline emissions inventory, so we're quantifying their emission reductions here and factoring those into an adjusted baseline that is a part of the baseline in the control strategy for the PM plan.

Next slide.

And this table specifically shows the suite of measures that are remaining and still have yet to be adopted by the CARB board as regulations and programs for both the 2016 and the 2022 State SIP Strategies. And then again, their corresponding NOx, direct, PM2.5, and ammonia emission reductions.

And so these are, of course, everything that

CARB still has on the docket that is going to support attainment in 2030 of the PM2.5 Standard, in addition, more, you know, really key programs as I mentioned earlier. And the reductions you see at the total at the bottom there, that 9.1 and the corresponding PM2.5 and ammonia reductions, those represent what CARB will be committing to for our emission reductions commitment to support attainment in 2030.

Next slide.

So in addition to evaluating the state SIP measures to support attainment, as Eric discussed, we also do have to analyze our control programs, our entire control programs to meet the most stringent measure, or MSM control requirements for the standard. Eric touched on this, but essentially, you know, this MSM is a level of stringency that exceeds both the, you know, other stringencies, reasonably available control measures, or RACM, and best available control measures known as BACM. And this is required for the plan because we're requesting the five-year extension of the attainment date.

As you may know, CARB has a unique authority under the federal Clean Air Act no other state has to set standards for mobile sources that are more stringent than the federal government. So we've over our history, you know, maximized utility of this unique authority such that our mobile control programs go far beyond other states and even national programs. So, you know, we have been able to demonstrate this in the past and EPA has approved our programs in the past as MSMs.

So we have, you know, updated this analysis consistent with our current programs, looking at all of our control measures being implemented by CARB in California compared to other jurisdictions, states, et cetera, talked about, also looked at our, you know, measures in the State SIP Strategy. And, you know, each mobile source category, as you can see here on this slide, is broken into a few, you know, subcategories, vehicle engine standards, in use control of the fuels. And our conclusion from this analysis is that CARB's programs, our current control programs for each source category does meet MSM requirements. So this is just kind of a summary of that here.

And I think that's the end of my slide deck.

IAN MacMILLAN: Great. Thank you very much, Ariel. Appreciate all the work that CARB does with us on these plans, it's always fun, and thanks for the presentation there too.

I do see we have a couple of other questions that came through from your presentation. I think that they might have actually been for the prior presentation.

So one question, I'm just going to go ahead and read it here from Mary V. Asking again -- asking again about San Bernardino and Muscoy data, and as they are one of the first communities selected for A B 617, just asking that we include that data in future presentations.

We'll take that into account and look at that for future presentations that are not the regional public hearings because the slides are already out, but we'll look at that for future meetings.

And then we have another question here as well from Bobby Joe. And I'm going to ask Eric to answer this briefly. I'll go ahead and just read it out.

With the vast expansion of new logistic centers built in Ontario, Eastville, Jurupa Valley, Fontana, Riverside and San Bernardino, how is AQMD and CARB accounting for the fact that none of these newer facilities are operating, or if they are, likely not yet at full capacity?

Eric, you want to touch on this briefly, how we accommodate and consider growth in the AQMP?

ERIC PRASKE: Yeah. Thanks, Ian.

So we rely on Southern California Association of Governments growth projections from their regional transportation plan sustainable community strategy. So we actually received those growth factors from SCAG and incorporate those into our modeling and emissions projections.

IAN MacMILLAN: Great. Thank you.

And that does include a lot of new warehousing, for example, in the Inland Empire as well as part of their land use planning.

Okay. So I think we're going to go ahead and move on to our next presentation. This will be our third presentation, and it's going to be an overview, just kind of an introductory overview of the socioeconomic impact assessment that will be conducted as part of the PM2.5 planning effort. So I'm going to ask Tony to go ahead and give the presentation on this third one.

TONY TIAN: Good morning, everyone. I'm Tony Tian, a program supervisor in South Coast AQMD. I've seen the socioeconomic impact assessment. Now let's begin our -- the slide one.

So next slide, please.

So for this presentation we'll cover several items. So first we'll cover cost estimates and the macroeconomic impacts of this PM2.5 Plan. So (inaudible) health benefit analysis.

So second, so for the health benefit analysis we will discuss some methodologies for quantifying the health benefits, specific health impacts to be considered in the analysis.

So finally we'll present next action plans and steps and staff contacts in case you have any questions.

So next slide, please.

So as we know, because of its small size, so PM2.5 tends to penetrate new gases exchange regions of the lung and cause many health risks, including respiratory and cardiovascular diseases, asthma exacerbation, and premature death.

So this PM2.5 Plan aims to lower PM2.5 emissions in South Coast Air Basin and thus achieve annual PM2.5 national ambient air quality standards by December 31st, 2030. And the health benefits brought about by control measures in the PM2.5 Plan will be quantified in the health benefits analysis.

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So note that the costs, the macroeconomic impacts and the health benefits control measures in PM2.5 Plan has already been assessed in prior 2016 and 2022 AQMPs. So for this PM2.5 Plan no additional costs or impacts are anticipated, and we're not prepare new modified socioeconomic impact assessment. However, we're due to refine the (inaudible) of the health benefits of the PM2.5 reductions, and the results of analysis will be presented in appendix to the PM2.5 Plan.

So next slide, please.

So basically we use environmental benefits mapping and analysis program software developed by EPA to quantify the health benefits of this PM2.5 Plan. So specifically we use three input modules to do the quantification.

So first air quality change. So staff will simulate air quality change by 2030 in South Coast Air Basin so (inaudible) PM2.5 to provide emission reductions. So secondly, population and incidences data, we obtain projections (inaudible) data from (inaudible) including California Department of Finance, U.S. Centers for Disease Control and Prevention, and California Department Healthcare Access Commission.

So lastly, concentration response functions. So those function is to establish quantitative links between PM2.5 exposure and the various health effects. So staff rely on the functions from the most reliable and imputable peer-reviewed academic research to quantify the health benefits of the PM2.5 reductions.

So next slide, please.

So we consider both long-term and short-term effects of PM2.5 reductions.

So long-term benefits include premature deaths avoided, decreased asthma onset and lung cancer, among others. So examples of short-term benefits include reduced emergency department visits, reduced hospital admissions. So less (inaudible) days and workless days.

So next slide, please.

So (inaudible) health benefit assessment will be released on or before May 7th, 2024, as an appendix to the PM2.5 Plan. So in case you should have any questions with regard to health benefits analysis of this PM2.5 Plan, so we provide staff contacts in the box of the slide (inaudible) appreciate it.

So that concludes my presentation. Thank you.

IAN MacMILLAN: Great. Thank you so much, Tony. Appreciate that.

I do see a question came in in the Q and A while you were speaking, but it was actually I think again for the previous presentation.

So I'm going to go ahead and read that one out and I'm going to ask Ariel if maybe she can take a quick response to this question.

So question came in from Fabian V. If the EPA does not approve the in use locomotive rule, how will it affect these efforts?

ARIEL FIDELDY: Thanks, Ian, and thanks, Fabian, for the question.

You know, CARB is working really closely as we always do with U.S. EPA at the regional and at the, you know, headquarters level to ensure that our authorization waivers, all of them are going to be approved, but especially, yes, for the in use locomotive regulation. And we do anticipate that happening and we do anticipate them approving the rule as well.

But by the form of our commitments, for any strategy really, you know, our commitments are made at the tonnage level for the total emissions reductions needed. So if a specific rule, you know, doesn't go forward or is not approved for some reason or another, we always -- our commitment is to meet the total emission reductions that we commit to in the plan. So we will need to go forth and basically identify other strategies, whether that is from locomotives or some other source category that we can still control to ensure we get those emission reductions. We would essentially always be identifying other strategies, but we're continuing to work really closely with U.S. EPA, and we do anticipate the authorization and the rule being approved.

IAN MacMILLAN: Great. Thanks so much, Ariel.

And just from the South Coast AQMD perspective, I think we share the same perspective. It's really critical that all three agencies take action when it comes to meeting air quality standards. The local government, ourselves, state government CARB, and the federal government EPA, it's really critical that all three do their part on emission sources within their authority. So we fully support CARB's authorization request on this.

So let's go ahead and keep moving in this presentation. I think we're on to our fourth presentation today, and we wanted to go over briefly the California Environmental Quality Act, CEQA analysis PM2.5 Plan, at least the draft, some draft results so far.

And, Jivar, if you wanted to come on and introduce yourself and cover this last topic.

JIVAR AFSHAR: Thank you, Ian.

Hello, everyone. My name is Jivar Afshar. I'm an air quality specialist here at South Coast AQMD. And I will be going over the CEQA portion of this presentation. Thank you.

So CEQA is a California state law that requires the state and local agencies to identify the significant environmental impacts of a project and to avoid or mitigate those impacts if feasible. But its main purpose is to disclose to public and decision makers the potential environmental effects of these projects.

Next slide, please.

So CEQA applies to PM2.5 Plan. It also applies to prior air quality management plans or AQMPs. PM2.5 Plan contains a series of control measures, and the environmental impacts of majority of these control measures have been previously evaluated and certified in Final Program EIRs for 2016 and 2022 AQMPs as you can see in the bottom in the little figure.

Next slide, please.

To be more specific, the PM2.5 Plan contains 38 control measures, 9 of which are carried over from 2016 AQMP as you can see on the left, the orange box, and 27 of them from 2022 AQMP on the right, the green box. This means that 36 of the control measures are retained from previously adopted CEQA documents. This leaves us with two new control measures in PM2.5 Plan in the middle purpose box.

So one of these control measures focuses on reducing emissions from chain-driven charbroilers, as Eric mentioned at the beginning of the presentation, by potentially retrofitting them with catalytic oxidizers and also making future amendments to Rule 1138, which is control of emissions from restaurants' operations.

The second new control measure in the PM2.5 Plan applies to emission reductions on unpaved road dust. And this specific control measures only involves administrative actions and will result in no physical alterations.

I will take a deeper dive in explaining these two control measures in the future slides, however, if you would to take a look at a list of previously adopted control measures, you can refer to Table 8.1 in Appendix 8 of PM2.5 Plan.

Next slide, please.

So the purpose of CEQA is to evaluate any alterations made to control measures, identifying new or modified environmental impacts, and also determine whether a new CEQA document needs to be prepared or not.

Next slide, please.

So this is the first new control measure out of the two that I am going to talk about. This specific control measure focuses on further reducing emissions from commercial cooking. And it expands upon previous control measure that was outlined in 2016 AQMP.

Back in 2016 the AQMP focused and targeted under-fired charbroilers and offered multiple control options. However, in PM2.5 Plan we shift our focus to emission reductions from chain-driven charbroilers equipped with catalytic oxidizers.

It's noteworthy to mention that this enhancement in utilization on catalytic oxidizers offer easy installation with minimal maintenance requirements. And as a component of a new measure, these catalytic oxidizers were previously assessed in final subsequent assessment for Rule 1138.

So these changes will result in improving operational air quality impacts by greater reductions in PM2.5 emissions. And the overall impacts are expected to either mirror or be less severe than those previously analyzed for under-fired charbroilers in our previous CEQA documents.

Next slide, please.

This is the second control measure that I talked about earlier, which is emission reductions from unpaved road dust, which proposes to create an inventory of unpaved roads and parking lots within the jurisdiction of South Coast AQMD. And as I mentioned previously, it's an administrative exercise, therefore, it has no environmental impacts.

Next slide, please.

Apart from the 2000 new control measures discussed earlier, the remaining control measures align with those adopted in 2016 and 2022 AQMP and are not expected to yield in additional changes in operational air quality benefits or environmental impacts. And because of that, the analysis of PM2.5 Plan does not change the conclusions from our previous CEQA documents.

Next slide, please.

So to conclude, the control measures in PM2.5 Plan, new and previously analyzed, reduce PM2.5 emissions and result in no additional environmental impacts. And since the PM2.5 Plan does not present substantial new information in comparison to what was analyzed in our previously adopted CEQA documents and the effects of PM2.5 Plan have sufficiently been outlined in previous CEQA documents, this plan qualifies as a later activity within the scope of previously approved CEQA documents under CEQA guidelines Section 15168(c).

If you are interested, you can access the detailed CEQA analysis in Appendix 8 of the PM2.5 Plan.

This concludes my presentation. And I will hand it over to Ian.

IAN MacMILLAN: Great. Thank you very much, Jivar, I really appreciate the work on the CEQA and then the presentation here.

I don't see any questions in the Q and A box right now. I think we've gotten everything that's been typed in so far. I think we're at the part of the agenda now where we'd like to open it up for any public comment, remaining questions. And this would be on any of the four presentations, whether it's the AQMP itself, CARB's measures, the socioeconomic impact assessment, or the CEQA analysis.

If anybody has any questions, again, you can raise your hand at the bottom of the screen, click that little button. If you're on the phone, press star 9. And we can just take any general comment or any questions if you'd like. And I'll pause right here in case anyone wants to click that.

All right. Not seeing any, we are looking to bring this to our board in June for their consideration. We do have three more regional public hearings that we're going to be holding this week and next week as well to go over the same material, but really, you know, trying to focus on each individual county, but, you know, anybody is free to attend any of those regional public hearings, provide some feedback there.

If you also have any feedback you'd like to provide or any questions, feel free to reach out to staff directly, and we're more than happy to engage with whatever stakeholders on this.

So I'm going to give one last call. Any more questions or comments?

Not seeing any. So I'll give you a thank you to all the stakeholders for joining us today, really do appreciate it. Thank you to all the staff who participated and prepared materials for today. And I think with that we're going to conclude this meeting today and we'll pick it up at the next hearing tomorrow.

All right. Thank you very much, everybody. Have a great day.

(End of recording.)

REPORTER'S CERTIFICATE

I, the undersigned, a Certified Shorthand Reporter of the State of California, do hereby certify:

That the foregoing electronically-recorded proceedings were transcribed by me to the best of my ability.

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Dated: 05/07/2024

Diana Sasseen

Diana Sasseen
CSR No. 13456

Summary of Public Comment Received at the PM2.5 Plan Regional Public Hearing for Riverside County April 24, 2024

The audio recording from this meeting was unsuitable for transcription. As such, a summary of public comment is provided below in lieu of the transcript.

Stacey Ramos, CCAEJ
Comment: Large growth in warehouses has resulted in an increase in truck trips to the Inland Empire. How does the air quality modeling account for this growth?
Response: Growth factors, including those for the logistics industry, are provided by the Southern California Association of Governments and these factors are used to project emissions in the future.

Oskar Zambrano
Comment: City councils approve development projects (resulting in businesses such as warehouses and marijuana facilities) which seem to bypass the CEQA process. Where can I find more information on a specific CEQA assessment?
Response: Land use decisions for development projects are subject to CEQA and are made by the local planning authority/government agency overseeing the approvals of these projects. To find out what CEQA determination was made for a specific project, please contact the local planning authority/government agency. In addition, the State Clearinghouse of the Governor's Office of Planning and Research at maintains a database of CEQA documents for a wide variety of projects throughout California which is accessible from the following website at: https://ceqanet.opr.ca.gov.

Comment: Which agency has land use authority?
Response: While the South Coast AQMD does not have land use authority, most local city and county planning departments are land use agencies with authority over development projects and land use decisions.

Comment: Which agency is responsible for enforcing mitigation measures such as limiting truck idling?
Response: A CEQA document associated with a land use development project may have adopted mitigation measures which are enforced through a Mitigation, Monitoring and Reporting Plan that will specify which government agency is responsible for enforcing the various mitigation measures. Truck idling is jointly enforced by CARB and South Coast AQMD.

Comment: Can truck traffic be curtailed?
Response: Most local city and county planning departments operate pursuant to a General Plan which contains a transportation element that sets the policy foundation for traffic, transportation and goods movement. In addition, while the South Coast AQMD does not have authority to limit truck traffic, warehouses that attract truck traffic are subject to South Coast AQMD's Rule 2305 – Warehouse Indirect Source Rule. Specifically, Rule 2305 requires owners and operators of applicable warehouses to take actions to reduce emissions or exposure to air pollution.

Comment: What is the timeframe for short-term and long-term health effects of PM2.5?
Response: Short-term health effects occur over a 24-hour period, while long-term effects are experienced over a year or more.

Audio Transcription

South Coast AQMD

Regional Public Hearing

April 25, 2024

South Coast Air Basin Attainment Plan

for the 2012 Annual PM2.5 Standard

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AUDIO TRANSCRIPTION

SOUTH COAST AQMD

REGIONAL PUBLIC HEARING FOR

SOUTH COAST AIR BASIN ATTAINMENT PLAN

FOR THE 2012 ANNUAL PM2.5 STANDARD

APRIL 25, 2024

REQUESTED PORTIONS:

34:25 - 36:26

50:00 - 51:03

Transcribed by:
Diana Sasseen
CSR No. 13456

Job No. 10141371

(Begin 34:25 - 36:26.)

IAN MacMILLAN: I want to open it up again in case there's any questions or comments on this agenda item, on CARB's measures. Feel free to raise your hand.

I do see we have one hand raised. Laura Hayter, do you have a question or comment?

LAURA HAYTER: Yes. Does the oil industry have to have the most strict standards also? And what's being done -- what are the emissions from the various stationary oil facilities and pipelines?

IAM MacMILLAN: So I can maybe take the first crack at this, and I'll see if any of my staff also wants to weigh in.

So all controls or all sources need to have Most Stringent Measures in place. It doesn't mean that we aren't going to continue to regulate and continue to find new reductions but we do need to demonstrate Most Stringent Measures across all categories I believe.

And I see Eric has popped on. I'm not sure if -- any clarification needed here?

ERIC PRASKE: I think you covered it well, Ian.

Yeah, Most Stringent Measures does not exempt any category. We have to look at everything under our authority.

IAM MacMILLAN: Great. And then you also have a question about the level of emissions in that sector.

We do have in the PM2.5 Plan itself we have a lot more information about emission inventory for all of the different sectors of emissions. So feel free to go ahead an look in there. And if you have questions, feel free to reach out, and we can help maybe point you to where you can find more specific information, but we have a lot of detailed information in that plan itself.

Did that answer your question, Laura?

LAURA HAYTER: Thanks. Yeah.

IAM MacMILLAN: Great. Thank you for that question.

(End of requested portion.)

(Begin 50:00 to 51:03.)

IAM MacMILLAN: I do see actually one hand just came up. Laura Hayter.

LAURA HAYTER: The carbon dioxide pipeline, has there been a leak, and did that affect the emissions that much? What effect did it have in the total carbon emissions?

IAM MacMILLAN: I'm not quite sure of the question you're asking, but it sounds like you're asking about a specific incident.

It might be better to take some of these questions off line and we can make sure that we can try to direct you to the right resources for information you're looking for.

We had contact information here in the presentation. I would -- maybe let's start with either Eric or Sing-Mi. Their contact information is in the slides, and maybe reach out to them. We an try to direct you to the right resources. Does that okay?

IAN MacMILLAN: Great. Super.

(End of requested portion.)

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I, the undersigned, a Certified Shorthand Reporter of the State of California, do hereby certify:

That the foregoing electronically-recorded proceedings were transcribed by me to the best of my ability.

I further certify I am neither financially interested in the action nor a relative or employee of any attorney or party to this action.

IN WITNESS WHEREOF, I have this date subscribed my name.

Dated: 05/07/2024

Diana Sasseen

Diana Sasseen
CSR No. 13456

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Audio Transcription

South Coast AQMD

Regional Public Hearing

May 01, 2024

South Coast Air Basin Attainment Plan

for the 2012 Annual PM2.5 Standard

AUDIO TRANSCRIPTION

SOUTH COAST AQMD

REGIONAL PUBLIC HEARING FOR

SOUTH COAST AIR BASIN ATTAINMENT PLAN

FOR THE 2012 ANNUAL PM2.5 STANDARD

MAY 1, 2024

REQUESTED PORTIONS:

4:12 - 4:21

12:50 - 15:57

22:37 - 27:57

31:12 - 34:35

37:53 - 38:23

40:09 - 53:20

Transcribed by:
Diana Sasseen
CSR No. 13456

Job No. 10141761

(Begin 4:12-4:21).

UNIDENTIFIED SPEAKER: Was that a voluntary designation or --

ERIC PRASKE: We requested a reclassification to serious.

UNIDENTIFIED SPEAKER: Okay. Got it. Okay.

(Begin 12:50-15:57)

UNIDENTIFIED SPEAKER: So I'm curious how this plan --

UNIDENTIFIED SPEAKER: Can you be sure to speak to the microphone, because we are required to record this.

UNIDENTIFIED SPEAKER: Gotcha.

UNIDENTIFIED SPEAKER: Thank you.

UNIDENTIFIED SPEAKER: So I'm curious as far as how this plan relates to the kind of brewing EPA action to basically reject the South Coast -- I think it was the PM plan. So I was wondering if you could go -- or basically I know that US EPA is looking at possibly rejecting a South Coast plan. Could you maybe talk about how this plan interacts with that?

ERIC PRASKE: So I think you're referring to the 1997 ozone standard --

UNIDENTIFIED SPEAKER: Okay. Gotcha.

ERIC PRASKE: -- contingency measure plan, right, that was submitted in 2019?

UNIDENTIFIED SPEAKER: Yeah. Okay. Yeah, I just wanted to make sure.

ERIC PRASKE: Yeah. So this is a different standard, it's for PM2.5 Standard, so it's on a completely separate track from that plan.

UNIDENTIFIED SPEAKER: Okay. Gotcha.

UNIDENTIFIED SPEAKER: On the monitoring data here which is from 2018 you mentioned?

ERIC PRASKE: Yep. The monitoring data is measured PM2.5 level in 2018, yes.

UNIDENTIFIED SPEAKER: 2016 through 2019 average.

UNIDENTIFIED SPEAKER: Okay. So it was averaged through multiple, okay, so it wasn't just one specific year.

UNIDENTIFIED SPEAKER: No, it was more year average.

UNIDENTIFIED SPEAKER: Okay. Okay. And these current stations as far as we know.

ERIC PRASKE: Yeah.

UNIDENTIFIED SPEAKER: Yeah, we still continue to monitor at all of the stations, it's just I think we were (inaudible) again, you have a base here that you build off of on the plan (inaudible) monitoring data (inaudible), but we continue to collect monitoring data.

UNIDENTIFIED SPEAKER: Okay. Very good.

UNIDENTIFIED SPEAKER: I know on that section that (inaudible) was just pointing out, that there is an exemption for exceptional events which, you know, obviously we know wildfires, 4th of July, things like that. Do we have a detailing of how many exceptional events there are in a particular year?

ERIC PRASKE: So -- go ahead.

UNIDENTIFIED SPEAKER: So it varies every year, but then usually we flag the 4th of July, fireworks, and then the New Year fireworks. And there are a few days, maybe wildfire effects here and there, but then when it comes to annual standards, it's limited numbers. But it changes year to year.

UNIDENTIFIED SPEAKER: What's the limit?

UNIDENTIFIED SPEAKER: Limited numbers. Not many days going into it.

UNIDENTIFIED SPEAKER: Okay.

UNIDENTIFIED SPEAKER: We can check how many days actually reflected, but it's very few.

UNIDENTIFIED SPEAKER: Okay.

UNIDENTIFIED SPEAKER: These two events are always.

UNIDENTIFIED SPEAKER: Yeah, 4th of July and New Years is kind of well known, so sometimes the fireworks show in the neighborhood is better than the professional ones, so --

UNIDENTIFIED SPEAKER: That's right. You can smell it too.

UNIDENTIFIED SPEAKER: Monitoring was difficult during the 4th of July for (inaudible), I'll tell you that.

UNIDENTIFIED SPEAKER: Those heavy metals. It's nasty.

UNIDENTIFIED SPEAKER: I tell you those labs came back; what's going on? Oh, fireworks. Yeah. Thank you.

(Begin 22:37-27:57)

UNIDENTIFIED SPEAKER: CARB.

SYLVIA: Yes.

UNIDENTIFIED SPEAKER: In state level, I mean we're looking at other air districts, so CARB's umbrella covers all the air districts.

SYLVIA: Right. Right.

UNIDENTIFIED SPEAKER: So looking at other best practices with them, is that incorporated in what they've -- in their attainments, or are they all -- from the CARB perspective, (inaudible) air district.

SYLVIA: Well, when we're looking at -- so I mean, you know, AQMD did identify -- they looked at other districts, but for mobile sources, I mean CARB is the only one in the state that can regulate mobile sources. And so we -- but we did look at other states. We looked at other states that had different idling requirements or different -- other types of measures and things like that. And, you know, we did come to the conclusion that we did, you know, meet these requirements. You know, other states do have the opportunity to, you know, adopt our regulations.

UNIDENTIFIED SPEAKER: But I think you also with all of your measures that you report here --

SYLVIA: Yeah.

UNIDENTIFIED SPEAKER: -- you're looking at how would that affect South Coast specifically --

SYLVIA: Yeah, I mean --

UNIDENTIFIED SPEAKER: -- and when you analyze San Joaquin and you (inaudible) for them.

SYLVIA: I mean we would --

UNIDENTIFIED SPEAKER: Same regulation, but it affects them differently, right?

SYLVIA: Well, I mean they have different sources. And so when you're doing something like Most Stringent Measure, like we're looking at what the sources are in the South Coast, and we had some difference -- like probably the biggest difference between the two, you know, because San Joaquin is also doing something right now, was for South Coast we looked at OGV, you know, that's a big source, that's not a source in San Joaquin for San Joaquin, we looked at (inaudible) tractors. That's not really a big source (inaudible).

UNIDENTIFIED SPEAKER: Okay.

UNIDENTIFIED SPEAKER: So looking at other states though, if they're -- other states that don't have, say, the -- I would say -- here our state reference in controlling the measures in comparison --

SYLVIA: Right.

UNIDENTIFIED SPEAKER: -- what was looked at there and seeing? Are we -- leaps and bounds we're ahead of them since more of other states will have -- or have struggled to implement versus where we're at, and seen in comparison to where we are at now, are we above that level? Right? That may be zero to no regulation to say as an example to where we are now and how we progress from there?

SYLVIA: I mean I will say that we did find someone that had a more stringent idling requirement; however, you know, CARB with the truck and bus rule requires 2010 engines, so their idling requirement did not -- was due to a different type of engine. And so our engines were already cleaner. And so there was just, you know, a handful of things.

I believe there was someone that required all school busses to be electric. You know, and when we're doing this, we're looking at this from the state perspective; we are pushing, you know, where we can, and everywhere to go electric. But overall when you're looking at like, you know, all the requirements that we have in general, we have the most stringent measures.

And it kind of goes to say, you know, with the air quality problems that we have here in California compared to the rest of the state; I mean, like even in this 12 microgram standard there's only three areas that don't meet it in the United States, and they're all in California.

UNIDENTIFIED SPEAKER: One question I had was regarding the measure schedule. So on the regulations passed before 2024 --

SYLVIA: Right.

UNIDENTIFIED SPEAKER: -- the ones that have already passed, the implementation date was -- of those regulations were scheduled within a year or two from passage of the ultimate regulation. But when you start going down further into like 2025 and beyond, there seems to be like a three- to four-, sometimes five-year gap between the passage date and the implementation deadline. Is that a facet more about kind of the (inaudible) sort of nature of the regulation or is that because those regulations are tougher nuts to crack or will require more -- you know, longer time to implement?

SYLVIA: Yeah, I think it's, you know, it's a matter of goals. You know, the Tier 5, that's a new emission standard.

UNIDENTIFIED SPEAKER: Right.

SYLVIA: You know, manufacturers need time to develop that. You know, that's I think something that, you know, normally would have a lead time on that process. The zero emission space and water heater, again, it's pushing the boundaries, you know, on a statewide basis.

But this is -- and part of these on these when can it be implemented, and when we're talk in our regulatory divisions, this is the information that they, you know, have given us. And then the emission reductions that are included in the plan are based on that.

UNIDENTIFIED SPEAKER: Got it. So the rail implementation, so we just start -- so what is -- what's the phase-in for them at the moment, because I know rails is kind of a touchy one.

SYLVIA: Right. I'd have to -- you know, I'm not really the expert on that. It's my understanding, you know, the spending account, I'd have to look to see when that actual date start is.

UNIDENTIFIED SPEAKER: Okay.

UNIDENTIFIED SPEAKER: I think right now that's still pending also at EPA for their consideration on authorizing that rule too. That's another process that's underway.

SYLVIA: Right. And they have had their public hearing on that.

UNIDENTIFIED SPEAKER: Right.

(Begin 31:12-34:35)

UNIDENTIFIED SPEAKER: The data that was used to do the calculation, what reference, when were the -- what's the age of the data (inaudible) the modeling?

UNIDENTIFIED SPEAKER: Which type of data I guess?

UNIDENTIFIED SPEAKER: The health risks.

UNIDENTIFIED SPEAKER: Health risk data, it's sort of a spread. So it's mostly -- I guess everything is in a forecasted year, so when we look at 2030, we're looking at what the forecast and like death rate is in

2030. That's from the California Department of Finance.

I think most of this we use the same data that was collected in the 2022 AQMP, just since it's not that much different or not that much updated and sort of a large data-gathering effort to get fully updated on all those things.

That being said, I believe everything from the 2022 AQMP was in the 2020 age range for data recency. Some of those end points as far as like incidence rates that aren't easily publicly available are taken from like academic research that is basically just as most as recent as we could find. I don't have specific numbers off the top of my head for all of it, but I'm sure we could dig all that up.

There's also a pretty detailed discussion in the technical appendix or the technical discussion portion of the report that will be up on May 7th. So you can refer there, or definitely reach out and we can answer specific questions that come up.

UNIDENTIFIED SPEAKER: I think that general, it's we get as recent as we can --

UNIDENTIFIED SPEAKER: Yeah.

UNIDENTIFIED SPEAKER: -- that's, you know -- got to find the right adjective here. I was going to say "validated," but it's, you know, peer-reviewed, you know, kind of scrutinized and it's appropriate for use. But we get as recent data as is available.

UNIDENTIFIED SPEAKER: So they used independent like academic research, and also other agencies, specifically OEHHA, Office of Environmental, I know they collect a lot of data; is that being referenced or is that being used? I know that they collect some like detailed information --

UNIDENTIFIED SPEAKER: Right, I'm not sure --

UNIDENTIFIED SPEAKER: -- to get a little more specific of the impact.

UNIDENTIFIED SPEAKER: I'm not sure we use anything from OEHHA, but as far as academic research is concerned for those like concentration response functions, those are all specific to the L.A. region, more California specific as we can get, it's all peer-reviewed research, and all been sort of collaborated on as far as what sort of end points we can look at as far as the quality of the research that we're pretty confident that there's a causal relationship between the PM2.5 concentrations and health impacts, and that's also something that we collaborated with an external consultant on, Industrial Economics, which does a lot of this type of health benefit work for a number of agencies.

So yeah, OEHHA, I don't know if we use any data from OEHHA in this health benefit analysis. Is there a specific type of --

UNIDENTIFIED SPEAKER: We use them a lot in a lot of our other processes, (inaudible) paramount with all the Hexachrome and all that there. We rely very heavily on what OEHHA does for the toxics assessments. So it sort of depends on the purpose of the health study, who develops the guidance and the, you know, the technical supporting information.

UNIDENTIFIED SPEAKER: Thank you.

UNIDENTIFIED SPEAKER: No questions on my end.

UNIDENTIFIED SPEAKER: Great. Thank you.

(Begin 37:53-38:23)

UNIDENTIFIED SPEAKER: Could you maybe explain what an administrative exercise is?

UNIDENTIFIED SPEAKER: So administrative exercise is like creating an inventory. Basically there's no physical change.

UNIDENTIFIED SPEAKER: Okay.

UNIDENTIFIED SPEAKER: We are not -- it's just -- we're just gathering data at the moment. It's not requiring like any equipment to install anything, any -- so there's no physical change, so it's an administrative exercise. It's not going to affect the environment in any way.

(Begin 40:09-53:20)

UNIDENTIFIED SPEAKER: Any questions you might have, now is a good time.

UNIDENTIFIED SPEAKER: So one thing I am curious about, especially with the -- you know, with South Coast AQMD currently considering the ports and railyard ISR, how -- basically what would this -- what would those rules mean for this particular plan?

UNIDENTIFIED SPEAKER: Maybe I'll take that one.

So on the indirect source rules, they certainly would help. I think as we're going through both those rule makings, we're still -- rail is a little farther along than ports --

UNIDENTIFIED SPEAKER: Right.

UNIDENTIFIED SPEAKER: -- but we're still working through what exactly would those do; and especially for the time line for this plan, for 2030, I think both of those rules are looking at, you know, potential implementation that would cross over through 2030 right before and after, so I don't think we have specific numbers yet. I don't think we have anything in this plan right now that is quantifying what the benefits are.

But we do have those measures included in the plan, same as the 2016 AQMP, the 2022 AQMP, and now for this plan that are there, we're working on it; but the specific numbers we're going to hold off on any quantifying commitment on those and kind of push that more to rule making. And in some ways for SIP purposes, which is what this exercise really is, that often can even come after rule making as well.

UNIDENTIFIED SPEAKER: Understood. Certainly would restate our support for a strong rules in either case, try to get those passed as expediently as possible, but appreciate that response.

UNIDENTIFIED SPEAKER: (Inaudible) rules given to the more detailed ground level community base as far as seeing the impact. It's what the inspecting and also enforcement, how do we know it's affecting -- I mean we're going through this whole process, how are we seeing, you know, some of these time lines we start getting into 2025, 2026 forward. Maybe I'm getting too deep into the weeds.

How are we going to start seeing the actual effect of it, what are we -- is that cascading down into more of the ground level? Are we going to be inspecting, are we going to be doing inventory checks on some of these different sources to see that we're starting to see some of this going along to be implemented? Maybe I'm --

UNIDENTIFIED SPEAKER: Maybe I can take a first crack from the AQMD side of it, and then, Sylvia, I don't know if you want to talk from the CARB side. We don't have our enforcement folks here, so, you know, I want to be careful about what I say for them because I can feel a virtual kick anything I talk about enforcement.

But yes we enforce our rules, of course, right. And then can we have a inspector at every facility at all times? No, right? Resources don't allow that.

There are, you know, a variety of mechanisms that are in different rules, including a lot of these control measures. One of the things that we do when we craft our rules is we try to think about how do you enforce it. So you imagine something like home heating. Are we really thinking of enforcing on individual homeowners? Boy, that is really -- there's a lot of challenges there as opposed to is it a manufacturer's mandate or distributor's mandate? Right? And so it gets to enforceability. How do you enforce a provision?

A lot of that still is worked out in every individual rule, but there are some, you know, things that are being done. For example, you mentioned inventory, emissions inventory. So if you look at AQMD, we have an emissions reporting program that every year large facilities need to report, CARB recently did a rule. Criteria talks (inaudible) reporting regulation that really expands the number of facilities that report emissions every year. So a lot more granular data is coming in from a lot more facilities, thousands and thousands more, and that's being phased in. But that gives us a lot more information about, oh, there's a little spike in emissions that really helps our -- I know, I've talked to plenty of inspectors, they look at this data before they go on inspections, and it helps inform them what to look for. So there's different ways to try to get at it.

The last thing I'm going to say, because any time enforcement comes up is if you see something, if something smells funny and you aren't sure about it, 1800GotSmog, right? That really helps our inspectors.

So I don't know, Sylvia, if you want to add anything from the CARB perspective on that.

SYLVIA: Yeah, I mean enforcement is something that's critical for all of these rules, and so each of the rules that CARB's, you know, adopting has, you know, an enforcement element to it.

And, you know, we learn also from our rules. I don't know if you remember, you know, the truck and bus regulation, you know, we were out in the field looking around and we realized that people were somehow getting around the requirement for, you know, having a 2010 truck. And so then we worked with our legislatures and stuff and so then we got a registration hold.

And so now, you know, we -- you know, when you're developing these rules, you come up with enforcement mechanisms, and sometimes you have to reassess them and see if they're working, but ultimately, you know, I mean when you look at emissions, they are going down, you know, especially NOx emissions. If you would get, you know, ambient NOx monitors, those trends are on a downward.

And, you know, air quality, you know, we've had some hiccups lately, but they are -- it is improving. I mean last year was -- for across the state was a great year for PM, it was one of the first years we had that we didn't have a lot of wildfires over the summer, and so you could actually see, you know, what air quality should be when it's not -- when we don't have these extensive wildfires.

UNIDENTIFIED SPEAKER: One other question I had was relating to -- so when we look at the air quality standards, you know, those are primarily looking at averages at different monitoring sites at the basin, it's kind of a district-wide average. What are some of the things that can be done to make sure that the communities with the highest levels are the ones experiencing the benefits? I know in this case it might be a little bit more limited since we are talking about just a handful of, what, two new rules and two amended rules, but just making sure that the communities that do have higher levels of particulate matter counts, worse air pollution are benefiting the most from these proposals.

SYLVIA: I mean, I can just say from the CARB side, when you look at what the sources we're targeting; I mean we are really targeting sources that are near disadvantaged communities, you know, trains, trucks, you know, port sources. And so, you know, I think we are, you know, listening to communities and trying to, you know, target our controls there. And so, you know, you can do, you know, some analysis and, you know, I don't know if -- you guys have done some in the past.

UNIDENTIFIED SPEAKER: Yeah, we have.

So I think sort of two thoughts in addition to what Sylvia just said.

So in our 2022 AQMP, that socioeconomic impact assessment we did do an environmental justice analysis looking at the geographic distribution of where the air quality benefits are and, you know, mapping that against, you know, where all the different communities are, and found that overall all these strategies have a net benefit for environmental justice communities in our region. And so that's really important, right? That's exactly to your point.

The other is I want to make sure it's clear; so when we're showing the monitors, and there's averaging that's done to compare against the standard, but not across different monitors. You don't average San Bernardino with Upland with Long Beach, right? You look at each individual monitor and you average across years at the same site, right? So you have to have every community where there's monitoring, right, has to meet that standard, right? So that's how we make sure that every community sort of meets a minimum level of air quality.

UNIDENTIFIED SPEAKER: Okay. Great.

UNIDENTIFIED SPEAKER: Maybe one final point. Maybe it's getting into the weeds a little too much. But we also look at areas that don't have a monitor too. And we have to make sure that they are also in attainment. So not every environmental justice community has a PM2.5 monitor --

UNIDENTIFIED SPEAKER: Right.

UNIDENTIFIED SPEAKER: -- but our analysis assures that they will be in attainment.

UNIDENTIFIED SPEAKER: How do you do that modeling for communities that don't have a monitor?

SYLVIA: (Inaudible) is an unmonitored area (inaudible) --

UNIDENTIFIED SPEAKER: Computer modeling. Very detailed computer modeling.

SYLVIA: Mark.

UNIDENTIFIED SPEAKER: You have to come on over.

UNIDENTIFIED SPEAKER: Yeah, maybe come over here so you can be picked up.

UNIDENTIFIED SPEAKER: So we use these air quality models (inaudible). We use these air quality models that model the entire region. I mean, you can think of these air quality models as when you look at the weather forecast, there are no weather station everywhere, right, but you have the model (inaudible), okay, this is the weather (inaudible). So air quality model is the same.

And so yeah, we don't have measurements everywhere, but we have these models. And then so we use these measurements where we have them to compare them with the modeling, we see that the model does a reasonably good job, so then we have some confidence that the modeling is telling us -- it's telling us whatever it is telling us in the regions that we don't have measurements, we can also trust models to tell us what the (inaudible) of air quality is in there.

UNIDENTIFIED SPEAKER: Got it. Understood.

UNIDENTIFIED SPEAKER: In the monitoring, does -- is there engagement between, say, does CARB have capacity or even EPA and have these -- we'll say if there's regions where maybe we're monitoring here, are there -- where maybe CARB is monitoring somewhere else, and then we have building that up --

SYLVIA: Right.

UNIDENTIFIED SPEAKER: -- is that somewhere over here because I -- I vaguely remember in 2016 that we started having that conversation about cross-referencing data and using equipment and all that.

SYLVIA: Yeah. There is a requirement that every year by July 1st of the year that you submit an annual network plan to EPA, and that annual network plan actually has to go through a public review process where you talk about, you know, changes to the network and things like that. But also a new element of it is addressing environmental justice communities. That's part of the new thing.

And then every five years, and I think it's next year, you actually have to do a network assessment where you are -- are you meeting the monitoring objectives, because EPA has some very strict like monitoring objectives about what has to be monitored, how -- what is a monitor, is it a high site. You know, it's looking at MSAs and those kind of things. But, you know, every five years then you do a reassessment on that. And so that's happening next year.

And both of these documents are -- will be out for public comment so people can comment on those. You know, South Coast will be doing theirs shortly. And CARB does one for the smaller districts and areas of the state that don't have their own monitoring organization.

UNIDENTIFIED SPEAKER: And I think there's also a difference sometimes in the toxics monitoring, that you do get multiple agencies in some cases pulling resources there for versus there's criteria pollutant monitoring, I mean, you know, we actually get some funding from -- from EPA, but largely it's up to the district to deploy all those monitors, but we certainly coordinate with, you know, the three agencies.

SYLVIA: Yeah, and there's, you know, quality control requirements, there's a lot to it that is -- you know, because you want make sure that the monitors are, you know, accurate.

UNIDENTIFIED SPEAKER: And what you see in L.A. is comparable to what you see in New York to what you see in Florida, to what you see everywhere.

SYLVIA: Yeah, so that --

UNIDENTIFIED SPEAKER: Right, level the playing field.

UNIDENTIFIED SPEAKER: And actually, as we get into this, I mean that's how we're going to -- the easiest to understand, if we go back to our communities, if we start seeing the monitoring data, right, is what's going to start checking all this work, that it's okay, we're starting to see, as we've already seen, as you mentioned, progress.

SYLVIA: Yeah. No, it's -- I mean monitoring data is super important to look at. And looking at it every day is very helpful. Then you can see changes and you know when, you know, air quality is, you know, bad or, you know, you shouldn't be outside and stuff. And so I think it's important, you know, I think -- and nowadays there's so much available air quality data out there that you can look, you know, instantaneously, oh, should I go outside or not. And so --

UNIDENTIFIED SPEAKER: You know, there are some agencies who have an app. I hear South Coast AQMD has a nice app with air quality alerts on there. Just saying. It's award winning.

SYLVIA: Sorry about that.

UNIDENTIFIED SPEAKER: Yeah, it's good. It's a good app, I use it quite a bit.

UNIDENTIFIED SPEAKER: There we go. Speak that into the mic.

UNIDENTIFIED SPEAKER: I highly recommend downloaded (inaudible) app.

UNIDENTIFIED SPEAKER: Thank you. That's good.

UNIDENTIFIED SPEAKER: So any other questions, comments on any of this?

No? Well --

UNIDENTIFIED SPEAKER: Not on the record.

UNIDENTIFIED SPEAKER: Thank you very much.

UNIDENTIFIED SPEAKER: Thank you all for coming, do appreciate it. All of our contact information is in there, feel free to reach out any time. So thanks a lot for coming out, and I think with that we'll officially adjourn, but we'll be here to keep talking.

(End of recording.)

REPORTER'S CERTIFICATE

I, the undersigned, a Certified Shorthand Reporter of the State of California, do hereby certify:

That the foregoing electronically-recorded proceedings were transcribed by me to the best of my ability.

I further certify I am neither financially interested in the action nor a relative or employee of any attorney or party to this action.

IN WITNESS WHEREOF, I have this date subscribed my name.

Dated: 05/13/2024

Diana Sasseen

Diana Sasseen
CSR No. 13456

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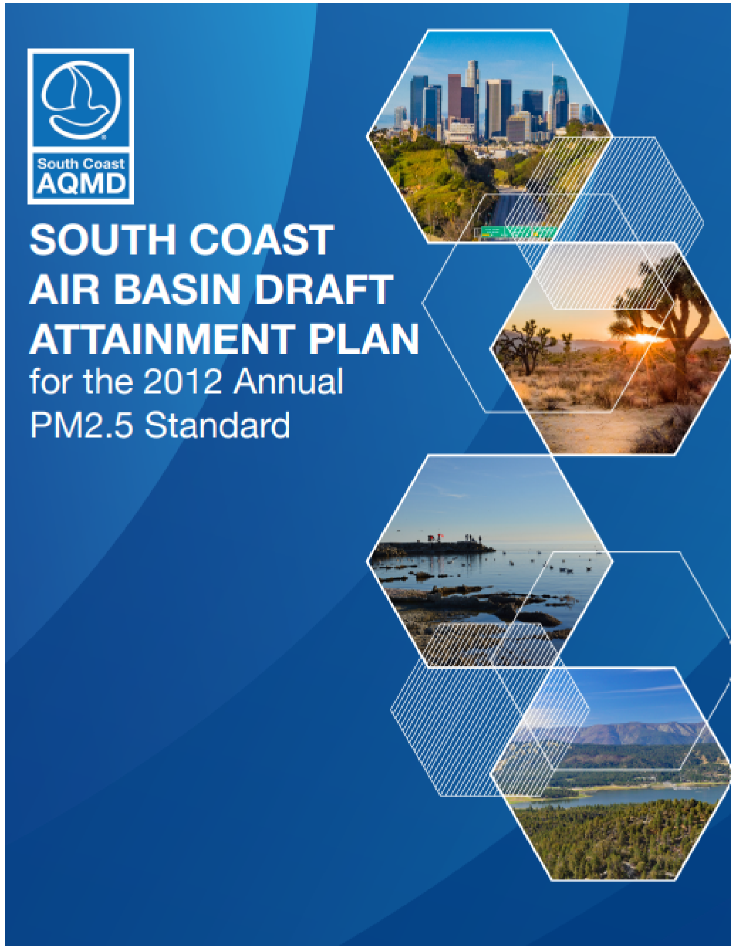


South Coast Air Basin Attainment Plan for the 2012 Annual PM2.5 Standard

Board Meeting

June 7, 2024

Background - Annual PM2.5 Standard

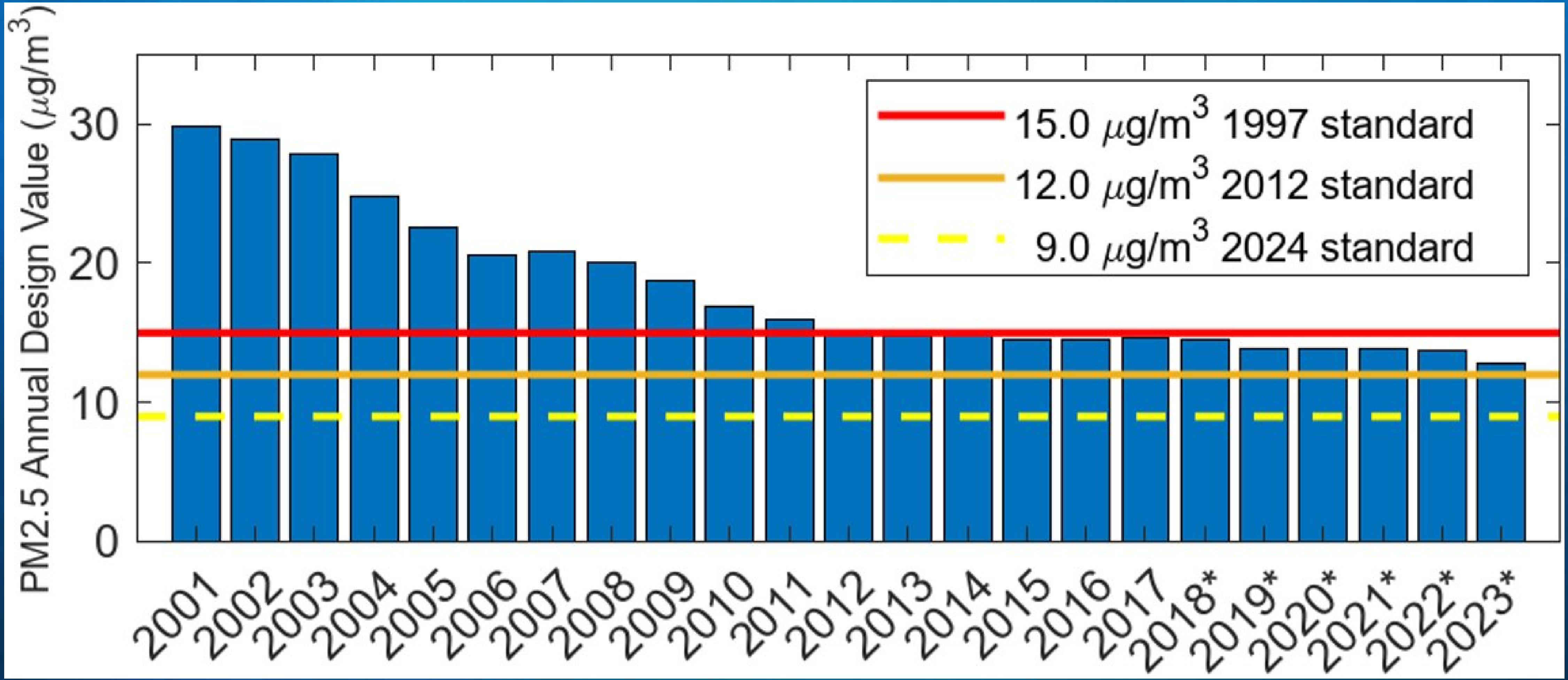
U.S. EPA set an annual PM2.5 standard in 2012, set at 12 $\mu g/m^3$

South Coast Air Basin is in “serious” nonattainment, which is the highest classification for PM2.5 standards[1]

Coachella Valley is in attainment of this standard

[1] Reclassification from “moderate” to “serious” approved by U.S. EPA effective December 9, 2020 (85 FR 71264)

Annual PM2.5 Trend in the South Coast Air Basin



*Data likely to be approved as exceptional events by U.S. EPA were removed.

Overview of Previous SIP Actions for the 2012 Annual PM2.5 Standard

- Attainment plan was included in the 2016 AQMP and submitted to U.S. EPA in 2017
- Near roadway data became available in 2020 and showed the highest annual PM2.5 level in the Basin
- U.S. EPA requested a supplemental attainment demonstration
- The submitted plan was withdrawn in 2023 to avoid potential disapproval*
- A revised attainment plan is due to U.S. EPA by December 23, 2024 to avoid sanctions

*U.S. EPA was sued by Center for Biological Diversity in 2023 for its failure to act on the submitted plan

SIP Development Public Process

Spring - Fall 2023
- AQMP & STMPR Advisory Group Meetings

March 2024
- Released Draft Plan for Public Review and Comments

April - May 2024
- Regional Public Hearings

May 2024
- Released Draft Socioeconomic Impact Assessment

June 7, 2024
- Public Hearing for Board consideration

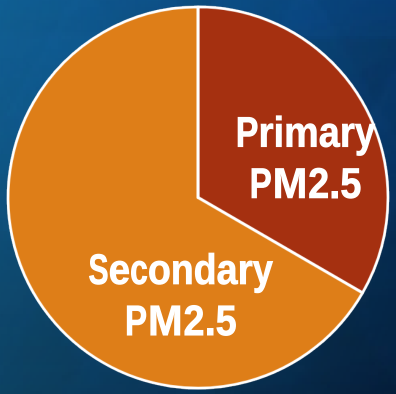
Summer 2024
- CARB adoption and submittal to EPA

For more information, visit https://www.aqmd.gov/home/air-quality/air-quality-management-plans/other-state-implementation-plan-(sip)-revisions

Strategy to Attain Annual PM2.5 Standard

NOx strategy from the 2022 AQMP

Limited controls needed for PM2.5 and precursors



Measures from the 2022 AQMP/SIP that can be Implemented by 2030

South Coast AQMD stationary source measures transition to zero emission where feasible, lower NOx where infeasible

South Coast AQMD mobile source measures include incentives and facility-based measures

CARB will continue to implement the 2022 State SIP Strategy

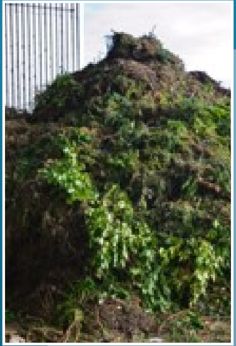
Control Measures Identified as Most Stringent Measures (MSM)

- MSM requires all South Coast AQMD rules to be at least as stringent as those in any other air district or state
- Four measures identified that need to be implemented by December 2029

Less residential burning allowed under Rule 445 (Check Before You Burn)

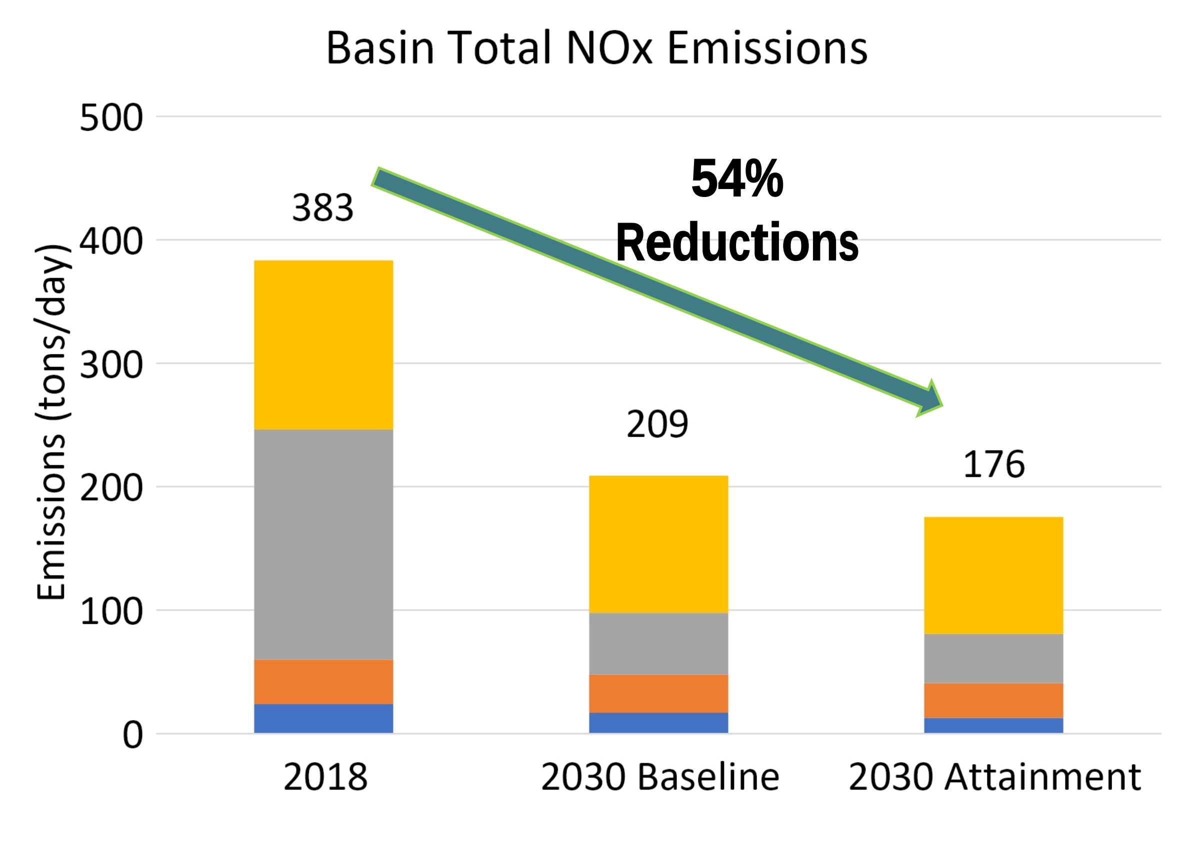
Lower permitting thresholds for confined animal facilities in Rule 223

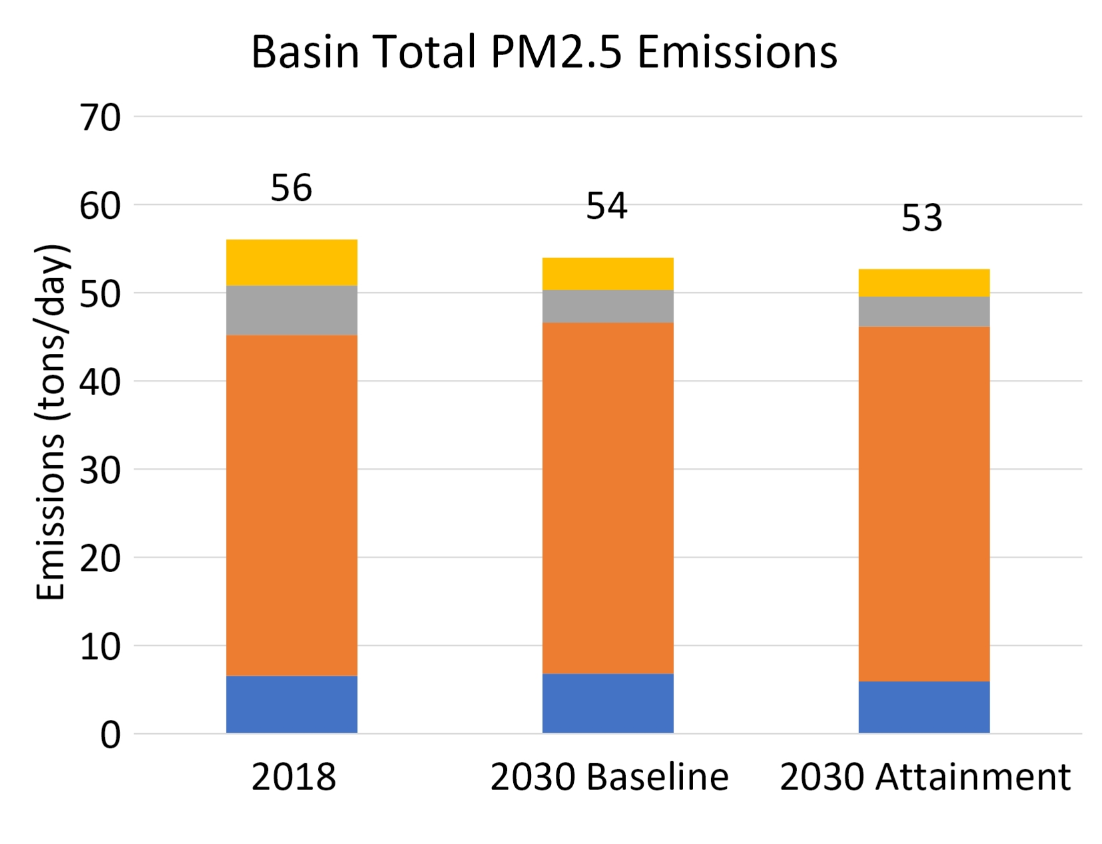
Lower threshold to require catalytic oxidizers for chain-driven charbroilers in Rule 1138



Require composting of chipped and ground greenwaste prior to land application

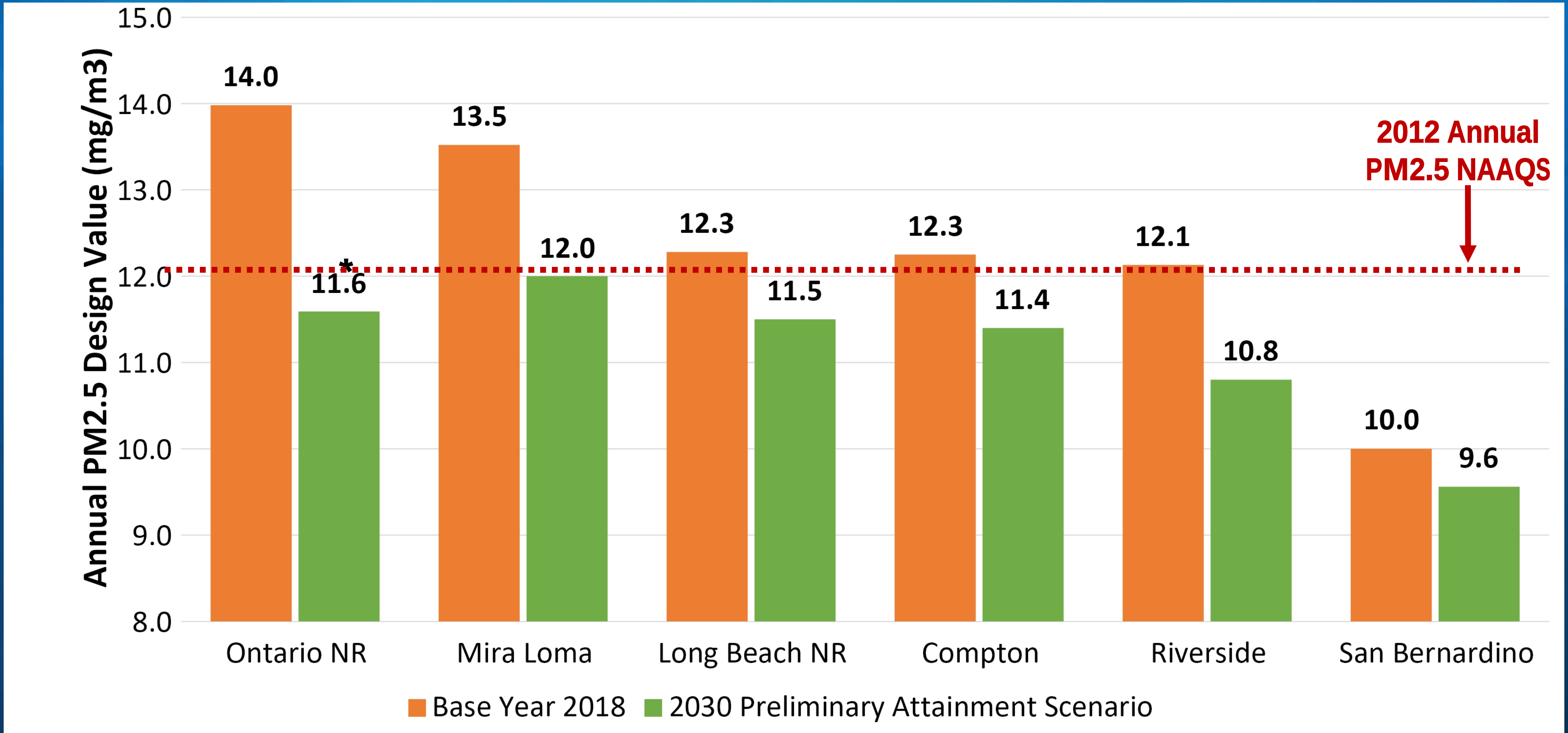
Future Emissions





'Baseline' includes all previously adopted rules. 'Attainment' includes projections from upcoming rules.

Future Annual PM2.5 Concentrations



** Design value calculated using a hybrid modeling approach*

Socioeconomic Impacts

Health Benefits in 2030

Health Outcome	Avoided Incidences	Monetized Value*
Long-Term PM 2.5 Exposure		
Premature deaths avoided, all causes	**665**	**$8,840**
Asthma, New Onset	1,031	$51
Incidence, Hay Fever/Rhinitis	4,867	$3
Incidence, Lung Cancer (non-fatal)	57	$1
Short-Term PM 2.5 Exposure		
Hospital Admission, All Cardiac Outcomes	24	$1
HA, All Respiratory	69	$2
Incidence, Ischemic Stroke	37	$1
Minor Restricted Activity Days	230,393	$21
Work Loss Days	39,204	$7

*Millions of 2023 Dollars

- The costs and macroeconomic impacts of the PM2.5 Plan control measures have been analyzed in previous AQMPs
- No additional costs are anticipated in excess of previous analyses
- **$9B total monetized health benefit annually by 2030**

Staff Recommendation

Adopt the Resolution:

- Determining that the PM2.5 Plan is a later activity within the scope of the Final Program Environmental Impact Report (EIR) for the 2022 AQMP and the Final Program EIR for the 2016 AQMP such that no new environmental document will be required.
- Adopting the PM2.5 Plan and directing staff to submit the adopted PM2.5 Plan to CARB for its approval and subsequent submittal to the U.S. EPA for inclusion into the SIP.

South Coast AQMD

APPENDIX I

Base and Future Year Emission Inventory

Chapter 1

INVENTORY DEVELOPMENT

Background

Federal and State standards limit concentration levels of air contaminants in ambient air to protect public health and welfare. An emission inventory of air pollutants and their sources is essential to identify the major contributors of air contaminants and to identify the measures necessary to reduce air pollution. This ~~Draft~~ PM2.5 Plan includes detailed emissions for base and future milestone years. 2018 is the base year used to project future year emissions for the 2024 PM2.5 Plan and 2030 is the attainment year for the 2012 annual PM2.5 National Ambient Air Quality Standard.

This appendix includes five attachments: Attachment A – Annual Average Emissions Summary by Major Source Category in the South Coast Air Basin (SCAB or Basin); Attachment B – On-Road Emissions by Vehicle Category; Attachment C – Emissions from Diesel Fuel Combustion by Major Source Category; Attachment D – Dust Emissions from Road Construction in SCAB, and Attachment E – Annual Average Emissions Summary for Condensable and Filterable PM2.5 in SCAB. Attachments A through E contain emissions and relevant data for the years of 2018, 2023, 2025, 2028, 2030 and 2031.

Information required to develop the emission inventory is obtained from various programs and rules by South Coast AQMD and other governmental agencies, including the California Air Resources Board (CARB), the California Department of Transportation (Caltrans), and the Southern California Association of Governments (SCAG). Each of these agencies is responsible for collecting data (e.g., industry growth factors, socio-economic projections, travel activity levels, emission factors, emission speciation profiles, and emissions) and developing methodologies (e.g., model and demographic forecast improvements) required to generate a comprehensive emissions inventory. Entire statewide emissions inventories are compiled and maintained by CARB in the California Emission Inventory Development and Reporting System (CEIDARS)[1] and the California Emission Forecasting and Planning Inventory System (CEFIS)[2]. CARB has primary responsibility for developing the emissions inventory for all mobile sources in collaboration with local districts. CARB provides the tool for on-road inventories, the Emission FACtors (EMFAC) 2021[3] model, and off-road inventories using models specific to each off-road category[4]. Caltrans provides SCAG with information related to highway projects. SCAG then incorporates these data into their Travel Demand Model for estimating/projecting vehicle miles traveled (VMT) and driving speeds for current and future years. SCAG's socio-economic and transportation activity projections in their 2020 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) are integrated in this ~~Draft~~ PM2.5 Plan. 2020 RTP/SCS is the

[1]Bickett, C., California Air Resources Board, "Redesign of the California Emission Inventory System", paper presented at the Emission Inventory International Specialty Conference, October 1993 https://www.arb.ca.gov/app/emsinv/dist/doc/transfmt.pdf

[2] Rulemaking Information: Redesign Of California's Emission Forecasting System (CEFS) https://ww3.arb.ca.gov/ei/pubs/cefs_mj.pdf.

[3] https://ww2.arb.ca.gov/sites/default/files/2021-08/emfac2021_technical_documentation_april2021.pdf

[4] More information about CARB's on-road and off-road models can be found at http://www.arb.ca.gov/msei/categories.htm

latest approved RTP at the time of developing this PM plan. The EMFAC2021 was run with the SCAG custom activities to produce the on-road mobile source inventories.

Air Contaminants

Currently, National Ambient Air Quality Standards (NAAQS), or federal standards, are limited to the following criteria pollutants: ozone (O_3), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), fine suspended particulate matter less than 10 microns in diameter (PM10), fine particulate matter less than 2.5 microns in diameter (PM2.5), lead, and sulfate. This appendix presents emission levels for the criteria pollutants and their precursors in the South Coast Air Basin. Specifically, data are included for emissions of total organic gases (TOG), volatile organic compounds (VOCs), oxides of nitrogen (NOx), oxides of sulfur (SOx), CO, particulate matter (PM), PM10, PM2.5, and ammonia (NH3).

TOG incorporates all gaseous compounds containing the element carbon, with the exception of the inorganic compounds, CO, carbon dioxide (CO_2), carbonic acid, carbonates, and metallic carbides. VOCs, a subset of TOG, includes all organic gases in TOG except acetone, ethane, methane, methylene chloride, methylchloroform, perchloroethylene, methyl acetate, para-Chlorobenzo trifluoride (pCBtF), and a number of Freon-type gases. The U.S. EPA definition of VOCs is different from the one used by CARB, which includes some compounds not considered as VOCs by the U.S. EPA. Table I-1-1 lists the compounds that are exempt in the U.S. EPA's VOCs list but are included in CARB's VOCs list. Certain chlorofluorocarbons (CFCs) are still included in CARB's VOCs list. According to CARB, the total VOC emission inventory difference between U.S. EPA and CARB is very small and the added compounds do not have a noticeable contribution to the VOC emission inventory; Those compounds do not impact regional tropospheric ozone and PM formation either.

PM represents all airborne particulate matter, also known as total suspended particles (TSP). PM10 and PM2.5 are important subsets of PM. In this ~~Draft~~ PM2.5 Plan, the amount of VOC in TOG and the amount of PM10 and PM2.5 in PM are calculated for each process primarily using speciation and size fraction profiles provided by CARB.[5] PM2.5 sources include both primary and secondary PM2.5 sources. Primary PM2.5 is directly emitted from various sources, whereas secondary PM2.5 is formed in the atmosphere from chemical reactions involving PM2.5 precursor emissions. Potential precursors of secondary PM2.5 include NOx, SOx, VOC and NH3. Furthermore, while air quality standards for NOx and SOx are based on NO_2 and SO_2, respectively, the emissions inventory includes emissions of NOx and SOx because multiple species of NOx and SOx contribute to the formation of particulate matter, and multiple species of NOx react with VOCs to produce ozone.

[5] https://ww2.arb.ca.gov/speciation-profiles-used-carb-modeling.

TABLE I-1-1
LIST OF COMPOUNDS EXEMPT IN U.S. EPA'S DEFINITION OF VOC; INCLUDED IN CARB'S DEFINITION OF VOC

COMPOUND	CAS*
3,3-dichloro-1,1,1,2,2-pentafluoropropane (HCFC-225ca)	422-56-0
1,3-dichloro-1,1,2,2,3-pentafluoropropane (HCFC-225cb)	507-55-1
1,1,1,2,3,4,4,5,5,5-decafluoropentane (HFC 43-10mee)	138495-42-8
difluoromethane (HFC-32)	75-10-5
ethylfluoride (HFC-161)	353-36-6
1,1,1,3,3,3-hexafluoropropane (HFC-236fa)	690-39-1
1,1,2,2,3-pentafluoropropane (HFC-245ca)	679-86-7
1,1,2,3,3-pentafluoropropane (HFC-245ea)	24270-66-4
1,1,1,2,3-pentafluoropropane (HFC-245eb)	431-31-2
1,1,1,3,3-pentafluoropropane (HFC-245fa)	460-73-1
1,1,1,2,3,3-hexafluoropropane (HFC-236ea)	431-63-0
1,1,1,3,3-pentafluorobutane (HFC-365mfc)	406-58-6
chlorofluoromethane (HCFC-31)	593-70-4
1 chloro-1-fluoroethane (HCFC-151a)	1615-75-4
1,2-dichloro-1,1,2-trifluoroethane (HCFC-123a)	354-23-4
1,1,1,2,2,3,3,4,4-nonafluoro-4-methoxy-butane (C4F9OCH3 or HFE-7100)	163702-07-6
2-(difluoromethoxymethyl)-1,1,1,2,3,3,3-heptafluoropropane ((CF3)2CFCF2OCH3)	163702-08-7
1-ethoxy-1,1,2,2,3,3,4,4,4-nonafluorobutane (C4F9OC2H5 or HFE-7200)[(2)]	163702-05-4
2-(ethoxydifluoromethyl)-1,1,1,2,3,3,3-heptafluoropropane ((CF3)2CFCF2OC2H5)	163702-06-5
1,1,1,2,2,3,3-heptafluoro-3-methoxy-propane (n-C3F7OCH3, HFE-7000)	375-03-1
3-ethoxy- 1,1,1,2,3,4,4,5,5,6,6,6-dodecafluoro-2-(trifluoromethyl) hexane (HFE-7500)	297730-93-9
1,1,1,2,3,3,3-heptafluoropropane (HFC 227ea)	431-89-0
methyl formate (HCOOCH3)[(3)]	107-31-3
1,1,1,2,2,3,4,5,5,5-decafluoro-3-methoxy-4-trifluoromethyl-pentane (HFE-7300)[(1)]	132182-92-4
propylene carbonate[(1)]	108-32-7
dimethyl carbonate[(1)]	616-38-6
trans-1,3,3,3-tetrafluoropropene[(1)]	29118-24-9
HCF2OCF2H (HFE-134) [(1)]	1691-17-4
HCF2OCF2OCF2H (HFE-236cal2) [(1)]	78522-47-1
HCF2OCF2CF2OCF2H (HFE-338pcc13) [(1)]	188690-78-0
HCF2OCF2OCF2CF2OCF2H (H-Galden 1040x or H-Galden ZT 130 (or 150 or 180)) [(1)]	188690-77-9
trans 1-chloro-3,3,3-trifluoroprop-1-ene[(1)]	102687-65-0
2,3,3,3-tetrafluoropropene[(1)]	754-12-1
2-amino-2-methyl-1-propanol[(1)]	124-68-5
Tertiary butyl acetate (tBAc)	540-88-5

Chemical Abstract Service (CAS) identification numbers have been included for convenience.

(1) Compounds are new since the 2012 AQMP.

(2) Exempt in the consumer product regulation not the architectural coatings suggested control measure.

(3) Recommend exemption for stationary source regulations under South Coast AQMD control.

Inventory Source Categories

Stationary Sources

Stationary sources of emissions are grouped into two categories - point sources and area sources. Point source emissions are from facilities having one or more pieces of equipment registered and permitted with the South Coast Air Quality Management District (AQMD). South Coast AQMD uses permits to collect facility emission-related information for those sources such as facility location in latitude and longitude, chimney stack height, and plume exit temperature. Area source emissions are from numerous small facilities or pieces of equipment, such as gasoline-dispensing facilities, residential water heaters, consumer products and architectural coatings, for which locations may not be specifically identified. For modeling purposes, area source emissions are spatially allocated to grid cells using demographic data as surrogates (e.g., population, housing, and land use).

Point Sources

The point source emission inventory for 2018 is based on the emissions data reported by facilities in the calendar year 2018 via the South Coast AQMD's Annual Emissions Reporting (AER) Program. This program applies to facilities emitting 4 tons per year (TPY) or more of VOCs, NOx, SOx, or PM or emitting more than 100 TPY of CO, as specified in Rule 301(e). Facilities subject to the AER Program calculate or measure their emissions and report them. If calculated, they are primarily based on their throughput data (e.g., fuel usage, material usage), appropriate emission factors or source tests, and control efficiency (if applicable). Under the calendar year 2018 AER Program, approximately, 1,596 facilities reported their annual emissions to the South Coast AQMD. Smaller industrial facilities with emissions below reporting thresholds are not subject to the AER program, but emissions from those facilities are included in the area source inventory.

In order to prepare the point source inventory, emissions data for each facility were categorized based on the U.S. EPA's Source Classification Codes (SCCs) for each emission source category. Since the AER program collects emissions data on an aggregate basis (i.e., similar equipment and processes with the same emission factor are grouped and reported together), facility's equipment permit data were used in conjunction with the reported data to assign the appropriate SCC codes and develop the inventory at the SCC level. Air quality modeling uses specific facility locations provided in latitude and longitude coordinates. Business operation activity profiles are also recorded to allocate the annual emission to finer time resolutions (e.g., hourly, day of the week, and monthly emission rates). The facility business type is assigned to facilities based on North American Industry Classification System (NAICS) Codes according to their primary activity. Growth projections are assigned by NAICS using socioeconomic indexes provided by the SCAG 2020 RTP/SCS.

Area Sources

The South Coast AQMD and CARB shared responsibility for developing the 2018 area source emissions inventory for approximately 400 area source categories. The South Coast AQMD developed the area source inventory for about 150 categories, while CARB developed the remaining area source categories such as consumer products and degreasing. For each area source category, a specific methodology is used to estimate emissions. Using revised data such as throughput, activity, consumption, various demographic data, and recently adopted regulations, the following categories were updated: consumer products, architectural coating, adhesive and sealants, composting, natural gas and LPG combustion sources, LPG transfer dispensing fugitive loss, paved and unpaved road dust, and livestock.

Rule Implementation

The cutoff dates for regulations on stationary sources included in the baseline emissions are the same as in the 2022 AQMP. All rules adopted since the 2016 AQMP by October 2020 and Rule 1109.1 were included in the baseline and are listed in Table I-1-2A (NOx regulations) and Table I-1-2B (VOC and PM regulations). Since the adoption of the 2016 AQMP and through the cutoff dates, a total of 14 source-specific rules were adopted or amended, that would achieve up to 6.6 tons per day NOx reductions by the milestone year of 2025. Rule 1109.1, amended in November 2021, is expected to achieve 3.94 tons per day NOx reductions by 2030 in addition to the reductions associated with declining RECLAIM allocation cap as defined in the Rule 2002. While the baseline emissions from the RECLAIM universe are the same as the baseline emissions included in the 2022 AQMP, this plan quantifies additional adjustments to RECLAIM sources as a result of recently approved regulations and their associated emission reductions are included in the attainment demonstration. NOx emission reductions from RECLAIM sources and these additional adjustments are discussed in detail in Chapter 3 of this Plan and in Chapter 2 of this Appendix.

TABLE I-1-2A

2016 AQMP NOX EMISSION REDUCTIONS IN TONS PER DAY BY MEASURE/ADOPTION DATE FROM SOUTH COAST AQMD MEASURES

Measure	2016 AQMP Measure	Adopted	2025	
			Commitment[c]	Expected Reductions from the Implementation
Rule 1135[a] – Electricity Generating Facilities	CMB-05	2018	5	0.36
Rules 1146, 1146.1, 1146.2[b] – Industrial/Commercial Boilers, Steam Generator and Process Heaters	CMB-05	2018		0.39
Rule 1118.1[a] – Non-Refinery Flares	CMB-05	2019		0.16
Rule 1134[a] – Stationary Gas Turbine	CMB-05	2019		1.18
Rule 1110.2[a] – Gaseous and Liquid-Fueled Engines	CMB-05	2019		0.15
Rule 1117[a] – Glass Melting Furnaces	CMB-05	2020		0.14
Rule 1179.1 – Combustion Equipment at Publicly Owned Treatment Works Facility	CMB-05	2020		0.05
Rule 1109.1[a] – NOx reduction from Refinery	CMB-05	2021		2.35
Rule 1111[d] – Residential NG Heating Furnaces	CMB-02	2018	1.1	1.28
Total adopted/amended				**6.6**

[a] Reductions are reflected in the RECLAIM allocation caps specified in South Coast AQMD's Rule 2002.

[b] Net reduction excluding the portion reflected in the RECLAIM allocation caps specified in South Coast AQMD Rule 2002

[c] Based on Table 4-8 of Final 2016 AQMP[6]

[d] R1111 reduction reflects the March 2018 amendment, which amended the schedule to implement the rule, but led no additional reductions compared to the previous version

[6] http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2016-air-quality-management-plan/final-2016-aqmp/chapter4.pdf?sfvrsn=4

TABLE I-1-2C
2016 AQMP VOC/PM EMISSION REDUCTIONS IN TONS PER DAY BY MEASURE/ADOPTION DATE

Agency	Measure	2016 AQMP Measure	Adopted	2025	
				Commitment	Expected Reductions from the Implementation
South Coast AQMD	Rule 1113 – Architectural Coatings	CTS-01	2016	1	0.95
	Rule 1168 – Adhesive and Sealant Application	CTS-01	2017		0.79
	Total adopted/amended VOC control measures				**1.8**
	Rule 445 – Wood Burning Devices	Contingency Measure	2020		0.13

Mobile Sources

On-Road Mobile Sources

The ~~Draft~~ PM2.5 Plan emission estimates for on-road motor vehicles are derived by applying emission rates from CARB's EMFAC2021[7] model to the transportation activity data provided by SCAG in its adopted 2020 RTP/SCS. The California Department of Transportation (Caltrans), the Department of Motor Vehicles (DMV), and SCAG supply CARB with necessary data to develop the on-road mobile source emissions inventory. The California DMV maintains a count of registered vehicles and Caltrans provides highway network, traffic counts, and road capacity data. SCAG maintains the regional transportation model containing the temporal and spatial distribution of motor vehicle activities (including travel time, travel speed, and volume of traffic for AM-peak, mid-day, PM-peak, evening and night hours). In addition, SCAG periodically conducts origin and destination surveys to validate the regional transportation model and updates the demographic database of population, housing, employment, and land use patterns within its jurisdiction.

Emission rate data in EMFAC2021 are collected from various sources, such as individual vehicles in a laboratory setting, tunnel studies and certification data, etc. Vehicle activity data are obtained from regional planning agencies, such as SCAG. The EMFAC2021 model calculates exhaust and evaporative emission rates by vehicle type under different vehicle speeds and environmental conditions (e.g., temperature and relative humidity). Temperature and humidity profiles are used to produce month specific, annual average, and episodic inventories.

Parameters considered by the EMFAC2021 include the type of emissions control technology, fuel type, distribution of operating speeds, speed and temperature correction factors, and the reduction in emissions resulting from the State's motor vehicle regulatory programs.

The EMFAC2021 Model includes the following mobile source data:

(1) Thirteen vehicle classes (passenger cars, light-duty trucks under 3,750 pounds, light- duty trucks between 3,750 pounds and 5,750 pounds, medium-duty trucks between 5,751 pounds and 8,500 pounds, light-heavy-duty trucks between 8,501 pounds and 10,000 pounds, light-heavy-duty trucks between 10,001 pounds and 14,000 pounds, medium-heavy-duty trucks between 14,001 pounds and 33,000 pounds , heavy-heavy-duty-trucks for over 33,000 pounds, motor homes, motorcycles, school buses, urban buses, and other buses)

(2) Five vehicle fuel types (gasoline, diesel, natural gas, electric and plug-in hybrid)

(3) Truck types (ports, agriculture, construction, interstate, out-of-state, public fleet, utility fleet, power take off, and tractor)

(4) In-state and out-of-state

(5) Fifty calendar years (2000-2050)

(6) Two vehicle exhaust processes (starts and running)

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[7] https://ww2.arb.ca.gov/sites/default/files/2021-08/emfac2021_technical_documentation_april2021.pdf

(7) Four evaporative processes (diurnal, hot soak, running loss, and resting loss)

(8) Twelve pollutants (TOG, ROG, CO, CO2, CH4, N2O, NOx, PM, PM10, PM2.5, NH3, and SOx)

(9) Fuel consumption and energy consumption for electric VMT.

To develop the detailed emission inputs needed by air quality chemical transport models, such as the Community Multi-scale Air Quality model (CMAQ), emissions from on-road motor vehicles are estimated at the grid level using the emission processing tool Emissions Spatial and Temporal Allocator (ESTA). ESTA is a command-line tool for processing raw emissions data into spatially and temporally allocated emissions inventories, making them suitable for photochemical modeling or other analysis. ESTA is an open-source, Python-based tool designed by the Air Quality Planning and Science Division (AQPSD) branch of CARB.[8]

EMFAC2021 includes more subcategories for some of the major vehicle class categories (i.e., medium-heavy-duty diesel trucks and heavy-heavy diesel trucks) based on their weights (heavy or small), types (agricultural, construction, CA international registration plan), road type (in-state or out-of-state), etc. However, the on-road mobile sources emissions in the ~~Draft~~ PM2.5 Plan are reported by major vehicle class categories to compare with previous inventory reporting.

EMFAC2021 was the basis for on-road planning inventories, emission budgets, and rate-of-progress calculations. The EMFAC2021 model has undergone extensive revisions from the previous version (EMFAC2017) to make it more user-friendly and flexible as well as to allow incorporation of larger amounts of data demanded by the current regulatory and planning processes. In addition to the model structural changes, other updates include:

- New data and significant changes to the methodologies regarding calculation of motor vehicle emissions and revisions to implementation data for control measures;
- New methodologies for brake and tire wear and evaporative emissions;
- New approaches to light-duty activity forecasting, using up-to-date modeling approaches from academic and government agencies to assess historic trends in multiple economic indicators to forecast future vehicle activity, alongside novel forecasting frameworks for heavy duty VMT and light duty ZEV sales;
- Updated emissions factors and data on car and truck activities, and emissions reductions associated with new regulations supporting new estimates of emissions from heavy-heavy duty diesel trucks and buses. New emission factors were developed based on data from the U.S. EPA's In-Use Vehicle Program, CARB's Vehicle and Truck and Bus Surveillance Programs, CARB's Portable Emissions Measurement Systems (PEMS), and Transit Bus testing, dynamometer and Portable Emission Measurement Systems Data;
- Updated motor vehicle fleet age, vehicle types, and vehicle population based on 2013-2019 California Department of Motor Vehicle (DMV) data, International Registration Plan (IRP) data, Truck Regulation Upload, Compliance, and Reporting System (TRUCRS) data, Port Vehicle Identification Number (VIN) data, California

[8] https://github.com/mmb-carb/ESTA_Documentation.

Highway Patrol School Bus Inspections, and National Transit Database information. Each of these changes affect emission factors for each area in California.[9]

Figure I-1-1 compares on-road baseline emissions estimated by EMFAC2017, which are used in the 2022 AQMP, with those estimated by EMFAC2021, which are used in the ~~Draft 2024 PM~~PM2.5 Plan. Both sets of emission estimates use the same travel activity data from the 2020 RTP/SCS. The figure includes emissions for base year 2018 and selected future milestone years: 2023, 2025, 2028, 2030, and 2031. The comparison of on-road emissions reflects changes due to the updated EMFAC model. EMFAC2021 is the most recent version of EMFAC that is approved by U.S. EPA, and it provides the basis of the ~~Draft 2024 PM~~PM2.5 Plan on-road emission estimates. The values shown in Figure I-1-1 reflects reductions from heavy-duty vehicle inspection and maintenance (HD I/M) regulation.

For year 2018, EMFAC2021 estimates notably higher VOC and NOx emissions, and lower emissions of PM2.5 than EMFAC2017. Estimates of NOx and VOC in EMFAC2021 are higher than in EMFAC2017 because newer vehicle test data show that light-duty vehicles have higher exhaust emissions, and updated DMV data for 2018 indicate that medium heavy-duty trucks are older than what was assumed in EMFAC2017. PM2.5 emissions are substantially reduced in EMFAC2021 with respect to EMFAC2017, as a result of updates on emissions and speed correction factors for brake wear obtained from newer emission testing. The differences in VOC and PM2.5 emissions are propagated through 2030, whereas NOx emissions only differ slightly between EMFAC2017 and EMFAC2021.

Emissions in future milestone years are significantly lower than the base year 2018 emissions for all pollutants except for ammonia. These emission reductions in the future can be attributed to the ongoing implementation of regulations and programs, such as Advanced Clean Cars Program[10], ICT Regulation, Zero Emission Airport Shuttle Bus Regulation[11], Clean Miles Standard[12], ACT, and HD Omnibus low NOx requirements. Despite the growth in vehicular activities, emissions from on-road mobile sources are expected to decrease in future years, with NOx and VOC emissions in 2030 projected to be 73 and 49 percent lower than those in 2018, respectively. Emissions of NH3 from both gasoline and diesel vehicles are projected to increase in the future. NH3 emissions from gasoline vehicles are produced as a reaction in the catalytic converter. NH3 emitted by heavy-duty diesel trucks originates from the use of selective catalytic reactors (SCR) to control NOx emissions from diesel vehicles. Ammonia emissions from SCR systems is generally referred to as *ammonia slip*. SCR technology reduces NOx emissions by converting them into harmless nitrogen and water vapor through a reaction with ammonia. However, if the SCR system injects more ammonia than required for the NOx reduction process, or if the catalyst becomes inefficient, unreacted ammonia can escape into the exhaust stream. The projected increase in vehicle activity for light-, medium- and heavy-duty vehicles leads to the increase in NH3 emissions.

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[9] More detailed information on the changes incorporated in EMFAC2017 can be found at: https://ww3.arb.ca.gov/msei/downloads/emfac2017-volume-iii-technical-documentation.pdf

[10] Advanced Clean Cars Program, https://ww2.arb.ca.gov/our-work/programs/advanced-clean-cars-program

[11] Zero-Emission Airport Shuttle Regulation, https://ww2.arb.ca.gov/our-work/programs/zero-emission-airport-shuttle

[12] Clean Mile Standard, https://ww2.arb.ca.gov/our-work/programs/clean-miles-standard

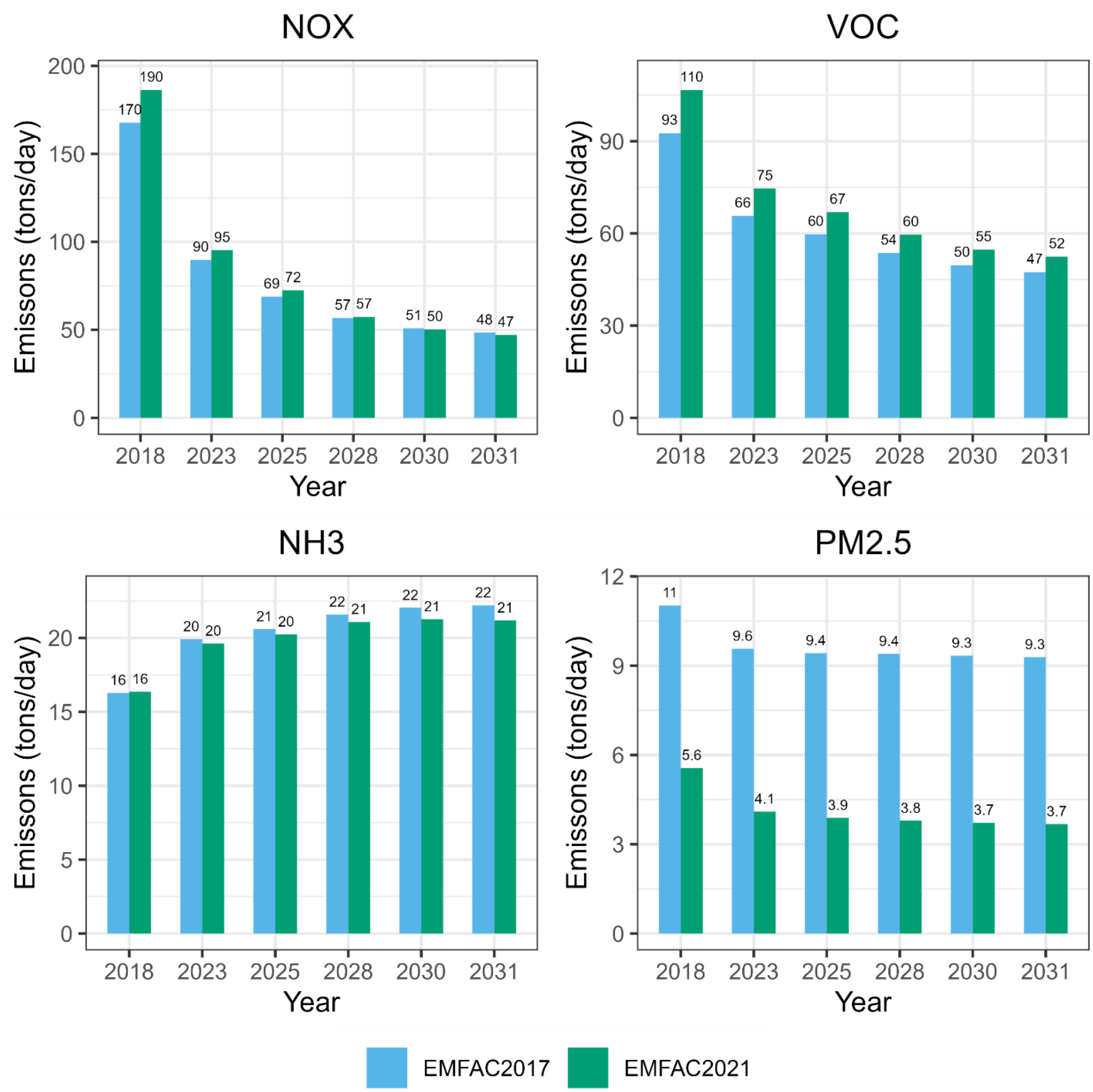

FIGURE I-1-1
COMPARISON OF ON-ROAD EMISSIONS OF BASE AND FUTURE MILESTONE YEARS USING EMFAC 2017 VERSUS EMFAC 2021
(ANNUAL AVERAGES)

Off-Road Mobile Sources

Mobile sources not included in the on-road mobile source emissions inventory are classified as off-road mobile sources. CARB uses a number of models to estimate emissions for more than one hundred off-road equipment categories. The models account for the effects of various adopted regulations, technology types, and seasonal effects on emissions. The models combine population, equipment activity, horsepower, load factors, population growth, retirement factors, and emission factors to yield annual emissions by county, air basin, or Statewide. Temporal usage profiles are used to develop seasonal emission estimates, which are then spatially allocated to counties or air basins using surrogates such as population.[13] The emissions presented here are consistent with the off-road emissions developed for the 2022 AQMP[14], except for a small change in construction equipment emissions. After the development of the 2022 AQMP, an error was discovered in the emission allocations for in-use emissions from off-road construction equipment in Riverside County. This error only affected future year emissions and is now corrected in this ~~Draft~~ PM2.5 Plan.

[13] More information about off-road models can be found at http://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles

[14] 2022 AQMP Appendix III: Base and Future Year Emission Inventory http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2022-air-quality-management-plan/final-2022-aqmp/appendix-iii.pdf?sfvrsn=6

Chapter 2

SUMMARY OF EMISSIONS

Baseline Emission Inventories

Base Year Emissions

Table I-2-1A compares the annual average emissions in the 2022 AQMP base year inventory and the emissions estimated in the ~~Draft~~ PM2.5 Plan for all PM2.5 precursors. As described above, the differences between the 2022 AQMP and the ~~Draft~~ PM2.5 Plan are from on-road sources due to the transition from EMFAC2017 to EMFAC2021. Overall, the base year 2018 emissions of VOC, NOx, and SOx in the ~~Draft~~ PM2.5 Plan are higher than those in the 2022 AQMP by 4%, 5% and 1%, respectively. In contrast, direct PM2.5 emissions in the ~~Draft~~ PM2.5 Plan are 9% lower than the 2022 AQMP.

Table I-2-1B shows the 2018 annual average emissions inventory by major source category. Stationary sources are further divided into point sources (e.g., petroleum production and electric utilities) and area sources (e.g., architectural coatings, residential water heaters, consumer products, and permitted sources smaller than the emission reporting threshold – generally 4 tons per year). Mobile sources consist of on-road (e.g., passenger cars and heavy-duty trucks) and off-road sources (e.g., locomotives and ships).

Figure I-2-1 illustrates the relative contribution of each source category to the 2018 inventory. VOC and NH3 emissions are both largely driven by area sources, although specific area sources differ for the two pollutants. Area sources account for half of the total VOC emissions, with consumer products alone accounting for 27% of total VOC emissions. For NH3 emissions, humans and pets contribute to half of the total area source emissions, and overall, area sources contribute to 70% of the total NH3 emissions. Mobile sources are the top contributor to NOx emissions, whereas area sources are the top contributor to PM2.5 emissions. Overall, total mobile source emissions account for almost 45% of VOC emissions and 85% of NOx emissions. The on-road mobile category alone contributes over 23% and 49% of VOC and NOx emissions, respectively. For directly emitted PM2.5, mobile sources represent 18% of total emissions, with an additional 15% from vehicle-related entrained dust from paved and unpaved roads. Non-vehicle related area sources, such as commercial cooking and residential fuel combustion, are the predominant source of directly emitted PM2.5 emissions, contributing 46% of total emissions. Stationary sources are responsible for most of the SOx emissions in the Basin, with the point source category (larger facilities subject to AER requirements) contributing 49% of total SOx emissions, whereas off-road mobile sources, mainly ocean-going vessels (OGV) and aircraft, contribute to 26% of total SOx emissions.

Figure I-2-2 shows the fraction of the 2018 inventory by responsible agency. The U.S. EPA, CARB, and South Coast AQMD split regulatory authority over these pollutants, with the U.S. EPA and CARB primarily responsible for mobile sources. Specifically, the U.S. EPA's authority applies to aircraft, locomotives, OGVs, military harbor craft, and other mobile categories, including California international registration plan (CAIRP) and out-of-state (OOS) medium- and heavy-duty trucks and pre-empt off-road equipment with less than 175 horsepower. CARB regulates other mobile sources, consumer products, and portions of area sources related to fuel combustion, and petroleum production and marketing. The South Coast AQMD has limited authority over mobile sources, which it exercises via fleet rules and facility-based mobile source measurements. On the other hand, it exercises authority over most area sources and all point sources. The same figure also illustrates agency responsibility as it pertains to VOC, NOx, SOx, NH3, and directly emitted PM2.5 emissions. NOx and VOCs are important precursors to ozone and PM2.5 formation, and SOx, NH3 and directly emitted PM2.5. As shown, most NOx and VOC emissions in the Basin are from sources that fall under the primary jurisdiction of the U.S. EPA or CARB. For example, 84% of NOx and 74% of VOC emissions are from sources primarily under CARB and the U.S. EPA control. Conversely, 61% of SOx emissions, 76% of NH3 emissions, and 81% of directly emitted PM2.5 emissions are from sources under the South Coast AQMD control. This underscores the need for coordinated actions at the local, state, and federal levels to ensure that the region attains the federal ambient air quality standards.

TABLE I-2-1A
COMPARISON OF 2018 EMISSIONS
BETWEEN THE 2022 AQMP AND THE DRAFT 2024 PM2.5 PLAN (TONS PER DAY)

	On-Road Vehicles	Total Emissions
VOC		
2022 AQMP	78.5	387
~~Draft~~ PM2.5 Plan	93.4	401.9
% Change	+19.0%	+3.9%
NOx		
2022 AQMP	167.7	364.7
~~Draft~~ PM2.5 Plan	186.3	383.2
% Change	+11.1%	+5.1%
SOx		
2022 AQMP	1.7	14.3
~~Draft~~ PM2.5 Plan	1.8	14.4
% Change	+5.9%	+0.7%
PM2.5		
2022 AQMP	11	61.5
~~Draft~~ PM2.5 Plan	5.6	56
% Change	-49.1%	-8.9%
NH3		
2022 AQMP	16.3	74.5
~~Draft~~ PM2.5 Plan	16.4	74.6
% Change	+0.6%	+0.1%

TABLE I-2-1B
SUMMARY OF 2018 EMISSIONS BY MAJOR SOURCE CATEGORY
(TONS PER DAY*)

Source Category	PM2.5 PLAN				
	VOC	NOx	SOx	PM2.5	NH3
Fuel Combustion	5.4	21.1	2.1	5.3	7.8
Waste Disposal	14.7	1.4	0.4	0.3	5.7
Cleaning and Surface Coatings	36.9	0.0	0.0	1.4	0.1
Petroleum Production and Marketing	19.6	0.3	0.3	0.9	0.1
Industrial Processes	10.2	0.1	0.1	4.7	8.7
Misc. Processes					
Residential fuel combustion	8.9	19.1	0.3	6.8	0.1
Cooking	1.1	0.0	0.0	11.4	0.0
Paved & Unpaved Road Dust	0.0	0.0	0.0	10.3	0.0
Others	2.6	0.2	0.1	4.1	34.3
Solvent Evaporation	120.0	0.0	0.0	0.0	1.2
RECLAIM Sources		17.8	5.5		
Total Stationary Sources	**219.4**	**59.9**	**8.8**	**45.2**	**58.0**
On-Road Vehicles	93.4	186.3	1.8	5.6	16.4
Off-Road Vehicles	89.2	137.1	3.8	5.2	0.2
Total Mobile Sources	**182.6**	**323.3**	**5.6**	**10.8**	**16.5**
TOTAL	**401.9**	**383.3**	**14.4**	**56.0**	**74.6**

*Values may not sum due to rounding error.

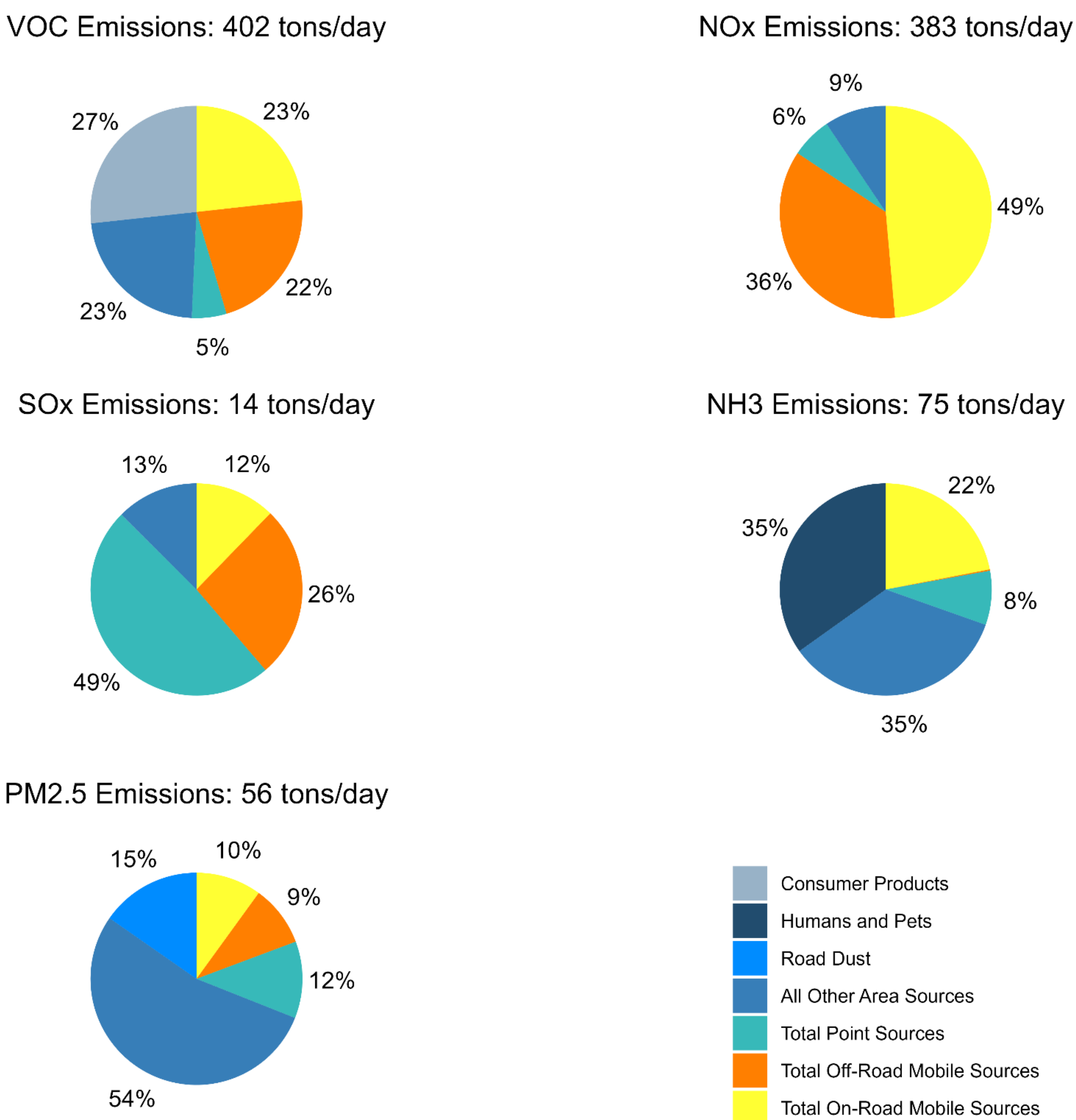

FIGURE I-2-1
2018 EMISSIONS BY MAJOR SOURCES
(Annual Average)

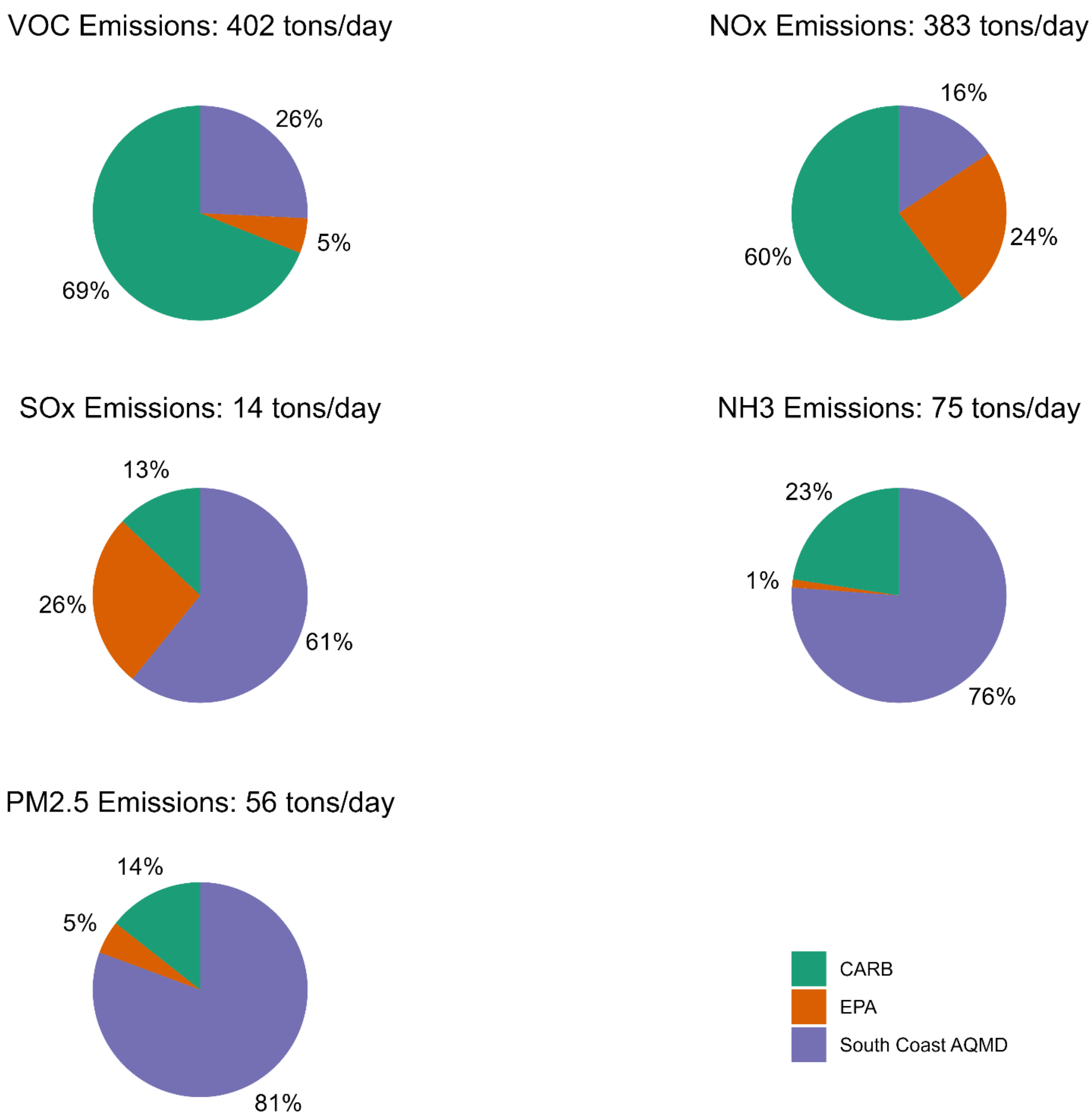

FIGURE I-2-2
2018 EMISSION INVENTORY AGENCY RESPONSIBILITY
(Annual Average)

Future Year Emissions

Future baseline emissions, which assume no additional air quality regulations introduced beyond those already adopted regulations and programs, are presented in this appendix. The future years include the attainment year and other milestone years significant to demonstrate progress toward attainment. They are 2023, 2025, 2028, 2030 and 2031. Emissions by major source category are provided in Attachment A. These emissions are forecasted from the 2018 base year by incorporating the controls implemented under South Coast AQMD rules and programs adopted as of October 2020, CARB rules adopted by December 2021, and a specific set of growth rates from SCAG for population, industry, and motor vehicle activity. South Coast AQMD's Rule 1109.1- Emissions of Oxides of Nitrogen from Petroleum Refineries and Related Operations, which was adopted in November 2021, is also reflected in this ~~Draft~~ PM2.5 Plan emissions inventory. Emission reductions from CARB's Heavy-Duty Inspection and Maintenance (HD I/M)[15] adopted in December 2021 are not embedded in EMFAC2021 but were reflected in the baseline emissions using an off-EMFAC model adjustment. Growth projections from SCAG were replaced in certain categories where more specific information was available to improve emission forecasts. For example, District-wide natural gas consumption forecasts, consistent with the 2020 California Gas Report,[16] were used to estimate the area source emissions associated with natural gas combustion.

The methodology used to forecast emissions for non-RECLAIM sources is described in the following sections. Baseline emissions for future years are obtained using the following equation:

$$\mathbf{FY_i = BY \times CF_i \times GF_i}$$

where FY_i is the forecasted emissions of an air pollutant in the Basin for a future year i. BY refers to the base year (2018) emissions of the air pollutant. The control factor, CF_i, is an indicator of the level of control on a specific source category as a result of adopted state and local air quality regulations in year i. GF_i is a growth factor determined for different categories of industry with socioeconomic data for year i with respect to base year. Both CF_i and GF_i are unitless factors that reflect a change with respect to the base year 2018.

For RECLAIM sources, baseline emissions are the same as the baseline emissions included in the 2022 AQMP. The RECLAIM allocation cap defined in the South Coast AQMD's rule 2002 was used for years prior to the conversion to a traditional command and control structure. After the sunset year, sources belonging to the RECLAIM universe, referred to as "former-RECLAIM", are then scaled using growth and control factors normalized by the growth and control factors of the sunset year. Baseline emissions for years after sunset are projected as follows:

$$\mathbf{FY_i = SY \times CF_i/CF_S \times GF_i/GF_S}$$

15 Heavy-Duty Inspection and Maintenance Program, https://ww2.arb.ca.gov/our-work/programs/heavy-duty-inspection-and-maintenance-program

16 https://www.socalgas.com/sites/default/files/2020-10/2020_California_Gas_Report_Joint_Utility_Biennial_Comprehensive_Filing.pdf.

where FY_i is the forecasted emissions for year *i*. *SY* is the emissions in the sunset year. CF_i is the control factor for year *i*, and CF_S is the control factor in the sunset year. GF_i is the growth factor for year *i* and GF_S is the growth factor in the sunset year.

In the 2022 AQMP, it was assumed that 2025 and 2026 would mark the initial years without RECLAIM programs for NOx and SOx, respectively, based on the best available information at the time of plan development. However, during the development of the RECLAIM landing rules, the sunset timeline was revised, delaying the sunset of the NOx RECLAIM program by one year to 2026, and placing the sunset of the SOx RECLAIM program on hold to accommodate operational requirements and stakeholder feedback. The change in the sunset year for NOx is not expected to affect the attainment demonstration, because landing rules are effectively implemented prior to 2030 and the reductions anticipated for 2030 are not impacted by the change of the sunset schedule. The change in sunset for SOx will ensure that the SOx emissions remain below the cap, and thus, does not affect the PM2.5 attainment strategy.

Control Factors

The impacts of South Coast AQMD rules and programs adopted or amended with compliance dates after 2018 are included in the baseline emission forecasts using control factors. Control factors were developed with reference to 2018 and applied to source categories and/or specific industries affected by the adopted rules/amendments. For industrial sources, the standard industrial codes (SIC) system is used. The U.S. EPA's SCC system is used for equipment. A control factor, CF_i, is calculated with the following equation for each individual source category:

$$\mathbf{CF_i = 1 - Control\ Efficiency}$$

Control efficiency is mostly based on estimates projected during rulemaking. Control factors represent the remaining emissions after a rule or regulation is implemented after 2018. Table I-2-2A lists control factors for the year 2025 and the attainment year 2030 for South Coast AQMD rules for non-RECLAIM sources amended or adopted between the adoption of the 2016 AQMP and the cutoff dates for this Plan, and that have post-2018 compliance dates. Table I-2-2B lists the resulting future accumulated annual average emission reductions in 2025 and 2030. In total, eleven regulations and a Facility Based Mobile Source Measure for Commercial Airports were amended or adopted by South Coast AQMD since the development of the 2016 AQMP, and they are reflected in the baseline emissions inventory of this ~~Draft~~ PM2.5 Plan.

Table I-2-2C lists the South Coast AQMD's regulations to convert the RECLAIM program to a traditional command-and-control structure. As of September of 2023, South Coast AQMD has adopted eleven so-called 'landing' rules to transition out of RECLAIM program to a traditional command-and-control structure. A portion of R1109.1 (2.35 tons per day NOx reduction) implements Rule 2002, therefore it was counted toward the RECLAIM cap "shave". The reductions attributed to the non-shave portion of Rule 1109.1, which amount to 3.94 and 4.65 tons per day by 2030 and 2037, respectively, are already reflected in the baseline emissions (and not included in Table I-2-2C). In contrast, the remaining landing rules were not included in the baseline. At the time of the 2022 AQMP development, many of these rules were still in progress, and it was uncertain whether the reductions would be considered part of the RECLAIM shave. To prevent double counting, the reductions from the landing rules were assumed to be included in the RECLAIM shave in the 2022 AQMP. Subsequently, the majority of the landing rules have been adopted, and they are expected to achieve reductions exceeding the requirements of the RECLAIM shave over a longer timeframe. Given the maturity of the RECLAIM shave in 2022, any reductions in excess of the 2022 reductions are considered new reductions. Consequently, the net NOx reductions from landing rules beyond the shave are projected to be 2.86 tons per day by 2030, as shown in Table I-2-2C.

Figure I-2-3 shows the (former-) RECLAIM universe NOx emission trend in the baseline for the ~~Draft~~ PM2.5 Plan SIP inventory for future years (which is the same as in the 2022 AQMP) and the adjusted future RECLAIM emissions that result from the quantification of all landing rules. The latest amendment of the Rule 2002 in December 2015 reduces NOx allocation cap for RECLAIM facilities from 26.5 tons per day in 2015 to 14.5 tons per day in 2022. The 2018 emissions are reported emissions which are smaller than the allocation cap, 23.5 tons per day, for that year. In the RECLAIM baseline emissions for this Plan, the NOx emissions under former-RECLAIM undergo a steady decrease with the implementation of R1109.1 from 2025 to future years. With the additional adjustment to the RECLAIM universe, RECLAIM NOx emissions in 2030 are reduced by 2.86 tons per day with respect to the baseline (consistent with Table I-2-2C). This adjustment to RECLAIM emissions is not included in the baseline, but it is included in the attainment strategy in this Plan for 2030.

There are several stationary rules for non-RECLAIM sources adopted or amended after the cut-off date of this Plan (October 2020 expect for R1109.1). Table I-2-2D lists the resulting future accumulated annual average emission reductions in 2030. R1111 was amended in January 2023 to update the implementation schedule with the full implementation year revised to 2048 with the same net reductions. R1168 was amended in November 2022 to revise the emission reductions. R1147, R1147.2 and R1150.3 are newly adopted or amended rules that have quantified emission reductions in milestone years for this plan, although those reductions were not reflected into the baseline emissions. As in the case of the RECLAIM adjustment, the emission reductions from these newly adopted or amended rules are included in the attainment strategy in this Plan for 2030.

TABLE I-2-2A
CONTROL FACTORS[+] BY SOUTH COAST AQMD RULES APPLYING TO NON-RECLAIM SOURCES WITH POST-2018 COMPLIANCE DATES

RULES	DESCRIPTION	Adoption /Amend Date	2025			2030		
			VOC	NOx	PM	VOC	NOx	PM
445	Wood Burning Devices	3-Oct-20	-	-	0.97	-	-	0.97
1109.1	NOx reduction from refinery	5-Nov-21	-	0.89	-	-	0.64	-
1111[a]	Residential NG Heating Furnaces (<175k btu/hr)	2-Mar-18	-	0.82	-	-	0.68	-
1113	Architectural Coatings	5-Feb-16	0.92	-	-	0.92	-	-
1118.1	Non-Refinery Flares	4-Jan-19	0.97	0.81	-	0.97	0.81	-
1134	Stationary Gas Turbine	5-Apr-19	-	0.58	-	-	0.36	-
1135	Electricity Generating Facilities	2-Nov-18	-	0.09	-	-	0.09	-
1146 & 1146.1	Industrial /Commercial Boilers, Steam Generator, & Process Heaters	7-Dec-18	-	0.35	-	-	0.34	-
1168	Adhesive and Sealant Applications	6-Oct-17	0.87	-	-	0.82	-	-
1179.1	Combustion Equipment at Publicly Owned Treatment Works Facility	2-Oct-20	0.75	-	-	0.75	-	-
Airport	FBMSM – Commercial Airports	6-Dec-19	0.46	0.46	-	0.34	0.34	-

[+] The control factors in this table indicate the implementation schedule of rules and their anticipated percentage reductions in the total emissions subject to the rule. However, these figures do not represent rule effectiveness.

[a]R1111 reduction reflect the implementation schedule for the March 2018 amendment.

TABLE I-2-2B
ACCUMULATED EMISSION REDUCTIONS IN TONS PER DAY BY SOUTH COAST AQMD RULES APPLYING TO NON-RECLAIM SOURCES

RULES	DESCRIPTION	Adoption /Amend Date	2025			2030		
			VOC	NOx	PM	VOC	NOx	PM
445	Wood Burning Devices	27-Oct-20	-	-	0.13	-	-	0.13
1109.1	NOx reduction from refinery	5-Nov-21	-	1.17	-	-	4.65	-
1111[a]	Residential NG Heating Furnaces	2-Mar-18		2.38	-	-	4.12	-
1113	Architectural Coatings	5-Feb-16	0.95	-	-	0.95	-	-
1118.1 (non-RECLAIM)[b]	Non-Refinery Flares	4-Jan-19	-	0.12	-	-	0.12	-
1134 (non-RECLAIM)[b]	Stationary Gas Turbine	5-Apr-19	-	0.11	-	-	0.17	-
1135 (non-RECLAIM)[b]	Electricity Generating Facilities	2-Nov-18	-	0.04	-	-	0.04	-
1146 & 1146.1 (non-RECLAIM)[b]	Industrial /Commercial Boilers, Steam Generator, & Process Heaters	7-Dec-18	-	-	-	-	0.06	-
1168	Adhesive and Sealant Applications	6-Oct-17	0.79	-	-	0.79	-	-
1179.1	Combustion Equipment at Publicly Owned Treatment Works Facility	2-Oct-20	0.05	-	-	0.05	-	-
Airport	FBMSM – Commercial Airports	6-Dec-19	-	0.5	-	-	0.5	-

[a]R1111 reduction reflect the implementation schedule for the March 2018 amendment.
[b]The emission reductions for RECLAIM portion are not included to avoid double counting.

TABLE I-2-2C
REDUCTIONS IN TONS PER DAY FROM SOUTH COAST AQMD'S REGULATIONS TO CONVERT THE RECLAIM PROGRAM TO A COMMAND-AND-CONTROL STRUCTURE

Adopted/Amended Date	District Rule	Implementation Schedule		Total Reductions from RECLAIM Sources in 2030 (tpd)	2030 Reduction in excess of 2022 reductions (tpd)
		Start Year	End Year		
11/1/2019	Rule 1110.2 – Control of Emissions from Gaseous- and Liquid-fueled Engines	2020	2029	0.25	0.21
1/4/2019	Rule 1118.1 – Control of Emissions from Non-Refinery Flares	2022	2025	0.03	0.03
4/5/2019	Rule 1134 – Emissions of Oxides of Nitrogen from Stationary Gas Turbines	2024	2027	1.66	1.66
11/2/2018	Rule 1135 – Electricity Generating Facilities	2020	2025	0.30	0.18
12/7/2018	Rule 1146 & 1146.1 – Emissions of Oxides of Nitrogen from Industrial, Institutional, Commercial Boilers, Steam Generators, and Process Heaters	2019	2033	0.36	0.08
12/7/2018	Rule 1146.2 – Emissions of Oxides of Nitrogen from Large Heaters and Small Boilers and Process Heaters	2022	2023	0.002	0.002
5/6/2022	Rule 1147 – NOx Reductions from Miscellaneous Sources	2024	2059	0.40	0.40
8/6/2021	Rule 1147.1 – NOx Reductions from Aggregate Dryers	2025	2057	0.01	0.01
4/1/2022	Rule 1147.2 – NOx Reductions from Metal Melting and Heating Furnaces	2026	2057	0.49	0.36
8/4/2023	Rule 1153.1 – Emissions of Oxides of Nitrogen from Commercial Food Ovens	2024	2036	0.02	0.02
Cumulative reductions from the landing rules listed above*				3.47	2.86

* Reductions are calculated for each rule individually. Because some sources are affected by more than one rule, the compounded emission reductions are slightly lower than the sum of reductions from individual rules.

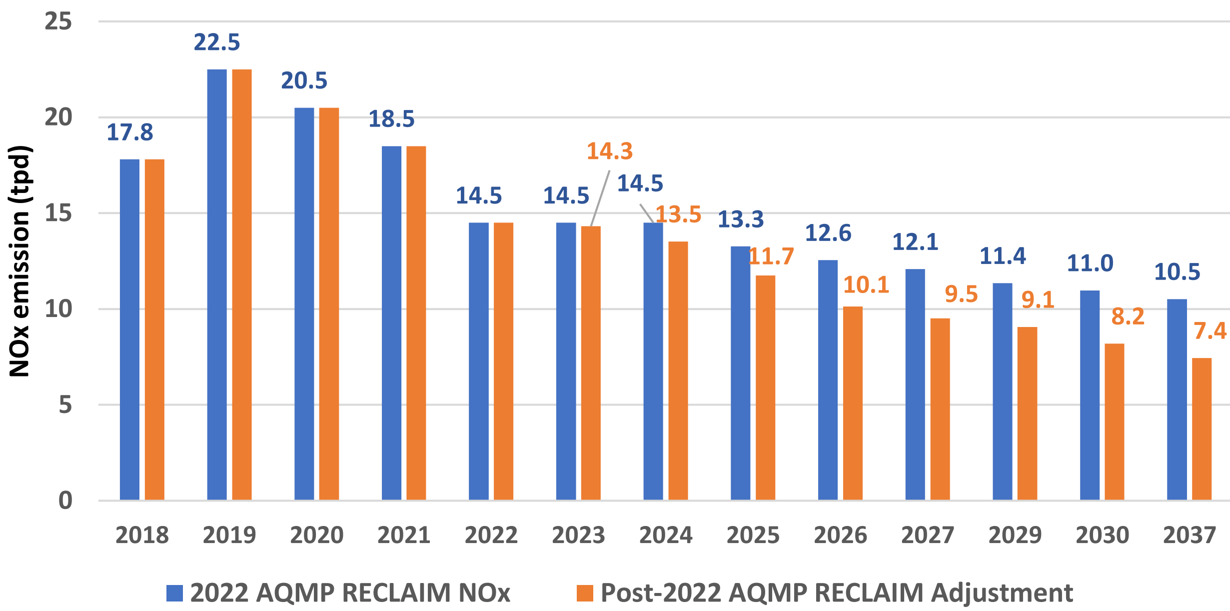

FIGURE I-2-3
NOX EMISSION OF (FORMER-) RECLAIM SOURCES FOR FUTURE YEARS IN THE DRAFT PM2.5 BASELINE AND ADJUSTED RECLAIM EMISSIONS AS A RESULT OF QUANTIFIED LANDING RULES

TABLE I-2-2D
ACCUMULATED EMISSION REDUCTIONS IN TONS PER DAY BY POST-2022 AQMP SOUTH COAST AQMD RULES FOR NON-RECLAIM SOURCES

Adoption Date	District Rule	Implementation Schedule		Net SIP Reduction by 2030* (tpd)
		Start Year	End Year	
9/1/2023	Rule 1111 – Reduction of NOx Emissions from Natural-Gas-Fired, Fan-Type Central Furnaces	2012	2050	-0.07**
5/6/2022	Rule 1147 – NOx Reductions from Miscellaneous Sources	2024	2059	0.28
8/6/2021	Rule 1147.1 – NOx Reductions from Aggregate Dryers	2025	2057	0.01
4/1/2022	Rule 1147.2 – NOx Reductions from Metal Melting and Heating Furnaces	2026	2057	0.06
2/5/2021	Rule 1150.3 – Emissions of Oxides of Nitrogen from Combustion Equipment at Landfills	2021	2031	0.04
8/4/2023	Rule 1153.1 – Emissions of Oxides of Nitrogen from Commercial Food Ovens	2024	2036	0.02
11/4/2022	Rule 1168 – VOC reductions from adhesive and sealant applications	2017	2028	-0.14**

*Reductions by 2030 for each rule are calculated with SIP baseline inventory and associated control factors based on rule-specific implementation schedules.

**The amendment allowed more time to comply with the rule requirements, which resulted in less reductions in 2030 than the earlier version. Negative values indicate the changes from the previous version reflected in the 2022 AQMP.

Growth Factors

To quantify growth, a facility business type is assigned to each facility based on the North American Industry Classification System (NAICS) Code according to their primary activity. Growth projections by NAICS are based on SCAG's 2020 RTP/SCS. The growth scalars were developed using the most recent data from Energy Information Administration (EIA), Southern California Gas Company, Bureau of Land Management (BLM), and South Coast AQMD rule compliance records.

Each emission inventory source grows based on its growth surrogate. These growth surrogates include industry output growth, employment growth, demographic growth, vehicle miles traveled (VMT) growth, and others. The demographic forecasts from the year 2018 through 2031 for population, housing, employment, and motor vehicle activity are shown in Table I-2-3. Current forecasts indicate that this region will experience a 7.9 percent population growth by the year 2030 with a 1.8 percent increase in vehicle miles traveled (VMT) from the 2018 levels. Housing units and total employment are projected to grow by 11.7 percent and 7.3 percent, respectively. Table I-2-4 shows the relative distribution of population by county in the Basin for the years 2018, 2023, 2025, 2028, 2030 and 2031. By 2031 the populations in Los Angeles and Orange counties are projected to increase by 9 percent from the 2018 levels, compared with the increases for Riverside and San Bernardino counties of 23 percent and 19 percent, respectively, indicating faster growth in inland counties than Los Angeles and Orange counties.

The selection of the surrogate by which emission growth is projected depends on the type of activity. For instance, manufacturing sectors use output growth as a surrogate. Output growth is the product of employment and productivity. Employment growth is chosen for labor intensive sectors, such as construction and laundering. Certain emission sources use demographic data as their surrogate; for example, the number of housing units is used to project emissions from architectural coatings, and population growth is used for the composting waste disposal category. Some growth projections are from SoCalGas 2020 Gas Data Report for natural gas combustion related categories. Growth factors for specified ranges of NAICS categories were projected by SCAG and are based on predictions of growth for different industrial sectors in each county. SCAG has provided growth factors for future milestone years such as 2023, 2025, 2028, 2030, and 2031. Table I-2-5 lists the point sources growth surrogate by NAICS. Table I-2-6 shows the area sources growth surrogate by source category. Tables I-2-7 through Table I-2-11 illustrate the growth factors for point sources by NAICS for years of 2023, 2025, 2028, 2030, and 2031 in the ~~Draft~~ PM2.5 Plan. Tables I-2-12 through Table I-2-16 contain the growth factors for years of 2023, 2025, 2028, 2030, and 2031 in the ~~Draft~~ PM2.5 Plan for the area sources by source category.

TABLE I-2-3
BASELINE DEMOGRAPHIC FORECASTS IN THE ~~DRAFT 2024 PM~~PM2.5 PLAN

CATEGORY		2018	2023	2025	2030	2031
Population	Millions	16.7	17.3	17.5	18	18.1
	Growth (%)		3.5	4.8	7.9	8.5
Housing Units	Millions	5.3	5.7	5.7	6	6
	Growth (%)	-	5.9	7.7	11.7	12.5
Total Employment	Millions	7.7	8	8.1	8.3	8.4
	Growth (%)	-	3	4.4	7.3	7.9
Daily VMT	Millions	388	394	394	395	397
	Growth (%)	-	1.7	1.6	1.8	2.5

TABLE I-2-4
POPULATION DISTRIBUTION BY COUNTY IN SCAB (IN THOUSANDS)

YEAR	LOS ANGELES	ORANGE	RIVERSIDE	SAN BERNARDINO	BASIN TOTAL
2018	9,869	3,232	1,937	1,634	16,672
2023	10,149	3,324	2,067	1,724	17,263
2025	10,239	3,361	2,124	1,753	17,477
2028	10,373	3,409	2,202	1,797	17,781
2030	10,463	3,441	2,254	1,827	17,985
2031	10,513	3,453	2,273	1,844	18,082

TABLE I-2-5
POINT SOURCES GROWTH SURROGATE BY SOURCE CATEGORY

NAICS	SOURCE DESCRIPTION	GROWTH SURROGATE
111	Crop Production	111-115 Output
112	Animal Production	111-115 Output
113	Forestry and Logging	111-115 Output
114	Fishing Hunting and Trapping	111-115 Output
115	Support Activities for Agriculture and Forestry	111-115 Output
211	Oil and Gas Extraction	211 Output
212	Mining (except Oil and Gas)	212-213 Output
213	Support Activities for Mining	212-213 Output
221111	Hydroelectric Power Generation	SCG-Electricity Power
221112	Fossil Fuel Electric Generation	SCG-Electricity Power
221113	Nuclear Electric Generation	SCG-Electricity Power
221119	Other Electric Generation	SCG-Electricity Power
221121	Electric Bulk Transmission and Control	SCG-Electricity Power
221122	Electric Power Distribution	SCG-Electricity Power
221	Utilities - Except Electricity	Total Employment
236	Construction of Buildings	236-238 Employment
237	Heavy and Civil Engineering Construction	236-238 Employment
238	Specialty Trade Contractors	236-238 Employment
311	Food Manufacturing	311 Output
312	Beverage and Tobacco Product Manufacturing	312 Output
313	Textile Mills	313 Output
314	Textile Product Mills	314 Output
315	Apparel Manufacturing	315 Output
316	Leather and Allied Product Manufacturing	316 Output
321	Wood Product Manufacturing	321 Output
322	Paper Manufacturing	322 Output
323	Printing and Related Support Activities	323 Output
324	Petroleum and Coal Products Manufacturing	No Growth
325	Chemical Manufacturing	325 Output
326	Plastics and Rubber Products Manufacturing	326 Output
327	Nonmetallic Mineral Product Manufacturing	327 Output
331	Primary Metal Manufacturing	331 Output
332	Fabricated Metal Product Manufacturing	332 Output

TABLE I-2-5 (CONTINUED)
POINT SOURCES GROWTH SURROGATE BY SOURCE CATEGORY

NAICS	SOURCE DESCRIPTION	GROWTH SURROGATE
333	Machinery Manufacturing	333 Output
334	Computer and Electronic Product Manufacturing	334 Output
335	Electrical Equipment -Appliance-Component Manufacturing	335 Output
336	Transportation Equipment Manufacturing	336 Output
337	Furniture and Related Product Manufacturing	337 Output
339	Miscellaneous Manufacturing	339 Output
423	Merchant Wholesalers-Durable Goods	423 Employment
424	Merchant Wholesalers - Nondurable Goods	424 Employment
425	Wholesale Electronic Markets and Agents and Brokers	425 Employment
441	Motor Vehicle and Parts Dealers	441 Employment
442	Furniture and Home Furniture Stores	442 Employment
443	Electronics and Appliance Stores	443 Employment
444	Building Material-Garden Equipment-Supplies Dealers	444 Employment
445	Food and Beverage Stores	445-6 Employment
446	Health and Personal Care Stores	445-6 Employment
447	Gasoline Stations	447 Output
448	Clothing and Clothing Accessories Stores	448 Output
451	Sporting Goods-Hobby-Book- Music Stores	451-454 Output
452	General Merchandise Stores	451-454 Output
453	Miscellaneous Store Retailers	451-454 Output
454	Nonstore Retailers	451-454 Output
481	Air Transportation	481 Output
482	Rail Transportation	482 Output
483	Water Transportation	483 Output
484	Truck Transportation	484 Output
485	Transit and Ground Passenger Transportation	485 Output
486	Pipeline Transportation	486 Output
487	Scenic and Sightseeing Transportation	487 Output
488	Support Activities for Transportation	488 Output
491	Postal Service	491-493 Employment
492	Couriers and Messengers	491-493 Employment
493	Warehousing and Storage	491-493 Output
511	Publishing Industries (except Internet)	511-519 Output

TABLE I-2-5 (CONTINUED)
POINT SOURCES GROWTH SURROGATE BY SOURCE CATEGORY

NAICS	SOURCE DESCRIPTION	GROWTH SURROGATE
512	Motion Picture and Sound Recording Industries	511-519 Output
515	Broadcasting (except Internet)	511-519 Output
517	Telecommunications	511-519 Output
518	Data Processing- Hosting and Related Services	511-519 Output
519	Other Information Services	511-519 Output
521	Monetary Authorities-Central Bank	521-525 Employment
522	Credit Intermediation and Related Activities	521-525 Employment
523	Securities-Commodity-Other Financial Investments	521-525 Employment
524	Insurance Carriers and Related Activities	521-525 Employment
525	Funds-Trusts-and Other Financial Vehicles	521-525 Employment
531	Real Estate	531-533 Employment
532	Rental and Leasing Services	531-533 Employment
533	Lessors of Nonfinancial Intangible Assets (no Copyright)	531-533 Employment
541	Professional-Scientific-and Technical Services	541 Employment
551	Management of Companies and Enterprises	551 Employment
561	Administrative and Support Services	561-562 Employment
562	Waste Management and Remediation Services	561-562 Employment
611	Educational Services	Pop 5 to 24
621	Ambulatory Health Care Services	Population
622	Hospitals	Pop 0 to 4 and 65 up
623	Nursing and Residential Care Facilities	Pop 65 up
624	Social Assistance	621-624 Employment
711	Performing Arts-Spectator Sports-and Related Industries	711-713 Output
712	Museums-Historical Sites-and Similar Institutions	711-713 Output
713	Amusement-Gambling-and Recreation Industries	711-713 Output
721	Accommodation	Total Employment
722	Food Services and Drinking Places	Total Employment
811	Repair and Maintenance	Total Employment
812	Personal and Laundry Services	Total Employment
813	Religious-Grant-Civic-Professional-and Similar Org	811-814 Employment
814	Private Households	811-814 Employment
921	Executive-Legislative-and Other General Govt Support	921-928 Employment
922	Justice-Public Order-and Safety Activities	921-928 Employment

TABLE I-2-5 (CONCLUDED)
POINT SOURCES GROWTH SURROGATE BY SOURCE CATEGORY

NAICS	SOURCE DESCRIPTION	GROWTH SURROGATE
923	Administration of Human Resource Programs	921-928 Employment
924	Administration of Environmental Quality Programs	921-928 Employment
925	Admin of Housing Pgms-Urban-Community Development	921-928 Employment
926	Administration of Economic Programs	921-928 Employment
927	Space Research and Technology	921-928 Employment
928	National Security and International Affairs	921-928 Employment

TABLE I-2-6
AREA SOURCES GROWTH SURROGATE BY SOURCE CATEGORY

SOURCE DESCRIPTION	SURROGATE
Cogen	SCG-Cogen*
Gaseous Fuel	NAICS 211 Output
Ind. Stationary IC Engines - Natural Gas	SCG - Industrial Combustion*
Industrial Natural Gas (Unspecified)	SCG - Industrial Combustion*
Industrial LPG Combustion	Manufacturing Output
Industrial Distillate Oil Combustion	Manufacturing Output
Ind. Stationary IC Engines - Other Fuel	Manufacturing Output
Ag Irrigation IC Engines-Stationary	CARB Growth Data
Ag Irrigation IC Engines-Portable	CARB Growth Data
Commercial Space Heating	SCG - Commercial Space*
Commercial Water Heating	SCG - Commercial Water*
Commercial Combustion – Internal	SCG - Commercial Combustion*
Commercial Combustion – External	SCG - Commercial Combustion*
Commercial LPG Combustion	Service Output
Stationary Engines – Diesel	CARB Growth Data
Resource Recovery	SCG-Cogen*
Sewage Treatment Plants - POTWs - Ammonia	Population
Municipal Waste Disposal	Population
Composting – Ammonia	No Growth
Biological Waste – Composting	Population
Laundering	Total Employment
Degreasing	Manufacturing Output
Auto Refinishing	Misc. Services Employment
Marine Coating	Water Transportation Output
Paper Coating	Paper Manufacturing Output
Fabric Coatings	Textile Output
Can and Coil Coatings	Fabricated Metal Output
Metal Part and Products Coatings	Fabricated Metal Output
Wood and Fabricated Furniture Coatings	Furniture Output
Plastic Parts Coatings	Plastic Output
Semiconductor Coatings	Computer Output
Aircraft and Aerospace Coatings	Air Transportation Output
Thinning and Cleanup Solvent Use	Manufacturing Output

TABLE I-2-6 (CONTINUED)
AREA SOURCES GROWTH SURROGATE BY SOURCE CATEGORY

SOURCE DESCRIPTION	SURROGATE
Printing	Printing Output
Adhesive and Sealants (Solvent Based)	Manufacturing Output
Adhesive and Sealants (Water Based)	Manufacturing Output
Miscellaneous Industrial Solvents	Manufacturing Output
Oil Production Fugitive	NAICS 211 Output
Natural Gas Transmission Losses	SCG - Total - Natural Gas*
LPG Transfer and Dispensing - Fugitive Losses	Households
Gasoline Dispersing Tank-Working Losses	Gasoline Consumption
Gasoline Dispensing Tank-Breathing Losses	Gasoline Consumption
Vehicle Refueling-Vapor Displacement Losses	Gasoline Consumption
Vehicle Refueling-Spillage	Gasoline Consumption
Storage Tank and Pipeline Cleaning	Gasoline Consumption
Tank Cargo-Pressure Related Fug. Losses	Gasoline Consumption
Tank Cargo-Vapor Hose Fugitive Losses	Gasoline Consumption
Tank Cargo-Product Hose Fugitive Losses	Gasoline Consumption
Bulk Gasoline Storage and Transfer (Unspec)	Gasoline Consumption
Rubber and Rubber Products	Plastic Output
Fiberglass and Fiberglass Products	Plastic Output
Plastic and Plastic Products	Plastic Output
Wine Fermentation	Beverage Manufacturing Output
Wine Aging	CARB Growth Data
Bakeries	Food Output
Agricultural Products Processing Losses	Agriculture Output
Agricultural Crop Processing Losses	Agriculture Output
Sand and Gravel Excavation	Mineral Product Output
Asphaltic Concrete Production	Construction Employment
Grinding/Crushing of Aggregates	Mineral Product Output
Surface Blasting	Mining Extraction Output
Cement Concrete Manufacturing and Fabrication	Mineral Product Output
Open Pile Storage	No Growth
Other Mineral Processes	Mineral Product Output
Secondary Metal Production	Primary Metal Output
Wood Product Losses	Furniture Output

TABLE I-2-6 (CONTINUED)
AREA SOURCES GROWTH SURROGATE BY SOURCE CATEGORY

SOURCE DESCRIPTION	SURROGATE
Industrial Lubricant	Population
Industrial Process Losses (Unspecified)	No Growth
Consumer Products (Except Aerosol)	Population
Aerosol Consumer Product – Aerosol	No Growth
Architectural Coatings	Households
Ag Pesticides Methyl Bromide	CARB Growth Data
Ag Pesticides non-Methyl Bromide	CARB Growth Data
non-Ag Pesticides-Methyl Bromide	CARB Growth Data
non-Ag Pesticides-non-Methyl Bromide	CARB Growth Data
Agricultural Fertilizer – Ammonia	CARB Growth Data
Asphalt Paving	Construction Employment
Residential Wood Stoves	No Growth
Residential Wood Fireplaces	No Growth
Residential Natural Gas Space Heating	SCG - Residential Space*
Residential Distillate Oil Combustion	Households
Residential Natural Gas Water Heating	SCG - Residential Water*
Residential Natural Gas Cooking	SCG - Residential Cooking*
Residential Natural Gas Comb – Other	SCG - Residential Combustion*
Residential LPG Combustion	Households
Farming Operations	CARB Growth Data
Residential Building Construction - Dust	Construction Employment
Commercial Building Construction - Dust	Construction Employment
Industrial Building Construction – Dust	Construction Employment
Institutional Building Construction - Dust	Construction Employment
Road Construction – Dust	Construction Employment
Paved Road Travel – Freeways	VMT (freeway)
Paved Road Travel (Unspecified)	No Growth
Paved Road Travel-Major	VMT (major)
Paved Road Travel-Collector	VMT (other)
Paved Road Travel-Local	VMT (other)
Unpaved Road Travel -City and County Roads	No Growth
Unpaved Road Travel - US Forest and Park Roads	No Growth
Unpaved Road Travel -BLM Roads	No Growth

TABLE I-2-6 (CONCLUDED)
AREA SOURCES GROWTH SURROGATE BY SOURCE CATEGORY

SOURCE DESCRIPTION	SURROGATE
Unpaved Road Travel -Farm Roads	CARB Growth Data
Unpaved Roads (Unspecified)	No Growth
Ag Land (Non-Pasture) - Wind Dust	CARB Growth Data
Ag Land (Pasture) - Wind Dust	CARB Growth Data
Unpaved Roads - Wind Dust	No Growth
Fires	No Growth
Ag Burning – Pruning	CARB Growth Data
Agricultural Burning - Field Crops	CARB Growth Data
Range Improvement	Agriculture Output
Forest Management	Forest Management Services Data**
Wildland Fire Use (WFU)	CARB Growth Data
Weed Abatement	No Growth
Waste Burning (Unspecified)	CARB Growth Data
Cooking	Total Employment
Domestic Activity – Ammonia	Population

* These projections by SCG incorporate the energy efficiency programs/standards.[17]

** FRAP provided burn perimeters and ignition dates which is used in FOOEM model to estimate prescribed burning emissions; future year estimates are based on a 10-year average, held flat in the forecast.

[17] https://www.socalgas.com/sites/default/files/2020-10/2020_California_Gas_Report_Joint_Utility_Biennial_Comprehensive_Filing.pdf

TABLE I-2-7
NAIC EMISSION GROWTH FACTORS BY COUNTY FOR THE YEAR 2023

NAIC SECTOR	NAIC	LOS ANGELES	ORANGE	RIVERSIDE	SAN BERNARDINO
Agriculture, Forestry, Animal, Fishing and Hunting	11	1.078	0.987	1.111	1.032
Oil and Gas Extraction	211	1.276	1.168	1.315	1.221
Mining (except Oil and Gas)	212	1.009	0.923	1.039	0.966
Support Activities for Mining	213	1.009	0.923	1.039	0.966
Utilities - Except Electricity	221	1.039	1.024	1.081	1.000
Utilities – Electricity	221	1.027	1.043	1.164	1.061
Construction	23	1.022	1.027	1.108	1.026
Food Manufacturing	311	1.037	1.060	1.124	1.071
Beverage and Tobacco Product Manufacturing	312	0.939	0.959	1.018	0.970
Textile Mills	313	1.130	1.155	1.225	1.167
Textile Product Mills	314	1.130	1.155	1.225	1.167
Apparel Manufacturing	315	1.127	1.151	1.221	1.163
Leather and Allied Product Manufacturing	316	1.127	1.151	1.221	1.163
Wood Product Manufacturing	321	1.032	1.054	1.118	1.065
Paper Manufacturing	322	1.033	1.056	1.120	1.067
Printing and Related Support Activities	323	1.104	1.128	1.196	1.140
Petroleum and Coal Products Manufacturing	324	1.000	1.000	1.000	1.000
Chemical Manufacturing	325	1.047	1.069	1.134	1.081
Plastics and Rubber Products Manufacturing	326	1.003	1.025	1.087	1.036
Nonmetallic Mineral Product Manufacturing	327	1.026	1.048	1.112	1.059
Primary Metal Manufacturing	331	1.097	1.121	1.189	1.133
Fabricated Metal Product Manufacturing	332	1.032	1.054	1.118	1.066
Machinery Manufacturing	333	1.053	1.076	1.141	1.087
Computer and Electronic Product Manufacturing	334	1.108	1.132	1.200	1.144
Electrical Equipment -Appliance-Component Manufacturing	335	1.049	1.072	1.137	1.083
Transportation Equipment Manufacturing	336	1.052	1.075	1.140	1.086
Furniture and Related Product Manufacturing	337	1.079	1.103	1.169	1.114

TABLE I-2-7 (CONTINUED)
NAIC EMISSION GROWTH FACTORS BY COUNTY FOR THE YEAR 2023

NAIC SECTOR	NAIC	LOS ANGELES	ORANGE	RIVERSIDE	SAN BERNARDINO
Miscellaneous Manufacturing	339	1.071	1.095	1.161	1.106
Wholesale Trade	42	1.000	0.997	1.055	0.994
Motor Vehicle and Parts Dealers	441	1.077	1.152	1.143	1.119
Furniture and Home Furniture Stores	442	1.120	1.198	1.188	1.164
Electronics and Appliance Stores	443	1.120	1.198	1.188	1.164
Building Material-Garden Equipment-Supplies Dealers	444	1.120	1.198	1.188	1.164
Food and Beverage Stores	445	0.990	1.059	1.050	1.029
Health and Personal Care Stores	446	0.990	1.059	1.050	1.029
Gasoline Stations	447	1.120	1.198	1.188	1.164
Clothing and Clothing Accessories Stores	448	1.120	1.198	1.188	1.164
Sporting Goods-Hobby-Book- Music Stores	451	1.120	1.198	1.188	1.164
General Merchandise Stores	452	1.120	1.198	1.188	1.164
Miscellaneous Store Retailers	453	1.120	1.198	1.188	1.164
Nonstore Retailers	454	1.120	1.198	1.188	1.164
Air Transportation	481	1.084	1.101	1.229	1.120
Rail Transportation	482	1.043	1.060	1.000	1.077
Water Transportation	483	1.179	1.198	1.336	1.218
Truck Transportation	484	1.115	1.133	1.264	1.152
Transit and Ground Passenger Transportation	485	1.105	1.123	1.253	1.142
Pipeline Transportation	486	1.097	1.115	1.243	1.133
Scenic and Sightseeing Transportation	487	1.052	1.069	1.192	1.087
Support Activities for Transportation	488	1.052	1.069	1.192	1.087
Postal Service	491	1.012	1.028	1.147	1.045
Couriers and Messengers	492	1.012	1.028	1.147	1.045
Warehousing and Storage	493	1.079	1.097	1.223	1.115
Information	51	1.165	1.150	1.207	1.155
Finance and Insurance	52	1.105	1.109	1.167	1.113
Real Estate and Rental and Leasing	53	1.106	1.110	1.168	1.113
Professional-Scientific-and Technical Services	541	1.064	1.076	1.156	1.064
Management of Companies and Enterprises	551	1.084	1.097	1.178	1.084

TABLE I-2-7 (CONCLUDED)
NAIC EMISSION GROWTH FACTORS BY COUNTY FOR THE YEAR 2023

NAIC SECTOR	NAIC	LOS ANGELES	ORANGE	RIVERSIDE	SAN BERNARDINO
Administrative and Support Services	561	1.014	1.027	1.103	1.014
Waste Management and Remediation Services	562	1.014	1.027	1.103	1.014
Educational Services	611	1.063	1.069	1.150	1.064
Ambulatory Health Care Services	621	1.028	1.028	1.067	1.054
Hospitals	622	1.121	1.120	1.160	1.140
Nursing and Residential Care Facilities	623	1.175	1.160	1.226	1.222
Social Assistance	624	1.060	1.065	1.146	1.061
Arts, Entertainment, Museums, and Recreation	71	1.104	1.119	1.191	1.204
Accommodation and Food Services	72	1.065	1.079	1.149	1.161
Repair and Maintenance	811	1.019	1.030	1.101	1.039
Personal and Laundry Services	812	1.019	1.030	1.101	1.039
Religious-Grant-Civic-Professional-and Similar Org	813	1.015	1.024	1.057	1.024
Private Households	814	1.015	1.024	1.057	1.024
Public Administration	92	1.057	1.050	1.151	1.053

TABLE I-2-8
NAIC EMISSION GROWTH FACTORS BY COUNTY FOR THE YEAR 2025

NAIC SECTOR	NAIC	LOS ANGELES	ORANGE	RIVERSIDE	SAN BERNARDINO
~~uAgriculture~~Agriculture, Forestry, Animal, Fishing and Hunting	11	1.102	0.992	1.157	1.050
Oil and Gas Extraction	211	1.396	1.255	1.465	1.329
Mining (except Oil and Gas)	212	1.004	0.904	1.054	0.957
Support Activities for Mining	213	1.004	0.904	1.054	0.957
Utilities - Except Electricity	221	1.058	1.035	1.122	1.000
Utilities - Electricity	221	0.940	0.965	1.126	0.984
Construction	23	1.032	1.039	1.167	1.043
Food Manufacturing	311	1.052	1.086	1.187	1.105
Beverage and Tobacco Product Manufacturing	312	0.915	0.945	1.032	0.961
Textile Mills	313	1.186	1.225	1.338	1.246
Textile Product Mills	314	1.186	1.225	1.338	1.246
Apparel Manufacturing	315	1.181	1.219	1.332	1.240
Leather and Allied Product Manufacturing	316	1.181	1.219	1.332	1.240
Wood Product Manufacturing	321	1.044	1.078	1.178	1.097
Paper Manufacturing	322	1.047	1.080	1.181	1.099
Printing and Related Support Activities	323	1.148	1.185	1.295	1.206
Petroleum and Coal Products Manufacturing	324	1.000	1.000	1.000	1.000
Chemical Manufacturing	325	1.065	1.100	1.202	1.119
Plastics and Rubber Products Manufacturing	326	1.004	1.036	1.132	1.054
Nonmetallic Mineral Product Manufacturing	327	1.036	1.070	1.169	1.088
Primary Metal Manufacturing	331	1.138	1.175	1.284	1.195
Fabricated Metal Product Manufacturing	332	1.044	1.078	1.178	1.097
Machinery Manufacturing	333	1.074	1.109	1.212	1.128
Computer and Electronic Product Manufacturing	334	1.154	1.191	1.301	1.211
Electrical Equipment -Appliance- Component Manufacturing	335	1.069	1.103	1.206	1.122
Transportation Equipment Manufacturing	336	1.073	1.108	1.210	1.127
Furniture and Related Product Manufacturing	337	1.112	1.148	1.254	1.168

TABLE I-2-8 (CONTINUED)
NAIC EMISSION GROWTH FACTORS BY COUNTY FOR THE YEAR 2025

NAIC SECTOR	NAIC	LOS ANGELES	ORANGE	RIVERSIDE	SAN BERNARDINO
Miscellaneous Manufacturing	339	1.100	1.136	1.241	1.156
Wholesale Trade	42	1.000	0.997	1.088	0.995
Motor Vehicle and Parts Dealers	441	1.112	1.212	1.211	1.171
Furniture and Home Furniture Stores	442	1.174	1.281	1.279	1.237
Electronics and Appliance Stores	443	1.174	1.281	1.279	1.237
Building Material-Garden Equipment-Supplies Dealers	444	1.174	1.281	1.279	1.237
Food and Beverage Stores	445	0.988	1.077	1.076	1.040
Health and Personal Care Stores	446	0.988	1.077	1.076	1.040
Gasoline Stations	447	1.174	1.281	1.279	1.237
Clothing and Clothing Accessories Stores	448	1.174	1.281	1.279	1.237
Sporting Goods-Hobby-Book- Music Stores	451	1.174	1.281	1.279	1.237
General Merchandise Stores	452	1.174	1.281	1.279	1.237
Miscellaneous Store Retailers	453	1.174	1.281	1.279	1.237
Nonstore Retailers	454	1.174	1.281	1.279	1.237
Air Transportation	481	1.119	1.149	1.341	1.171
Rail Transportation	482	1.060	1.089	0.000	1.110
Water Transportation	483	1.259	1.293	1.509	1.317
Truck Transportation	484	1.164	1.196	1.396	1.219
Transit and Ground Passenger Transportation	485	1.150	1.181	1.379	1.204
Pipeline Transportation	486	1.138	1.168	1.364	1.191
Scenic and Sightseeing Transportation	487	1.073	1.102	1.286	1.123
Support Activities for Transportation	488	1.073	1.102	1.286	1.123
Postal Service	491	1.016	1.044	1.218	1.064
Couriers and Messengers	492	1.016	1.044	1.218	1.064
Warehousing and Storage	493	1.112	1.142	1.333	1.164
Information	51	1.241	1.215	1.315	1.215
Finance and Insurance	52	1.151	1.159	1.247	1.174
Real Estate and Rental and Leasing	53	1.153	1.161	1.248	1.175
Professional-Scientific-and Technical Services	541	1.093	1.111	1.236	1.096
Management of Companies and Enterprises	551	1.122	1.141	1.269	1.126

TABLE I-2-8 (CONCLUDED)
NAIC EMISSION GROWTH FACTORS BY COUNTY FOR THE YEAR 2025

NAIC SECTOR	NAIC	LOS ANGELES	ORANGE	RIVERSIDE	SAN BERNARDINO
Administrative and Support Services	561	1.022	1.040	1.157	1.026
Waste Management and Remediation Services	562	1.022	1.040	1.157	1.026
Educational Services	611	1.090	1.099	1.221	1.092
Ambulatory Health Care Services	621	1.038	1.040	1.097	1.073
Hospitals	622	1.168	1.169	1.229	1.193
Nursing and Residential Care Facilities	623	1.244	1.227	1.324	1.308
Social Assistance	624	1.086	1.095	1.216	1.087
Arts, Entertainment, Museums, and Recreation	71	1.152	1.173	1.282	1.296
Accommodation and Food Services	72	1.095	1.115	1.219	1.231
Repair and Maintenance	811	1.028	1.044	1.152	1.058
Personal and Laundry Services	812	1.028	1.044	1.152	1.058
Religious-Grant-Civic-Professional-and Similar Org	813	1.023	1.038	1.095	1.041
Private Households	814	1.023	1.038	1.095	1.041
Public Administration	92	1.082	1.073	1.229	1.084

TABLE I-2-9
NAIC EMISSION GROWTH FACTORS BY COUNTY FOR THE YEAR 2028

NAIC SECTOR	NAIC	LOS ANGELES	ORANGE	RIVERSIDE	SAN BERNARDINO
Agriculture, Forestry, Animal, Fishing and Hunting	11	1.147	0.988	1.189	1.095
Oil and Gas Extraction	211	1.598	1.375	1.656	1.526
Mining (except Oil and Gas)	212	1.008	0.868	1.045	0.962
Support Activities for Mining	213	1.008	0.868	1.045	0.962
Utilities - Except Electricity	221	1.086	1.050	1.182	0.991
Utilities - Electricity	221	0.820	0.849	1.022	0.877
Construction	23	1.047	1.056	1.212	1.068
Food Manufacturing	311	1.070	1.118	1.240	1.153
Beverage and Tobacco Product Manufacturing	312	0.882	0.921	1.022	0.950
Textile Mills	313	1.263	1.320	1.465	1.362
Textile Product Mills	314	1.263	1.320	1.465	1.362
Apparel Manufacturing	315	1.259	1.315	1.459	1.357
Leather and Allied Product Manufacturing	316	1.259	1.315	1.459	1.357
Wood Product Manufacturing	321	1.059	1.107	1.228	1.142
Paper Manufacturing	322	1.062	1.110	1.232	1.145
Printing and Related Support Activities	323	1.207	1.261	1.400	1.302
Petroleum and Coal Products Manufacturing	324	1.000	1.000	1.000	1.000
Chemical Manufacturing	325	1.088	1.137	1.262	1.173
Plastics and Rubber Products Manufacturing	326	1.002	1.047	1.162	1.080
Nonmetallic Mineral Product Manufacturing	327	1.048	1.095	1.215	1.129
Primary Metal Manufacturing	331	1.192	1.246	1.382	1.285
Fabricated Metal Product Manufacturing	332	1.059	1.106	1.228	1.141
Machinery Manufacturing	333	1.101	1.150	1.276	1.187
Computer and Electronic Product Manufacturing	334	1.216	1.270	1.410	1.310
Electrical Equipment -Appliance-Component Manufacturing	335	1.093	1.142	1.268	1.179
Transportation Equipment Manufacturing	336	1.100	1.149	1.276	1.186
Furniture and Related Product Manufacturing	337	1.155	1.206	1.339	1.245

TABLE I-2-9 (CONTINUED)
NAIC EMISSION GROWTH FACTORS BY COUNTY FOR THE YEAR 2028

NAIC SECTOR	NAIC	LOS ANGELES	ORANGE	RIVERSIDE	SAN BERNARDINO
Miscellaneous Manufacturing	339	1.138	1.189	1.320	1.227
Wholesale Trade	42	1.003	0.996	1.100	1.000
Motor Vehicle and Parts Dealers	441	1.161	1.295	1.276	1.248
Furniture and Home Furniture Stores	442	1.252	1.396	1.375	1.346
Electronics and Appliance Stores	443	1.252	1.396	1.375	1.346
Building Material-Garden Equipment-Supplies Dealers	444	1.252	1.396	1.375	1.346
Food and Beverage Stores	445	0.984	1.098	1.081	1.058
Health and Personal Care Stores	446	0.984	1.098	1.081	1.058
Gasoline Stations	447	1.252	1.396	1.375	1.346
Clothing and Clothing Accessories Stores	448	1.252	1.396	1.375	1.346
Sporting Goods-Hobby-Book- Music Stores	451	1.252	1.396	1.375	1.346
General Merchandise Stores	452	1.252	1.396	1.375	1.346
Miscellaneous Store Retailers	453	1.252	1.396	1.375	1.346
Nonstore Retailers	454	1.252	1.396	1.375	1.346
Air Transportation	481	1.171	1.211	1.455	1.252
Rail Transportation	482	1.087	1.124	1.000	1.162
Water Transportation	483	1.377	1.425	1.711	1.473
Truck Transportation	484	1.237	1.280	1.537	1.323
Transit and Ground Passenger Transportation	485	1.217	1.260	1.513	1.302
Pipeline Transportation	486	1.197	1.239	1.488	1.280
Scenic and Sightseeing Transportation	487	1.104	1.143	1.372	1.181
Support Activities for Transportation	488	1.104	1.143	1.372	1.181
Postal Service	491	1.025	1.061	1.274	1.096
Couriers and Messengers	492	1.025	1.061	1.274	1.096
Warehousing and Storage	493	1.161	1.201	1.442	1.241
Information	51	1.353	1.315	1.432	1.322
Finance and Insurance	52	1.217	1.228	1.327	1.254
Real Estate and Rental and Leasing	53	1.219	1.230	1.329	1.256
Professional-Scientific-and Technical Services	541	1.133	1.158	1.308	1.142
Management of Companies and Enterprises	551	1.174	1.200	1.356	1.184

TABLE I-2-9 (CONCLUDED)
NAIC EMISSION GROWTH FACTORS BY COUNTY FOR THE YEAR 2028

NAIC SECTOR	NAIC	LOS ANGELES	ORANGE	RIVERSIDE	SAN BERNARDINO
Administrative and Support Services	561	1.033	1.056	1.193	1.042
Waste Management and Remediation Services	562	1.033	1.056	1.193	1.042
Educational Services	611	1.048	1.043	1.121	1.429
Ambulatory Health Care Services	621	1.100	1.092	1.148	1.528
Hospitals	622	1.231	1.230	1.319	1.262
Nursing and Residential Care Facilities	623	1.420	1.357	1.409	2.212
Social Assistance	624	1.124	1.135	1.277	1.126
Arts, Entertainment, Museums, and Recreation	71	1.218	1.248	1.370	1.429
Accommodation and Food Services	72	1.136	1.164	1.277	1.332
Repair and Maintenance	811	1.086	1.050	1.182	0.991
Personal and Laundry Services	812	1.086	1.050	1.182	0.991
Religious-Grant-Civic-Professional-and Similar Org	813	1.034	1.052	1.117	1.064
Private Households	814	1.034	1.052	1.117	1.064
Public Administration	92	1.082	1.073	1.229	1.084

(Base year is 2018)

TABLE I-2-10
NAIC EMISSION GROWTH FACTORS BY COUNTY FOR THE YEAR 2030

NAIC SECTOR	NAIC	LOS ANGELES	ORANGE	RIVERSIDE	SAN BERNARDINO
Agriculture, Forestry, Animal, Fishing and Hunting	11	1.154	0.958	1.188	1.093
Oil and Gas Extraction	211	1.687	1.401	1.736	1.598
Mining (except Oil and Gas)	212	0.998	0.828	1.027	0.945
Support Activities for Mining	213	0.998	0.828	1.027	0.945
Utilities - Except Electricity	221	1.105	1.062	1.223	1.000
Utilities - Electricity	221	0.750	0.781	0.958	0.812
Construction	23	1.057	1.066	1.242	1.084
Food Manufacturing	311	1.066	1.123	1.260	1.171
Beverage and Tobacco Product Manufacturing	312	0.858	0.904	1.015	0.943
Textile Mills	313	1.282	1.351	1.516	1.408
Textile Product Mills	314	1.282	1.351	1.516	1.408
Apparel Manufacturing	315	1.285	1.354	1.519	1.411
Leather and Allied Product Manufacturing	316	1.285	1.354	1.519	1.411
Wood Product Manufacturing	321	1.056	1.112	1.248	1.159
Paper Manufacturing	322	1.058	1.115	1.251	1.162
Printing and Related Support Activities	323	1.219	1.284	1.441	1.339
Petroleum and Coal Products Manufacturing	324	1.000	1.000	1.000	1.000
Chemical Manufacturing	325	1.086	1.144	1.284	1.192
Plastics and Rubber Products Manufacturing	326	0.991	1.045	1.172	1.089
Nonmetallic Mineral Product Manufacturing	327	1.042	1.098	1.232	1.145
Primary Metal Manufacturing	331	1.202	1.266	1.421	1.320
Fabricated Metal Product Manufacturing	332	1.053	1.110	1.245	1.157
Machinery Manufacturing	333	1.100	1.159	1.300	1.208
Computer and Electronic Product Manufacturing	334	1.229	1.295	1.453	1.350
Electrical Equipment -Appliance-Component Manufacturing	335	1.091	1.150	1.290	1.199
Transportation Equipment Manufacturing	336	1.102	1.161	1.303	1.211
Furniture and Related Product Manufacturing	337	1.160	1.222	1.371	1.274

TABLE I-2-10 (CONTINUED)
NAIC EMISSION GROWTH FACTORS BY COUNTY FOR THE YEAR 2030

NAIC SECTOR	NAIC	LOS ANGELES	ORANGE	RIVERSIDE	SAN BERNARDINO
Miscellaneous Manufacturing	339	1.141	1.202	1.349	1.253
Wholesale Trade	42	1.003	0.993	1.107	1.001
Motor Vehicle and Parts Dealers	441	1.185	1.342	1.309	1.291
Furniture and Home Furniture Stores	442	1.284	1.455	1.419	1.400
Electronics and Appliance Stores	443	1.284	1.455	1.419	1.400
Building Material-Garden Equipment-Supplies Dealers	444	1.284	1.455	1.419	1.400
Food and Beverage Stores	445	0.981	1.112	1.084	1.070
Health and Personal Care Stores	446	0.981	1.112	1.084	1.070
Gasoline Stations	447	1.284	1.455	1.419	1.400
Clothing and Clothing Accessories Stores	448	1.284	1.455	1.419	1.400
Sporting Goods-Hobby-Book- Music Stores	451	1.284	1.455	1.419	1.400
General Merchandise Stores	452	1.284	1.455	1.419	1.400
Miscellaneous Store Retailers	453	1.284	1.455	1.419	1.400
Nonstore Retailers	454	1.284	1.455	1.419	1.400
Air Transportation	481	1.194	1.244	1.526	1.293
Rail Transportation	482	1.099	1.145	1.000	1.190
Water Transportation	483	1.426	1.485	1.822	1.544
Truck Transportation	484	1.268	1.320	1.620	1.373
Transit and Ground Passenger Transportation	485	1.249	1.301	1.596	1.353
Pipeline Transportation	486	1.220	1.271	1.559	1.322
Scenic and Sightseeing Transportation	487	1.118	1.165	1.429	1.211
Support Activities for Transportation	488	1.118	1.165	1.429	1.211
Postal Service	491	1.031	1.074	1.317	1.116
Couriers and Messengers	492	1.031	1.074	1.317	1.116
Warehousing and Storage	493	1.180	1.229	1.507	1.278
Information	51	1.410	1.358	1.490	1.365
Finance and Insurance	52	1.245	1.257	1.361	1.294
Real Estate and Rental and Leasing	53	1.249	1.260	1.365	1.298
Professional-Scientific-and Technical Services	541	1.152	1.182	1.350	1.167
Management of Companies and Enterprises	551	1.195	1.225	1.400	1.209

TABLE I-2-10 (CONCLUDED)
NAIC EMISSION GROWTH FACTORS BY COUNTY FOR THE YEAR 2030

NAIC SECTOR	NAIC	LOS ANGELES	ORANGE	RIVERSIDE	SAN BERNARDINO
Administrative and Support Services	561	1.041	1.067	1.219	1.053
Waste Management and Remediation Services	562	1.041	1.067	1.219	1.053
Educational Services	611	1.153	1.167	1.322	1.156
Ambulatory Health Care Services	621	1.060	1.065	1.164	1.118
Hospitals	622	1.273	1.271	1.379	1.310
Nursing and Residential Care Facilities	623	1.403	1.372	1.534	1.498
Social Assistance	624	1.149	1.163	1.317	1.152
Arts, Entertainment, Museums, and Recreation	71	1.249	1.285	1.414	1.506
Accommodation and Food Services	72	1.156	1.190	1.309	1.394
Repair and Maintenance	811	1.051	1.073	1.211	1.105
Personal and Laundry Services	812	1.051	1.073	1.211	1.105
Religious-Grant-Civic-Professional-and Similar Org	813	1.041	1.063	1.133	1.080
Private Households	814	1.041	1.063	1.133	1.080
Public Administration	92	1.137	1.121	1.327	1.149

(Base year is 2018)

TABLE I-2-11
NAIC EMISSION GROWTH FACTORS BY COUNTY FOR THE YEAR 2031

NAIC SECTOR	NAIC	LOS ANGELES	ORANGE	RIVERSIDE	SAN BERNARDINO
Agriculture, Forestry, Animal, Fishing and Hunting	11	1.155	0.955	1.192	1.100
Oil and Gas Extraction	211	1.725	1.425	1.779	1.641
Mining (except Oil and Gas)	212	0.992	0.820	1.024	0.944
Support Activities for Mining	213	0.992	0.820	1.024	0.944
Utilities - Except Electricity	221	1.114	1.068	1.243	1.000
Utilities - Electricity	221	0.745	0.776	0.963	0.812
Construction	23	1.062	1.071	1.258	1.093
Food Manufacturing	311	1.063	1.123	1.269	1.178
Beverage and Tobacco Product Manufacturing	312	0.848	0.896	1.013	0.940
Textile Mills	313	1.287	1.360	1.537	1.426
Textile Product Mills	314	1.287	1.360	1.537	1.426
Apparel Manufacturing	315	1.295	1.368	1.547	1.435
Leather and Allied Product Manufacturing	316	1.295	1.368	1.547	1.435
Wood Product Manufacturing	321	1.053	1.112	1.257	1.167
Paper Manufacturing	322	1.055	1.115	1.260	1.169
Printing and Related Support Activities	323	1.221	1.290	1.458	1.353
Petroleum and Coal Products Manufacturing	324	1.000	1.000	1.000	1.000
Chemical Manufacturing	325	1.083	1.144	1.293	1.200
Plastics and Rubber Products Manufacturing	326	0.986	1.041	1.177	1.092
Nonmetallic Mineral Product Manufacturing	327	1.039	1.097	1.240	1.151
Primary Metal Manufacturing	331	1.203	1.271	1.436	1.333
Fabricated Metal Product Manufacturing	332	1.049	1.108	1.253	1.162
Machinery Manufacturing	333	1.097	1.159	1.310	1.216
Computer and Electronic Product Manufacturing	334	1.232	1.302	1.471	1.365
Electrical Equipment -Appliance-Component Manufacturing	335	1.089	1.150	1.300	1.206
Transportation Equipment Manufacturing	336	1.102	1.164	1.316	1.221
Furniture and Related Product Manufacturing	337	1.160	1.225	1.385	1.285

TABLE I-2-11 (CONTINUED)
NAIC EMISSION GROWTH FACTORS BY COUNTY FOR THE YEAR 2031

NAIC SECTOR	NAIC	LOS ANGELES	ORANGE	RIVERSIDE	SAN BERNARDINO
Miscellaneous Manufacturing	339	1.139	1.203	1.360	1.262
Wholesale Trade	42	1.005	0.993	1.112	1.004
Motor Vehicle and Parts Dealers	441	1.195	1.362	1.325	1.310
Furniture and Home Furniture Stores	442	1.298	1.479	1.439	1.422
Electronics and Appliance Stores	443	1.298	1.479	1.439	1.422
Building Material-Garden Equipment-Supplies Dealers	444	1.298	1.479	1.439	1.422
Food and Beverage Stores	445	0.981	1.118	1.088	1.075
Health and Personal Care Stores	446	0.981	1.118	1.088	1.075
Gasoline Stations	447	1.298	1.479	1.439	1.422
Clothing and Clothing Accessories Stores	448	1.298	1.479	1.439	1.422
Sporting Goods-Hobby-Book- Music Stores	451	1.298	1.479	1.439	1.422
General Merchandise Stores	452	1.298	1.479	1.439	1.422
Miscellaneous Store Retailers	453	1.298	1.479	1.439	1.422
Nonstore Retailers	454	1.298	1.479	1.439	1.422
Air Transportation	481	1.204	1.254	1.557	1.312
Rail Transportation	482	1.105	1.150	1.000	1.204
Water Transportation	483	1.444	1.504	1.868	1.574
Truck Transportation	484	1.280	1.333	1.655	1.395
Transit and Ground Passenger Transportation	485	1.263	1.315	1.633	1.376
Pipeline Transportation	486	1.229	1.280	1.589	1.340
Scenic and Sightseeing Transportation	487	1.124	1.171	1.453	1.225
Support Activities for Transportation	488	1.124	1.171	1.453	1.225
Postal Service	491	1.034	1.077	1.337	1.127
Couriers and Messengers	492	1.034	1.077	1.337	1.127
Warehousing and Storage	493	1.187	1.237	1.535	1.294
Information	51	1.434	1.378	1.515	1.386
Finance and Insurance	52	1.255	1.267	1.377	1.308
Real Estate and Rental and Leasing	53	1.259	1.271	1.382	1.312
Professional-Scientific-and Technical Services	541	1.161	1.191	1.369	1.177
Management of Companies and Enterprises	551	1.202	1.233	1.418	1.219

TABLE I-2-11 (CONCLUDED)
NAIC EMISSION GROWTH FACTORS BY COUNTY FOR THE YEAR 2031

NAIC SECTOR	NAIC	LOS ANGELES	ORANGE	RIVERSIDE	SAN BERNARDINO
Administrative and Support Services	561	1.044	1.071	1.232	1.059
Waste Management and Remediation Services	562	1.044	1.071	1.232	1.059
Educational Services	611	1.165	1.178	1.341	1.167
Ambulatory Health Care Services	621	1.065	1.068	1.174	1.128
Hospitals	622	1.291	1.286	1.399	1.329
Nursing and Residential Care Facilities	623	1.430	1.393	1.563	1.528
Social Assistance	624	1.162	1.175	1.338	1.164
Arts, Entertainment, Museums, and Recreation	71	1.261	1.298	1.434	1.539
Accommodation and Food Services	72	1.165	1.199	1.324	1.421
Repair and Maintenance	811	1.055	1.078	1.224	1.114
Personal and Laundry Services	812	1.055	1.078	1.224	1.114
Religious-Grant-Civic-Professional-and Similar Org	813	1.045	1.066	1.142	1.087
Private Households	814	1.045	1.066	1.142	1.087
Public Administration	92	1.145	1.125	1.345	1.160

TABLE I-2-12
STATIONARY AREA SOURCE EMISSION GROWTH FACTORS FOR THE YEAR 2023

EIC3	CATEGORY DESCRIPTION	LOS ANGELES	ORANGE	RIVERSIDE	SAN BERNARDINO
020	Cogeneration	1.059	1.076	1.200	1.094
030	Petroleum Production Fuel Combustion - Gaseous Fuel	1.276	1.168	1.315	1.221
050	Industrial Stationary I.C. Engines - Natural Gas	1.276	1.168	1.315	1.221
050	Industrial Combustion - L.P.G./Distillate Oil/Other Fuel	1.008	1.030	1.092	1.041
060	Commercial Natural Gas Combustion - Space Heating	0.951	1.017	1.009	0.988
060	Commercial Natural Gas Combustion - Water Heating	0.938	1.003	0.995	0.975
060	Commercial Natural Gas Ice/Ext. Comb (Others)	0.939	1.004	0.996	0.976
060	Commercial L.P.G. Combustion	1.058	1.064	1.130	1.059
099	Resource Recovery	1.059	1.076	1.200	1.094
110	Sewage Treatment Plants-Potws - Ammonia	1.028	1.028	1.067	1.054
120	Landfills - Municipal Solid Waste Disposal (Biodegradation)	1.028	1.028	1.067	1.054
199	Composting - Ammonia	1.000	1.000	1.000	1.000
199	Composting Waste Disposal	1.028	1.028	1.067	1.054
210	Dry Cleaning	1.019	1.030	1.101	1.039
220	Degreasing	1.008	1.030	1.092	1.041
230	Auto Refinishing - Coatings	1.015	1.024	1.057	1.024
230	Marine Coatings	1.179	1.198	1.336	1.218
230	Paper Coatings	1.033	1.056	1.120	1.067
230	Can And Coil, Metal Parts And Products Coatings	1.032	1.054	1.118	1.066
230	Wood Furniture And Fabricated Products Coatings	1.079	1.103	1.169	1.114
230	Plastic Parts	1.003	1.025	1.087	1.036
230	Semiconductor Coatings	1.108	1.132	1.200	1.144
230	Aircraft And Aerospace Coatings	1.084	1.101	1.229	1.120
240	Printing	1.104	1.128	1.196	1.140
250	Adhesives And Sealants	1.008	1.030	1.092	1.041
299	Miscellaneous Industrial Solvent Uses	1.008	1.030	1.092	1.041
310	Oil & Gas Production	1.276	1.168	1.315	1.221

TABLE I-2-12 (CONTINUED)
STATIONARY AREA SOURCE EMISSION GROWTH FACTORS FOR THE YEAR 2023

EIC3	CATEGORY DESCRIPTION	LOS ANGELES	ORANGE	RIVERSIDE	SAN BERNARDINO
330	Petroleum Marketing - Natural Gas Transmission Losses	1.002	1.009	1.065	1.033
330	LPG Transfer And Dispensing - Fugitive Losses	1.052	1.036	1.131	1.065
330	Gasoline Dispensing & Transfers/Storage/Cargo Tanks	0.876	0.878	0.921	0.900
330	Bulk Gasoline Storage & Transfer (Unspecified)	0.876	0.878	0.921	0.900
410	Chemical	1.047	1.069	1.134	1.081
420	Wine Fermentation / Aging	0.990	1.059	1.050	1.029
420	Bakeries	1.037	1.060	1.124	1.071
430	Asphaltic Concrete Production	1.022	1.027	1.108	1.026
430	Surface Blasting	1.009	0.923	1.039	0.966
430	Open Storage Piles	1.000	1.000	1.000	1.000
430	Mineral Processes - Sand/Gravel/Cement Concrete	1.026	1.048	1.112	1.059
440	Secondary Metal Production	1.097	1.121	1.189	1.133
450	Wood Processing Losses	1.079	1.103	1.169	1.114
499	Industrial Lubricant	1.028	1.028	1.067	1.054
499	Industrial Process Losses (Unspecified Material)	1.000	1.000	1.000	1.000
510	Consumer Products - Aerosol	1.000	1.000	1.000	1.000
510	Consumer Products - Non Aerosol	1.028	1.028	1.067	1.054
520	Architectural Coatings	1.052	1.036	1.131	1.065
540	Asphalt Paving And Roofing Operations	1.022	1.027	1.108	1.026
610	Residential Wood Combustion	1.000	1.000	1.000	1.000
610	Residential Distillate Oil Combustion - Space Heating	1.052	1.036	1.131	1.065
610	Residential Natural Gas Combustion - Space Heating	1.068	1.068	1.109	1.095
610	Residential Natural Gas Combustion - Water Heating	1.063	1.063	1.103	1.090
610	Residential Natural Gas Combustion - Cooking/Other	1.067	1.067	1.108	1.094
610	Residential L.P.G. Combustion (Unspecified)	1.052	1.036	1.131	1.065
620	Tilling/Harvest Operations - Dust	1.000	1.000	1.000	1.000

TABLE I-2-12 (CONCLUDED)
STATIONARY AREA SOURCE EMISSION GROWTH FACTORS FOR THE YEAR 2023

EIC3	CATEGORY DESCRIPTION	LOS ANGELES	ORANGE	RIVERSIDE	SAN BERNARDINO
620	Livestock Husbandry - Dairy Cattle	1.000	1.000	1.000	1.000
620	Livestock Husbandry - Layers	1.000	1.000	0.819	0.864
620	Livestock Husbandry - Others	1.000	1.000	1.037	0.858
630	Building And Road Construction - Dust	1.022	1.027	1.108	1.026
640	Paved Road Travel - Freeways - Dust	0.993	1.006	1.040	1.042
640	Paved Road Travel - (Unspecified) - Dust	0.993	1.006	1.040	1.042
640	Paved Road Travel - Major Streets - Dust	1.017	1.037	1.075	1.028
640	Paved Road Travel - Collector/Local Streets - Dust	1.014	1.025	1.068	1.029
645	Unpaved Road Travel - Farm Roads - Dust	1.000	0.933	0.982	0.883
645	Unpaved Road Travel - Others - Dust	1.000	1.000	1.000	1.000
650	Agricultural Lands - Windblown Dust	0.995	0.933	0.982	0.883
650	Unpaved Roads And Associated Areas - Windblown Dust	1.000	1.000	1.000	1.000
660	Structural/Automobile Fires	1.000	1.000	1.000	1.000
670	Agricultural Burning - Pruning/Field Crops	1.000	1.000	0.982	0.883
670	Agricultural Burning - Forest Management*	----	----	----	----
670	Agricultural Burning - Weed Abatement	1.000	1.000	1.000	1.000
670	Wildland Fire Use And Waste Burning (Unspecified)	1.000	1.000	1.000	1.000
690	Cooking	1.019	1.030	1.101	1.039
699	Domestic Activity - Ammonia	1.028	1.028	1.067	1.054

* 2018 emissions based on information provided by Forest Management Services and special handling for future year emissions.

TABLE I-2-13
STATIONARY AREA SOURCE EMISSION GROWTH FACTORS FOR THE YEAR 2025

EIC3	CATEGORY DESCRIPTION	LOS ANGELES	ORANGE	RIVERSIDE	SAN BERNARDINO
020	Cogeneration	1.046	1.074	1.253	1.094
030	Petroleum Production Fuel Combustion - Gaseous Fuel	1.396	1.255	1.465	1.329
050	Industrial Stationary I.C. Engines - Natural Gas	1.396	1.255	1.465	1.329
050	Industrial Combustion - L.P.G./Distillate Oil/Other Fuel	1.012	1.045	1.142	1.063
060	Commercial Natural Gas Combustion - Space Heating	0.913	0.996	0.994	0.961
060	Commercial Natural Gas Combustion - Water Heating	0.895	0.976	0.975	0.943
060	Commercial Natural Gas Ice/Ext. Comb (Others)	0.891	0.972	0.971	0.939
060	Commercial L.P.G. Combustion	1.085	1.093	1.197	1.090
099	Resource Recovery	1.046	1.074	1.253	1.094
110	Sewage Treatment Plants-Potws - Ammonia	1.038	1.040	1.097	1.073
120	Landfills - Municipal Solid Waste Disposal (Biodegradation)	1.038	1.040	1.097	1.073
199	Composting - Ammonia	1.000	1.000	1.000	1.000
199	Composting Waste Disposal	1.038	1.040	1.097	1.073
210	Dry Cleaning	1.028	1.044	1.152	1.058
220	Degreasing	1.012	1.045	1.142	1.063
230	Auto Refinishing - Coatings	1.023	1.038	1.095	1.041
230	Marine Coatings	1.259	1.293	1.509	1.317
230	Paper Coatings	1.047	1.080	1.181	1.099
230	Can And Coil, Metal Parts And Products Coatings	1.044	1.078	1.178	1.097
230	Wood Furniture And Fabricated Products Coatings	1.112	1.148	1.254	1.168
230	Plastic Parts	1.004	1.036	1.132	1.054
230	Semiconductor Coatings	1.154	1.191	1.301	1.211
230	Aircraft And Aerospace Coatings	1.119	1.149	1.341	1.171
240	Printing	1.148	1.185	1.295	1.206
250	Adhesives And Sealants	1.012	1.045	1.142	1.063
299	Miscellaneous Industrial Solvent Uses	1.012	1.045	1.142	1.063
310	Oil & Gas Production	1.396	1.255	1.465	1.329

TABLE I-2-13 (CONTINUED)
STATIONARY AREA SOURCE EMISSION GROWTH FACTORS FOR THE YEAR 2025

EIC3	CATEGORY DESCRIPTION	LOS ANGELES	ORANGE	RIVERSIDE	SAN BERNARDINO
330	Petroleum Marketing - Natural Gas Transmission Losses	0.976	0.996	1.061	1.017
330	LPG Transfer And Dispensing - Fugitive Losses	1.069	1.045	1.172	1.088
330	Gasoline Dispensing & Transfers/Storage/Cargo Tanks	0.829	0.828	0.884	0.864
330	Bulk Gasoline Storage & Transfer (Unspecified)	0.829	0.828	0.884	0.864
410	Chemical	1.065	1.100	1.202	1.119
420	Wine Fermentation / Aging	0.988	1.077	1.076	1.040
420	Bakeries	1.052	1.086	1.187	1.105
430	Asphaltic Concrete Production	1.032	1.039	1.167	1.043
430	Surface Blasting	1.004	0.904	1.054	0.957
430	Open Storage Piles	1.000	1.000	1.000	1.000
430	Mineral Processes - Sand/Gravel/Cement Concrete	1.036	1.070	1.169	1.088
440	Secondary Metal Production	1.138	1.175	1.284	1.195
450	Wood Processing Losses	1.112	1.148	1.254	1.168
499	Industrial Lubricant	1.038	1.040	1.097	1.073
499	Industrial Process Losses (Unspecified Material)	1.000	1.000	1.000	1.000
510	Consumer Products - Aerosol	1.000	1.000	1.000	1.000
510	Consumer Products - Non Aerosol	1.038	1.040	1.097	1.073
520	Architectural Coatings	1.069	1.045	1.172	1.088
540	Asphalt Paving And Roofing Operations	1.032	1.039	1.167	1.043
610	Residential Wood Combustion	1.000	1.000	1.000	1.000
610	Residential Distillate Oil Combustion - Space Heating	1.069	1.045	1.172	1.088
610	Residential Natural Gas Combustion - Space Heating	1.034	1.036	1.093	1.069
610	Residential Natural Gas Combustion - Water Heating	1.027	1.029	1.086	1.061
610	Residential Natural Gas Combustion - Cooking/Other	1.033	1.035	1.092	1.068
610	Residential L.P.G. Combustion (Unspecified)	1.069	1.045	1.172	1.088
620	Tilling/Harvest Operations - Dust	1.000	1.000	1.000	1.000

TABLE I-2-13 (CONCLUDED)
STATIONARY AREA SOURCE EMISSION GROWTH FACTORS FOR THE YEAR 2025

EIC3	CATEGORY DESCRIPTION	LOS ANGELES	ORANGE	RIVERSIDE	SAN BERNARDINO
620	Livestock Husbandry - Dairy Cattle	1.000	1.000	1.056	1.000
620	Livestock Husbandry - Layers	0.762	1.000	0.762	0.820
620	Livestock Husbandry - Others	1.000	1.000	1.050	0.811
630	Building And Road Construction - Dust	1.032	1.039	1.167	1.043
640	Paved Road Travel - Freeways - Dust	0.982	1.014	1.046	1.022
640	Paved Road Travel - (Unspecified) - Dust	0.982	1.014	1.046	1.022
640	Paved Road Travel - Major Streets - Dust	1.011	1.035	1.121	1.043
640	Paved Road Travel - Collector/Local Streets - Dust	1.009	1.025	1.105	1.049
645	Unpaved Road Travel - Farm Roads - Dust	1.000	0.978	0.994	0.955
645	Unpaved Road Travel - Others - Dust	1.000	1.000	1.000	1.000
650	Agricultural Lands - Windblown Dust	0.999	0.978	0.994	0.955
650	Unpaved Roads And Associated Areas - Windblown Dust	1.000	1.000	1.000	1.000
660	Structural/Automobile Fires	1.000	1.000	1.000	1.000
670	Agricultural Burning - Prunings/Field Crops	1.000	1.000	0.975	0.843
670	Agricultural Burning - Forest Management*	----	----	----	----
670	Agricultural Burning - Weed Abatement	1.000	1.000	1.000	1.000
670	Wildland Fire Use And Waste Burning (Unspecified)	1.000	1.000	1.000	1.000
690	Cooking	1.028	1.044	1.152	1.058
699	Domestic Activity - Ammonia	1.038	1.040	1.097	1.073

* 2018 emissions based on information provided by Forest Management Services and special handling for future year emissions.

TABLE I-2-14
STATIONARY AREA SOURCE EMISSION GROWTH FACTORS FOR THE YEAR 2028

EIC3	CATEGORY DESCRIPTION	LOS ANGELES	ORANGE	RIVERSIDE	SAN BERNARDINO
020	Cogeneration	1.018	1.053	1.268	1.088
030	Petroleum Production Fuel Combustion - Gaseous Fuel	1.598	1.375	1.656	1.526
050	Industrial Stationary I.C. Engines - Natural Gas	0.090	0.950	1.054	0.981
050	Industrial Combustion - L.P.G./Distillate Oil/Other Fuel	1.016	1.053	1.156	1.076
060	Commercial Natural Gas Combustion - Space Heating	0.891	0.978	0.973	0.944
060	Commercial Natural Gas Combustion - Water Heating	0.873	0.958	0.953	0.925
060	Commercial Natural Gas Ice/Ext. Comb (Others)	0.866	0.951	0.945	0.917
060	Commercial L.P.G. Combustion	1.098	1.107	1.216	1.105
099	Resource Recovery	1.040	1.069	1.262	1.097
110	Sewage Treatment Plants-Potws - Ammonia	1.042	1.045	1.110	1.082
120	Landfills - Municipal Solid Waste Disposal (Biodegradation)	1.042	1.045	1.110	1.082
199	Composting - Ammonia	1.000	1.000	1.000	1.000
199	Composting Waste Disposal	1.042	1.045	1.110	1.082
210	Dry Cleaning	1.033	1.050	1.164	1.067
220	Degreasing	1.016	1.053	1.156	1.076
230	Auto Refinishing - Coatings	1.026	1.041	1.103	1.048
230	Marine Coatings	1.301	1.338	1.579	1.373
230	Paper Coatings	1.055	1.093	1.200	1.117
230	Can And Coil, Metal Parts And Products Coatings	1.053	1.090	1.198	1.115
230	Wood Furniture And Fabricated Products Coatings	1.130	1.171	1.286	1.197
230	Plastic Parts	1.006	1.042	1.144	1.065
230	Semiconductor Coatings	1.179	1.222	1.342	1.249
230	Aircraft And Aerospace Coatings	1.138	1.170	1.380	1.200
240	Printing	1.173	1.215	1.334	1.242
250	Adhesives And Sealants	1.016	1.053	1.156	1.076
299	Miscellaneous Industrial Solvent Uses	1.016	1.053	1.156	1.076
310	Oil & Gas Production	1.459	1.309	1.535	1.399

TABLE I-2-14 (CONTINUED)
STATIONARY AREA SOURCE EMISSION GROWTH FACTORS FOR THE YEAR 2028

EIC3	CATEGORY DESCRIPTION	LOS ANGELES	ORANGE	RIVERSIDE	SAN BERNARDINO
330	Petroleum Marketing - Natural Gas Transmission Losses	0.962	0.986	1.052	1.008
330	LPG Transfer And Dispensing - Fugitive Losses	1.077	1.048	1.191	1.099
330	Gasoline Dispensing & Transfers/Storage/Cargo Tanks	0.806	0.804	0.865	0.844
330	Bulk Gasoline Storage & Transfer (Unspecified)	0.806	0.804	0.865	0.844
410	Chemical	1.077	1.115	1.225	1.140
420	Wine Fermentation / Aging	0.987	1.084	1.078	1.046
420	Bakeries	1.061	1.099	1.207	1.124
430	Asphaltic Concrete Production	1.037	1.045	1.182	1.052
430	Surface Blasting	1.002	0.899	1.054	0.961
430	Open Storage Piles	1.000	1.000	1.000	1.000
430	Mineral Processes - Sand/Gravel/Cement Concrete	1.043	1.081	1.187	1.105
440	Secondary Metal Production	1.161	1.202	1.321	1.229
450	Wood Processing Losses	1.130	1.171	1.286	1.197
499	Industrial Lubricant	1.042	1.045	1.110	1.082
499	Industrial Process Losses (Unspecified Material)	1.000	1.000	1.000	1.000
510	Consumer Products - Aerosol	1.000	1.000	1.000	1.000
510	Consumer Products - Non Aerosol	1.042	1.045	1.110	1.082
520	Architectural Coatings	1.077	1.048	1.191	1.099
540	Asphalt Paving And Roofing Operations	1.037	1.045	1.182	1.052
610	Residential Wood Combustion	1.000	1.000	1.000	1.000
610	Residential Distillate Oil Combustion - Space Heating	1.077	1.048	1.191	1.099
610	Residential Natural Gas Combustion - Space Heating	1.016	1.019	1.083	1.055
610	Residential Natural Gas Combustion - Water Heating	1.009	1.012	1.075	1.047
610	Residential Natural Gas Combustion - Cooking/Other	1.015	1.018	1.082	1.054
610	Residential L.P.G. Combustion (Unspecified)	1.077	1.048	1.191	1.099
620	Tilling/Harvest Operations - Dust	1.000	1.000	1.000	1.000

TABLE I-2-14 (CONCLUDED)
STATIONARY AREA SOURCE EMISSION GROWTH FACTORS FOR THE YEAR 2028

EIC3	CATEGORY DESCRIPTION	LOS ANGELES	ORANGE	RIVERSIDE	SAN BERNARDINO
620	Livestock Husbandry - Dairy Cattle	1.000	1.000	1.086	1.000
620	Livestock Husbandry - Layers	0.736	1.000	0.736	0.800
620	Livestock Husbandry - Others	1.000	1.000	1.056	0.79
630	Building And Road Construction - Dust	1.037	1.045	1.182	1.052
640	Paved Road Travel - Freeways - Dust	0.984	1.032	1.059	1.035
640	Paved Road Travel - (Unspecified) - Dust	0.984	1.032	1.059	1.035
640	Paved Road Travel - Major Streets - Dust	1.009	1.038	1.153	1.050
640	Paved Road Travel - Collector/Local Streets - Dust	1.009	1.015	1.122	1.062
645	Unpaved Road Travel - Farm Roads - Dust	1.000	0.957	0.988	0.915
645	Unpaved Road Travel - Others - Dust	1.000	1.000	1.000	1.000
650	Agricultural Lands - Windblown Dust				
650	Unpaved Roads And Associated Areas - Windblown Dust	1.000	1.000	1.000	1.000
660	Structural/Automobile Fires	1.000	1.000	1.000	1.000
670	Agricultural Burning - Prunings/Field Crops	1.000	1.000	0.973	0.824
670	Agricultural Burning - Forest Management*	--	--	--	--
670	Agricultural Burning - Weed Abatement	1.000	1.000	1.000	1.000
670	Wildland Fire Use And Waste Burning (Unspecified)	1.000	1.000	1.000	1.000
690	Cooking	1.033	1.050	1.164	1.067
699	Domestic Activity - Ammonia	1.042	1.045	1.110	1.082

TABLE I-2-15
STATIONARY AREA SOURCE EMISSION GROWTH FACTORS FOR THE YEAR 2030

EIC3	CATEGORY DESCRIPTION	LOS ANGELES	ORANGE	RIVERSIDE	SAN BERNARDINO
020	Cogeneration	1.004	1.045	1.283	1.087
030	Petroleum Production Fuel Combustion - Gaseous Fuel	1.687	1.401	1.736	1.598
050	Industrial Stationary I.C. Engines - Natural Gas	1.687	1.401	1.736	1.598
050	Industrial Combustion - L.P.G./Distillate Oil/Other Fuel	1.009	1.063	1.193	1.108
060	Commercial Natural Gas Combustion - Space Heating	0.822	0.932	0.909	0.896
060	Commercial Natural Gas Combustion - Water Heating	0.804	0.911	0.888	0.876
060	Commercial Natural Gas Ice/Ext. Comb (Others)	0.794	0.899	0.877	0.865
060	Commercial L.P.G. Combustion	1.142	1.152	1.285	1.157
099	Resource Recovery	1.004	1.045	1.283	1.087
110	Sewage Treatment Plants-Potws - Ammonia	1.060	1.065	1.164	1.118
120	Landfills - Municipal Solid Waste Disposal (Biodegradation)	1.060	1.065	1.164	1.118
199	Composting - Ammonia	1.000	1.000	1.000	1.000
199	Composting Waste Disposal	1.060	1.065	1.164	1.118
210	Dry Cleaning	1.051	1.073	1.211	1.105
220	Degreasing	1.009	1.063	1.193	1.108
230	Auto Refinishing - Coatings	1.041	1.063	1.133	1.080
230	Marine Coatings	1.426	1.485	1.822	1.544
230	Paper Coatings	1.058	1.115	1.251	1.162
230	Can And Coil, Metal Parts And Products Coatings	1.053	1.110	1.245	1.157
230	Wood Furniture And Fabricated Products Coatings	1.160	1.222	1.371	1.274
230	Plastic Parts	0.991	1.045	1.172	1.089
230	Semiconductor Coatings	1.229	1.295	1.453	1.350
230	Aircraft And Aerospace Coatings	1.194	1.244	1.526	1.293
240	Printing	1.219	1.284	1.441	1.339
250	Adhesives And Sealants	1.009	1.063	1.193	1.108
299	Miscellaneous Industrial Solvent Uses	1.009	1.063	1.193	1.108
310	Oil & Gas Production	1.687	1.401	1.736	1.598

TABLE I-2-15 (CONTINUED)
STATIONARY AREA SOURCE EMISSION GROWTH FACTORS FOR THE YEAR 2030

EIC3	CATEGORY DESCRIPTION	LOS ANGELES	ORANGE	RIVERSIDE	SAN BERNARDINO
330	Petroleum Marketing - Natural Gas Transmission Losses	0.898	0.934	1.010	0.964
330	LPG Transfer And Dispensing - Fugitive Losses	1.106	1.060	1.263	1.144
330	Gasoline Dispensing & Transfers/Storage/Cargo Tanks	0.741	0.737	0.818	0.790
330	Bulk Gasoline Storage & Transfer (Unspecified)	0.741	0.737	0.818	0.790
410	Chemical	1.086	1.144	1.284	1.192
420	Wine Fermentation / Aging	0.981	1.112	1.084	1.070
420	Bakeries	1.066	1.123	1.260	1.171
430	Asphaltic Concrete Production	1.057	1.066	1.242	1.084
430	Surface Blasting	0.998	0.828	1.027	0.945
430	Open Storage Piles	1.000	1.000	1.000	1.000
430	Mineral Processes - Sand/Gravel/Cement Concrete	1.042	1.098	1.232	1.145
440	Secondary Metal Production	1.202	1.266	1.421	1.320
450	Wood Processing Losses	1.160	1.222	1.371	1.274
499	Industrial Lubricant	1.060	1.065	1.164	1.118
499	Industrial Process Losses (Unspecified Material)	1.000	1.000	1.000	1.000
510	Consumer Products - Aerosol	1.000	1.000	1.000	1.000
510	Consumer Products - Non Aerosol	1.060	1.065	1.164	1.118
520	Architectural Coatings	1.106	1.060	1.263	1.144
540	Asphalt Paving And Roofing Operations	1.057	1.066	1.242	1.084
610	Residential Wood Combustion	1.000	1.000	1.000	1.000
610	Residential Distillate Oil Combustion - Space Heating	1.106	1.060	1.263	1.144
610	Residential Natural Gas Combustion - Space Heating	0.951	0.954	1.043	1.002
610	Residential Natural Gas Combustion - Water Heating	0.942	0.946	1.034	0.993
610	Residential Natural Gas Combustion - Cooking/Other	0.950	0.953	1.042	1.001
610	Residential L.P.G. Combustion (Unspecified)	1.106	1.060	1.263	1.144
620	Tilling/Harvest Operations - Dust	1.000	1.000	1.000	1.000

TABLE I-2-15 (CONCLUDED)
STATIONARY AREA SOURCE EMISSION GROWTH FACTORS FOR THE YEAR 2030

EIC3	CATEGORY DESCRIPTION	LOS ANGELES	ORANGE	RIVERSIDE	SAN BERNARDINO
620	Livestock Husbandry - Dairy Cattle	1.000	1.000	1.094	1.000
620	Livestock Husbandry - Layers	0.648	1.000	0.648	0.728
620	Livestock Husbandry - Others	1.000	1.000	1.08	0.716
630	Building And Road Construction - Dust	1.057	1.066	1.242	1.084
640	Paved Road Travel - Freeways - Dust	1.015	1.031	1.124	1.037
640	Paved Road Travel - (Unspecified) - Dust	1.000	1.000	1.000	1.000
640	Paved Road Travel - Major Streets - Dust	1.005	1.040	1.225	1.083
640	Paved Road Travel - Collector/Local Streets - Dust	0.975	1.019	1.135	1.079
645	Unpaved Road Travel - Farm Roads - Dust	1.000	0.872	0.962	0.756
645	Unpaved Road Travel - Others - Dust	1.000	1.000	1.000	1.000
650	Agricultural Lands - Windblown Dust				
650	Unpaved Roads And Associated Areas - Windblown Dust	1.000	1.000	1.000	1.000
660	Structural/Automobile Fires	1.000	1.000	1.000	1.000
670	Agricultural Burning - Pruning/Field Crops	1.000	1.000	0.963	0.756
670	Agricultural Burning - Forest Management*	----	----	----	----
670	Agricultural Burning - Weed Abatement	1.000	1.000	1.000	1.000
670	Wildland Fire Use And Waste Burning (Unspecified)	1.000	1.000	1.000	1.000
690	Cooking	1.051	1.073	1.211	1.105
699	Domestic Activity - Ammonia	1.060	1.065	1.164	1.118

* 2018 emissions based on information provided by Forest Management Services and special handling for future year emissions.

TABLE I-2-16
STATIONARY AREA SOURCE EMISSION GROWTH FACTORS FOR THE YEAR 2031

EIC3	CATEGORY DESCRIPTION	LOS ANGELES	ORANGE	RIVERSIDE	SAN BERNARDINO
020	Cogeneration	0.993	1.034	1.284	1.082
030	Petroleum Production Fuel Combustion - Gaseous Fuel	1.725	1.425	1.779	1.641
050	Industrial Stationary I.C. Engines - Natural Gas	1.725	1.425	1.779	1.641
050	Industrial Combustion - L.P.G./Distillate Oil/Other Fuel	1.005	1.062	1.200	1.113
060	Commercial Natural Gas Combustion - Space Heating	0.809	0.922	0.897	0.887
060	Commercial Natural Gas Combustion - Water Heating	0.792	0.902	0.878	0.868
060	Commercial Natural Gas Ice/Ext. Comb (Others)	0.782	0.891	0.867	0.857
060	Commercial L.P.G. Combustion	1.150	1.160	1.300	1.167
099	Resource Recovery	0.993	1.034	1.284	1.082
110	Sewage Treatment Plants-Potws - Ammonia	1.065	1.068	1.174	1.128
120	Landfills - Municipal Solid Waste Disposal (Biodegradation)	1.065	1.068	1.174	1.128
199	Composting - Ammonia	1.000	1.000	1.000	1.000
199	Composting Waste Disposal	1.065	1.068	1.174	1.128
210	Dry Cleaning	1.055	1.078	1.224	1.114
220	Degreasing	1.005	1.062	1.200	1.113
230	Auto Refinishing - Coatings	1.045	1.066	1.142	1.087
230	Marine Coatings	1.444	1.504	1.868	1.574
230	Paper Coatings	1.055	1.115	1.260	1.169
230	Can And Coil, Metal Parts And Products Coatings	1.049	1.108	1.253	1.162
230	Wood Furniture And Fabricated Products Coatings	1.160	1.225	1.385	1.285
230	Plastic Parts	0.986	1.041	1.177	1.092
230	Semiconductor Coatings	1.232	1.302	1.471	1.365
230	Aircraft And Aerospace Coatings	1.204	1.254	1.557	1.312
240	Printing	1.221	1.290	1.458	1.353
250	Adhesives And Sealants	1.005	1.062	1.200	1.113
299	Miscellaneous Industrial Solvent Uses	1.005	1.062	1.200	1.113
310	Oil & Gas Production	1.725	1.425	1.779	1.641

TABLE I-2-16 (CONTINUED)
STATIONARY AREA SOURCE EMISSION GROWTH FACTORS FOR THE YEAR 2031

EIC3	CATEGORY DESCRIPTION	LOS ANGELES	ORANGE	RIVERSIDE	SAN BERNARDINO
330	Petroleum Marketing - Natural Gas Transmission Losses	0.892	0.928	1.009	0.963
330	LPG Transfer And Dispensing - Fugitive Losses	1.114	1.064	1.277	1.156
330	Gasoline Dispensing & Transfers/Storage/Cargo Tanks	0.730	0.724	0.810	0.784
330	Bulk Gasoline Storage & Transfer (Unspecified)	0.730	0.724	0.810	0.784
410	Chemical	1.083	1.144	1.293	1.200
420	Wine Fermentation / Aging	0.981	1.118	1.088	1.075
420	Bakeries	1.063	1.123	1.269	1.178
430	Asphaltic Concrete Production	1.062	1.071	1.258	1.093
430	Surface Blasting	0.992	0.820	1.024	0.944
430	Open Storage Piles	1.000	1.000	1.000	1.000
430	Mineral Processes - Sand/Gravel/Cement Concrete	1.039	1.097	1.240	1.151
440	Secondary Metal Production	1.203	1.271	1.436	1.333
450	Wood Processing Losses	1.160	1.225	1.385	1.285
499	Industrial Lubricant	1.065	1.068	1.174	1.128
499	Industrial Process Losses (Unspecified Material)	1.000	1.000	1.000	1.000
510	Consumer Products - Aerosol	1.000	1.000	1.000	1.000
510	Consumer Products - Non Aerosol	1.065	1.068	1.174	1.128
520	Architectural Coatings	1.114	1.064	1.277	1.156
540	Asphalt Paving And Roofing Operations	1.062	1.071	1.258	1.093
610	Residential Wood Combustion	1.000	1.000	1.000	1.000
610	Residential Distillate Oil Combustion - Space Heating	1.114	1.064	1.277	1.156
610	Residential Natural Gas Combustion - Space Heating	0.948	0.951	1.045	1.004
610	Residential Natural Gas Combustion - Water Heating	0.939	0.942	1.035	0.994
610	Residential Natural Gas Combustion - Cooking/Other	0.947	0.949	1.043	1.002
610	Residential L.P.G. Combustion (Unspecified)	1.114	1.064	1.277	1.156
620	Tilling/Harvest Operations - Dust	1.000	1.000	1.000	1.000

TABLE I-2-16 (CONCLUDED)
STATIONARY AREA SOURCE EMISSION GROWTH FACTORS FOR THE YEAR 2031

EIC3	CATEGORY DESCRIPTION	LOS ANGELES	ORANGE	RIVERSIDE	SAN BERNARDINO
620	Livestock Husbandry - Dairy Cattle	1.000	1.000	1.069	1.000
620	Livestock Husbandry - Layers	0.629	1.000	0.629	0.713
620	Livestock Husbandry - Others	1.000	1.000	1.085	0.700
630	Building And Road Construction - Dust	1.062	1.071	1.258	1.093
640	Paved Road Travel - Freeways - Dust	1.015	1.031	1.124	1.057
640	Paved Road Travel - (Unspecified) - Dust	1.015	1.031	1.124	1.057
640	Paved Road Travel - Major Streets - Dust	1.005	1.040	1.225	1.083
640	Paved Road Travel - Collector/Local Streets - Dust	0.975	1.019	1.135	1.079
645	Unpaved Road Travel - Farm Roads - Dust	1.000	0.865	0.960	0.741
645	Unpaved Road Travel - Others - Dust	1.000	1.000	1.000	1.000
650	Agricultural Lands - Windblown Dust	0.991	0.865	0.960	0.741
650	Unpaved Roads And Associated Areas - Windblown Dust	1.000	1.000	1.000	1.000
660	Structural/Automobile Fires	1.000	1.000	1.000	1.000
670	Agricultural Burning - Prunings/Field Crops	1.000	1.000	0.960	0.741
670	Agricultural Burning - Forest Management*	----	----	----	----
670	Agricultural Burning - Weed Abatement	1.000	1.000	1.000	1.000
670	Wildland Fire Use And Waste Burning (Unspecified)	1.000	1.000	1.000	1.000
690	Cooking	1.055	1.078	1.224	1.114
699	Domestic Activity - Ammonia	1.065	1.068	1.174	1.128

* 2018 emissions based on information provided by Forest Management Services and special handling for future year emissions.

Future Emission Trends and Agency Responsibilities

Even- and odd-numbered figures from Figures I-2-4 through I-2-11 present the relative contributions by source categories (i.e., point, area, on-road, and off-road) and the agency with primary authority to regulate emissions from the source category, respectively, for the years 2025, 2028, 2030 and 2031. These figures present total annual average emission levels for VOC, NOx, NH3, SOx, and PM2.5.

Odd-numbered figures from Figure I-2-5 to Figure I-2-11 show the emissions coming from sources under the primary regulatory purview of each of the three agencies – U.S. EPA, CARB, and South Coast AQMD – for all the milestone years. South Coast AQMD primarily oversees stationary sources via permitting, while CARB is responsible for selected area sources such as consumer products and pesticide/fertilizer and on-road and off-road mobile sources. Among off-road mobile sources, locomotive, OGVs, aircraft, selected heavy-duty trucks such as out-out-state, international registration, and interstate trucks are subject to federal and international regulations. Preempted off-road equipment with horsepower less than 175 are federally regulated as well.

NOx emissions are one of the important precursors for ozone and PM2.5 formation, and majority of NOx emissions fall under the authority of CARB and U.S. EPA. In 2030, 77 percent of the NOx emissions fall under U.S. EPA and CARB control. Conversely, most SOx, NH3, and PM2.5 emissions are from sources under South Coast AQMD authority. Given the relationship between a growing population and economic activity, emissions regulations, and air pollution, the projections discussed in this chapter suggest that meeting the district's ozone and PM2.5 attainment obligations will require collaboration and efforts from all three agencies.

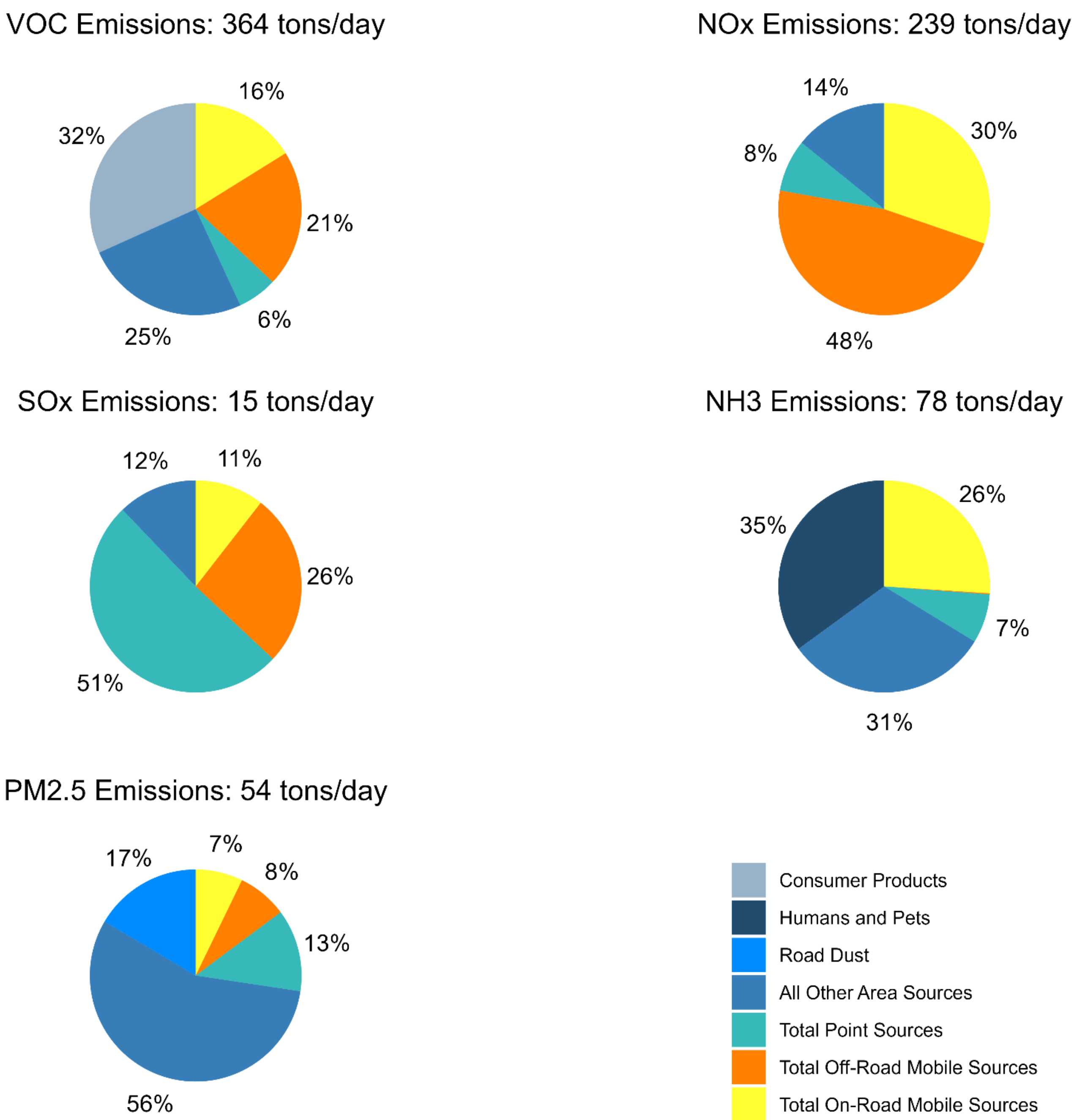

FIGURE I-2-4

RELATIVE CONTRIBUTION BY SOURCE CATEGORY TO 2025 EMISSION INVENTORY

(Annual Average)

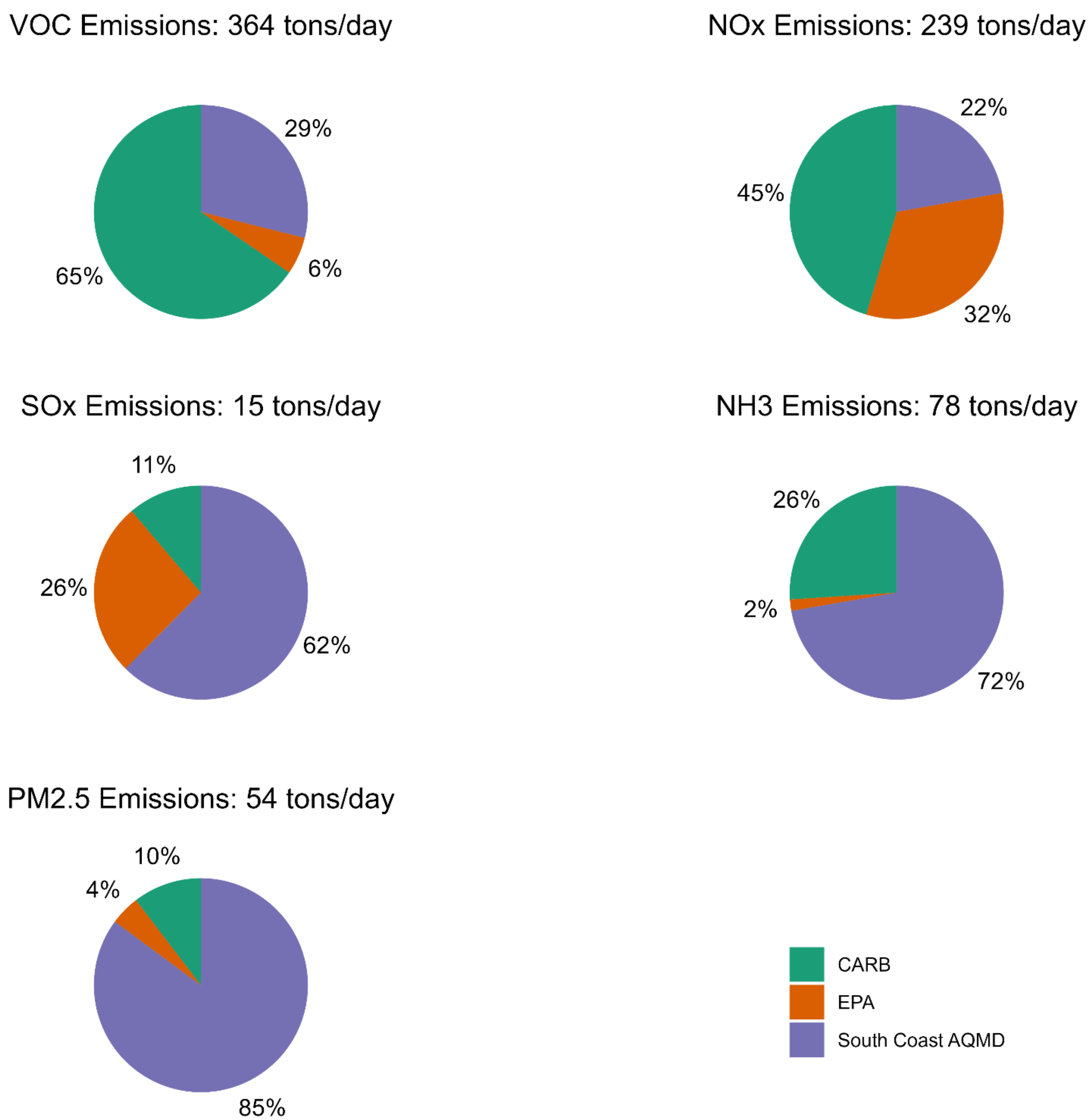

FIGURE I-2-5
2025 EMISSION INVENTORY AGENCY RESPONSIBILITY
(Annual Average)

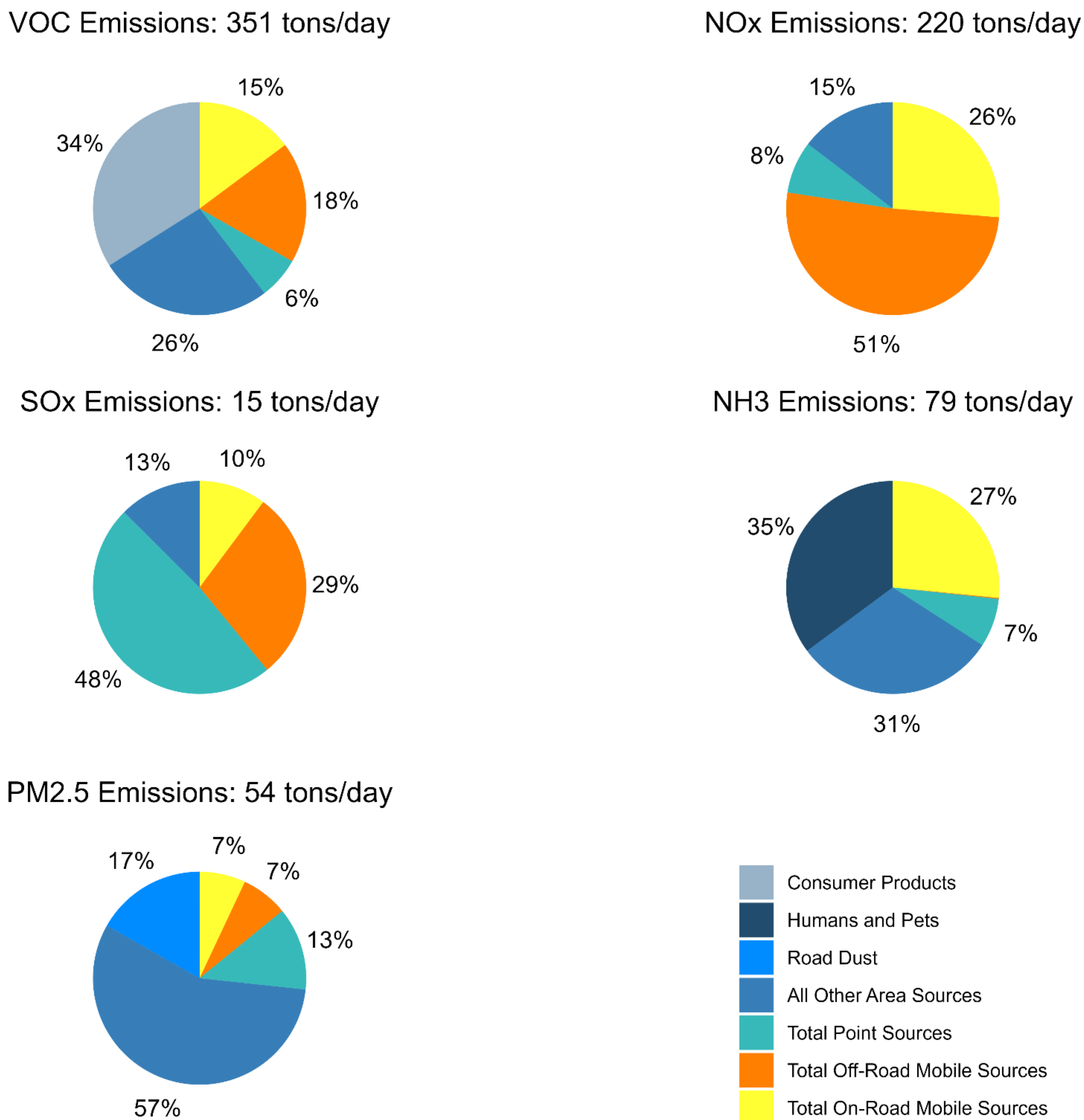

FIGURE I-2-6

RELATIVE CONTRIBUTION BY SOURCE CATEGORY TO 2028 EMISSION INVENTORY

(Annual Average)

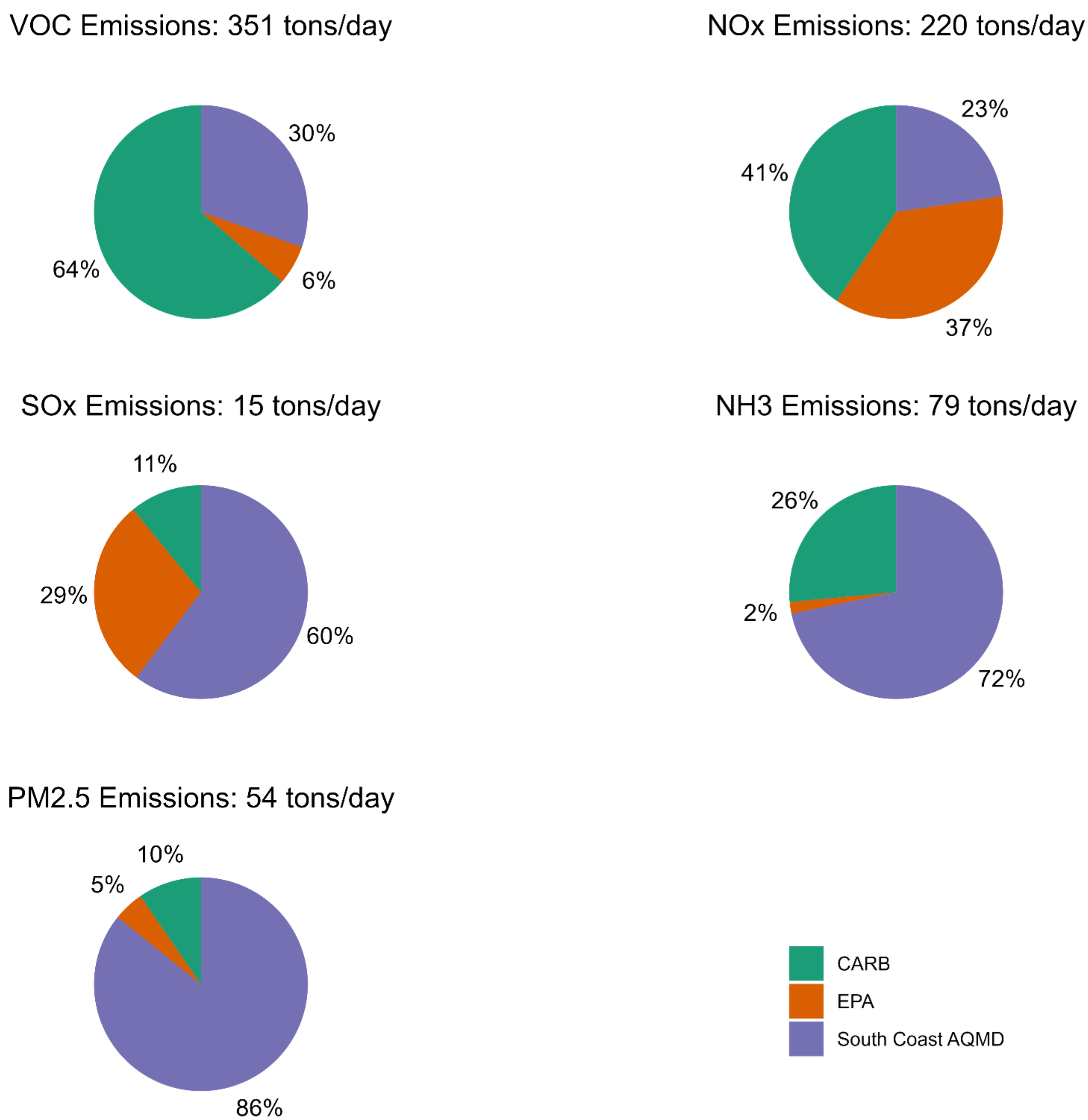

FIGURE I-2-7
2028 EMISSION INVENTORY AGENCY RESPONSIBILITY
(Annual Average)

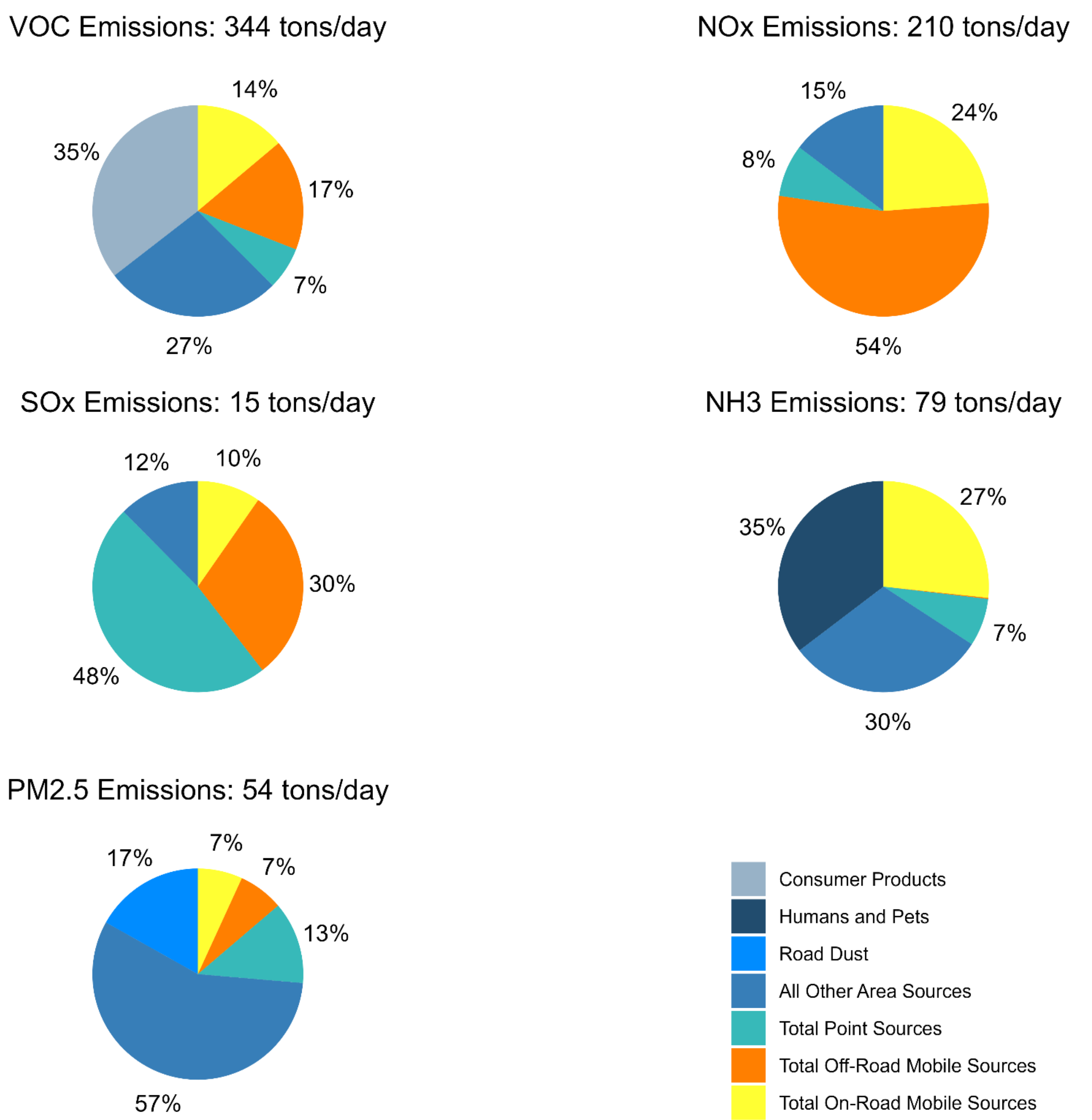

FIGURE I-2-8
RELATIVE CONTRIBUTION BY SOURCE CATEGORY TO 2030 EMISSION INVENTORY
(Annual Average)

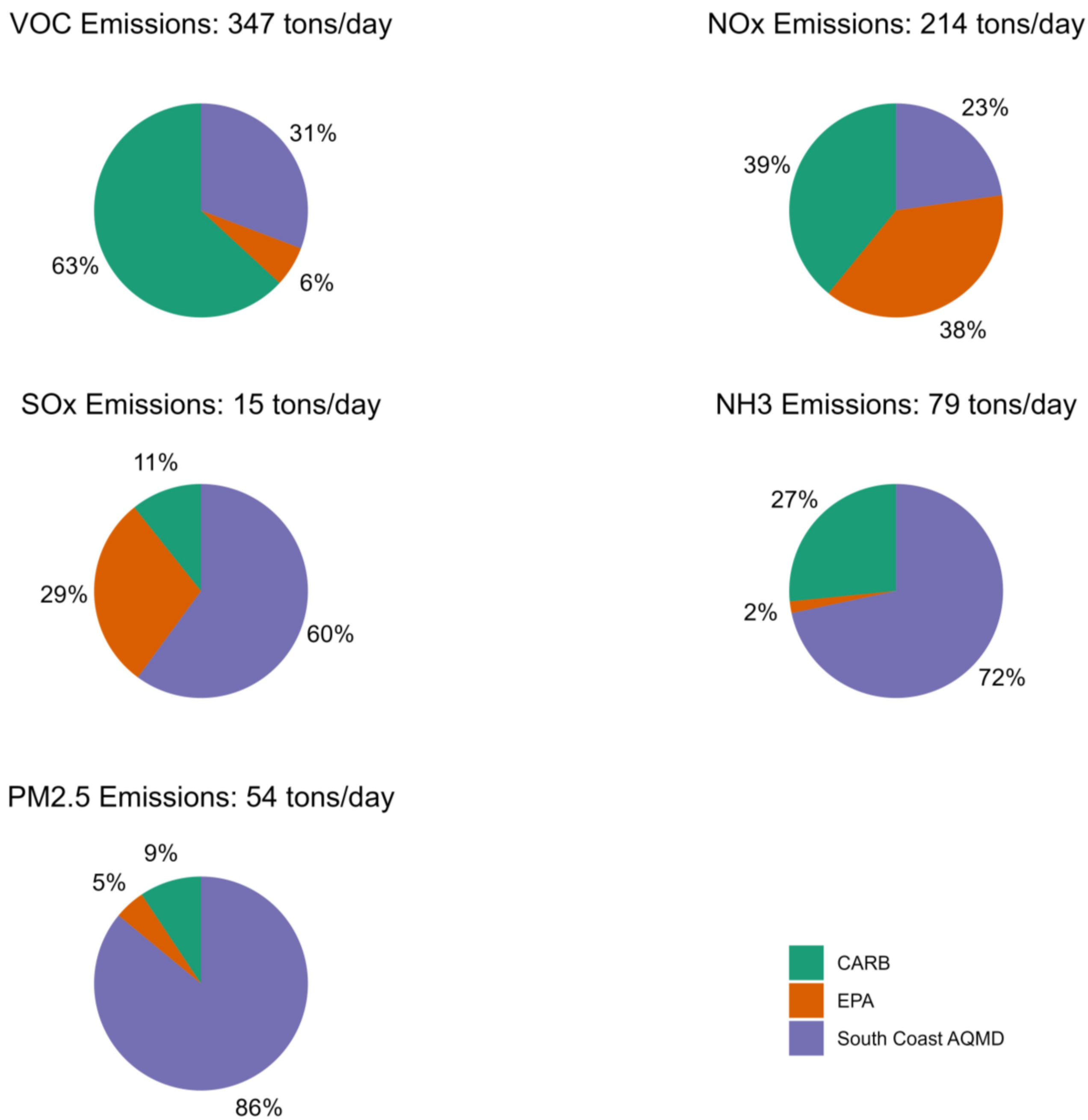

FIGURE I-2-9
2030 EMISSION INVENTORY AGENCY RESPONSIBILITY
(Annual Average)

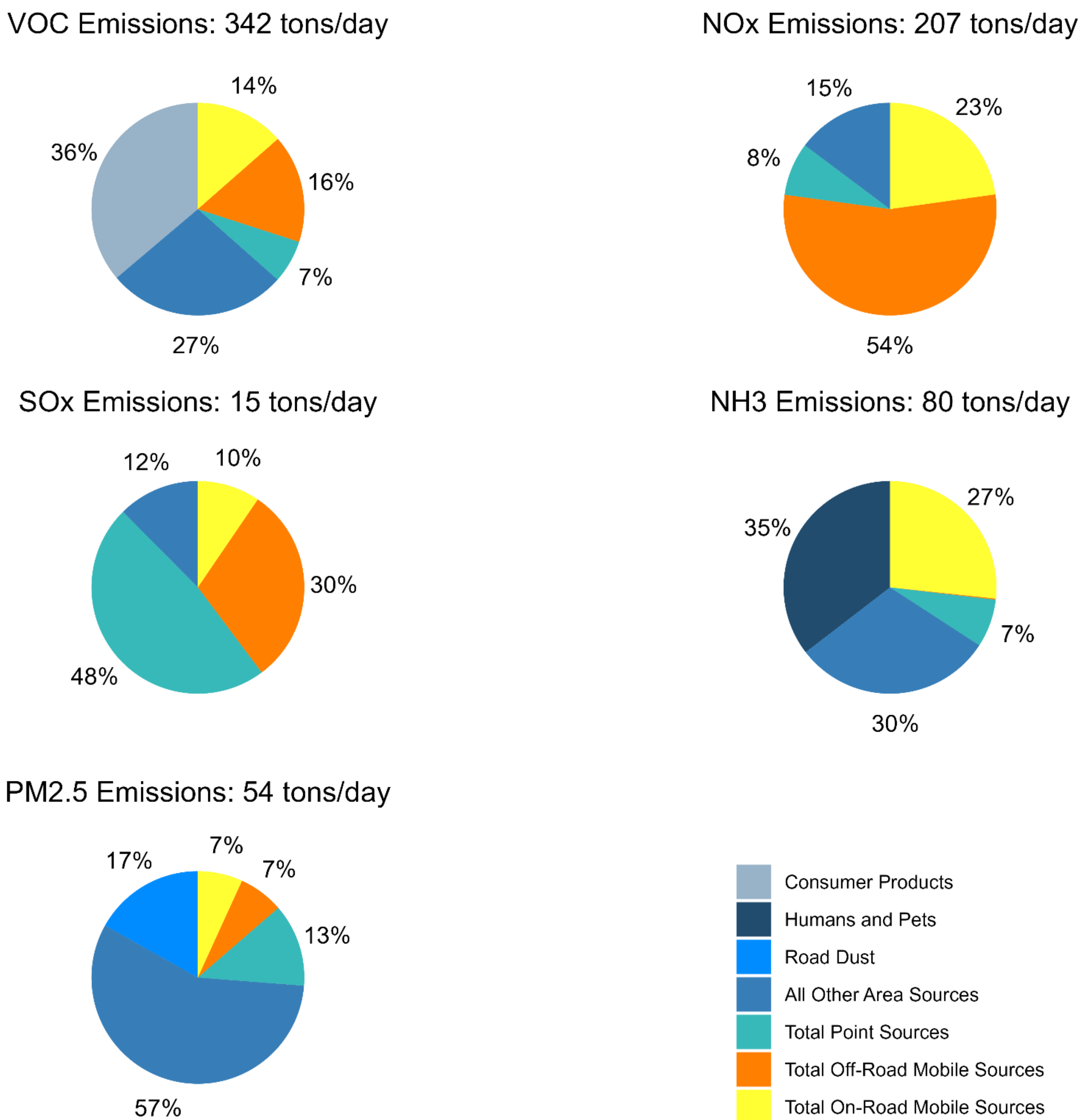

FIGURE I-2-10

RELATIVE CONTRIBUTION BY SOURCE CATEGORY TO 2031 EMISSION INVENTORY

(Annual Average)

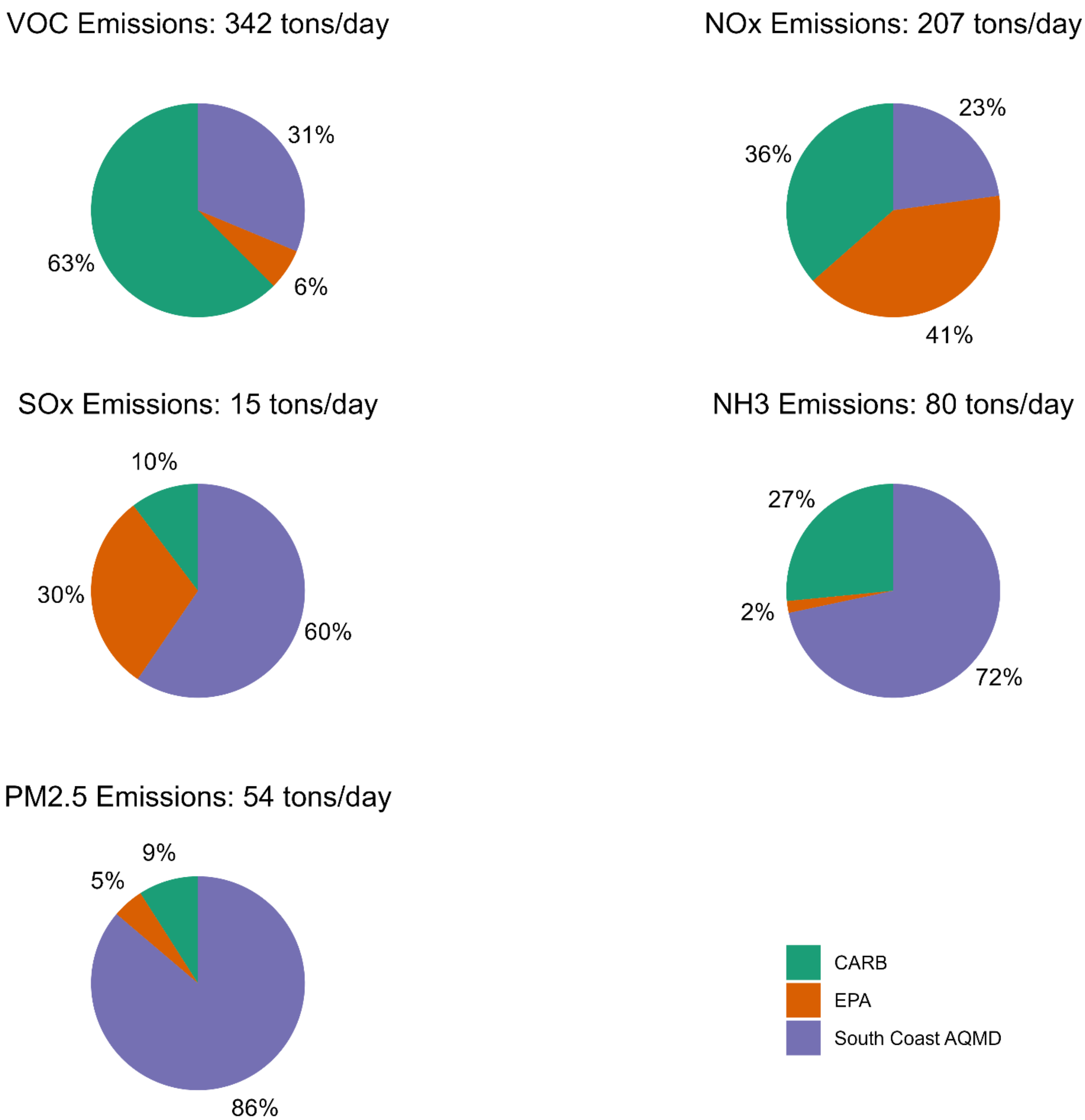

FIGURE I-2-11
2031 EMISSION INVENTORY AGENCY RESPONSIBILITY
(Annual Average)

Figures I-2-12 through I-2-16 illustrate the emission trends by pollutant (NOx, VOC, SOx, PM2.5, and NH3) for the same milestone years in the Draft 2024 PM2.5 plan: 2018, 2023, 2025, 2028, 2030, and 2031. Starting with Figure I-2-12 and Figure I-2-13, significant reductions in NOx and VOC emissions are evident, particularly for the mobile source categories. As seen in Figures I-2-14 and I-2-15, PM2.5 and SOx emissions experience little to no change from 2018 to 2031. NH3 emissions are expected to increase through 2031 as shown in Figure I-2-16.

NOx Emissions

Figure I-2-12 illustrates the NOx emissions trend by major source category. Mobile sources are the major contributor to total NOx emissions in the base year and future year inventories. NOx emissions are projected to decrease in all major source categories with on-road mobile, off-road mobile, point, and area sources drop by 135, 24, 7, and 6 tons per day, respectively, between 2018 and 2031. Reductions in NOx emissions primarily come from recently implemented regulations from CARB, such as Truck and Bus regulations, Advanced Clean Cars, Heavy Duty Low NOx Omnibus,[18] and Heavy-Duty Inspection and Maintenance[19] regulations. These regulations result in corresponding declines in on-road NOx emissions by 75 percent, respectively between 2018 and 2031, amidst overall respective reductions of 45 percent. Most of the anticipated on-road NOx emission reductions are expected between 2018 and 2023, when Truck and Bus regulations are expected to take effect. On the other hand, beyond 2025, reductions are expected from regulations such as Advanced Clean Cars, Heavy Duty Inspection and Maintenance, and NOx omnibus regulations. Off-road sources show a slight increase from 2025 to 2031 driven by an increase in aircraft emissions (from 19.6 to 25.7 tons per day) and OGV emissions (from 28.4 to 30.3 tons per day). Point and area sources decline by 30 and 15 percent, respectively from 2018 to 2031 due to regulation implementation from South Coast AQMD stationary sources rules such as R1109.1 for NOx reduction from refinery and R1111 for NOx reduction from residential natural gas heating furnaces.

[18] Heavy-Duty Engine and Vehicle Omnibus Regulations, https://ww2.arb.ca.gov/rulemaking/2020/hdomnibuslownox

[19] Heavy-Duty Inspection and Maintenance Program, https://ww2.arb.ca.gov/our-work/programs/heavy-duty-inspection-and-maintenance-program

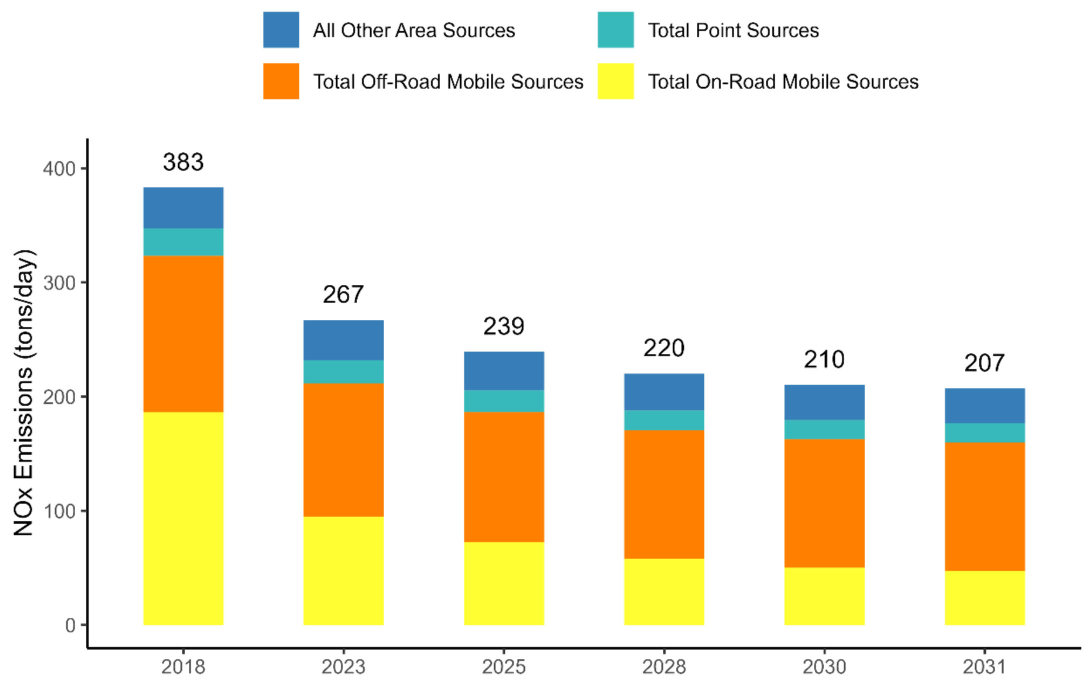

FIGURE I-2-12
NOX EMISSION TREND BY SOURCE CATEGORY – ANNUAL AVERAGE

VOC Emissions

As shown in Figure I-2-13, area sources are major contributors to base and future years' VOC emissions. VOC emissions from area sources increase over time from 198 to 203 tons per day between 2018 and 2023 and increase to 217 tons per day in 2031. Within area sources, the main source of VOC emissions is consumer products. In 2018, VOC emissions from consumer products accounted for 27% of the total VOC emissions baseline, and this is expected to increase to 35% by 2030. Following population growth, VOC emissions from consumer products are set to increase over time, from 107 tons per day in 2018 to 124 tons per day in 2031. Coatings and related processes are the second-largest contributor to VOC emissions among area sources. Emissions from on-road mobile sources are set to decrease over time, with the largest decreases occurring prior to 2025, from 93 tons per day in 2018 to 65 tons per day in 2023. On-road emissions are expected to fall from 65 tons per day to 46 tons per day from 2023 to 2031. Off-road emissions show a similar trend dropping from 89 to 82 tons per day between 2018 and 2023; the rate of reduction is much more modest over the years between 2023 and 2031 (82 down to 56 tons per day) compared to the sharp reduction from base year 2018 to 2023. The amount of reduction from 2018 to 2031 for VOC emissions from on-road and off-road sources is expected to be 47 tons per day (50 percent) and 33 tons per day (37 percent), respectively; total VOC emissions reduction is 60 tons per day (15 percent). Because of increased activity due to demographic and economic growth, both point and area sources are expected to increase from 21 and 198 tons per day in 2018 to 22 and 217 tons per day in 2031, respectively. The increase of consumer products-related VOC emissions contribute 85 percent of the increase from point and area VOC emissions from 2018 to 2031.

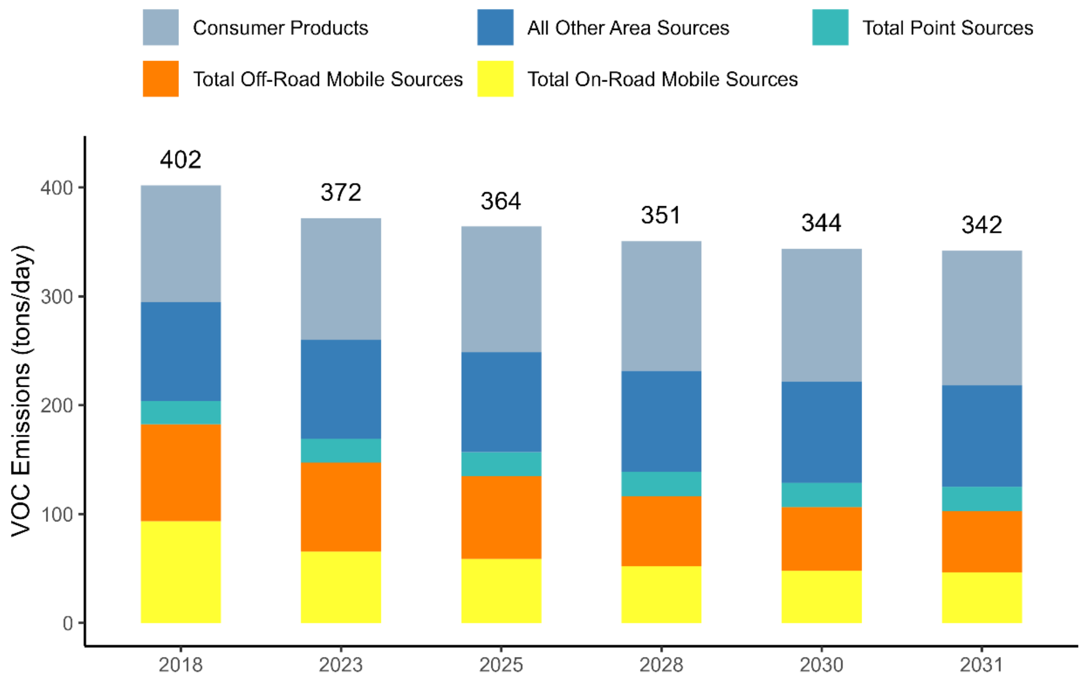

FIGURE I-2-13
VOC EMISSION TREND BY SOURCE CATEGORY – ANNUAL AVERAGE

SOx Emissions

Figure I-2-14 illustrates the SOx emissions trend. Total SOx emissions show a slight increase from 2018 to 2031 due to marginal growth in point and off-road categories. Among off-road sources, OGVs are the primary source of SOx emissions which are expected to grow in future due to the increased ports activities. SOx emissions from on-road mobile sources are expected to slightly decrease from 2018 to 2023 and plateau beyond 2023; area sources plateau for all years (2018 through 2031). The overall 3 percent increase for total SOx emissions from 2018 to 2031 is mainly driven by the increase of aircraft and OGVs in the future.

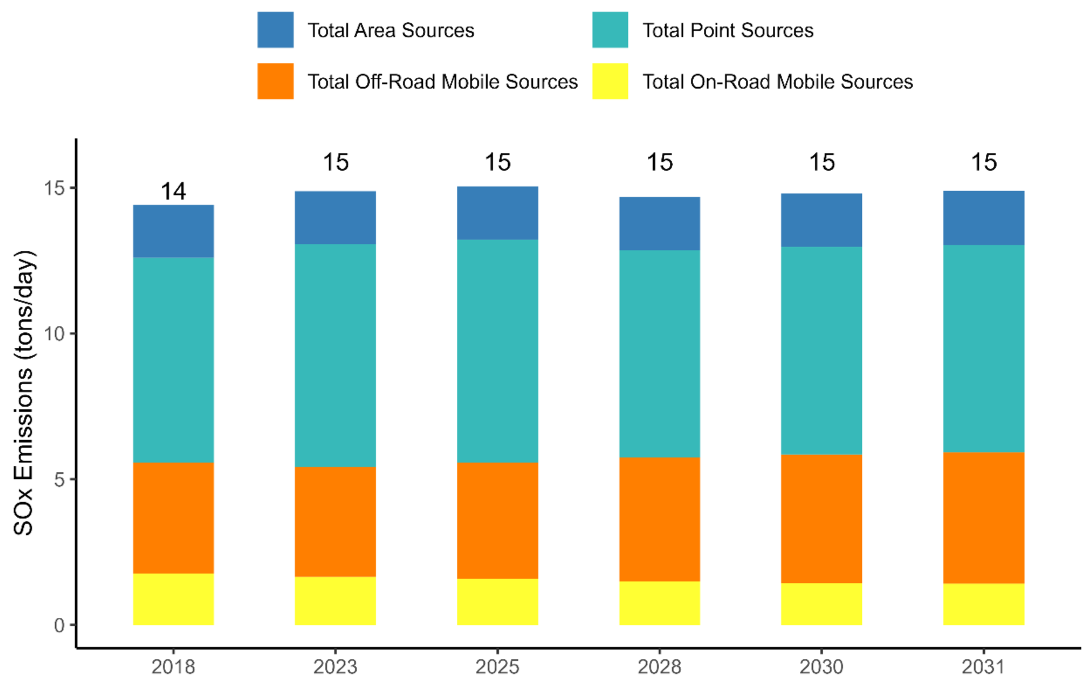

FIGURE I-2-14
SOX EMISSION TREND BY SOURCE CATEGORY – ANNUAL AVERAGE

PM2.5 Emissions

Figure I-2-15 shows the PM2.5 emissions trend. Area sources, including entrained road dust, are projected to remain the largest contributor to PM2.5 emissions. Point and area sources are projected to increase from 2018 to 2031 due to increased activity driven by growth, resulting in higher emissions from commercial cooking, paved road dust, wood and paper production, as well as construction and demolition. The increase in vehicle miles traveled is the main cause of the increasing trend in paved road dust, while PM2.5 emissions from on-road mobile tail pipe emissions decrease due to the fleet turnover to cleaner vehicles. Off-road emissions slightly drop from 5.2 to 3.7 tons per day between 2018 and 2031. Overall, PM2.5 emissions are projected to decline by 4 percent from 2018 (56 tons per day) to 2031 (54 tons per day).

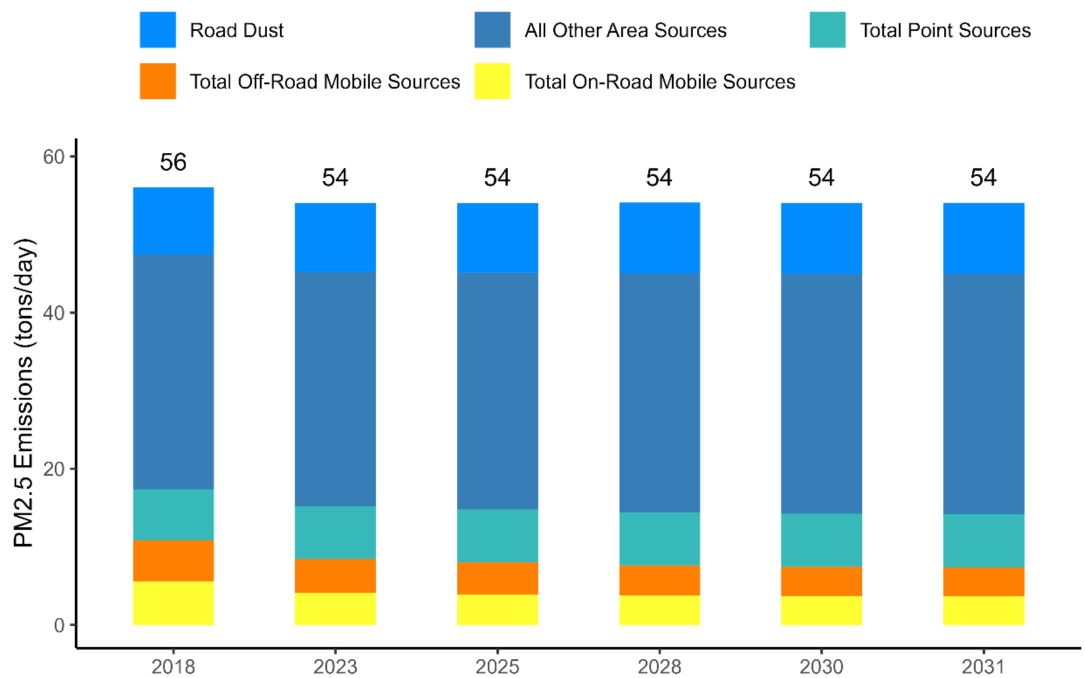

FIGURE I-2-15
PM2.5 EMISSION TREND BY SOURCE CATEGORY – ANNUAL AVERAGE

NH3 Emissions

Figure I-2-16 shows the NH3 emissions trend. Area sources are the largest contributor to NH3 emissions. Among area sources, emissions from human and pet perspiration are the largest source of NH3. Because this source is uncontrolled, emissions from this source are expected to increase over time as population increases. Another large contributor to NH3 is vehicle emissions. NH3 emissions from gasoline vehicles are a byproduct of the catalytic conversion of NOx in the three-way catalysts, whereas NH3 emissions from diesel vehicles are caused by the ammonia slip from SCR systems used in heavy-duty diesel vehicles. Because VMT in gasoline and diesel vehicles are expected to increase, NH3 emissions from vehicles is also projected to increase. Other NH3 sources in the basin include emissions from manufacturing, which are expected to remain relatively constant, and emissions from farming, which are projected to decline over time. Overall, NH3 emissions in the basin is projected to increase 7 percent from 75 tons per day in 2018 to 80 tons per day in 2031. NH3 emissions from human and pet perspiration alone contribute 44 percent of the total NH3 emission increase from 2018 to 2031.

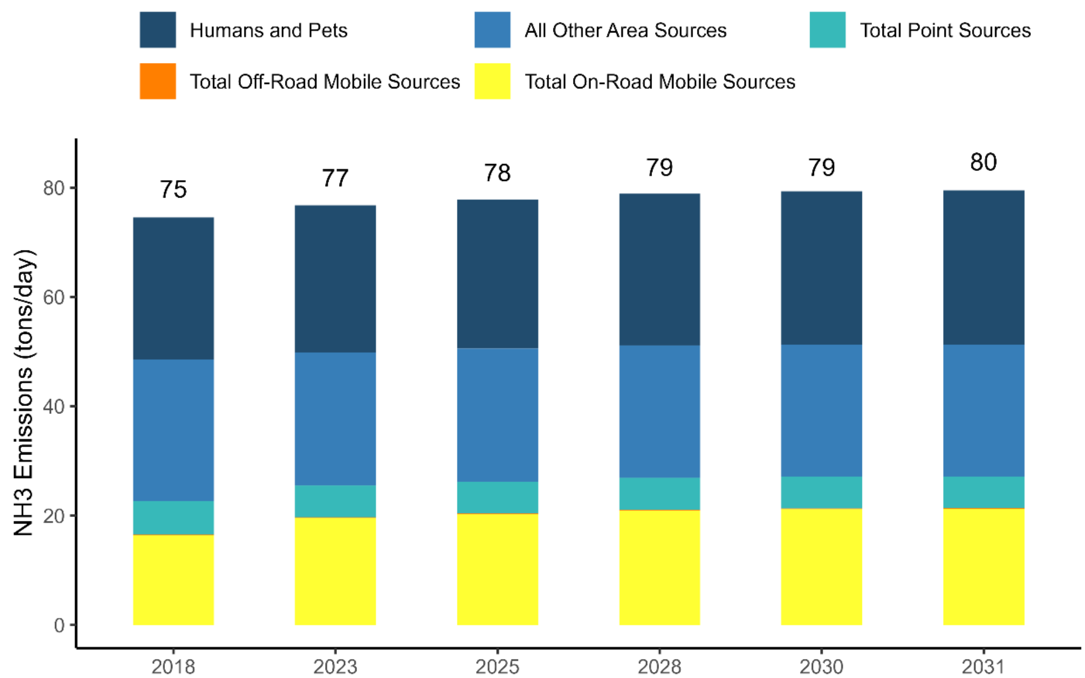

FIGURE I-2-16
NH3 EMISSION TREND BY SOURCE CATEGORY – ANNUAL AVERAGE

Condensable and Filterable PM2.5 Emissions

Per PM2.5 NAAQS final implementation rule,[20] the SIP emissions inventory is required to separately identify condensable and filterable portions of PM2.5 within primary PM2.5 emissions. Primary PM emissions consist of condensable and filterable portions. Condensable PM is the material that is in vapor phase in stack conditions. The U.S. EPA's Air Emissions Reporting Requirements (AERR) requires states to report annual emissions of filterable and condensable components of PM2.5 and PM10, "as applicable," for large sources for every inventory year and for all sources every third inventory year, beginning with 2011.[21] Subsequent emissions inventory guidance[22] from the U.S. EPA clarifies the meaning of the phrase "as applicable" by providing a list of source types "for which condensable PM is expected by the AERR." Filterable PM comprises "particles that are directly emitted by a source as a solid or liquid [aerosol] at stack or release conditions." Primary PM2.5 is the sum of condensable and filterable PM2.5 emissions. Category specific conversion factors

[20] 40 CFR 51.1008(a)(1)(iv).

[21] 40 CFR §51.15(a)(1) and §51.30(b)(1).

[22] USEPA. 2017. Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations. Available at: https://www.epa.gov/sites/production/files/2017- 7/documents/ei_guidance_may_2017_final_rev.pdf.

developed by CARB and used in the Imperial County 2018 SIP[23] were applied in the current analysis to estimate condensable PM and then filterable PM was calculated by subtracting the condensable from the total PM2.5 primary emissions. The baseline 2018, future attainment year 2030, and the RFP milestone years 2023, 2025, 2028, and 2031 are included in the analysis. Figure I-2-15 shows the annual average emissions of primary (or direct), condensable, and filterable PM2.5 emissions for those years.

As shown in Figure I-2-19, total primary PM2.5 emissions increase between the base and future years, rising from 45.2 tpd in 2018 to 46.6 tpd in 2030. This increase in total primary PM2.5 is due to both condensable and filterable portions, which experience respective increases of 0.8 and 0.6 tpd between 2018 and 2031. The condensable portion shows a sharper increase than the filterable portion in the initial interim years from 2018 through 2023, with a 0.4 tpd increase versus little to no change. These increases can be attributed to the growth in population and economic activities in the Basin.

Table I-2-17 presents the top five source categories for condensable PM2.5 in 2018 and future milestone years. Most condensable PM2.5 is emitted from cooking, which accounts for 75.1% and 76.8% of the total condensable PM2.5 in 2018 and 2030, respectively. The sum of the top five condensable PM2.5 categories represents 95.7% and 95.9% of the total condensable PM2.5 both in 2018 and 2030, respectively. Table I-2-18 shows the top five categories for filterable PM2.5. Paved road dust is the greatest source of filterable PM2.5. The top five filterable PM2.5 emissions categories account for approximately 70.7% (2018) and 72.9% (2030) of the total filterable PM2.5 emissions. This points to a marginally higher contribution of the top five filterable categories to total filterable PM2.5 emissions in future years.

List of Category Specific Conversion Factors (Developed by CARB and Used in the Imperial County 2018 SIP) to Estimate Condensable PM2.5 from Primary PM2.5 as well as detailed emissions by major source category for condensable and filterable PM2.5 are included in Appendix I Attachment E of this Plan.

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[23] Imperial County 2018 Annual Particulate Matter less than 2.5 microns in Diameter State Implementation Plan, April 2018. Available at https://ww3.arb.ca.gov/planning/sip/planarea/imperial/final_2018_ic_pm25_sip.pdf.

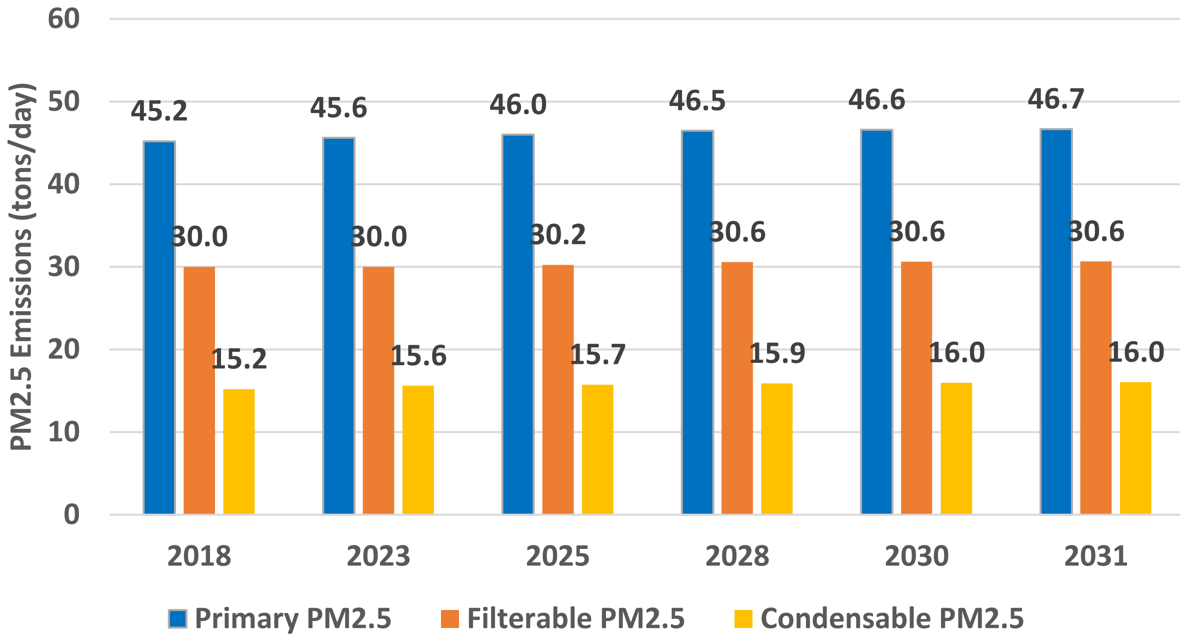

FIGURE I-2-17

ANNUAL AVERAGE PRIMARY, FILTERABLE AND CONDENSABLE PM2.5 EMISSIONS

TABLE I-2-17

TOP 5 CATEGORIES EMITTING CONDENSABLE PM2.5 (TONS PER DAY)

Category	2018	2023	2025	2028	2030	2031
Cooking	11.41	11.76	11.93	12.13	12.27	12.33
Petroleum Refining (Combustion)	1.00	1.00	1.00	1.00	1.00	1.00
Residential Fuel Combustion	0.79	0.82	0.81	0.78	0.77	0.77
Manufacturing and Industrial	0.75	0.73	0.74	0.73	0.72	0.71
Service and Commercial	0.61	0.61	0.60	0.58	0.57	0.57

TABLE I-2-18

TOP 5 CATEGORIES EMITTING FILTERABLE PM2.5 (TONS PER DAY)

Category	2018	2023	2025	2028	2030	2031
Paved Road Dust	8.59	8.83	8.91	9.08	9.11	9.11
Residential Fuel Combustion	5.98	5.95	5.92	5.86	5.82	5.82
Wood and Paper	2.7	2.95	3.06	3.2	3.23	3.23
Construction and Demolition	2.27	2.36	2.41	2.46	2.49	2.51
Unpaved Road Dust	1.67	1.67	1.67	1.67	1.67	1.67

Uncertainty in the Inventory

An effective PM Plan relies on a robust emission inventory. Over the years, significant improvements have been made to quantify emission sources for which control measures are developed. Increased use of continuous monitoring and source tests has contributed to the improvement in point source inventories. Technical assistance to facilities and auditing of reported emissions by South Coast AQMD also have improved the accuracy of the emissions inventory. CARB inventory staff collaborates with the South Coat AQMD to ensure the accuracy of these data. The locations of point sources, including stacks, are checked for validity. Area source inventories that rely on average emission factors and regional activities have inherent uncertainty. Area source emissions estimates are developed by both CARB and South Coast AQMD staff, and the methodologies are reviewed by both agencies before their inclusion in the emissions inventory. Industry-specific surveys and source-specific studies during rule development have provided much-needed refinement to the emissions estimates. Many sectors in area sources were revised extensively as well based on the best available emission factors and activity data. As described earlier, many improvements are included in the on-road mobile source model EMFAC2021 which estimates emissions from trucks, automobiles, and buses. Improvements and updates are included in the off-road models for locomotives, OGVs, commercial harbor craft, pleasure craft and off-road recreational vehicles, cargo handling equipment, and farm equipment. Mobile categories are verified with CARB mobile source staff for consistency with the on-road and off-road emission models.

CARB maintains and assembles base year emissions in the California Emission Inventory Development and Reporting System (CEIDARS), which is designed with automatic system checks to prevent errors, such as double counting of emission sources. At the final stage, California Emissions Projection Analysis Model (CEPAM), a tool designed and maintained by CARB to model emissions inventory for the 2022 State SIP Strategy is thoroughly reviewed by CARB staff as well as South Coast AQMD staff to validate the accuracy of growth and control application, and the output emissions are compared against prior approved versions of CEPAM to identify data anomalies.

Overall, the ~~Draft~~ PM2.5 Plan inventory is based on the most current information and estimation methodologies, resulting in the most accurate inventory available. However, there are still areas that could be improved if better data were available. Technology changes and improvements in the area of electric, hybrid, flexible fuel, and fuel cell vehicles, or the change in future gasoline prices, all add uncertainty to the future on-road emissions inventory.

Relative to future growth, there are many challenges involved with making accurate projections, such as where vehicle trips will occur, the distribution between various modes of transportation (such as trucks and trains), as well as estimates for population growth and changes to the number and type of jobs. Forecasts are made with the best information available; nevertheless, they contribute to the overall uncertainty in emission projections. Fortunately, AQMP updates are generally performed every three to five years; thereby allowing for frequent improvements and adjustments to the inventories.

Controlled Emission Inventories

This section describes the methodology used to estimate the controlled and remaining emissions after the proposed control measures in the ~~Draft~~ PM2.5 Plan are implemented for the year 2030. Emission reductions are derived by applying the control efficiency of a control measure to the projected baseline inventories.

The methodology used in this ~~Draft~~ PM2.5 Plan to calculate emission reductions from the implementation of the proposed control measures and remaining emissions is the same methodology used in the 2022 AQMP.[24] The in-house algorithm calculates remaining emissions as well as reductions for each control measure using the control factors specified at the Emission Inventory Codes (EIC) level for a given year and pollutant. It is not unusual to have more than one control factors targeting the same EIC when multiple rules exist. To avoid double counting of reductions, the composite control factor is used by multiplying the individual control factors for the same EIC. Details of the steps taken in the calculation are discussed in the "Emission Reduction Calculations" section of this document.

Emission Reductions from the Proposed Control Measures

To assess emission reduction potential and remaining emissions from proposed control measures, a control factor profile needs to be developed identifying the source category targeted by each measure, its control efficiency, and the implementation schedule.

Control Efficiency/Control Factor

One factor that determines the effectiveness of a control measure is its control efficiency (CE), expressed in percentage. Control efficiency is dependent on the specific control technologies proposed, and each control measure may have one or more technology options available. If there is only one feasible control technology in a control measure, its control efficiency is primarily based on an engineering evaluation of the proposed technology. However, if several control technologies are available to control an emission source, the average control efficiency is used. If multiple control technologies are proposed to reduce emissions from various steps of an operation, a weighted average control efficiency is developed to represent an overall control of the emission sources. Once the control efficiency of a control measure is determined, it is used to estimate emission reductions of the proposed measure. Control efficiencies for the proposed control measures are identified and discussed in detail in Appendix IV of the ~~Draft~~ PM2.5 Plan.

The control factor (CF) is used to estimate remaining emissions once a proposed control measure is implemented. A control factor equal to 0 indicates complete emission control or 100 percent efficiency. A control factor equal to 1 indicates no emission control or emissions remain unchanged. A high control factor value indicates a low control efficiency. As the control efficiency goes up, the control factor value goes down. The equation to calculate a control factor follows:

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[24] 2022 AQMP Appendix III: Base and Future Year Emission Inventory http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2022-air-quality-management-plan/final-2022-aqmp/appendix-iii.pdf?sfvrsn=6

$$CF = 1 - (CE/100)$$

The remaining emissions can be calculated as:

$$REM = BE \times CF$$

Where REM is Remaining Emissions, and BE is Baseline Emissions.

To assess the influence of control measures on future PM2.5 levels, control factors for 2030 were developed. The control factor profile for each measure is developed considering the following factors:

- proposed adoption date;
- implementation lead time; and
- phase-in period, if any.

The adoption date as proposed in the ~~Draft~~ PM2.5 Plan is the date South Coast AQMD or another agency is expected to adopt the control measure as a rule. The implementation lead time reflects the time allowed for the emission sources to install controls. When a rule is implemented, it is not unusual that it may have multiple interim implementation dates prior to full implementation. This is because the requirements in a rule may require two or three phases to include such as technology-forcing regulation to reach the final emission target. Sometime, a particular rule may regulate such a large population of equipment that it is impractical to implement it all at once, then, it becomes administratively necessary break down the implementation into different phases. In either case, a control profile would indicate an initial implementation date and an ending implementation date. The adoption and implementation schedule of the proposed control measures is presented in Chapter 4 of the ~~Draft~~ PM2.5 Plan.

Impact Factors

Each proposed control measure describes specific emission sources subject to potential controls. Based on the description of these sources, corresponding sources as tracked in the emission inventory are identified. In general, emission sources are grouped by major source category, which can be further subcategorized into point sources denoted by Source Classification Codes (SCC) and area sources denoted by Category Emission Source (CES) Codes. To track emission reductions more accurately, the control factors at the SCC/CES level become necessary.

An SCC, an 8-digit EPA code, is used to identify emissions from a point source at the equipment level. A CES, a 5-digit CARB code, is used to describe an area source for which emissions are distributed across the region with no specific locations.

For some measures, the controls apply not only to the type of equipment but also to the industries engaged in a particular activity. In those cases, control factors will be developed by pairing SCCs with Standard Industrial Classification (SIC) Codes to clearly and specifically point out the emission sources in the inventory that the measure is designed to reduce. Such SCC/SIC pairs significantly enhance the ability to quantify emissions closely following the intent of a proposed control measure.

There are instances where an SCC or CES category is not fully impacted by a control measure. As a result, an impact factor (IF) is developed as a weighing factor for such an adjustment. The following equation illustrates how the impact factor (IF) is included in the CF calculation.

CF = 1 - ((CE /100) x IF)

Impact factors will accurately track the measure's baseline emissions and calculate more accurate reductions from the proposed control measures.

Emission reductions for the attainment year 2030 for South Coast Air Basin are estimated from the control measures provided in Chapter 4 and Appendix IV of this ~~Draft~~ PM2.5 Plan.

Emission Reduction Calculations

An in-house algorithm (in MATLAB programming language) is developed to calculate the emission reductions from controlled emission scenarios. A brief description of the steps taken in the algorithm is as follows:

I. Compile baseline emissions by EIC:
Compile the annual baseline emissions (BE) by EIC for each pollutant and year. Attachment A in Appendix I present the annual average emission summary tables for the South Coast Air Basin by major source categories.

Baseline Emissions by year, pollutant and EIC: $BE_{year,pol,EIC}$

II. Compile composite control factors for all measures by EIC:
The control factors by pollutant and year are provided by South Coast AQMD rule writers or CARB staff for each proposed control measure. The composite control factors by EIC and pollutant are obtained by multiplying all control factors applied to the same EIC to reflect the overall reduction resulting from the application of all control and incentive measures to the baseline emissions.

Example: Assume there are 2 control measures applying to 3 EIC codes

Control factors for measure 1 applies to EIC1 and EIC2:

$$CF1_{year,pol,EIC1} \text{ and } CF1_{year,pol,EIC2}$$

Control factors for measure 2 applies to EIC1 and EIC3:

$$CF2_{year,pol,EIC1} \text{ and } CF2_{year,pol,EIC3}$$

Composite control factors for the 3 EIC are:

$$CCF_{year,pol,EIC1} = CF1_{year,pol,EIC1} \times CF2_{year,pol,EIC1}$$

$$CCF_{year,pol,EIC2} = CF1_{year,pol,EIC2}$$

$$CCF_{year,pol,EIC3} = CF2_{year,pol,EIC3}$$

III. Calculate remaining Emissions:
Calculate the remaining emissions after multiplying the composite control factors by baseline emissions, by EIC, pollutant, and year. The result is the remaining emissions after applying all defined measures and South Coast AQMD incentive programs for mobile and stationary sources.

Example: Apply the control factors of measures 1 and 2 to baseline emissions of EIC1, EIC2 and EIC3 to calculate controlled emissions (CE)

$$CE_{year,pol,EIC1} = CCF_{year,pol,EIC1} \times BE_{year,pol,EIC1}$$

$$CE_{year,pol,EIC2} = CCF_{year,pol,EIC2} \times BE_{year,pol,EIC2}$$

$$CE_{year,pol,EIC3} = CCF_{year,pol,EIC3} \times BE_{year,pol,EIC3}$$

IV. Add back set-aside account emissions to remaining basin total for the controlled emissions scenario.

The result of emission reductions from the proposed control measures for 2025 and 2030 are presented in Appendix II of the ~~Draft~~ PM2.5 Plan.

CARB Emission Data Reports System

As mentioned in Chapter 1 of this Appendix, the entire emission inventories are compiled and maintained by CARB in its statewide emission related information databases, namely the California Emission Inventory Development and Reporting System (CEIDARS) and the California Emission Forecasting and Planning Inventory System (CEFIS).

In both systems, emissions are tracked by EIC codes. The EIC code is a 14-digit number arranged into four fields: major category, source category, material description, and emission sub-category. For example, EIC 210-200-3300-0000 is for dry cleaning using perchloroethylene. 210 indicates that this source is under the laundering group. 200 means the source category is dry cleaning. 3300 refers to the material perchloroethylene. 0000 implies there is no sub-category for this particular source. EIC codes separate emission sources into four major divisions: stationary, area, non-anthropogenic, and mobile source. This coding system allows flexibility in how sources are selected, sorted, and grouped to fit users' needs. EIC codes link area sources and point sources together to allow a computer program to automatically reconcile point and area source emissions. In the ~~Draft~~ PM2.5 Plan, all the emission summary reports are based on CARB's EIC codes. Because only anthropogenic sources are included in this document, all summary reports in the appendices include three major divisions: stationary, area, and mobile sources.

The California Emissions Projection Analysis Model (CEPAM)[25] was created to support SIP development, air quality modeling efforts, and SIP progress tracking. CEPAM starts with a base year, which is pulled from CEIDARS, and forecasts emissions for point and area sources using the most current growth and control data available at the time of the development of the model version. For mobile sources, CEPAM integrates the

[25] https://ww2.arb.ca.gov/criteria-pollutant-emission-inventory-data#:~:text=California%20Emissions%20Projection%20Analysis%20Model&text=CEPAM%20starts%20with%20a%20base,development%20of%20the%20model%20version.

emission estimates from EMFAC and OFFROAD[26] mobile source emission models to provide a comprehensive anthropogenic emission inventory. CEPAM2022 projected from 2018 using control and growth factors employed for this PM plan will be released and hosted on CARB's website for public review.

[26] https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/msei-road-documentation-0.

Attachment A:

Annual Average Emissions by Source Category in

South Coast Air Basin

Attachment A

2018 Annual Average Emissions by Source Category in South Coast Air Basin (Tons/Day)

MSC	DESC	TOG	VOC	NOX	CO	SOX	PM	PM10	PM25	NH3
Fuel Combustion										
10	Electric Utilities	2.72	0.32	0.64	4.31	0.23	0.54	0.53	0.53	0.69
20	Cogeneration	0.03	0.01	0.02	0.11	0.00	0.02	0.01	0.01	0.17
30	Oil and Gas Production (combustion)	1.01	0.12	0.58	0.57	0.01	0.09	0.09	0.09	0.17
40	Petroleum Refining (Combustion)	6.55	1.38	0.00	5.17	0.01	1.80	1.80	1.79	1.54
50	Manufacturing and Industrial	4.29	0.91	6.41	48.46	1.04	1.45	1.37	1.33	2.30
52	Food and Agricultural Processing	0.09	0.04	0.20	0.49	0.00	0.05	0.05	0.05	0.06
60	Service and Commercial	4.96	1.95	10.48	20.67	0.77	1.17	1.17	1.16	2.61
99	Other (Fuel Combustion)	0.74	0.61	2.77	1.27	0.01	0.42	0.39	0.37	0.25
	Total Fuel Combustion	**20.40**	**5.34**	**21.10**	**81.04**	**2.08**	**5.54**	**5.42**	**5.34**	**7.79**
Waste Disposal										
110	Sewage Treatment	0.39	0.28	0.00	0.00	0.00	0.02	0.00	0.00	0.21
120	Landfills	621.84	8.63	0.45	0.39	0.37	0.20	0.20	0.20	3.97
130	Incineration	0.19	0.04	0.98	0.25	0.07	0.12	0.06	0.05	0.23
140	Soil Remediation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
199	Other (Waste Disposal)	71.22	5.72	0.01	0.01	0.00	0.00	0.00	0.00	1.33
	Total Waste Disposal	**693.64**	**14.67**	**1.44**	**0.65**	**0.44**	**0.34**	**0.26**	**0.25**	**5.74**
Cleaning and Surface Coatings										
210	Laundering	3.41	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00
220	Degreasing	66.82	12.71	0.00	0.00	0.00	0.02	0.02	0.02	0.01
230	Coatings and Related Processes	18.07	17.68	0.00	0.00	0.00	1.51	1.45	1.40	0.09
240	Printing	0.67	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.04
250	Adhesives and Sealants	5.79	5.12	0.00	0.00	0.00	0.02	0.02	0.02	0.00
299	Other (Cleaning and Surface Coatings)	0.63	0.62	0.01	0.11	0.00	0.01	0.00	0.00	0.00
	Total Cleaning and Surface Coatings	**95.39**	**36.93**	**0.01**	**0.11**	**0.00**	**1.56**	**1.50**	**1.44**	**0.14**
Petroleum Production and Marketing										
310	Oil and Gas Production	5.10	2.34	0.01	0.02	0.06	0.04	0.03	0.02	0.00
320	Petroleum Refining	6.35	4.43	0.23	2.39	0.24	1.87	1.25	0.88	0.07
330	Petroleum Marketing	53.80	12.80	0.00	0.23	0.00	0.01	0.00	0.00	0.00
399	Other (Petroleum Production and Marketing)	0.04	0.04	0.01	0.01	0.00	0.00	0.00	0.00	0.00
	Total Petroleum Production and Marketing	**65.29**	**19.61**	**0.25**	**2.65**	**0.30**	**1.91**	**1.28**	**0.91**	**0.07**
Industrial Processes										
410	Chemical	4.25	4.14	0.03	0.12	0.05	0.46	0.40	0.38	0.01
420	Food and Agriculture	0.53	0.51	0.00	0.01	0.01	0.25	0.12	0.05	0.00
430	Mineral Processes	0.35	0.31	0.02	0.29	0.04	8.43	3.57	0.94	0.06
440	Metal Processes	0.11	0.09	0.05	0.25	0.03	0.35	0.27	0.21	0.00
450	Wood and Paper	0.23	0.23	0.00	0.00	0.00	6.43	4.50	2.70	0.01
460	Glass and Related Products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
470	Electronics	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00
499	Other (Industrial Processes)	5.40	4.85	0.01	0.01	0.00	1.03	0.71	0.45	8.59
	Total Industrial Processes	**10.89**	**10.16**	**0.11**	**0.67**	**0.14**	**16.95**	**9.58**	**4.74**	**8.67**
Solvent Evaporation										
510	Consumer Products	135.77	107.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00
520	Architectural Coatings and Related Solvent	10.62	10.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00
530	Pesticides/Fertilizers	1.09	1.09	0.00	0.00	0.00	0.00	0.00	0.00	1.23
540	Asphalt Paving/Roofing	1.06	0.98	0.00	0.00	0.00	0.03	0.02	0.02	0.00
	Total Solvent Evaporation	**148.53**	**120.06**	**0.00**	**0.00**	**0.00**	**0.03**	**0.02**	**0.02**	**1.23**

Attachment A

(Continued)

2018 Annual Average Emissions by Source Category in South Coast Air Basin (Tons/Day)

MSC	DESC	TOG	VOC	NOX	CO	SOX	PM	PM10	PM25	NH3
Miscellaneous Processes										
610	Residential Fuel Combustion	19.57	8.88	19.10	47.62	0.33	7.32	6.96	6.77	0.11
620	Farming Operations	17.80	1.48	0.00	0.00	0.00	1.66	0.81	0.17	8.17
630	Construction and Demolition	0.00	0.00	0.00	0.00	0.00	46.32	22.66	2.27	0.00
640	Paved Road Dust	0.00	0.00	0.00	0.00	0.00	125.15	57.22	8.59	0.00
645	Unpaved Road Dust	0.00	0.00	0.00	0.00	0.00	28.17	16.74	1.67	0.00
650	Fugitive Windblown Dust	0.00	0.00	0.00	0.00	0.00	3.20	1.62	0.23	0.00
660	Fires	0.34	0.29	0.08	3.02	0.00	0.45	0.44	0.41	0.00
670	Waste Burning and Disposal	1.03	0.85	0.10	12.00	0.06	1.18	1.14	0.97	0.12
690	Cooking	2.73	1.08	0.00	0.00	0.00	11.44	11.44	11.44	0.00
699	Other (Miscellaneous Processes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.98
	RECLAIM	0	0	17.77	0	5.48	0	0	0	0
	Total Miscellaneous Processes	**41.47**	**12.59**	**37.04**	**62.65**	**5.87**	**224.89**	**119.04**	**32.52**	**34.39**
On-Road Motor Vehicles										
710	Passenger Cars (P)	42.05	38.58	28.22	394.54	0.73	4.38	4.33	1.61	6.98
722	Light Duty Trucks 1 (T1)	8.84	8.03	6.73	76.33	0.07	0.45	0.44	0.18	0.71
723	Light Duty Trucks 2 (T2)	18.52	16.75	20.54	190.38	0.34	1.70	1.68	0.63	2.65
724	Medium Duty Vehicles (T3)	17.28	15.51	20.13	163.73	0.29	1.21	1.19	0.45	1.85
725	Light Heavy Duty Trucks 1 (T4)	2.33	2.12	8.90	14.81	0.04	0.70	0.70	0.30	0.49
726	Light Heavy Duty Trucks 2 (T5)	0.42	0.38	2.50	2.24	0.01	0.19	0.19	0.08	0.15
727	Medium Heavy Duty Trucks (T6)	2.22	1.91	29.85	14.78	0.08	1.12	1.11	0.83	0.79
728	Heavy Heavy Duty Trucks (T7)	3.47	1.98	61.67	16.33	0.17	2.30	2.29	1.36	1.94
750	Motorcycles (MCY)	7.60	7.17	1.01	25.98	0.00	0.03	0.03	0.01	0.01
775	Buses	3.26	0.61	5.70	22.73	0.01	0.23	0.23	0.13	0.76
780	Motor Homes (MH)	0.41	0.38	0.78	1.97	0.01	0.04	0.04	0.03	0.03
	Total On-Road Motor Vehicles	**106.40**	**93.42**	**186.03**	**923.81**	**1.77**	**12.35**	**12.23**	**5.60**	**16.36**
Other Mobile Sources										
810	Aircraft	3.66	3.52	17.11	36.58	1.64	0.79	0.76	0.68	0.00
820	Trains	0.82	0.69	15.10	3.55	0.02	0.37	0.37	0.34	0.01
833	Ocean Going Vessels	10.93	9.36	32.21	4.32	2.04	0.69	0.69	0.64	0.02
835	Commercial Harbor Crafts	0.39	0.33	5.86	1.25	0.00	0.25	0.25	0.23	0.00
840	Recreational Boats	17.12	15.92	3.00	51.77	0.00	1.00	0.90	0.68	0.01
850	Off-Road Recreational Vehicles	1.32	1.29	0.04	2.12	0.00	0.01	0.01	0.01	0.00
860	Off-Road Equipment	55.86	51.48	54.24	603.92	0.09	2.69	2.62	2.30	0.09
861	Off-Road Equipment (PERP)	0.90	0.76	8.83	4.80	0.01	0.34	0.34	0.31	0.01
870	Farm Equipment	0.34	0.31	0.67	4.18	0.00	0.05	0.05	0.04	0.00
890	Fuel Storage and Handling	5.48	5.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total Other Mobile Sources	**96.83**	**89.15**	**137.05**	**712.49**	**3.81**	**6.17**	**5.97**	**5.21**	**0.15**
Natural Sources										
910	Biogenic Sources	135.14	132.07	5.28	0.00	0.00	0.00	0.00	0.00	0.00
920	Geogenic Sources	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.73
930	Wildfires	84.50	69.80	14.81	352.16	4.13	40.33	38.76	32.84	0.00
	Total Natural Sources Category	**219.64**	**201.87**	**20.09**	**352.16**	**4.13**	**40.33**	**38.76**	**32.84**	**1.73**
Total Stationary and Area Sources		1075.62	219.36	59.94	147.78	8.83	251.23	137.09	45.23	58.03
Total On-Road Vehicles		106.40	93.42	186.03	923.81	1.77	12.35	12.23	5.60	16.36
Total Other Mobile		96.83	89.15	137.05	712.49	3.81	6.17	5.97	5.21	0.15
Total Anthropogenic		**1278.86**	**401.93**	**383.02**	**1784.07**	**14.40**	**269.75**	**155.29**	**56.04**	**74.54**
Total Natural Sources		219.64	201.87	20.09	352.16	4.13	40.33	38.76	32.84	1.73
Grand Total		**1498.50**	**603.80**	**403.11**	**2136.24**	**18.53**	**310.08**	**194.05**	**88.87**	**76.27**

Attachment A

2023 Annual Average Emissions by Source Category in South Coast Air Basin (Tons/Day)

MSC	DESC	TOG	VOC	NOX	CO	SOX	PM	PM10	PM25	NH3
Fuel Combustion										
10	Electric Utilities	2.83	0.33	0.66	4.45	0.23	0.56	0.56	0.55	0.72
20	Cogeneration	0.04	0.01	0.02	0.12	0.00	0.02	0.01	0.01	0.18
30	Oil and Gas Production (combustion)	1.22	0.14	0.67	0.66	0.01	0.10	0.10	0.10	0.21
40	Petroleum Refining (Combustion)	6.55	1.38	0.00	5.17	0.01	1.80	1.80	1.79	1.54
50	Manufacturing and Industrial	4.20	0.91	6.23	47.03	1.04	1.43	1.35	1.32	2.25
52	Food and Agricultural Processing	0.09	0.04	0.21	0.49	0.00	0.05	0.05	0.05	0.06
60	Service and Commercial	5.09	2.01	10.32	20.41	0.80	1.17	1.17	1.16	2.50
99	Other (Fuel Combustion)	0.73	0.60	2.38	1.17	0.01	0.43	0.40	0.38	0.27
	Total Fuel Combustion	**20.76**	**5.42**	**20.51**	**79.50**	**2.11**	**5.57**	**5.44**	**5.36**	**7.73**
Waste Disposal										
110	Sewage Treatment	0.40	0.28	0.00	0.01	0.00	0.02	0.00	0.00	0.21
120	Landfills	645.49	8.96	0.42	0.40	0.37	0.21	0.20	0.20	4.11
130	Incineration	0.20	0.04	0.99	0.26	0.07	0.12	0.06	0.05	0.23
140	Soil Remediation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
199	Other (Waste Disposal)	72.70	5.84	0.01	0.01	0.00	0.00	0.00	0.00	1.47
	Total Waste Disposal	**718.80**	**15.12**	**1.41**	**0.67**	**0.45**	**0.34**	**0.27**	**0.25**	**6.02**
Cleaning and Surface Coatings										
210	Laundering	3.52	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00
220	Degreasing	68.38	13.05	0.00	0.00	0.00	0.02	0.02	0.02	0.01
230	Coatings and Related Processes	18.94	18.53	0.00	0.00	0.00	1.59	1.52	1.47	0.10
240	Printing	0.72	0.72	0.00	0.00	0.00	0.00	0.00	0.00	0.04
250	Adhesives and Sealants	5.15	4.55	0.00	0.00	0.00	0.02	0.02	0.02	0.00
299	Other (Cleaning and Surface Coatings)	0.64	0.64	0.01	0.11	0.00	0.01	0.01	0.00	0.00
	Total Cleaning and Surface Coatings	**97.36**	**37.64**	**0.01**	**0.12**	**0.00**	**1.64**	**1.57**	**1.51**	**0.15**
Petroleum Production and Marketing										
310	Oil and Gas Production	6.42	2.94	0.01	0.02	0.08	0.04	0.03	0.02	0.00
320	Petroleum Refining	6.35	4.43	0.22	2.39	0.24	1.87	1.25	0.88	0.07
330	Petroleum Marketing	52.97	11.61	0.00	0.21	0.00	0.01	0.00	0.00	0.00
399	Other (Petroleum Production and Marketing)	0.04	0.04	0.01	0.01	0.00	0.00	0.00	0.00	0.00
	Total Petroleum Production and Marketing	**65.78**	**19.01**	**0.24**	**2.63**	**0.31**	**1.92**	**1.28**	**0.91**	**0.07**
Industrial Processes										
410	Chemical	4.37	4.25	0.03	0.12	0.05	0.47	0.41	0.39	0.01
420	Food and Agriculture	0.55	0.53	0.00	0.01	0.01	0.25	0.12	0.06	0.00
430	Mineral Processes	0.37	0.33	0.02	0.30	0.05	8.54	3.63	0.96	0.06
440	Metal Processes	0.11	0.10	0.05	0.27	0.03	0.39	0.31	0.23	0.00
450	Wood and Paper	0.24	0.24	0.00	0.00	0.00	7.03	4.92	2.95	0.01
460	Glass and Related Products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
470	Electronics	0.02	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00
499	Other (Industrial Processes)	5.49	4.94	0.01	0.01	0.00	1.07	0.73	0.47	8.59
	Total Industrial Processes	**11.15**	**10.41**	**0.11**	**0.71**	**0.14**	**17.75**	**10.12**	**5.07**	**8.68**
Solvent Evaporation										
510	Consumer Products	141.43	111.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00
520	Architectural Coatings and Related Solvent	11.23	11.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00
530	Pesticides/Fertilizers	1.12	1.12	0.00	0.00	0.00	0.00	0.00	0.00	1.20
540	Asphalt Paving/Roofing	1.11	1.02	0.00	0.00	0.00	0.03	0.03	0.02	0.00
	Total Solvent Evaporation	**154.89**	**125.34**	**0.00**	**0.00**	**0.00**	**0.03**	**0.03**	**0.02**	**1.20**

Attachment A

(Continued)
2023 Annual Average Emissions by Source Category in South Coast Air Basin (Tons/Day)

MSC	DESC	TOG	VOC	NOX	CO	SOX	PM	PM10	PM25	NH3
Miscellaneous Processes										
610	Residential Fuel Combustion	19.77	8.97	18.99	48.34	0.34	7.31	6.96	6.78	0.11
620	Farming Operations	13.55	1.13	0.00	0.00	0.00	1.46	0.71	0.15	6.19
630	Construction and Demolition	0.00	0.00	0.00	0.00	0.00	48.22	23.59	2.36	0.00
640	Paved Road Dust	0.00	0.00	0.00	0.00	0.00	128.76	58.87	8.83	0.00
645	Unpaved Road Dust	0.00	0.00	0.00	0.00	0.00	28.16	16.74	1.67	0.00
650	Fugitive Windblown Dust	0.00	0.00	0.00	0.00	0.00	3.07	1.56	0.22	0.00
660	Fires	0.34	0.29	0.08	3.02	0.00	0.45	0.44	0.41	0.00
670	Waste Burning and Disposal	0.24	0.21	0.09	2.85	0.03	0.33	0.32	0.28	0.03
690	Cooking	2.82	1.12	0.00	0.00	0.00	11.79	11.79	11.79	0.00
699	Other (Miscellaneous Processes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26.90
	RECLAIM	0	0	14.28	0	6.08	0	0	0	0
	Total Miscellaneous Processes	**36.72**	**11.72**	**33.44**	**54.22**	**6.45**	**229.56**	**120.99**	**32.49**	**33.24**
On-Road Motor Vehicles										
710	Passenger Cars (P)	28.07	26.23	15.85	253.69	0.63	4.07	4.02	1.45	7.25
722	Light Duty Trucks 1 (T1)	6.12	5.62	4.23	48.48	0.06	0.38	0.37	0.15	0.65
723	Light Duty Trucks 2 (T2)	13.70	12.63	11.64	135.98	0.35	1.94	1.92	0.69	3.52
724	Medium Duty Vehicles (T3)	12.09	11.07	11.24	103.41	0.27	1.21	1.20	0.44	2.10
725	Light Heavy Duty Trucks 1 (T4)	1.57	1.44	5.10	9.92	0.04	0.59	0.59	0.24	0.54
726	Light Heavy Duty Trucks 2 (T5)	0.29	0.27	1.48	1.48	0.01	0.18	0.18	0.07	0.19
727	Medium Heavy Duty Trucks (T6)	0.87	0.70	11.40	8.00	0.09	0.51	0.51	0.22	1.46
728	Heavy Heavy Duty Trucks (T7)	2.04	0.68	30.61	14.33	0.19	1.75	1.74	0.74	3.03
750	Motorcycles (MCY)	7.07	6.68	0.90	22.81	0.00	0.03	0.03	0.01	0.01
775	Buses	2.48	0.21	2.15	28.88	0.01	0.17	0.17	0.07	0.84
780	Motor Homes (MH)	0.24	0.23	0.60	0.63	0.01	0.04	0.04	0.02	0.03
	Total On-Road Motor Vehicles	**74.54**	**65.75**	**95.20**	**627.62**	**1.66**	**10.86**	**10.77**	**4.09**	**19.63**
Other Mobile Sources										
810	Aircraft	3.51	3.35	17.77	34.15	1.54	0.76	0.73	0.65	0.00
820	Trains	0.83	0.69	16.13	3.90	0.02	0.37	0.37	0.34	0.01
833	Ocean Going Vessels	11.07	9.47	31.12	4.42	2.08	0.70	0.70	0.65	0.03
835	Commercial Harbor Crafts	0.39	0.33	5.77	1.22	0.00	0.25	0.25	0.23	0.00
840	Recreational Boats	13.76	12.81	2.82	51.47	0.00	0.80	0.72	0.55	0.01
850	Off-Road Recreational Vehicles	1.14	1.12	0.04	2.25	0.00	0.01	0.01	0.01	0.00
860	Off-Road Equipment	52.72	48.64	37.22	656.46	0.09	2.08	2.01	1.74	0.07
861	Off-Road Equipment (PERP)	0.63	0.53	5.16	4.72	0.01	0.18	0.18	0.16	0.01
870	Farm Equipment	0.26	0.23	0.51	4.20	0.00	0.04	0.04	0.03	0.00
890	Fuel Storage and Handling	4.62	4.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total Other Mobile Sources	**88.92**	**81.81**	**116.55**	**762.79**	**3.76**	**5.18**	**5.00**	**4.36**	**0.12**
Natural Sources										
910	Biogenic Sources	135.14	132.07	5.28	0.00	0.00	0.00	0.00	0.00	0.00
920	Geogenic Sources	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.73
930	Wildfires	58.09	47.98	6.55	245.39	2.12	26.10	25.08	21.25	2.45
	Total Natural Sources Category	**193.24**	**180.06**	**11.83**	**245.39**	**2.12**	**26.10**	**25.08**	**21.25**	**4.19**
Total Stationary and Area Sources		1105.46	224.67	55.71	137.84	9.47	256.80	139.69	45.63	57.08
Total On-Road Vehicles		74.54	65.75	95.20	627.62	1.66	10.86	10.77	4.09	19.63
Total Other Mobile		88.92	81.81	116.55	762.79	3.76	5.18	5.00	4.36	0.12
Total Anthropogenic		**1268.92**	**372.22**	**267.46**	**1528.26**	**14.88**	**272.83**	**155.46**	**54.08**	**76.83**
Total Natural Sources		193.24	180.06	11.83	245.39	2.12	26.10	25.08	21.25	4.19
Grand Total		**1462.15**	**552.28**	**279.29**	**1773.65**	**17.01**	**298.93**	**180.54**	**75.32**	**81.02**

Attachment A

2025 Annual Average Emissions by Source Category in South Coast Air Basin (Tons/Day)

MSC	DESC	TOG	VOC	NOX	CO	SOX	PM	PM10	PM25	NH3
Fuel Combustion										
10	Electric Utilities	2.64	0.31	0.57	4.18	0.22	0.52	0.52	0.52	0.66
20	Cogeneration	0.04	0.01	0.01	0.12	0.00	0.02	0.01	0.01	0.18
30	Oil and Gas Production (combustion)	1.30	0.15	0.72	0.69	0.01	0.11	0.11	0.11	0.22
40	Petroleum Refining (Combustion)	6.55	1.38	0.00	5.17	0.01	1.80	1.80	1.79	1.54
50	Manufacturing and Industrial	4.23	0.92	6.25	47.21	1.04	1.44	1.36	1.33	2.27
52	Food and Agricultural Processing	0.09	0.04	0.21	0.50	0.00	0.05	0.05	0.05	0.06
60	Service and Commercial	5.11	2.02	10.25	19.93	0.81	1.16	1.16	1.15	2.41
99	Other (Fuel Combustion)	0.74	0.60	2.31	1.18	0.01	0.44	0.41	0.39	0.28
	Total Fuel Combustion	**20.71**	**5.44**	**20.32**	**78.99**	**2.12**	**5.54**	**5.42**	**5.34**	**7.61**
Waste Disposal										
110	Sewage Treatment	0.40	0.28	0.00	0.01	0.00	0.02	0.00	0.00	0.22
120	Landfills	655.04	9.09	0.38	0.40	0.38	0.21	0.20	0.20	4.16
130	Incineration	0.20	0.04	0.99	0.26	0.07	0.12	0.06	0.05	0.23
140	Soil Remediation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
199	Other (Waste Disposal)	73.38	5.90	0.01	0.01	0.00	0.00	0.00	0.00	1.54
	Total Waste Disposal	**729.03**	**15.31**	**1.38**	**0.67**	**0.45**	**0.35**	**0.27**	**0.26**	**6.14**
Cleaning and Surface Coatings										
210	Laundering	3.58	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00
220	Degreasing	69.16	13.22	0.00	0.00	0.00	0.02	0.02	0.02	0.01
230	Coatings and Related Processes	19.38	18.96	0.00	0.00	0.00	1.62	1.56	1.50	0.10
240	Printing	0.74	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.04
250	Adhesives and Sealants	5.22	4.61	0.00	0.00	0.00	0.02	0.02	0.02	0.00
299	Other (Cleaning and Surface Coatings)	0.65	0.64	0.01	0.11	0.00	0.01	0.01	0.00	0.00
	Total Cleaning and Surface Coatings	**98.73**	**38.33**	**0.01**	**0.12**	**0.00**	**1.67**	**1.61**	**1.55**	**0.15**
Petroleum Production and Marketing										
310	Oil and Gas Production	7.00	3.21	0.01	0.03	0.08	0.04	0.03	0.02	0.00
320	Petroleum Refining	6.35	4.43	0.21	2.39	0.24	1.87	1.25	0.88	0.07
330	Petroleum Marketing	51.63	11.17	0.00	0.20	0.00	0.01	0.00	0.00	0.00
399	Other (Petroleum Production and Marketing)	0.04	0.04	0.01	0.01	0.00	0.00	0.00	0.00	0.00
	Total Petroleum Production and Marketing	**65.02**	**18.85**	**0.23**	**2.63**	**0.32**	**1.92**	**1.28**	**0.91**	**0.07**
Industrial Processes										
410	Chemical	4.42	4.30	0.03	0.12	0.05	0.48	0.42	0.39	0.01
420	Food and Agriculture	0.57	0.55	0.00	0.01	0.01	0.26	0.12	0.06	0.00
430	Mineral Processes	0.38	0.34	0.02	0.31	0.05	8.59	3.65	0.97	0.06
440	Metal Processes	0.12	0.10	0.06	0.29	0.03	0.41	0.32	0.24	0.00
450	Wood and Paper	0.24	0.24	0.00	0.00	0.00	7.29	5.10	3.06	0.01
460	Glass and Related Products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
470	Electronics	0.02	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00
499	Other (Industrial Processes)	5.53	4.98	0.01	0.01	0.00	1.07	0.74	0.47	8.59
	Total Industrial Processes	**11.28**	**10.52**	**0.11**	**0.73**	**0.15**	**18.10**	**10.35**	**5.21**	**8.68**
Solvent Evaporation										
510	Consumer Products	145.79	115.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00
520	Architectural Coatings and Related Solvent	11.43	11.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00
530	Pesticides/Fertilizers	1.12	1.12	0.00	0.00	0.00	0.00	0.00	0.00	1.19
540	Asphalt Paving/Roofing	1.14	1.04	0.00	0.00	0.00	0.03	0.03	0.02	0.00
	Total Solvent Evaporation	**159.49**	**129.17**	**0.00**	**0.00**	**0.00**	**0.03**	**0.03**	**0.02**	**1.19**

Attachment A

(Continued)
2025 Annual Average Emissions by Source Category in South Coast Air Basin (Tons/Day)

MSC	DESC	TOG	VOC	NOX	CO	SOX	PM	PM10	PM25	NH3
Miscellaneous Processes										
610	Residential Fuel Combustion	19.70	8.94	17.85	48.07	0.33	7.26	6.91	6.72	0.11
620	Farming Operations	13.42	1.12	0.00	0.00	0.00	1.46	0.70	0.14	6.19
630	Construction and Demolition	0.00	0.00	0.00	0.00	0.00	49.19	24.07	2.41	0.00
640	Paved Road Dust	0.00	0.00	0.00	0.00	0.00	129.93	59.41	8.91	0.00
645	Unpaved Road Dust	0.00	0.00	0.00	0.00	0.00	28.16	16.74	1.67	0.00
650	Fugitive Windblown Dust	0.00	0.00	0.00	0.00	0.00	3.02	1.54	0.22	0.00
660	Fires	0.34	0.29	0.08	3.02	0.00	0.45	0.44	0.41	0.00
670	Waste Burning and Disposal	0.24	0.21	0.09	2.85	0.03	0.33	0.32	0.28	0.03
690	Cooking	2.86	1.13	0.00	0.00	0.00	11.96	11.96	11.96	0.00
699	Other (Miscellaneous Processes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	27.25
	RECLAIM	0	0	0	0	6.08	0	0	0	0
	Total Miscellaneous Processes	**36.55**	**11.69**	**18.02**	**53.94**	**6.44**	**231.77**	**122.09**	**32.73**	**33.58**
On-Road Motor Vehicles										
710	Passenger Cars (P)	24.62	23.15	13.07	217.26	0.58	3.92	3.88	1.38	7.30
722	Light Duty Trucks 1 (T1)	5.04	4.65	3.36	39.31	0.06	0.35	0.35	0.13	0.63
723	Light Duty Trucks 2 (T2)	12.49	11.58	9.75	121.99	0.34	1.97	1.95	0.70	3.76
724	Medium Duty Vehicles (T3)	10.55	9.75	8.78	86.86	0.25	1.20	1.19	0.43	2.19
725	Light Heavy Duty Trucks 1 (T4)	1.30	1.20	4.02	8.74	0.03	0.57	0.57	0.22	0.56
726	Light Heavy Duty Trucks 2 (T5)	0.25	0.23	1.19	1.31	0.01	0.17	0.17	0.07	0.20
727	Medium Heavy Duty Trucks (T6)	0.77	0.61	9.00	6.92	0.09	0.50	0.50	0.19	1.53
728	Heavy Heavy Duty Trucks (T7)	2.03	0.71	19.97	14.74	0.19	1.71	1.71	0.67	3.20
750	Motorcycles (MCY)	6.99	6.60	0.86	21.95	0.00	0.03	0.03	0.01	0.01
775	Buses	2.61	0.21	1.83	29.42	0.01	0.16	0.16	0.06	0.83
780	Motor Homes (MH)	0.20	0.19	0.54	0.42	0.01	0.04	0.04	0.02	0.03
	Total On-Road Motor Vehicles	**66.84**	**58.87**	**72.38**	**548.91**	**1.58**	**10.63**	**10.55**	**3.89**	**20.24**
Other Mobile Sources										
810	Aircraft	3.65	3.49	19.69	35.30	1.65	0.77	0.75	0.67	0.00
820	Trains	0.81	0.68	16.43	4.05	0.02	0.37	0.37	0.34	0.01
833	Ocean Going Vessels	11.14	9.54	31.09	4.50	2.19	0.72	0.72	0.66	0.03
835	Commercial Harbor Crafts	0.39	0.33	5.79	1.22	0.00	0.25	0.25	0.23	0.00
840	Recreational Boats	12.68	11.81	2.77	51.68	0.00	0.74	0.67	0.50	0.01
850	Off-Road Recreational Vehicles	1.07	1.05	0.05	2.32	0.00	0.01	0.01	0.01	0.00
860	Off-Road Equipment	47.80	44.10	33.41	625.72	0.09	1.87	1.80	1.56	0.07
861	Off-Road Equipment (PERP)	0.59	0.49	4.25	4.90	0.02	0.13	0.13	0.12	0.01
870	Farm Equipment	0.23	0.21	0.45	3.80	0.00	0.03	0.03	0.03	0.00
890	Fuel Storage and Handling	4.37	4.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total Other Mobile Sources	**82.72**	**76.06**	**113.94**	**733.50**	**3.98**	**4.88**	**4.72**	**4.12**	**0.13**
Natural Sources										
910	Biogenic Sources	135.14	132.07	5.28	0.00	0.00	0.00	0.00	0.00	0.00
920	Geogenic Sources	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.73
930	Wildfires	58.09	47.98	6.55	245.39	2.12	26.10	25.08	21.25	2.45
	Total Natural Sources Category	**193.24**	**180.06**	**11.83**	**245.39**	**2.12**	**26.10**	**25.08**	**21.25**	**4.19**
Total Stationary and Area Sources		1120.81	229.30	53.08	137.08	9.48	259.37	141.03	46.01	57.43
Total On-Road Vehicles		66.84	58.87	72.38	548.91	1.58	10.63	10.55	3.89	20.24
Total Other Mobile		82.72	76.06	113.94	733.50	3.98	4.88	4.72	4.12	0.13
Total Anthropogenic		**1270.37**	**364.24**	**239.40**	**1419.48**	**15.05**	**274.89**	**156.30**	**54.01**	**77.79**
Total Natural Sources		193.24	180.06	11.83	245.39	2.12	26.10	25.08	21.25	4.19
Grand Total		**1463.61**	**544.30**	**251.23**	**1664.87**	**17.17**	**300.99**	**181.39**	**75.26**	**81.98**

Attachment A

2028 Annual Average Emissions by Source Category in South Coast Air Basin (Tons/Day)

MSC	DESC	TOG	VOC	NOX	CO	SOX	PM	PM10	PM25	NH3
Fuel Combustion										
10	Electric Utilities	2.36	0.27	2.70	3.81	0.22	0.46	0.46	0.46	0.58
20	Cogeneration	0.04	0.01	0.02	0.12	0.00	0.02	0.01	0.01	0.18
30	Oil and Gas Production (combustion)	1.44	0.17	0.92	0.75	0.01	0.11	0.11	0.11	0.24
40	Petroleum Refining (Combustion)	6.55	1.38	4.76	5.17	3.14	1.80	1.80	1.79	1.54
50	Manufacturing and Industrial	4.17	0.92	7.73	46.16	1.82	1.43	1.35	1.31	2.24
52	Food and Agricultural Processing	0.09	0.04	0.39	0.50	0.01	0.05	0.05	0.05	0.06
60	Service and Commercial	5.14	2.04	11.30	19.21	0.83	1.14	1.13	1.13	2.28
99	Other (Fuel Combustion)	0.76	0.62	2.40	1.19	0.02	0.45	0.43	0.40	0.28
	Total Fuel Combustion	**20.55**	**5.45**	**30.22**	**76.91**	**6.06**	**5.46**	**5.34**	**5.26**	**7.39**
Waste Disposal										
110	Sewage Treatment	0.41	0.29	0.00	0.01	0.00	0.02	0.00	0.00	0.22
120	Landfills	667.80	9.26	0.38	0.41	0.38	0.21	0.21	0.20	4.22
130	Incineration	0.21	0.04	1.17	0.26	0.08	0.12	0.06	0.05	0.24
140	Soil Remediation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
199	Other (Waste Disposal)	74.19	5.96	0.01	0.01	0.00	0.00	0.00	0.00	1.61
	Total Waste Disposal	**742.60**	**15.55**	**1.57**	**0.68**	**0.46**	**0.35**	**0.27**	**0.26**	**6.29**
Cleaning and Surface Coatings										
210	Laundering	3.64	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00
220	Degreasing	70.05	13.42	0.00	0.00	0.00	0.02	0.02	0.02	0.01
230	Coatings and Related Processes	19.84	19.42	0.00	0.00	0.00	1.66	1.59	1.53	0.10
240	Printing	0.77	0.77	0.00	0.00	0.00	0.00	0.00	0.00	0.04
250	Adhesives and Sealants	5.29	4.67	0.00	0.00	0.00	0.02	0.02	0.02	0.00
299	Other (Cleaning and Surface Coatings)	0.66	0.65	0.04	0.11	0.01	0.01	0.01	0.00	0.00
	Total Cleaning and Surface Coatings	**100.25**	**39.08**	**0.04**	**0.12**	**0.01**	**1.71**	**1.64**	**1.58**	**0.16**
Petroleum Production and Marketing										
310	Oil and Gas Production	7.96	3.65	0.01	0.03	0.10	0.04	0.03	0.02	0.00
320	Petroleum Refining	6.35	4.43	0.63	2.39	1.43	1.87	1.25	0.88	0.07
330	Petroleum Marketing	49.31	10.63	0.02	0.19	0.00	0.00	0.00	0.00	0.00
399	Other (Petroleum Production and Marketing)	0.04	0.04	0.01	0.01	0.00	0.00	0.00	0.00	0.00
	Total Petroleum Production and Marketing	**63.67**	**18.75**	**0.67**	**2.62**	**1.52**	**1.92**	**1.28**	**0.91**	**0.07**
Industrial Processes										
410	Chemical	4.47	4.35	0.07	0.12	0.09	0.48	0.42	0.40	0.01
420	Food and Agriculture	0.58	0.56	0.03	0.01	0.01	0.26	0.13	0.06	0.00
430	Mineral Processes	0.39	0.34	0.38	0.31	0.21	8.64	3.68	0.98	0.07
440	Metal Processes	0.12	0.11	0.28	0.30	0.23	0.43	0.34	0.26	0.00
450	Wood and Paper	0.24	0.24	0.00	0.00	0.00	7.62	5.33	3.20	0.01
460	Glass and Related Products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
470	Electronics	0.02	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00
499	Other (Industrial Processes)	5.58	5.03	0.02	0.01	0.00	1.08	0.74	0.47	8.59
	Total Industrial Processes	**11.41**	**10.65**	**0.79**	**0.75**	**0.54**	**18.53**	**10.64**	**5.38**	**8.68**
Solvent Evaporation										
510	Consumer Products	150.08	119.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
520	Architectural Coatings and Related Solvent	11.70	11.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00
530	Pesticides/Fertilizers	1.13	1.13	0.00	0.00	0.00	0.00	0.00	0.00	1.17
540	Asphalt Paving/Roofing	1.16	1.07	0.00	0.00	0.00	0.03	0.03	0.03	0.00
	Total Solvent Evaporation	**164.07**	**132.98**	**0.00**	**0.00**	**0.00**	**0.03**	**0.03**	**0.03**	**1.17**

Attachment A

(Continued)
2028 Annual Average Emissions by Source Category in South Coast Air Basin (Tons/Day)

MSC	DESC	TOG	VOC	NOX	CO	SOX	PM	PM10	PM25	NH3
Miscellaneous Processes										
610	Residential Fuel Combustion	19.58	8.89	16.20	47.64	0.33	7.18	6.83	6.64	0.11
620	Farming Operations	13.22	1.10	0.00	0.00	0.00	1.44	0.69	0.14	6.16
630	Construction and Demolition	0.00	0.00	0.00	0.00	0.00	50.23	24.58	2.46	0.00
640	Paved Road Dust	0.00	0.00	0.00	0.00	0.00	132.29	60.48	9.08	0.00
645	Unpaved Road Dust	0.00	0.00	0.00	0.00	0.00	28.16	16.73	1.67	0.00
650	Fugitive Windblown Dust	0.00	0.00	0.00	0.00	0.00	2.96	1.52	0.21	0.00
660	Fires	0.34	0.29	0.08	3.02	0.00	0.45	0.44	0.41	0.00
670	Waste Burning and Disposal	0.24	0.21	0.09	2.85	0.03	0.33	0.32	0.28	0.03
690	Cooking	2.91	1.15	0.00	0.00	0.00	12.17	12.17	12.17	0.00
699	Other (Miscellaneous Processes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	27.73
	Total Miscellaneous Processes	**36.29**	**11.64**	**16.36**	**53.51**	**0.36**	**235.22**	**123.77**	**33.06**	**34.04**
On-Road Motor Vehicles										
710	Passenger Cars (P)	21.34	20.22	10.61	182.59	0.53	3.77	3.73	1.29	7.45
722	Light Duty Trucks 1 (T1)	3.96	3.69	2.43	29.74	0.05	0.33	0.32	0.12	0.61
723	Light Duty Trucks 2 (T2)	11.30	10.55	8.13	110.59	0.34	2.04	2.02	0.71	4.08
724	Medium Duty Vehicles (T3)	8.86	8.27	6.48	73.27	0.24	1.21	1.19	0.42	2.31
725	Light Heavy Duty Trucks 1 (T4)	1.02	0.95	2.82	7.44	0.03	0.53	0.53	0.21	0.56
726	Light Heavy Duty Trucks 2 (T5)	0.21	0.19	0.88	1.10	0.01	0.16	0.16	0.07	0.21
727	Medium Heavy Duty Trucks (T6)	0.65	0.50	6.90	5.74	0.09	0.49	0.49	0.18	1.57
728	Heavy Heavy Duty Trucks (T7)	1.94	0.72	16.14	14.83	0.19	1.80	1.80	0.69	3.35
750	Motorcycles (MCY)	7.02	6.63	0.83	21.27	0.00	0.03	0.03	0.01	0.01
775	Buses	2.73	0.20	1.47	29.28	0.01	0.16	0.16	0.06	0.80
780	Motor Homes (MH)	0.15	0.15	0.47	0.23	0.01	0.03	0.03	0.02	0.03
	Total On-Road Motor Vehicles	**59.20**	**52.07**	**57.17**	**476.07**	**1.49**	**10.55**	**10.48**	**3.78**	**20.98**
Other Mobile Sources										
810	Aircraft	3.85	3.69	22.56	37.01	1.83	0.80	0.78	0.69	0.00
820	Trains	0.84	0.71	17.23	4.29	0.03	0.38	0.38	0.35	0.01
833	Ocean Going Vessels	11.31	9.68	31.91	4.70	2.28	0.75	0.75	0.69	0.03
835	Commercial Harbor Crafts	0.38	0.32	5.75	1.20	0.00	0.24	0.24	0.23	0.00
840	Recreational Boats	11.28	10.52	2.70	52.35	0.00	0.66	0.60	0.45	0.01
850	Off-Road Recreational Vehicles	0.93	0.91	0.05	2.38	0.00	0.01	0.01	0.01	0.00
860	Off-Road Equipment	36.91	34.00	28.24	551.85	0.08	1.59	1.53	1.32	0.06
861	Off-Road Equipment (PERP)	0.57	0.48	3.64	5.20	0.02	0.10	0.10	0.09	0.01
870	Farm Equipment	0.19	0.17	0.38	3.14	0.00	0.03	0.03	0.03	0.00
890	Fuel Storage and Handling	4.09	4.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total Other Mobile Sources	**70.35**	**64.56**	**112.47**	**662.11**	**4.24**	**4.56**	**4.41**	**3.85**	**0.12**
Natural Sources										
910	Biogenic Sources	135.14	132.07	5.28	0.00	0.00	0.00	0.00	0.00	0.00
920	Geogenic Sources	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.73
930	Wildfires	58.09	47.98	6.55	245.39	2.12	26.10	25.08	21.25	2.45
	Total Natural Sources Category	**193.24**	**180.06**	**11.83**	**245.39**	**2.12**	**26.10**	**25.08**	**21.25**	**4.19**
Total Stationary and Area Sources		1138.84	234.10	49.65	134.60	8.95	263.21	142.97	46.48	57.81
Total On-Road Vehicles		59.20	52.07	57.17	476.07	1.49	10.55	10.48	3.78	20.98
Total Other Mobile		70.35	64.56	112.47	662.11	4.24	4.56	4.41	3.85	0.12
Total Anthropogenic		**1268.40**	**350.73**	**219.29**	**1272.78**	**14.68**	**278.32**	**157.85**	**54.11**	**78.91**
Total Natural Sources		193.24	180.06	11.83	245.39	2.12	26.10	25.08	21.25	4.19
Grand Total		**1461.63**	**530.78**	**231.12**	**1518.17**	**16.81**	**304.42**	**182.94**	**75.36**	**83.10**

Attachment A

2030 Annual Average Emissions by Source Category in South Coast Air Basin (Tons/Day)

MSC	DESC	TOG	VOC	NOX	CO	SOX	PM	PM10	PM25	NH3
Fuel Combustion										
10	Electric Utilities	2.19	0.25	2.49	3.59	0.21	0.43	0.43	0.43	0.53
20	Cogeneration	0.04	0.01	0.02	0.12	0.00	0.02	0.01	0.01	0.17
30	Oil and Gas Production (combustion)	1.49	0.17	0.93	0.77	0.01	0.11	0.11	0.11	0.25
40	Petroleum Refining (Combustion)	6.55	1.38	4.27	5.17	3.14	1.80	1.80	1.79	1.54
50	Manufacturing and Industrial	4.09	0.91	7.62	45.13	1.82	1.41	1.33	1.29	2.20
52	Food and Agricultural Processing	0.09	0.04	0.39	0.50	0.01	0.05	0.05	0.05	0.06
60	Service and Commercial	5.16	2.04	11.27	18.84	0.84	1.12	1.12	1.12	2.21
99	Other (Fuel Combustion)	0.76	0.62	2.40	1.19	0.02	0.46	0.43	0.40	0.28
	Total Fuel Combustion	**20.38**	**5.43**	**29.39**	**75.31**	**6.06**	**5.40**	**5.28**	**5.20**	**7.25**
Waste Disposal										
110	Sewage Treatment	0.41	0.29	0.00	0.01	0.00	0.02	0.00	0.00	0.22
120	Landfills	675.98	9.38	0.39	0.41	0.38	0.21	0.21	0.21	4.26
130	Incineration	0.21	0.04	1.18	0.27	0.08	0.12	0.06	0.05	0.24
140	Soil Remediation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
199	Other (Waste Disposal)	74.73	6.01	0.01	0.01	0.00	0.00	0.00	0.00	1.67
	Total Waste Disposal	**751.34**	**15.71**	**1.58**	**0.69**	**0.46**	**0.35**	**0.27**	**0.26**	**6.39**
Cleaning and Surface Coatings										
210	Laundering	3.68	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00
220	Degreasing	69.91	13.41	0.00	0.00	0.00	0.02	0.02	0.02	0.01
230	Coatings and Related Processes	20.01	19.57	0.00	0.00	0.00	1.66	1.60	1.54	0.10
240	Printing	0.78	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.04
250	Adhesives and Sealants	5.28	4.67	0.00	0.00	0.00	0.02	0.02	0.02	0.00
299	Other (Cleaning and Surface Coatings)	0.66	0.65	0.04	0.11	0.01	0.01	0.01	0.00	0.00
	Total Cleaning and Surface Coatings	**100.31**	**39.23**	**0.04**	**0.12**	**0.01**	**1.72**	**1.65**	**1.59**	**0.16**
Petroleum Production and Marketing										
310	Oil and Gas Production	8.37	3.83	0.01	0.03	0.10	0.04	0.03	0.02	0.00
320	Petroleum Refining	6.35	4.43	0.59	2.39	1.43	1.87	1.25	0.88	0.07
330	Petroleum Marketing	47.90	10.39	0.02	0.18	0.00	0.00	0.00	0.00	0.00
399	Other (Petroleum Production and Marketing)	0.04	0.04	0.01	0.01	0.00	0.00	0.00	0.00	0.00
	Total Petroleum Production and Marketing	**62.66**	**18.68**	**0.63**	**2.61**	**1.53**	**1.92**	**1.28**	**0.91**	**0.07**
Industrial Processes										
410	Chemical	4.46	4.34	0.07	0.12	0.09	0.48	0.42	0.40	0.01
420	Food and Agriculture	0.58	0.56	0.03	0.01	0.01	0.26	0.13	0.06	0.00
430	Mineral Processes	0.39	0.35	0.38	0.31	0.21	8.65	3.68	0.99	0.07
440	Metal Processes	0.12	0.11	0.29	0.31	0.24	0.44	0.35	0.26	0.00
450	Wood and Paper	0.25	0.25	0.00	0.00	0.00	7.69	5.38	3.23	0.01
460	Glass and Related Products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
470	Electronics	0.02	0.02	0.00	0.00	0.00	0.01	0.01	0.00	0.00
499	Other (Industrial Processes)	5.61	5.06	0.02	0.01	0.00	1.08	0.74	0.47	8.59
	Total Industrial Processes	**11.44**	**10.67**	**0.79**	**0.76**	**0.55**	**18.61**	**10.70**	**5.42**	**8.68**
Solvent Evaporation										
510	Consumer Products	153.55	121.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00
520	Architectural Coatings and Related Solvent	11.87	11.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00
530	Pesticides/Fertilizers	1.14	1.14	0.00	0.00	0.00	0.00	0.00	0.00	1.17
540	Asphalt Paving/Roofing	1.18	1.08	0.00	0.00	0.00	0.03	0.03	0.03	0.00
	Total Solvent Evaporation	**167.74**	**136.03**	**0.00**	**0.00**	**0.00**	**0.03**	**0.03**	**0.03**	**1.17**

Attachment A

(Continued)
2030 Annual Average Emissions by Source Category in South Coast Air Basin (Tons/Day)

MSC	DESC	TOG	VOC	NOX	CO	SOX	PM	PM10	PM25	NH3
Miscellaneous Processes										
610	Residential Fuel Combustion	19.51	8.86	15.17	47.37	0.32	7.13	6.78	6.59	0.11
620	Farming Operations	13.08	1.08	0.00	0.00	0.00	1.44	0.69	0.13	6.13
630	Construction and Demolition	0.00	0.00	0.00	0.00	0.00	50.91	24.91	2.49	0.00
640	Paved Road Dust	0.00	0.00	0.00	0.00	0.00	132.87	60.75	9.11	0.00
645	Unpaved Road Dust	0.00	0.00	0.00	0.00	0.00	28.16	16.73	1.67	0.00
650	Fugitive Windblown Dust	0.00	0.00	0.00	0.00	0.00	2.93	1.50	0.21	0.00
660	Fires	0.34	0.29	0.08	3.02	0.00	0.45	0.44	0.41	0.00
670	Waste Burning and Disposal	0.24	0.21	0.09	2.85	0.03	0.33	0.32	0.28	0.03
690	Cooking	2.94	1.16	0.00	0.00	0.00	12.30	12.30	12.30	0.00
699	Other (Miscellaneous Processes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28.03
	Total Miscellaneous Processes	**36.10**	**11.61**	**15.33**	**53.24**	**0.35**	**236.51**	**124.42**	**33.21**	**34.31**
On-Road Motor Vehicles										
710	Passenger Cars (P)	19.34	18.37	9.52	165.82	0.50	3.66	3.63	1.24	7.49
722	Light Duty Trucks 1 (T1)	3.36	3.14	1.93	24.71	0.05	0.31	0.31	0.11	0.60
723	Light Duty Trucks 2 (T2)	10.53	9.84	7.41	105.71	0.33	2.06	2.04	0.71	4.23
724	Medium Duty Vehicles (T3)	7.87	7.37	5.51	67.26	0.23	1.20	1.19	0.41	2.37
725	Light Heavy Duty Trucks 1 (T4)	0.83	0.77	2.24	6.50	0.03	0.51	0.51	0.19	0.54
726	Light Heavy Duty Trucks 2 (T5)	0.18	0.16	0.73	0.99	0.01	0.16	0.16	0.06	0.20
727	Medium Heavy Duty Trucks (T6)	0.58	0.44	5.73	5.08	0.09	0.49	0.48	0.18	1.55
728	Heavy Heavy Duty Trucks (T7)	1.87	0.73	14.47	14.69	0.19	1.86	1.86	0.71	3.41
750	Motorcycles (MCY)	7.00	6.61	0.82	20.87	0.00	0.03	0.03	0.01	0.01
775	Buses	2.64	0.20	1.18	26.68	0.01	0.15	0.15	0.05	0.71
780	Motor Homes (MH)	0.12	0.12	0.43	0.13	0.01	0.03	0.03	0.02	0.04
	Total On-Road Motor Vehicles	**54.33**	**47.76**	**49.98**	**438.45**	**1.44**	**10.46**	**10.40**	**3.70**	**21.15**
Other Mobile Sources										
810	Aircraft	3.98	3.82	24.48	38.16	1.95	0.82	0.79	0.71	0.00
820	Trains	0.86	0.72	17.66	4.45	0.03	0.38	0.38	0.35	0.01
833	Ocean Going Vessels	11.38	9.74	32.57	4.83	2.34	0.77	0.77	0.71	0.03
835	Commercial Harbor Crafts	0.37	0.31	5.70	1.18	0.00	0.24	0.24	0.23	0.00
840	Recreational Boats	10.48	9.77	2.66	52.96	0.00	0.62	0.56	0.42	0.01
850	Off-Road Recreational Vehicles	0.84	0.83	0.05	2.43	0.00	0.01	0.01	0.01	0.00
860	Off-Road Equipment	31.40	28.82	25.56	483.55	0.08	1.46	1.40	1.21	0.07
861	Off-Road Equipment (PERP)	0.58	0.49	3.55	5.41	0.02	0.09	0.09	0.08	0.01
870	Farm Equipment	0.16	0.15	0.34	2.73	0.00	0.03	0.03	0.02	0.00
890	Fuel Storage and Handling	3.96	3.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total Other Mobile Sources	**64.02**	**58.61**	**112.57**	**595.70**	**4.41**	**4.41**	**4.27**	**3.74**	**0.14**
Natural Sources										
910	Biogenic Sources	135.14	132.07	5.28	0.00	0.00	0.00	0.00	0.00	0.00
920	Geogenic Sources	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.73
930	Wildfires	58.09	47.98	6.55	245.39	2.12	26.10	25.08	21.25	2.45
	Total Natural Sources Category	**193.24**	**180.06**	**11.83**	**245.39**	**2.12**	**26.10**	**25.08**	**21.25**	**4.19**
Total Stationary and Area Sources		1149.96	237.37	47.76	132.74	8.96	264.54	143.63	46.61	58.02
Total On-Road Vehicles		54.33	47.76	49.98	438.45	1.44	10.46	10.40	3.70	21.15
Total Other Mobile		64.02	58.61	112.57	595.70	4.41	4.41	4.27	3.74	0.14
Total Anthropogenic		**1268.31**	**343.74**	**210.31**	**1166.89**	**14.81**	**279.41**	**158.30**	**54.05**	**79.31**
Total Natural Sources		193.24	180.06	11.83	245.39	2.12	26.10	25.08	21.25	4.19
Grand Total		**1461.54**	**523.80**	**222.14**	**1412.28**	**16.93**	**305.51**	**183.38**	**75.30**	**83.50**

Attachment A

2031 Annual Average Emissions by Source Category in South Coast Air Basin (Tons/Day)

MSC	DESC	TOG	VOC	NOX	CO	SOX	PM	PM10	PM25	NH3
Fuel Combustion										
10	Electric Utilities	2.19	0.25	2.48	3.58	0.21	0.43	0.43	0.43	0.53
20	Cogeneration	0.04	0.01	0.02	0.12	0.00	0.02	0.01	0.01	0.17
30	Oil and Gas Production (combustion)	1.52	0.17	0.95	0.78	0.01	0.11	0.11	0.11	0.25
40	Petroleum Refining (Combustion)	6.55	1.38	4.18	5.17	3.14	1.80	1.80	1.79	1.54
50	Manufacturing and Industrial	4.07	0.91	7.59	44.82	1.82	1.40	1.32	1.28	2.19
52	Food and Agricultural Processing	0.09	0.04	0.39	0.50	0.01	0.05	0.05	0.05	0.06
60	Service and Commercial	5.17	2.05	11.27	18.71	0.84	1.12	1.12	1.11	2.18
99	Other (Fuel Combustion)	0.76	0.62	2.40	1.19	0.02	0.46	0.43	0.40	0.28
	Total Fuel Combustion	**20.39**	**5.44**	**29.27**	**74.88**	**6.06**	**5.39**	**5.27**	**5.19**	**7.21**
Waste Disposal										
110	Sewage Treatment	0.41	0.30	0.00	0.01	0.00	0.02	0.00	0.00	0.22
120	Landfills	679.57	9.42	0.39	0.41	0.38	0.21	0.21	0.21	4.29
130	Incineration	0.21	0.04	1.19	0.27	0.08	0.12	0.06	0.05	0.24
140	Soil Remediation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
199	Other (Waste Disposal)	74.86	6.02	0.01	0.01	0.00	0.00	0.00	0.00	1.68
	Total Waste Disposal	**755.05**	**15.78**	**1.58**	**0.69**	**0.46**	**0.36**	**0.27**	**0.26**	**6.42**
Cleaning and Surface Coatings										
210	Laundering	3.70	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00
220	Degreasing	69.79	13.39	0.00	0.00	0.00	0.02	0.02	0.02	0.01
230	Coatings and Related Processes	20.07	19.63	0.00	0.00	0.00	1.67	1.60	1.54	0.10
240	Printing	0.78	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.04
250	Adhesives and Sealants	5.28	4.66	0.00	0.00	0.00	0.02	0.02	0.02	0.00
299	Other (Cleaning and Surface Coatings)	0.65	0.65	0.04	0.11	0.01	0.01	0.01	0.00	0.00
	Total Cleaning and Surface Coatings	**100.28**	**39.27**	**0.04**	**0.12**	**0.01**	**1.72**	**1.65**	**1.59**	**0.16**
Petroleum Production and Marketing										
310	Oil and Gas Production	8.55	3.91	0.01	0.03	0.10	0.04	0.03	0.02	0.00
320	Petroleum Refining	6.35	4.43	0.58	2.39	1.43	1.87	1.25	0.88	0.07
330	Petroleum Marketing	47.59	10.30	0.02	0.18	0.00	0.00	0.00	0.00	0.00
399	Other (Petroleum Production and Marketing)	0.04	0.04	0.01	0.01	0.00	0.00	0.00	0.00	0.00
	Total Petroleum Production and Marketing	**62.54**	**18.68**	**0.62**	**2.61**	**1.53**	**1.92**	**1.28**	**0.91**	**0.07**
Industrial Processes										
410	Chemical	4.45	4.33	0.07	0.12	0.09	0.48	0.42	0.40	0.01
420	Food and Agriculture	0.59	0.57	0.03	0.01	0.01	0.26	0.13	0.06	0.00
430	Mineral Processes	0.39	0.35	0.38	0.31	0.21	8.65	3.68	0.99	0.07
440	Metal Processes	0.12	0.11	0.29	0.31	0.24	0.44	0.35	0.27	0.00
450	Wood and Paper	0.25	0.25	0.00	0.00	0.00	7.71	5.40	3.24	0.01
460	Glass and Related Products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
470	Electronics	0.02	0.02	0.00	0.00	0.00	0.01	0.01	0.00	0.00
499	Other (Industrial Processes)	5.63	5.07	0.02	0.01	0.00	1.09	0.74	0.48	8.59
	Total Industrial Processes	**11.45**	**10.68**	**0.79**	**0.76**	**0.55**	**18.64**	**10.72**	**5.43**	**8.68**
Solvent Evaporation										
510	Consumer Products	155.69	123.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00
520	Architectural Coatings and Related Solvent	11.96	11.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00
530	Pesticides/Fertilizers	1.14	1.14	0.00	0.00	0.00	0.00	0.00	0.00	1.16
540	Asphalt Paving/Roofing	1.19	1.09	0.00	0.00	0.00	0.03	0.03	0.03	0.00
	Total Solvent Evaporation	**169.98**	**137.90**	**0.00**	**0.00**	**0.00**	**0.03**	**0.03**	**0.03**	**1.16**

Attachment A

(Continued)

2031 Annual Average Emissions by Source Category in South Coast Air Basin (Tons/Day)

MSC	DESC	TOG	VOC	NOX	CO	SOX	PM	PM10	PM25	NH3
Miscellaneous Processes										
610	Residential Fuel Combustion	19.51	8.86	14.85	47.36	0.32	7.12	6.77	6.59	0.11
620	Farming Operations	13.02	1.08	0.00	0.00	0.00	1.43	0.69	0.13	6.12
630	Construction and Demolition	0.00	0.00	0.00	0.00	0.00	51.26	25.08	2.51	0.00
640	Paved Road Dust	0.00	0.00	0.00	0.00	0.00	132.82	60.72	9.11	0.00
645	Unpaved Road Dust	0.00	0.00	0.00	0.00	0.00	28.16	16.73	1.67	0.00
650	Fugitive Windblown Dust	0.00	0.00	0.00	0.00	0.00	2.91	1.49	0.21	0.00
660	Fires	0.34	0.29	0.08	3.02	0.00	0.45	0.44	0.41	0.00
670	Waste Burning and Disposal	0.24	0.21	0.09	2.85	0.03	0.33	0.32	0.28	0.03
690	Cooking	2.95	1.17	0.00	0.00	0.00	12.37	12.37	12.37	0.00
699	Other (Miscellaneous Processes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28.18
	Total Miscellaneous Processes	**36.06**	**11.61**	**15.01**	**53.23**	**0.35**	**236.85**	**124.62**	**33.28**	**34.44**
On-Road Motor Vehicles										
710	Passenger Cars (P)	18.58	17.68	9.14	159.87	0.49	3.63	3.61	1.22	7.54
722	Light Duty Trucks 1 (T1)	3.09	2.90	1.70	22.59	0.05	0.31	0.30	0.11	0.60
723	Light Duty Trucks 2 (T2)	10.32	9.67	7.16	104.31	0.33	2.08	2.06	0.71	4.31
724	Medium Duty Vehicles (T3)	7.56	7.09	5.18	65.49	0.23	1.21	1.20	0.41	2.41
725	Light Heavy Duty Trucks 1 (T4)	0.77	0.71	2.02	6.10	0.03	0.50	0.50	0.19	0.53
726	Light Heavy Duty Trucks 2 (T5)	0.17	0.15	0.67	0.95	0.01	0.16	0.16	0.06	0.20
727	Medium Heavy Duty Trucks (T6)	0.55	0.41	5.22	4.79	0.08	0.48	0.48	0.18	1.52
728	Heavy Heavy Duty Trucks (T7)	1.82	0.73	13.81	14.51	0.19	1.89	1.89	0.72	3.43
750	Motorcycles (MCY)	7.02	6.63	0.81	20.82	0.00	0.03	0.03	0.01	0.01
775	Buses	2.41	0.19	1.00	22.73	0.01	0.15	0.15	0.05	0.60
780	Motor Homes (MH)	0.11	0.11	0.42	0.12	0.01	0.03	0.03	0.02	0.04
	Total On-Road Motor Vehicles	**52.41**	**46.26**	**47.13**	**422.27**	**1.42**	**10.46**	**10.40**	**3.68**	**21.19**
Other Mobile Sources										
810	Aircraft	4.05	3.89	25.44	38.73	2.01	0.83	0.80	0.72	0.00
820	Trains	0.85	0.72	17.78	4.54	0.03	0.38	0.38	0.35	0.01
833	Ocean Going Vessels	11.41	9.76	32.84	4.90	2.37	0.78	0.78	0.72	0.03
835	Commercial Harbor Crafts	0.37	0.31	5.67	1.17	0.00	0.24	0.24	0.23	0.00
840	Recreational Boats	10.10	9.42	2.65	53.28	0.00	0.60	0.54	0.41	0.01
850	Off-Road Recreational Vehicles	0.81	0.79	0.05	2.46	0.00	0.01	0.01	0.01	0.00
860	Off-Road Equipment	29.29	26.85	24.46	451.80	0.08	1.41	1.36	1.17	0.07
861	Off-Road Equipment (PERP)	0.59	0.49	3.51	5.52	0.02	0.09	0.09	0.08	0.02
870	Farm Equipment	0.15	0.14	0.32	2.54	0.00	0.03	0.03	0.02	0.00
890	Fuel Storage and Handling	3.91	3.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total Other Mobile Sources	**61.53**	**56.28**	**112.73**	**564.93**	**4.50**	**4.35**	**4.21**	**3.69**	**0.13**
Natural Sources										
910	Biogenic Sources	135.14	132.07	5.28	0.00	0.00	0.00	0.00	0.00	0.00
920	Geogenic Sources	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.73
930	Wildfires	58.09	47.98	6.55	245.39	2.12	26.10	25.08	21.25	2.45
	Total Natural Sources Category	**193.24**	**180.06**	**11.83**	**245.39**	**2.12**	**26.10**	**25.08**	**21.25**	**4.19**
Total Stationary and Area Sources		1155.74	239.36	47.31	132.29	8.97	264.90	143.84	46.69	58.15
Total On-Road Vehicles		52.41	46.26	47.13	422.27	1.42	10.46	10.40	3.68	21.19
Total Other Mobile		61.53	56.28	112.73	564.93	4.50	4.35	4.21	3.69	0.13
Total Anthropogenic		**1269.68**	**341.90**	**207.17**	**1119.49**	**14.89**	**279.71**	**158.46**	**54.06**	**79.48**
Total Natural Sources		193.24	180.06	11.83	245.39	2.12	26.10	25.08	21.25	4.19
Grand Total		**1462.92**	**521.96**	**219.01**	**1364.88**	**17.01**	**305.82**	**183.54**	**75.31**	**83.66**

Attachment B:

Annual Average

On-Road Mobile Source Emissions in South Coast Air Basin

Attachment B

Table B-1

2018 Annual Average On-Road Mobile Source Emissions (tons per day) in the South Coast Air Basin

		Light and Medium		Light Heavy		Medium Heavy		Heavy Heavy		Other Buses		Urban Buses		School Buses		Motor Homes		All Vehicles		
		Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Grand Total
	Vehicles	9,713,377	38,622	134,357	75,709	28,310	119,072	5,701	74,910	6,807	3,634	5,855	106	5,180	3,943	38,401	10,996	9,937,988	326,992	10,264,981
	VMT	360,796,926	1,432,071	4,858,047	2,866,683	1,412,856	4,802,967	414,379	9,134,357	294,022	237,321	655,319	11,408	173,752	81,563	335,222	107,773	368,940,523	18,674,143	387,614,668
Reactive Organic Gas Emissions																				
	Run Exhaust	14.33	0.06	0.27	0.46	0.22	1.00	0.05	1.50	0.03	0.12	0.22	0.00	0.07	0.02	0.06	0.01	15.25	3.17	18.41
	Idle Exhaust	0.00	0.00	0.07	0.01	0.03	0.08	0.00	0.41	0.01	0.01	0.00	0.00	0.03	0.00	0.00	0.00	0.14	0.51	0.66
	Start Exhaust	27.92	0.00	0.46	0.00	0.23	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.01	0.00	0.00	0.00	28.65	0.00	28.65
	Total Exhaust	42.25	0.06	0.80	0.47	0.47	1.08	0.06	1.92	0.07	0.13	0.23	0.00	0.11	0.02	0.06	0.01	44.04	3.68	47.72
	Diurnal	20.25	0.00	0.46	0.00	0.11	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.24	0.00	21.08	0.00	21.08
	Hot Soak	7.56	0.00	0.14	0.00	0.03	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.08	0.00	7.81	0.00	7.81
	Running	15.92	0.00	0.64	0.00	0.21	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00	16.81	0.00	16.81
	Total	85.98	0.06	2.04	0.47	0.82	1.08	0.06	1.92	0.11	0.13	0.23	0.00	0.13	0.02	0.37	0.01	89.74	3.68	93.42
Carbon Monoxide Emissions																				
	Run Exhaust	609.60	0.55	8.23	1.46	5.97	3.35	5.81	5.69	0.81	0.38	17.76	0.02	2.55	0.04	1.91	0.04	652.63	11.53	664.17
	Idle Exhaust	0.00	0.00	0.56	0.07	0.45	1.04	0.41	4.40	0.04	0.07	0.00	0.00	0.29	0.01	0.00	0.00	1.76	5.60	7.36
	Start Exhaust	240.80	0.00	6.72	0.00	3.97	0.00	0.01	0.00	0.60	0.00	0.03	0.00	0.13	0.00	0.02	0.00	252.28	0.00	252.28
	Total Exhaust	850.40	0.55	15.51	1.54	10.39	4.39	6.23	10.10	1.45	0.45	17.79	0.02	2.98	0.05	1.92	0.04	906.68	17.13	923.81
Oxides of Nitrogen Emissions																				
	Run Exhaust	54.52	0.36	1.53	8.08	1.35	23.22	0.86	53.06	0.22	1.75	1.95	0.23	0.19	0.94	0.25	0.53	60.88	88.16	149.04
	Idle Exhaust	0.00	0.00	0.01	0.20	0.01	3.80	0.07	5.85	0.00	0.13	0.00	0.00	0.02	0.15	0.00	0.00	0.11	10.14	10.25
	Start Exhaust	21.75	0.00	1.59	0.00	0.29	1.18	0.00	1.82	0.06	0.04	0.00	0.00	0.01	0.01	0.00	0.00	23.70	3.04	26.75
	Total Exhaust	76.27	0.36	3.13	8.28	1.64	28.21	0.94	60.73	0.28	1.92	1.95	0.23	0.22	1.10	0.26	0.53	84.69	101.34	186.03
PM2.5 Emissions																				
	Run Exhaust	0.68	0.03	0.01	0.11	0.00	0.68	0.00	0.92	0.00	0.06	0.00	0.00	0.00	0.01	0.00	0.02	0.69	1.83	2.52
	Idle Exhaust	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.04
	Start Exhaust	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.12
	Total Exhaust	0.80	0.03	0.01	0.11	0.00	0.70	0.00	0.94	0.00	0.06	0.00	0.00	0.00	0.01	0.00	0.02	0.82	1.87	2.69
	Tire Wear	0.79	0.00	0.01	0.01	0.00	0.02	0.00	0.09	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.82	0.12	0.94
	Brake Wear	1.24	0.00	0.15	0.09	0.02	0.08	0.02	0.31	0.00	0.01	0.03	0.00	0.00	0.00	0.01	0.00	1.48	0.49	1.97
	Total	2.84	0.04	0.17	0.21	0.03	0.79	0.03	1.33	0.01	0.07	0.03	0.00	0.00	0.01	0.01	0.02	3.12	2.48	5.60
NH3 Emissions																				
	Total Exhaust	12.21	0.00	0.25	0.39	0.12	0.67	0.37	1.57	0.04	0.03	0.61	0.00	0.08	0.01	0.02	0.01	13.68	2.68	16.36
Fuel Consumption (1000 gallons) and SO2																				
	Fuel	15267.93	50.03	417.18	155.24	284.08	550.14	77.55	1590.94	59.14	34.36	195.08	2.32	28.69	11.33	69.13	10.66	16398.80	2405.03	18803.83
	SOx	1.43	0.01	0.04	0.02	0.03	0.06	0.00	0.17	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	1.51	0.25	1.77

Attachment B

Table B-2

2023 Annual Average On-Road Mobile Source Emissions (tons per day) in the South Coast Air Basin

		Light and Medium		Light Heavy		Medium Heavy		Heavy Heavy		Other Buses		Urban Buses		School Buses		Motor Homes		All Vehicles		
		Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Grand Total
	Vehicles	9,187,356	38,078	101,979	70,591	29,655	128,764	8,906	82,918	5,924	2,949	5,910	15	5,688	3,377	30,469	11,533	9,375,887	338,225	9,714,245
	VMT	364,057,423	1,429,040	3,923,726	2,936,059	1,574,008	5,520,250	582,895	10,611,348	248,836	233,227	693,093	1,749	193,919	69,272	287,688	114,142	371,561,586	20,915,087	392,482,215
Reactive Organic Gas Emissions																				
	Run Exhaust	7.78	0.04	0.13	0.32	0.10	0.12	0.03	0.16	0.01	0.02	0.03	0.00	0.02	0.01	0.02	0.01	8.11	0.68	8.79
	Idle Exhaust	0.00	0.00	0.05	0.01	0.03	0.03	0.00	0.48	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.12	0.53	0.65
	Start Exhaust	17.97	0.00	0.29	0.00	0.15	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.44	0.00	18.44
	Total Exhaust	25.75	0.04	0.47	0.32	0.28	0.16	0.04	0.64	0.04	0.02	0.03	0.00	0.05	0.01	0.02	0.01	26.68	1.20	27.88
	Diurnal	17.07	0.00	0.35	0.00	0.09	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.16	0.00	17.69	0.00	17.69
	Hot Soak	6.12	0.00	0.09	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	6.27	0.00	6.27
	Running	13.25	0.00	0.47	0.00	0.16	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.90	0.00	13.90
	Total	62.18	0.04	1.38	0.32	0.55	0.16	0.04	0.64	0.08	0.02	0.03	0.00	0.06	0.01	0.22	0.01	64.54	1.20	65.75
Carbon Monoxide Emissions																				
	Run Exhaust	402.77	0.48	4.79	0.90	2.66	0.50	5.79	0.93	0.46	0.06	25.80	0.00	1.51	0.03	0.58	0.04	444.35	2.92	447.27
	Idle Exhaust	0.00	0.00	0.44	0.07	0.50	1.06	0.63	6.98	0.04	0.06	0.00	0.00	0.32	0.01	0.00	0.00	1.92	8.18	10.10
	Start Exhaust	161.13	0.00	5.21	0.00	3.28	0.00	0.01	0.00	0.46	0.00	0.03	0.00	0.11	0.00	0.01	0.00	170.24	0.00	170.24
	Total Exhaust	563.90	0.48	10.44	0.97	6.44	1.56	6.42	7.91	0.96	0.11	25.83	0.00	1.94	0.04	0.59	0.04	616.52	11.10	627.62
Oxides of Nitrogen Emissions																				
	Run Exhaust	29.37	0.23	0.81	4.50	0.73	5.91	0.66	20.62	0.12	0.45	0.43	0.00	0.14	0.68	0.13	0.47	32.40	32.86	65.26
	Idle Exhaust	0.00	0.00	0.00	0.15	0.01	1.77	0.09	5.61	0.00	0.05	0.00	0.00	0.02	0.12	0.00	0.00	0.13	7.69	7.82
	Start Exhaust	14.25	0.00	1.11	0.00	0.26	2.72	0.00	3.63	0.05	0.06	0.00	0.00	0.01	0.01	0.00	0.00	15.69	6.43	22.12
	Total Exhaust	43.63	0.23	1.92	4.65	1.00	10.40	0.75	29.86	0.17	0.56	0.44	0.00	0.17	0.81	0.13	0.47	48.22	46.99	95.20
PM2.5 Emissions																				
	Run Exhaust	0.56	0.02	0.00	0.07	0.00	0.07	0.00	0.27	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.57	0.46	1.03
	Idle Exhaust	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
	Start Exhaust	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.10
	Total Exhaust	0.66	0.02	0.01	0.07	0.00	0.07	0.00	0.28	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.67	0.47	1.14
	Tire Wear	0.80	0.00	0.01	0.01	0.01	0.02	0.01	0.10	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.83	0.14	0.97
	Brake Wear	1.24	0.01	0.13	0.09	0.03	0.09	0.03	0.32	0.00	0.01	0.03	0.00	0.00	0.00	0.00	0.00	1.47	0.51	1.99
	Total	2.71	0.03	0.14	0.17	0.03	0.18	0.04	0.70	0.01	0.02	0.04	0.00	0.00	0.01	0.01	0.01	2.97	1.12	4.09
NH3 Emissions																				
	Total Exhaust	13.53	0.00	0.20	0.54	0.17	1.29	0.50	2.53	0.04	0.05	0.64	0.00	0.09	0.01	0.01	0.02	15.19	4.44	19.63
Fuel Consumption (1000 gallons) and SO2																				
	Fuel	13913.63	50.17	303.41	155.17	301.49	620.26	99.24	1778.61	48.08	32.86	204.45	0.26	31.76	9.53	59.25	11.34	14961.31	2658.22	17619.53
	SOx	1.31	0.01	0.03	0.02	0.03	0.07	0.00	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	1.38	0.28	1.66

Attachment B

Table B-3

2025 Annual Average On-Road Mobile Source Emissions (tons per day) in the South Coast Air Basin

	Light and Medium		Light Heavy		Medium Heavy		Heavy Heavy		Other Buses		Urban Buses		School Buses		Motor Homes		All Vehicles		
	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Grand Total
Vehicles	9,173,598	36,641	94,465	71,733	29,381	137,312	9,890	90,110	5,636	3,079	5,937	11	6,023	3,182	28,223	11,854	9,353,153	353,921	9,710,077
VMT	364,335,570	1,363,418	3,676,629	2,981,538	1,542,077	5,772,183	633,665	11,137,852	229,573	233,905	696,210	1,417	202,584	64,277	271,714	116,909	371,588,023	21,671,498	393,469,640
Reactive Organic Gas Emissions																			
Run Exhaust	6.33	0.03	0.09	0.27	0.07	0.10	0.03	0.16	0.01	0.01	0.03	0.00	0.01	0.01	0.01	0.01	6.58	0.60	7.18
Idle Exhaust	0.00	0.00	0.04	0.01	0.03	0.03	0.00	0.52	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.12	0.56	0.68
Start Exhaust	15.33	0.00	0.24	0.00	0.14	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00	15.74	0.00	15.74
Total Exhaust	21.66	0.03	0.38	0.28	0.24	0.13	0.03	0.68	0.04	0.02	0.03	0.00	0.05	0.01	0.01	0.01	22.44	1.16	23.60
Diurnal	15.90	0.00	0.30	0.00	0.08	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.13	0.00	16.43	0.00	16.43
Hot Soak	5.74	0.00	0.07	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	5.87	0.00	5.87
Running	12.41	0.00	0.40	0.00	0.14	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.97	0.00	12.97
Total	55.70	0.03	1.15	0.28	0.47	0.13	0.03	0.68	0.08	0.02	0.03	0.00	0.07	0.01	0.18	0.01	57.71	1.16	58.87
Carbon Monoxide Emissions																			
Run Exhaust	346.29	0.42	3.89	0.73	1.90	0.44	5.64	0.86	0.37	0.06	26.45	0.00	1.51	0.03	0.38	0.03	386.42	2.56	388.98
Idle Exhaust	0.00	0.00	0.41	0.07	0.51	1.12	0.69	7.54	0.04	0.06	0.00	0.00	0.34	0.01	0.00	0.00	1.98	8.80	10.78
Start Exhaust	140.66	0.00	4.94	0.00	2.96	0.00	0.01	0.00	0.43	0.00	0.03	0.00	0.11	0.00	0.01	0.00	149.15	0.00	149.15
Total Exhaust	486.95	0.42	9.24	0.80	5.36	1.56	6.34	8.40	0.83	0.12	26.48	0.00	1.97	0.04	0.39	0.03	537.55	11.36	548.91
Oxides of Nitrogen Emissions																			
Run Exhaust	23.26	0.17	0.59	3.51	0.53	4.40	0.58	13.26	0.10	0.35	0.38	0.00	0.14	0.57	0.10	0.44	25.68	22.71	48.39
Idle Exhaust	0.00	0.00	0.00	0.13	0.02	1.45	0.09	3.50	0.00	0.03	0.00	0.00	0.02	0.11	0.00	0.00	0.14	5.24	5.37
Start Exhaust	12.39	0.00	0.97	0.00	0.24	2.36	0.00	2.53	0.04	0.05	0.00	0.00	0.01	0.01	0.00	0.00	13.65	4.96	18.62
Total Exhaust	35.65	0.17	1.56	3.65	0.79	8.21	0.67	19.30	0.14	0.44	0.38	0.00	0.17	0.70	0.10	0.44	39.47	32.91	72.38
PM2.5 Emissions																			
Run Exhaust	0.51	0.02	0.00	0.06	0.00	0.04	0.00	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.52	0.32	0.84
Idle Exhaust	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
Start Exhaust	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.09
Total Exhaust	0.60	0.02	0.00	0.06	0.00	0.05	0.00	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.61	0.33	0.93
Tire Wear	0.80	0.00	0.01	0.01	0.01	0.02	0.01	0.11	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.83	0.14	0.97
Brake Wear	1.23	0.00	0.12	0.09	0.03	0.10	0.04	0.33	0.00	0.01	0.03	0.00	0.00	0.00	0.00	0.00	1.45	0.53	1.98
Total	2.63	0.02	0.13	0.16	0.03	0.16	0.05	0.62	0.00	0.01	0.03	0.00	0.00	0.00	0.01	0.01	2.89	1.00	3.88
NH3 Emissions																			
Total Exhaust	13.88	0.00	0.19	0.57	0.17	1.36	0.54	2.65	0.04	0.05	0.63	0.00	0.10	0.01	0.01	0.02	15.57	4.67	20.24
Fuel Consumption (1000 gallons) and SO2																			
Fuel	13161.45	46.83	270.70	155.48	288.74	643.36	104.27	1819.73	43.32	33.40	198.79	0.21	32.95	8.81	55.99	11.63	14156.21	2719.44	16875.65
SOx	1.23	0.00	0.03	0.02	0.03	0.07	0.00	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	1.30	0.29	1.58

Attachment B

Table B-4

2028 Annual Average On-Road Mobile Source Emissions (tons per day) in the South Coast Air Basin

	Light and Medium		Light Heavy		Medium Heavy		Heavy Heavy		Other Buses		Urban Buses		School Buses		Motor Homes		All Vehicles		
	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Grand Total
Vehicles	9,325,858	27,576	41,188	41,652	7,856	76,164	5,394	72,076	2,333	3,350	12,251	0	3,189	916	21,515	12,141	9,419,585	233,874	9,810,464
VMT	367,575,705	1,066,953	1,595,334	1,697,756	396,269	3,193,573	578,197	10,043,085	98,759	247,726	1,168,543	0	99,471	18,300	215,851	121,052	371,728,129	16,388,445	397,599,316
Reactive Organic Gas Emissions																			
Run Exhaust	5.02	0.02	0.05	0.22	0.04	0.07	0.02	0.15	0.01	0.01	0.03	0.00	0.01	0.01	0.01	0.01	5.19	0.50	5.69
Idle Exhaust	0.00	0.00	0.04	0.01	0.03	0.03	0.00	0.54	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.11	0.59	0.70
Start Exhaust	12.64	0.00	0.19	0.00	0.12	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00	12.98	0.00	12.98
Total Exhaust	17.66	0.02	0.28	0.23	0.19	0.10	0.02	0.70	0.03	0.02	0.03	0.00	0.05	0.01	0.01	0.01	18.28	1.09	19.36
Diurnal	14.70	0.00	0.24	0.00	0.07	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.11	0.00	15.14	0.00	15.14
Hot Soak	5.31	0.00	0.06	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	5.41	0.00	5.41
Running	11.67	0.00	0.33	0.00	0.12	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00	12.15	0.00	12.15
Total	49.33	0.02	0.91	0.23	0.40	0.10	0.03	0.70	0.07	0.02	0.03	0.00	0.07	0.01	0.14	0.01	50.98	1.09	52.07
Carbon Monoxide Emissions																			
Run Exhaust	296.14	0.34	2.96	0.55	1.19	0.35	5.30	0.78	0.28	0.05	26.44	0.00	1.50	0.02	0.19	0.03	334.00	2.13	336.12
Idle Exhaust	0.00	0.00	0.37	0.07	0.50	1.17	0.75	7.99	0.03	0.07	0.00	0.00	0.36	0.01	0.00	0.00	2.02	9.31	11.33
Start Exhaust	120.98	0.00	4.59	0.00	2.51	0.00	0.00	0.00	0.37	0.00	0.03	0.00	0.11	0.00	0.01	0.00	128.62	0.00	128.62
Total Exhaust	417.12	0.34	7.92	0.62	4.21	1.53	6.06	8.77	0.68	0.12	26.47	0.00	1.98	0.03	0.20	0.03	464.63	11.43	476.07
Oxides of Nitrogen Emissions																			
Run Exhaust	17.71	0.10	0.37	2.42	0.34	3.04	0.46	10.49	0.07	0.30	0.29	0.00	0.13	0.42	0.06	0.41	19.43	17.17	36.60
Idle Exhaust	0.00	0.00	0.00	0.12	0.02	1.17	0.10	2.87	0.00	0.03	0.00	0.00	0.02	0.09	0.00	0.00	0.14	4.28	4.42
Start Exhaust	10.68	0.00	0.79	0.00	0.21	2.12	0.00	2.24	0.04	0.05	0.00	0.00	0.01	0.01	0.00	0.00	11.73	4.42	16.15
Total Exhaust	28.38	0.10	1.17	2.53	0.56	6.34	0.56	15.59	0.11	0.38	0.29	0.00	0.16	0.53	0.07	0.41	31.30	25.87	57.17
PM2.5 Emissions																			
Run Exhaust	0.43	0.01	0.00	0.05	0.00	0.03	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.44	0.28	0.72
Idle Exhaust	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Start Exhaust	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.08
Total Exhaust	0.51	0.01	0.00	0.05	0.00	0.03	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.52	0.28	0.80
Tire Wear	0.80	0.00	0.01	0.01	0.01	0.02	0.01	0.11	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.84	0.14	0.98
Brake Wear	1.22	0.00	0.11	0.09	0.03	0.10	0.04	0.35	0.00	0.01	0.03	0.00	0.00	0.00	0.00	0.00	1.45	0.55	1.99
Total	2.54	0.02	0.12	0.15	0.03	0.15	0.06	0.64	0.00	0.01	0.03	0.00	0.01	0.00	0.01	0.01	2.80	0.97	3.77
NH3 Emissions																			
Total Exhaust	14.46	0.00	0.17	0.59	0.18	1.39	0.58	2.77	0.05	0.05	0.59	0.00	0.10	0.01	0.01	0.02	16.14	4.84	20.98
Fuel Consumption (1000 gallons) and SO2																			
Fuel	12052.96	36.49	110.95	87.55	69.85	348.97	57.26	1535.60	15.80	34.21	14.07	0.00	16.96	2.47	44.37	12.09	12382.22	2057.37	14439.59
SOx	1.15	0.00	0.02	0.01	0.02	0.07	0.00	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.21	0.28	1.49

Table B-5

2030 Annual Average On-Road Mobile Source Emissions (tons per day) in the South Coast Air Basin

	Light and Medium		Light Heavy		Medium Heavy		Heavy Heavy		Other Buses		Urban Buses		School Buses		Motor Homes		All Vehicles		
	Non-Disel	**Diesel**	**Non-Disel**	**Diesel**	**Non-Disel**	**Diesel**	**Non-Disel**	**Diesel**	**Non-Disel**	**Diesel**	**Non-Disel**	**Diesel**	**Non-Disel**	**Diesel**	**Non-Disel**	**Diesel**	**Non-Disel**	**Diesel**	**Grand Total**
Vehicles	9,336,249	32,083	79,033	70,640	26,667	144,514	11,084	96,360	4,956	3,347	6,005	4	6,659	2,508	24,254	12,405	9,494,908	361,862	9,885,730
VMT	364,906,675	1,207,516	3,026,814	2,793,391	1,322,422	5,731,859	709,120	11,749,647	186,359	236,851	704,281	368	214,539	50,230	244,095	120,500	371,314,304	21,890,360	395,049,835
Reactive Organic Gas Emissions																			
Run Exhaust	4.42	0.02	0.03	0.19	0.03	0.06	0.02	0.15	0.01	0.01	0.03	0.00	0.01	0.01	0.00	0.01	4.55	0.44	4.99
Idle Exhaust	0.00	0.00	0.03	0.01	0.03	0.03	0.00	0.56	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.10	0.60	0.70
Start Exhaust	11.27	0.00	0.16	0.00	0.11	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00	11.56	0.00	11.56
Total Exhaust	15.68	0.02	0.23	0.20	0.17	0.09	0.02	0.71	0.03	0.02	0.03	0.00	0.05	0.01	0.00	0.01	16.22	1.04	17.26
Diurnal	13.68	0.00	0.20	0.00	0.06	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.09	0.00	14.05	0.00	14.05
Hot Soak	5.00	0.00	0.05	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	5.08	0.00	5.08
Running	10.96	0.00	0.27	0.00	0.11	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00	11.36	0.00	11.36
Total	45.32	0.02	0.74	0.20	0.35	0.09	0.02	0.71	0.07	0.02	0.03	0.00	0.07	0.01	0.11	0.01	46.72	1.04	47.76
Carbon Monoxide Emissions																			
Run Exhaust	272.92	0.29	2.34	0.46	0.88	0.31	5.02	0.73	0.23	0.05	23.96	0.00	1.47	0.02	0.09	0.03	306.91	1.89	308.80
Idle Exhaust	0.00	0.00	0.34	0.07	0.49	1.18	0.78	8.16	0.03	0.07	0.00	0.00	0.37	0.01	0.00	0.00	2.01	9.48	11.49
Start Exhaust	111.16	0.00	4.28	0.00	2.23	0.00	0.00	0.00	0.34	0.00	0.03	0.00	0.11	0.00	0.01	0.00	118.16	0.00	118.16
Total Exhaust	384.08	0.29	6.97	0.53	3.60	1.49	5.80	8.89	0.60	0.12	23.98	0.00	1.95	0.03	0.10	0.03	427.08	11.37	438.45
Oxides of Nitrogen Emissions																			
Run Exhaust	15.22	0.07	0.26	1.91	0.24	2.38	0.39	9.29	0.05	0.28	0.17	0.00	0.12	0.32	0.05	0.38	16.52	14.62	31.14
Idle Exhaust	0.00	0.00	0.00	0.10	0.02	1.01	0.10	2.63	0.00	0.03	0.00	0.00	0.02	0.08	0.00	0.00	0.14	3.85	3.99
Start Exhaust	9.90	0.00	0.69	0.00	0.18	1.90	0.00	2.07	0.04	0.05	0.00	0.00	0.01	0.01	0.00	0.00	10.83	4.02	14.85
Total Exhaust	25.12	0.07	0.96	2.01	0.45	5.28	0.49	13.98	0.09	0.35	0.17	0.00	0.16	0.41	0.05	0.38	27.49	22.49	49.98
PM2.5 Emissions																			
Run Exhaust	0.38	0.01	0.00	0.04	0.00	0.03	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.39	0.26	0.65
Idle Exhaust	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Start Exhaust	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.07
Total Exhaust	0.45	0.01	0.00	0.05	0.00	0.03	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.46	0.27	0.73
Tire Wear	0.80	0.00	0.01	0.01	0.01	0.02	0.01	0.11	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.84	0.15	0.98
Brake Wear	1.22	0.00	0.11	0.08	0.03	0.09	0.05	0.36	0.00	0.01	0.03	0.00	0.00	0.00	0.00	0.00	1.44	0.55	1.99
Total	2.47	0.01	0.12	0.14	0.04	0.14	0.06	0.65	0.00	0.01	0.03	0.00	0.01	0.00	0.01	0.01	2.73	0.96	3.70
NH3 Emissions																			
Total Exhaust	14.70	0.00	0.16	0.58	0.18	1.37	0.59	2.82	0.05	0.06	0.49	0.00	0.11	0.01	0.01	0.02	16.29	4.87	21.15
Fuel Consumption (1000 gallons) and SO2																			
Fuel	11800.04	39.12	205.03	143.07	235.78	624.72	107.28	1784.08	32.34	31.98	151.50	0.04	34.25	6.72	50.27	12.00	12616.48	2641.72	15258.20
SOx	1.11	0.00	0.02	0.01	0.02	0.07	0.00	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.16	0.28	1.44

Attachment B

Table B-6

2031 Annual Average On-Road Mobile Source Emissions (tons per day) in the South Coast Air Basin

	Light and Medium		Light Heavy		Medium Heavy		Heavy Heavy		Other Buses		Urban Buses		School Buses		Motor Homes		All Vehicles		
	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Non-Disel	Diesel	Grand Total
Vehicles	9,407,492	31,662	76,615	70,218	25,717	143,032	11,049	96,009	4,811	3,361	6,020	1	6,720	2,347	23,703	12,498	9,562,128	359,128	9,959,958
VMT	366,561,998	1,188,907	2,911,087	2,737,729	1,255,556	5,623,098	714,118	11,816,876	177,708	237,636	706,001	53	214,396	47,165	240,259	120,974	372,781,124	21,772,438	396,979,568
Reactive Organic Gas Emissions																			
Run Exhaust	4.21	0.02	0.02	0.18	0.02	0.05	0.02	0.15	0.01	0.01	0.03	0.00	0.01	0.01	0.00	0.01	4.32	0.42	4.74
Idle Exhaust	0.00	0.00	0.03	0.01	0.03	0.03	0.00	0.56	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.10	0.60	0.70
Start Exhaust	10.73	0.00	0.15	0.00	0.10	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00	11.01	0.00	11.01
Total Exhaust	14.94	0.02	0.21	0.19	0.16	0.08	0.02	0.70	0.02	0.02	0.03	0.00	0.05	0.01	0.00	0.01	15.43	1.02	16.45
Diurnal	13.37	0.00	0.18	0.00	0.06	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.08	0.00	13.72	0.00	13.72
Hot Soak	4.88	0.00	0.04	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	4.95	0.00	4.95
Running	10.77	0.00	0.25	0.00	0.10	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00	11.15	0.00	11.15
Total	43.95	0.02	0.68	0.19	0.33	0.08	0.02	0.70	0.06	0.02	0.03	0.00	0.07	0.01	0.10	0.01	45.24	1.02	46.26
Carbon Monoxide Emissions																			
Run Exhaust	265.26	0.28	2.06	0.43	0.77	0.29	4.84	0.71	0.21	0.04	20.08	0.00	1.44	0.02	0.08	0.03	294.73	1.80	296.53
Idle Exhaust	0.00	0.00	0.33	0.07	0.47	1.17	0.78	8.18	0.03	0.07	0.00	0.00	0.38	0.01	0.00	0.00	1.99	9.49	11.48
Start Exhaust	107.55	0.00	4.16	0.00	2.09	0.00	0.00	0.00	0.32	0.00	0.03	0.00	0.11	0.00	0.01	0.00	114.26	0.00	114.26
Total Exhaust	372.80	0.28	6.55	0.50	3.33	1.46	5.62	8.89	0.56	0.11	20.10	0.00	1.93	0.03	0.09	0.03	410.98	11.29	422.27
Oxides of Nitrogen Emissions																			
Run Exhaust	14.30	0.06	0.22	1.71	0.21	2.10	0.36	8.83	0.05	0.26	0.07	0.00	0.12	0.27	0.04	0.37	15.37	13.61	28.98
Idle Exhaust	0.00	0.00	0.00	0.10	0.02	0.94	0.09	2.53	0.00	0.03	0.00	0.00	0.02	0.07	0.00	0.00	0.14	3.66	3.80
Start Exhaust	9.64	0.00	0.66	0.00	0.17	1.78	0.00	1.99	0.03	0.05	0.00	0.00	0.01	0.01	0.00	0.00	10.52	3.84	14.35
Total Exhaust	23.94	0.06	0.88	1.81	0.40	4.82	0.46	13.35	0.08	0.34	0.07	0.00	0.15	0.35	0.05	0.37	26.03	21.11	47.13
PM2.5 Emissions																			
Run Exhaust	0.36	0.01	0.00	0.04	0.00	0.03	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.37	0.26	0.62
Idle Exhaust	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Start Exhaust	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.07
Total Exhaust	0.43	0.01	0.00	0.04	0.00	0.03	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.43	0.26	0.70
Tire Wear	0.81	0.00	0.01	0.01	0.01	0.02	0.01	0.11	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.84	0.15	0.99
Brake Wear	1.22	0.00	0.11	0.08	0.03	0.09	0.05	0.36	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.00	1.44	0.55	1.99
Total	2.45	0.01	0.12	0.13	0.04	0.14	0.07	0.65	0.00	0.01	0.03	0.00	0.01	0.00	0.01	0.01	2.72	0.96	3.68
NH3 Emissions																			
Total Exhaust	14.87	0.00	0.15	0.58	0.17	1.35	0.59	2.84	0.05	0.06	0.38	0.00	0.11	0.01	0.01	0.02	16.34	4.86	21.19
Fuel Consumption (1000 gallons) and SO2																			
Fuel	11657.72	38.14	195.07	139.94	222.05	609.77	105.97	1768.51	30.97	32.02	116.94	0.01	34.48	6.30	49.53	12.08	12412.73	2606.77	15019.50
SOx	1.09	0.00	0.02	0.01	0.02	0.06	0.00	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.14	0.28	1.42

Attachment C:

Diesel Emissions in South Coast Air Basin

Attachment C

TABLE C-1
2018 BASELINE DIESEL EMISSIONS (TONS/DAY) IN SOUTH COAST AIR BASIN

MSC	Major Source Category (MSC)	annual average								
		TOG	VOC	NOX	CO	SOX	PM	PM10	PM25	NH3
10	Electric Utilities	0	0	0.17	0.01	0	0.01	0.01	0.01	0
30	Oil and Gas Production (combustion)	0	0	0.03	0.01	0	0	0	0	0
40	Petroleum Refining (Combustion)	0	0	0	0	0	0	0	0	0
50	Manufacturing and Industrial	0.15	0.16	0.57	2.85	0.01	0.02	0.02	0.02	0.05
52	Food and Agricultural Processing	0.01	0.01	0.08	0.02	0	0.01	0.01	0.01	0
60	Service and Commercial	0.1	0.08	0.93	0.24	0	0.07	0.07	0.07	0
99	Other (Fuel Combustion)	0.8	0.61	2.84	1.21	0.07	0.4	0.38	0.37	0.25
430	Mineral Processes	0.1	0.08	0.06	0.07	0.02	0.74	0.08	0.06	0.04
710	Light Duty Passenger (LDA)	0.04	0.03	0.24	0.31	0.00	0.03	0.03	0.03	0.00
722	Light Duty Trucks - 1 (LDA1)	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00
723	Light Duty Trucks - 2 (LDA2)	0.01	0.01	0.03	0.05	0.00	0.01	0.01	0.00	0.00
724	Medium Duty Vehicles (MDV)	0.01	0.01	0.07	0.17	0.00	0.02	0.02	0.01	0.00
725	Light Heavy Duty Trucks - 1 (LHDT1)	0.36	0.32	5.79	1.07	0.01	0.26	0.26	0.14	0.26
726	Light Heavy Duty Trucks - 2 (LHDT2)	0.19	0.16	2.76	0.51	0.01	0.16	0.16	0.08	0.15
727	Medium Heavy Duty Trucks (MHDT)	1.23	1.08	28.21	4.39	0.06	1.03	1.02	0.79	0.67
728	Heavy Heavy Duty Trucks (HHDT)	2.18	1.92	60.73	10.10	0.17	2.21	2.21	1.33	1.57
775	Buses	0.18	0.15	3.25	0.52	0.01	0.10	0.10	0.08	0.04
780	Motor Homes (MH)	0.01	0.01	0.53	0.04	0.00	0.02	0.02	0.02	0.01
820	Trains	0.82	0.69	15.1	3.55	0.02	0.37	0.37	0.34	0.01
833	Ocean Going Vessels	1.71	1.44	30.62	4.16	1.57	0.53	0.53	0.49	0.02
835	Commercial Habor Crafts	0.39	0.33	5.86	1.25	0	0.25	0.25	0.23	0
840	Recreational Boats	0.21	0.17	0.59	0.26	0	0.01	0.01	0.01	0
860	Off-Road Equipment	5.42	4.51	37.91	24.45	0.05	1.79	1.79	1.64	0.05
861	Off-Road Equipment (PERP)	0.9	0.76	8.83	4.8	0.01	0.34	0.34	0.31	0.01
870	Farm Equipment	0.12	0.1	0.61	0.43	0	0.04	0.04	0.03	0
Total		14.94	12.65	205.82	60.50	2.01	8.43	7.73	6.07	3.13

Attachment C

TABLE C-2
2023 BASELINE DIESEL EMISSIONS (TONS/DAY) IN SOUTH COAST AIR BASIN

MSC	Major Source Category (MSC)	annual average								
		TOG	VOC	NOX	CO	SOX	PM	PM10	PM25	NH3
10	Electric Utilities	0	0	0.14	0.01	0	0.01	0.01	0.01	0
30	Oil and Gas Production (combustion)	0	0	0.02	0.01	0	0	0	0	0
40	Petroleum Refining (Combustion)	0	0	0.01	0	0	0	0	0	0
50	Manufacturing and Industrial	0.15	0.16	0.55	2.9	0.01	0.02	0.02	0.02	0.05
52	Food and Agricultural Processing	0.01	0.01	0.08	0.02	0	0.01	0.01	0.01	0
60	Service and Commercial	0.1	0.09	1.07	0.26	0	0.08	0.08	0.07	0
99	Other (Fuel Combustion)	0.78	0.6	2.38	1.11	0.17	0.4	0.39	0.37	0.27
430	Mineral Processes	0.11	0.08	0.17	0.07	0.1	0.74	0.08	0.06	0.04
710	Light Duty Passenger (LDA)	0.02	0.02	0.11	0.19	0.00	0.02	0.02	0.01	0.00
722	Light Duty Trucks - 1 (LDA1)	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00
723	Light Duty Trucks - 2 (LDA2)	0.01	0.01	0.02	0.05	0.00	0.01	0.01	0.00	0.00
724	Medium Duty Vehicles (MDV)	0.02	0.01	0.10	0.22	0.00	0.02	0.02	0.01	0.00
725	Light Heavy Duty Trucks - 1 (LHDT1)	0.24	0.21	3.13	0.64	0.01	0.23	0.23	0.11	0.33
726	Light Heavy Duty Trucks - 2 (LHDT2)	0.15	0.13	1.65	0.35	0.01	0.16	0.16	0.07	0.23
727	Medium Heavy Duty Trucks (MHDT)	0.18	0.15	10.36	1.54	0.07	0.41	0.41	0.18	1.29
728	Heavy Heavy Duty Trucks (HHDT)	0.73	0.64	29.75	7.87	0.19	1.61	1.61	0.70	2.52
775	Buses	0.04	0.03	1.39	0.16	0.00	0.04	0.04	0.02	0.06
780	Motor Homes (MH)	0.01	0.01	0.47	0.04	0.00	0.02	0.02	0.01	0.02
820	Trains	0.83	0.69	16.13	3.9	0.02	0.37	0.37	0.34	0.01
833	Ocean Going Vessels	1.72	1.45	29.47	4.25	1.6	0.54	0.54	0.49	0.02
835	Commercial Habor Crafts	0.39	0.33	5.77	1.22	0	0.25	0.25	0.23	0
840	Recreational Boats	0.2	0.17	0.57	0.25	0	0.01	0.01	0.01	0
860	Off-Road Equipment	3.75	3.12	22.11	16.34	0.04	1.06	1.06	0.97	0.02
861	Off-Road Equipment (PERP)	0.63	0.53	5.16	4.72	0.01	0.18	0.18	0.16	0.01
870	Farm Equipment	0.09	0.08	0.45	0.39	0	0.03	0.03	0.03	0
Total		**10.14**	**8.52**	**131.05**	**46.52**	**2.24**	**6.22**	**5.54**	**3.89**	**4.87**

Attachment C

TABLE C-3
2025 BASELINE DIESEL EMISSIONS (TONS/DAY) IN SOUTH COAST AIR BASIN

MSC	Major Source Category (MSC)	annual average								
		TOG	VOC	NOX	CO	SOX	PM	PM10	PM25	NH3
10	Electric Utilities	0	0	0.14	0.01	0	0.01	0.01	0.01	0
30	Oil and Gas Production (combustion)	0	0	0.02	0.01	0	0	0	0	0
40	Petroleum Refining (Combustion)	0	0	0.01	0	0	0	0	0	0
50	Manufacturing and Industrial	0.16	0.16	0.57	2.93	0.01	0.02	0.02	0.02	0.05
52	Food and Agricultural Processing	0.01	0.01	0.08	0.02	0	0.01	0.01	0.01	0
60	Service and Commercial	0.1	0.09	1.13	0.26	0	0.08	0.08	0.07	0
99	Other (Fuel Combustion)	0.79	0.61	2.39	1.13	0.17	0.42	0.4	0.39	0.28
430	Mineral Processes	0.11	0.08	0.21	0.07	0.1	0.74	0.08	0.06	0.04
710	Light Duty Passenger (LDA)	0.01	0.01	0.07	0.15	0.00	0.01	0.01	0.01	0.00
722	Light Duty Trucks - 1 (LDA1)	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
723	Light Duty Trucks - 2 (LDA2)	0.01	0.01	0.01	0.05	0.00	0.01	0.01	0.00	0.00
724	Medium Duty Vehicles (MDV)	0.01	0.01	0.08	0.21	0.00	0.02	0.02	0.01	0.00
725	Light Heavy Duty Trucks - 1 (LHDT1)	0.20	0.18	2.41	0.52	0.01	0.22	0.22	0.10	0.35
726	Light Heavy Duty Trucks - 2 (LHDT2)	0.14	0.12	1.37	0.31	0.01	0.17	0.17	0.07	0.26
727	Medium Heavy Duty Trucks (MHDT)	0.15	0.13	8.21	1.56	0.07	0.40	0.40	0.16	1.36
728	Heavy Heavy Duty Trucks (HHDT)	0.77	0.68	19.30	8.40	0.19	1.58	1.57	0.62	2.65
775	Buses	0.04	0.03	1.15	0.16	0.00	0.03	0.03	0.01	0.06
780	Motor Homes (MH)	0.01	0.01	0.45	0.04	0.00	0.01	0.01	0.01	0.02
820	Trains	0.81	0.68	16.43	4.05	0.02	0.37	0.37	0.34	0.01
833	Ocean Going Vessels	1.74	1.47	29.39	4.33	1.69	0.54	0.54	0.5	0.02
835	Commercial Habor Crafts	0.39	0.33	5.79	1.22	0	0.25	0.25	0.23	0
840	Recreational Boats	0.2	0.17	0.56	0.25	0	0.01	0.01	0.01	0
860	Off-Road Equipment	3.43	2.85	19.85	15.97	0.04	0.92	0.92	0.84	0.02
861	Off-Road Equipment (PERP)	0.59	0.49	4.25	4.9	0.02	0.13	0.13	0.12	0.01
870	Farm Equipment	0.08	0.07	0.4	0.37	0	0.02	0.02	0.02	0
Total		**9.75**	**8.19**	**114.27**	**46.92**	**2.34**	**5.97**	**5.28**	**3.63**	**5.14**

Attachment C

TABLE C-4
2028 BASELINE DIESEL EMISSIONS (TONS/DAY) IN SOUTH COAST AIR BASIN

MSC	Major Source Category (MSC)	annual average								
		TOG	VOC	NOX	CO	SOX	PM	PM10	PM25	NH3
10	Electric Utilities	0.00	0.00	0.12	0.01	0.00	0.01	0.01	0.01	0.00
30	Oil and Gas Production (combustion)	0.00	0.00	0.02	0.01	0.00	0.00	0.00	0.00	0.00
40	Petroleum Refining (Combustion)	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
50	Manufacturing and Industrial	0.16	0.17	0.57	2.96	0.01	0.02	0.02	0.02	0.05
52	Food and Agricultural Processing	0.01	0.01	0.08	0.02	0.00	0.01	0.01	0.01	0.00
60	Service and Commercial	0.11	0.09	1.18	0.27	0.00	0.08	0.08	0.08	0.00
99	Other (Fuel Combustion)	0.81	0.62	2.40	1.14	0.08	0.43	0.41	0.40	0.28
430	Mineral Processes	0.11	0.09	0.22	0.07	0.02	0.74	0.08	0.06	0.04
710	Light Duty Passenger (LDA)	0.01	0.01	0.03	0.10	0.00	0.01	0.01	0.00	0.00
722	Light Duty Trucks - 1 (LDA1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
723	Light Duty Trucks - 2 (LDA2)	0.01	0.01	0.01	0.06	0.00	0.01	0.01	0.00	0.00
724	Medium Duty Vehicles (MDV)	0.01	0.01	0.05	0.18	0.00	0.02	0.02	0.01	0.00
725	Light Heavy Duty Trucks - 1 (LHDT1)	0.16	0.14	1.60	0.38	0.01	0.20	0.20	0.09	0.36
726	Light Heavy Duty Trucks - 2 (LHDT2)	0.12	0.10	1.03	0.26	0.01	0.16	0.16	0.07	0.27
727	Medium Heavy Duty Trucks (MHDT)	0.12	0.10	6.31	1.52	0.07	0.39	0.39	0.15	1.39
728	Heavy Heavy Duty Trucks (HHDT)	0.79	0.70	15.58	8.76	0.19	1.63	1.63	0.64	2.77
775	Buses	0.03	0.03	0.90	0.15	0.00	0.03	0.03	0.01	0.06
780	Motor Homes (MH)	0.01	0.01	0.41	0.03	0.00	0.01	0.01	0.01	0.02
820	Trains	0.84	0.71	17.23	4.29	0.03	0.38	0.38	0.35	0.01
833	Ocean Going Vessels	1.82	1.53	30.14	4.52	1.76	0.57	0.57	0.52	0.02
835	Commercial Habor Crafts	0.38	0.32	5.75	1.20	0.00	0.24	0.24	0.23	0.00
840	Recreational Boats	0.20	0.17	0.56	0.25	0.00	0.01	0.01	0.01	0.00
860	Off-Road Equipment	3.20	2.66	17.09	15.70	0.05	0.76	0.75	0.69	0.02
861	Off-Road Equipment (PERP)	0.57	0.48	3.64	5.20	0.02	0.10	0.10	0.09	0.01
870	Farm Equipment	0.07	0.06	0.34	0.35	0.00	0.02	0.02	0.02	0.00
Total		**9.53**	**8.00**	**105.29**	**47.43**	**2.23**	**5.83**	**5.15**	**3.46**	**5.32**

Attachment C

TABLE C-5
2030 BASELINE DIESEL EMISSIONS (TONS/DAY) IN SOUTH COAST AIR BASIN

MSC	Major Source Category (MSC)	annual average								
		TOG	VOC	NOX	CO	SOX	PM	PM10	PM25	NH3
10	Electric Utilities	0	0	0.11	0.01	0	0	0	0	0
30	Oil and Gas Production (combustion)	0	0	0.02	0.01	0	0	0	0	0
40	Petroleum Refining (Combustion)	0	0	0.01	0	0	0	0	0	0
50	Manufacturing and Industrial	0.16	0.17	0.57	2.95	0.01	0.02	0.02	0.02	0.05
52	Food and Agricultural Processing	0.01	0.01	0.08	0.02	0	0.01	0.01	0.01	0
60	Service and Commercial	0.11	0.09	1.2	0.27	0	0.08	0.08	0.08	0
99	Other (Fuel Combustion)	0.81	0.63	2.4	1.14	0.08	0.43	0.42	0.4	0.28
430	Mineral Processes	0.11	0.09	0.22	0.07	0.02	0.74	0.08	0.06	0.04
710	Light Duty Passenger (LDA)	0.00	0.00	0.02	0.07	0.00	0.01	0.01	0.00	0.00
722	Light Duty Trucks - 1 (LDA1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
723	Light Duty Trucks - 2 (LDA2)	0.01	0.01	0.01	0.06	0.00	0.01	0.01	0.00	0.00
724	Medium Duty Vehicles (MDV)	0.01	0.01	0.04	0.16	0.00	0.02	0.02	0.01	0.00
725	Light Heavy Duty Trucks - 1 (LHDT1)	0.14	0.12	1.24	0.32	0.01	0.19	0.19	0.08	0.35
726	Light Heavy Duty Trucks - 2 (LHDT2)	0.11	0.10	0.88	0.24	0.01	0.16	0.16	0.07	0.27
727	Medium Heavy Duty Trucks (MHDT)	0.10	0.09	5.28	1.49	0.07	0.38	0.38	0.14	1.37
728	Heavy Heavy Duty Trucks (HHDT)	0.80	0.71	13.98	8.89	0.19	1.67	1.67	0.65	2.82
775	Buses	0.03	0.02	0.77	0.14	0.00	0.03	0.03	0.01	0.06
780	Motor Homes (MH)	0.01	0.01	0.39	0.03	0.00	0.01	0.01	0.01	0.02
820	Trains	0.86	0.72	17.66	4.45	0.03	0.38	0.38	0.35	0.01
833	Ocean Going Vessels	1.87	1.57	30.75	4.65	1.8	0.58	0.58	0.54	0.02
835	Commercial Habor Crafts	0.37	0.31	5.7	1.18	0	0.24	0.24	0.23	0
840	Recreational Boats	0.2	0.16	0.55	0.25	0	0.01	0.01	0.01	0
860	Off-Road Equipment	3.13	2.57	15.76	15.65	0.05	0.67	0.67	0.61	0.04
861	Off-Road Equipment (PERP)	0.58	0.49	3.55	5.41	0.02	0.09	0.09	0.08	0.01
870	Farm Equipment	0.07	0.06	0.3	0.34	0	0.02	0.02	0.02	0
Total		**9.48**	**7.92**	**101.49**	**47.80**	**2.29**	**5.74**	**5.06**	**3.38**	**5.35**

Attachment C

TABLE C-6
2031 BASELINE DIESEL EMISSIONS (TONS/DAY) IN SOUTH COAST AIR BASIN

MSC	Major Source Category (MSC)	annual average								
		TOG	VOC	NOX	CO	SOX	PM	PM10	PM25	NH3
10	Electric Utilities	0	0	0.11	0.01	0	0	0	0	0
30	Oil and Gas Production (combustion)	0	0	0.03	0.01	0	0.01	0.01	0	0
40	Petroleum Refining (Combustion)	0	0	0.01	0	0	0	0	0	0
50	Manufacturing and Industrial	0.16	0.17	0.57	2.95	0.01	0.02	0.02	0.02	0.05
52	Food and Agricultural Processing	0.01	0.01	0.08	0.02	0	0.01	0.01	0.01	0
60	Service and Commercial	0.11	0.09	1.21	0.28	0	0.08	0.08	0.08	0
99	Other (Fuel Combustion)	0.82	0.63	2.4	1.14	0.08	0.44	0.42	0.4	0.28
430	Mineral Processes	0.11	0.09	0.22	0.07	0.02	0.74	0.08	0.06	0.04
710	Light Duty Passenger (LDA)	0.00	0.00	0.01	0.06	0.00	0.00	0.00	0.00	0.00
722	Light Duty Trucks - 1 (LDA1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
723	Light Duty Trucks - 2 (LDA2)	0.01	0.01	0.01	0.06	0.00	0.01	0.01	0.00	0.00
724	Medium Duty Vehicles (MDV)	0.01	0.01	0.03	0.16	0.00	0.02	0.02	0.01	0.00
725	Light Heavy Duty Trucks - 1 (LHDT1)	0.13	0.11	1.10	0.30	0.01	0.18	0.18	0.08	0.34
726	Light Heavy Duty Trucks - 2 (LHDT2)	0.10	0.09	0.82	0.23	0.01	0.16	0.16	0.07	0.27
727	Medium Heavy Duty Trucks (MHDT)	0.09	0.08	4.82	1.46	0.06	0.37	0.37	0.14	1.35
728	Heavy Heavy Duty Trucks (HHDT)	0.80	0.70	13.35	8.89	0.19	1.68	1.68	0.65	2.84
775	Buses	0.03	0.02	0.70	0.14	0.00	0.03	0.03	0.01	0.06
780	Motor Homes (MH)	0.01	0.01	0.38	0.03	0.00	0.01	0.01	0.01	0.02
820	Trains	0.85	0.72	17.78	4.54	0.03	0.38	0.38	0.35	0.01
833	Ocean Going Vessels	1.89	1.59	30.99	4.72	1.82	0.59	0.59	0.54	0.02
835	Commercial Habor Crafts	0.37	0.31	5.67	1.17	0	0.24	0.24	0.23	0
840	Recreational Boats	0.2	0.16	0.55	0.25	0	0.01	0.01	0.01	0
860	Off-Road Equipment	3.10	2.55	15.32	15.60	0.05	0.64	0.64	0.58	0.04
861	Off-Road Equipment (PERP)	0.59	0.49	3.51	5.52	0.02	0.09	0.09	0.08	0.02
870	Farm Equipment	0.06	0.05	0.29	0.34	0	0.02	0.02	0.02	0
Total		9.45	7.89	99.97	47.95	2.30	5.73	5.05	3.35	5.35

Attachment D:

Road Construction Dust Emissions in South Coast Air Basin

Table D-1

Emissions of Road Construction Dust (Tons/Day) in South Coast Air Basin

(Annual Average Inventory)

Years	PM	PM10	PM25
2018	4.96	2.43	0.24
2022	5.12	2.50	0.25
2024	5.23	2.56	0.26
2023	5.18	2.53	0.25
2025	5.29	2.59	0.26
2026	5.33	2.61	0.26
2027	5.36	2.62	0.26
2028	5.40	2.64	0.26
2029	5.44	2.66	0.27
2030	5.48	2.68	0.27
2031	5.51	2.70	0.27

Attachment E:

Table E-A

List of Category Specific Conversion Factors (Developed by CARB and Used in the Imperial County 2018 SIP) to Estimate Condensable PM2.5 from Primary PM2.5

Tables E-B

Primary, Condensable and Filterable $PM_{2.5}$ emissions by Major Source Category (Tons per Day)

1. 2018 Annual Average Emissions
2. 2023 Annual Average Emissions
3. 2025 Annual Average Emissions
4. 2028 Annual Average Emissions
5. 2030 Annual Average Emissions
6. 2031 Annual Average Emissions

Table E-A. List of Category Specific Conversion Factors (Developed by CARB and Used in the Imperial County 2018 SIP) to Estimate Condensable PM2.5 from Primary PM2.5

SCC	SCC_LEVEL_ONE	SCC_LEVEL_TWO	SCC_LEVEL_THREE	SCC_LEVEL_FOUR	Conversion Factor
20100101	Internal Combustion Engines	Electric Generation	Distillate Oil (Diesel)	Turbine	0.070272896
20100102	Internal Combustion Engines	Electric Generation	Distillate Oil (Diesel)	Reciprocating	0.070272896
20100105	Internal Combustion Engines	Electric Generation	Distillate Oil (Diesel)	Reciprocating: Crankcase Blowby	0.07063197
20100106	Internal Combustion Engines	Electric Generation	Distillate Oil (Diesel)	Reciprocating: Evaporative Losses (Fuel Storage and Delivery System)	0
20100107	Internal Combustion Engines	Electric Generation	Distillate Oil (Diesel)	Reciprocating: Exhaust	0.07063197
20100109	Internal Combustion Engines	Electric Generation	Distillate Oil (Diesel)	Turbine: Exhaust	0.07063197
20100201	Internal Combustion Engines	Electric Generation	Natural Gas	Turbine	0.450549451
20100202	Internal Combustion Engines	Electric Generation	Natural Gas	Reciprocating	0.450549451
20100205	Internal Combustion Engines	Electric Generation	Natural Gas	Reciprocating: Crankcase Blowby	0.450549451
20100206	Internal Combustion Engines	Electric Generation	Natural Gas	Reciprocating: Evaporative Losses (Fuel Delivery System)	0.450549451
20100207	Internal Combustion Engines	Electric Generation	Natural Gas	Reciprocating: Exhaust	0.450549451
20100209	Internal Combustion Engines	Electric Generation	Natural Gas	Turbine: Exhaust	0.450549451
20100301	Internal Combustion Engines	Electric Generation	Gasified Coal	Turbine	0.450549451
20100702	Internal Combustion Engines	Electric Generation	Process Gas	Reciprocating	0.450549451
20100707	Internal Combustion Engines	Electric Generation	Process Gas	Reciprocating: Exhaust	0.450549451
20100801	Internal Combustion Engines	Electric Generation	Landfill Gas	Turbine	0.450549451
20100802	Internal Combustion Engines	Electric Generation	Landfill Gas	Reciprocating	0.450549451
20100805	Internal Combustion Engines	Electric Generation	Landfill Gas	Reciprocating: Crankcase Blowby	0.450549451
20100807	Internal Combustion Engines	Electric Generation	Landfill Gas	Reciprocating: Exhaust	0.450549451
20100809	Internal Combustion Engines	Electric Generation	Landfill Gas	Turbine: Exhaust	0.450549451
20100901	Internal Combustion Engines	Electric Generation	Kerosene/Naphtha (Jet Fuel)	Turbine	0.056603774
20100902	Internal Combustion Engines	Electric Generation	Kerosene/Naphtha (Jet Fuel)	Reciprocating	0.058789987
20100907	Internal Combustion Engines	Electric Generation	Kerosene/Naphtha (Jet Fuel)	Reciprocating: Exhaust	0.056603774
20100909	Internal Combustion Engines	Electric Generation	Kerosene/Naphtha (Jet Fuel)	Turbine: Exhaust	0.056603774
20101001	Internal Combustion Engines	Electric Generation	Geysers/Geothermal	Steam Turbine	0.450549451
20101020	Internal Combustion Engines	Electric Generation	Geysers/Geothermal	Well Pad Fugitives: Blowdown	0
20101302	Internal Combustion Engines	Electric Generation	Liquid Waste	Waste Oil - Turbine	0.07063197
20182599	Internal Combustion Engines	Electric Generation	Wastewater, Points of Generation	Specify Point of Generation	0
20200101	Internal Combustion Engines	Industrial	Distillate Oil (Diesel)	Turbine	0.022698613
20200102	Internal Combustion Engines	Industrial	Distillate Oil (Diesel)	Reciprocating	0.022698613
20200103	Internal Combustion Engines	Industrial	Distillate Oil (Diesel)	Turbine: Cogeneration	0.022698613
20200104	Internal Combustion Engines	Industrial	Distillate Oil (Diesel)	Reciprocating: Cogeneration	0.022698613
20200105	Internal Combustion Engines	Industrial	Distillate Oil (Diesel)	Reciprocating: Crankcase Blowby	0.022698613
20200106	Internal Combustion Engines	Industrial	Distillate Oil (Diesel)	Reciprocating: Evaporative Losses (Fuel Storage and Delivery System)	0
20200107	Internal Combustion Engines	Industrial	Distillate Oil (Diesel)	Reciprocating: Exhaust	0.022698613
20200109	Internal Combustion Engines	Industrial	Distillate Oil (Diesel)	Turbine: Exhaust	0.022698613
20200201	Internal Combustion Engines	Industrial	Natural Gas	Turbine	0.450549451
20200202	Internal Combustion Engines	Industrial	Natural Gas	Reciprocating	0.450549451
20200203	Internal Combustion Engines	Industrial	Natural Gas	Turbine: Cogeneration	0.450549451
20200204	Internal Combustion Engines	Industrial	Natural Gas	Reciprocating: Cogeneration	0.450549451
20200205	Internal Combustion Engines	Industrial	Natural Gas	Reciprocating: Crankcase Blowby	0.450549451
20200207	Internal Combustion Engines	Industrial	Natural Gas	Reciprocating: Exhaust	0.450549451
20200209	Internal Combustion Engines	Industrial	Natural Gas	Turbine: Exhaust	0.450549451
20200252	Internal Combustion Engines	Industrial	Natural Gas	2-cycle Lean Burn	0.450549451
20200253	Internal Combustion Engines	Industrial	Natural Gas	4-cycle Rich Burn	0.450549451
20200254	Internal Combustion Engines	Industrial	Natural Gas	4-cycle Lean Burn	0.450549451
20200255	Internal Combustion Engines	Industrial	Natural Gas	2-cycle Clean Burn	0.450549451
20200256	Internal Combustion Engines	Industrial	Natural Gas	4-cycle Clean Burn	0.450549451
20200401	Internal Combustion Engines	Industrial	Large Bore Engine	Diesel	0.134380454
20200402	Internal Combustion Engines	Industrial	Large Bore Engine	Dual Fuel (Oil/Gas)	0.134380454
20200403	Internal Combustion Engines	Industrial	Large Bore Engine	Cogeneration: Dual Fuel	0.134380454
20200406	Internal Combustion Engines	Industrial	Large Bore Engine	Evaporative Losses (Fuel Storage and Delivery System)	0
20200407	Internal Combustion Engines	Industrial	Large Bore Engine	Exhaust	0.134199134
20200501	Internal Combustion Engines	Industrial	Residual/Crude Oil	Reciprocating	0.08296754
20200701	Internal Combustion Engines	Industrial	Process Gas	Turbine	0.450549451

(Continued)

Table E-A. List of Category Specific Conversion Factors (Developed by CARB and Used in the Imperial County 2018 SIP) to Estimate Condensable PM2.5 from Primary PM2.5

SCC	SCC_LEVEL_ONE	SCC_LEVEL_TWO	SCC_LEVEL_THREE	SCC_LEVEL_FOUR	Conversion Factor
20200702	Internal Combustion Engines	Industrial	Process Gas	Reciprocating Engine	0.450549451
20200705	Internal Combustion Engines	Industrial	Process Gas	Refinery Gas: Turbine	0.450549451
20200706	Internal Combustion Engines	Industrial	Process Gas	Refinery Gas: Reciprocating Engine	0.450549451
20200711	Internal Combustion Engines	Industrial	Process Gas	Reciprocating: Evaporative Losses (Fuel Delivery System)	0.450549451
20200712	Internal Combustion Engines	Industrial	Process Gas	Reciprocating: Exhaust	0.450549451
20200714	Internal Combustion Engines	Industrial	Process Gas	Turbine: Exhaust	0.450549451
20200901	Internal Combustion Engines	Industrial	Kerosene/Naphtha (Jet Fuel)	Turbine	0.022698613
20200902	Internal Combustion Engines	Industrial	Kerosene/Naphtha (Jet Fuel)	Reciprocating	0.022698613
20200909	Internal Combustion Engines	Industrial	Kerosene/Naphtha (Jet Fuel)	Turbine: Exhaust	0.022698613
20201001	Internal Combustion Engines	Industrial	Liquified Petroleum Gas (LPG)	Propane: Reciprocating	0.450549451
20201002	Internal Combustion Engines	Industrial	Liquified Petroleum Gas (LPG)	Butane: Reciprocating	0.450549451
20201005	Internal Combustion Engines	Industrial	Liquified Petroleum Gas (LPG)	Reciprocating: Crankcase Blowby	0.450549451
20201012	Internal Combustion Engines	Industrial	Liquified Petroleum Gas (LPG)	Reciprocating Engine	0.450549451
20201013	Internal Combustion Engines	Industrial	Liquified Petroleum Gas (LPG)	Turbine: Cogeneration	0.450549451
20201602	Internal Combustion Engines	Industrial	Methanol	Reciprocating Engine	0.450549451
20201607	Internal Combustion Engines	Industrial	Methanol	Reciprocating: Exhaust	0.450549451
20201609	Internal Combustion Engines	Industrial	Methanol	Turbine: Exhaust	0.450549451
20201701	Internal Combustion Engines	Industrial	Gasoline	Turbine	0.450549451
20201702	Internal Combustion Engines	Industrial	Gasoline	Reciprocating Engine	0.450549451
20201707	Internal Combustion Engines	Industrial	Gasoline	Reciprocating: Exhaust	0.450549451
20280001	Internal Combustion Engines	Industrial	Equipment Leaks	Equipment Leaks	0.450549451
20282599	Internal Combustion Engines	Industrial	Wastewater, Points of Generation	Specify Point of Generation	0
20300101	Internal Combustion Engines	Commercial/Institutional	Distillate Oil (Diesel)	Reciprocating	0.022698613
20300102	Internal Combustion Engines	Commercial/Institutional	Distillate Oil (Diesel)	Turbine	0.022698613
20300105	Internal Combustion Engines	Commercial/Institutional	Distillate Oil (Diesel)	Reciprocating: Crankcase Blowby	0.022698613
20300106	Internal Combustion Engines	Commercial/Institutional	Distillate Oil (Diesel)	Reciprocating: Evaporative Losses (Fuel Storage and Delivery System)	0
20300107	Internal Combustion Engines	Commercial/Institutional	Distillate Oil (Diesel)	Reciprocating: Exhaust	0.022698613
20300108	Internal Combustion Engines	Commercial/Institutional	Distillate Oil (Diesel)	Turbine: Evaporative Losses (Fuel Storage and Delivery System)	0
20300109	Internal Combustion Engines	Commercial/Institutional	Distillate Oil (Diesel)	Turbine: Exhaust	0.022698613
20300201	Internal Combustion Engines	Commercial/Institutional	Natural Gas	Reciprocating	0.450549451
20300202	Internal Combustion Engines	Commercial/Institutional	Natural Gas	Turbine	0.450549451
20300203	Internal Combustion Engines	Commercial/Institutional	Natural Gas	Turbine: Cogeneration	0.450549451
20300204	Internal Combustion Engines	Commercial/Institutional	Natural Gas	Reciprocating: Cogeneration	0.450549451
20300207	Internal Combustion Engines	Commercial/Institutional	Natural Gas	Reciprocating: Exhaust	0.450549451
20300301	Internal Combustion Engines	Commercial/Institutional	Gasoline	Reciprocating	0.067164179
20300307	Internal Combustion Engines	Commercial/Institutional	Gasoline	Reciprocating: Exhaust	0.067164179
20300701	Internal Combustion Engines	Commercial/Institutional	Digester Gas	Turbine	0.375
20300702	Internal Combustion Engines	Commercial/Institutional	Digester Gas	Reciprocating: POTW Digester Gas	0.450549451
20300706	Internal Combustion Engines	Commercial/Institutional	Digester Gas	Reciprocating: Evaporative Losses (Fuel Storage and Delivery System)	0
20300707	Internal Combustion Engines	Commercial/Institutional	Digester Gas	Reciprocating: Exhaust	0.450549451
20300801	Internal Combustion Engines	Commercial/Institutional	Landfill Gas	Turbine	0.450549451
20300802	Internal Combustion Engines	Commercial/Institutional	Landfill Gas	Reciprocating	0.450549451
20300805	Internal Combustion Engines	Commercial/Institutional	Landfill Gas	Reciprocating: Crankcase Blowby	0.450549451
20300809	Internal Combustion Engines	Commercial/Institutional	Landfill Gas	Turbine: Exhaust	0.450549451
20300901	Internal Combustion Engines	Commercial/Institutional	Kerosene/Naphtha (Jet Fuel)	Turbine: JP-4	0.450549451
20301001	Internal Combustion Engines	Commercial/Institutional	Liquified Petroleum Gas (LPG)	Propane: Reciprocating	0.450549451

(Continued)

Table E-A. List of Category Specific Conversion Factors (Developed by CARB and Used in the Imperial County 2018 SIP) to Estimate Condensable PM2.5 from Primary PM2.5

SCC	SCC_LEVEL_ONE	SCC_LEVEL_TWO	SCC_LEVEL_THREE	SCC_LEVEL_FOUR	Conversion Factor
20301002	Internal Combustion Engines	Commercial/Institutional	Liquified Petroleum Gas (LPG)	Butane: Reciprocating	0.450549451
20301007	Internal Combustion Engines	Commercial/Institutional	Liquified Petroleum Gas (LPG)	Reciprocating: Exhaust	0.450549451
20400101	Internal Combustion Engines	Engine Testing	Aircraft Engine Testing	Turbojet	0.071204135
20400102	Internal Combustion Engines	Engine Testing	Aircraft Engine Testing	Turboshaft	0.450549451
20400111	Internal Combustion Engines	Engine Testing	Aircraft Engine Testing	JP-5 Fuel	0.450549451
20400112	Internal Combustion Engines	Engine Testing	Aircraft Engine Testing	JP-4 Fuel	0.071204135
20400199	Internal Combustion Engines	Engine Testing	Aircraft Engine Testing	Other Not Classified	0
20400201	Internal Combustion Engines	Engine Testing	Rocket Engine Testing	Rocket Motor: Solid Propellant	0.450549451
20400202	Internal Combustion Engines	Engine Testing	Rocket Engine Testing	Liquid Propellant	0.450549451
20400299	Internal Combustion Engines	Engine Testing	Rocket Engine Testing	Other Not Classified	0
20400301	Internal Combustion Engines	Engine Testing	Turbine	Natural Gas	0.450549451
20400302	Internal Combustion Engines	Engine Testing	Turbine	Diesel/Kerosene	0.071204135
20400303	Internal Combustion Engines	Engine Testing	Turbine	Distillate Oil	0.071204135
20400305	Internal Combustion Engines	Engine Testing	Turbine	Kerosene/Naphtha	0.071204135
20400399	Internal Combustion Engines	Engine Testing	Turbine	Other Not Classified	0
20400401	Internal Combustion Engines	Engine Testing	Reciprocating Engine	Gasoline	0.071204135
20400402	Internal Combustion Engines	Engine Testing	Reciprocating Engine	Diesel/Kerosene	0.071204135
20400403	Internal Combustion Engines	Engine Testing	Reciprocating Engine	Distillate Oil	0.071204135
20400404	Internal Combustion Engines	Engine Testing	Reciprocating Engine	Process Gas	0.450549451
20400406	Internal Combustion Engines	Engine Testing	Reciprocating Engine	Kerosene/Naphtha (Jet Fuel)	0.071204135
20400407	Internal Combustion Engines	Engine Testing	Reciprocating Engine	Dual Fuel (Gas/Oil)	0.071204135
20400408	Internal Combustion Engines	Engine Testing	Reciprocating Engine	Residual Oil/Crude Oil	0.071204135
20400409	Internal Combustion Engines	Engine Testing	Reciprocating Engine	Liquified Petroleum Gas (LPG)	0.450549451
20400499	Internal Combustion Engines	Engine Testing	Reciprocating Engine	Other Not Classified	0
26000320	Internal Combustion Engines	Off-highway 2-stroke Gasoline Engines	Industrial Equipment	Industrial Fork Lift: Gasoline Engine (2-stroke)	0.071204135
26500320	Internal Combustion Engines	Off-highway 4-stroke Gasoline Engines	Industrial Equipment	Industrial Fork Lift: Gasoline Engine (4-stroke)	0.071204135
27000320	Internal Combustion Engines	Off-highway Diesel Engines	Industrial Equipment	Industrial Fork Lift: Diesel	0.071204135
27300320	Internal Combustion Engines	Off-highway LPG-fueled Engines	Industrial Equipment	Industrial Fork Lift: Liquified Petroleum Gas (LPG)	0.450549451
28500201	Internal Combustion Engines	Railroad Equipment	Diesel	Yard Locomotives	0.071204135
28888801	Internal Combustion Engines	Fugitive Emissions	Other Not Classified	Specify in Comments	0

Table E-B-1. 2018 Primary, Condensable and Filterable PM2.5 Emissions by Major Source Category (Tons per Day)

CODE		Source Category	PM2.5 Total	PM2.5 Condensable	PM2.5 Filterable
Fuel Combustion					
	10	Electric Utilities	0.53	0.24	0.3
	20	Cogeneration	0.01	0	0.01
	30	Oil and Gas Production (Combustion)	0.09	0.03	0.06
	40	Petroleum Refining (Combustion)	1.79	1	0.79
	50	Manufacturing and Industrial	1.33	0.75	0.58
	52	Food and Agricultural Processing	0.05	0.03	0.02
	60	Service and Commercial	1.15	0.61	0.54
	99	Other (Fuel Combustion)	0.38	0.01	0.38
Total Fuel Combustion			**5.34**	**2.66**	**2.68**
Waste Disposal					
	110	Sewage Treatment	0	0	0
	120	Landfills	0.2	0.02	0.18
	130	Incineration	0.05	0.02	0.03
	140	Soil Remediation	0	0	0
	199	Other (Water Disposal)	0	0	0
Total Waste Disposal			**0.25**	**0.04**	**0.21**
Cleaning and Surface Coatings					
	210	Laundering	0	0	0
	220	Degreasing	0.02	0	0.02
	230	Coatings and Related Processes	1.4	0	1.4
	240	Printing	0	0	0
	250	Adhesives and Sealants	0.02	0	0.02
	299	Other (Cleaning and Surface Coatings)	0	0	0
Total Cleaning and Surface Coatings			**1.44**	**0**	**1.44**
Petroleum Production and Marketing					
	310	Oil and Gas Production	0.02	0	0.02
	320	Petroleum Refining	0.88	0.14	0.74
	330	Petroleum Marketing	0	0	0
	399	Other (Petroleum Production and Marketing)	0	0	0
Total Petroleum Production and Marketing			**0.91**	**0.91**	**0.14**
Industrial Processes					
	410	Chemical	0.37	0.01	0.37
	420	Food and Agriculture	0.05	0.01	0.04
	430	Mineral Processes	0.94	0.03	0.91
	440	Metal Processes	0.2	0.09	0.11
	450	Wood and Paper	2.7	0	2.7
	460	Glass and Related Products	0	0	0
	470	Electronics	0	0	0
	499	Other (Industrial Processes)	0.46	0.02	0.44
Total Industrial Processes			**4.72**	**0.16**	**4.56**
Solvent Evaporation					
	510	Consumer Products	0	0	0
	520	Architectural Coatings and Related Solvent	0	0	0
	530	Pesticides/Fertilizers	0	0	0
	540	Asphalt Paving/Roofing	0.02	0	0.02
Total Solvent Evaporation			**0.02**	**0**	**0.02**

(Continued)

Table E-B-1. 2018 Primary, Condensable and Filterable PM2.5 Emissions by Major Source Category (Tons per Day)

CODE	Source Category	PM2.5 Total	PM2.5 Condensable	PM2.5 Filterable
Miscellaneous Processes				
610	Residential Fuel Combustion	6.77	0.79	5.98
620	Farming Operations	0.17	0	0.17
630	Construction and Demolition	2.27	0	2.27
640	Paved Road Dust	8.59	0	8.59
645	Unpaved Road Dust	1.67	0	1.67
650	Fugitive Windblown Dust	0.23	0	0.23
660	Fires	0.41	0	0.41
670	Waste Burning and Disposal	0.97	0	0.97
690	Cooking	11.44	11.41	0.03
699	Other (Miscellaneous Processes)	0	0	0
Total Miscellaneous Processes		**32.52**	**12.2**	**20.32**
Total Stationary and Area Sources		**45.2**	**15.2**	**30.0**

Table E-B-2. 2023 Primary, Condensable and Filterable PM2.5 Emissions by Major Source Category (Tons per Day)

CODE		Source Category	PM2.5 Total	PM2.5 Condensable	PM2.5 Filterable
Fuel Combustion					
	10	Electric Utilities	0.55	0.25	0.31
	20	Cogeneration	0.01	0	0.01
	30	Oil and Gas Production (Combustion)	0.1	0.04	0.06
	40	Petroleum Refining (Combustion)	1.79	1	0.79
	50	Manufacturing and Industrial	1.31	0.73	0.58
	52	Food and Agricultural Processing	0.05	0.03	0.02
	60	Service and Commercial	1.15	0.61	0.55
	99	Other (Fuel Combustion)	0.39	0.01	0.38
Total Fuel Combustion			**5.36**	**2.66**	**2.7**
Waste Disposal					
	110	Sewage Treatment	0	0	0
	120	Landfills	0.2	0.02	0.18
	130	Incineration	0.05	0.02	0.03
	140	Soil Remediation	0	0	0
	199	Other (Water Disposal)	0	0	0
Total Waste Disposal			**0.25**	**0.04**	**0.21**
Cleaning and Surface Coatings					
	210	Laundering	0	0	0
	220	Degreasing	0.02	0	0.02
	230	Coatings and Related Processes	1.47	0	1.47
	240	Printing	0	0	0
	250	Adhesives and Sealants	0.02	0	0.02
	299	Other (Cleaning and Surface Coatings)	0	0	0
Total Cleaning and Surface Coatings			**1.51**	**0**	**1.51**
Petroleum Production and Marketing					
	310	Oil and Gas Production	0.02	0	0.02
	320	Petroleum Refining	0.88	0.14	0.74
	330	Petroleum Marketing	0	0	0
	399	Other (Petroleum Production and Marketing)	0	0	0
Total Petroleum Production and Marketing			**0.91**	**0.14**	**0.77**
Industrial Processes					
	410	Chemical	0.38	0.01	0.38
	420	Food and Agriculture	0.05	0.01	0.04
	430	Mineral Processes	0.96	0.03	0.93
	440	Metal Processes	0.22	0.1	0.12
	450	Wood and Paper	2.95	0	2.95
	460	Glass and Related Products	0	0	0
	470	Electronics	0	0	0
	499	Other (Industrial Processes)	0.48	0.02	0.46
Total Industrial Processes			**5.05**	**0.18**	**4.87**
Solvent Evaporation					
	510	Consumer Products	0	0	0
	520	Architectural Coatings and Related Solvent	0	0	0
	530	Pesticides/Fertilizers	0	0	0
	540	Asphalt Paving/Roofing	0.02	0	0.02
Total Solvent Evaporation			**0.02**	**0**	**0.02**

(Continued)

Table E-B-2. 2023 Primary, Condensable and Filterable PM2.5 Emissions by Major Source Category (Tons per Day)

CODE	Source Category	PM2.5 Total	PM2.5 Condensable	PM2.5 Filterable
Miscellaneous Processes				
610	Residential Fuel Combustion	6.78	0.82	5.95
620	Farming Operations	0.15	0	0.15
630	Construction and Demolition	2.36	0	2.36
640	Paved Road Dust	8.83	0	8.83
645	Unpaved Road Dust	1.67	0	1.67
650	Fugitive Windblown Dust	0.22	0	0.22
660	Fires	0.41	0	0.41
670	Waste Burning and Disposal	0.28	0	0.28
690	Cooking	11.79	11.76	0.04
699	Other (Miscellaneous Processes)	0	0	0
Total Miscellaneous Processes		**32.49**	**12.58**	**19.91**
Total Stationary and Area Sources		**45.6**	**15.6**	**30.0**

Table E-B-3. 2025 Primary, Condensable and Filterable PM2.5 Emissions by Major Source Category (Tons per Day)

CODE		Source Category	PM2.5 Total	PM2.5 Condensable	PM2.5 Filterable
Fuel Combustion					
	10	Electric Utilities	0.52	0.23	0.29
	20	Cogeneration	0.01	0	0.01
	30	Oil and Gas Production (Combustion)	0.1	0.04	0.07
	40	Petroleum Refining (Combustion)	1.79	1	0.79
	50	Manufacturing and Industrial	1.33	0.74	0.59
	52	Food and Agricultural Processing	0.05	0.03	0.02
	60	Service and Commercial	1.14	0.6	0.54
	99	Other (Fuel Combustion)	0.4	0.01	0.39
Total Fuel Combustion			**5.34**	**2.64**	**2.7**
Waste Disposal					
	110	Sewage Treatment	0	0	0
	120	Landfills	0.2	0.02	0.18
	130	Incineration	0.05	0.02	0.03
	140	Soil Remediation	0	0	0
	199	Other (Water Disposal)	0	0	0
Total Waste Disposal			**0.26**	**0.04**	**0.21**
Cleaning and Surface Coatings					
	210	Laundering	0	0	0
	220	Degreasing	0.02	0	0.02
	230	Coatings and Related Processes	1.5	0	1.5
	240	Printing	0	0	0
	250	Adhesives and Sealants	0.02	0	0.02
	299	Other (Cleaning and Surface Coatings)	0	0	0
Total Cleaning and Surface Coatings			**1.55**	**0**	**1.54**
Petroleum Production and Marketing					
	310	Oil and Gas Production	0.02	0	0.02
	320	Petroleum Refining	0.88	0.14	0.74
	330	Petroleum Marketing	0	0	0
	399	Other (Petroleum Production and Marketing)	0	0	0
Total Petroleum Production and Marketing			**0.91**	**0.14**	**0.77**
Industrial Processes					
	410	Chemical	0.39	0.01	0.38
	420	Food and Agriculture	0.05	0.01	0.04
	430	Mineral Processes	0.97	0.03	0.94
	440	Metal Processes	0.23	0.11	0.12
	450	Wood and Paper	3.06	0	3.06
	460	Glass and Related Products	0	0	0
	470	Electronics	0	0	0
	499	Other (Industrial Processes)	0.48	0.02	0.46
Total Industrial Processes			**5.19**	**0.18**	**5**
Solvent Evaporation					
	510	Consumer Products	0	0	0
	520	Architectural Coatings and Related Solvent	0	0	0
	530	Pesticides/Fertilizers	0	0	0
	540	Asphalt Paving/Roofing	0.02	0	0.02
Total Solvent Evaporation			**0.02**	**0**	**0.02**

(Continued)
Table E-B-3. 2025 Primary, Condensable and Filterable PM2.5 Emissions by Major Source Category (Tons per Day)

CODE	Source Category	PM2.5 Total	PM2.5 Condensable	PM2.5 Filterable
Miscellaneous Processes				
610	Residential Fuel Combustion	6.72	0.81	5.92
620	Farming Operations	0.14	0	0.14
630	Construction and Demolition	2.41	0	2.41
640	Paved Road Dust	8.91	0	8.91
645	Unpaved Road Dust	1.67	0	1.67
650	Fugitive Windblown Dust	0.22	0	0.22
660	Fires	0.41	0	0.41
670	Waste Burning and Disposal	0.28	0	0.28
690	Cooking	11.96	11.93	0.04
699	Other (Miscellaneous Processes)	0	0	0
Total Miscellaneous Processes		**32.73**	**12.73**	**19.99**
Total Stationary and Area Sources		**45.99**	**15.74**	**30.25**

Table E-B-4. 2028 Primary, Condensable and Filterable PM2.5 Emissions by Major Source Category (Tons per Day)

CODE		Source Category	PM2.5 Total	PM2.5 Condensable	PM2.5 Filterable
Fuel Combustion					
	10	Electric Utilities	0.46	0.21	0.25
	20	Cogeneration	0.01	0	0.01
	30	Oil and Gas Production (Combustion)	0.11	0.04	0.07
	40	Petroleum Refining (Combustion)	1.79	1	0.79
	50	Manufacturing and Industrial	1.31	0.73	0.58
	52	Food and Agricultural Processing	0.05	0.03	0.02
	60	Service and Commercial	1.12	0.58	0.54
	99	Other (Fuel Combustion)	0.41	0.01	0.41
Total Fuel Combustion			**5.26**	**2.59**	**2.67**
Waste Disposal					
	110	Sewage Treatment	0	0	0
	120	Landfills	0.2	0.02	0.19
	130	Incineration	0.05	0.02	0.03
	140	Soil Remediation	0	0	0
	199	Other (Water Disposal)	0	0	0
Total Waste Disposal			**0.26**	**0.04**	**0.22**
Cleaning and Surface Coatings					
	210	Laundering	0	0	0
	220	Degreasing	0.02	0	0.02
	230	Coatings and Related Processes	1.53	0	1.53
	240	Printing	0	0	0
	250	Adhesives and Sealants	0.02	0	0.02
	299	Other (Cleaning and Surface Coatings)	0	0	0
Total Cleaning and Surface Coatings			**1.58**	**0**	**1.58**
Petroleum Production and Marketing					
	310	Oil and Gas Production	0.02	0	0.02
	320	Petroleum Refining	0.88	0.14	0.74
	330	Petroleum Marketing	0	0	0
	399	Other (Petroleum Production and Marketing)	0	0	0
Total Petroleum Production and Marketing			**0.91**	**0.14**	**0.77**
Industrial Processes					
	410	Chemical	0.39	0.01	0.39
	420	Food and Agriculture	0.06	0.01	0.05
	430	Mineral Processes	0.98	0.03	0.95
	440	Metal Processes	0.24	0.12	0.13
	450	Wood and Paper	3.2	0	3.2
	460	Glass and Related Products	0	0	0
	470	Electronics	0	0	0
	499	Other (Industrial Processes)	0.49	0.03	0.46
Total Industrial Processes			**5.36**	**0.19**	**5.17**
Solvent Evaporation					
	510	Consumer Products	0	0	0
	520	Architectural Coatings and Related Solvent	0	0	0
	530	Pesticides/Fertilizers	0	0	0
	540	Asphalt Paving/Roofing	0.03	0	0.03
Total Solvent Evaporation			**0.03**	**0**	**0.03**

(Continued)

Table E-B-4. 2028 Primary, Condensable and Filterable PM2.5 Emissions by Major Source Category (Tons per Day)

CODE	Source Category	PM2.5 Total	PM2.5 Condensable	PM2.5 Filterable
Miscellaneous Processes				
610	Residential Fuel Combustion	6.64	0.78	5.86
620	Farming Operations	0.14	0	0.14
630	Construction and Demolition	2.46	0	2.46
640	Paved Road Dust	9.08	0	9.08
645	Unpaved Road Dust	1.67	0	1.67
650	Fugitive Windblown Dust	0.21	0	0.21
660	Fires	0.41	0	0.41
670	Waste Burning and Disposal	0.28	0	0.28
690	Cooking	12.17	12.13	0.04
699	Other (Miscellaneous Processes)	0	0	0
Total Miscellaneous Processes		**33.06**	**12.92**	**20.14**
Total Stationary and Area Sources		**46.46**	**15.89**	**30.57**

Table E-B-5. 2030 Primary, Condensable and Filterable PM2.5 Emissions by Major Source Category (Tons per Day)

CODE		Source Category	PM2.5 Total	PM2.5 Condensable	PM2.5 Filterable
Fuel Combustion					
	10	Electric Utilities	0.43	0.19	0.24
	20	Cogeneration	0.01	0	0.01
	30	Oil and Gas Production (Combustion)	0.11	0.04	0.07
	40	Petroleum Refining (Combustion)	1.79	1	0.79
	50	Manufacturing and Industrial	1.29	0.72	0.57
	52	Food and Agricultural Processing	0.05	0.03	0.02
	60	Service and Commercial	1.1	0.57	0.53
	99	Other (Fuel Combustion)	0.42	0.01	0.41
Total Fuel Combustion			**5.2**	**2.56**	**2.64**
Waste Disposal					
	110	Sewage Treatment	0	0	0
	120	Landfills	0.21	0.02	0.19
	130	Incineration	0.05	0.02	0.03
	140	Soil Remediation	0	0	0
	199	Other (Water Disposal)	0	0	0
Total Waste Disposal			**0.26**	**0.04**	**0.22**
Cleaning and Surface Coatings					
	210	Laundering	0	0	0
	220	Degreasing	0.02	0	0.02
	230	Coatings and Related Processes	1.54	0	1.54
	240	Printing	0	0	0
	250	Adhesives and Sealants	0.02	0	0.02
	299	Other (Cleaning and Surface Coatings)	0	0	0
Total Cleaning and Surface Coatings			**1.59**	**0**	**1.59**
Petroleum Production and Marketing					
	310	Oil and Gas Production	0.02	0	0.02
	320	Petroleum Refining	0.88	0.14	0.74
	330	Petroleum Marketing	0	0	0
	399	Other (Petroleum Production and Marketing)	0	0	0
Total Petroleum Production and Marketing			**0.91**	**0.14**	**0.77**
Industrial Processes					
	410	Chemical	0.39	0.01	0.38
	420	Food and Agriculture	0.06	0.01	0.05
	430	Mineral Processes	0.98	0.03	0.95
	440	Metal Processes	0.25	0.12	0.13
	450	Wood and Paper	3.23	0	3.23
	460	Glass and Related Products	0	0	0
	470	Electronics	0	0	0
	499	Other (Industrial Processes)	0.49	0.03	0.46
Total Industrial Processes			**5.4**	**0.2**	**5.2**
Solvent Evaporation					
	510	Consumer Products	0	0	0
	520	Architectural Coatings and Related Solvent	0	0	0
	530	Pesticides/Fertilizers	0	0	0
	540	Asphalt Paving/Roofing	0.03	0	0.03
Total Solvent Evaporation			**0.03**	**0**	**0.03**

(Continued)

Table E-B-5. 2030 Primary, Condensable and Filterable PM2.5 Emissions by Major Source Category (Tons per Day)

CODE	Source Category	PM2.5 Total	PM2.5 Condensable	PM2.5 Filterable
Miscellaneous Processes				
610	Residential Fuel Combustion	6.59	0.77	5.82
620	Farming Operations	0.13	0	0.13
630	Construction and Demolition	2.49	0	2.49
640	Paved Road Dust	9.11	0	9.11
645	Unpaved Road Dust	1.67	0	1.67
650	Fugitive Windblown Dust	0.21	0	0.21
660	Fires	0.41	0	0.41
670	Waste Burning and Disposal	0.28	0	0.28
690	Cooking	12.3	12.27	0.04
699	Other (Miscellaneous Processes)	0	0	0
Total Miscellaneous Processes		33.21	13.03	20.17
Total Stationary and Area Sources		**45.59**	**15.97**	**30.62**

Table E-B-6. 2031 Primary, Condensable and Filterable PM2.5 Emissions by Major Source Category (Tons per Day)

CODE		Source Category	PM2.5 Total	PM2.5 Condensable	PM2.5 Filterable
Fuel Combustion					
	10	Electric Utilities	0.43	0.19	0.24
	20	Cogeneration	0.01	0	0.01
	30	Oil and Gas Production (Combustion)	0.11	0.04	0.07
	40	Petroleum Refining (Combustion)	1.79	1	0.79
	50	Manufacturing and Industrial	1.28	0.71	0.57
	52	Food and Agricultural Processing	0.05	0.03	0.02
	60	Service and Commercial	1.1	0.57	0.53
	99	Other (Fuel Combustion)	0.42	0.01	0.41
Total Fuel Combustion			**5.19**	**2.55**	**2.64**
Waste Disposal					
	110	Sewage Treatment	0	0	0
	120	Landfills	0.21	0.02	0.19
	130	Incineration	0.05	0.02	0.03
	140	Soil Remediation	0	0	0
	199	Other (Water Disposal)	0	0	0
Total Waste Disposal			**0.26**	**0.04**	**0.22**
Cleaning and Surface Coatings					
	210	Laundering	0	0	0
	220	Degreasing	0.02	0	0.02
	230	Coatings and Related Processes	1.54	0	1.54
	240	Printing	0	0	0
	250	Adhesives and Sealants	0.02	0	0.02
	299	Other (Cleaning and Surface Coatings)	0	0	0
Total Cleaning and Surface Coatings			**1.59**	**0**	**1.59**
Petroleum Production and Marketing					
	310	Oil and Gas Production	0.02	0	0.02
	320	Petroleum Refining	0.88	0.14	0.74
	330	Petroleum Marketing	0	0	0
	399	Other (Petroleum Production and Marketing)	0	0	0
Total Petroleum Production and Marketing			**0.91**	**0.14**	**0.77**
Industrial Processes					
	410	Chemical	0.39	0.01	0.38
	420	Food and Agriculture	0.06	0.01	0.05
	430	Mineral Processes	0.98	0.03	0.95
	440	Metal Processes	0.25	0.12	0.13
	450	Wood and Paper	3.24	0	3.23
	460	Glass and Related Products	0	0	0
	470	Electronics	0	0	0
	499	Other (Industrial Processes)	0.49	0.03	0.46
Total Industrial Processes			**5.41**	**0.2**	**5.21**
Solvent Evaporation					
	510	Consumer Products	0	0	0
	520	Architectural Coatings and Related Solvent	0	0	0
	530	Pesticides/Fertilizers	0	0	0
	540	Asphalt Paving/Roofing	0.03	0	0.03
Total Solvent Evaporation			**0.03**	**0**	**0.03**

(Continued)

Table E-B-6. 2031 Primary, Condensable and Filterable PM2.5 Emissions by Major Source Category (Tons per Day)

CODE	Source Category	PM2.5 Total	PM2.5 Condensable	PM2.5 Filterable
Miscellaneous Processes				
610	Residential Fuel Combustion	6.59	0.77	5.82
620	Farming Operations	0.13	0	0.13
630	Construction and Demolition	2.51	0	2.51
640	Paved Road Dust	9.11	0	9.11
645	Unpaved Road Dust	1.67	0	1.67
650	Fugitive Windblown Dust	0.21	0	0.21
660	Fires	0.41	0	0.41
670	Waste Burning and Disposal	0.28	0	0.28
690	Cooking	12.37	12.33	0.04
699	Other (Miscellaneous Processes)	0	0	0
Total Miscellaneous Processes		**33.28**	**13.1**	**20.18**
Total Stationary and Area Sources		**46.66**	**16.03**	**30.64**

South Coast AQMD

APPENDIX II

Modeling and Attainment Demonstration

CHAPTER 1 – MODELING OVERVIEW

CHAPTER 2 – MODELING PROTOCOL

CHAPTER 3 – METEOROLOGICAL MODELING

CHAPTER 4 - MODELING EMISSIONS, BOUNDARY CONDITIONS, AND INITIAL CONDITIONS

CHAPTER 5 - ANNUAL PM2.5 ATTAINMENT DEMOSTRATION

CHAPTER 6 – ATTAINMENT DEMONSTRATION FOR THE CA-60 NEAR-ROAD MONITORING STATION

CHAPTER 7 – ~~EXCEPTIONAL~~ATYPICAL EVENTS ~~DEMONSTRATION~~ANALYSIS

Chapter 1

MODELING OVERVIEW

Introduction

Air quality modeling to demonstrate future attainment of air quality standards is an integral part of the planning process to achieve clean air. Modeling provides the means to relate emission reductions from pollution sources to the resulting air quality improvements. The attainment demonstrations provided in this ~~Draft~~ PM2.5 Plan reflect updated emissions estimates, new technical information, enhanced air quality modeling techniques, updated attainment demonstration methodology, and the control strategies provided in Chapter 4.

This ~~Draft~~ PM2.5 Plan aims to develop a control strategy and corresponding attainment demonstration that: 1) ensures that the 2012 annual PM2.5 National Ambient Air Quality Standard (NAAQS) is met by the established deadline in the federal Clean Air Act (CAA) and 2) achieves an expeditious rate of progress towards attaining the air quality standard.

The South Coast Air Basin is classified as an "serious" nonattainment area for the 2012 annual PM2.5 NAAQS with an attainment year of 2025. This plan seeks an extension of the attainment to 2030 and included control strategy and modeling demonstration to attain in 2030. The modeling base year is 2018 and was used to derive meteorological inputs; it also served as an anchor year to project future emissions and was used in the attainment demonstration.

Modeling Methodology

Design Values

U.S. EPA guidance recommends the use of multiple year averages of design values, where appropriate, to dampen the effects of single year anomalies to the air quality trend due to factors such as adverse or favorable meteorology or radical changes in the local emissions profile. The Basin PM2.5 design value trend is presented in Chapter 5 of the ~~Draft~~ PM2.5 Plan, Figure 5-1. The trend in the Basin Annual PM2.5 design values from 2001 through 2022 reveals substantial reductions in concentrations over this timeframe. The year 2020 was particularly anomalous for a variety of reasons such as recorded-setting wildfires and pandemic-era emissions. The five-year period, 2016-2020 was used in the current modeling attainment demonstration. However, due to the anomality of year 2020 related with COVID-19 pandemic and record-setting wildfires, a five-year weighted design value recommended by U.S. EPA was modified to exclude the impact 2020 measurements. Chapter 5 of the ~~Draft~~ PM2.5 Plan discusses the detail of the 5-year weighted design value calculations.

Model Selection

The attainment demonstration was developed using the U.S. EPA Community Multiscale Air Quality (CMAQ) (version 5.3.3) modeling platform with Statewide Air Pollution Research Center (SAPRC) 07 chemistry and aerosol mechanism of aero6, and the Weather Research and Forecasting Model (WRF) (version 4.4.2) meteorological fields. Comprehensive descriptions of the CMAQ modeling system are provided by U.S. EPA.[1] Additional descriptions of the SAPRC07 chemistry module and aerosol mechanism of aero6 are provided are available online.[2] Documentation of the National Center for Atmospheric Research (NCAR) WRF model is available from the University Corporation for Atmospheric Research (UCAR).[3]

Regional Modeling

The CMAQ air quality modeling platform with SAPRC07 chemistry and WRF meteorology were employed as the primary tool used to demonstrate future year attainment of the PM2.5 standard. Simulations are conducted from January 1st to December 31th. Daily average values of PM2.5 concentrations were Predicted.

As in the 2022 AQMP, simulations were conducted using a Lambert Conformal grid projection where the western boundary of the domain is at 084 UTM, over 100 miles west of the ports of Los Angeles and Long Beach. The eastern boundary extends beyond the Colorado River, while the northern and southern boundaries of the domain extend to the southern edge of the San Joaquin Valley and the Northern portions of Mexico (3543 UTM). The grid size is 4 x 4 kilometers with 30 vertical layers. Figure II-1-1 depicts the CMAQ modeling domain which includes a grid of 156 cells from west to east and 102 cells from south to north.

[1] http://www.epa.gov/scram001/
[2] https://intra.engr.ucr.edu/~carter/SAPRC/
[3] https://www.mmm.ucar.edu/models/wrf

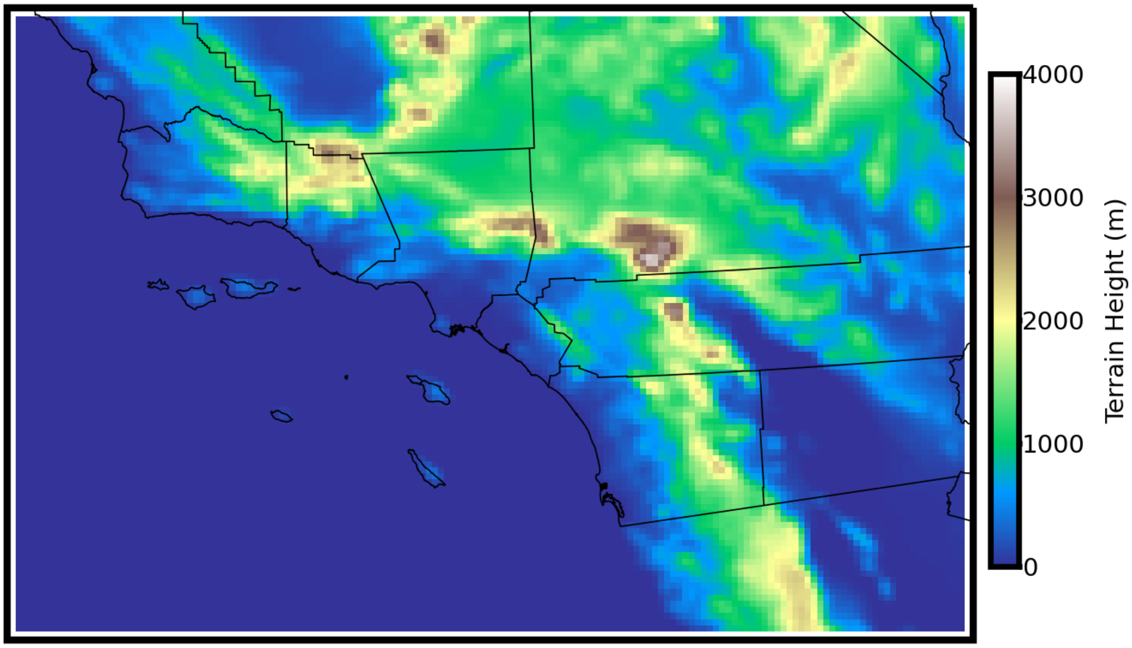


FIGURE II-1-1

CMAQ Regional Modeling Domain for the ~~Draft~~ PM2.5 Plan

WRF was updated to the most recent version (version 4.4.2) available at the time of this protocol preparation and was evaluated with a set of observation data. The WRF simulations were initialized from National Centers for Environmental Prediction (NCEP) North American Regional reanalysis (NARR) Re-analysis data and run for 4-day increments with the option for four-dimensional data assimilation (FDDA). The atmospheric chemistry package used in the CMAQ simulations relied on SAPRC07 gas phase chemistry with version "c" toluene updates with the AERO6 aerosol mechanism, the Euler Backward Iterative solver, the Yamo horizontal advection scheme, the WRF vertical advection scheme, the multiscale CMAQ horizontal diffusion scheme, the ACM2 vertical diffusion scheme, in-line photolysis calculations, and clean homogeneous initial values.

Relative Response Factors and Future Year Design Values

To bridge the gap between air quality model output evaluation and applicability to the health-based air quality standards, EPA guidance[4] has proposed the use of relative response factors (RRF). South Coast AQMD developed a tool to calculate the RRF and did not rely on EPA's MATS/SMAT software. The RRF is simply a ratio of future year predicted air quality with the control strategy fully implemented to the simulated air quality in the base year (U.S. EPA, 2018). For PM2.5 simulations, PM2.5 component-specific

[4] U.S. EPA (2018) Modeling Guidance for Demonstrating Air Quality Goals for Ozone, PM2.5, and Regional Haze.

relative response factors (RRF) should be calculated for each quarter. The guidance requires that quarterly mean concentrations for each component to be determined among 9 grid cells around a monitoring station if model grid resolution is equal or less than 12km and that the specific grid location be preserved in the future year modeling scenario when calculating. The ratio of base to future year quarterly mean concentrations for each component is the RRF for that component.

The future year design value is estimated by multiplying the non-dimensional RRF to the measured base year design value. Thus, the simulated improvement in air quality, based on multiple meteorological episodes, is translated to a simple metric that directly determines compliance of the standard. Equations II-1-1 and II-1-2 summarize the calculation.

Equation II-1-1:

$$\mathrm{RRF} = \frac{\text{Future Year Model Prediction}}{\text{Base Year Model Prediction}}$$

Equation II-1-2:

$$\text{Future Design Value} = \mathrm{RRF} \times \text{Base Design Value}$$

The modeling analyses described above use the RRF method to project future design values. A future design value less than or equal to the standard constitutes attainment. The RRF approach aims to minimize the effects of biases in the model simulations, thus providing more accurate projections of future air quality.

Modeling Results

Air quality modeling simulations are conducted to quantify the air quality improvements resulting from the measures proposed in the ~~Draft~~ PM2.5 Plan, and to demonstrate that future PM2.5 concentrations will meet the air quality standards. Modeling results show that the measures proposed in this ~~Draft~~ PM2.5 Plan will be able to bring PM2.5 concentrations down and that all areas in the Basin will be in attainment of the 2012 annual PM2.5 standard by 2030.

Uncertainties Associated with the Technical Analysis

As with any attainment plan, there are uncertainties associated with the technical analysis. Uncertainties are inherent to many of the inputs used in the emissions, meteorological and air quality models. Uncertainty in emission projections stem from the uncertainties associated with the demographic and socioeconomic factors, the emission factors and the spatial distribution surrogates used in the development of emissions inventories. Modeling tools also contribute to the uncertainty as all models can only be a limited representation of the real world. Also, uncertainty in the measurements add to the uncertainty when model performance is assessed. And finally, uncertainty in future climate may also impact our understanding and ability to determine the necessary emission controls to attain the standards. While completely eliminating uncertainties is an impossible task, there are a number of features and practices built into the air quality planning process that manage and control such uncertainties and preserve the integrity of an air quality management plan. These measures include the constant revision of modeling tools and the design of contingency measures that could be enacted in the event that the measures in the ~~Draft~~ PM2.5 Plan do not result in the projected air quality improvements.

Document Organization

This document provides the federal attainment demonstration for PM2.5. Chapter 2 provides the modeling protocol which summarizes the key elements that have been revised relative to the 2022 AQMP modeling protocol. Chapter 3 provides a discussion of the meteorological modeling including a comprehensive model performance evaluation. Chapter 4 provides a brief summary of the modeling emissions, boundary conditions and initial conditions. Chapter 5 discusses the annual PM2.5 attainment demonstration for the 2030 attainment year. The PM2.5 analysis includes discussions of base-year modeling performance, and projections of future year PM2.5 concentrations for baseline emissions. Table II-1-2 lists the Attachments to this document.

TABLE II-1-2

ATTACHMENTS

Number	Description
Attachment-1	WRF Model Performance Time Series
Attachment-2	CMAQ Model Performance Figures
Attachment-3	Emissions Reductions Summary for Future Control Scenarios

Chapter 2

MODELING PROTOCOL

Background

One of the basic requirements of a modeling attainment demonstration is the development of a comprehensive modeling protocol that defines the scope of the regional modeling analyses. This includes the attainment demonstration methodology, meteorological and chemical transport platforms, gridded and speciated emission inventories, and geographical characteristics of the modeling domains. The protocol also defines the methodology to assess model performance and the selection of the simulation periods. The 2016 AQMP provided a comprehensive discussion of the modeling protocol used for the development of the PM2.5 and ozone attainment demonstrations. The 2016 AQMP Modeling Protocol served as the prototype of the ~~Draft 2024~~ PM2.5 Plan modeling protocol. This ~~Draft 2024~~ PM2.5 Plan demonstrates attainment of the 2012 annual PM2.5 standard with 2018 as the base year and 2030 as the attainment year. Future attainment years (See Table II-2-1) are identified based on nonattainment designation, pollutant standards, and geographical area.

TABLE II-2-1

UPCOMING ATTAINMENT YEARS FOR THE 2012 ANNUAL PM2.5 NAAQS FOR THE SOUTH COAST AIR BASIN

Attainment Year	Remarks
2018	Base Year for Modeling and Emissions Projection
2025	2012 PM2.5 Serious Area Attainment Due
2030	2012 PM2.5 Serious Area with 5 -year Extension

Attainment Demonstration

The annual PM2.5 attainment demonstration was performed based on the U.S. EPA guidance document, "Modeling Guidance for Demonstrating Air Quality Goals for Ozone, PM2.5, and Regional Haze", issued on November 29, 2018 (U.S. EPA, 2018). To predict the future annual PM2.5 design values, PM2.5 component-specific relative response factors (RRF) should be calculated for each quarter. The guidance requires that quarterly mean concentrations for each component to be determined among 9 grid cells around a monitoring station if model grid resolution is equal or less than 12km and that the specific grid location be preserved in the future year modeling scenario when calculating. The ratio of base to future year quarterly mean concentrations for each component is the RRF for that component.

Numerical Models

Table II-2-2 provides a side-by-side comparison of the 2016, 2022 AQMP and the current ~~Draft 2024~~ PM2.5 Plan modeling protocols. In general, changes have occurred in the following categories: emissions inventories, future-year simulations, the level of the non-attainment designation and the attainment demonstration methodology. As such, these changes are expected to occur with each subsequent modeling update. Table II-2-3 highlights the main differences in CMAQ setup since the 2022 AQMP.

TABLE II-2-2

NUMERICAL MODELING PLATFORMS AND DOMAINS FOR 2024 PM2.5 PLAN AND PREVIOUS AQMPS

	2016 AQMP	2022 AQMP	~~Draft 2024~~ PM2.5 Plan
Modeling Base Year	2012 Ozone: May – Sep PM: Annual	2018 Ozone: May - Sep	2018 Entire Year
Chemical Transport Model	CMAQ version 5.0.2	CMAQ version 5.2.1	CMAQ version 5.3.3
Meteorological Model	WRF version 3.6 with Updated Land Use	WRF version 4.0.3 Unified Noah	WRF version 4.4.2 Pleim-Xiu
Emission: On-Road	EMFAC 2014	EMFAC 2017	EMFAC 2021
Off-Road	Category Specific Calculation	Category Specific Calculation	Category Specific Calculation
Modeling Domain	624 km by 408 km	624 km by 408 km	624 km by 408 km
Grid Resolution	4km by 4km grid	4km by 4km grid	4km by 4km grid
Vertical Layer	18 layers with 14 layer below 2000 m AGL and 50 hPa as top boundary	30 layers with 14 layer below 2000 m AGL and 50 hPa as top boundary	30 layers with 14 layer below 2000 m AGL and 50 hPa as top boundary

TABLE II-2-3

CHEMICAL TRANSPORT MODELING PLATFORM FOR THE ~~DRAFT 2024~~ PM2.5 PLAN

Options	~~Draft 2024~~ PM2.5 Plan
Numerical Model	CMAQ version 5.3.3
Modeling Grid	156 by 102 grids with 4 km grid distance
Vertical Layers	30 layers
Gas Phase Chemical Mechanism	SAPRC07 with version “c” toluene updates
Aerosol Mechanism	AERO6
Chemical Solver	Euler Backward Iterative solver (EBI)
Horizontal Advection	Yamo
Vertical Advection	WRF
Horizontal Diffusion	Multiscale CMAQ scheme
Vertical Diffusion	ACM2
Photolysis	In-line Calculation
Initial Values	Clean Homogeneous Condition
Boundary Values	Nested modeling with 12km statewide CMAQ The 12km CMAQ domain used boundaries from the global model of Community Atmosphere Model with Chemistry (CAM-chem)

The Weather Research and Forecast (WRF) model remains the primary tool for meteorological modeling. WRF was updated with the most recent version (version 4.4.2) available and was evaluated with a set of observation data to ensure the accuracy and reliability of meteorological predictions. WRF simulations were conducted with three nested domains with grid resolutions of 36 km, 12 km and 4 km. The innermost domain spans 652 km by 460 km in the east–west and north–south directions, respectively, which includes the greater Los Angeles area, its surrounding mountains, and ocean waters off the coast of the South Coast Air Basin (Figure II-2-1). A Lambert conformal map projection was used with reference latitudes of 30° and 60° N and the center of the modeling domain positioned at 37° N and 120° 30’ W. Details on the WRF model configuration are provided in Chapter 3 of Appendix II.

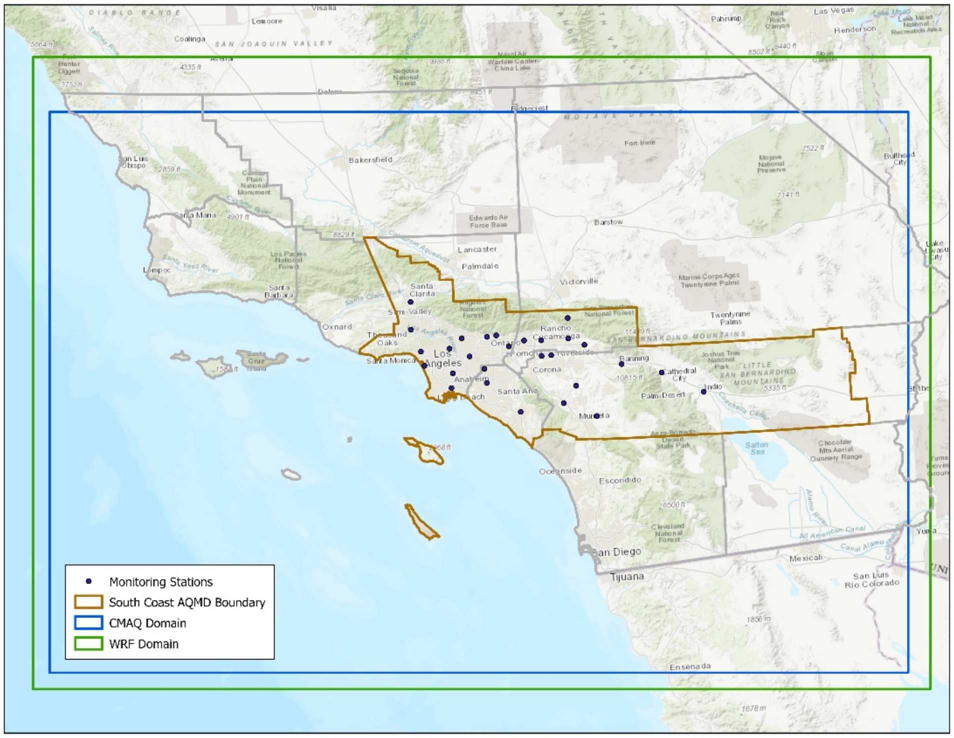


FIGURE II-2-1

THE RELATIVE LOCATIONS OF THE INNER MOST WRF DOMAIN COMPARED TO THE CMAQ DOMAIN. THE BOUNDARY OF SOUTH COAST AQMD JURISDICTION BOUNDARY AND AIR MONITORING LOCATIONS ARE OVERLAID BY A THICK SOLID LINE AND BLACK DOTS, RESPECTIVELY.

Emissions Processing

Emissions inventories are often developed on an annual basis for large geographic areas and a process must be developed to allocate the emissions to a time-dependent grid for use in chemical transport modeling. Traditionally, emissions were allocated to the modeling grid using generic or average activity patterns and profiles. These approaches did not sufficiently reflect the real-world characteristics of emissions sources. Shortcomings of previous emissions allocation methods included an inability to account for traffic flows responding to changes in weather, vessels transiting outside of well-known shipping lanes, or aircraft following airport-specific landing and takeoff trajectories. For these reasons, new approaches were developed to spatially and temporally allocate emissions from on-road mobile sources, Ocean-Going Vessels (OGV), and aircraft. Each method used information from sensor or transponder-based datasets, which accurately reflected where and when emissions were occurring. Further details on the updated allocation methods are presented in Chapter 4 of Appendix II.

TABLE II-2-4

SUMMARY OF EMISSION PROCESSING FOR THE ~~DRAFT 2024~~ PM2.5 PLAN

Options	~~Draft 2024~~ PM2.5 Plan
On-Road Emissions	EMFAC 2021
	Temporal allocation using Caltrans real-time PeMS single loop detector-based traffic data for light & medium-duty vehicles. Heavy-duty vehicle temporal allocation based on PeMS data and an algorithm to detect heavy-duty vehicle classes[1]
Aircraft Emissions	ACARS/GATE[1] spatial allocation
OGV Emissions	AIS-based[2] spatial allocation
Vehicle Miles Traveled	2020 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS)
Off-Road Emissions	Category Specific Calculation
Mexico Emissions	CARB's Mexican emissions profile

[1] Aircraft Communication Addressing and Reporting System (ACARS)/Gridded Aircraft Trajectory Emissions (GATE)

[2] Automated Identification System

[1] Kwon J, Varaiya P, Skabardonis A. Estimation of Truck Traffic Volume from Single Loop Detectors with Lane-to-Lane Speed Correlation. Transportation Research Record. 2003;1856(1):106-117, https://doi.org/10.3141%2F1856-11

TABLE II-2-5

LIST OF EMISSIONS CATEGORIES WITH TEMPORAL PROFILE USED

Day-Specific Profile	Generic Profile
• Wildfires[1] • Prescribed burns[1] • Biogenic and On-Road motor vehicle emissions are adjusted using day/hour-specific meteorological data.	• Agricultural burning • Residential wood combustion • Facilities • Paved road dust • Unpaved road dust • Windblown dust • Livestock dust

[1] Wildfires and prescribed burns were modeled using day-specific profiles for the model performance evaluation only. For the attainment demonstration, wildfire emissions were excluded, and prescribed burns were modeled using a generic profile.

Biogenic Emissions

Daily biogenic VOC emissions were calculated using the Model of Emissions of Gases and Aerosols from Nature version 3.0 (MEGAN3.0) using 2018 meteorology as input. MEGAN was executed in its default configuration, except for the normalized Leaf Area Index (LAIv) input. LAIv was developed by the California Air Resources Board using 2018 data from the Moderate Resolution Imaging Spectroradiometer (MODIS) on the National Aeronautical Space Administration’s Terra and Aqua satellites. Because MODIS does not provide data in urban areas, LAIv in these areas was based on tree survey data from the US Forest Service. A detailed description of the biogenic inventory is provided in Chapter 4 of Appendix II.

Computational Resources

The main computation platform employs high performance nodes. New servers, compiled to enhance computational capability, were configured with Red-Hat Enterprise Linux 7 and 64-bit operating systems. Details of the computing resources are summarized in Table II-2-6.

TABLE II-2-6

DETAILS OF COMPUTATIONAL RESOURCES USED IN THE 2016, 2022 AQMPS AND THE ~~DRAFT 2024~~ PM2.5 PLAN

2016 AQMP	2022 AQMP	~~Draft 2024~~ PM2.5 Plan
• HP DL560 G8, 64 bit 4x8 cores • HP DL560 G8, Total 320 processors • HP DL560 G8 Total 64 processors	• HP DL380 G10, 64 bit 2x16 cores • HPE DL380 G10 Total 320 processors • HP DL560 G8, Total 256 processors	• Same as 2022 AQMP

Chapter 3

METEOROLOGICAL MODELING

Overview

This chapter provides a description of the meteorological modeling that serves as the foundation of the ~~Draft 2024~~ PM2.5 plan modeling analysis. The Weather Research and Forecasting (WRF) model was used to generate meteorological fields for further modeling analysis. The model offers a variety of user options to cover atmospheric boundary layer parameterizations, turbulent diffusion, cumulus parameterizations, land surface-atmosphere interactions, which can be customized to specific geographical and climatological situations. South Coast AQMD staff performed extensive sensitivity tests and developments to improve WRF performance for the South Coast Air Basin, where prediction of complex meteorological structures associated with air quality episodes is particularly challenging due to the region's unique geography and climate. This chapter describes the numerical configuration, sensitivity test on key parameterizations, input database, and initial and boundary values used in the ~~Draft 2024~~ PM2.5 Plan modeling analysis.

Comparison of 2018 Observed Meteorology to 10-Year Average

Meteorological data from airport weather stations across the Basin and the Coachella Valley were used to assess differences between regional weather patterns observed in 2018 and average conditions from 10 years (2013-2022). The 15 weather stations used for this analysis were Los Angeles International Airport (LAX), Santa Monica Municipal Airport (SMO), Hawthorne Municipal Airport (HHR), Long Beach Airport (LGB), John Wayne Airport (SNA), Fullerton Municipal Airport (FUL), Chino Airport (CNO), Ontario International Airport (ONT), Riverside Municipal Airport (RAL), March Air Reserve Base (RIV), Palm Springs International Airport (PSP), Burbank Bob Hope Airport (BUR) and Van Nuys Airport (VNY). The location of the stations is shown in Figure II-3-1. Comparisons of 2018 and 2013-2022 daily total rain, daily average wind speed, relative humidity and temperature at the station of LAX are shown as examples in Figures II-3-2 through II-3-5. Comparisons for all other stations are included in Attachment 1 of Appendix II.

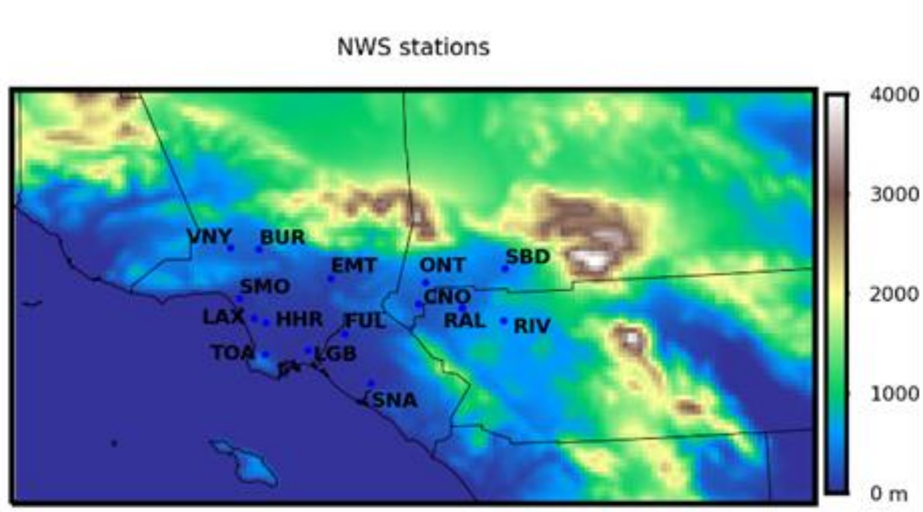


FIGURE II-3-1

15 NATIONAL WEATHER SERVICE (NWS) STATIONS AND TOPOGRAPHY IN THE BASIN

As shown in Figure II-3-2, the daily total rain at the station of LAX recorded higher precipitation for some years such as 2017, 2019 and 2021. Lower precipitation is observed during years such as 2013 and 2022. Typically, the first quarter and the 4th quarter of the year are the rain seasons. For example, the first quarter of 2017 and the last quarter of 2021 observed more than 2 inches daily total rain. There are more rain days with > 1 inch daily total rain in the year of 2019 from both first quarter and 4th quarter. On the other side, the year of 2013 is dry and observed the lowest rain amount comparing with other years. Regarding both precipitation days and rain amount, the year of 2018 observed values between the lower and the higher values among the 10 years precipitation record. Figure II-3-3, II-3-4, and II-3-5 are normalized histogram of daily average at station of LAX in 2018 and the 10-year (2013-2022) for wind speed, relative humidity, and temperature respectively. The higher value range for the above three variables in 2018 are in line with the counterparts from the 10 years observations. The histogram of 2018 didn't show much shifting to the higher or the lower values comparing with the 10 years normalized histogram. For example, the higher wind speed is in the 2.5 m/s - 4 m/s range for both 2018 and the 10 years observations. The higher relative humidity is in the 65% - 85% range for both 2018 and the 10 years observations.

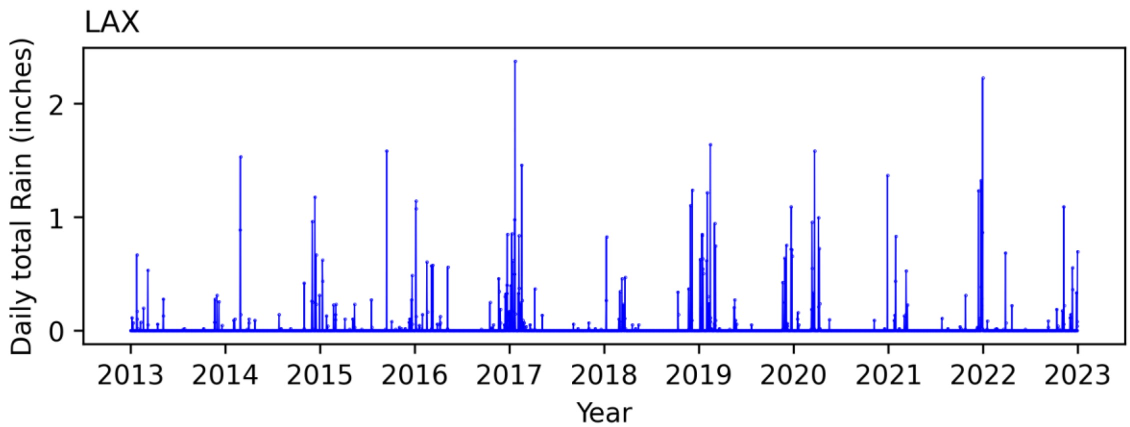


FIGURE II-3-2

DAILY TOTAL RAIN AT STATION OF LAX DURING 2013 - 2022

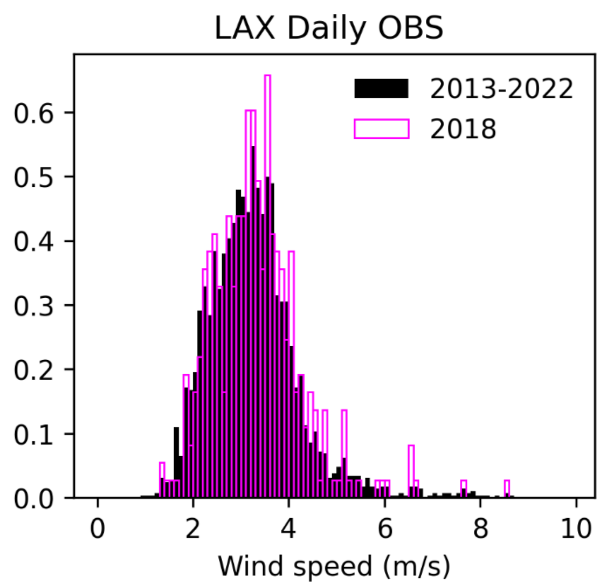


FIGURE II-3-3

NORMALIZED HISTOGRAM OF DAILY AVERAGE WIND SPEED AT STATION OF LAX IN 2018 AND THE 10-YEAR (2013-2022)

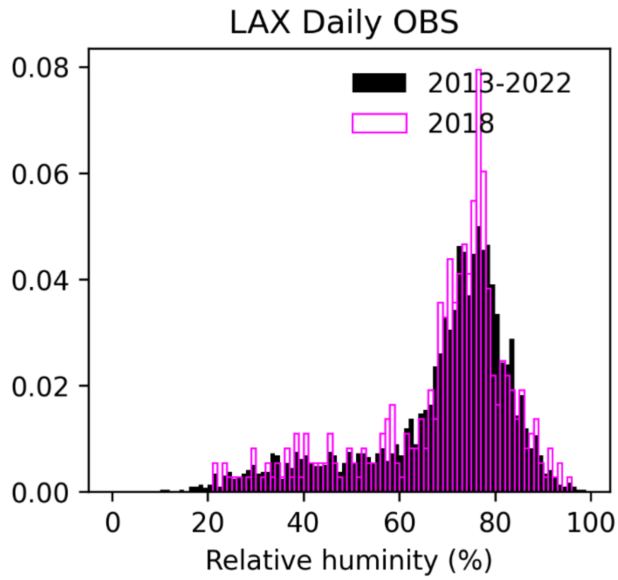


FIGURE II-3-4

NORMALIZED HISTOGRAM OF DAILY AVERAGE RELATIVE HUMIDITY AT STATION OF LAX IN 2018 AND THE 10-YEAR (2013-2022)

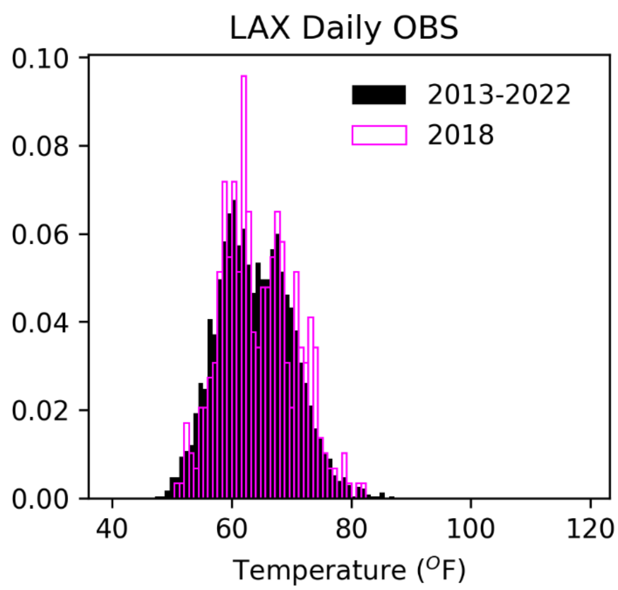


FIGURE II-3-5

NORMALIZED HISTOGRAM OF DAILY AVERAGE TEMPERATURE AT STATION OF LAX IN 2018 AND THE 10-YEAR (2013-2022)

Modeling Configuration

The WRF model is one of the most widely used meteorological models for both operational forecasting and research applications. WRF has been applied to a wide range of phenomena across geographic scales from tens of meters to thousands of kilometers, such as regional climate, monsoons, baroclinic waves, mesoscale fronts, hurricanes, deep convection, land-sea breezes, mountain-valley circulations, large eddy simulations, and fire events. The model is supported by the National Center for Atmospheric Research (NCAR) and actively developed by a worldwide user community. The WRF system contains two dynamical solvers, referred to as the ARW (Advanced Research WRF) core and the NMM (Nonhydrostatic Mesoscale Model) core. The ARW configuration was used for the ~~Draft 2024~~ PM2.5 Plan modeling analysis. The ARW is primarily developed and maintained by the NCAR Mesoscale and Microscale Meteorology Laboratory.

The WRF model is a fully compressible and nonhydrostatic model (with a run-time hydrostatic option). For vertical coordinate, the model uses either a terrain-following (TF) or hybrid vertical coordinate (HVC). The grid staggering is the Arakawa C-grid[1] (Skamarock, W. C., 2019). It uses a time-split small step for acoustic and gravity-wave modes. The dynamics conserve scalar variables. The WRF is designed to be a flexible, state-of-the-art atmospheric simulation system that is portable and efficient on parallel computing platforms.

The WRF simulation domain designed for the ~~Draft 2024~~ PM2.5 Plan encompasses the greater Los Angeles and suburban areas, its surrounding mountains, and ocean off the coast of the Basin, as shown in Figure II-3-6. WRF simulations were conducted with three nested domains at grid resolutions of 36 km, 12 km, and 4 km. The innermost domain has 163 by 115 grid points, which span 652km by 460km in east-west and north-south directions, respectively. Figure II-3-6 also shows the relative locations and sizes of the three nested grids. The innermost domain presented in Figure II-3-6, excluding three boundary columns and rows, served as the CMAQ (Community Multiscale Air Quality Model) chemical transport modeling domain.

The WRF simulation employed 30 layers vertically with the lowest computational layer at approximately 20 m above ground level (agl) and the top layer at 50 hPa. Four-Dimensional Data Assimilation (FDDA) was conducted using grid analysis data enhanced with available surface and vertical sounding data. Sea surface temperatures (SST) are a critical control on the land-sea breeze and up-slope/down-slope flow. SST data from the Global Data Assimilation Experiment (GODAE) were used to update the WRF modeling every 6 hours to better represent the sea surface temperature. The Yon-Sei University (YSU) scheme[2] (Hong and

[1] Skamarock, W. C., J. B. Klemp, J. Dudhia, D. O. Gill, Z. Liu, J. Berner, W. Wang, J. G. Powers, M. G. Duda, D. M. Barker, and X.-Y. Huang (2019). A Description of the Advanced Research WRF Version 4. NCAR Tech. Note NCAR/TN-556+STR, 145 pp.
doi:10.5065/1dfh-6p97

[2] Hong, S.-Y., and H.-L. Pan (1996). Nonlocal boundary layer vertical diffusion in a medium-range forecast model. Mon. Wea. Rev., 124, 2322–2339, doi:10.1175/1520-0493

Pan, 1996) was used to model the planetary boundary layer (PBL). The flowchart (Figure II-3-7) of WRF simulation shows the meteorology input data, processing steps, observation nudging, and one-way nesting for high resolution inner domain.

After careful testing of different WRF physics options, the longwave radiation scheme of Rapid Radiative Transfer Model (RRTM)[3], the shortwave radiation scheme of Dudhia[4] and WRF Single-Moment 3-class scheme of micro physics were chosen for simulations. Kain-Fritsch cumulus schemes[5] were used in all three domains. The Pleim-Xiu land surface model (LSM) is used.

[3] Mlawer, E. J., S. J. Taubman, P. D. Brown, M. J. Iacono, and S. A. Clough (1997). Radiative transfer for inhomogeneous atmosphere: RRTM, a validated correlated-k model for the longwave. J. Geophys. Res., 102 (D14), 16 663 - 16 682.

[4] Dudhia, J. (1989), Numerical study of convection observed during the winter monsoon experiment using a mesoscale two-dimensional model, J. Atmos. Sci, 46(20), 3077–3107, doi:10.1175/1520-046919890463C3077:NSOCOD3E2.0.CO;2. 16 682.

[5] Kain, J.S. (2004). The Kain–Fritsch Convective Parameterization: An Update. J. Appl. Meteor., 43, 170–181.

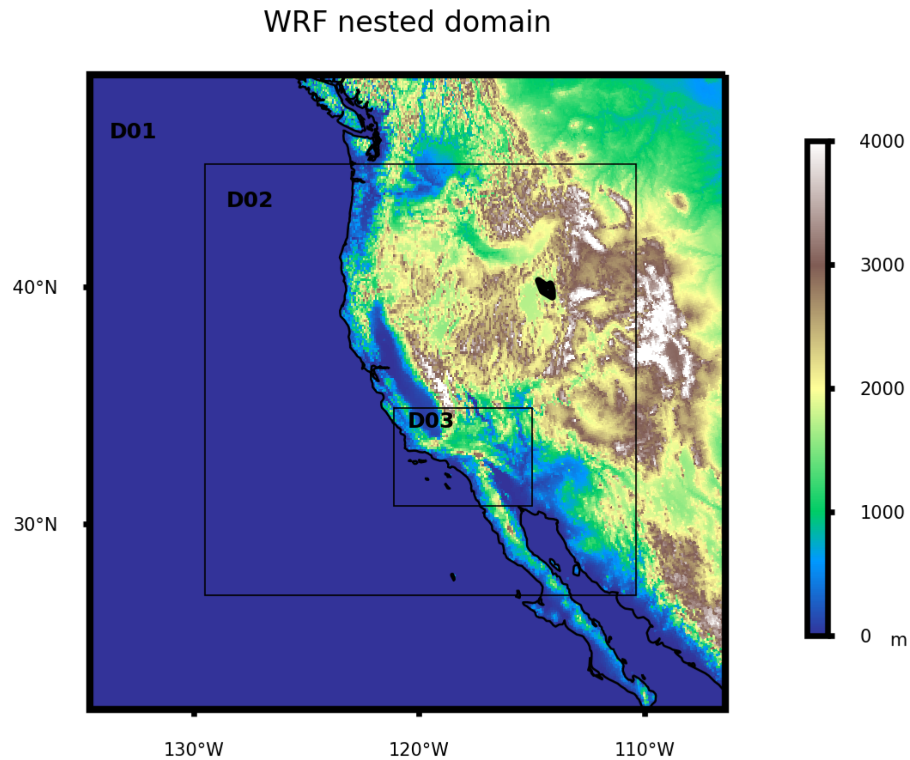


FIGURE II-3-6

THREE NESTED MODELING DOMAINS EMPLOYED IN THE WRF SIMULATIONS. COLOR SCALE INDICATES ELEVATION.

Table II-3-1 below provides a summary of the WRF configuration of the major options relevant for air quality modeling used for the ~~Draft 2024~~ PM2.5 Plan in comparison with the 2022 AQMP. Major parameters used for the ~~Draft 2024~~ PM2.5 Plan are similar to those used for the 2022 AQMP.

TABLE II-3-1

OVERVIEW OF WRF CONFIGURATION FOR ~~DRAFT 2024~~ PM2.5 PLAN IN COMPARISON WITH 2022 AQMP

Component	2022 AQMP	~~Draft 2024~~ PM2.5 Plan
Numerical Platform	WRF v4.0.3	WRF v4.4.2
Number of domains	3 nested domains	
Nested Domain setting	D01: 36 km (83 X 83)	
	D02: 12 km (169 X 169)	
	D03: 4 km (163 X 115)	
Number of vertical layers	30 layers, the lowest layer is at ~ 20 m agl.	
Simulation Length	4 days with 24-hour spin-up	
Initial and boundary values	NCEP NARR[1] Re-analysis (32 km X 32 km)	
Sea Surface Temperature	GHRSST[2]	
Boundary layer scheme	YSU[3] scheme	
Land Surface model	Unified Noah	Pleim-Xiu
Cumulus parameterization	Kain-Fritsch	
Micro physics	WRF Single-Moment 3-class	
Radiation	RRTM scheme for longwave, Dudhia scheme for shortwave	
Four-dimensional data analysis	Analysis nudging with NWS surface and upper air Measurements	

[1]NARR - North American Regional Reanalysis
[2]GHRSST - The Group for High Resolution Sea Surface Temperature (https://www.ghrsst.org/)
[3]YSU - Yon-Sei University

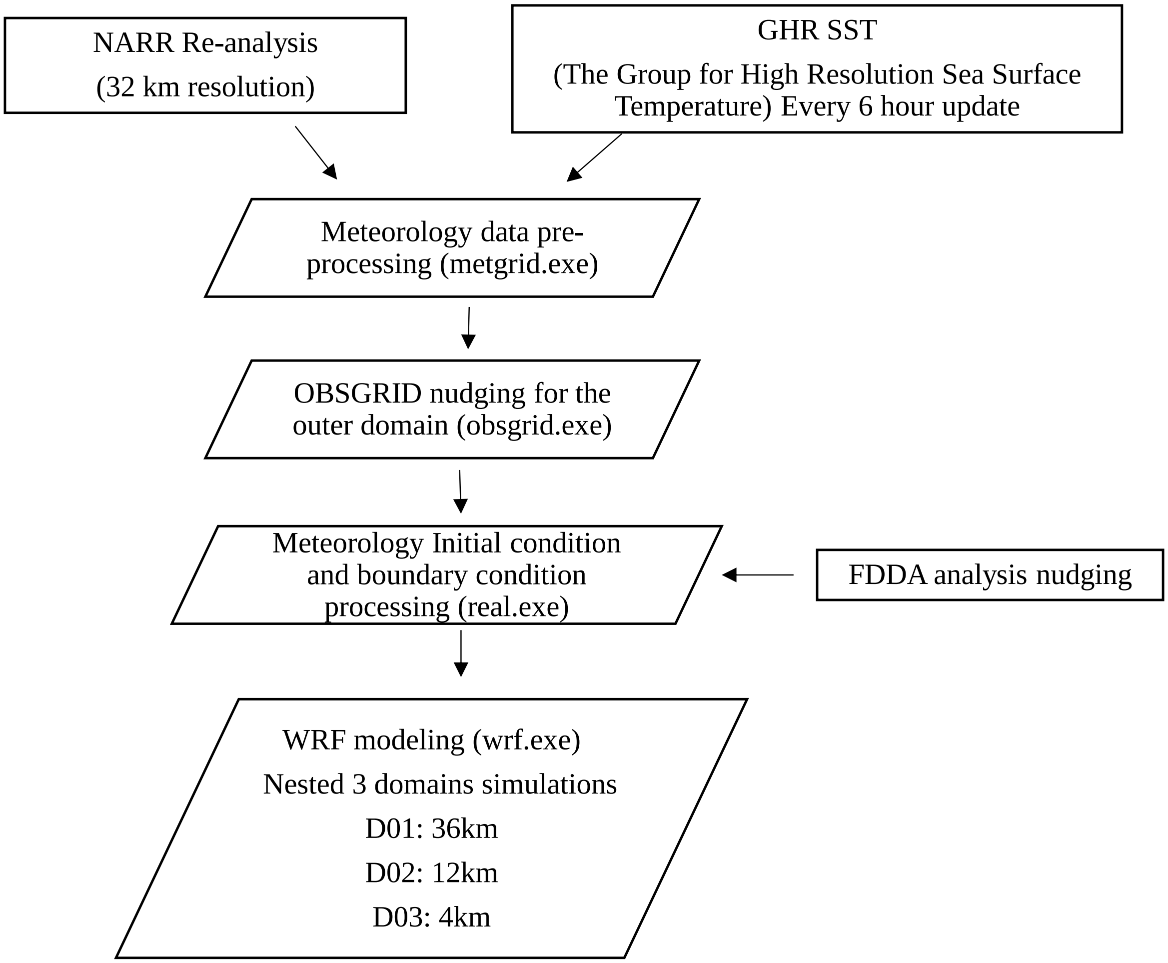


FIGURE II-3-7

FLOWCHART OF WRF SIMULATION FOR 2024 ~~DRAFT~~ PM2.5 PLAN

Model Performance Evaluation: Surface Level

The performance of the WRF simulations is summarized in Table II-3-2 for 4 quarters of 2018. All the results shown in Table II-3-2 are averaged values for the 15 airport weather stations. Overall, WRF simulations for 4 quarters provided representative meteorological fields that well characterized observed conditions in 2018. These fields were used directly in the CMAQ joint particulate simulations.

The performance of WRF simulations used as transport fields for CMAQ modeling is shown in Figure II-3-8 through Figure II-3-16. The model performance was evaluated for each month at airport stations in the model domain for January through December 2018. For simplicity, only one summer month (July) and one winter month (January) are shown in Figure II-3-8 through Figure II-3-16.

Three weather stations are carefully selected from near coastal areas (HHR, Hawthorne municipal Airport) through inland Orange County (FUL, Fullerton Municipal airport) to further east in San Bernardino County (CNO, Chino Airport) for surface level model performance evaluations. Diurnal variations of temperature, humidity and surface wind were well represented by the WRF simulations. Temperature and wind speed predictions were more accurate in the summer season than the winter months (Figure II-3-8 – Figure II-3-13). The observed temperature gradient from the coastal station of HHR to the inland station of CNO was also well characterized by the WRF model. Median observed summer temperatures in 2018 were 296.6, 298.7, and 300.9 K at HHR, FUL and CNO, respectively. The WRF model showed similar median temperature for these stations. Temperature is one of the key factors for atmospheric photochemical reactions, and high temperature is favorable for ozone formation. For the stations of CNO, the WRF simulations showed slight underestimation of daily high temperatures during July 2018. At the station of FUL and HHR, the WRF simulation showed better performance in predicting daily high temperatures in the summer. During the winter, daily high temperature predictions were closer to observed values during the 2nd half of January 2018 at all three stations. While the model tended to overpredict the daily minimum temperatures during the 2nd half of January 2018 at CNO and FUL.

Both observational data and WRF simulations at all stations showed distinct diurnal variations in wind speed during the summer, with a strong sea breeze in the early afternoon. Mostly, stronger wind speed indicates less accumulation of air pollutants. Daily maximum wind speeds were relatively consistent throughout July 2018, with much more variability observed during January 2018 (e.g., range of daily maximum wind speeds from ~2-13 m/s during January at CNO from both measurements and simulations). The model performance in predicting the wind speed was significantly better for July 2018 compared to January 2018 at all stations; R values for model-observation correlations were 0.81, 0.70, and 0.78 in July 2018 at CNO, FUL, and HHR stations, respectively. It is noticed that the model underestimated daily maximum wind speeds at the HHR station during July 2018.

The WRF model predicted water vapor mixing ratio trends well at all stations. The WRF simulations yield water vapor mixing ratios comparable to observed values in both January and July. The model-observation correlation coefficients are 0.85, 0.87, and 0.89 in January 2018 and 0.72, 0.70, and 0.71 in July 2018 at CNO, FUL, and HHR stations, respectively.

TABLE II-3-2

WRF PERFORMANCE STATISTICS FOR QUARTER AVERAGE OF 2018 AT 15 NWS STATIONS

	Statistic	Q1	Q2	Q3	Q4
T	T Mean Observation (K)	288.1	291.8	297.8	290.4
	T Mean Simulation (K)	287.1	292	297.4	289.6
	T Bias (K)	-1	0.2	-0.3	-0.8
	T Gross Error (K)	2	1.4	1.4	1.7
	T RMSE (K)	2.7	1.9	1.9	2.3
	Q Mean Observation (K)	5.8	8.1	10.8	6.6
Q	Q Mean Simulation (K)	6	8.5	12.2	7.3
	Q Bias (K)	0.3	0.4	1.4	0.7
	Q Gross Error (K)	1	0.9	1.7	1.3
	Q RMSE (K)	1.5	1.3	3	2
	WS Mean Observation (kg/kg)	2	2.7	2.6	1.9
WS	WS Mean Simulation (kg/kg)	2.1	2.5	2.5	1.9
	WS Bias (kg/kg)	0.1	-0.2	-0.1	0
	WS Gross Error (kg/kg)	1.4	1.2	1.1	1.4
	WS RMSE (kg/kg)	1.8	1.6	1.4	1.9

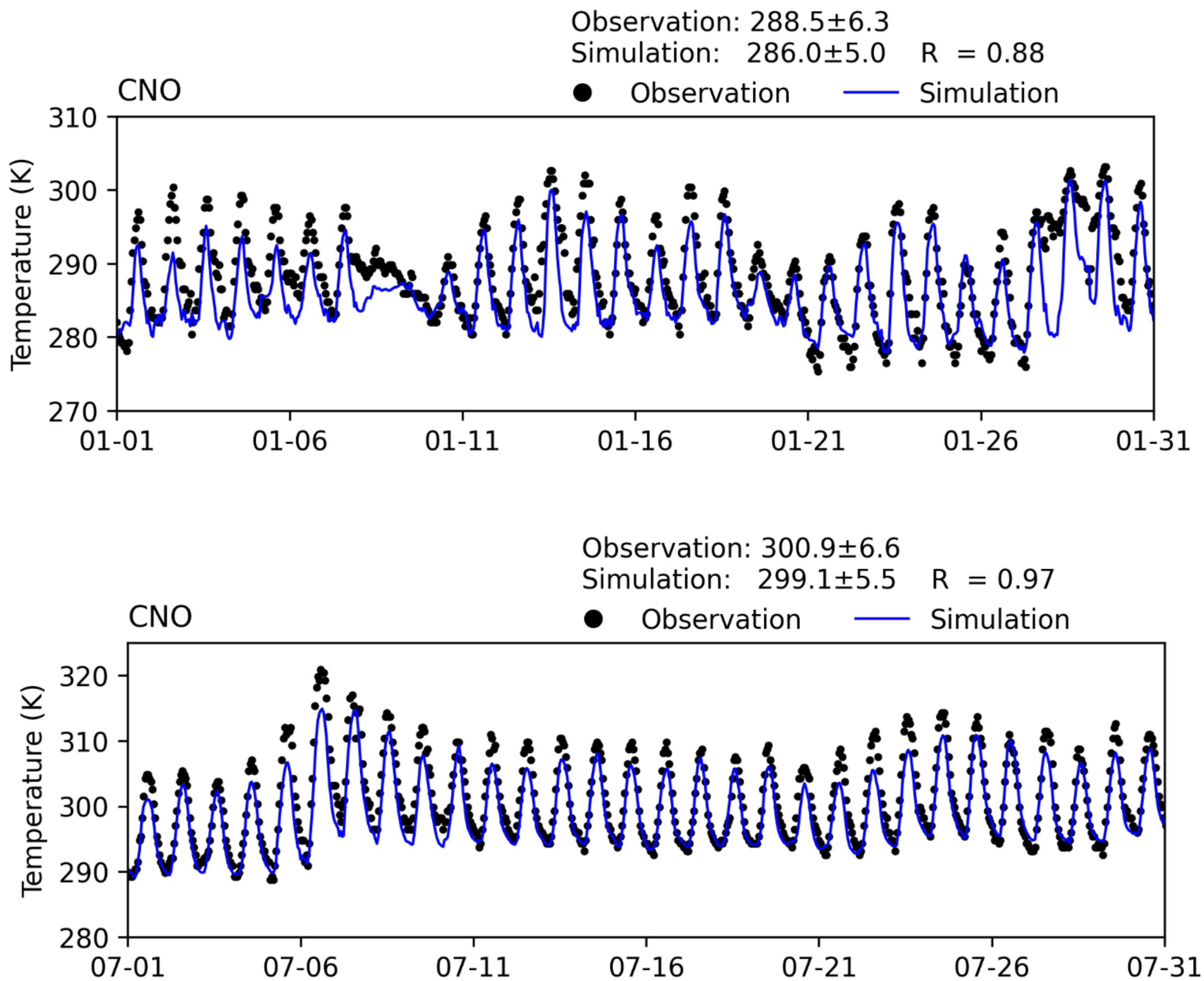


FIGURE II-3-8

TIME SERIES OF HOURLY TEMPERATURE FROM MEASUREMENT AND WRF SIMULATIONS AT CHINO (CNO) STATION FOR JANUARY 2018 AND JULY 2018

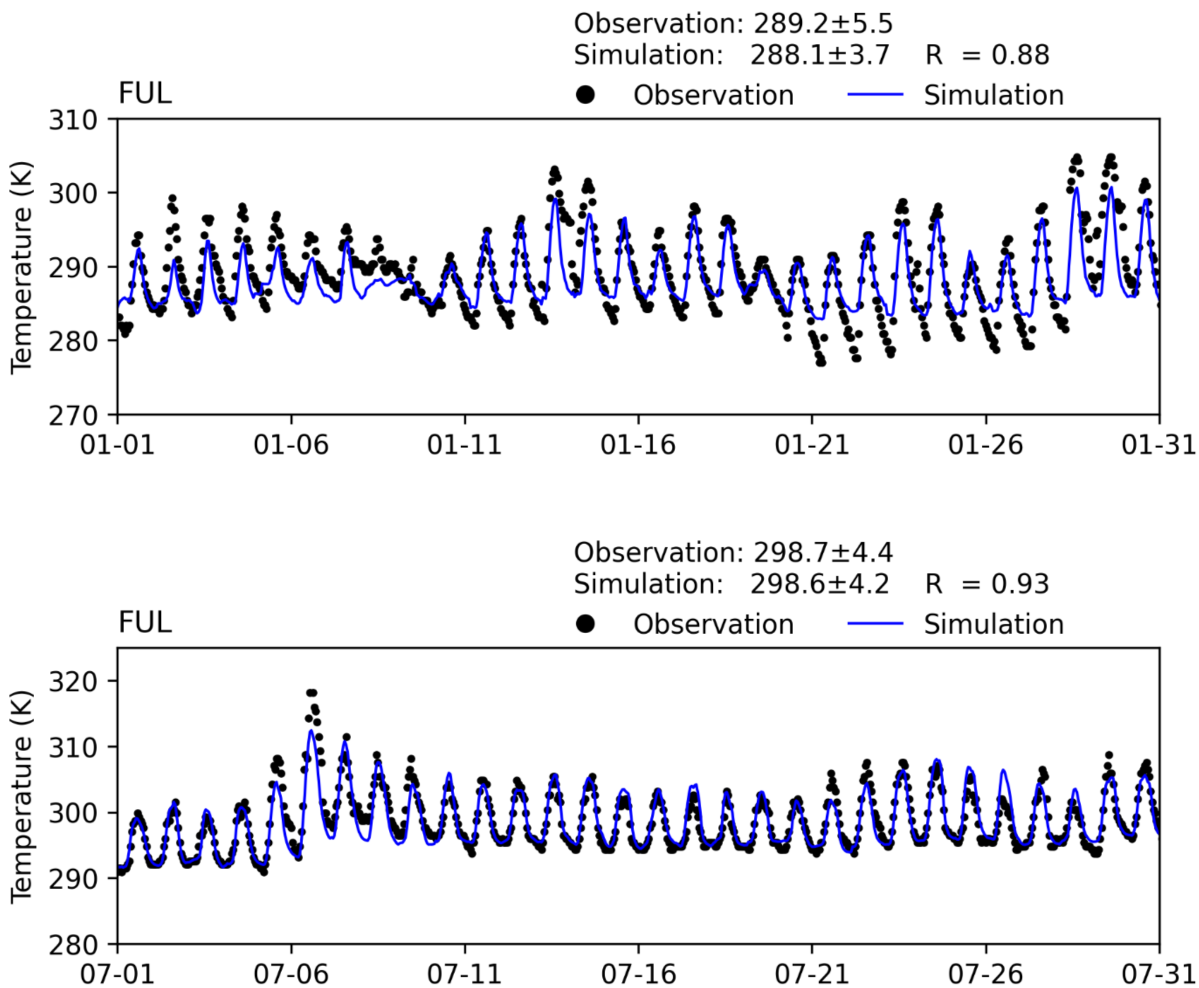


FIGURE II-3-9

TIME SERIES OF HOURLY TEMPERATURE FROM MEASUREMENTS AND WRF SIMULATIONS AT FULLERTON (FUL) STATION FOR JANUARY 2018 AND JULY 2018

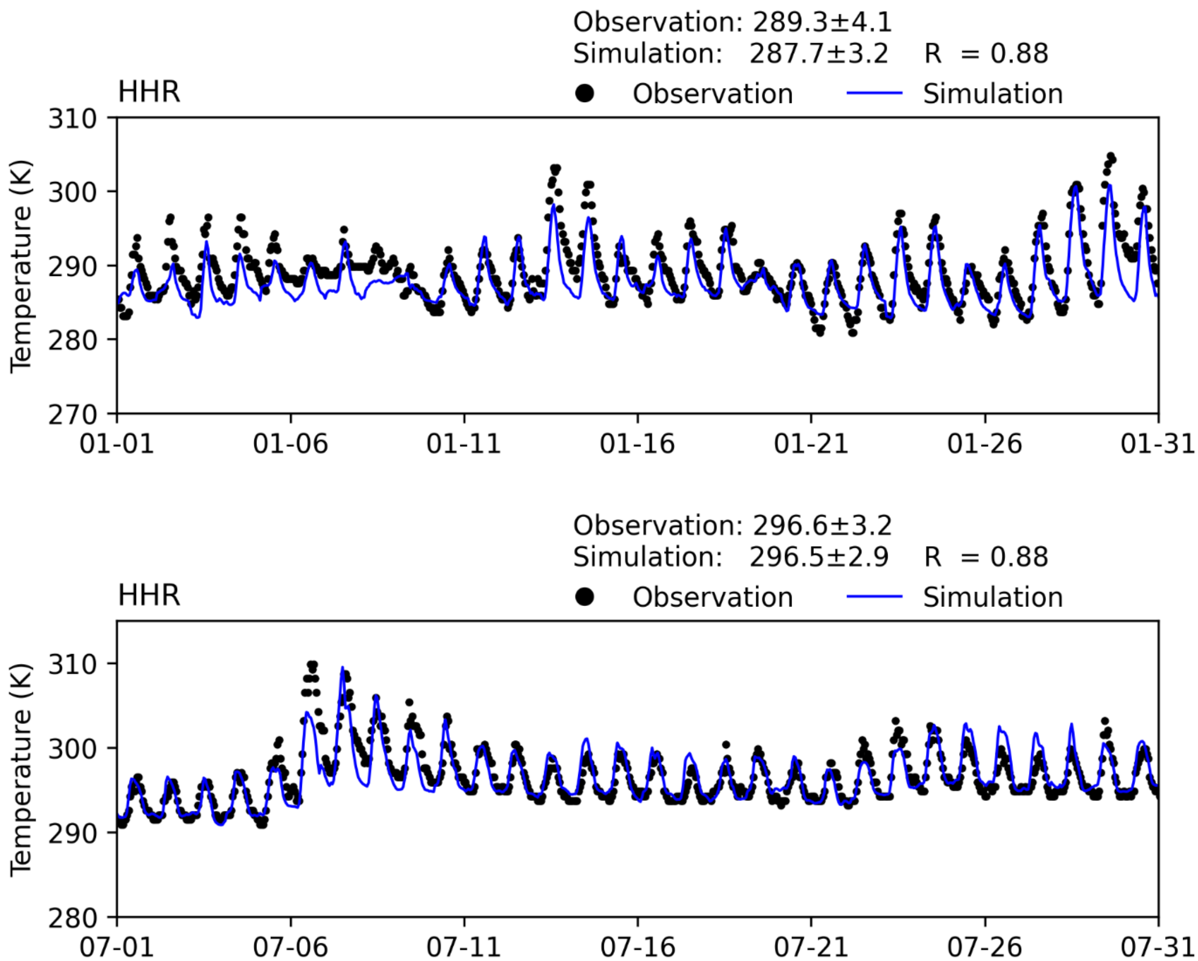
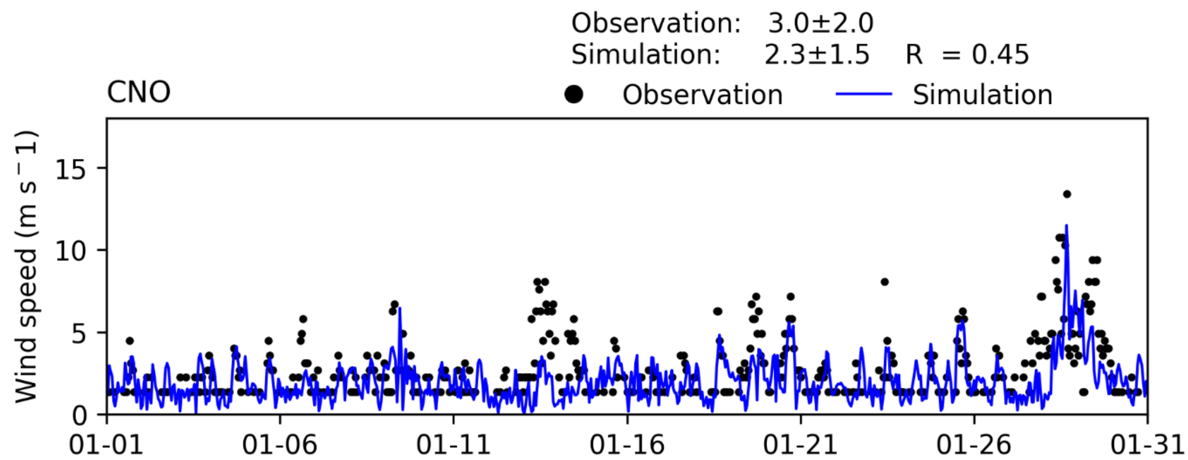


FIGURE II-3-10

TIME SERIES OF HOURLY TEMPERATURE FROM MEASUREMENTS AND WRF SIMULATIONS AT HAWTHORNE (HHR) STATION FOR JANUARY 2018 AND JULY 2018



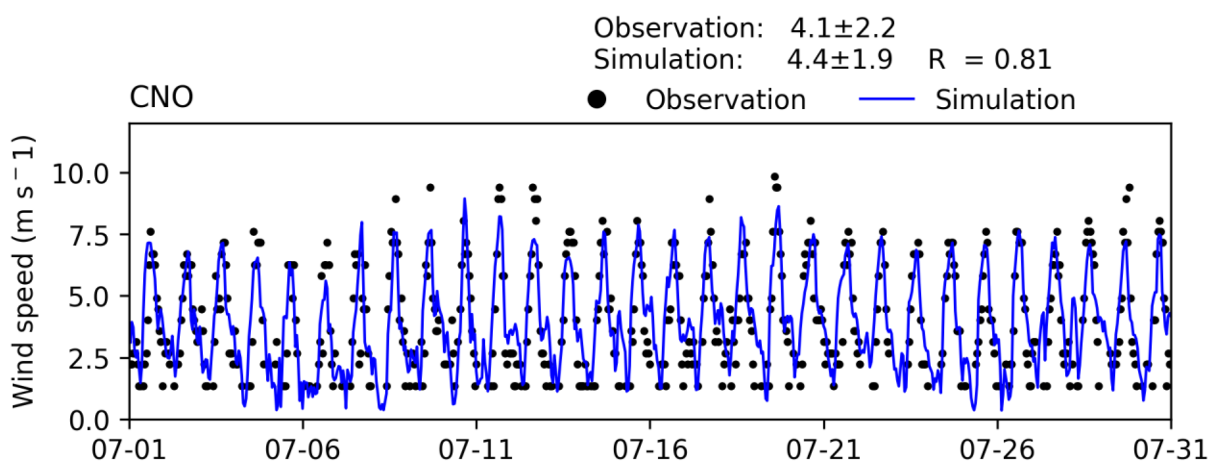


FIGURE II-3-11

TIME SERIES OF HOURLY WIND SPEED FROM MEASUREMENTS AND WRF SIMULATIONS AT CHINO (CNO) STATION FOR JANUARY 2018 AND JULY 2018

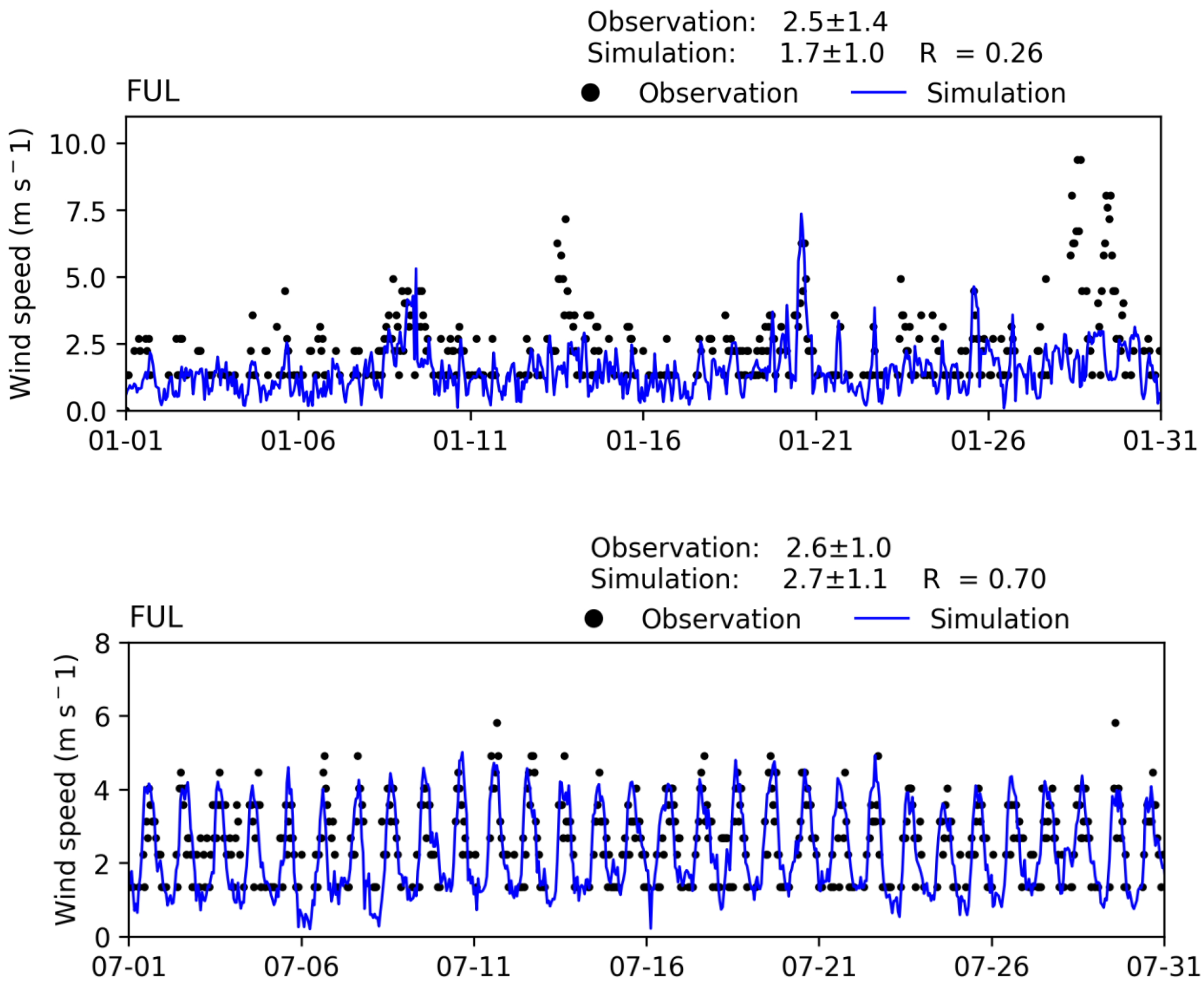
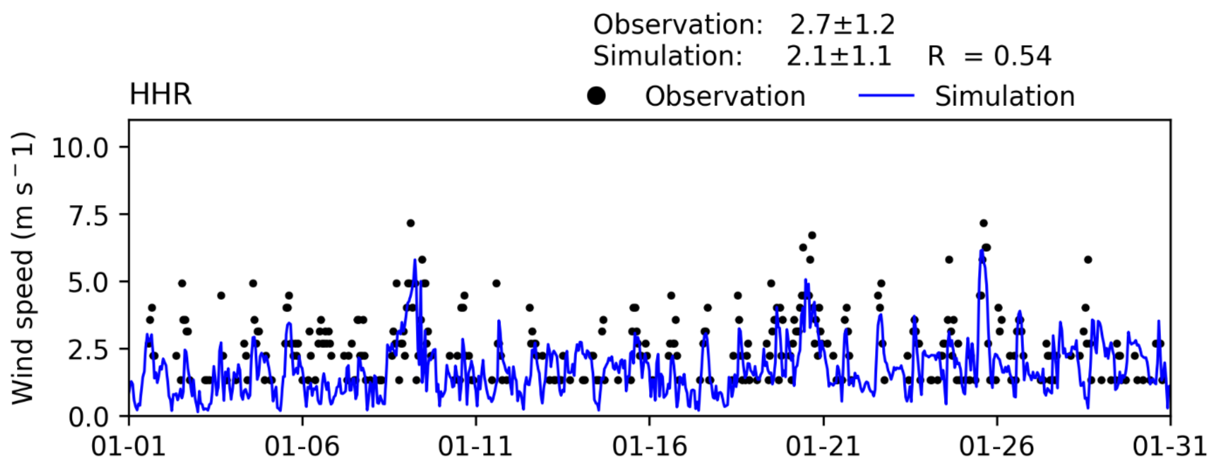


FIGURE II-3-12

TIME SERIES OF HOURLY WIND SPEED FROM MEASUREMENTS AND WRF SIMULATIONS AT FULLERTON (FUL) STATION FOR JANUARY 2018 AND JULY 2018



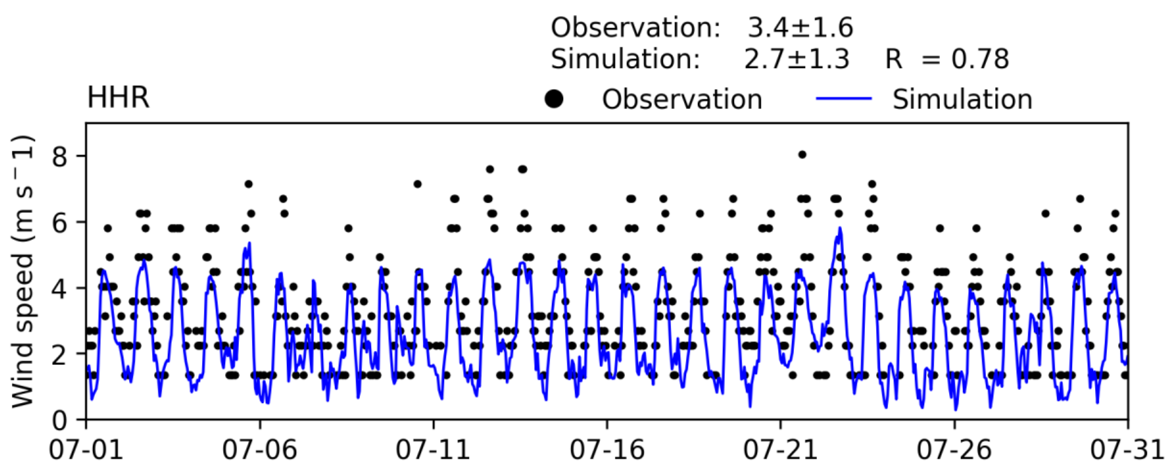


FIGURE II-3-13

TIME SERIES OF HOURLY WIND SPEED FROM MEASUREMENTS AND WRF SIMULATIONS AT HAWTHORNE (HHR) STATION FOR JANUARY 2018 AND JULY 2018

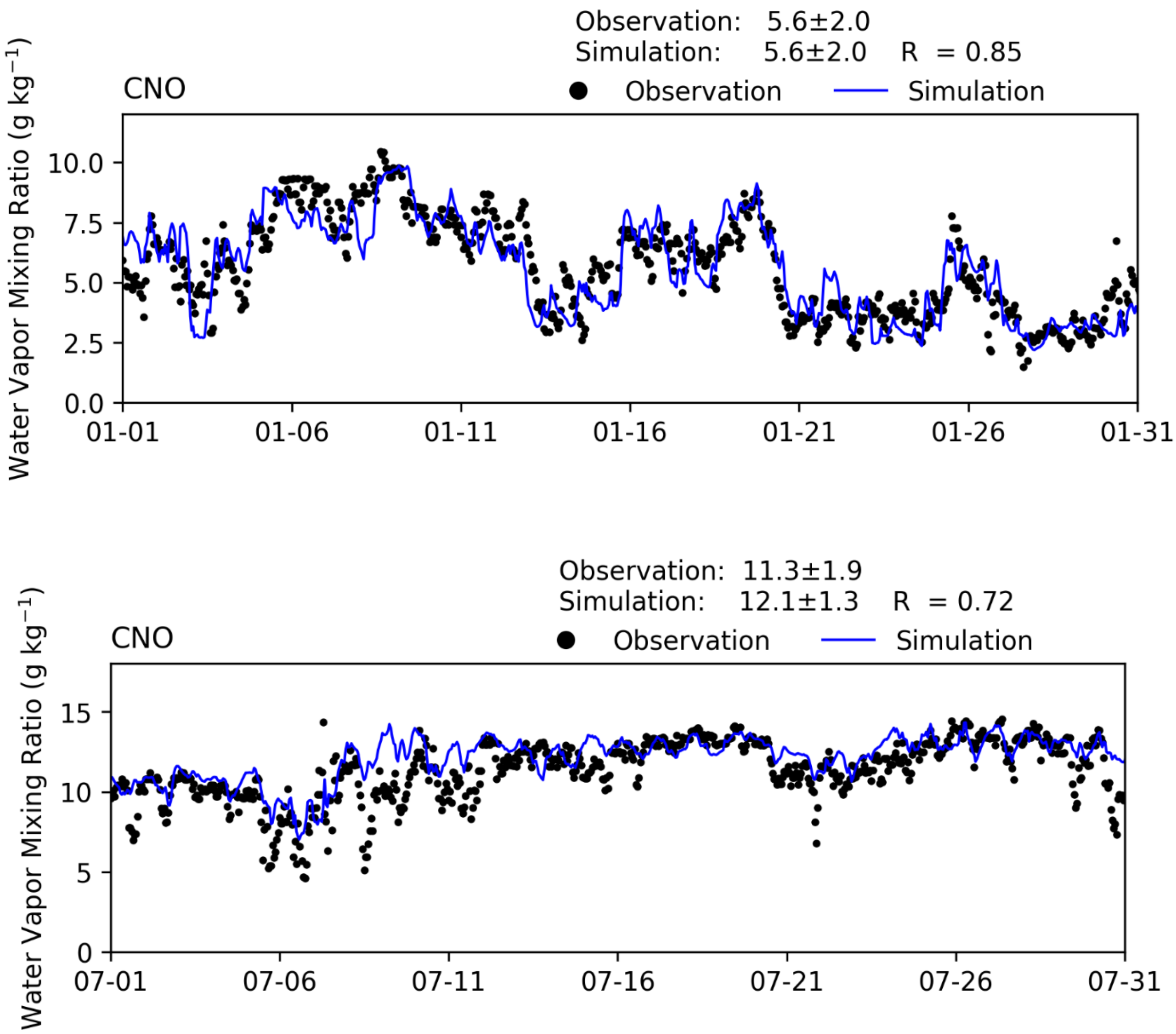
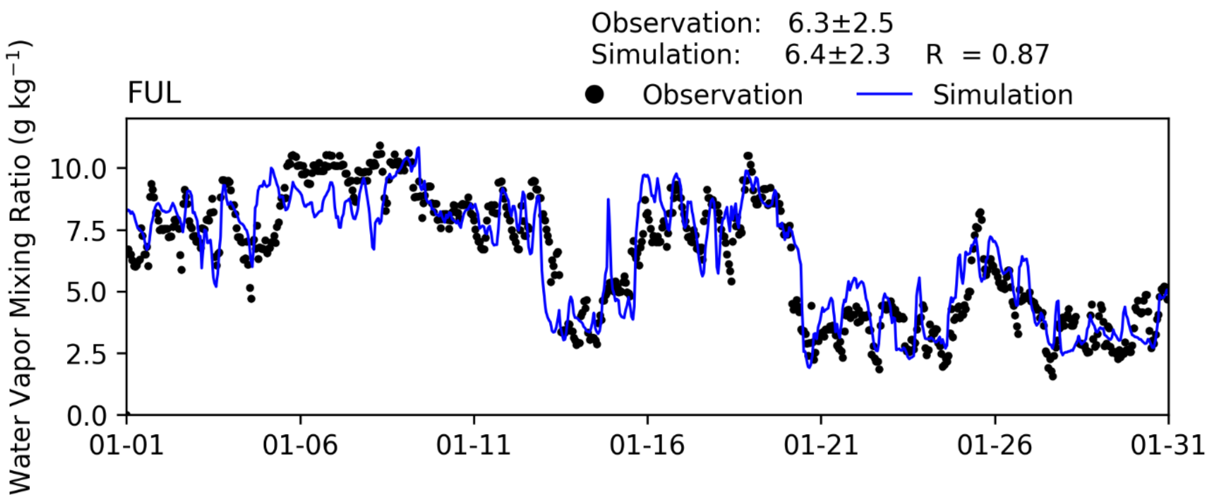


FIGURE II-3-14

TIME SERIES OF HOURLY WATER VAPOR MIXING RATIO FROM MEASUREMENTS AND WRF SIMULATIONS AT CHINO (CNO) STATION FOR JANUARY 2018 AND JULY 2018



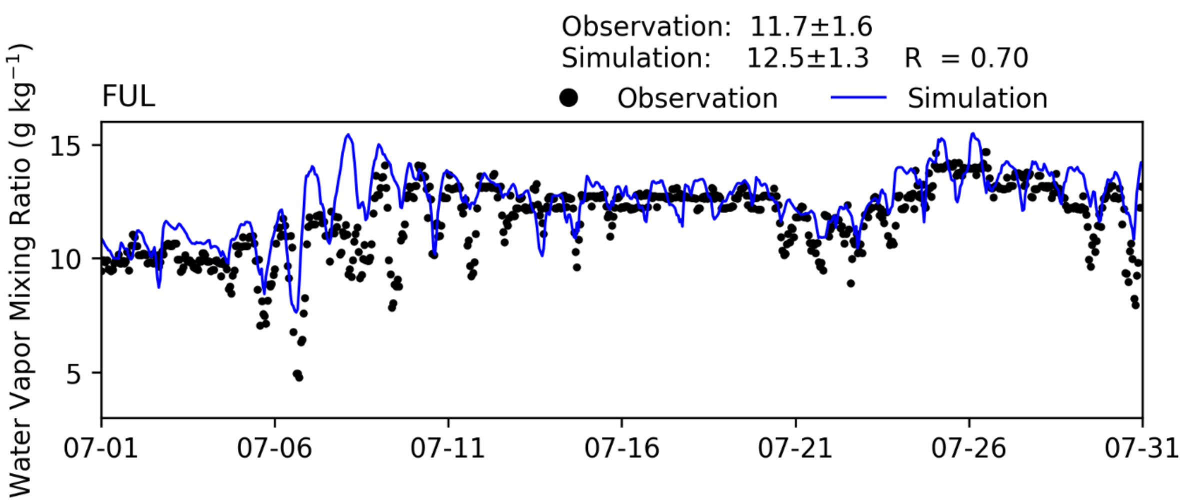


FIGURE II-3-15

TIME SERIES OF HOURLY WATER VAPOR MIXING RATIO FROM MEASUREMENTS AND WRF SIMULATIONS AT FULLERTON (FUL) STATION FOR JANUARY 2018 AND JULY 2018

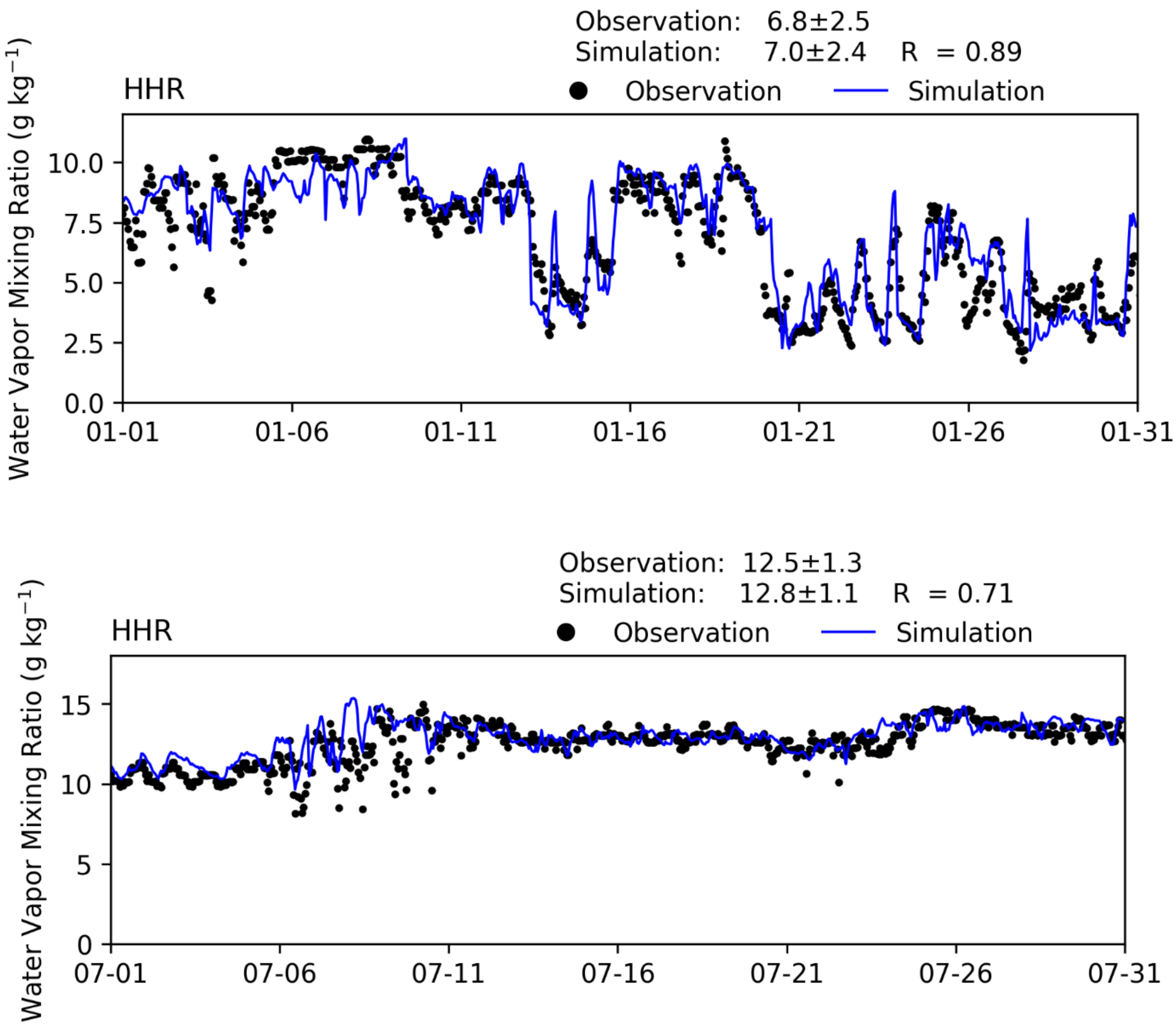


FIGURE II-3-16

TIME SERIES OF HOURLY WATER VAPOR MIXING RATIO FROM MEASUREMENTS AND WRF SIMULATIONS AT HAWTHORNE (HHR) STATION FOR JANUARY 2018 AND JULY 2018

Model Performance Evaluation: Diurnal Variations

Comparisons of simulated and measured monthly average diurnal temperature and water vapor mixing ratio variations at the Fullerton (FUL) station are shown in Figure II-3-17 and Figure II-3-18. Seasonal differences between summer and winter, as represented by July and January, respectively, and diurnal patterns were well reproduced in the WRF simulation. For example, daily temperatures in both observed and simulated diurnal profiles peaked around 14:00 local time during summer (~297 K) and winter (~290 K). Water vapor mixing ratios did not exhibit distinct diurnal variation in either observed or simulated data.

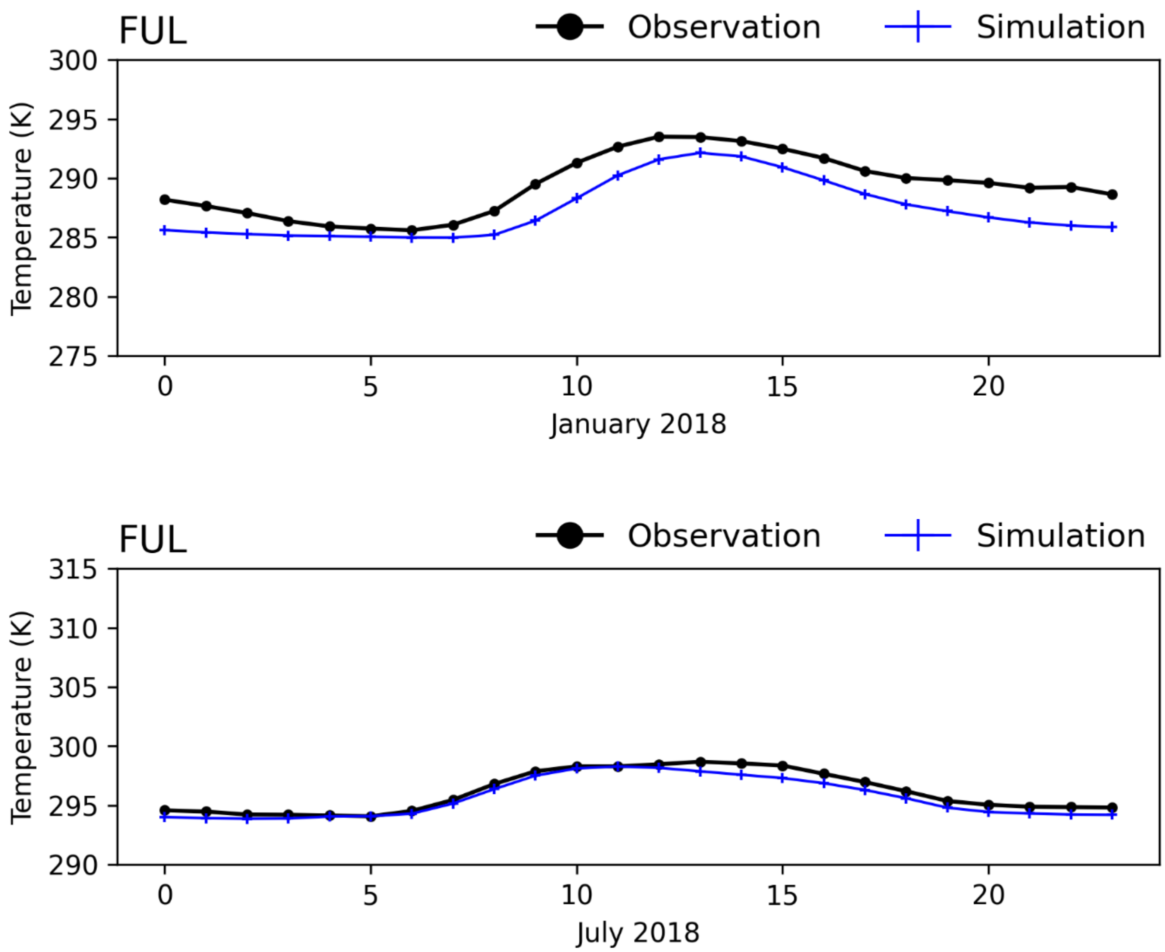


FIGURE II-3-17

MEASURED VS. SIMULATED COMPOSITE DIURNAL TEMPERATURE VARIATION AT FULLERTON (FUL) STATION FOR JANUARY 2018 AND JULY 2018

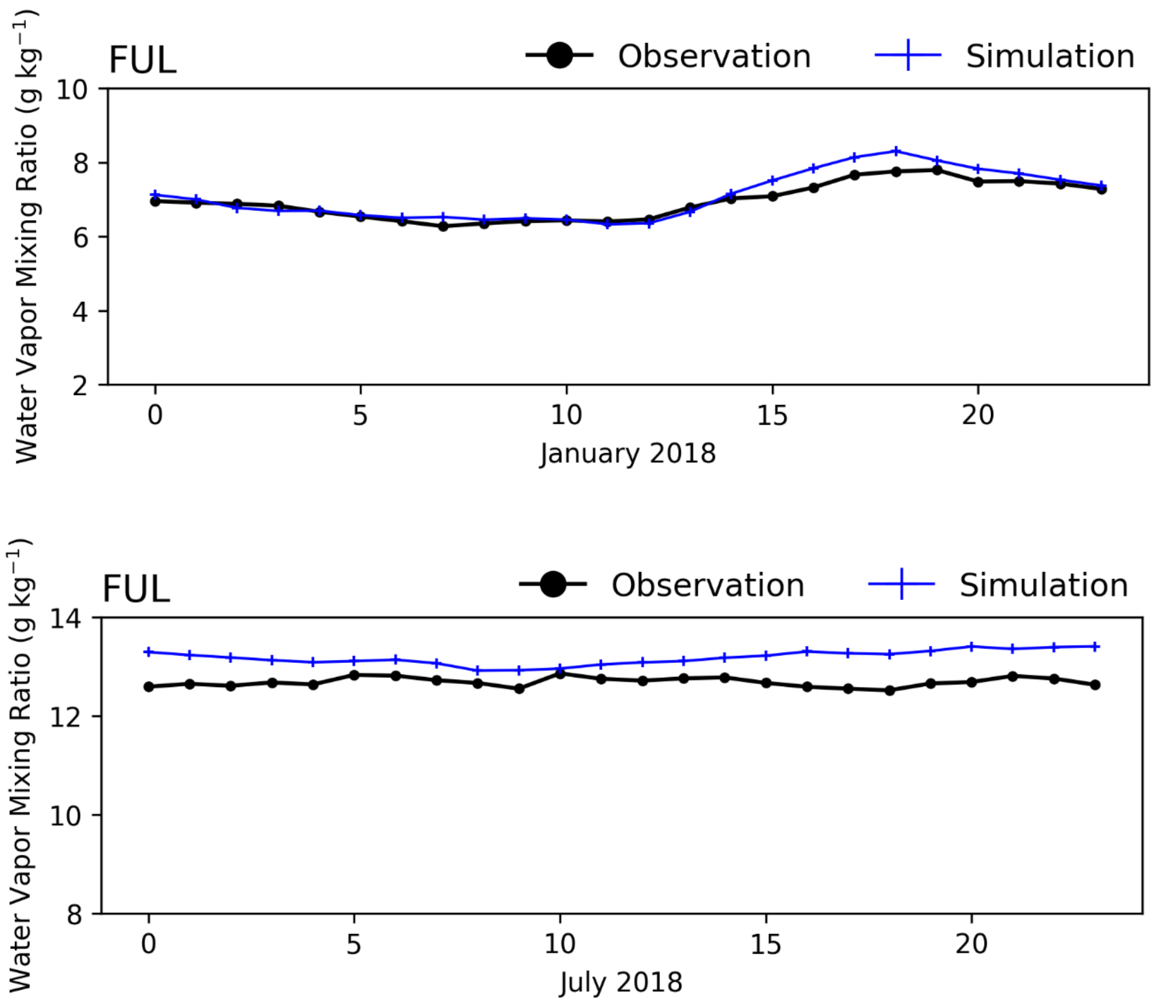


FIGURE II-3-18

WATER VAPOR MIXING RATIO AT FULLERTON (FUL) STATION FROM MEASUREMENTS AND WRF SIMULATIONS FOR JANUARY 2018 AND JULY 2018

Model Performance Evaluation: Wind Rose

The measured and WRF simulated wind rose at each station for 1-year period of January – December 2018 are shown in Figure II-3-19 – Figure II-3-23. Consistent with the sections above, the wind rose at HHR (near coastal areas), FUL (inland Orange County) and CNO (further east in San Bernardino County) are presented. Another two stations: BUR (inland Los Angeles County) and ONT (San Bernardino County) are included as well to evaluate the model performance in further downwind areas. In general, the WRF simulations reproduce the dominant wind direction as the measurements at each station. For example, model and observations both show that westerly and south-westerly directions are the prevailing wind directions for the stations of CNO, FUL, HHR and ONT. The wind direction is mostly from the southeast at the BUR station, as presented in both observations and simulations. For the wind speed, among the five stations, the FUL and BUR stations have calm winds, mostly under 6 m/s, while other stations showed stronger wind between 6 - 8 m/s. In general, the WRF simulation underestimates the observed wind speed at HHR and ONT stations. Overall, WRF simulates surface wind speed and direction reasonably well as shown in the wind roses.

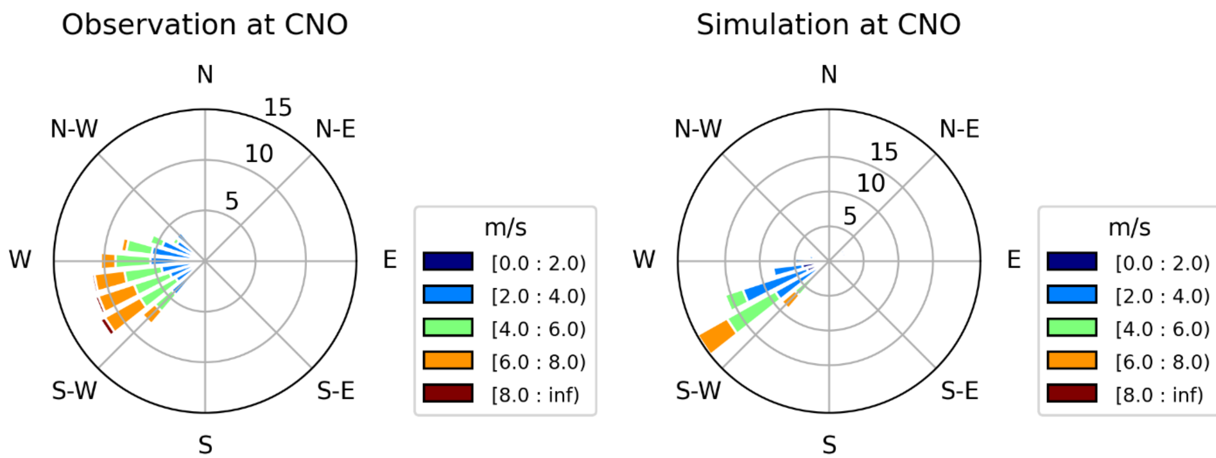


FIGURE II-3-19

WIND ROSE FROM MEASUREMENT AND WRF SIMULATION AT CHINO (CNO) STATION IN 2018

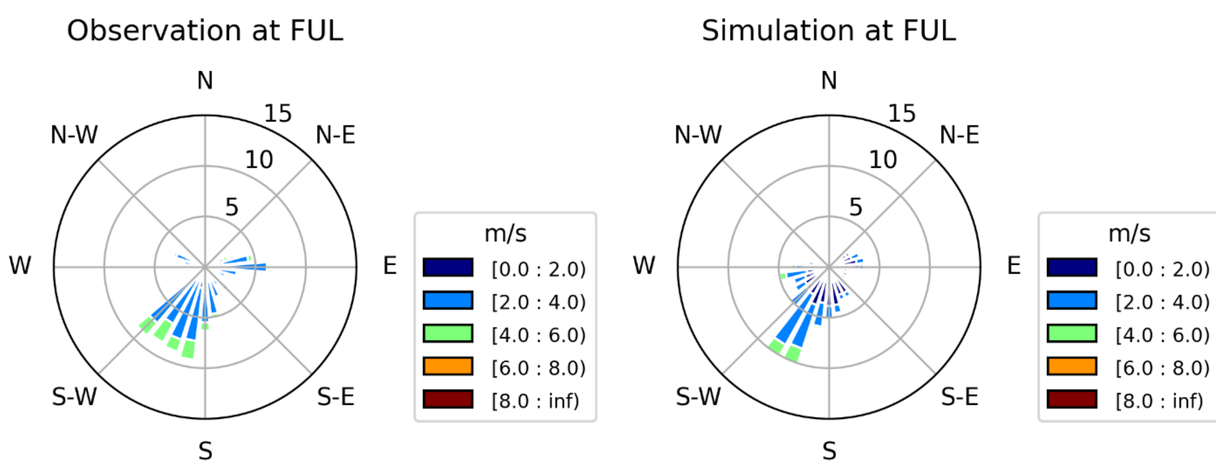


FIGURE II-3-20

WIND ROSE FROM MEASUREMENT AND WRF SIMULATION AT FULLERTON (FUL) STATION IN 2018

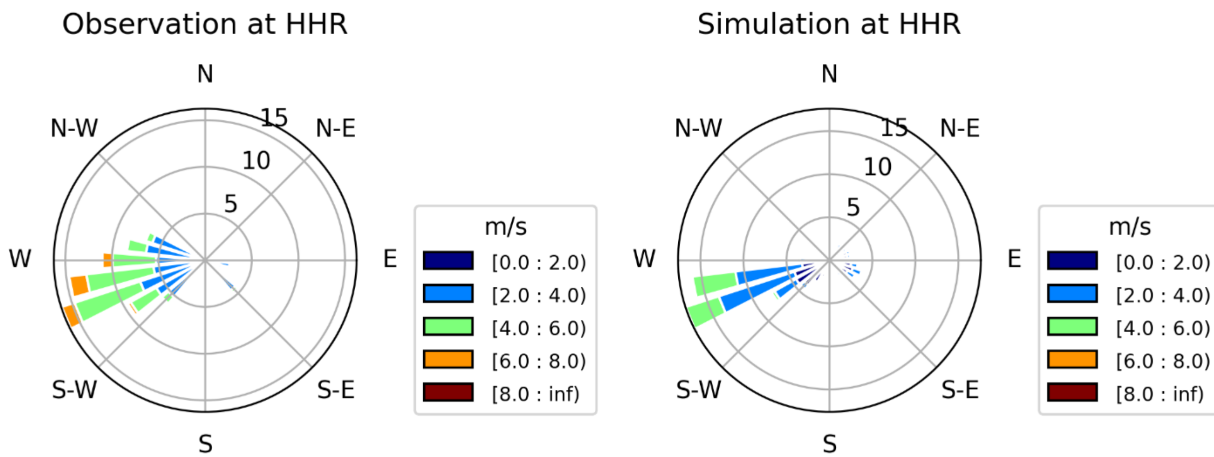


FIGURE II-3-21

WIND ROSE FROM MEASUREMENT AND WRF SIMULATION AT HAWTHORNE (HHR) STATION IN 2018

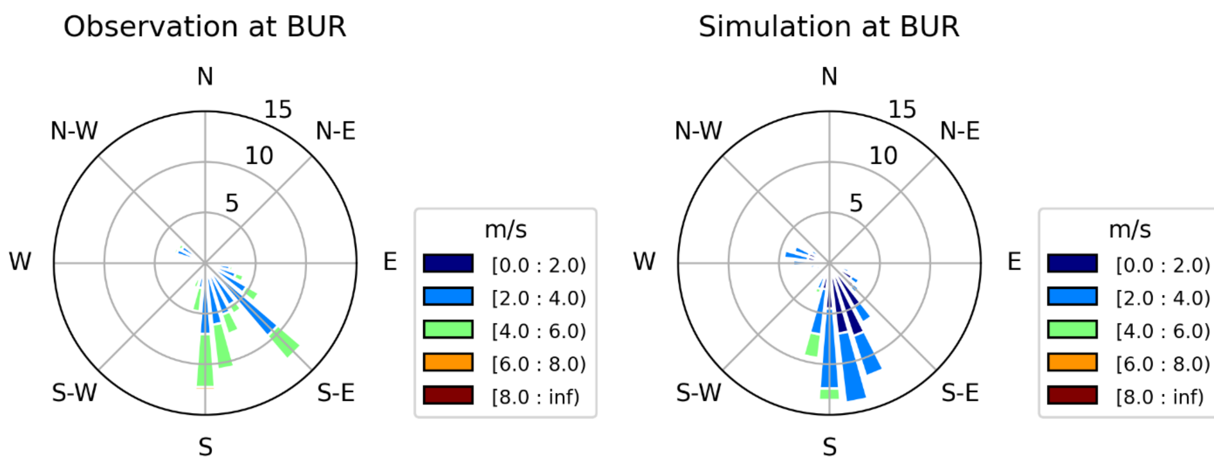


FIGURE II-3-22

WIND ROSE FROM MEASUREMENT AND WRF SIMULATION AT BURBANK (BUR) STATION IN 2018

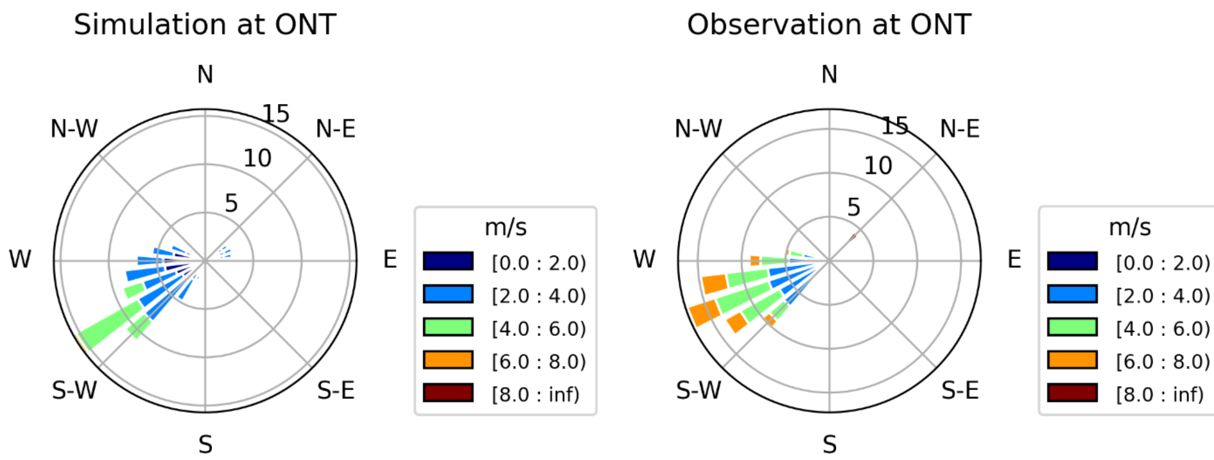


FIGURE II-3-23

WIND ROSE FROM MEASUREMENT AND WRF SIMULATION AT ONTARIO (ONT) STATION IN 2018

Model Performance Evaluation: Planetary Boundary Layer Height

Time series of hourly PBLH from ceilometer measurements and WRF simulations at ONT and IRV during July 2018 are shown in Figure II-3-24. Simulated PBLHs generally showed good agreement with ceilometer derived PBLHs except for very high reported PBLH values (> 2 km). These very high PBLH measurements may have been measurements artifacts caused by cloud interference in ceilometer profiles. Time series of average PBLH diurnal variation from measurements and WRF simulations for the summer season (June-August 2018) at ONT and IRV are shown in Figure II-3-24. The diurnal cycle in PBL height was well captured by the simulations. For example, at ONT, both measured and simulated PBLHs were lowest during early morning, increased to maximum values of ~800m at midday due to stronger convection and vertical mixing, and then slowly decayed to lower heights during the late afternoon and early night. Usually, the days with lower PBL height will lead to lower ventilation of air pollutions, and higher PBL height will help with dispersion of surface pollutions.

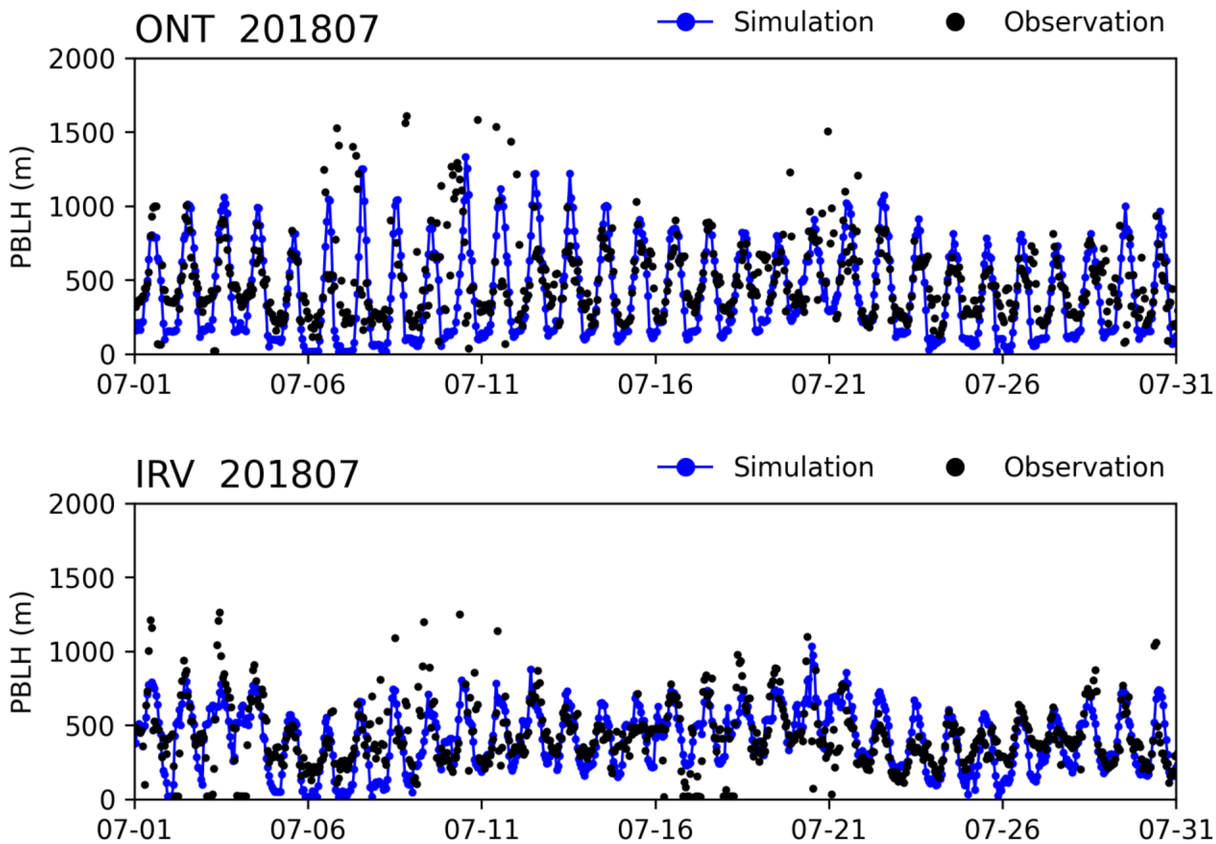


FIGURE II-3-24

TIME SERIES OF HOURLY PBLH FROM CEILOMETER MEASUREMENTS AND WRF SIMULATIONS FOR JULY 2018 AT ONTARIO (ONT) STATION AND AT IRVINE (IRV) STATION

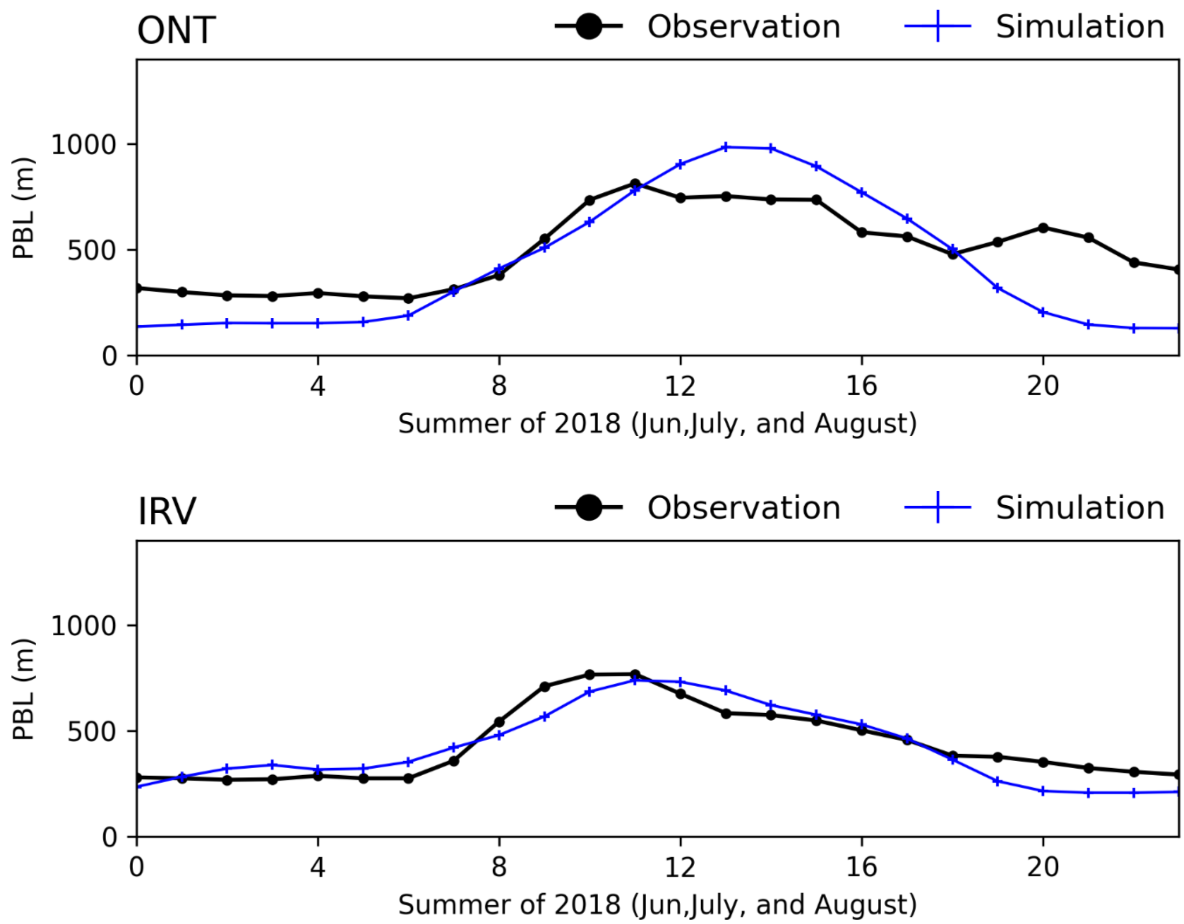


FIGURE II-3-25

TIME SERIES OF SEASONAL COMPOSED PBLH DIURNAL VARIATION FROM CEILOMETER MEASUREMENT AND WRF SIMULATIONS FOR SUMMER SEASON (JUNE-AUGUST 2018) AT ONTARIO (ONT) STATION AND IRVINE (IRV) STATION

Sensitivity Test of Planetary Boundary Layer Scheme

A set of WRF sensitivity simulations regarding the planetary boundary layer scheme was conducted. The planetary boundary layer scheme of Asymmetric Convective Model version 2 (ACM2)[6] (Pleim, J. E., 2007) was tested in the WRF model. Comparing this set of sensitivity simulations with the simulation with YSU planetary boundary layer scheme, statistical results for temperature, water vapor and wind predictions are similar for both winter and summer seasons. The ACM2 PBL scheme showed slightly better performance for temperature and water vapor mixing ratio comparing with the YSU PBL scheme. The

[6] Pleim, J. E. (2007). A Combined Local and Nonlocal Closure Model for the Atmospheric Boundary Layer. Part I: Model Description and Testing. J. Appl. Meteor. Climatol., 46, 1383–1395, https://doi.org/10.1175/JAM2539.1.

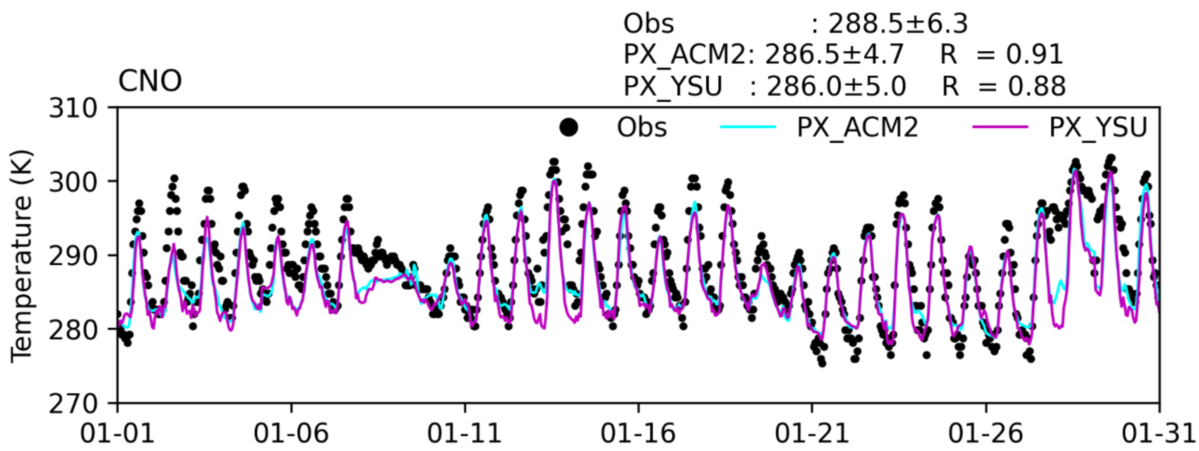
YSU PBL scheme had marginally better performance for wind speed and the ACM2 PBL scheme has small lower bias for wind speed.

TABLE II-3-3

WRF PERFORMANCE STATISTICS FOR QUARTER AVERAGE OF 2018 AT 15 NWS STATIONS

	Statistic	Q1	Q2	Q3	Q4
T	T Mean Observation (K)	288.1	291.8	297.8	290.4
	T Mean Simulation (K)	287.3	292.4	297.8	289.7
	T Bias (K)	-0.8	0.6	0	-0.7
	T Gross Error (K)	1.9	1.6	1.5	1.7
	T RMSE (K)	2.6	2.1	2	2.3
Q	Q Mean Observation (K)	5.8	8.1	10.8	6.6
	Q Mean Simulation (K)	5.7	8.2	11.9	7
	Q Bias (K)	-0.1	0.1	1.1	0.4
	Q Gross Error (K)	0.9	0.9	1.6	1.2
	Q RMSE (K)	1.4	1.3	2.9	1.9
WS	WS Mean Observation (kg/kg)	2	2.7	2.6	1.9
	WS Mean Simulation (kg/kg)	2	2.4	2.3	1.8
	WS Bias (kg/kg)	0	-0.3	-0.3	-0.1
	WS Gross Error (kg/kg)	1.4	1.3	1.2	1.4
	WS RMSE (kg/kg)	1.8	1.6	1.5	1.9

The performance of the WRF simulations with ACM2 PBL scheme is summarized in Table II-3-3 for 4 quarters of 2018. All the results shown in Table II-3-3 are averaged values for the 15 airport weather stations. Overall, the results from YSU PBL scheme and YSU PBL scheme are consistent with each other with small discrepancies. Both WRF simulations proved representative meteorological fields that well characterized the observed values in summer and winter of 2018.



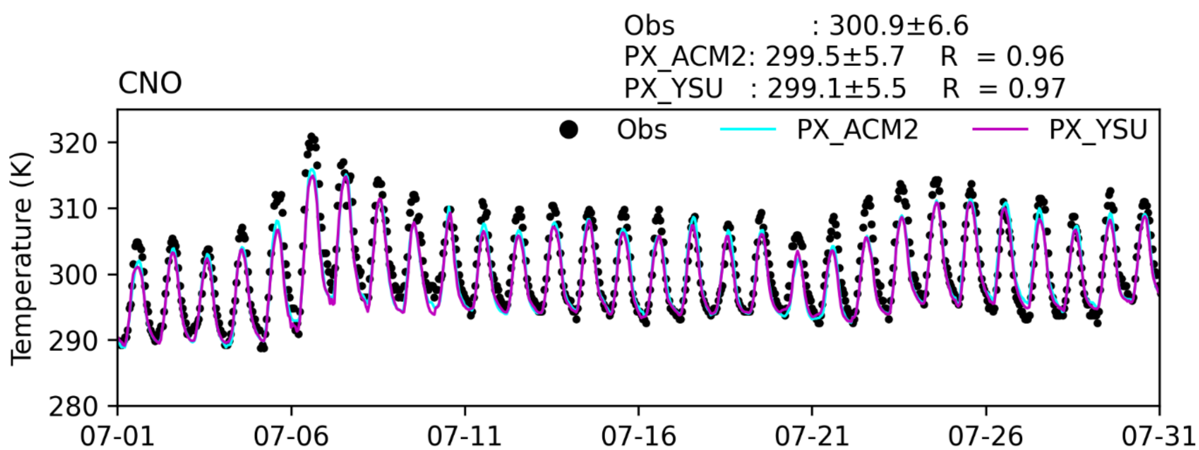
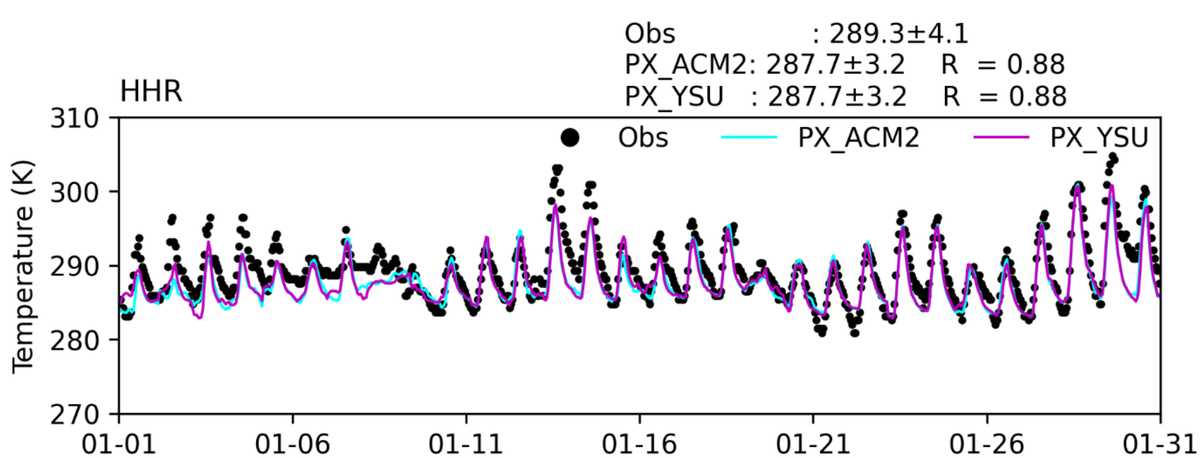


FIGURE II-3-26

TIME SERIES OF HOURLY TEMPERATURE FROM MEASUREMENT AND WRF SIMULATIONS AT CHINO (CNO) STATION FOR JANUARY 2018 AND JULY 2018



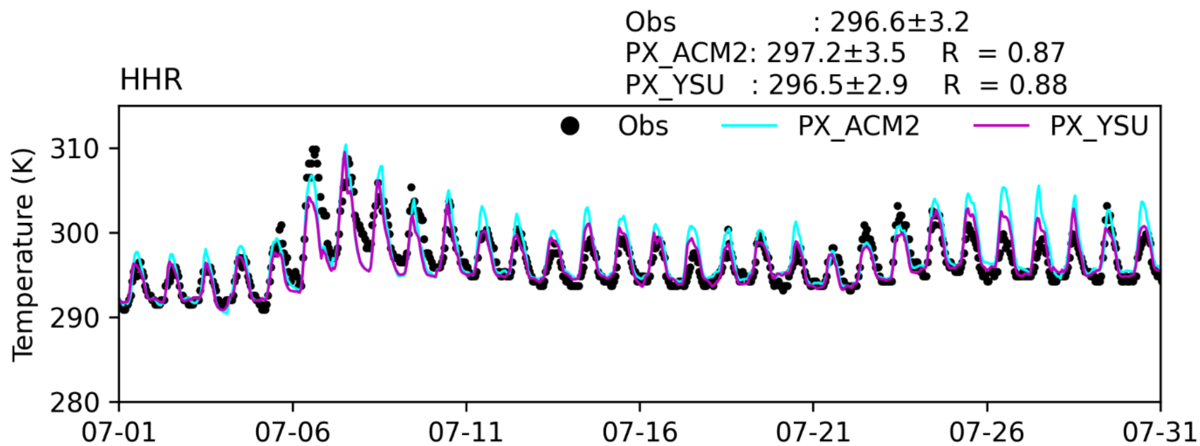
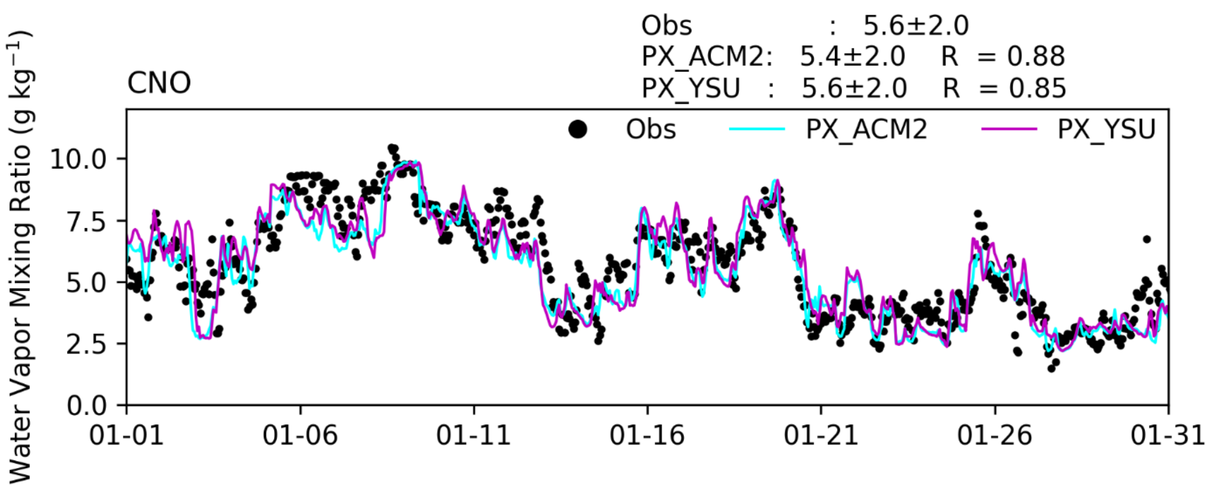


FIGURE II-3-27

TIME SERIES OF HOURLY TEMPERATURE FROM MEASUREMENTS AND WRF SIMULATIONS AT HAWTHORNE (HHR) STATION FOR JANUARY 2018 AND JULY 2018



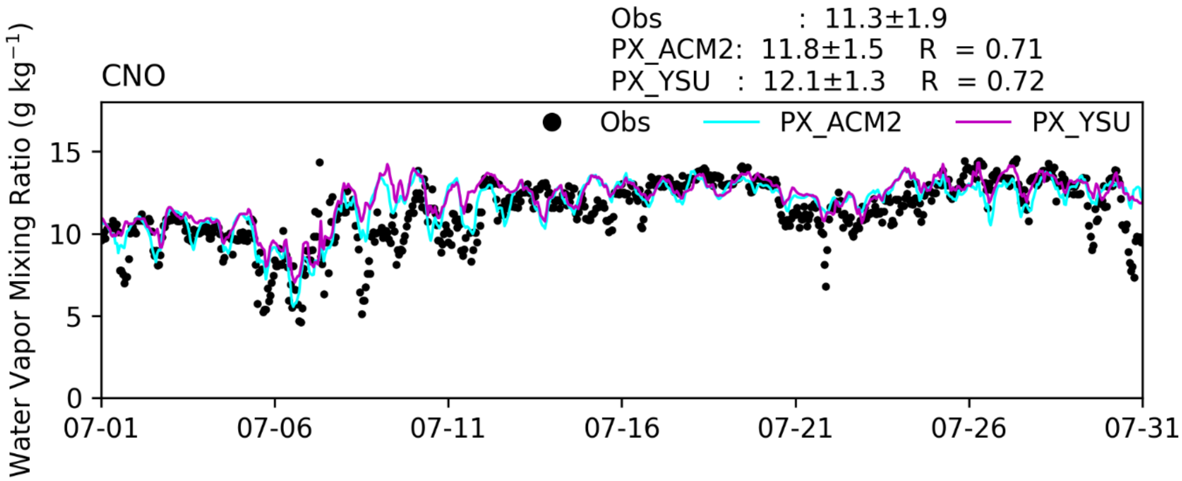


FIGURE II-3-28

TIME SERIES OF HOURLY WATER VAPOR MIXING RATIO FROM MEASUREMENTS AND WRF SIMULATIONS AT CHINO (CNO) STATION FOR JANUARY 2018 AND JULY 2018

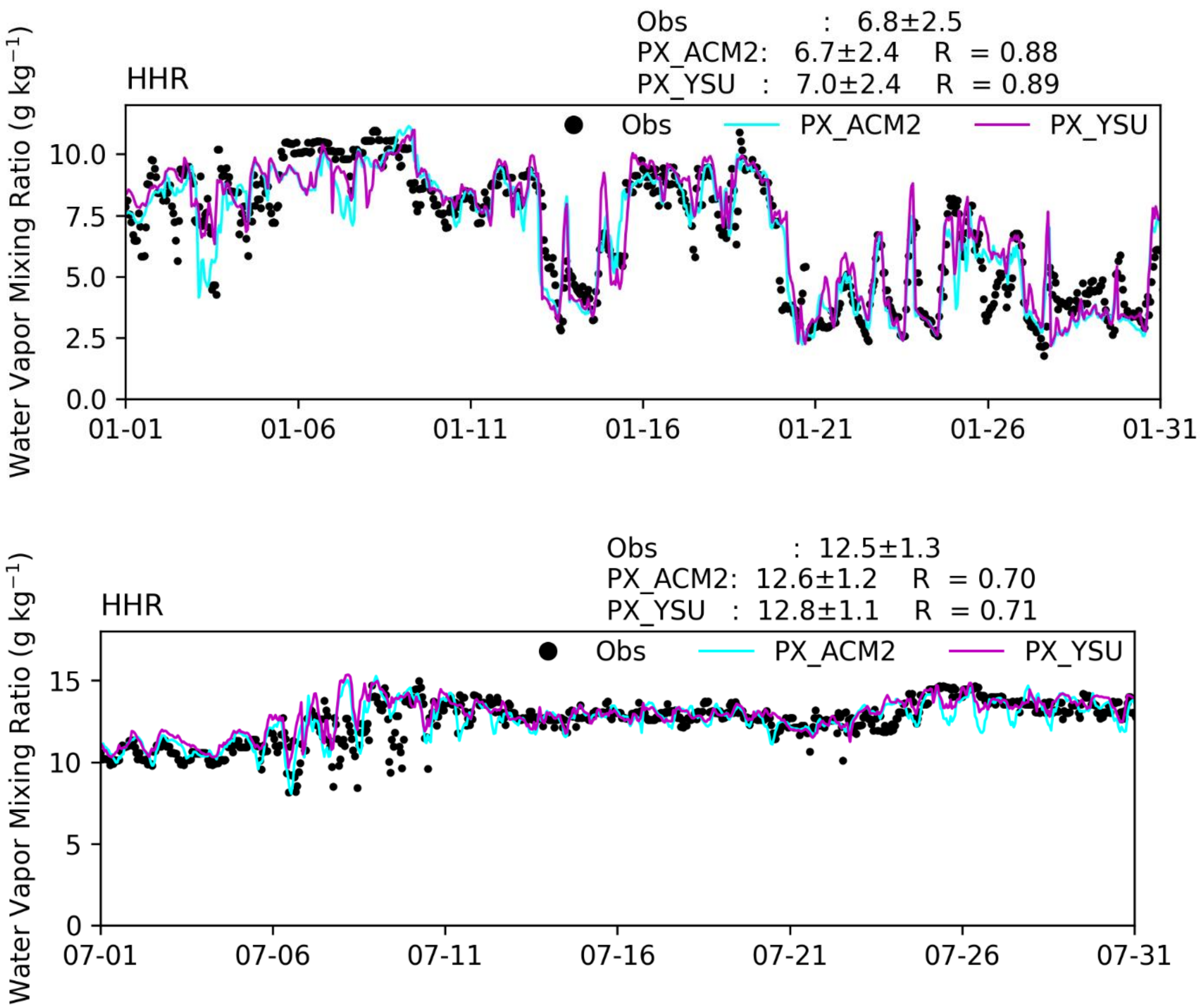


FIGURE II-3-29

TIME SERIES OF HOURLY WATER VAPOR MIXING RATIO FROM MEASUREMENTS AND WRF SIMULATIONS AT HAWTHORNE (HHR) STATION FOR JANUARY 2018 AND JULY 2018

The surface level model performance comparison between the YSU PBL scheme and ACM2 PBL scheme were evaluated for each month at airport stations in the model domain for January through December 2018. For simplicity, only one summer month (July) and one winter month (January) are shown in Figure II-3-26 through Figure II-3-29. Two stations were selected as examples for surface level model performance evaluation: CNO and HHR. The station of CNO represents inland area and the station of HHR represents coastal climate. In general, the two sets of WRF simulations generated similar hourly temperature and water vapor mixing ratio at each station. The WRF simulations with ACM2 PBL scheme have slightly higher daily maximum temperatures during winter, while it shows warm bias during summertime in the coastal station of HHR. For water vapor mixing ratio, the WRF simulations with ACM2 PBL scheme showed lower values comparing with the WRF simulations with YSU PBL scheme. In all, the performance of WRF with ACM2 PBL scheme is very close to WRF with YSU PBL scheme and the

WRF with YSU PBL scheme was used as the primary model platform to generate meteorological fields for the ~~Draft~~ PM2.5 ~~plan~~Plan.

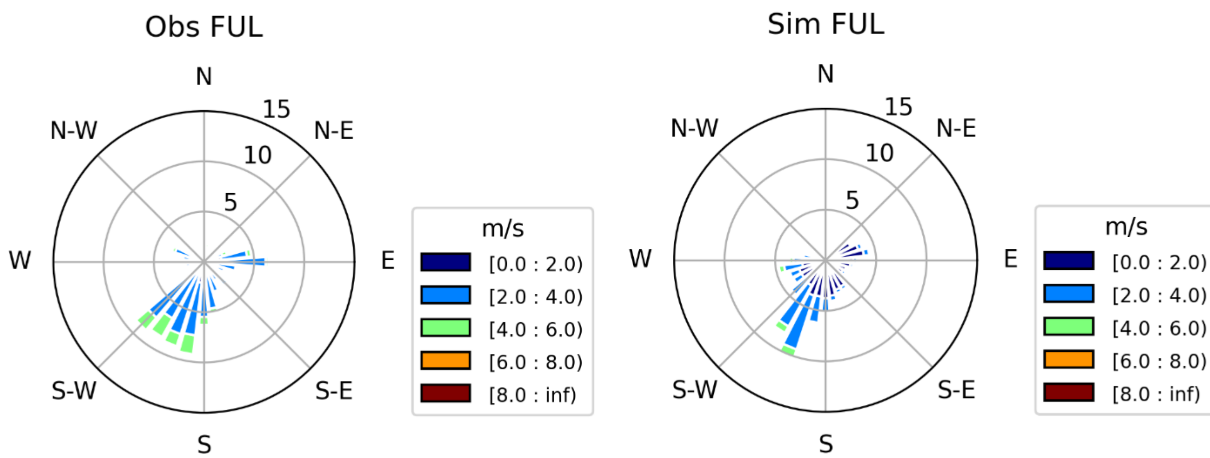


FIGURE II-3-30

WIND ROSE FROM MEASUREMENT AND WRF SIMULATION AT FULLERTON (FUL) STATION FOR THE ENTIRE YEAR OF 2018

The measured and WRF simulated wind rose at the station of FUL for 1-year period of January – December 2018 are shown in Figure II-3-30. In general, the WRF simulations with ACM2 reproduces the dominant wind direction as the measurement. For example, model and observations both show that westerly and south-westerly directions are the prevailing wind directions for the stations of FUL. In general, the WRF with ACM2 PBL scheme simulates surface wind speed and direction reasonably well as shown in the wind roses, although the simulation show slightly more underestimates of the observed wind speed comparing with the WRF simulations with YSU PBL scheme.

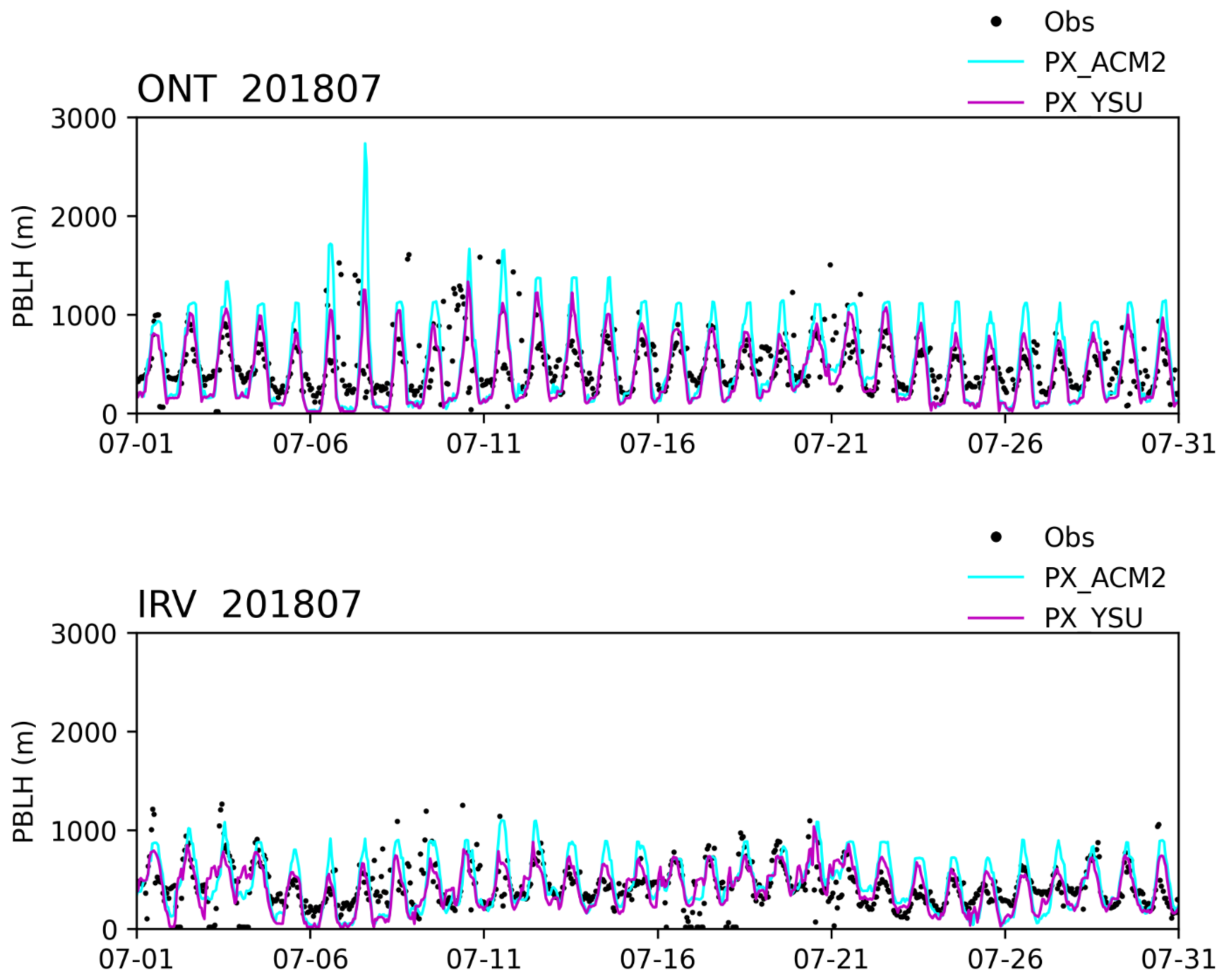
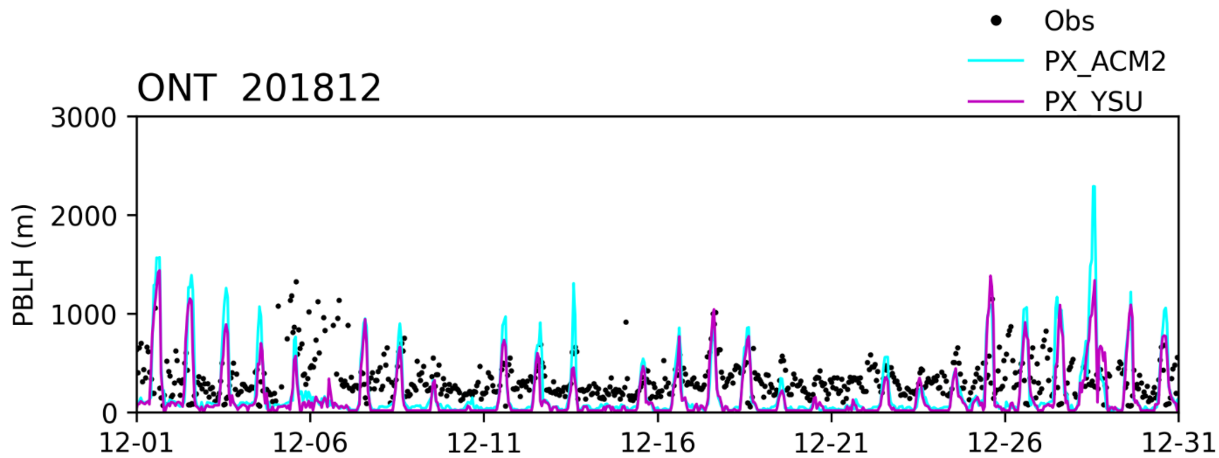


FIGURE II-3-31

TIME SERIES OF HOURLY PBLH FROM CEILOMETER MEASUREMENTS AND WRF SIMULATIONS FOR JULY 2018 AT ONTARIO (ONT) STATION AND AT IRVINE (IRV) STATION



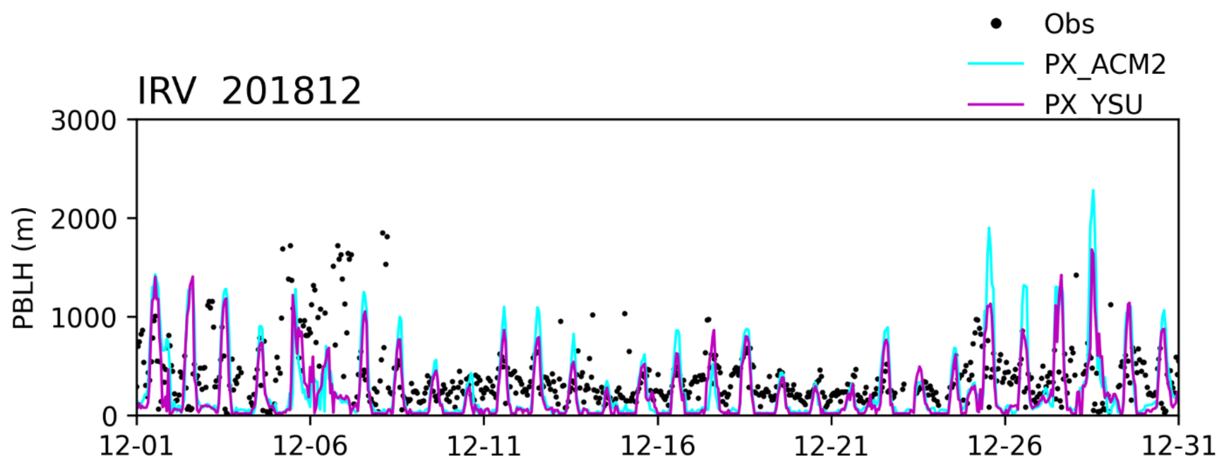


FIGURE II-3-32

TIME SERIES OF HOURLY PBLH FROM CEILOMETER MEASUREMENTS AND WRF SIMULATIONS FOR DECEMBER 2018 AT ONTARIO (ONT) STATION AND AT IRVINE (IRV) STATION

Time series of hourly PBLH from ceilometer measurements and WRF simulations at ONT and IRV during December 2018 are shown in Figure II-3-32. The simulation with ACM2 PBL scheme showed higher daily maximum PBL and this pattern is consistent with the simulated higher daily maximum temperature comparing with the simulations with YSU PBL scheme.

Summary

The performance of the WRF simulations for the year of 2018 is evaluated with observations from airport weather stations and PBL height measurement from ceilometers. Overall, WRF simulations for each season provided representative meteorological fields that well characterized observed conditions in 2018. Regarding different option of planetary boundary layer scheme, set of WRF sensitivity simulations of Asymmetric Convective Model version 2 (ACM2) was conducted. Comparing this set of sensitivity simulations with the simulation with YSU planetary boundary layer scheme, statistical results for temperature, water vapor and wind predictions are similar for both winter and summer seasons. The ACM2 PBL scheme showed slightly better performance for temperature and water vapor mixing ratio comparing with the YSU PBL scheme. The YSU PBL scheme had marginally better performance for wind speed and the ACM2 PBL scheme has small lower bias for wind speed. Since the modeling discrepancies between different PBL height scheme are very small, the meteorological fields obtained with WRF simulations with YSU PBL scheme are used as meteorological inputs for CMAQ modeling of PM2.5 in this plan.

Chapter 4

MODELING EMISSIONS, BOUNDARY CONDITIONS, AND INITIAL CONDITIONS

Modeling Emissions Inventory

Table II-4-1 provides the baseline and controlled modeling emissions inventories that are consistent with the emissions used in the attainment demonstration and alternative analyses. The CMAQ simulations were based on the annual emissions inventory, with adjustments made for source-specific temporal profiles and daily temperature variations. An extensive discussion of the overall emissions inventory is provided in Appendix I. Approaches used in generating gridded hourly emissions for each modeling day are presented in this Chapter.

TABLE II-4-1

ANNUAL AVERAGE ANTHROPOGENIC EMISSIONS INVENTORY IN SOUTH COAST AIR BASIN (TONS/DAY)

	Annual Average				
Year	VOC	NOX	SOX	PM2.5	NH3
(a) Baseline					
2018	402	383	14	56	75
2025	364	239	15	54	78
2030	344	210	15	54	79
~~(4-~~ (b) Controlled[1]					
2030	340	~~178~~175	15	~~52~~53	76

[1]Emission account for reductions due to control strategies described in Chapter 4.

Inventory Profile

This section discusses the baseline modeling inventories for the base year 2018 and the future years 2025 and 2030, as outlined in the ~~Draft~~ PM2.5 Plan. The primary focus of this plan is to demonstrate attainment of the 2012 annual PM2.5 National Ambient Air Quality Standard (NAAQS) set at 12 µg/m^3.

The baseline emissions projection assumes no additional emission controls beyond the measures and programs already in place. These projections consider emissions resulting from population growth, increased vehicle miles traveled (VMT), and the implementation of all previously adopted rules and regulations. The cut-off date for South Coast AQMD regulations is October 2020 (except for Rule 1109.1, adopted in November 2021), and for CARB's regulations, the cut-off date is December 2021. Controlled emission projections reflect the anticipated benefits of implementing control measures in relation to future baseline emissions. Comprehensive descriptions of these control measures can be found in Chapter 4 and Appendix IV of the ~~Draft~~ PM2.5 Plan report. For further details on emission sources, readers can refer to Appendix I which contains emission summary reports categorized by source for both the base year and future baseline scenarios used in this modeling analysis. Detailed summaries of emissions reductions by source category for future (2025 and 2030) controlled scenarios are available in Attachment 3 of Appendix II.

Temporal and Spatial Allocations of Emissions

Point, mobile, and area emissions inventories specific to each day were generated for the base year 2018. On-road mobile source emissions were calculated using data from SCAG transportation modeling, CARB's EMFAC2021 emissions rates, observed daily traffic fluctuations, and modeled daily temperature variations. To create day-specific hourly emissions, annual emissions were distributed using temporal profiles. Each source type was assigned profiles for monthly throughputs, day-of-week variations, and diurnal changes.

Point source emissions were allocated spatially based on the precise locations of emitting facilities. Conversely, countywide emissions stemming from area and off-road sources were distributed using spatial surrogates. For this purpose, a comprehensive set of over 110 spatial surrogates was employed, a compilation refined by CARB during each AQMP development cycle. Each emissions source, identified by its Emission Inventory Code, was associated with an appropriate surrogate profile. These surrogates represented a diverse range of sources, encompassing gas stations, landfills, military bases, single-family homes, and railyards. In alignment with our established AQMP practices, socioeconomic data for both the base and future years, incorporating population, employment, and housing statistics, as provided by SCAG during its RTP/SCS process, were incorporated into these surrogates. Further elaboration on the temporal and spatial allocation of on-road and total emissions are provided in following sections.

On-road Mobile Emissions

On-road mobile sources are responsible for a large fraction of the total VOC, NOx, CO, NH_3 and PM2.5 emissions in our modeling domain. These emission sources are highly dependent on both time and location, with variations up to a factor of 8 between overnight and peak traffic hours at specific locations. On-road mobile emission patterns also exhibit substantial variation throughout the week and year, influenced by factors such as special events, holidays, and weather conditions. Location-specific variations may also arise due to proximity to high-employment areas, sporting events, or/and seasonal activities.

Real-time traffic flow measurements from 2018 were used to apportion traffic volumes on an hourly basis throughout the five counties (Ventura, Los Angeles, Orange, Riverside and San Bernardino). These measurements include data from thousands of sensors scattered throughout the Basin, covering both light- and heavy-duty vehicle flow. Given the limited availability of monitoring data in the five outlying counties (San Luis Obispo, Santa Barbara, Kern, Imperial, and San Diego), grid-based on-road emissions were generated for those regions using generic traffic profiles that account for variations by day of the week (Kwon et al., 2003)[1].

In Figures II-4-1 to II-4-4, we compare daily on-road emissions of NOx, Primary Elemental Carbon (PEC), Primary Organic Carbon (POC), and CO between the 2022 AQMP estimated with EMFAC2017 (blue) and the ~~Draft~~ PM2.5 ~~plan~~Plan estimated with EMFAC2021 (orange) over the south coast air basin (SCAB) in 2018. On-road emissions estimated with EMFAC2021 exhibit very similar daily/weekly patterns and seasonal variation as those estimated with EMFAC2017. Despite of the similar temporal variation in emissions in the two models, EMFAC2021 estimates higher NOx (higher by 10% on average) and CO (higher by 24% on average) emissions compared to EMAFC2017 whereas it estimates noticeably lower POC emissions than EMAFC2017 (lower by 38% on average). PEC estimated with the two emission models (EMFAC2017 and EMFAC2021) are comparable (differs by 5% on average). The higher estimates of NOx and CO in EMFAC2021 compared to EMFAC2017 are mostly because new vehicle emissions test data show that light-duty vehicles have higher exhaust emissions and updated DMV data for 2018 indicate that medium heavy-duty trucks are older than what was assumed in EMFAC2017. The lower primary particulate emissions (PEC and POC) in EMFAC2021 compared to EMFAC2017 can be attributed to the model updates on emissions and speed correction factors for brake wear that are obtained from new emission tests.

[1] Kwon J, Varaiya P, Skabardonis A. Estimation of Truck Traffic Volume from Single Loop Detectors with Lane-to-Lane Speed Correlation. Transportation Research Record. 2003;1856(1):106-117, https://doi.org/10.3141%2F1856-11

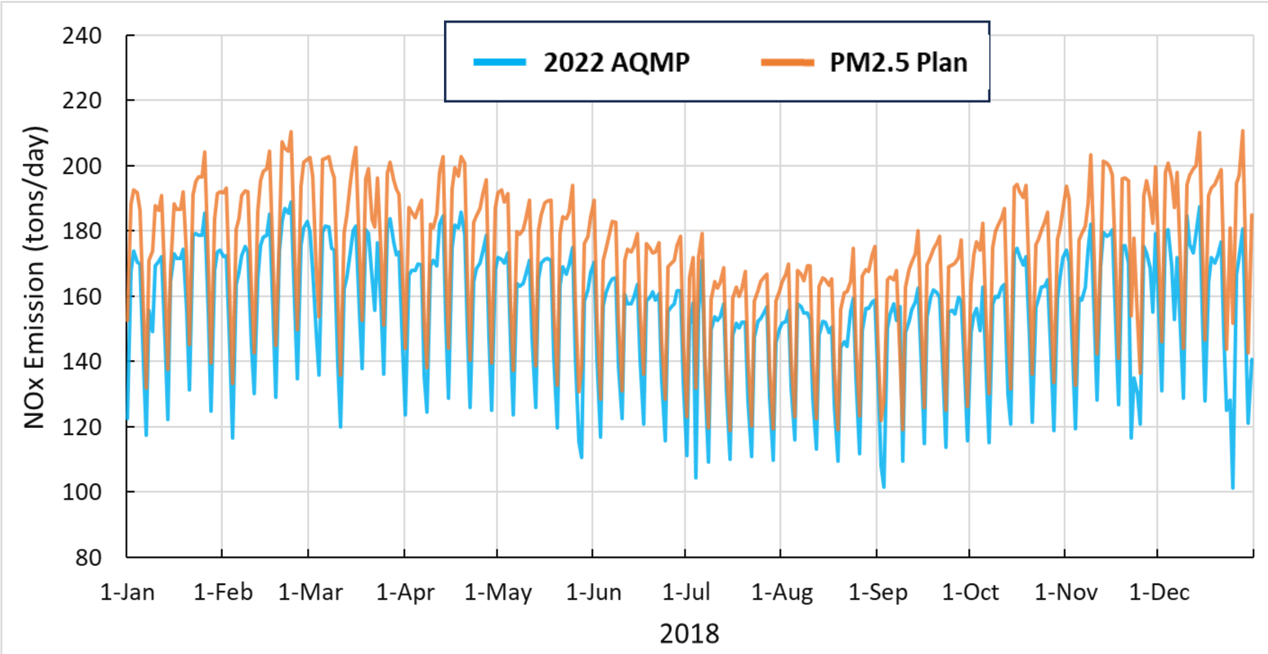


FIGURE II-4-1

A COMPARISON OF TOTAL DAILY ON-RAOD NITROGEN OXIDES (NOx) EMISSION OVER THE SOUTH COAST AIR BASIN FROM THE 2022 AQMP AND THE ~~DRAFT~~ PM2.5 PLAN DURING THE BASE YEAR 2018.

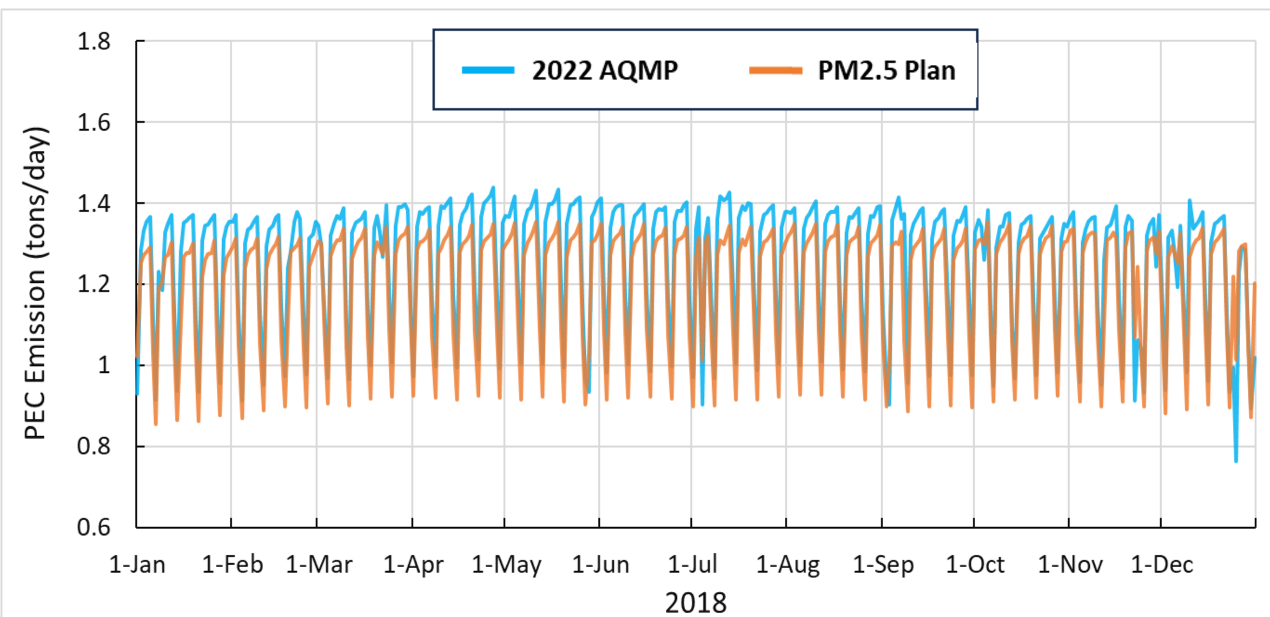


FIGURE II-4-2

A COMPARISON OF TOTAL DAILY ON-RAOD PRIMARY ELEMENTAL CARBON (PEC) EMISSION OVER THE SOUTH COAST AIR BASIN FROM THE 2022 AQMP AND THE ~~DRAFT~~ PM2.5 PLAN DURING THE BASE YEAR 2018.

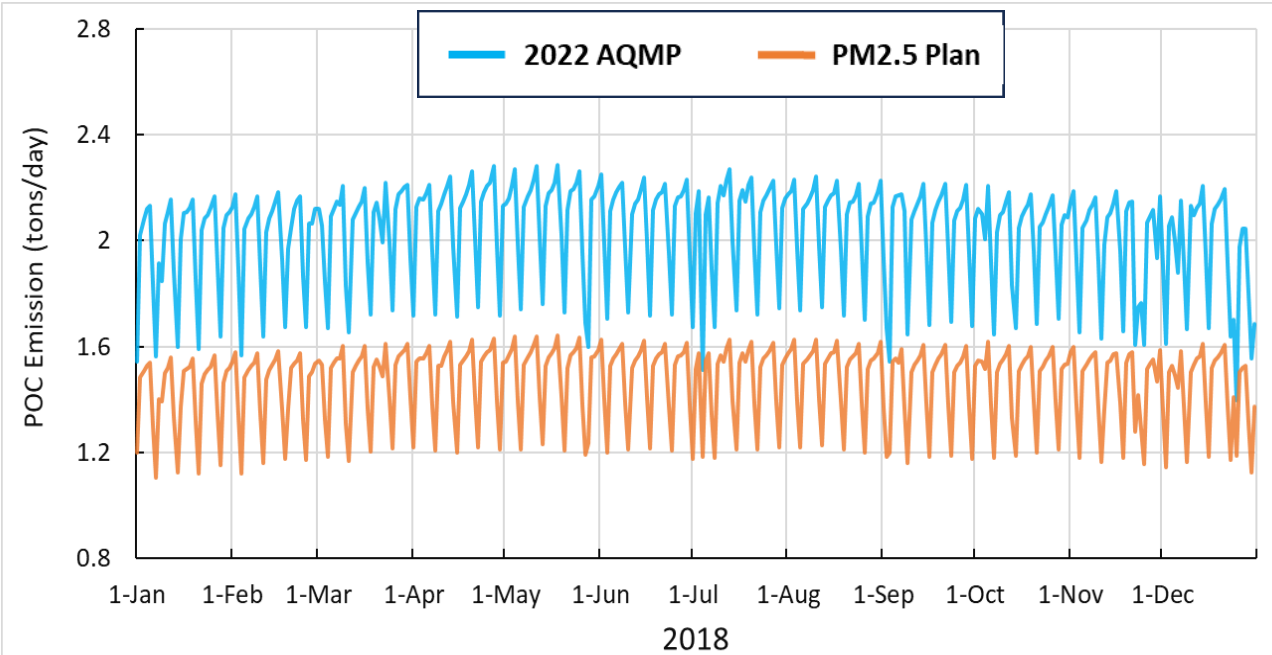


FIGURE II-4-3

A COMPARISON OF TOTAL DAILY ON-RAOD PRIMARY ORGANIC CARBON (POC) EMISSION OVER THE SOUTH COAST AIR BASIN FROM THE 2022 AQMP AND THE ~~DRAFT~~ PM2.5 PLAN DURING THE BASE YEAR 2018.

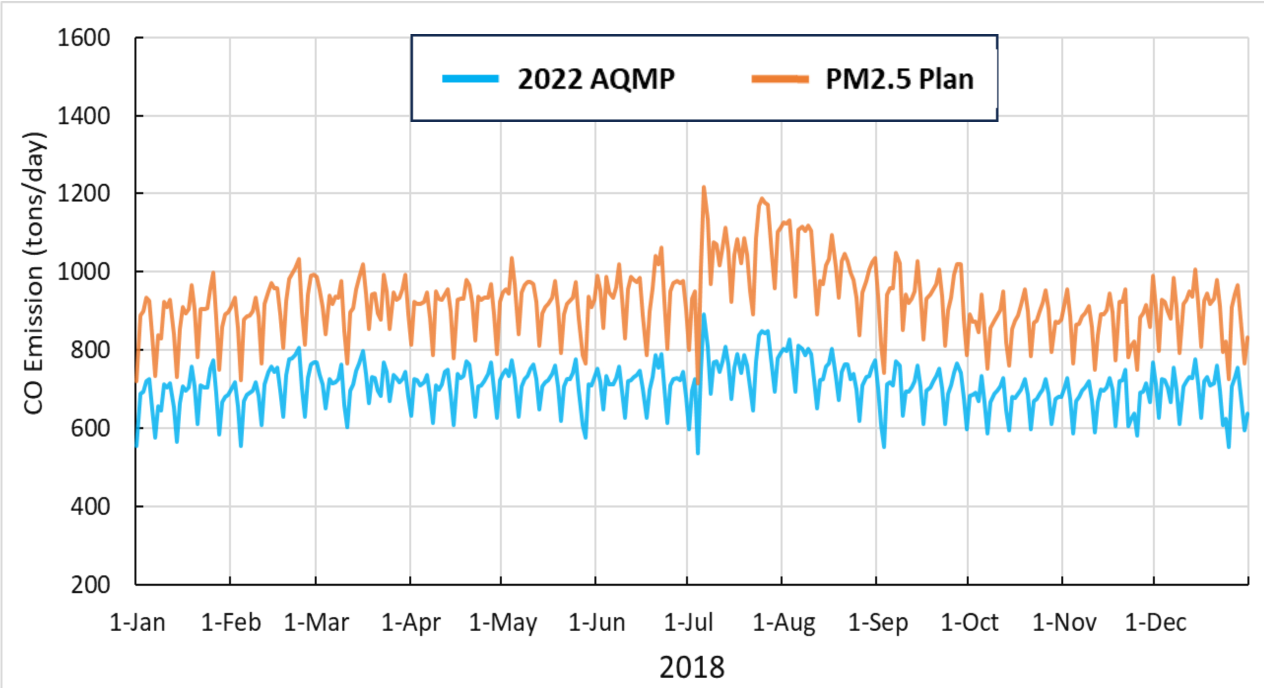


FIGURE II-4-4

A COMPARISON OF TOTAL DAILY ON-RAOD CARBON MONOXIDE (CO) EMISSION OVER THE SOUTH COAST AIR BASIN FROM THE 2022 AQMP AND THE ~~DRAFT~~ PM2.5 PLAN DURING THE BASE YEAR 2018.

Emissions Profiles

Day specific emissions were generated for 2018. Figure II-4-5 illustrates the total daily emissions of NOx, NH_3, and Primary PM2.5 contained in the CMAQ modeling domain during the base year of 2018. Note that the emissions totals are much higher than those presented in Table II-4-1. This is because the values in Table II-4-1 represent basin-wide total emissions while those in Figure II-4-5 comprise totals from the entire modeling domain. The profile clearly depicts a changing emissions pattern with two distinct cycles represented: a weekly cycle, illustrated by Sunday through Saturday peaks and valleys, and day-to-day variations in emissions within the weekly cycle. Daily variations are primarily driven by daily vehicular activities and ambient temperature and humidity changes. Although not included in Figure II-4-5, spatially and temporally resolved emissions from prescribed fires were also included in the emissions in the modeling domain. The attainment demonstration does not include emissions from wildfires.

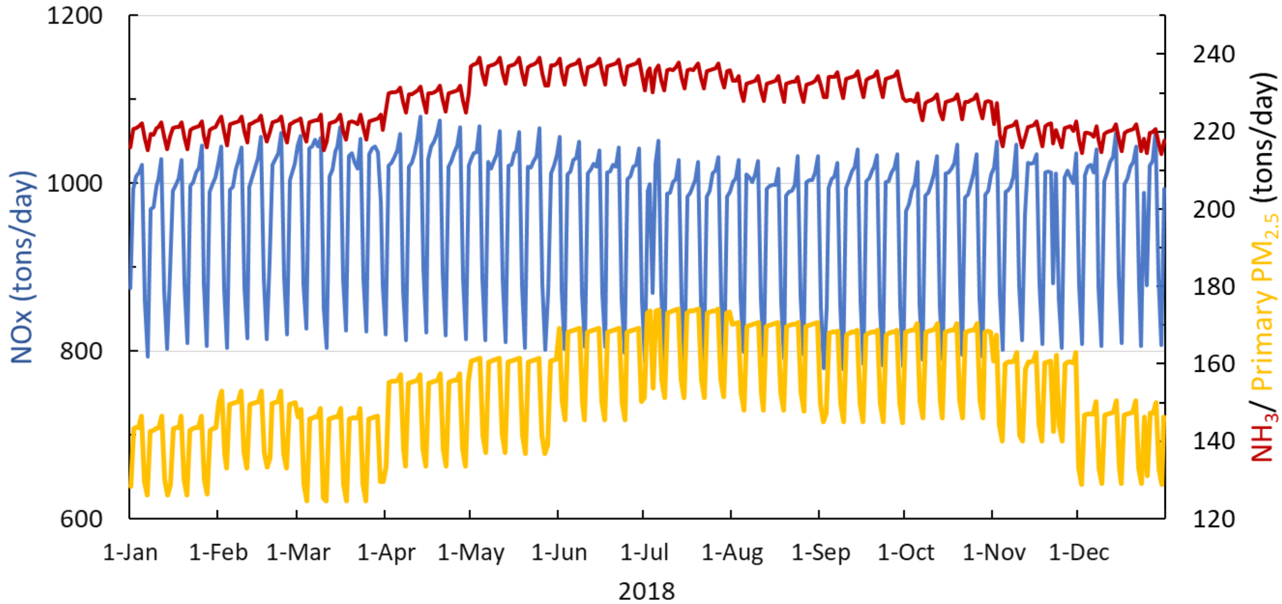


FIGURE II-4-5

2018 DAILY EMISSIONS OF NO_X, NH_3, AND PRIMARY PM2.5 IN THE MODELING DOMAIN.

Spatial Distribution

Figures II-4-6 through V-4-8 illustrate the spatial distribution of on-road emissions for primary PM2.5, NOx, and NH_3 in the modeling domain. Figures II-4-9 through II-4-11 show the spatial distribution of total emissions from all sources for these key primary pollutants across the entire modeling domain. The maps reveal that on-road emissions tend to cluster in urban areas, such as the downtown areas of Los Angeles, San Diego, and Long Beach, as well as along major arterial highways like I-5 and I-15. This concentration results from the high density of vehicles and substantial traffic volumes in these regions. When examining the total emissions of these key pollutants, urban centers emerge as major sources, characterized by their high population density and significant anthropogenic activities, including heavy transportation and various industrial and commercial operations. Notably, the spatial distribution of primary emissions also highlights elevated emissions in Mexican cities near the US-Mexico border. These emissions from across the border can influence background pollutant levels and directly impact Southern California's air quality, particularly under specific meteorological conditions, such as southerly winds during the summer, which facilitate the transport of air pollution across borders.

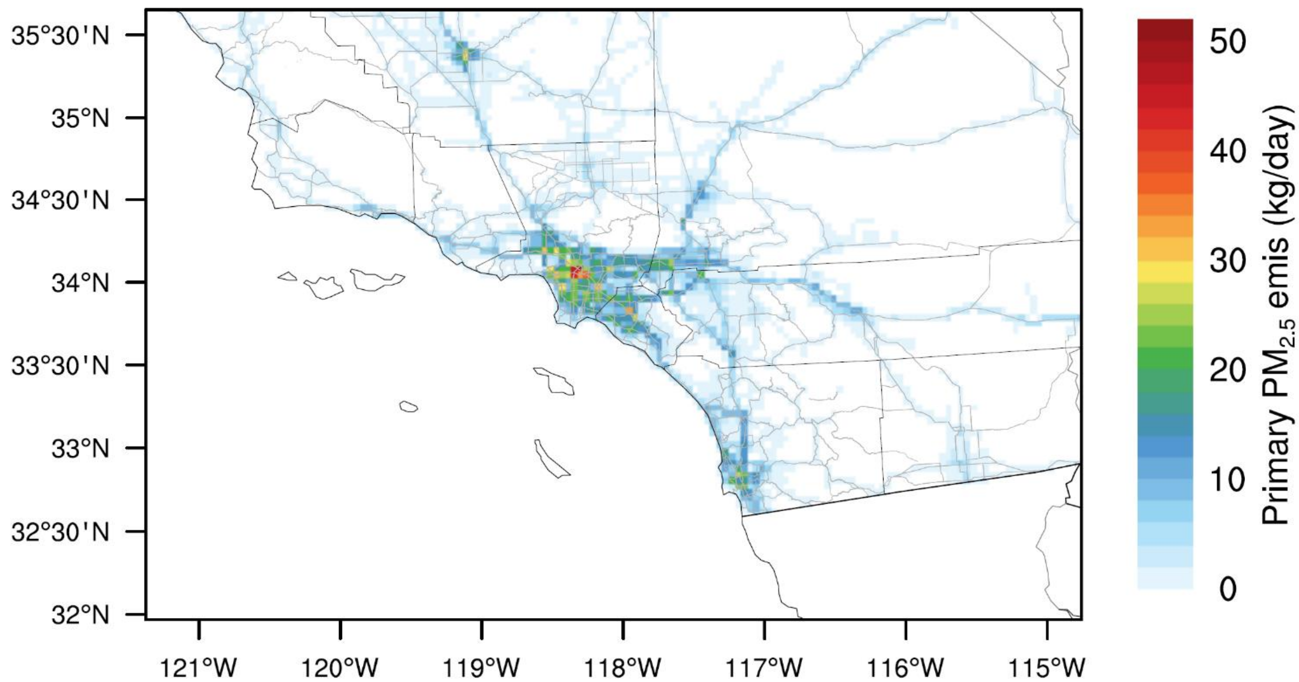


FIGURE II-4-6

ON-ROAD PRIMARY PM2.5 EMISSIONS OVER THE MODELING DOMAIN DURING THE BASE YEAR 2018.

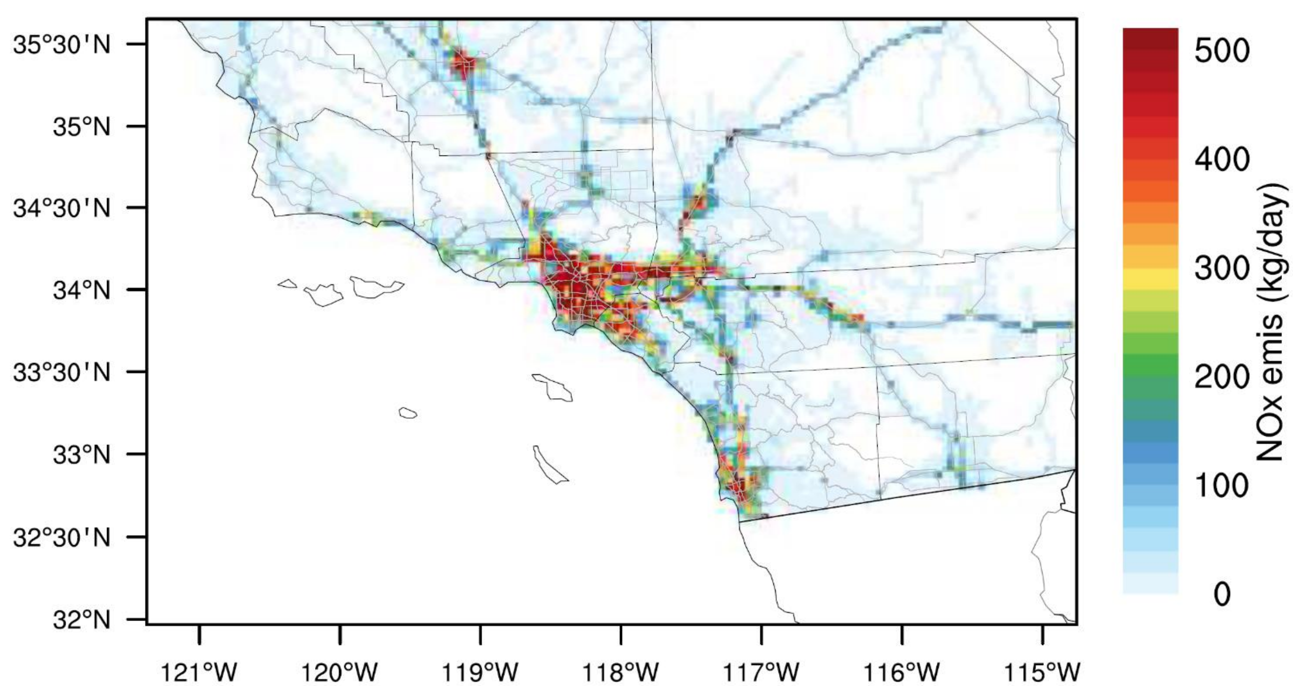


FIGURE II-4-7

ON-ROAD NOx EMISSIONS OVER THE MODELING DOMAIN DURING THE BASE YEAR 2018.

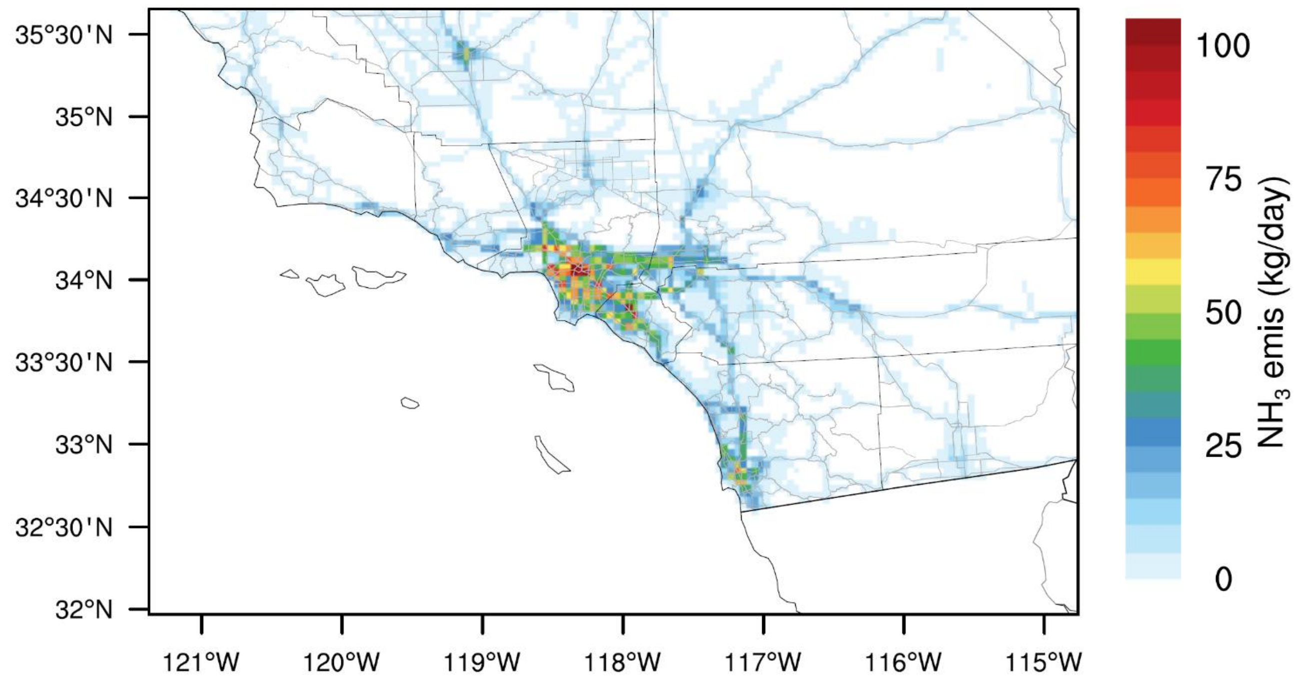


FIGURE II-4-8

ON-ROAD NH_3 EMISSIONS OVER THE MODELING DOMAIN DURING THE BASE YEAR 2018.

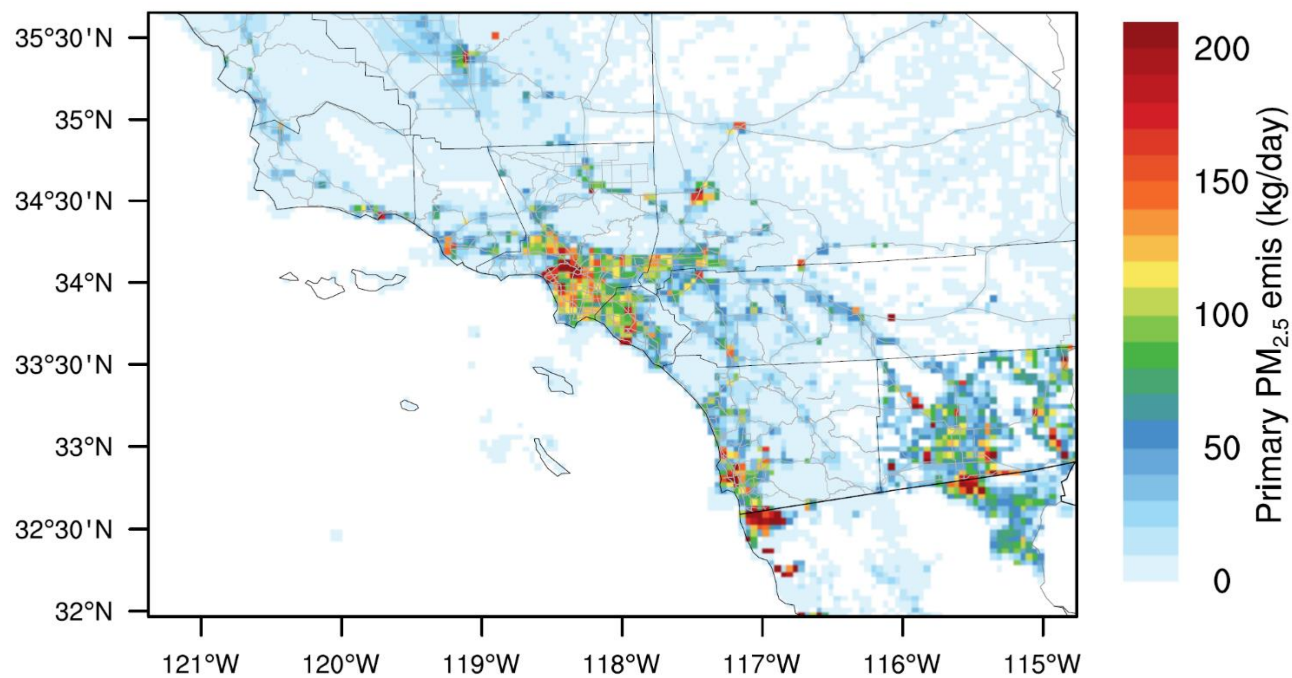


FIGURE II-4-9

TOTAL PRIMARY PM2.5 EMISSIONS FROM ALL SOURCES OVER THE MODELING DOMAIN DURING THE BASE YEAR 2018.

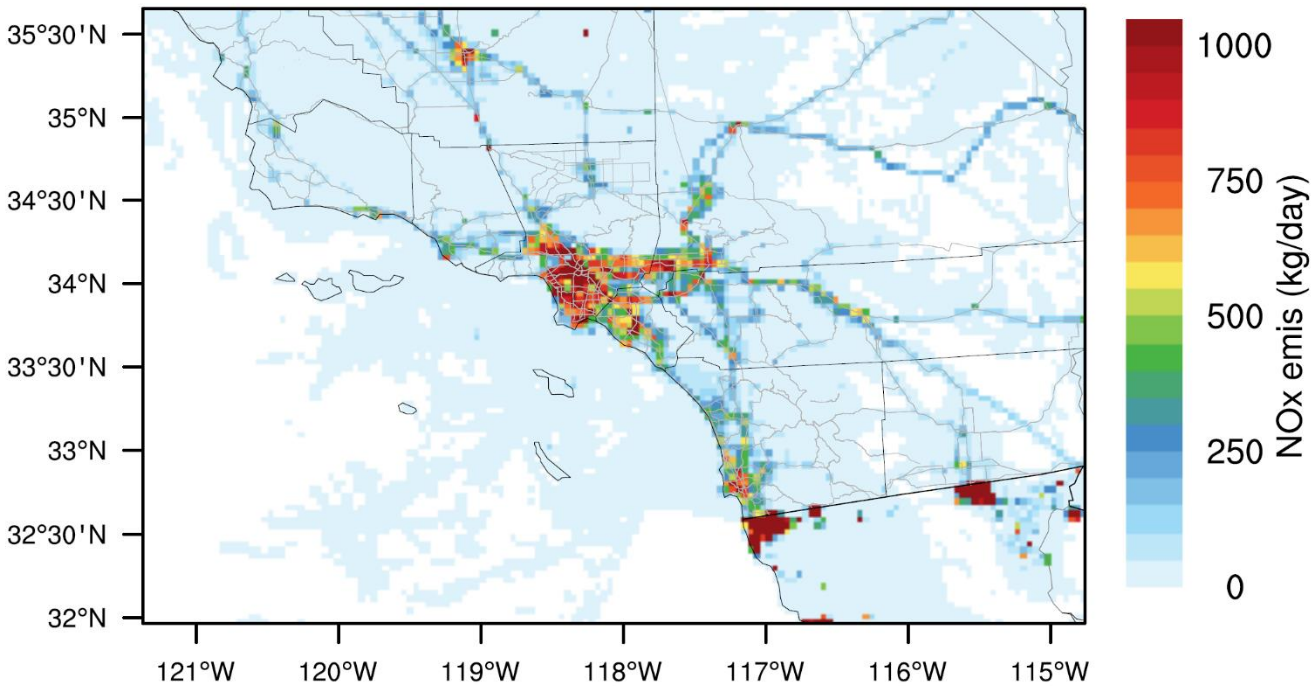


FIGURE II-4-10

TOTAL NOx EMISSIONS FROM ALL SOURCES OVER THE MODELING DOMAIN DURING THE BASE YEAR 2018.

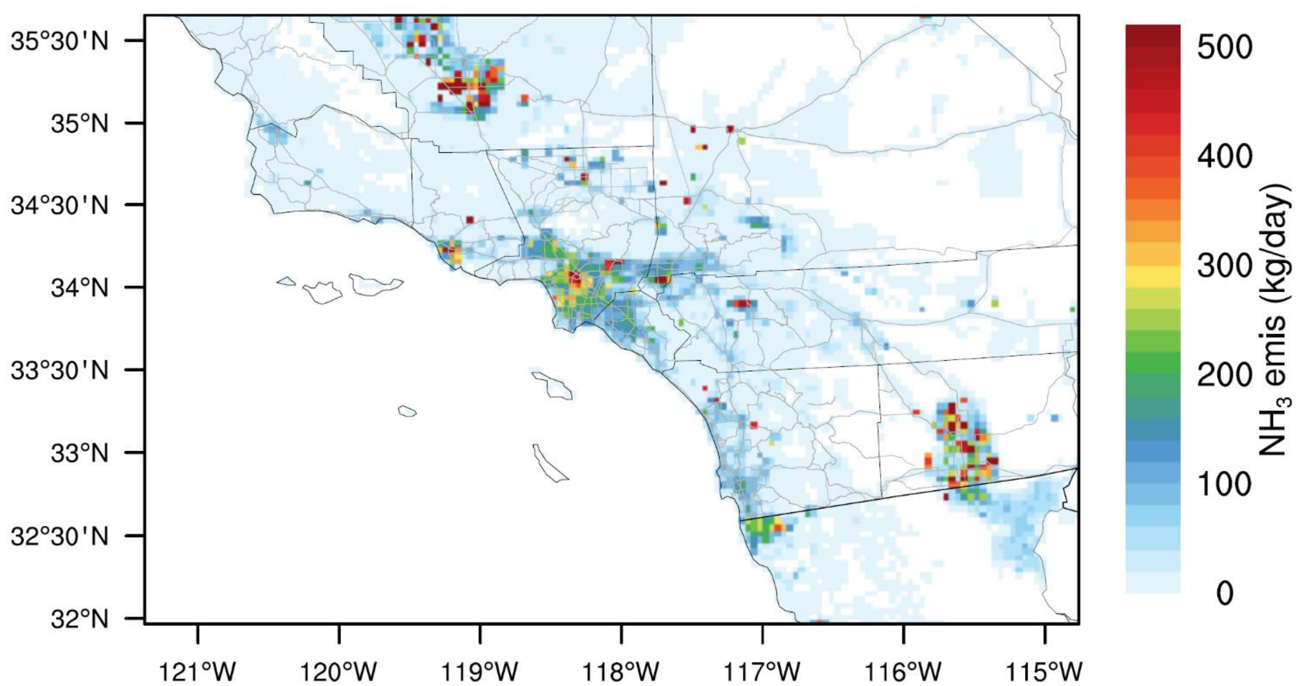


FIGURE II-4-11

TOTAL NH_3 EMISSIONS FROM ALL SOURCES OVER THE MODELING DOMAIN DURING THE BASE YEAR 2018.

Biogenic Emissions

Biogenic VOC emissions were calculated at an hourly frequency using the Model of Emissions of Gases and Aerosols from Nature version 3.0 (MEGAN3.0) with 2018 meteorological data as input (simulated with WRFv4.4.2). MEGAN was employed in its default configuration, with the exception of the normalized Leaf Area Index (LAIv) input. The LAIv input we used here was developed by the California Air Resources Board and was derived from 2018 data obtained from the Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Terra and Aqua satellites. In urban areas where MODIS data were unavailable, LAIv was based on tree survey data from the US Forest Service. Figure II-4-12 illustrates the daily total emissions of biogenic VOC, in tons per day, within the Basin. The trend shows higher emissions during spring and summer months, with multiple peaks occurring from June to August, coinciding with periods of high temperatures. Table II-4-1 shows the total emissions from biogenic sources within the Basin.

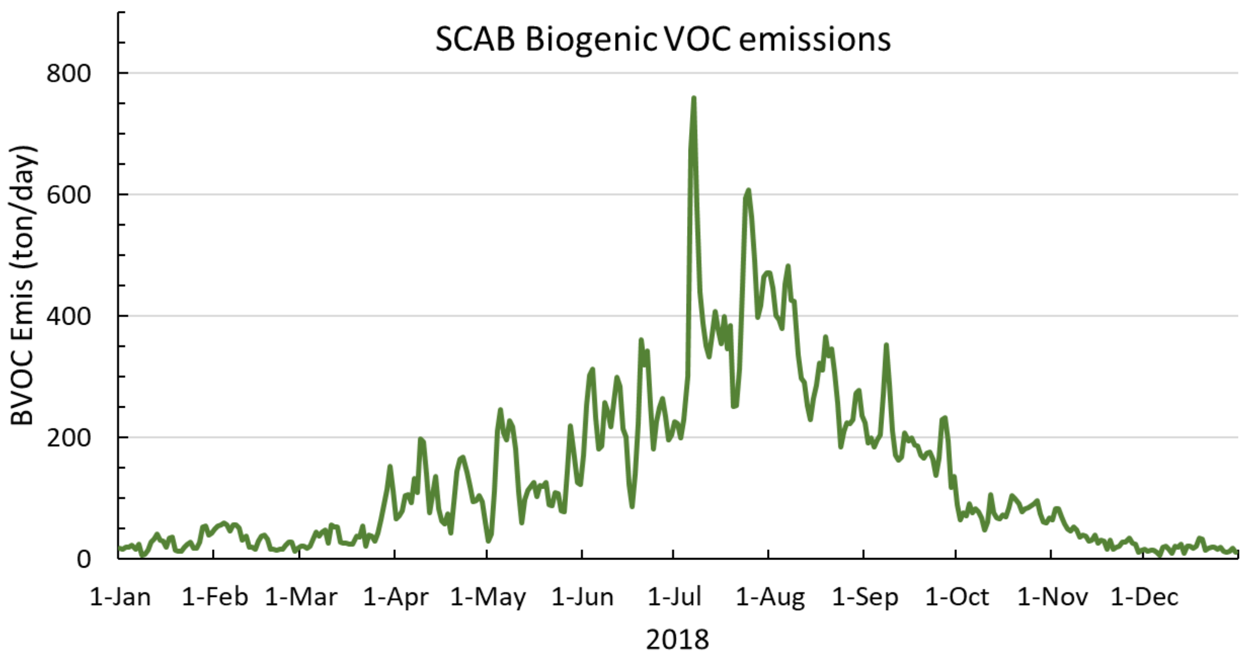


FIGURE II-4-12

2018 DAILY BIOGENIC VOC EMISSIONS IN THE SOUTH COAST AIR BASIN

TABLE II-4-1

ANNUAL AVERAGES EMISSIONS FROM BIOGENIC SOURCES IN THE BASIN (TONS/DAY)

	TOG	VOC	NOx
Basin-wide Emissions (tons/day)	135.1	132.1	5.3

Boundary and Initial Conditions

We utilized the Community Atmosphere Model with Chemistry (CAM-chem; Emmons et al., 2020)[2], a component of the National Center for Atmospheric Research (NCAR) Community Earth System Model (CESM), to generate boundary conditions (BCONs) for our modeling domains. Specifically, CAM-chem provided BCONs for the 12 km statewide Community Multi-scale Air Quality (CMAQ) domain, while the boundary conditions for the 4 km inner South Coast domain were derived from the 12 km CMAQ output.

CAM-chem is a well-established global atmospheric model known for simulating tropospheric and stratospheric compositions. We extracted boundary conditions encompassing inorganic gases, volatile organic compounds (VOCs), and aerosol species such as elemental carbon, organic matter, sulfate, and nitrate from CAM-chem simulations conducted in 2018[3]. These CAM-chem simulation results are publicly accessible at https://www.acom.ucar.edu/cam-chem/cam-chem.shtml. To prepare this data for integration into the CMAQ model, we used the 'mozart2camx' computer program, originally designed for processing outputs from the MOZART global model. Some modifications were made to adapt it for CAM-chem output processing.

Vertical layering in the BCON data adheres to the meteorological files, utilizing pressure levels at each layer interface for vertical interpolation. For horizontal alignment, bilinear interpolation was applied to interpolate data from the global model grids to the regional CMAQ grids. Speciation profiles were employed to map CAM-chem species into CMAQ species for trace gases (SAPRC07TC) and aerosols. The final CAM-chem derived BCONs for the CMAQ domain represent day-specific mixing ratios, varying in spatial (horizontal and vertical) and temporal (every 6 hours) dimensions.

Total PM2.5 Mass in Boundary Conditions

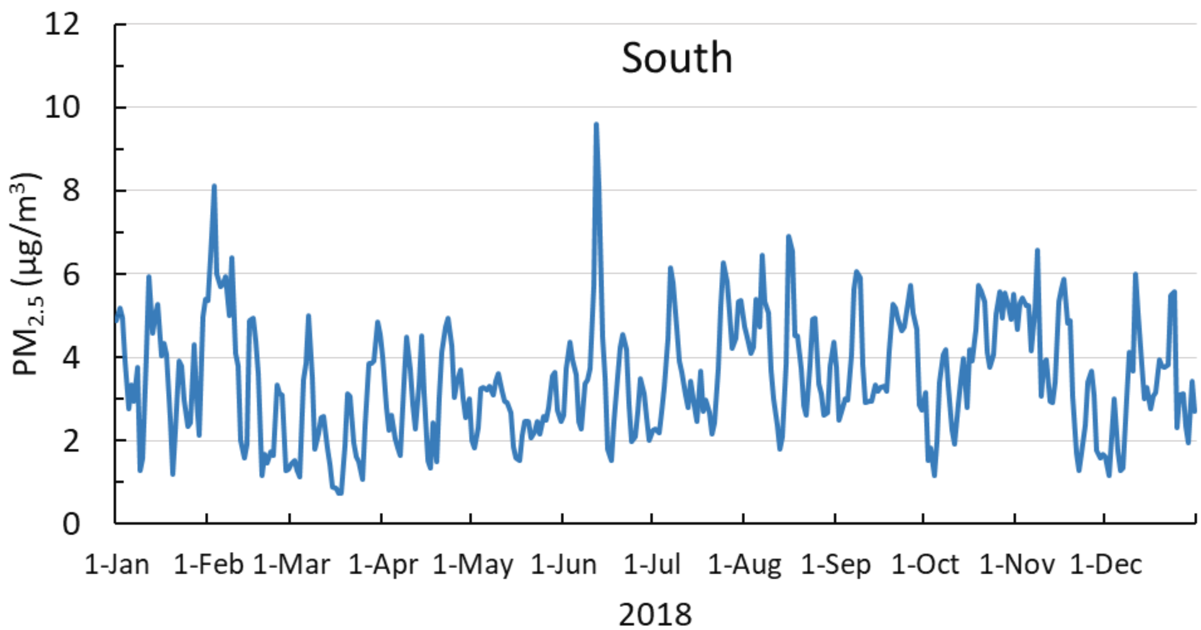
Figures II-4-13 and II-4-14 illustrate daily averages of surface total PM2.5 along the four boundaries of our modeling domain. The mean surface PM2.5 levels along the southern and northern boundaries exhibit similarities, typically ranging from 1 to 6 µg/m³. Notably, there are periodic peaks in PM2.5 concentrations (ranging from 6 to 10 µg/m³) along the southern boundary during the summer season, possibly attributed

[2] Emmons, L. K., Schwantes, R. H., Orlando, J. J., Tyndall, G., Kinnison, D., Lamarque, J.-F., et al., (2020). The Chemistry Mechanism in the Community Earth System Model version 2 (CESM2). Journal of Advances in Modeling Earth Systems, 12, e2019MS001882, https://doi.org/10.1029/2019MS001882

[3] Buchholz, R. R., Emmons, L. K., Tilmes, S., & The CESM2 Development Team, (2019). CESM2.1/CAM-chem Instantaneous Output for Boundary Conditions. UCAR/NCAR - Atmospheric Chemistry Observations and Modeling Laboratory. https://doi.org/10.5065/NMP7-EP60.

to regional transport from Mexico when southerly winds prevail. In contrast, the northern boundary is influenced by emissions from central California, resulting in a seasonal average surface PM2.5 concentration of approximately 3-4 µg/m³. The western boundary, situated over the Pacific Ocean west of the Basin, consistently shows the lowest concentrations, with an average PM2.5 concentration peaking in summer and fall seasons (~3 µg/m³) and dropping in spring (~2 µg/m³).

The eastern boundary, on the other hand, exhibits a broader range, with average PM2.5 concentrations ranging from 2 to 12 µg/m³. These concentrations tend to be higher than those observed along other boundaries, particularly during the summer months. This difference may be attributed to elevated background particulate levels resulting from wildfires and biogenic sources originating from the eastern region. Additionally, the prevailing general circulation in Southern California moves from west to east, causing the eastern boundary to experience a higher background level of PM2.5 due to the influence of upwind emissions compared to other boundaries. The peak of PM2.5 (>12 µg/m³) occurred in June at the eastern boundary is likely attributed to a wildfire event.



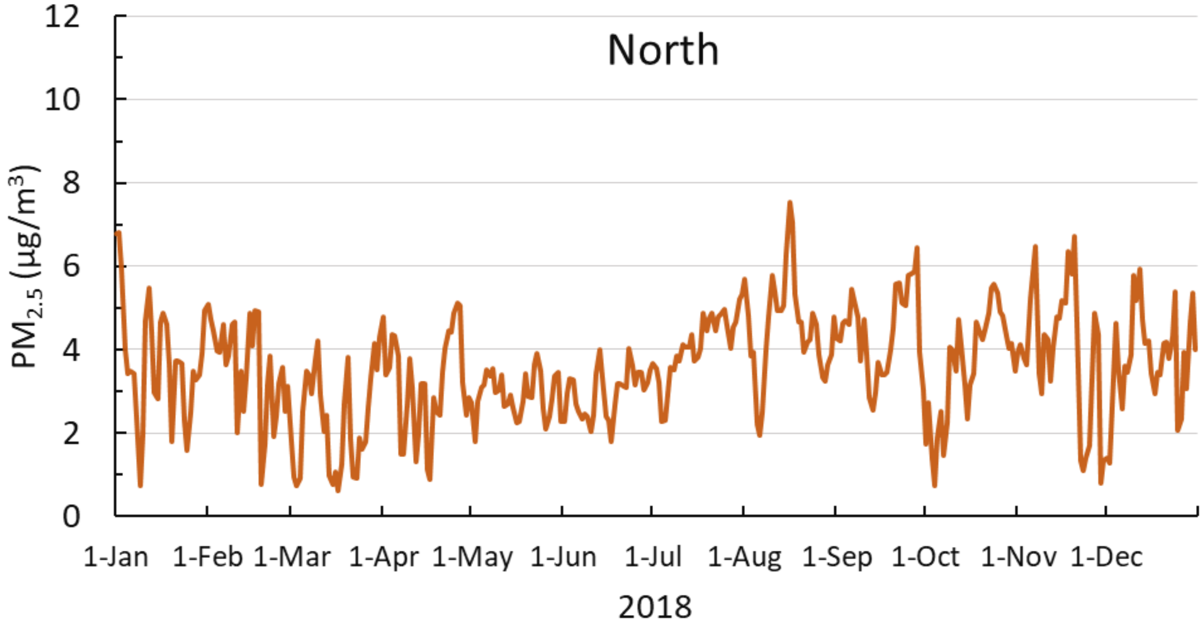
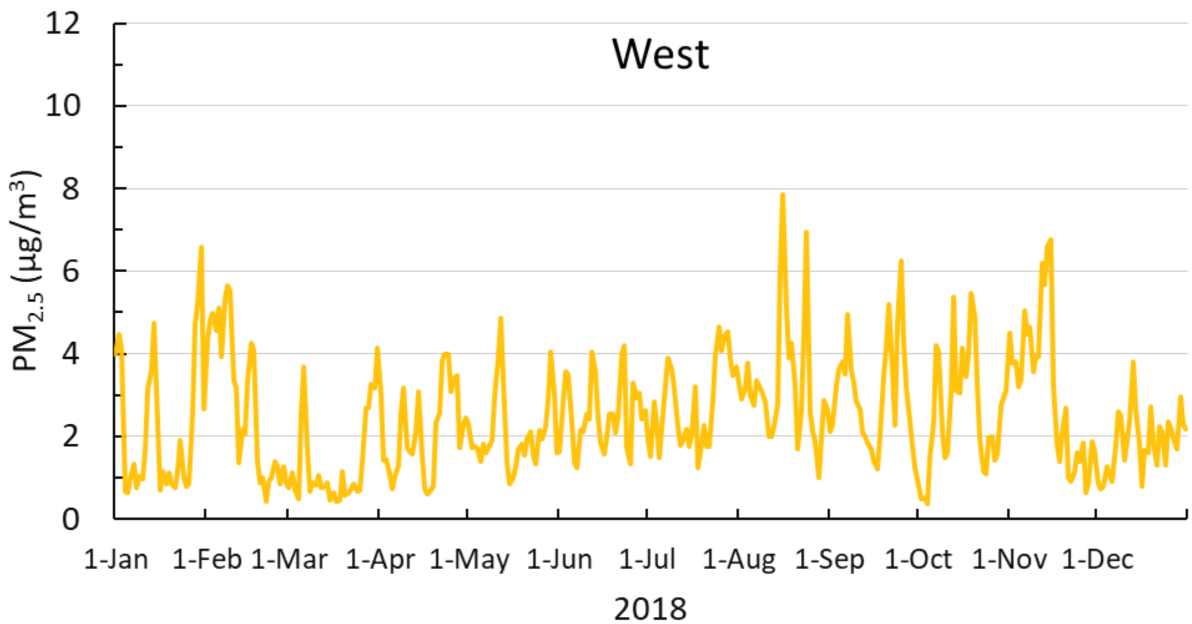


FIGURE II-4-13

DAILY AVERAGES OF SURFACE PM2.5 CONCENTRATION ALONG THE SOUTH AND NORTH BOUNDARIES



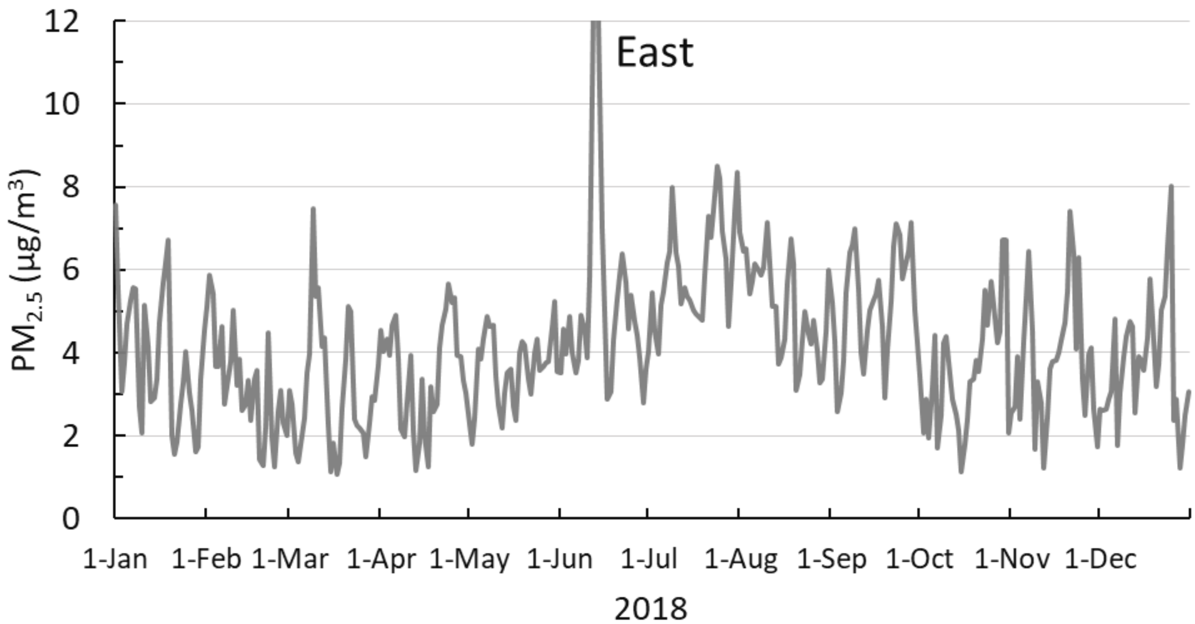


FIGURE II-4-14

DAILY AVERAGES OF SURFACE PM2.5 CONCENTRATION ALONG THE WEST AND EAST BOUNDARIES

Figures II-4-15 through II-4-18 depict vertical profiles of seasonal $PM_{2.5}$ concentrations, extending from the ground surface to the mid-troposphere, along the four boundaries of our modeling domain. In all seasons, $PM_{2.5}$ is predominantly concentrated within the atmospheric boundary layer, with background $PM_{2.5}$ levels above the boundary layer typically below 2 µg/m³. Both near-surface $PM_{2.5}$ and background $PM_{2.5}$ in the free troposphere peaks in the summer months along all four boundaries. This phenomenon is likely attributable to increased secondary production under warm and humid summer conditions. The most notable disparity between near-surface (or boundary layer) and free-tropospheric PM2.5 concentrations occurs during winter due to reduced vertical mixing and ventilation compared to warmer seasons.

Both near-surface and free-tropospheric PM2.5 concentrations are higher along the eastern boundary compared to the other boundaries. This disparity arises from downwind transport and greater influences from wildfires and biogenic matter compared to the other boundaries. Conversely, the western boundary consistently has the lowest PM2.5 levels within both the boundary layer and free troposphere due to the relatively cleaner airflow originating from the ocean.

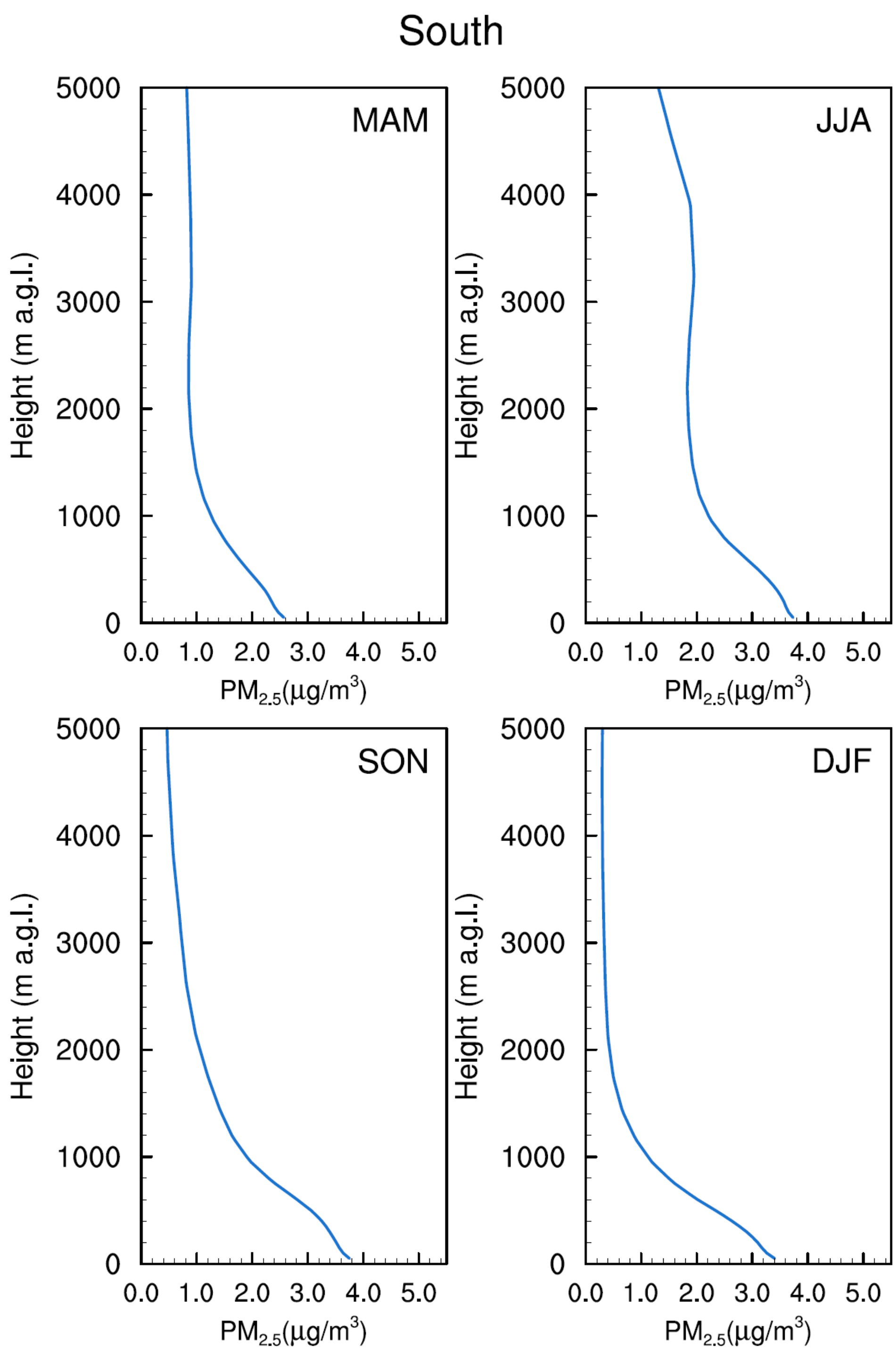


FIGURE II-4-15

PM2.5 VERTICAL PROFILE ALONG THE SOUTHERN BOUNDARY IN FOUR SEASONS

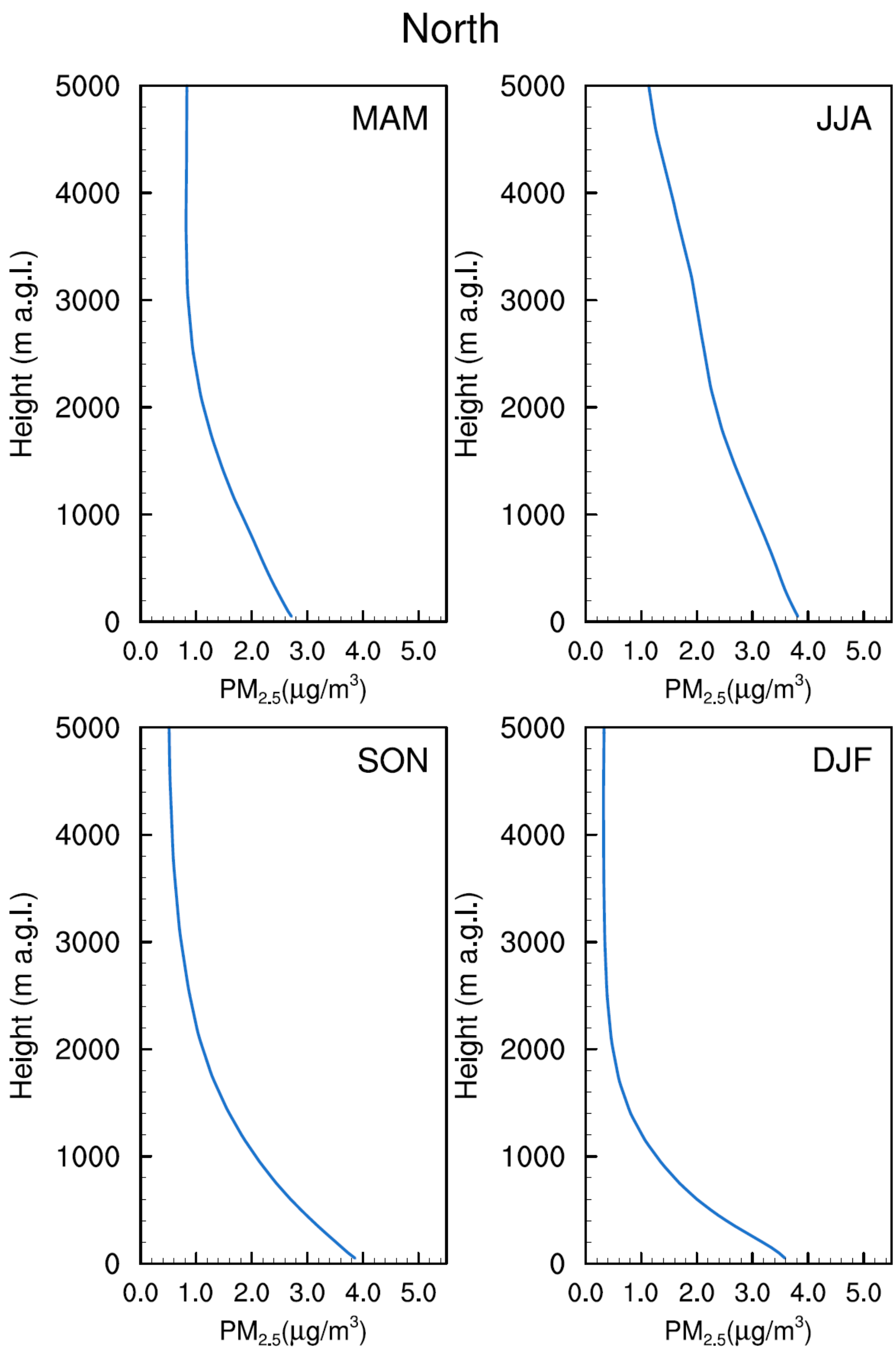


FIGURE II-4-16

PM2.5 VERTICAL PROFILE ALONG THE NORTHERN BOUNDARY IN FOUR SEASONS

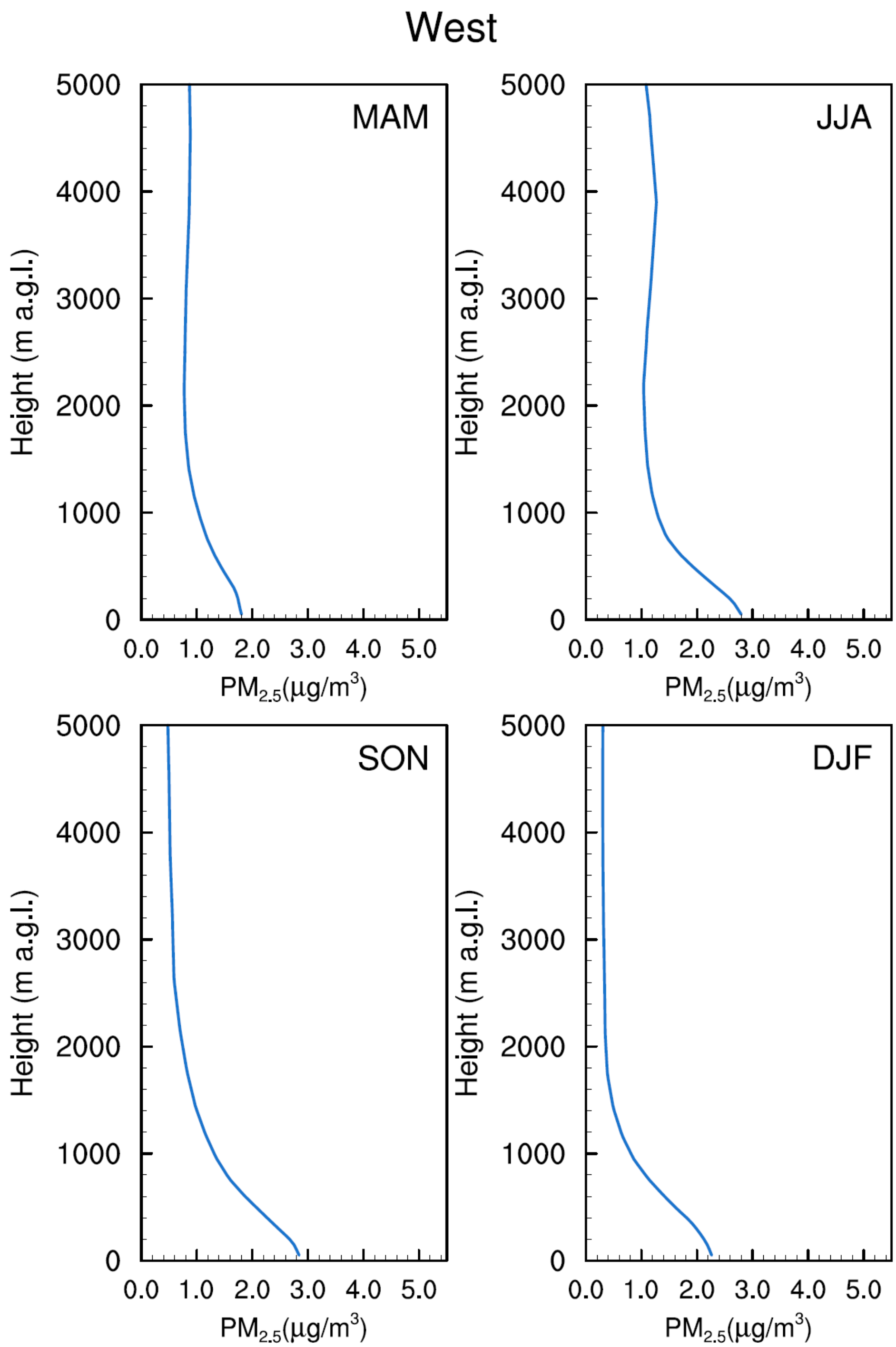


FIGURE II-4-17

PM2.5 VERTICAL PROFILE ALONG THE WESTERN BOUNDARY IN FOUR SEASONS

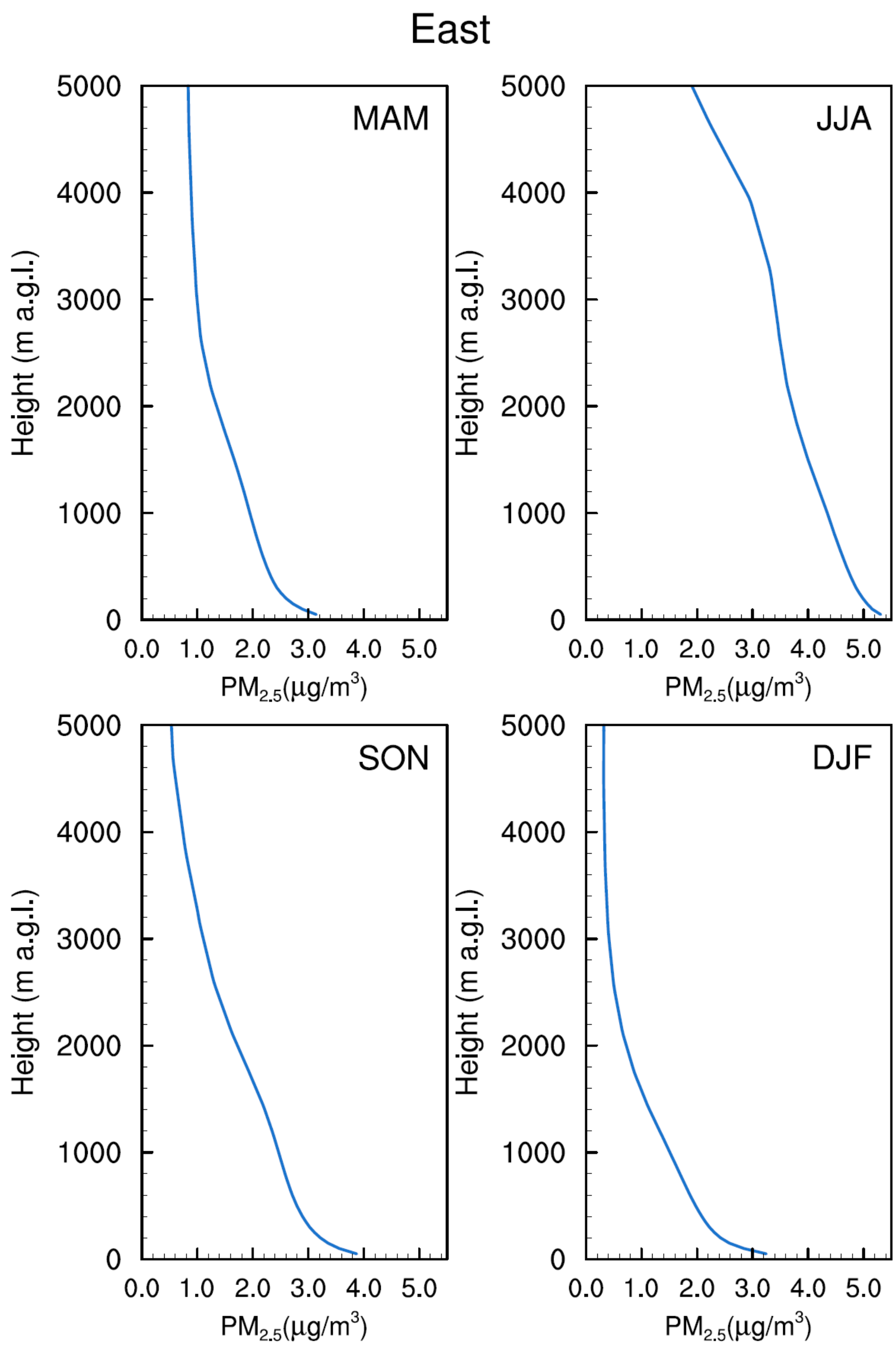


FIGURE II-4-18

PM2.5 VERTICAL PROFILE ALONG THE EASTERN BOUNDARY IN FOUR SEASONS

The boundary values used in future year simulations were retrieved using the same approach as in the base year (2018), except for anthropogenic emissions, which were adjusted based on the projected future emission levels in the State. In this approach, out of state emissions were not adjusted due to the lack of accurate information, but the impact of statewide emission reductions was considered.

PM2.5 Species in Boundary Conditions

We further examine the boundary and initial conditions of several major PM2.5 species, including nitrate, sulfate, elemental carbon (EC), and organic carbon (OC). Figures II-4-19 and II-4-22 illustrate daily averages of these PM2.5 species along the four boundaries of our modeling domain. The boundary conditions exhibit significant variations across four different directions and among various PM2.5 species. OC emerges as the predominant PM2.5 species along all four boundaries, with annual average concentrations ranging from 0.72 to 1.88 µg/m³. This is followed by sulfate (0.43-0.73 µg/m³), nitrate (0.30-0.38 µg/m³), and EC (0.05-0.19 µg/m³). Table II-4-2 provides an overview of the annual averages of PM2.5 species along these four boundaries.

Nitrate and sulfate levels are at their highest along the southern boundary due to anthropogenic emissions originating from cities in Southern California and Mexico (Figures II-4-19 and II-4-20). However, at the western boundary, nitrate and sulfate concentrations are comparable to the levels in other boundary directions. This is possibly attributed to various factors, including transport by land-sea oscillations, long-range transport from Asia, and marine/ship emissions. EC concentrations peak at the southern and eastern boundaries due to anthropogenic emissions from Mexico and wildfires occurring in the western U.S. states (Figure II-4-21). OC exhibits higher levels at the northern and eastern boundaries, possibly due to the influence of wildfires and biogenic sources. Compared to nitrate, sulfate, and EC, OC generally has a shorter atmospheric lifetime and thus is closer to its sources than other species (e.g., Cheung et al., 2011)[4]. Therefore, unlike other species, OC concentrations are at their lowest along the western boundaries (Figure II-4-22), owing to the relatively clean airflow originating from the ocean.

When comparing PM2.5 species to gaseous pollutants such as NOx, it's worth noting that particulate matter has a longer atmospheric lifetime. This extended lifetime allows PM2.5 species to disperse more evenly across different boundaries than most gaseous pollutants. In contrast, gaseous pollutants like NOx show substantial concentration variations across boundaries, with notably low levels at the western boundary (close to zero) and comparatively higher levels at other boundaries (Figure not shown).

[4] Cheung, K., Daher, N., Kam, W., Shafer, M. M., Ning, Z., Schauer, J. J., & Sioutas, C. (2011). Spatial and temporal variation of chemical composition and mass closure of ambient coarse particulate matter (PM10–2.5) in the Los Angeles area. Atmospheric environment, 45(16), 2651-2662, https://doi.org/10.1016/j.atmosenv.2011.02.066

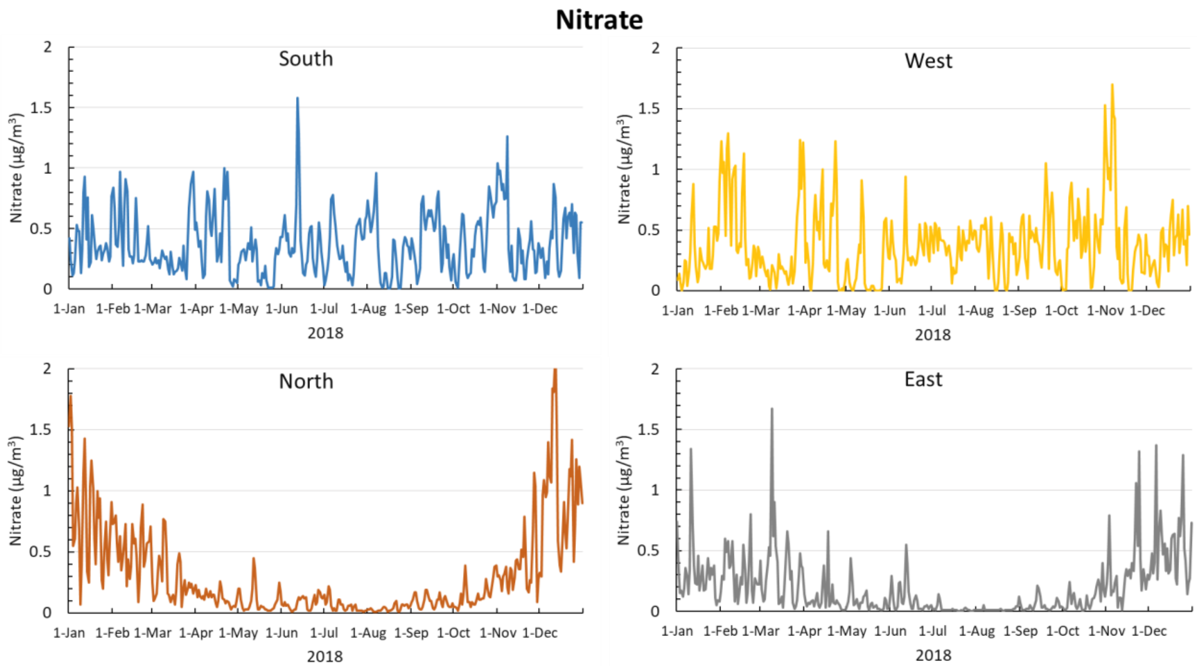


FIGURE II-4-19

DAILY AVERAGES OF SURFACE NITRATE CONCENTRATION ALONG THE FOUR BOUNDARIES OF MODELING DOMAIN

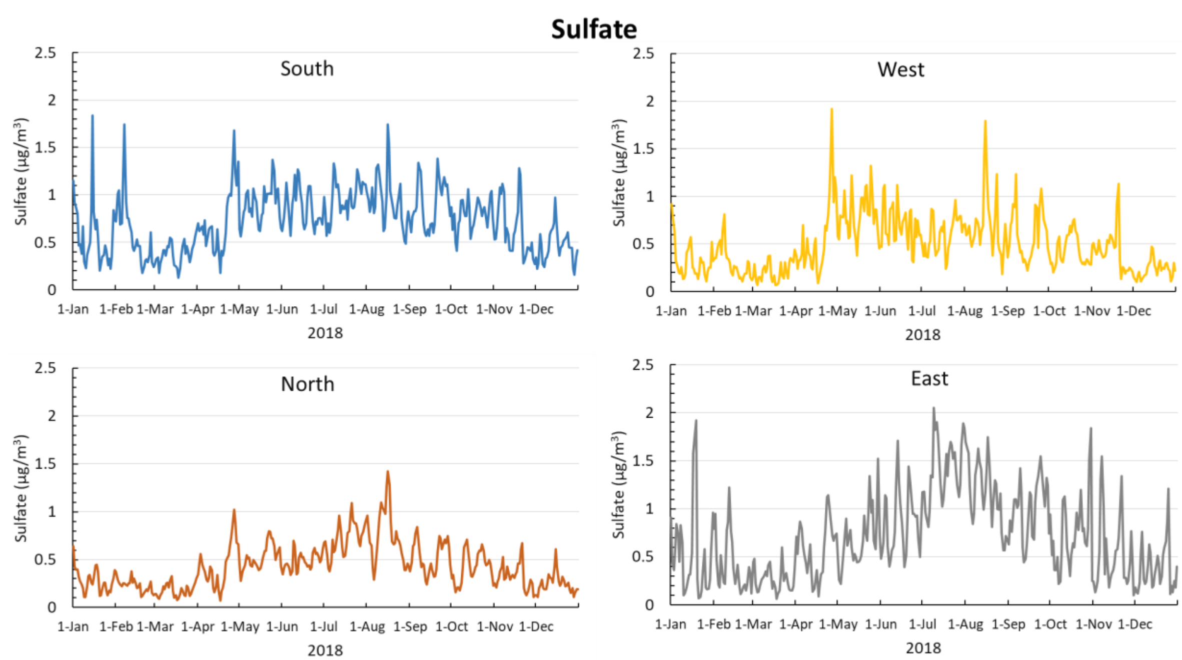


FIGURE II-4-20

DAILY AVERAGES OF SURFACE SULFATE CONCENTRATION ALONG THE FOUR BOUNDARIES OF MODELING DOMAIN

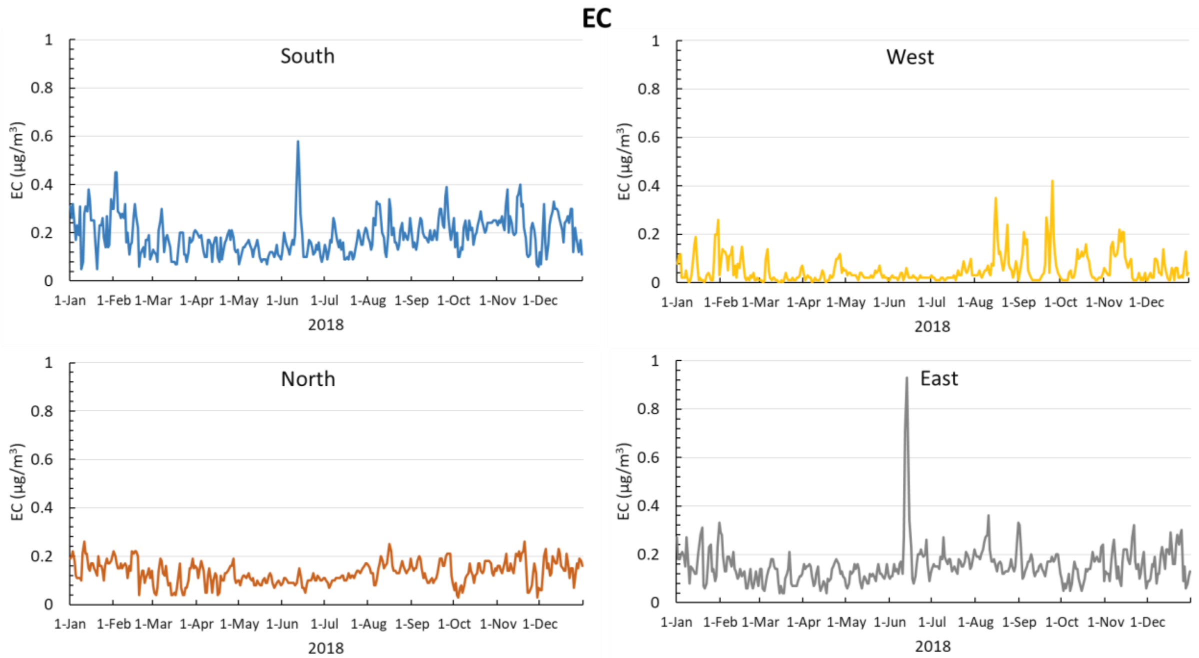


FIGURE II-4-21

DAILY AVERAGES OF SURFACE ELEMENTAL CARBON CONCENTRATION ALONG THE FOUR BOUNDARIES OF MODELING DOMAIN

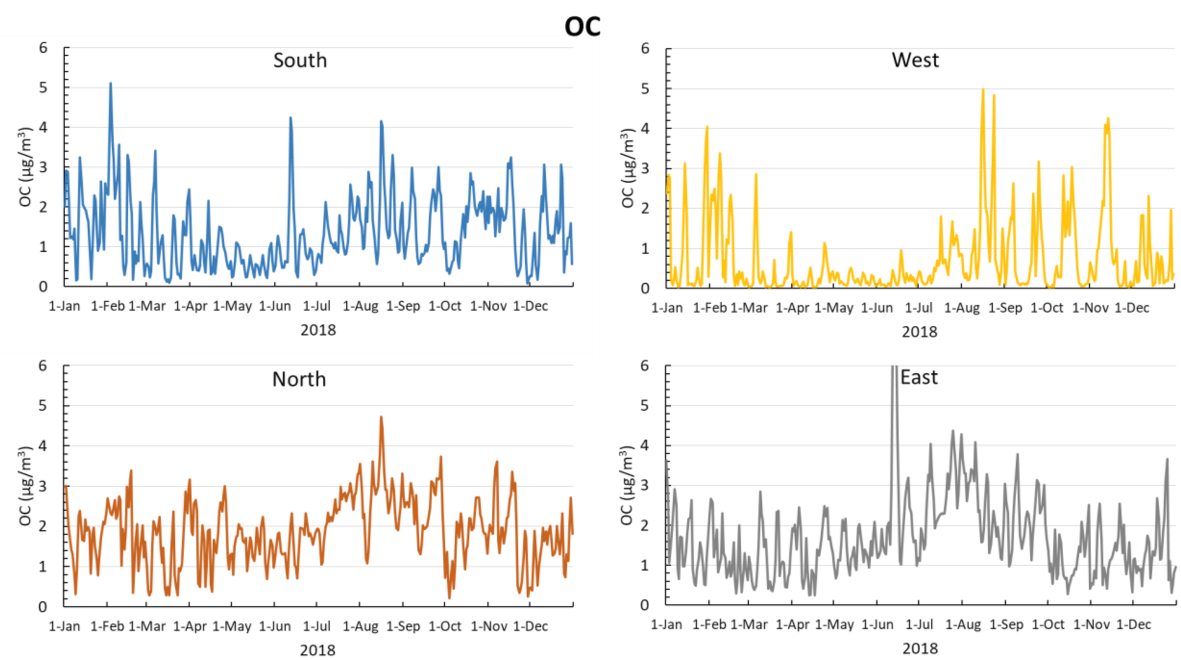


FIGURE II-4-22

DAILY AVERAGES OF SURFACE ORGANIC CARBON CONCENTRATION ALONG THE FOUR BOUNDARIES OF MODELING DOMAIN

TABLE II-4-2

ANNUAL AVERAGES OF MAJOR PM2.5 SPECIES AND TOTAL PM2.5 ALONG THE FOUR BOUNDARIES OF MODELING DOMAIN (μg/m³)

	South	West	North	East
Nitrate	0.38	0.37	0.30	0.19
Sulfate	0.73	0.49	0.43	0.71
EC	0.19	0.05	0.13	0.15
OC	1.36	0.72	1.88	1.70
Total PM2.5	3.48	2.47	3.59	4.19

Chapter 5

ANNUAL PM2.5 ATTAINMENT DEMOSTRATION

Introduction

On April 15, 2015, the South Coast Air Basin was designated a 'moderate' non-attainment area for the 2012 annual PM2.5 standard of 12 µg/m3. This designation set an attainment deadline of December 31, 2021, based on CAA subpart 4, which establishes that attainment must be reached by the end of the 6th calendar year after the effective date of "moderate" designation. Acknowledging the challenges in meeting the standard, including the feasibility of proposed measures, uncertainties in drought conditions, and the potential inability to credit all ozone strategy reductions towards PM2.5 attainment if approved under CAA Section 182(e)(5), South Coast AQMD requested a voluntary bump-up to the "serious" classification, with a new attainment date of 2025. On December 9, 2020, U.S. EPA reclassified the Basin from "moderate" to "serious" nonattainment for the 2012 annual PM2.5 NAAQS with an attainment deadline by December 31, 2025.[1] "Serious" nonattainment areas are required to attain the standard as expeditiously as practicable, but no later than the end of the tenth calendar year after the designation, i.e., December 31, 2025. Under CAA Section 188(e), "serious" nonattainment areas may request an attainment date extension to no later than the end of the fifteenth calendar year after the designation, i.e., December 31, 2030. This plan requests an extension of attainment in 2030 due to unforeseen challenges associated with near-road monitored PM2.5 levels, lack of progress from the sources subject to federal and international sources and adverse meteorology.

PM2.5 FRM Sampling

The South Coast AQMD maintains a sampling network of Federal Reference Method (FRM) PM2.5 monitors at 20 sites throughout the Basin and Coachella Valley. This network is supplemented by Federal Equivalent Method (FEM) continuous PM2.5 monitors at a subset of these locations to report real-time data to the public and to feed for forecasting algorithms. FRM samplers pull ambient air through a filter over a 24-hour period. The filter is then removed and weighed to determine ambient PM2.5 concentrations during the sampling period. The FEM samplers used by South Coast AQMD are Beta Attenuation monitors that report hourly PM2.5 concentrations continuously, which are averaged over a 24-hour period to determine daily averages. While measurements from FRM and FEM produce similar concentrations, there still is some variation, with FEM samplers typically reading higher than collocated FRM samplers. FRM measurements are used in the determination of attainment status, whereas FEM measurements are used to supplement FRM measurements for days with missing data, if the FEM monitor is determined to be eligible for NAAQS comparison by U.S. EPA. The calculation of 5-year-weighted base year design values used FRM samples with missing FRM samples replaced by NAAQS-comparable FEM samples.

Speciated PM2.5 Sampling

South Coast AQMD adopted a Multi-Channel Fine Particulate (MCFP) sampling system for the PM10 Technical Enhancement Program (PTEP) monitoring program in 1995.[1] New PM samplers, speciated air sampling system (SASS) samplers, were deployed at the four Chemical Speciation Network (CSN) sites in the Basin. The SASS sampler collects PM2.5 particles on 47mm quartz and Teflon filters simultaneously within the same sampler continuously for 24-hours for subsequent laboratory chemical analysis. Samples were originally collected one out of every six days.

PM2.5 speciation data, measured as individual species at the four CSN sites in the Basin during the period 2017-2019, provided the PM2.5 chemical characterization for evaluation and validation of the CMAQ annual modeling. The four CSN sites include Riverside-Rubidoux, Fontana, Anaheim and Central Los Angeles (Figure II-5-1). These four sites represent each county that the monitor is located in. PM2.5 mass, ions, organic and elemental carbon, and metals, for a total of 43 chemical species, were analyzed from a one-in-six-day sampling schedule at the 4 sites. The speciation profiles in these four sites are used to estimate the speciation profiles at the other monitoring stations using interpolation with inverse distance weighting per U.S. EPA's guidance.

[1] Bong Mann Kim, Solomon Teffera & Melvin D. Zeldin (2000). Characterization of PM25 and PM10 in the South Coast Air Basin of Southern California: Part 1—Spatial Variations, Journal of the Air & Waste Management Association, 50:12, 2034-2044, Available at: https://doi.org/10.1080/10473289.2000.10464242

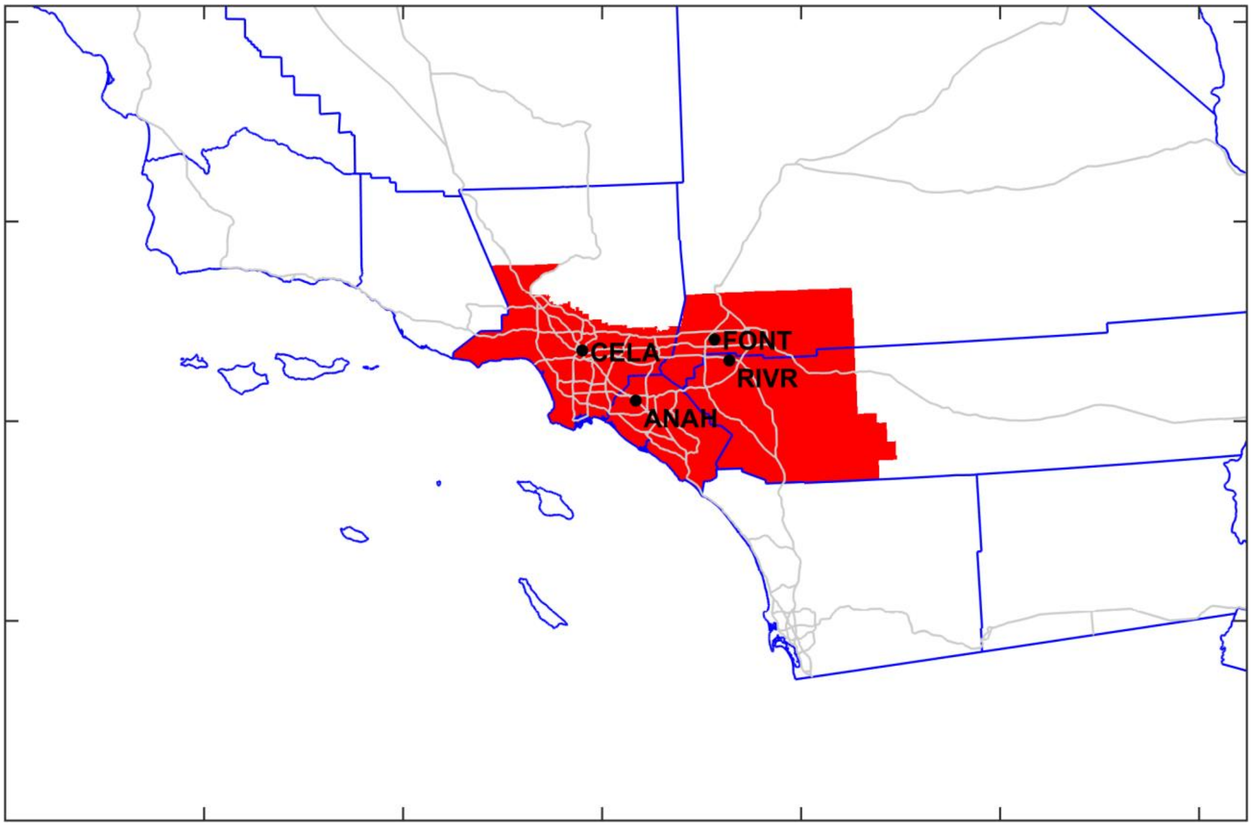


FIGURE II-5-1

SAMPLING SITES IN THE BASIN

PM2.5 speciation data measured by the SASS samplers are used to derive the species fractions required for the PM2.5 attainment demonstration methodology. U.S. EPA's PM2.5 modeling guidance recommends calculating future year PM2.5 design values by multiplying quarterly, species-specific Relative Response Factors (RRFs) with the base year speciated design values for each quarter for each monitoring site. Base year design values are determined from the FRM mass data, however the FRM filters are not chemically speciated. Therefore, the guidance document recommends multiplying the species fractions that are measured in a speciation sampler such as the SASS to the FRM mass data to derive chemically speciated design values for the FRM data. Discussion in the measured design values and the calculation of speciation profiles is presented later in this chapter.

Annual PM2.5 Modeling Approach

This PM2.5 Plan's annual PM2.5 modeling follows the U.S. EPA modeling guidance[2] to estimate the future year annual PM2.5 levels, which is based on the site and species-specific RRF approach. A five-year weighted quarterly average from the 2016 to 2020 period was established as the base year 2018 design value. The year 2020, however, was excluded in calculation of 2018 base year design values due to exceptionality of 2020. Refer to Chapter 5 for more details~~.~~ on the formulation of the modified 5-year weighted design value.

The year 2020 was characterized by a large disruption in air pollutant emissions due to the response to the COVID-19 pandemic and by the exceptionally widespread wildfire activity in the state. The COVID-19 Pandemic started to influence economic activity in March of 2020 in the South Coast AQMD region. During the initial months of "safer at home" orders in late March to June 2020, light-duty and heavy-duty vehicle traffic decreased by 43 percent and 26 percent, respectively, with respect to the month before the COVID stay-at-home measures began. In addition, cargo movement at the ports of Los Angeles and Long Beach decreased by 12 percent, and flights in major airports in the Basin decreased by over 50% during April to June, compared to the same period in 2019. Activity at the ports and airports remained significantly below the business-as-usual level in 2020. Wildfires are a significant source of both fine particulate matter and VOCs. Additional VOC emissions from wildfire activity may lead to increases in secondary PM2.5 throughout the Basin. The 2020 fire season was extremely active, with a record amount of acreage burned. Over 4 million acres burned in California in 2020, more than double the previous modern record set in 2018. Both fires within the South Coast Air Basin such as the Bobcat, El Dorado, Silverado, Blue Ridge, Ranch2, Apple and Snow fires and fires in Northern and Central California affected air quality in 2020. In total, we identified 13 events that potentially affected PM2.5 concentrations in the Basin and that triggered smoke advisories for the Basin.[3] These 13 events, listed in Attachment 4 of this appendix, spanned for long periods from mid-June through mid-December. Accordingly, it is unreasonable to use such extraordinary circumstances impacting human activities and associated emissions in a SIP planning which is based on business-as-usual normal situation. More discussions on the COVID-19 impacts, meteorology and wildfire impacts in relation with ozone can be found in Chapter 2 of the 2022 AQMP.

The modeling platform is developed to model an entire year to calculate quarterly PM2.5 averages. A day-specific emissions inventory was developed to reflect the temperature and relative humidity dependency of mobile sources and biogenic emissions. Also, seasonal fuel switching, and the resulting emission rates were incorporated in the modeling inventory.

In addition to the base year (2018), future milestone years simulated under this plan were 2025 and 2030, with the former being the target attainment year for a 'serious' non-attainment area and the latter for an extended attainment deadline for a 'serious' non-attainment area. Both baseline and control scenarios were simulated for each of the future years. CMAQ output was averaged over the 3X3 grid around each monitoring station following U.S. EPA's modeling guidance.

[2] Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5, and Regional Haze, U.S. EPA, November 2018. Available at: https://www.epa.gov/sites/default/files/2020-10/documents/o3-pm-rh-modeling_guidance-2018.pdf

[3] Smoke advisories released in 2020 available here: https://www.aqmd.gov/home/news-events/news-and-media/2020-news-archives#

The base year design values are listed in Table II-5-1. The future year design values are calculated using the base year quarterly averages and the RRF calculated using modeled concentrations for the base year and future scenario. Site- and species-specific RRFs are calculated from CMAQ simulations and then, they are applied to the quarterly average design values which are averaged for the period of 2016 to 2019 using the 5-year weighted average approach. The average of the quarterly species-specific projections is the future design value.

TABLE II-5-1

FIVE-YEAR WEIGHTED ANNUAL PM2.5 DESIGN VALUES FOR 2018 (µg/m^3)

Monitoring Site	Annual 2018 DVB
Anaheim-Pampas Lane	10.55
Azusa	10.13
Big Bear	6.35
Los Angeles-North Main Street	11.97
Compton-700 North Bullis Road	12.25
Fontana-Arrow Highway	11.35
Long Beach-Route 710 Near Road	12.28
North Long Beach	10.53
Mira Loma Van Buren	13.53
Mission Viejo-26081 Via Pera	7.94
Ontario- Route 60 Near Road	13.98
Pasadena-S Wilson Avenue	9.68
Pechanga	6.36
Pico Rivera-4144 San Gabriel	11.87
Reseda	9.74
Riverside-Rubidoux	12.13
South Long Beach	10.58
San Bernardino-4th Street	10.87

Performance Evaluation

The EPA guidance assesses model performance on the ability to predict both PM2.5 component species concentrations and the total mass. No specific performance criteria thresholds are recommended in EPA's modeling guidance document. This is because the model uses relative response factors rather than direct predictions to forecast future concentrations. Performance is evaluated by examining key statistics and graphical representations of differences between model-predicted concentrations and observations. The statistics examine model bias and error, while graphical representations of model prediction as a function of time and concentration scatter plots supplement the model performance evaluation. The CMAQ modeling results presented for each station are based on the same "1-cell" basis, as recommended by the guidance.

For the CMAQ performance evaluation, the modeling domain is separated into several sub-regions or zones. Figure II-5-2 depicts the sub-regional zones used for base-year simulation performance. The different zones present unique air quality profiles. The Basin is represented by five zones: "Coastal", "San Fernando", "Foothills", "Urban Source", and "Urban Receptor". The "Urban Receptor" region typically has the highest PM2.5 concentrations in the Basin. Table II-5-2 lists the stations, their abbreviations, and their assigned performance evaluation zone.

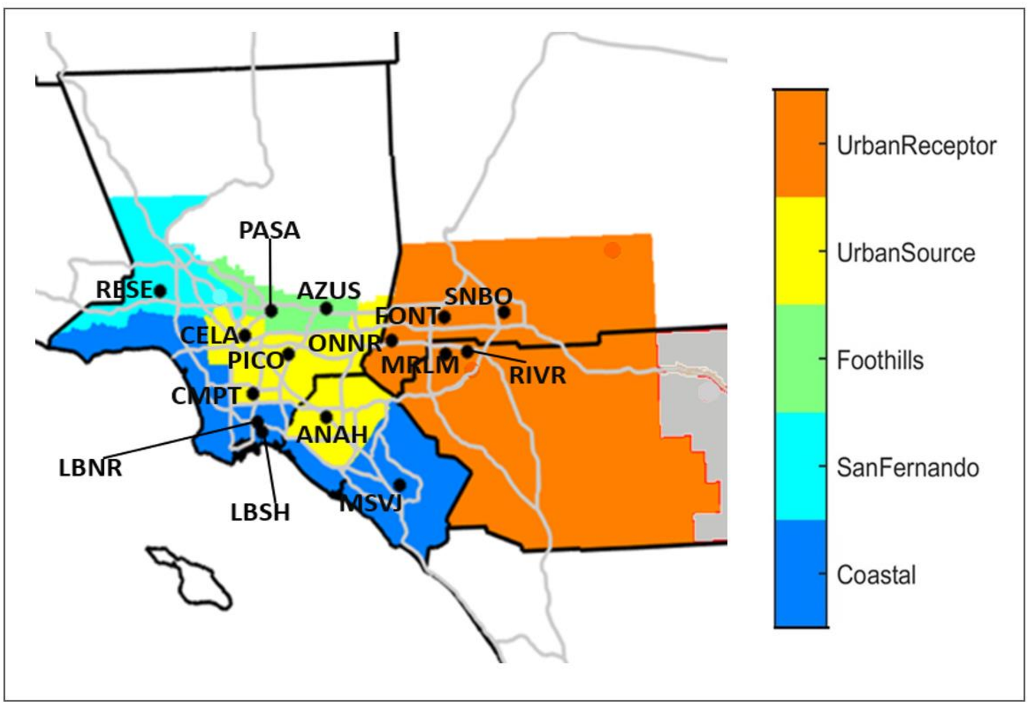


FIGURE II-5-2

PERFORMANCE EVALUATION ZONES. BLACK DOTS INDICATE THE LOCATION OF FRM STATIONS.

TABLE II-5-2

FRM STATIONS IN THE SOUTH COAST AIR BASIN

Station Location	Station Abbreviation	Performance Evaluation Zone
Long Beach	LGBH	Coastal
Mission Viejo	MSVJ	Coastal
South Long Beach	SLBH	Coastal
Azusa	AZUS	Foothills
Pasadena	PASA	Foothills
Reseda	RESE	San Fernando
Fontana	FONT	Urban Receptor
Mira Loma	MRLM	Urban Receptor
Ontario	ONFS	Urban Receptor
Riverside	RIVR	Urban Receptor
San Bernardino	SNBO	Urban Receptor
Anaheim	ANAH	Urban Source
Compton	CMPT	Urban Source
Los Angeles	CELA	Urban Source
Pico Rivera	PICO	Urban Source

Daily predicted and observed PM2.5 concentrations at CELA, ANAH, FONT, MRLM, and RIVR are presented in Figures II-5-3 through II-5-7. While absolute concentrations may differ, the model simulates trends in PM2.5 reasonably well. Both modelled and observed PM2.5 concentrations have high variability and display the highest peaks in the 1st and 4th quarter. Concentrations have less day-to-day variation in the 2nd and 3rd quarters at all the 5 sites. This behavior is likely due to differences in meteorology throughout the year. Weather patterns during the first quarter and the second half of the 4th quarter are typically highly variable; precipitation days, cold, high-winds and unstable conditions associated with synoptic scale storms are all commonly experienced during the winter months. On the contrary, spring and summer weather patterns are dominated by high pressure systems, leading to less day-to-day variation in boundary layer heights and wind speeds.

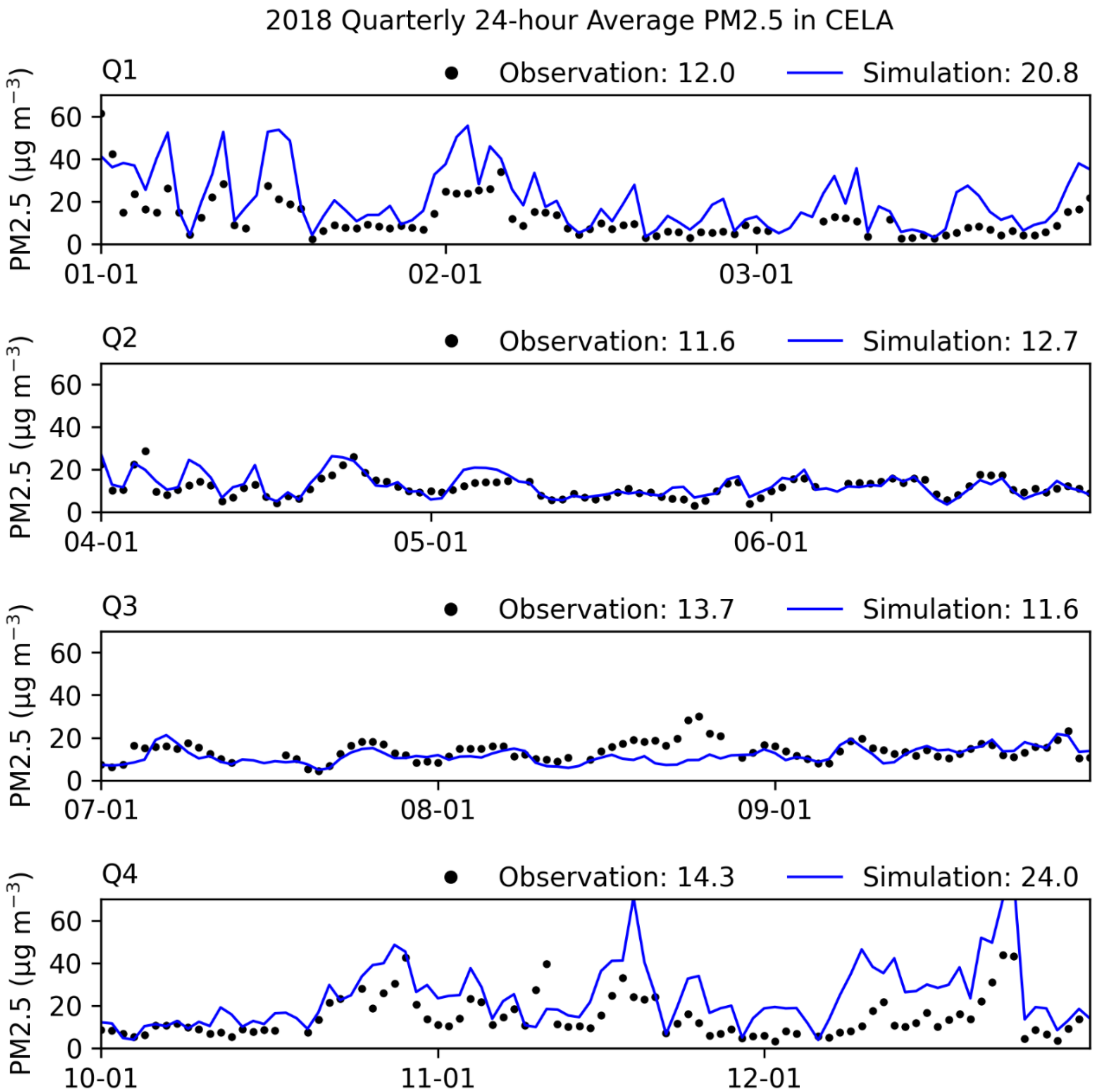


FIGURE II-5-3

2018 MODELLED AND MEASURED 24-HOUR AVERAGE PM2.5 CONCENTRATIONS IN LOS ANGELES

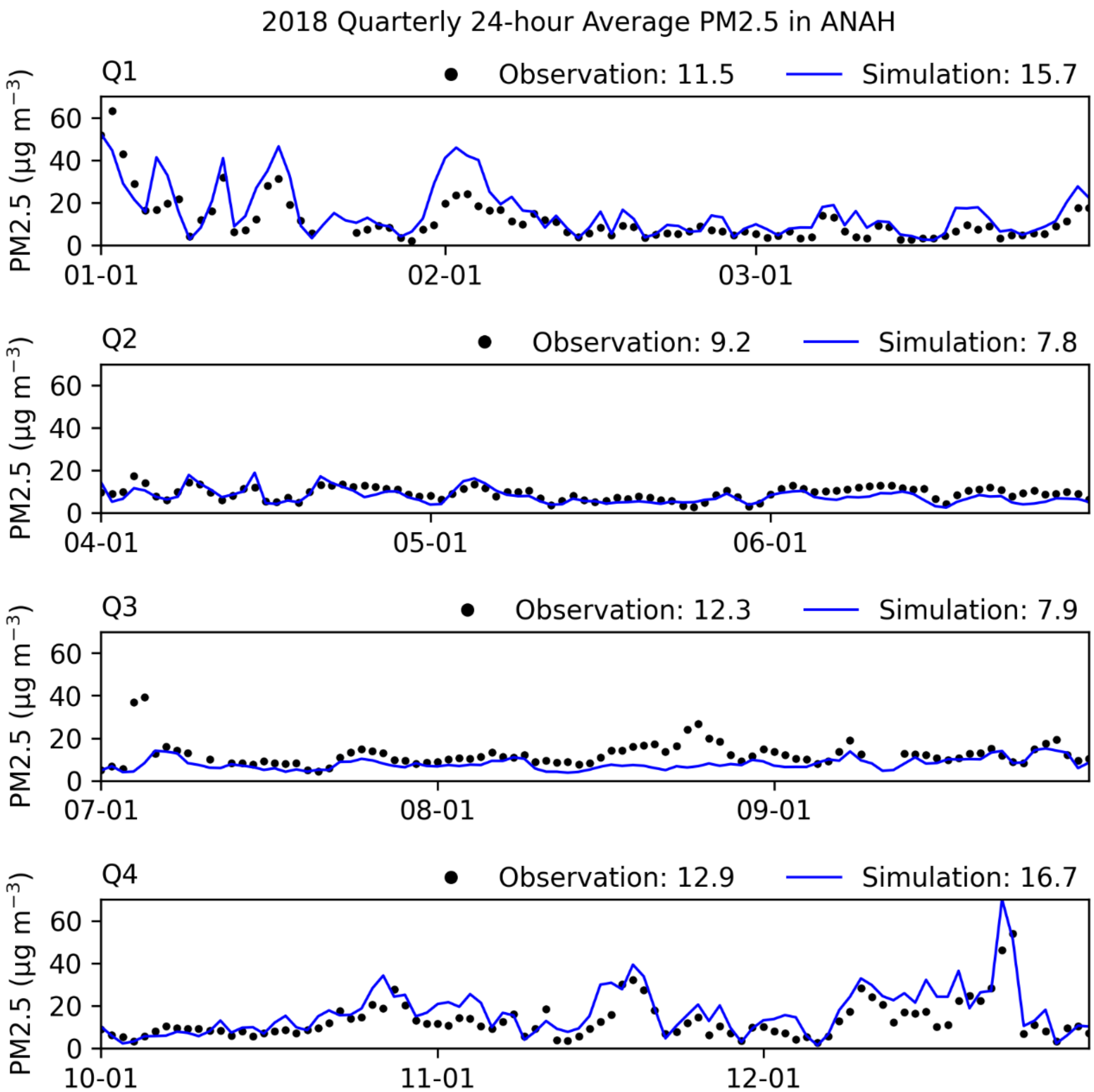


FIGURE II-5-4

2018 MODELLED AND MEASURED 24-HOUR AVERAGE PM2.5 CONCENTRATIONS IN ANAHEIM

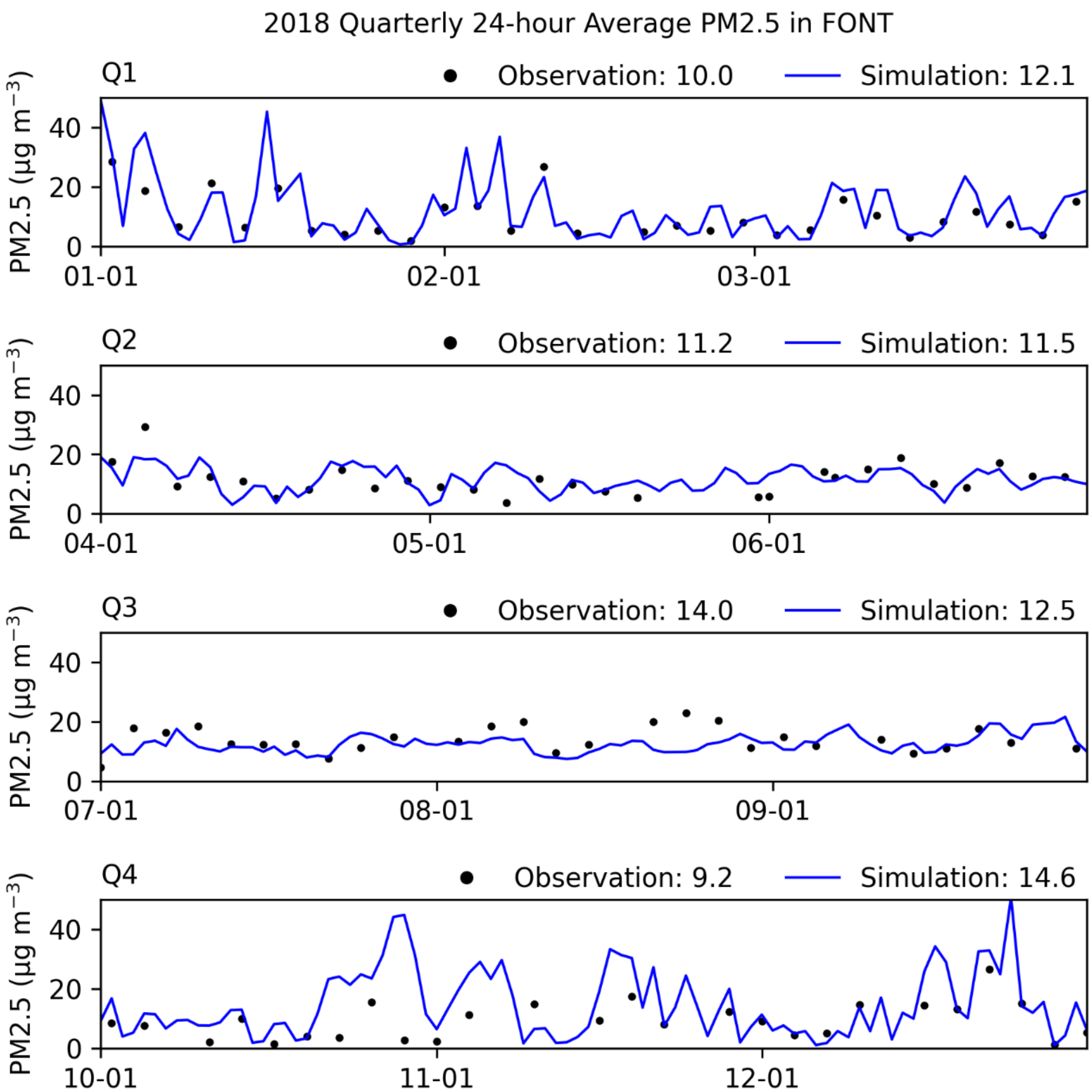


FIGURE II-5-5

2018 MODELLED AND MEASURED 24-HOUR AVERAGE PM2.5 CONCENTRATIONS IN FONTANA

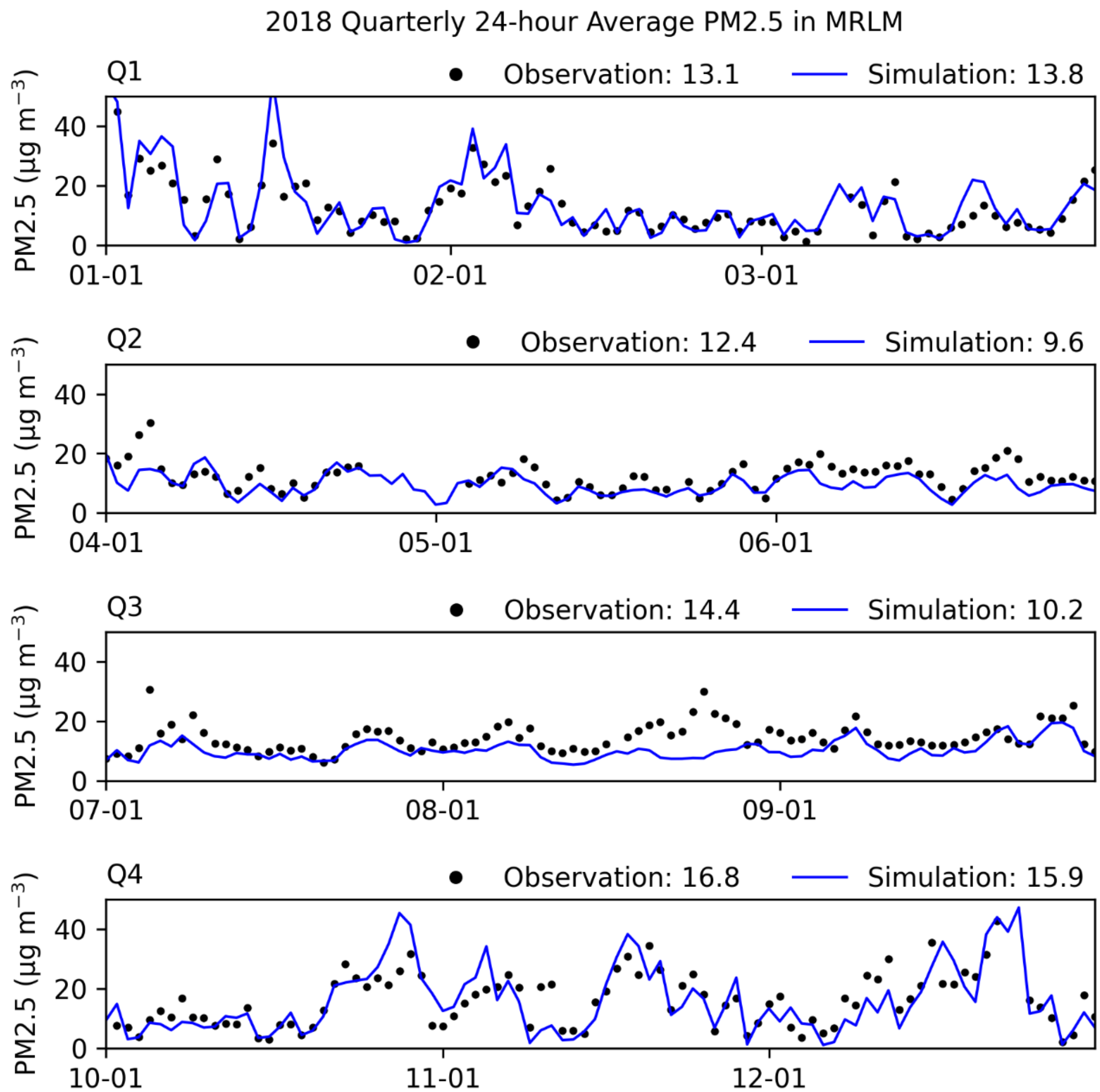


FIGURE II-5-6

2018 MODELLED AND MEASURED 24-HOUR AVERAGE PM2.5 CONCENTRATIONS IN MIRA LOMA

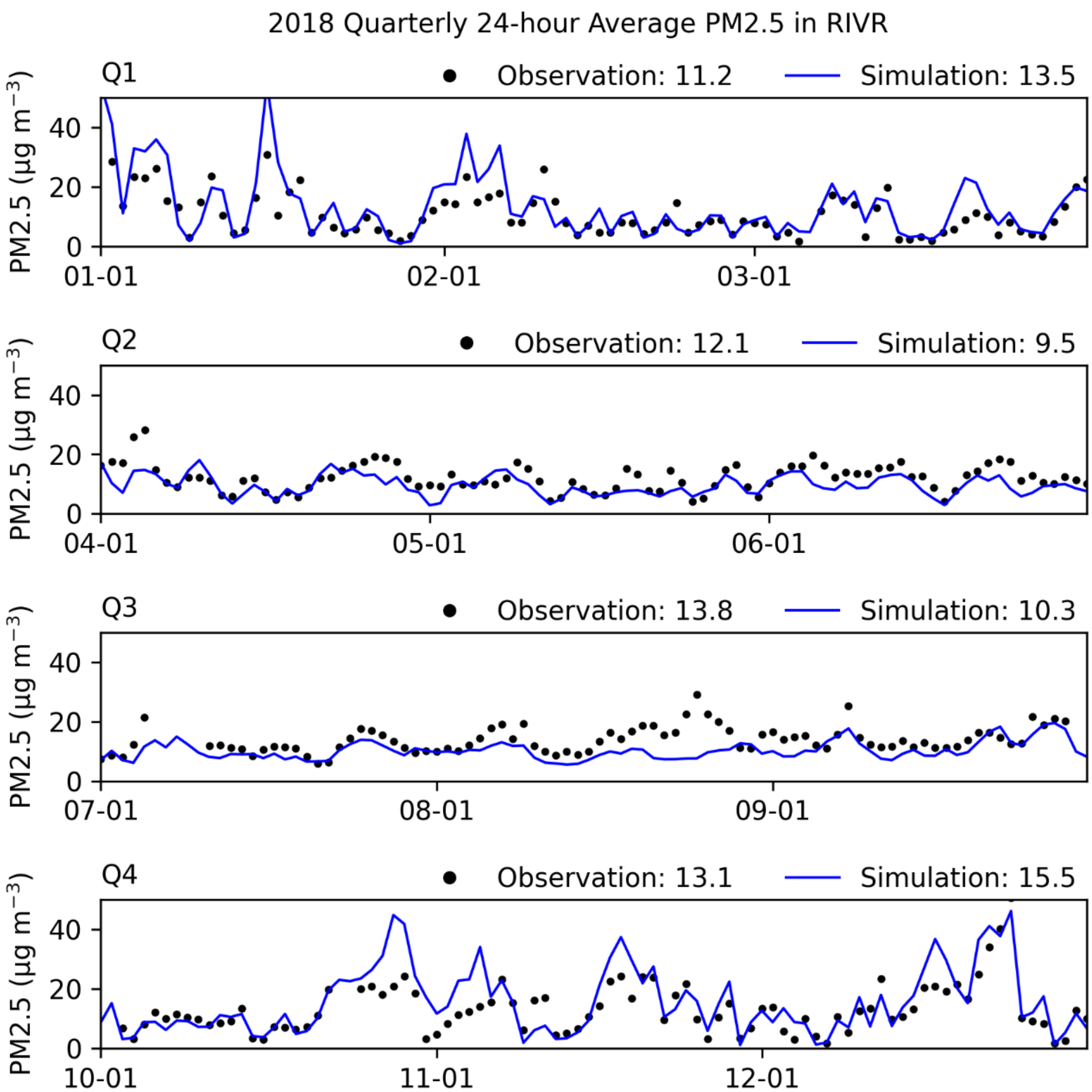


FIGURE II-5-7

2018 MODELLED AND MEASURED 24-HOUR AVERAGE PM2.5 CONCENTRATIONS IN RIVERSIDE

Scatter plots comparing daily FRM observations and corresponding model predictions for each region are presented in Figure II-5-8.

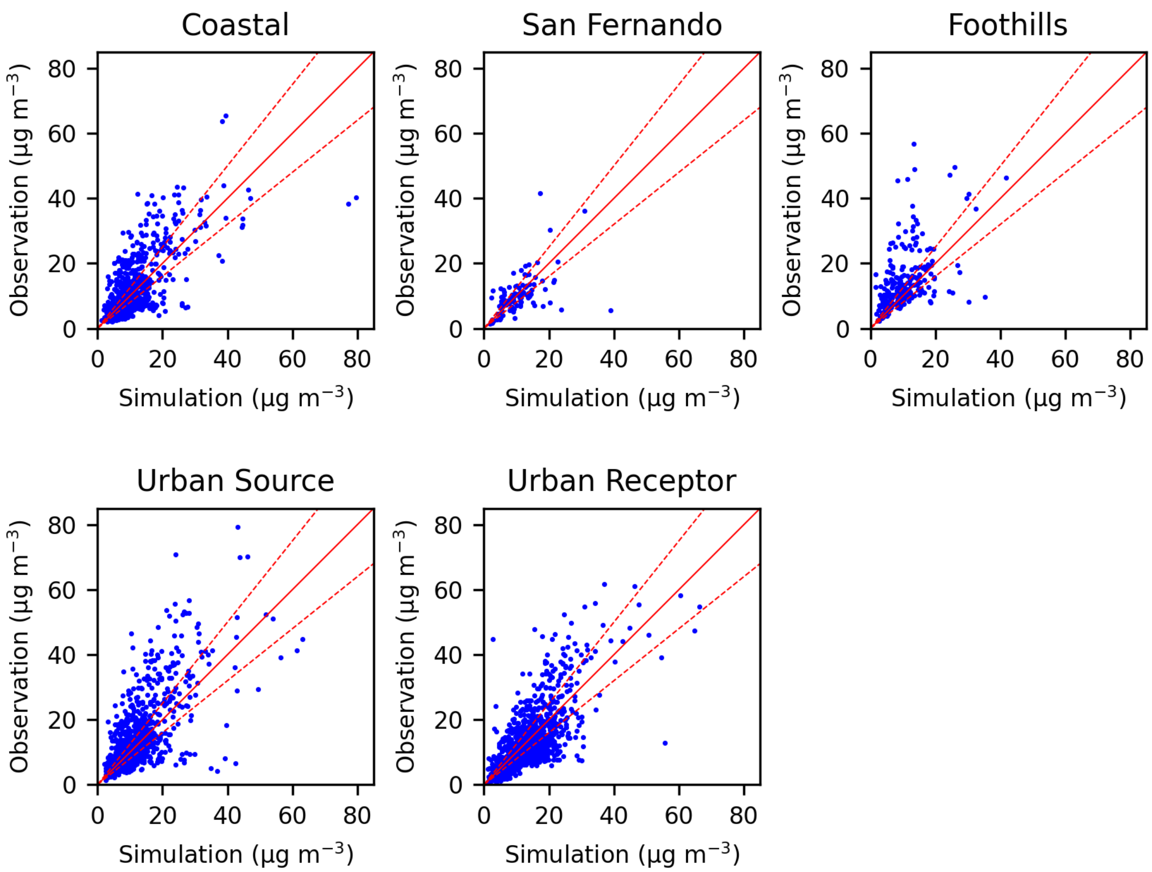


FIGURE II-5-8

2018 MODELLED AND FRM MEASURED PM2.5 COMPARISON FOR EACH REGION. DASHED LINES INDICATE AGREEMENT WITHIN 20 PERCENT.

Statistical Evaluation of Total PM2.5 mass

CMAQ over-predicts total PM2.5 mass in the "Coastal", "Foothills" and "Urban Source" regions. The "San Fernando", "Urban Receptor" regions, are well represented by CMAQ in the base year. The "Urban Receptor" region typically contains the highest PM2.5 concentrations in the South Coast Basin. Statistical measures to evaluate the modeling performance in each geographical zone are provided in Table II-5-3.

The statistics used to evaluate the daily CMAQ PM2.5 performance include the following:

Statistic	Equation	Definition
Bias Error	$BiasError = \frac{1}{N}\sum(Obs - Pred)$ where "N" is the number of values.	Average of the differences in observed and predicted daily values. Negative values indicate under-prediction.
Normalized Bias Error	$NormBiasError = \frac{1}{N}\sum\left(\frac{Obs-Pred}{Obs}\right)\cdot 100$	Average of the quantity: absolute difference in observed and predicted daily values normalized by the observed daily concentration
Gross Error	$GrossError = \frac{1}{N}\sum\lvert Obs - Pred\rvert$	Average of the absolute differences in observed and predicted daily values
Normalized Gross Error	$NormGrossError = \frac{1}{N}\sum\left\lvert\frac{Obs - Pred}{Obs}\right\rvert\cdot 100$	Average of the quantity: absolute difference in observed and predicted daily values normalized by the observed daily concentration

TABLE II-5-3

QUARTERLY STATISTICAL ANALYSIS OF TOTAL PM2.5 MASS FOR EACH OF THE SIX ANALYSIS ZONES

Region	Quarter	Mean Sim. (µg/m³)	Mean Obs. (µg/m³)	Bias Error (µg/m³)	Norm Bias (%)	Gross Error (µg/m³)	Norm Gross (%)
Coastal	Q1	15.4	11.1	-4.3	-60.9	5.9	67.5
Coastal	Q2	7.6	8.9	1.3	11.1	2.3	27.5
Coastal	Q3	7.8	11.4	3.6	26.4	4.0	31.8
Coastal	Q4	17.6	13.1	-4.5	-45.8	6.5	58.6
Coastal	**Annual**	**12.0**	**11.1**	**-0.9**	**-16.3**	**4.6**	**45.9**
Foothills	Q1	14.6	8.0	-6.7	-97.9	6.8	100.5
Foothills	Q2	12.0	11.1	-0.8	-10.8	2.3	22.0
Foothills	Q3	12.1	13.2	1.2	-22.6	3.8	50.1
Foothills	Q4	19.8	9.9	-9.9	-119.0	11.0	123.7
Foothills	**Annual**	**14.6**	**10.6**	**-4.1**	**-62.6**	**6.0**	**74.2**
San Fernando	Q1	9.4	8.5	-1.0	-12.2	2.5	34.0
San Fernando	Q2	9.2	10.4	1.2	-1.0	2.4	31.3
San Fernando	Q3	9.4	12.1	2.7	11.3	4.1	31.0
San Fernando	Q4	12.2	11.2	-1.0	-22.7	4.8	42.2
San Fernando	**Annual**	**10.1**	**10.5**	**0.4**	**-7.5**	**3.5**	**35.1**
Urban Receptor	Q1	14.0	12.1	-1.9	-17.6	4.3	39.0
Urban Receptor	Q2	10.1	12.2	2.1	13.0	3.1	25.6
Urban Receptor	Q3	10.9	14.5	3.7	20.9	4.2	26.4
Urban Receptor	Q4	16.7	14.3	-2.4	-25.7	5.5	49.1
Urban Receptor	**Annual**	**13.0**	**13.3**	**0.3**	**-2.4**	**4.3**	**35.1**
Urban Source	Q1	17.8	12.2	-5.7	-59.3	7.1	65.6
Urban Source	Q2	10.0	10.5	0.5	3.5	2.5	25.0
Urban Source	Q3	9.7	13.1	3.4	20.4	4.1	27.1
Urban Source	Q4	20.4	13.8	-6.6	-56.8	7.9	65.9
Urban Source	**Annual**	**14.5**	**12.4**	**-2.1**	**-23.1**	**5.4**	**45.9**

Model performance in the "Urban Receptor" region consistently outperforms the four other regions exhibiting the smaller normalized bias and normalized gross error for the annual analysis. Model performance in the "Urban Receptor" region is also strong when evaluating statistics on a quarterly basis. It is important to model this region accurately, as it contains the stations with the highest PM2.5 concentrations in the Basin.

Model Performance of Speciated PM2.5 Predictions

Figures II-5-9 through II-5-12 compare predicted and observed particulate sulfate, nitrate, elemental carbon, and organic carbon concentrations for the four stations where speciation data are available (ANAH, CELA, FONT, and RIVR). Note that organic carbon concentrations in the figures are based on direct measurements and are not adjusted with the SANDWICH method.

The model predicts ammonium ion, sulfate, nitrate, EC, and OM reasonably well in general. However, the model tends to overpredict concentrations at Central Los Angeles, which is near major sources of emissions. Conversely, the model tends to underestimate PM2.5 species concentrations at inland stations in Fontana and Riverside. Overall, the model captures the relative contributions of PM2.5 species reasonably well, showing that OM is the largest contributors to total PM2.5; OM fraction of total PM2.5 mass is 44% which agrees with measurements showing 41% of total mass being OM. OM predictions have significantly improved compared to 2016 AQMP values possibly due to the addition of a pseudo-SOA precursor thus increasing the estimates of SOA by CMAQ.

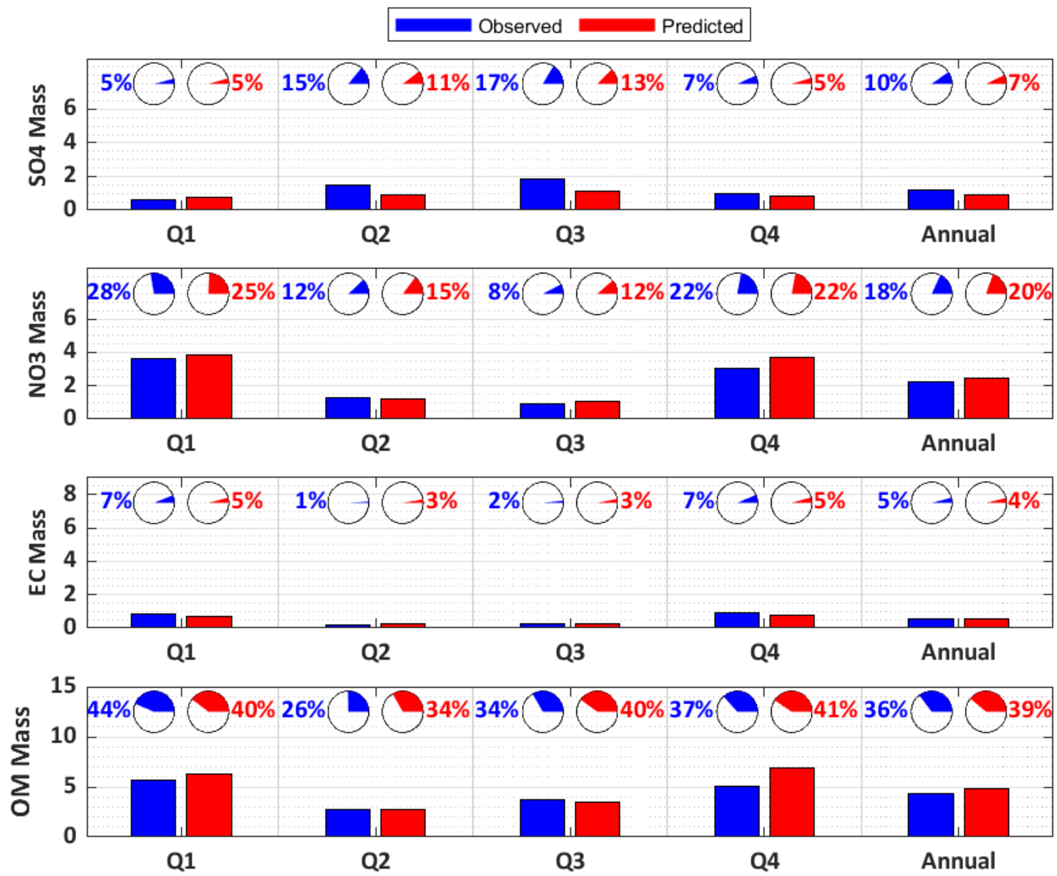


FIGURE II-5-9

2018 MODELLED AND MEASURED PM2.5 SPECIATION IN ANAHEIM. BARS INDICATE THE ABSOLUTE PM2.5 CONCENTRATION OF EACH SPECIES IN µg/m^3. PIE CHARTS REPRESENT THE SPECIES FRACTION. OM IS CALCULATED FROM OC AS OM = 1.4 × OC.

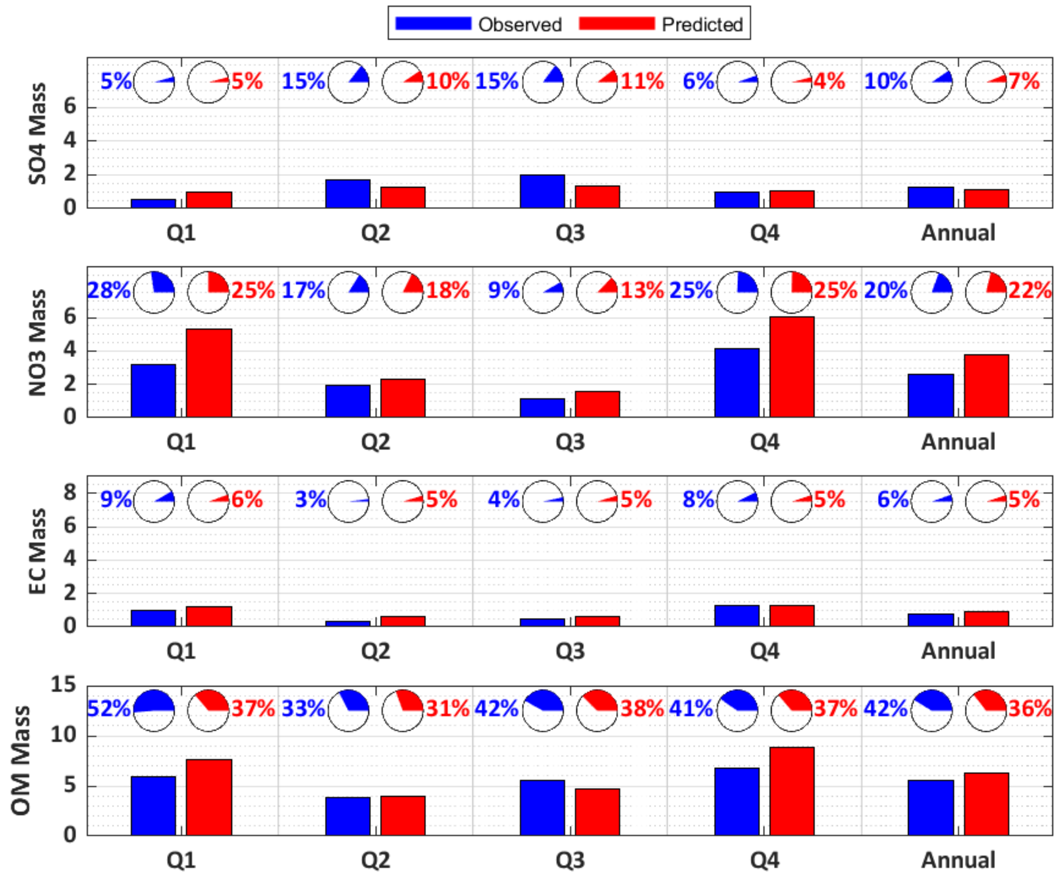


FIGURE II-5-10

2018 MODELLED AND MEASURED PM2.5 SPECIATION IN LOS ANGELES. BARS INDICATE THE ABSOLUTE PM2.5 CONCENTRATION OF EACH SPECIES IN µg/m³. PIE CHARTS REPRESENT THE SPECIES FRACTION. OM IS CALCULATED FROM OC AS OM = 1.4 × OC.

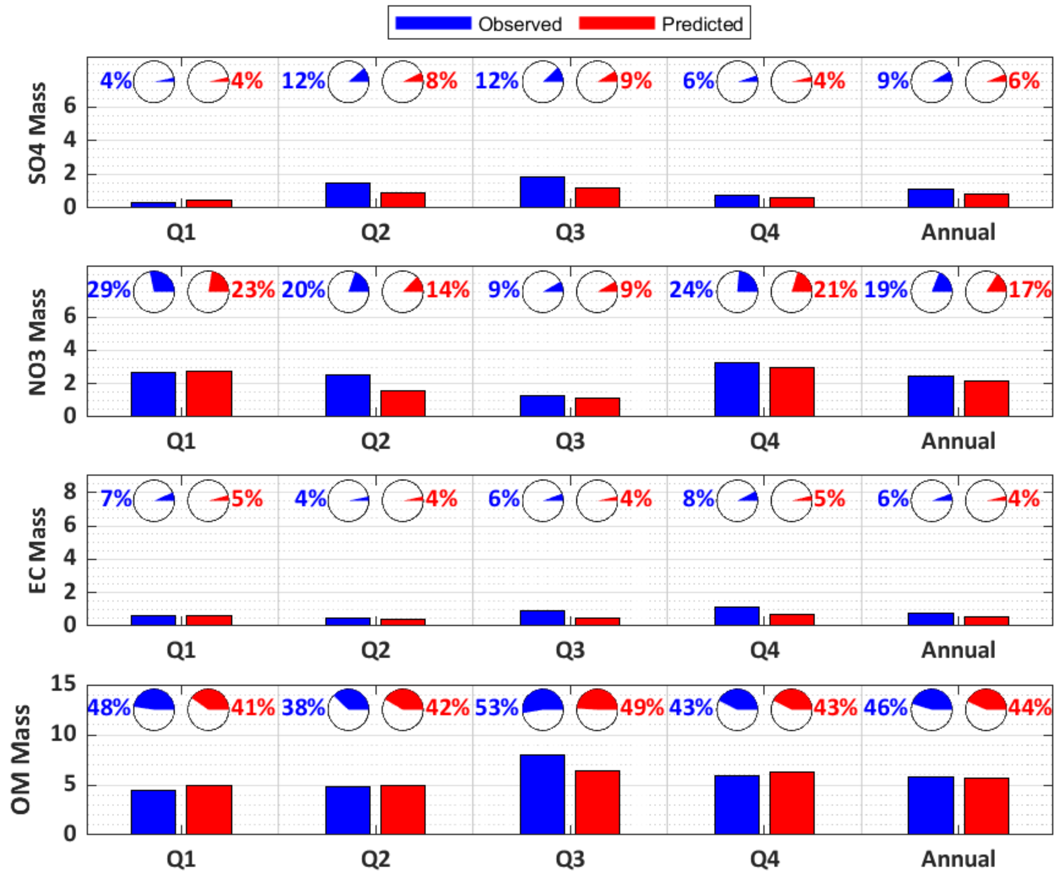


FIGURE II-5-11

2018 MODELLED AND MEASURED PM2.5 SPECIATION IN FONTANA. BARS INDICATE THE ABSOLUTE PM2.5 CONCENTRATION OF EACH SPECIES IN μg/m³. PIE CHARTS REPRESENT THE SPECIES FRACTION. OM IS CALCULATED FROM OC AS OM = 1.4 × OC.

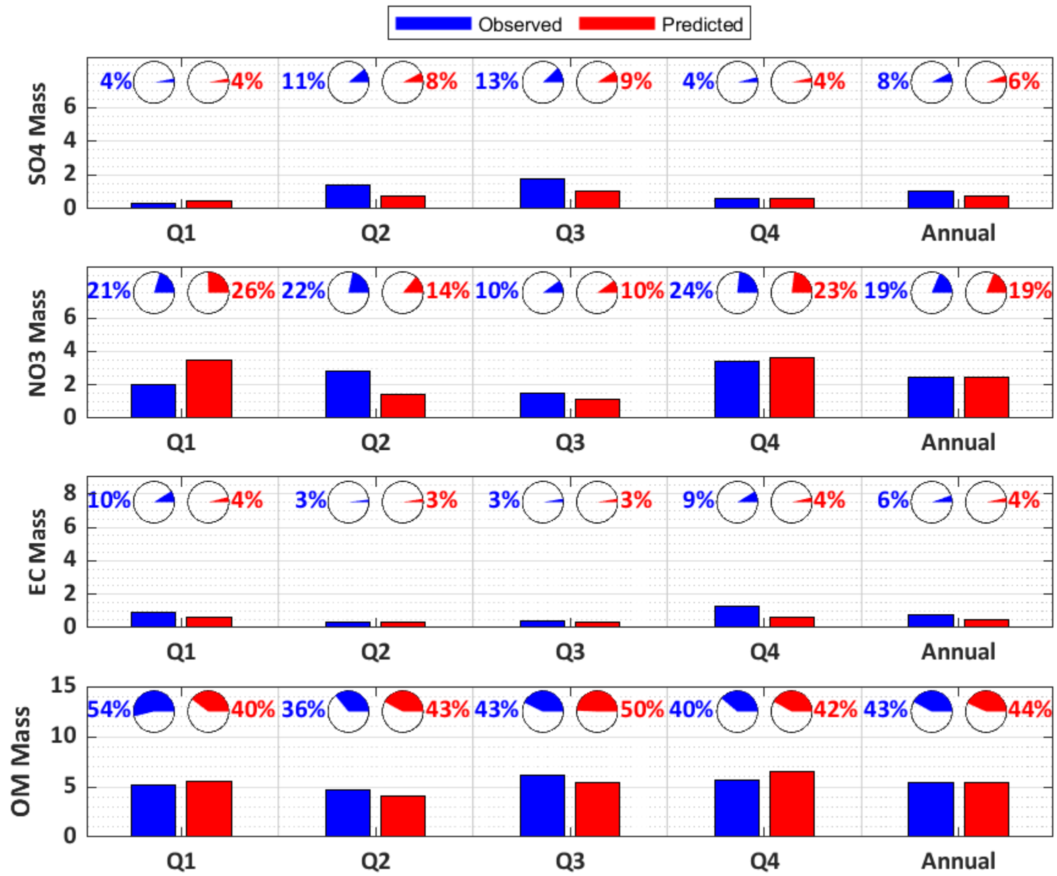


FIGURE II-5-12

2018 MODELLED AND MEASURED PM2.5 SPECIATION IN RIVERSIDE. BARS INDICATE THE ABSOLUTE PM2.5 CONCENTRATION OF EACH SPECIES IN µg/m^3. PIE CHARTS REPRESENT THE SPECIES FRACTION. OM IS CALCULATED FROM OC AS OM = 1.4 × OC.

CMAQ SOA Mass Simulation

Traditionally, air quality models tend to underpredict secondary organic aerosols (SOA) concentrations. Mounting evidence from field and laboratory observations coupled with atmospheric model analysis shows that primary combustion emissions of organic compounds exhibit a broad spectrum of volatility, leading to dynamic partitioning of these compounds, especially in the early stages of their atmospheric lifetime (Murphy et al., 2017).[4] Starting from CMAQ version 5.2, the model accounts for the semi-volatile partitioning and gas-phase aging of these primary organic aerosol (POA) compounds consistent with experimentally derived parameterizations. A new surrogate species termed potential secondary organic aerosol from combustion (pcSOA) was added to the model. It provides a cumulative representation of the SOA from combustion sources that could be missing from current chemical transport model predictions. The reasons for this missing mass likely include: [5]

- Missing intermediate volatility organic compound (IVOC) emissions in current inventories.
- Multigenerational aging of organic vapor products from known SOA precursors (e.g., toluene, alkanes).
- Underestimation of SOA yields due to vapor losses at the walls in smog chamber experiments.
- Organic-water interactions and aqueous-phase processing of known organic vapor emissions.

The result of this new parameterization is a good model performance with respect to measured organic aerosol by CMAQ, as shown in Figures II-5-9 through II-5-12. The quarterly averages of primary organic aerosol (POA) and secondary organic aerosol (SOA) mass concentrations are depicted in Figures II-5-13 to II-5-16 for each station. Generally, POA concentrations are elevated in the first and fourth quarters. This trend is attributed to increased residential fuel combustion during colder months, which contribute to higher POA levels. SOA concentrations are also high in fall and winter due to the formation of SOA from the oxidation of combustion related pollutant emissions, as well as due lower temperatures and higher humidity in winter, that contribute to the accumulation of air pollutants. Some inland stations, such as RESE, FONT, MRLM, ONFS, and SNBO exhibit also high SOA concentrations in the third quarter. These high concentrations can be attributed to increased biogenic volatile organic compound (VOC) emissions in the summer, resulting in higher SOA levels due to the elevated temperatures during this season.

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[4] Murphy, B. N., Woody, M. C., Jimenez, J. L., Carlton, A. M. G., Hayes, P. L., Liu, S., Ng, N. L., Russell, L. M., Setyan, A., Xu, L., Young, J., Zaveri, R. A., Zhang, Q., and Pye, H. O. T.: Semivolatile POA and parameterized total combustion SOA in CMAQv5.2: impacts on source strength and partitioning, Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2017-193

[5] Implemented Semivolatile POA and Potential Combustion SOA (pcSOA). Information available here: CMAQ/CCTM/docs/Release_Notes/SemiVolPOA_pcSOA.md at 5.2 · USEPA/CMAQ · GitHub

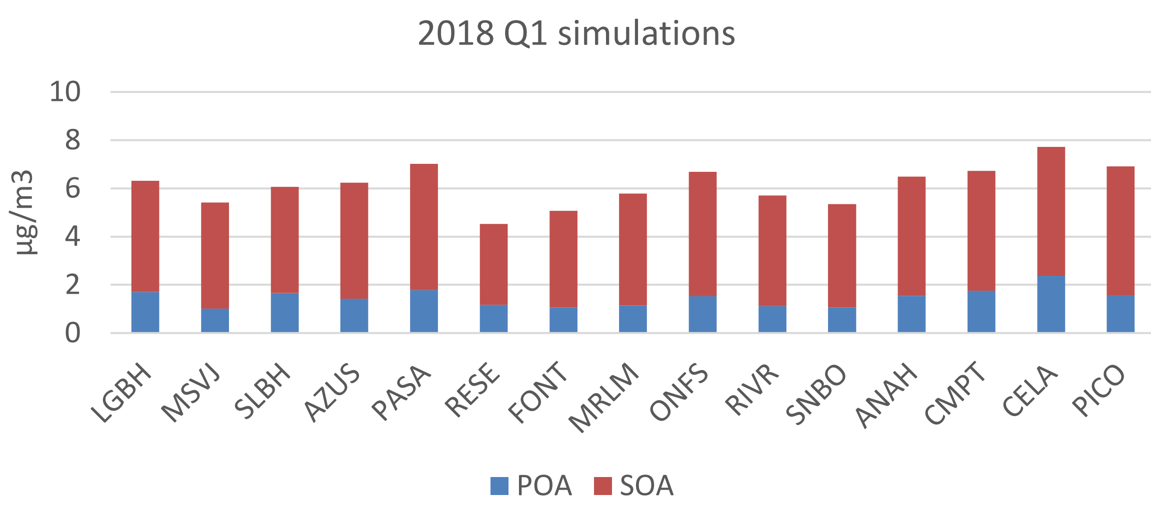


FIGURE II-5-13

QUARTERLY AVERAGE OF POA AND SOA MASS CONCENTRATIONS OF FIRST QUARTER IN 2018.

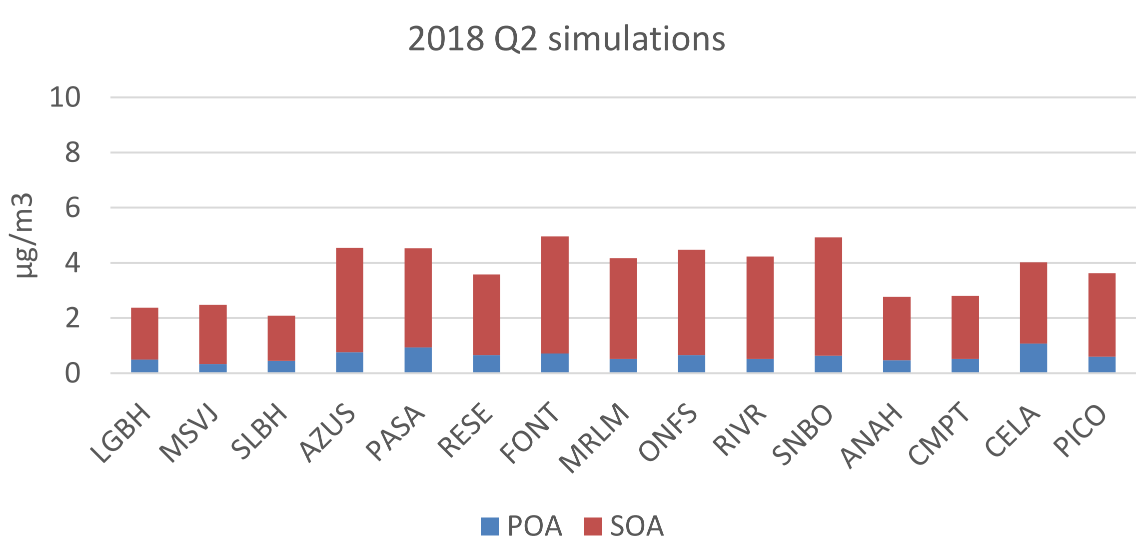


FIGURE II-5-14

QUARTERLY AVERAGE OF POA AND SOA MASS CONCENTRATIONS OF SECOND QUARTER IN 2018.

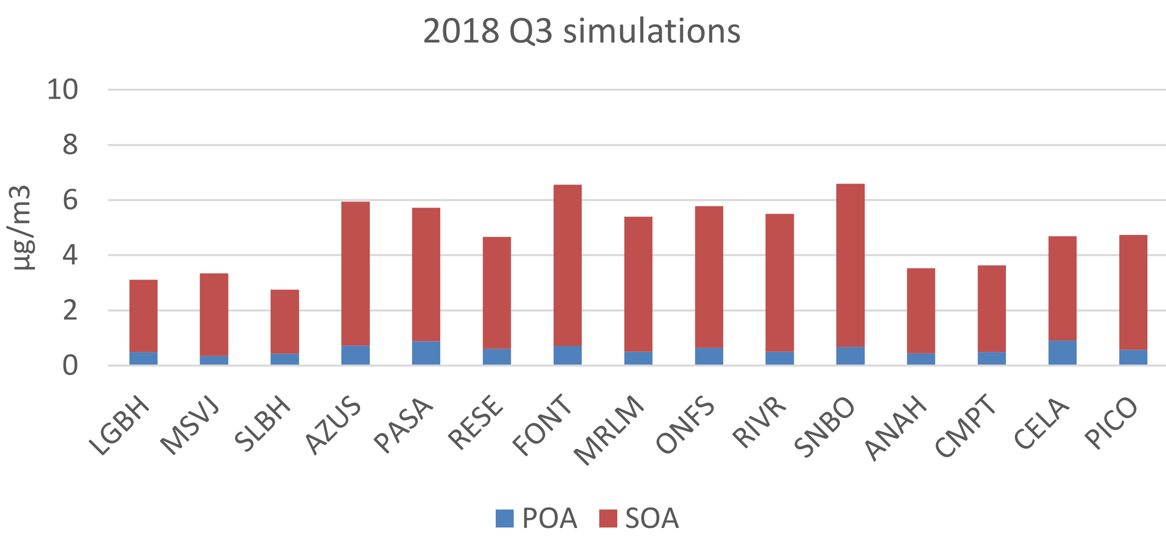


FIGURE II-5-15

QUARTERLY AVERAGE OF POA AND SOA MASS CONCENTRATIONS OF THIRD QUARTER IN 2018.

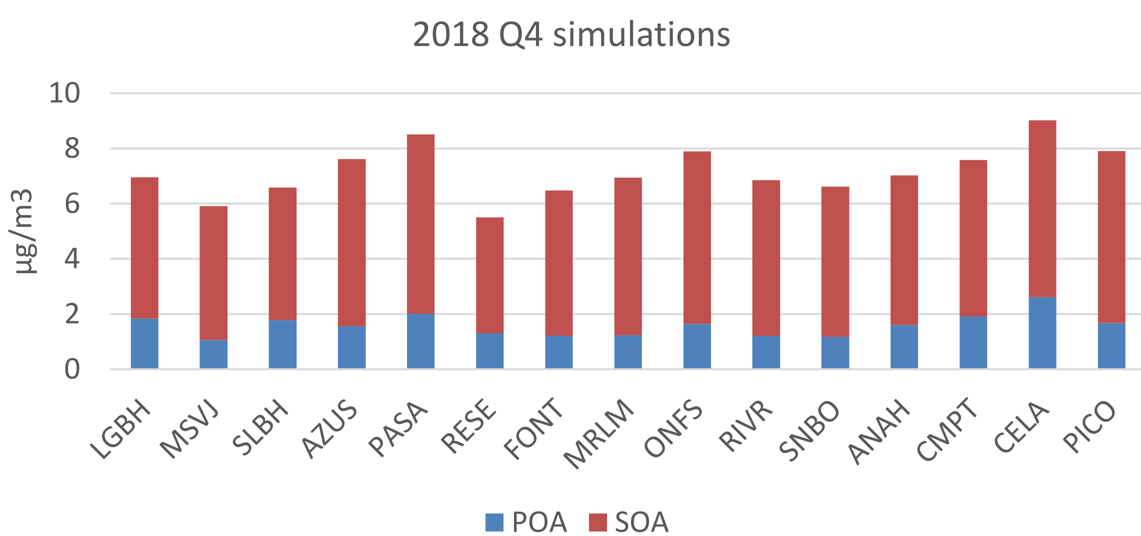


FIGURE II-5-16

QUARTERLY AVERAGE OF POA AND SOA MASS CONCENTRATIONS OF FOURTH QUARTER IN 2018.

Base Year Annual PM2.5

Quarterly average of PM2.5 FRM mass concentrations, using the modified 5-year weighted average of measurements during 2016-2020 is shown in Figure II-5-17. As shown, among the four stations, Anaheim has the lowest level of PM2.5 concentrations in all quarters, and the highest values occur at Rubidoux (13.50 µg/m^3) and CELA (13.49 µg/m^3) in quarter 4. In general, the sites in the western half of the Basin: Los Angeles and Anaheim, tend to have the highest average levels in the fourth quarter. Rubidoux also presents the highest concentration in the fourth quarter, whereas Fontana experiences the highest concentration in the third quarter. All stations tend to have the lowest concentrations in the first or second quarter. Typically, spring storms and favorable atmospheric dispersion drive PM2.5 concentrations down in the second quarter. Fontana, Rubidoux, and Los Angeles presented the lowest concentrations during the first quarter, whereas Anaheim had the lowest value in the second quarter.

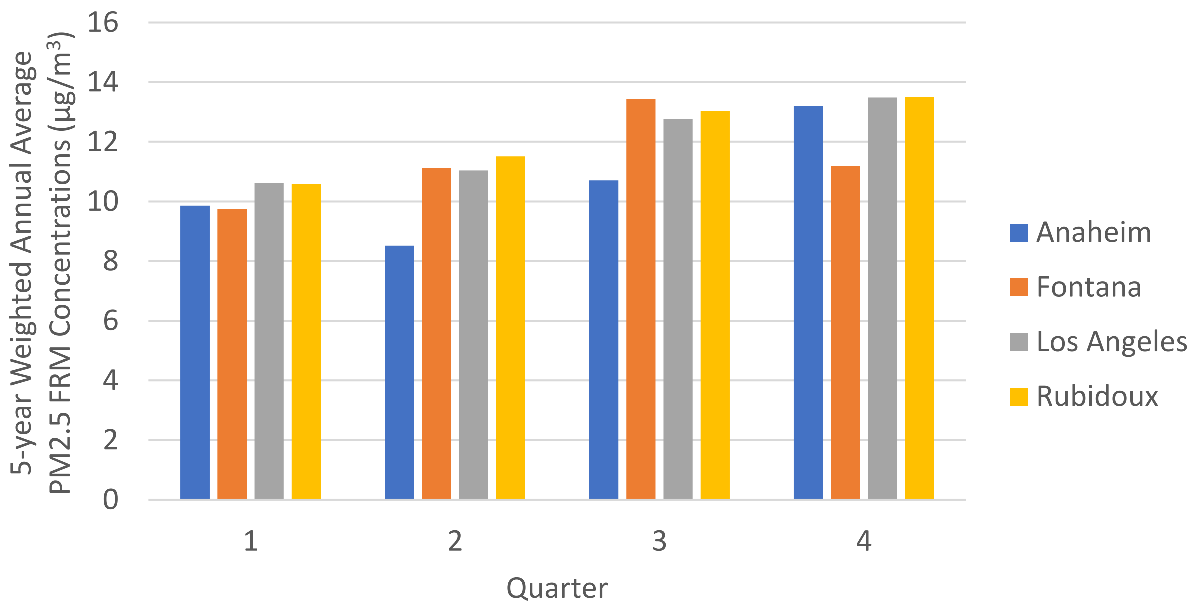


FIGURE II-5-17

QUARTERLY AVERAGE OF PM2.5 FRM MASS CONCENTRATIONS, USING THE MODIFIED 5-YEAR WEIGHTED AVERAGE OF MEASUREMENTS DURING 2016-2020 AT CSN MONITORS.

Speciated Quarterly Average Data

The measurements of individual species obtained from the CSN sites may differ from the retained mass of a specific species in the FRM filter, due to the inherent differences in the measurement techniques. To reconcile the expected differences between speciated and FRM measurements, species are adjusted following the SANDWICH method,[6] which is described in the U.S. EPA modeling guidance.[7] This adjustment results in reduced nitrates (relative to the amount measured by routine speciation networks), higher mass associated with sulfates and nitrates (reflecting water included in gravimetric FRM measurements), and an estimate of organic carbonaceous mass, which is derived from the difference between FRM-measured PM2.5 and the sum of all components except measured organic carbon. EPA's mas balance method sets a ceiling for OC mass (OCM) to be 80 percent of the total PM2.5 mass. However, based on scientific literature on PM2.5 speciation data taken in the greater Los Angeles area,[8,9] this ceiling was set as the 50 percent of PM2.5 FRM mass. EPA's guidance also sets a floor value for OCM to be the measured OC value. However, the sum of individual species measured from CSN is sometimes larger than the FRM mass. Under this condition, the measured OC as floor would erroneously exaggerate the OC fraction while reducing the other species, therefore, the OC floor was scaled by the ratio of FRM mass divided by the total CSN mass.

Directly measured ammonium (associated with nitrate and sulfate) at CSN stations, which is equivalent to particulate ammonium retained on FRM filters, was used for the speciation profiles. These measurements, however, were capped with fully neutralized ammonium, which is calculated as follows:

$$Ammonium\ ceiling = 0.375 \times sulfate + 0.29 \times retained\ nitrate$$

Additionally, particle water bound (PBW) should be estimated as sulfate and nitrate retained on FRM filters include water because ammonium sulfate and ammonium nitrate are hygroscopic. PBW was estimated using a polynomial regression equation fitted to the equilibrium model Aerosol Inorganic Matter (AIM) as a function of sulfate, nitrate, and ammonium concentrations (described above). Most of FRM monitors in the basin do not have a co-located CSN monitor. Thus, as recommended by EPA guidance, we interpolated the individual speciation components

[6] Frank, Neil. (2006). Retained Nitrate, Hydrated Sulfates, and Carbonaceous Mass in Federal Reference Method Fine Particulate Matter for Six Eastern U.S. Cities. Journal of the Air & Waste Management Association (1995). 56. 500-11. 10.1080/10473289.2006.10464517.

[7] Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5, and Regional Haze, U.S. EPA, November 2018. Available at: https://www.epa.gov/sites/default/files/2020-10/documents/o3-pm-rh-modeling_guidance-2018.pdf

[8] Hayes et al., 2013. Organic aerosol composition and sources in Pasadena, California, during the 2010 CalNex campaign. Journal of Geophysical Research, 118, 9233-9257

[9] Shirmohammadi et al., 2016. Fine and Ultrafine Particulate Organic Carbon in the Los Angeles Basin: Trends in Sources and Composition. Science of Total Environment, 541, 1083-1096

from co-located CSN monitors to latitude and longitude of FRM monitors that do not have a co-located CSN monitor. Inverse Distance Squared Weights interpolation method was used. This method gives a particular monitor a weight inversely proportional with squared distance from a given point.

Figures II-5-18 through II-5-21 provide SANDWICH-applied species fractions for each CSN site and each quarter. OC and nitrate are the two most common species with OC comprising between 30% to 43% of total PM2.5 mass, and nitrate comprising between 13% to 22% of the total PM2.5 mass, depending on quarter and location. OC in general tends to be higher in Urban Receptor and San Fernando regions both during the 3rd quarter while nitrate is the lowest during the same quarter. Higher temperatures and abundant sunlight increase evaporative emissions of SOA precursors and increase photochemical processing of those precursors.

On average, secondary ammonium, nitrate and sulfate comprise between 30% to 48% of the total PM2.5 concentration and show strong seasonal variability (Figure II-5-22); the highest contribution levels occur in quarter 2, among the four CSN stations. High nitrate concentrations in the fall or winter are caused by the favorable formation of ammonium nitrate under cool temperatures, high humidity, and frequent nocturnal inversions; the CSN stations on the east side – Fontana and Riverside – have the highest nitrate levels. On the contrary, high summertime temperatures reduce concentrations of nitrate, which is relatively volatile. The higher values of sulfate typically occur under conditions of strong inversions and strong sea breeze transport toward inland areas, which is the characteristic of late spring and summer. In addition, heterogeneous formation of sulfate is favored by higher temperatures occurring in the summer. Higher temperatures with abundant afternoon sunlight and the persistence of morning fog and low clouds trigger – the marine boundary layer, both homogeneous and heterogeneous sulfate formation reactions to produce secondary sulfate. Higher temperatures and abundant sunlight increase evaporative emissions of SOA precursors and increase photochemical processing of those precursors.

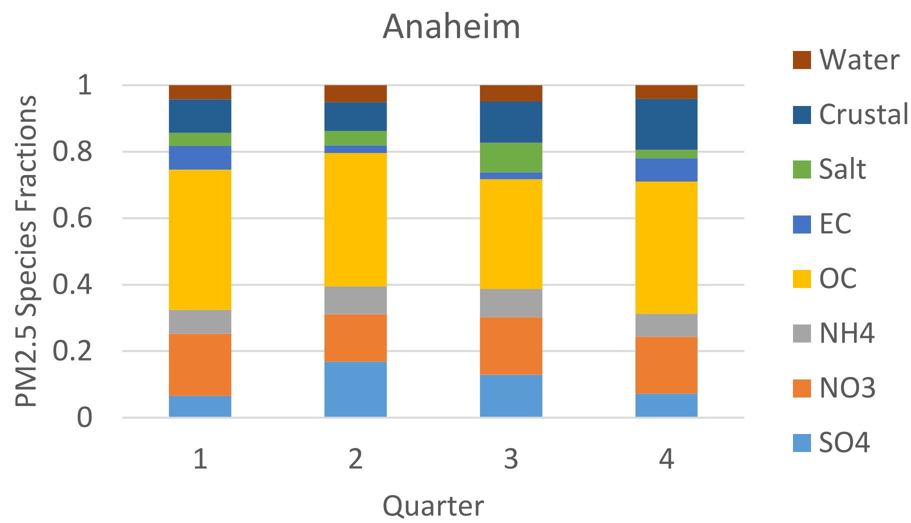


FIGURE II-5-18

SANDWICH-APPLIED QUARTERLY AVERAGES OF PM2.5 SPECIES FRACTIONS DURING 2017 TO 2019 IN ANAHEIM

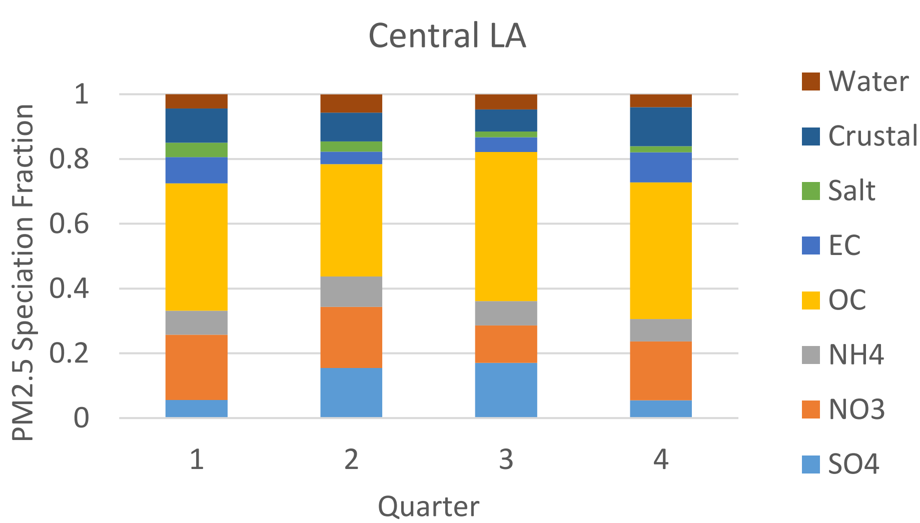


FIGURE II-5-19

SANDWICH-APPLIED QUARTERLY AVERAGES OF PM2.5 SPECIES FRACTIONS DURING 2017 TO 2019 IN CENTRAL LOS ANGELES (CELA)

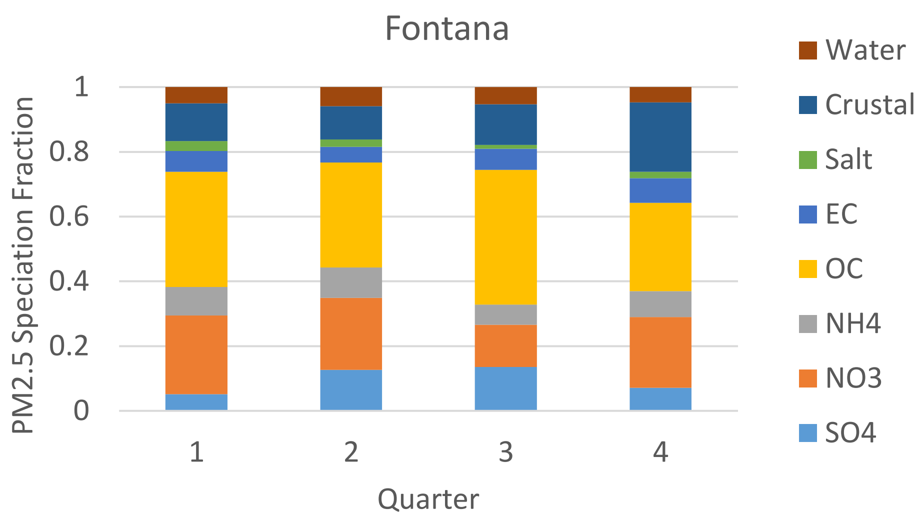


FIGURE II-5-20

SANDWICH-APPLIED QUARTERLY AVERAGES OF PM2.5 SPECIES FRACTIONS DURING 2017 TO 2019 IN FONTANA

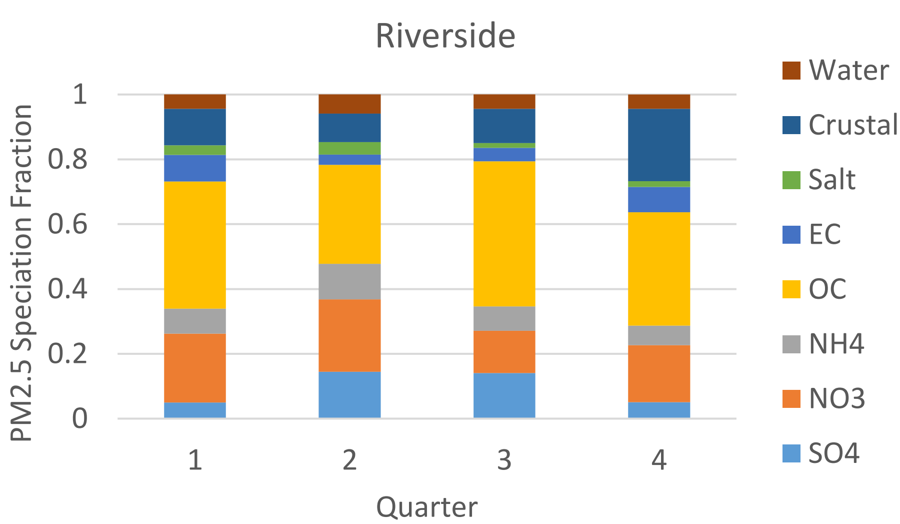


FIGURE II-5-21

SANDWICH-APPLIED QUARTERLY AVERAGES OF PM2.5 SPECIES FRACTIONS DURING 2017 TO 2019 IN RIVERSIDE

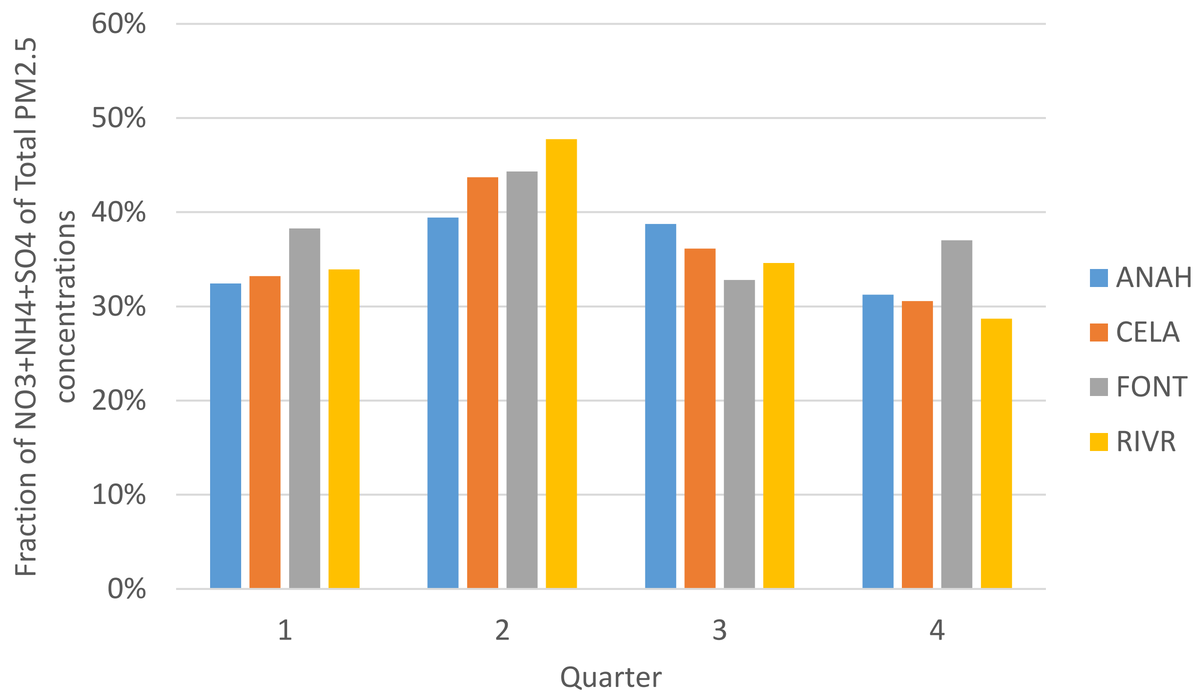


FIGURE II-5-22

5-YEAR WEIGHTED QUARTERLY AVERAGE FRACTIONS OF NO3, NH4, AND SO4 COMBINED MASS TO THE TOTAL PM2.5 MASS

Speciated base year annual design values at different stations are shown in Figure II-5-23. Figure II-5-24 through Figure II-5-30 show the base year quarterly DV for the four CSN sites along with the stations with the top three highest annual design value in the basin which includes Ontario Near-road (ONNR), Mira Loma (MRLM), and Compton (CMPT). Among all the stations in the basin, the highest base year annual design value is observed at ONNR with an annual DV of 13.98 μg/m^3, followed by MRLM with a DV of 13.52 μg/m^3. MRLM is the station with the highest quarterly DV in the basin, with quarter 4 quarterly average exceeding 16 μg/m^3. Among the four CSN stations, the highest sulfate concentration was observed in central Los Angeles (4.81 μg/m^3), while the highest concentration of nitrate occurred in Fontana (2.22 μg/m^3) followed by Rubidoux (2.19 μg/m^3); Rubidoux also has the highest ammonium concentrations (0.95 μg/m^3).

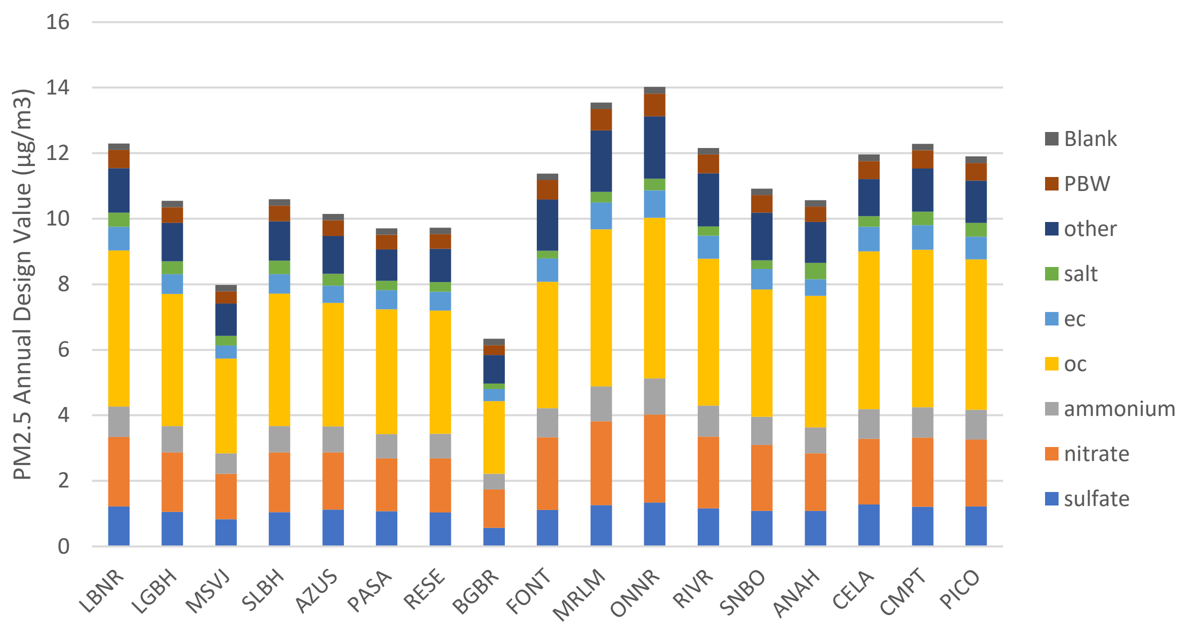


FIGURE II-5-23

BASE YEAR SPECIATED ANNUAL PM2.5 DESIGN VALUES FOR ALL STATIONS IN THE BASIN. TABLE II-5-2 SHOWS THE STATION NAMES AND ABBREBIATIONS FOR REFERENCE.

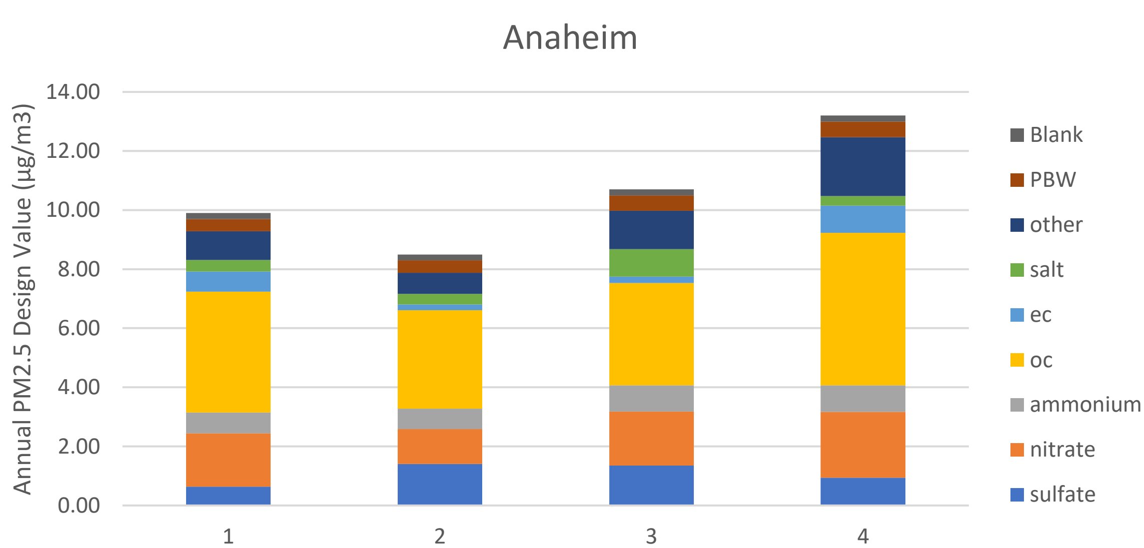


FIGURE II-5-24

BASE YEAR QUARTERLY PM2.5 DESIGN VALUES FOR ANAHEIM.

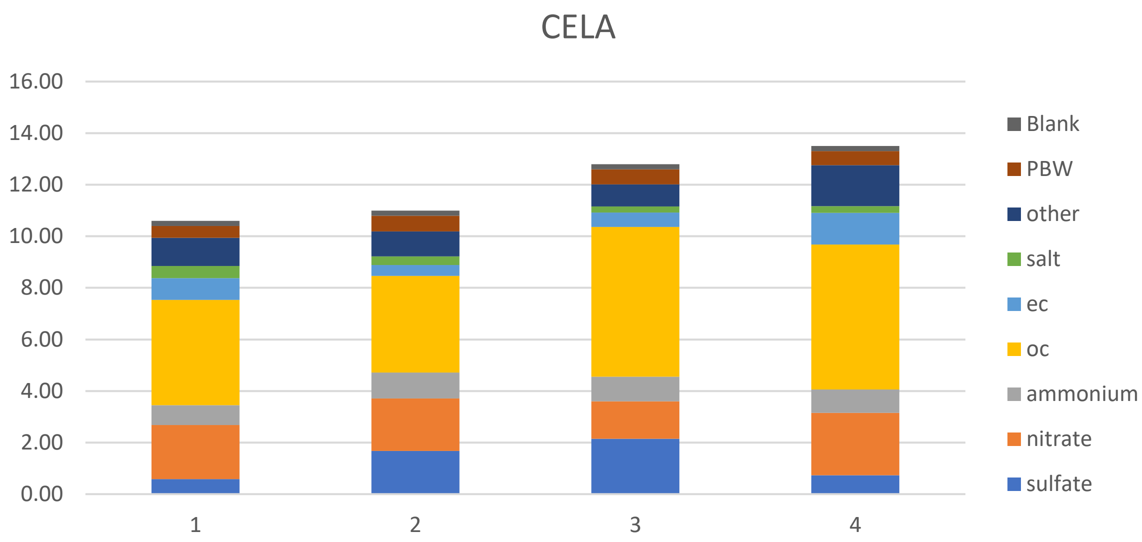


FIGURE II-5-25

BASE YEAR QUARTERLY PM2.5 DESIGN VALUES FOR CENTRAL LOS ANGELES (CELA).

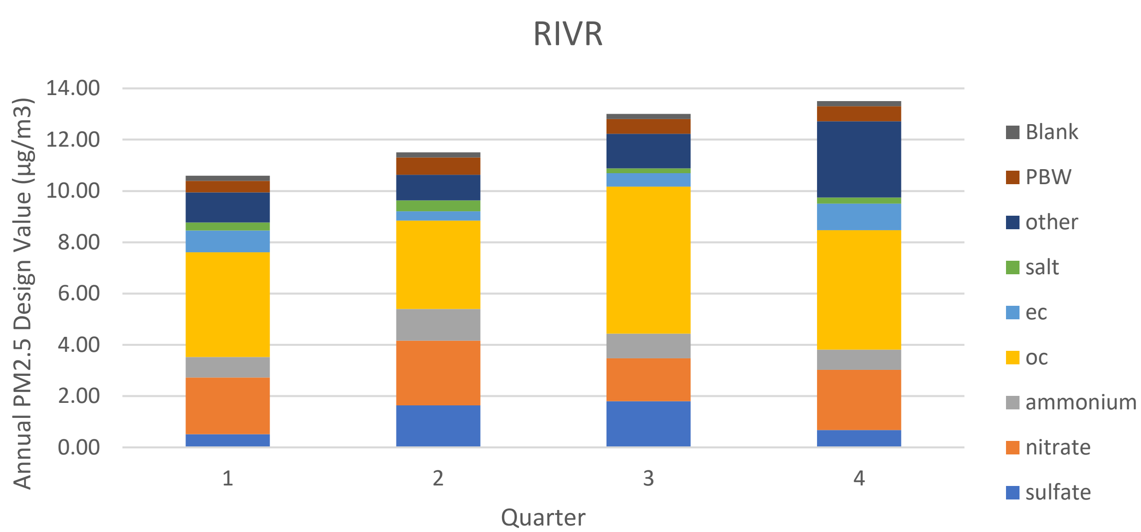


FIGURE II-5-26

BASE YEAR QUARTERLY PM2.5 DESIGN VALUES FOR RUBIDOUX (RIVR).

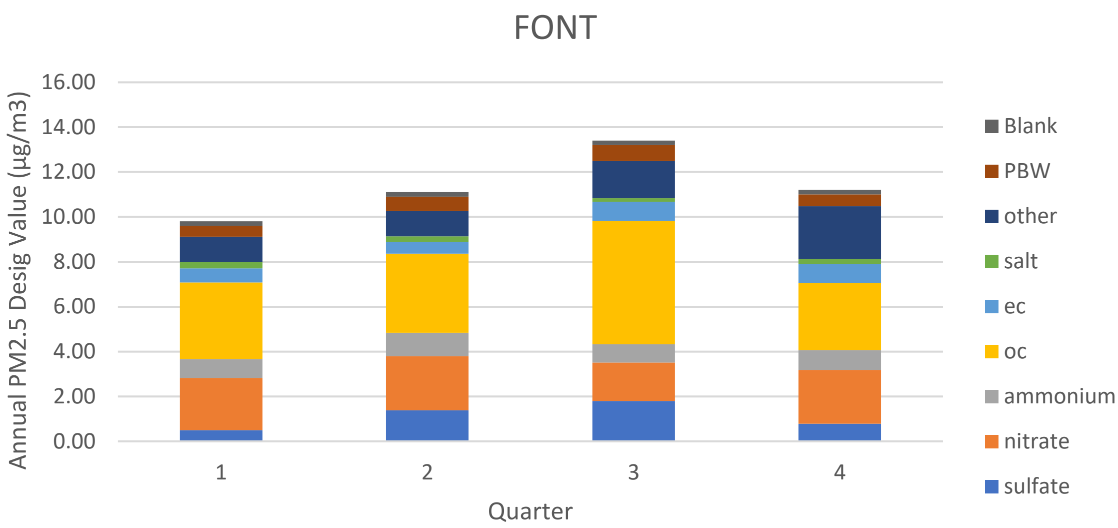


FIGURE II-5-27

BASE YEAR QUARTERLY PM2.5 DESIGN VALUES FOR FONTANA (FONT).

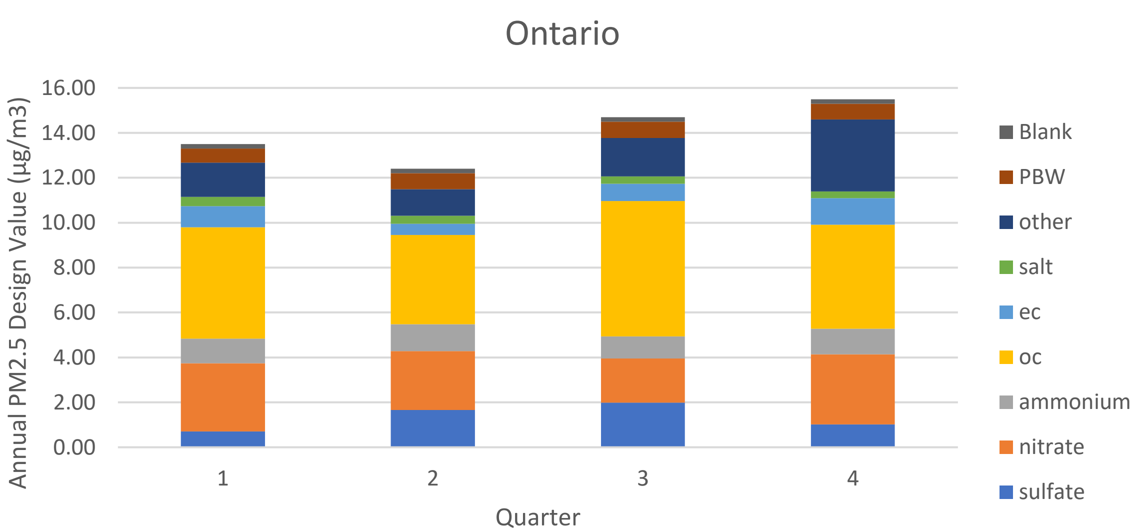


FIGURE II-5-28

BASE YEAR QUARTERLY PM2.5 DESIGN VALUES FOR ONTARIO NEAR-ROAD (ONNR).

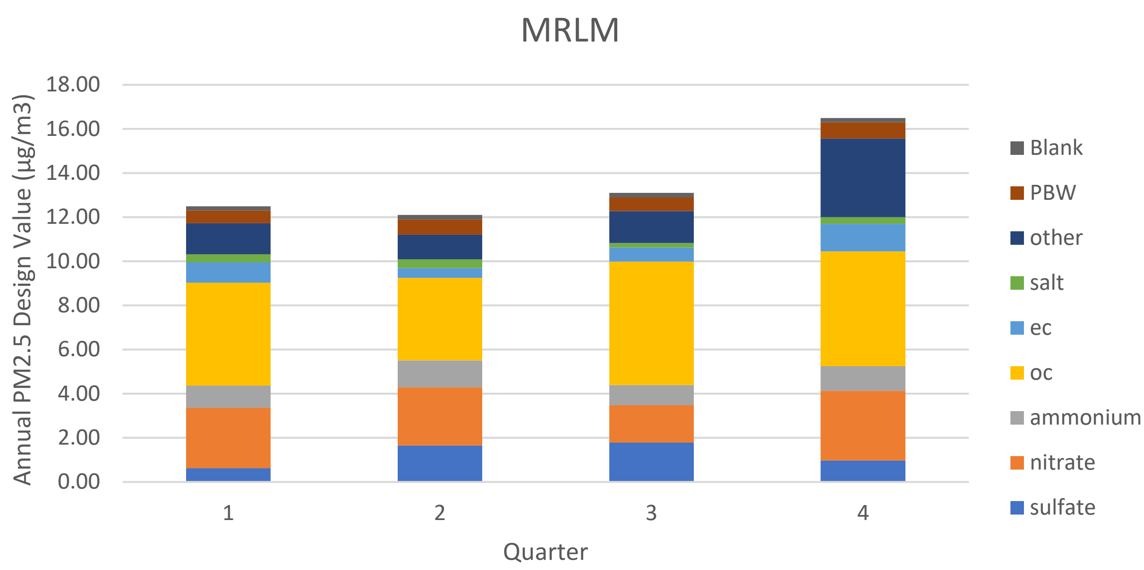


FIGURE II-5-29

BASE YEAR QUARTERLY PM2.5 DESIGN VALUES FOR MIRA LOMA (MRLM).

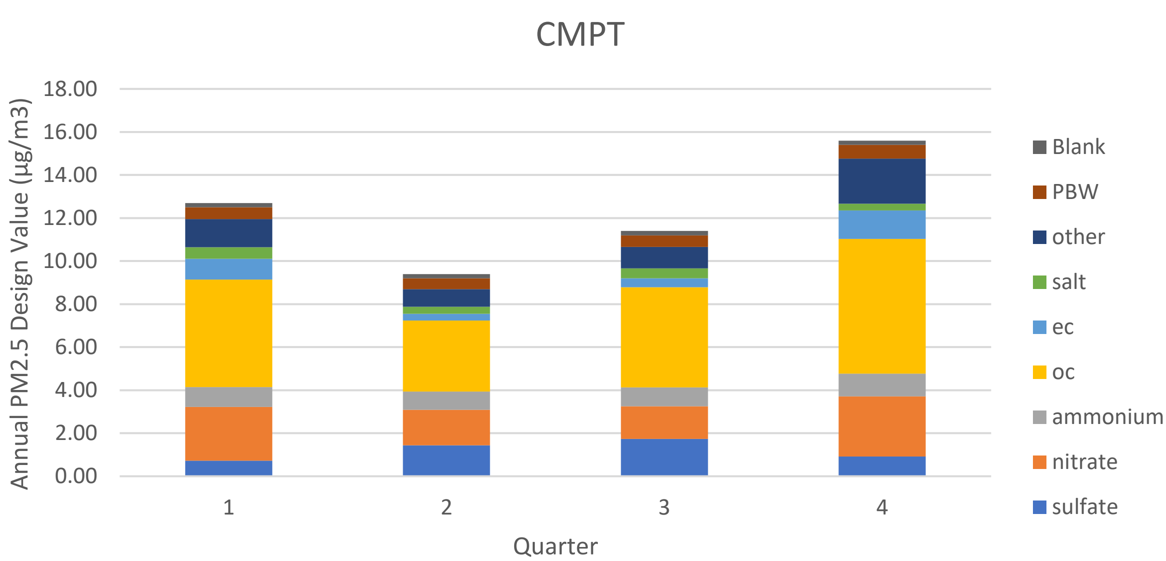
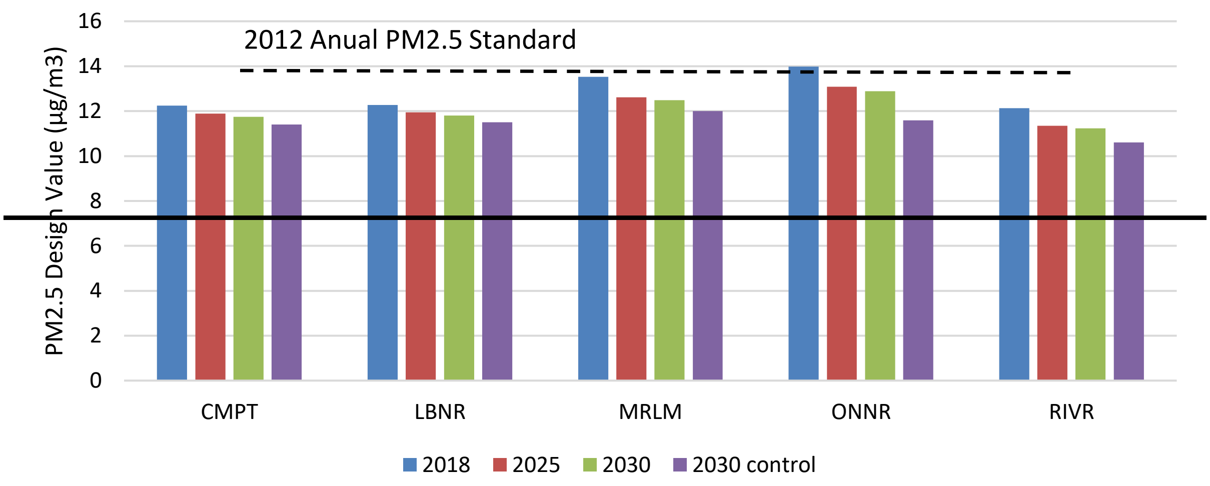


FIGURE II-5-30

BASE YEAR QUARTERLY PM2.5 DESIGN VALUES FOR COMPTON (CMPT).

Future Annual PM2.5 air quality

PM2.5 annual concentrations projected for milestone years are shown in Figure II-5-31. Ontario Near Road is projected to remain as the design value site in 2025 and 2030. The annual design value for Ontario Near Road in the 2030 attainment scenario is projected to be 12.35 $\mu g/m^3$. All other areas will be in attainment of the federal annual standard (12 $\mu g/m^3$) by 2030 with the proposed PM strategy presented in Chapter 4 of this Plan. A demonstration of Ontario Near Road projection using a hybrid modeling approach is provided in Chapter 5 and in chapter 6 of this Appendix II. Applying the hybrid approach, Ontario Near Road is expected to have 11.59 $\mu g/m^3$ in 2030 with the controls proposed in this Plan. Tables II-5-4 through II-5-6 provide the projected future year PM2.5 annual design values speciated by PM2.5 components for 2025, 2030 baseline and 2030 attainment.



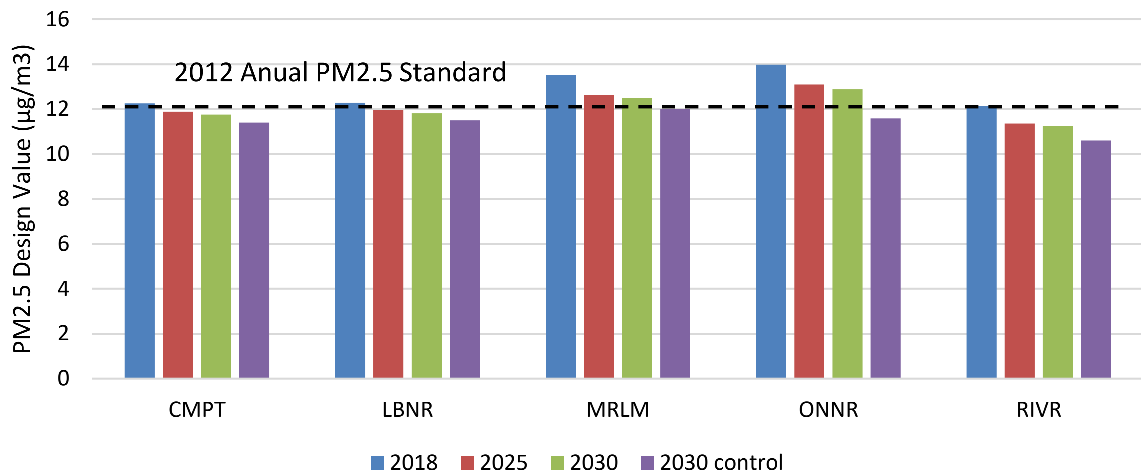


FIGURE II-5-31

ANNUAL PM2.5 DESIGN VALUES AT THE TOP 5 STATIONS. FEDERAL STANDARD IS DENOTED WITH HORIZONTAL BLACK DASHED LINE. THE DV FOR THE 2030 CONTROL CASES AT ONTARIO NEAR-ROAD (ONNR) IS BASED ON THE HYBRID MODELING APPROACH

TABLE II-5-4

RRF-BASED PREDICTED 2025 BASELINE ANNUAL DESIGN VALUES (µg/m³)

Sites	SO4	NO3	NH4	OC	EC	Salt	Others	Water	Blank	Total
ANAH	1.1	1.4	0.7	4.2	0.4	0.5	1.3	0.5	0.2	10.2
AZUS	1.2	1.3	0.6	4.0	0.4	0.4	1.2	0.5	0.2	9.7
BGBR	0.6	0.8	0.4	2.2	0.4	0.2	0.9	0.2	0.2	5.9
CELA	1.3	1.6	0.8	5.0	0.6	0.3	1.2	0.5	0.2	11.5
CMPT	1.3	1.7	0.8	5.0	0.6	0.4	1.4	0.5	0.2	11.9
FONT	1.2	1.6	0.7	4.0	0.6	0.2	1.7	0.6	0.2	10.7
LBNR	1.3	1.8	0.8	5.0	0.6	0.4	1.4	0.5	0.2	12.0
LGBH	1.1	1.5	0.7	4.2	0.5	0.4	1.2	0.4	0.2	10.3
MRLM	1.3	1.9	0.8	4.9	0.6	0.3	2.0	0.6	0.2	12.6
MSVJ	0.8	1.2	0.5	2.9	0.3	0.3	1.0	0.4	0.2	7.6
ONNR	1.4	2.0	0.8	5.0	0.6	0.4	2.0	0.7	0.2	13.1
PASA	1.1	1.3	0.6	4.0	0.4	0.3	1.0	0.4	0.2	9.3
PICO	1.3	1.6	0.8	4.8	0.5	0.4	1.3	0.5	0.2	11.5
RESE	1.1	1.2	0.6	3.8	0.4	0.3	1.0	0.4	0.2	9.1
RIVR	1.2	1.6	0.7	4.6	0.5	0.3	1.7	0.5	0.2	11.4
SLBH	1.1	1.6	0.7	4.2	0.5	0.4	1.2	0.4	0.2	10.3
SNBO	1.1	1.5	0.6	4.0	0.5	0.3	1.5	0.5	0.2	10.1

TABLE II-5-5

RRF-BASED PREDICTED 2030 BASELINE ANNUAL DESIGN VALUES (µg/m³)

Sites	SO4	NO3	NH4	OC	EC	Salt	Others	Water	Blank	Total
ANAH	1.1	1.4	0.6	4.2	0.4	0.5	1.3	0.5	0.2	10.2
AZUS	1.2	1.2	0.6	4.0	0.4	0.4	1.2	0.5	0.2	9.5
BGBR	0.6	0.8	0.4	2.2	0.4	0.2	1.0	0.2	0.2	5.9
CELA	1.3	1.5	0.7	5.0	0.6	0.3	1.2	0.5	0.2	11.4
CMPT	1.3	1.6	0.8	5.0	0.6	0.4	1.4	0.5	0.2	11.8
FONT	1.2	1.5	0.6	4.0	0.5	0.2	1.7	0.6	0.2	10.5
LBNR	1.3	1.7	0.8	5.0	0.6	0.4	1.4	0.5	0.2	11.8
LGBH	1.1	1.5	0.7	4.2	0.5	0.4	1.2	0.4	0.2	10.1
MRLM	1.3	1.7	0.7	4.9	0.6	0.3	2.1	0.6	0.2	12.5
MSVJ	0.8	1.1	0.5	2.9	0.3	0.3	1.0	0.4	0.2	7.5
ONNR*	1.4	1.8	0.7	5.0	0.6	0.4	2.1	0.7	0.2	12.9
PASA	1.1	1.2	0.6	4.0	0.4	0.3	1.0	0.4	0.2	9.2
PICO	1.3	1.5	0.7	4.9	0.5	0.4	1.4	0.5	0.2	11.3
RESE	1.1	1.2	0.6	3.8	0.4	0.3	1.1	0.4	0.2	9.0
RIVR	1.2	1.5	0.6	4.6	0.5	0.3	1.8	0.5	0.2	11.2
SLBH	1.1	1.5	0.7	4.2	0.5	0.4	1.3	0.4	0.2	10.2
SNBO	1.1	1.4	0.6	3.9	0.5	0.3	1.6	0.5	0.2	10.0

* indicates results using the traditional CMAQ based RRF approach

TABLE II-5-6

RRF-BASED PREDICTED 2030 ATTAINMENT ANNUAL DESIGN VALUES (µg/m³)

Sites	SO4	NO3	NH4	OC	EC	Salt	Others	Water	Blank	Total
ANAH	1.1	1.2	0.6	4.2	0.4	0.5	1.3	0.5	0.2	9.9
AZUS	1.2	1.0	0.5	4.0	0.4	0.4	1.2	0.5	0.2	9.2
BGBR	0.6	0.7	0.4	2.2	0.4	0.2	1.0	0.2	0.2	5.7
CELA	1.3	1.3	0.6	5.0	0.5	0.3	1.2	0.5	0.2	11.0
CMPT	1.3	1.4	0.7	5.1	0.6	0.4	1.4	0.5	0.2	11.4
FONT	1.2	1.2	0.5	3.9	0.5	0.3	1.7	0.6	0.2	10.0
LBNR	1.3	1.5	0.7	5.0	0.5	0.4	1.4	0.5	0.2	11.5
LGBH	1.1	1.3	0.6	4.2	0.5	0.4	1.2	0.4	0.2	9.9
MRLM	1.3	1.4	0.6	4.9	0.6	0.3	2.1	0.7	0.2	12.0
MSVJ	0.8	1.0	0.5	2.8	0.3	0.3	1.0	0.4	0.2	7.3
ONNR*	1.4	1.5	0.6	5.0	0.6	0.4	2.1	0.7	0.2	12.4
PASA	1.1	1.0	0.5	4.1	0.4	0.3	1.0	0.4	0.2	9.0
PICO	1.3	1.3	0.6	4.9	0.5	0.4	1.4	0.5	0.2	11.0
RESE	1.1	1.0	0.5	3.8	0.4	0.3	1.1	0.4	0.2	8.7
RIVR	1.2	1.2	0.5	4.5	0.5	0.3	1.8	0.6	0.2	10.8
SLBH	1.1	1.4	0.7	4.2	0.4	0.4	1.2	0.4	0.2	10.0
SNBO	1.1	1.1	0.5	3.9	0.4	0.3	1.6	0.6	0.2	9.6

* indicates results using the traditional CMAQ based RRF approach

Unmonitored Area Analysis

U.S. EPA modeling guidance requires that the attainment demonstration include an analysis that confirms that all grid cells in the modeling domain meet the federal standard. This "unmonitored area analysis" is essential since speciation monitoring is conducted at a limited number of sites in the modeling domain. Variability in the species profiles at selected locations coupled with the differing responses to emissions control scenarios are expected to result in spatially variable impacts to PM2.5 air quality in any grid cell. As described earlier in this chapter, speciation profiles from CSN sites are interpolated using inverse distance squared weighting. With interpolation of the CSN speciation profiles, attainment demonstrations can be directly conducted for the remaining grid cells where FRM mass data has been collected over the modified 5-year weighted period of 2016-2019.

The methodology used to assess the unmonitored grid cell impact is as follows. The speciation fractions throughout the Basin for each relevant species except particle bound water were estimated with inverse distance squared interpolation for each quarter of 2018. In the unmonitored area analysis, the modified five-year weighted annual PM2.5 design values were calculated for all Federal Reference Method (FRM) monitoring stations within the modelling domain for the 2016 to 2019 period for each quarter. Quarterly design values were interpolated using inverse distance squared weighting interpolation. The product of the interpolated total PM2.5 mass from the FRM monitors and the interpolated speciation fractions from the CSN monitors yields spatial distributions of speciated mass in each quarter. In order to maintain consistency with the attainment demonstration at individual stations, base and future year species concentrations at each grid cell were replaced with the average value of the 3x3 grid encompassing the selected grid cell. Model derived base and future-year quarterly averaged species concentrations were used to calculate RRFs for each species except water. RRFs were multiplied by quarterly averaged species concentrations to project future species concentrations. Particle-bound water was then calculated using a polynomial regression of the Aerosol Inorganic Model (AIM) and summed along with a "blank" concentration to calculate the quarterly-averaged PM2.5 future-year design values. Quarterly PM2.5 concentrations were averaged to produce future-year design values throughout the Basin. This approach is consistent with the U.S. EPA's guidance.[10]

Figure II-5-32 shows the annual PM2.5 design values in the base year 2018 for the entire basin. Figures II-5-33 through II-5-35 provide the Basin-wide spatial extent of annual PM2.5 projected for 2025 baseline, 2030 baseline and 2030 attainment scenario. Without additional controls in the baseline 2025 and 2030, the number of grid cells with concentrations exceeding the federal standard is restricted to a small region around the Ontario CA-60 near-road and the Mira Loma monitoring stations, across the border between northwestern Riverside County and southwestern San Bernardino County. Figure II-5-35 shows the projected PM2.5 concentrations in 2030 with the full implementation of the PM2.5 control strategy, and

[10] Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5, and Regional Haze, U.S. EPA, November 2018. Available at: https://www.epa.gov/sites/default/files/2020-10/documents/o3-pm-rh-modeling_guidance-2018.pdf

demonstrate that all areas in the basin are projected to be below the federal standard of 12 µg/m³. Table II-5-7 summarizes the design values projected for the entire basin including unmonitored areas.

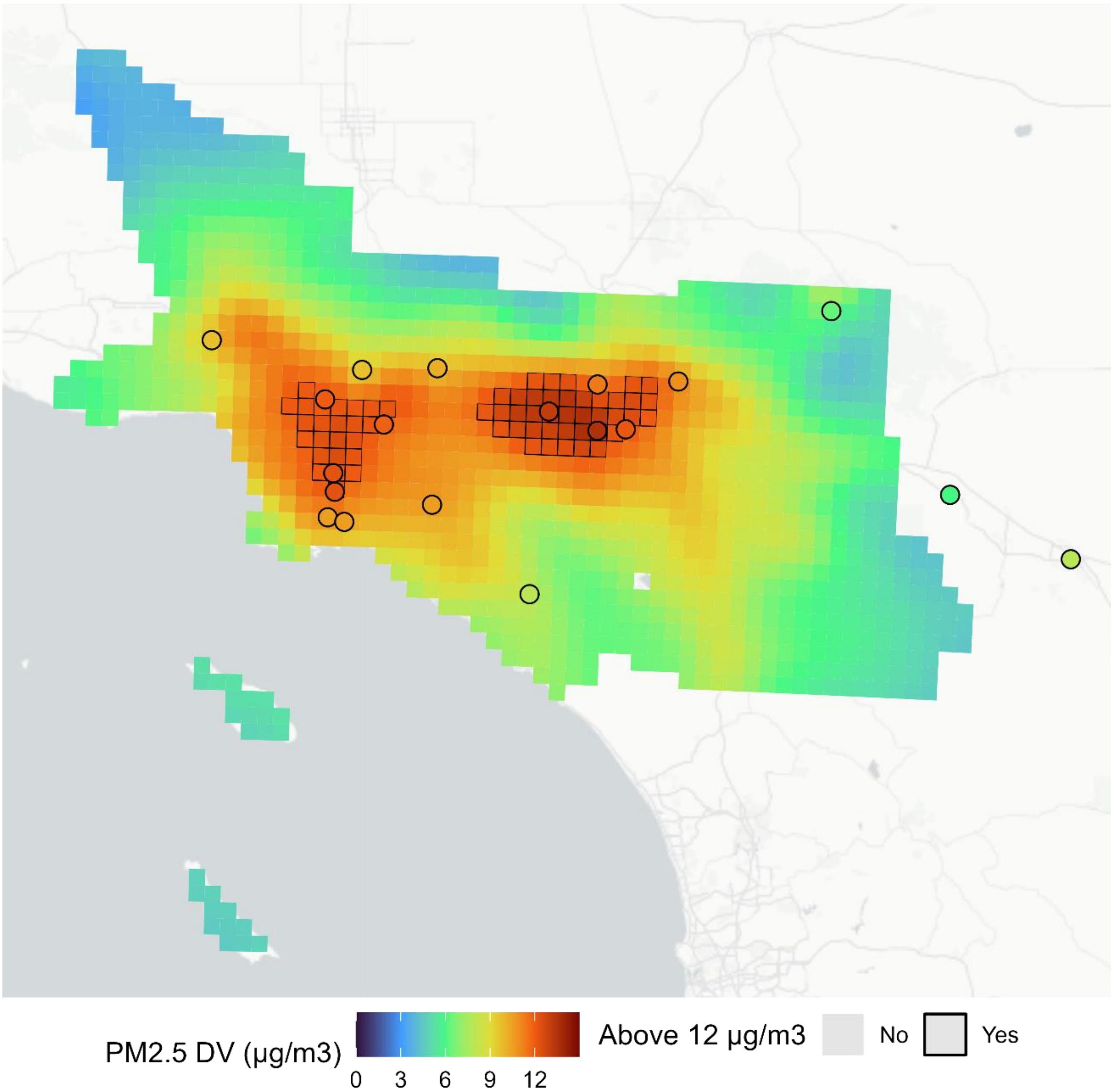


FIGURE II-5-32

PM2.5 DESIGN VALUES (µg/m³) FROM THE 2018 BASE YEAR SCENARIO. CELLS EXCEEDING 12 µg/m³ ARE OUTLINED IN BLACK.

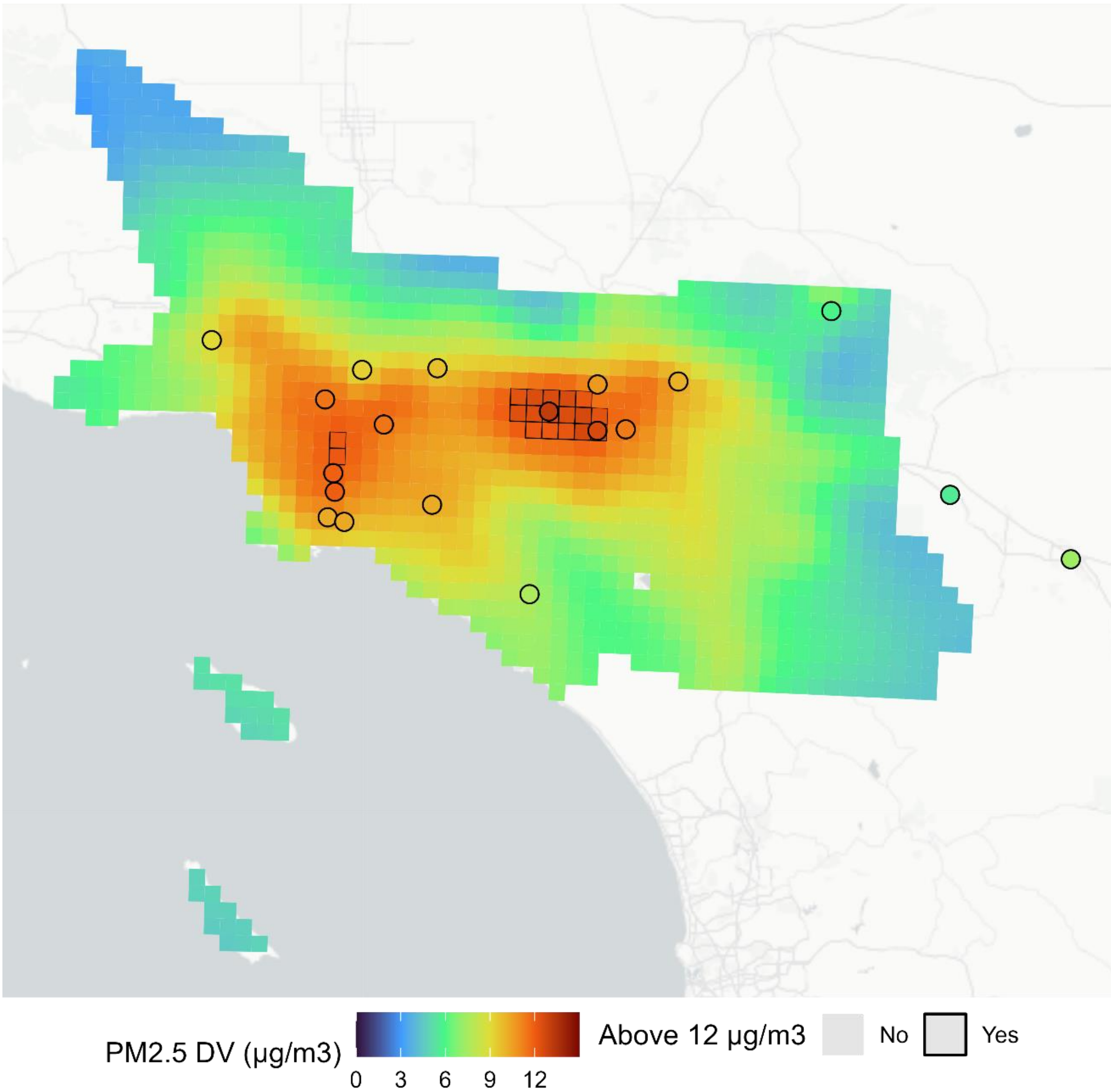


FIGURE II-5-33

ANNUAL PM2.5 DESIGN VALUES (µg/m³) FROM THE 2025 BASELINE SCENARIO. CELLS EXCEEDING 12 µg/m³ ARE OUTLINED IN BLACK.

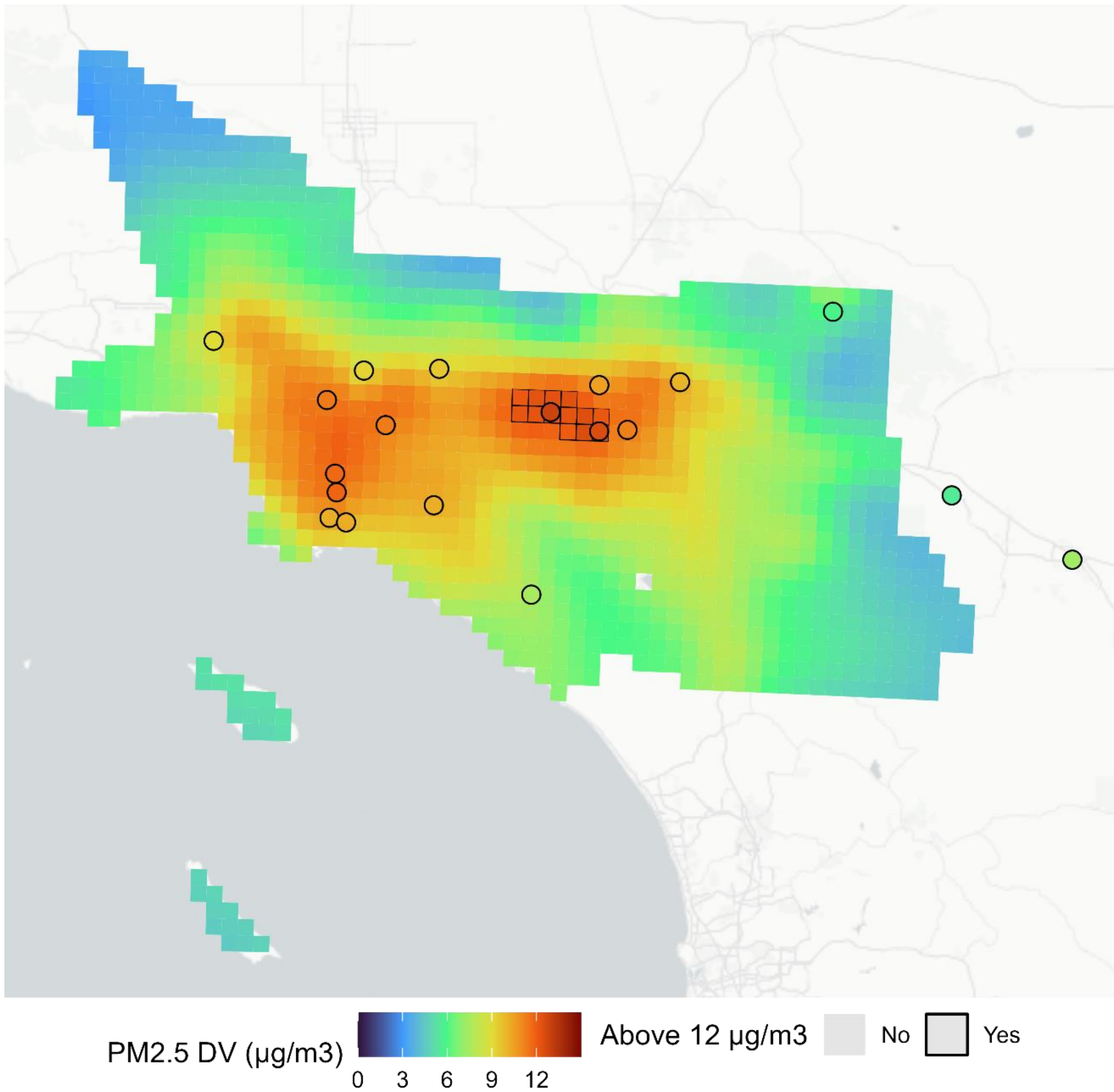


FIGURE II-5-34

ANNUAL PM2.5 DESIGN VALUES (µg/m^3) FROM THE 2030 BASELINE SCENARIO. CELLS EXCEEDING 12 µg/m3 ARE OUTLINED IN BLACK.

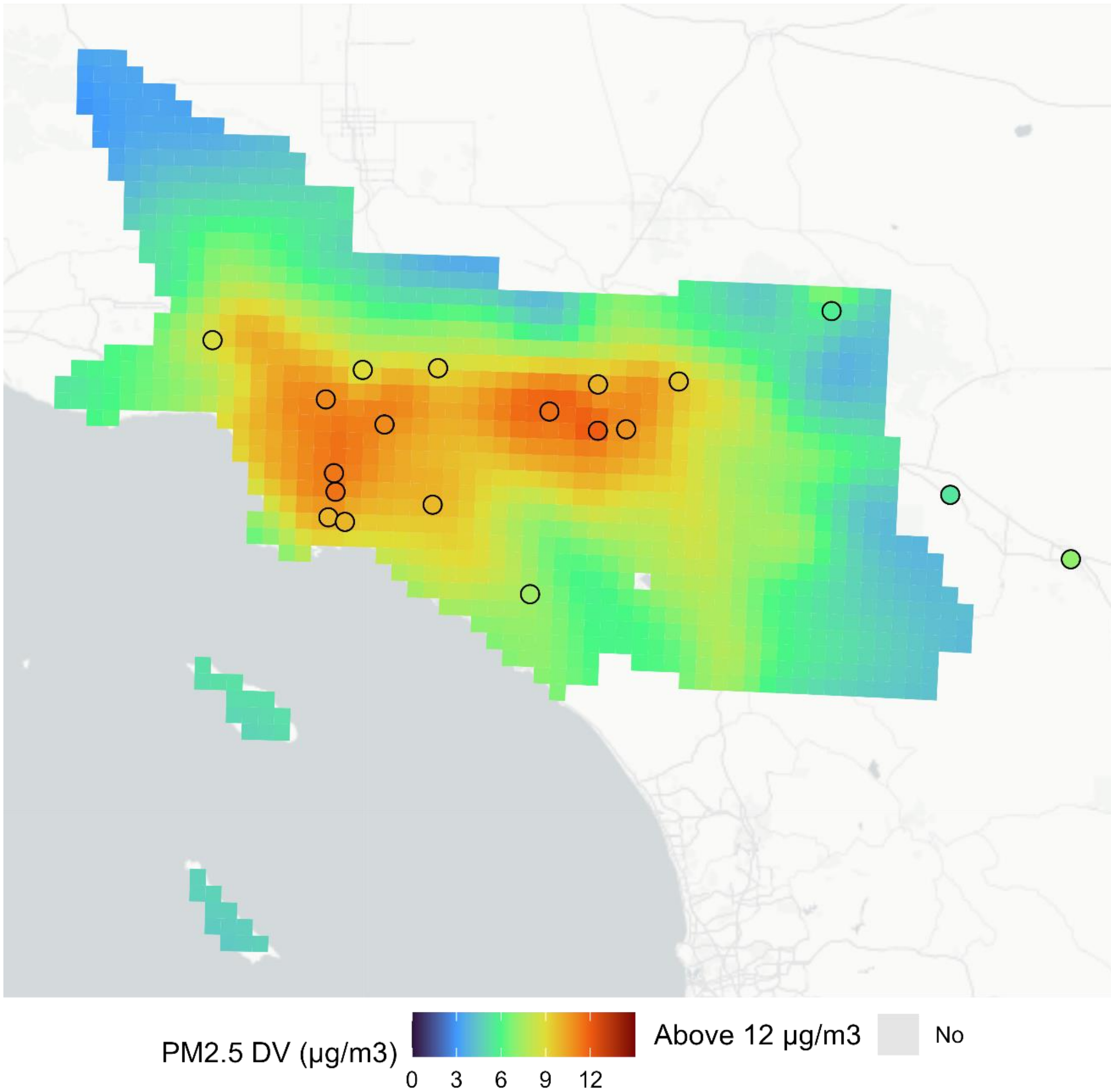


FIGURE II-5-35

ANNUAL PM2.5 DESIGN VALUES (µg/m^3) FROM THE 2030 ATTAINMENT SCENARIO.

TABLE II-5-7

UNMONITORED AREA ANALYSIS PROJECTED BASIN-MAXIMUM ANNUAL PM2.5 DESIGN VALUES

Simulation	Maximum Annual PM2.5 Concentration in the Basin
2025 Baseline	13.1
2030 Baseline	12.9
2030 Attainment	12.0

Summary and Conclusions

This section presents the performance of the modeling platform developed for this ~~Draft~~ PM2.5 ~~plan~~Plan and demonstrates the attainment of the annual PM2.5 standard in 2030 in the South Coast Air Basin. The modeling platform reproduces the PM2.5 temporal trends throughout the year 2018 and shows good agreement with PM2.5 speciation. The control strategy presented in this ~~Draft~~ PM2.5 ~~plan~~Plan is expected to lead the South Coast Air Basin to attainment of the 2012 annual PM2.5 standard in 2030. This was demonstrated using a traditional photochemical-modeling-based approach recommended by U.S. EPA and an alternative hybrid approach for Ontario CA-60 near-road site, which was developed in consultation with U.S. EPA and CARB. The latter approach is presented in detail in the next chapter of this appendix.

Chapter 6

ATTAINMENT DEMONSTRATION FOR THE CA-60 NEAR-ROAD MONITORING STATION

Introduction

The current design site in the basin is the near-road monitor located by CA-60 freeway in Ontario. The monitor is sited just 16 meters away from the freeway, as shown in Figure II-6-1, and is heavily influenced by the emissions released from vehicles as well as resuspended particles caused by moving traffic. The Ontario CA-60 near-road monitor (referred to as CA60NR hereinafter) has been operational since 2015, and since the monitor started collecting data, it has been the station with the highest annual average PM2.5 concentration in the basin. This monitor surpassed the concentrations at the previous design site in Mira Loma, which is located approximately 12 km eastward. However, the differences in annual PM2.5 concentrations between Mira Loma and CA60NR have narrowed since 2015 (see Figure 5-11 in Chapter 5). This trend can be attributed to the fact that emissions from on-road sources have decreased substantially more than all other sources in the basin, and as a result, PM2.5 concentrations at near-road monitors are decreasing faster than concentrations at regional monitors that represent air quality of wider areas.

FIGURE II-6-1

LOCATION OF THE ONTARIO CA-60 NEAR-ROAD MONITOR

Regional photochemical transport modeling is designed to calculate air quality that is representative at the grid resolution of the model. This attainment demonstration uses a model resolution of 4 km by 4 km grid, and thus, should model concentration at monitors that are representative of a similar area. Near-road sites are heavily impacted by near-road sources and thus are not representative of the overall grid. U.S. EPA’s modeling guidance acknowledges that attainment demonstration at near-road sites may require a different treatment compared to other monitors as is indicated in modeling guidance, Section 4.6:

> "PM2.5 measurement data from monitors that are not representative of "area-wide" air quality, but rather of relatively unique micro-scale, or localized hot spot, or unique middle-scale impact sites, are not eligible for comparison to the annual PM2.5 NAAQS."

> "… numerous cases where local source contributions may not be dominant, but are a sizable contributor to total PM2.5 (~10- 30% of total annual average PM2.5). In these cases, a more refined analysis of the contribution of local primary PM2.5 sources to PM2.5 at the monitor(s) will help explain the causes of nonattainment at and near the monitor."

And in section 6.0:

> "There may be some areas for which the supplemental evidence is persuasive enough to support a conclusion that the area can expect to achieve timely attainment despite failing the modeled attainment test,…"

For monitors affected by localized sources like the CA60NR site, the U.S. EPA modeling guidance suggests additional modeling techniques that would support the attainment demonstration. These techniques include increasing model resolution to a finer grid and using dispersion modeling to assess the impact of primary PM2.5 emissions from near sources on the monitor:

> "A grid model can be run at very high horizontal resolution (1 or 2 km or finer) or a Gaussian dispersion model can be used. Grid based models simulate chemical transformation and complex meteorological conditions, while dispersion models are generally more simplistic; being limited to a local scale, using Gaussian approximations with little or no chemistry. Therefore, while dispersion models may not be an appropriate tool for determining secondary PM2.5 or ozone concentrations, they work well for use in determining local primary PM2.5 impacts."

This chapter describes the application of hybrid approach using a combination of regional photochemical grid modeling (CMAQ) and dispersion modeling (AERMOD) to show that the annual PM2.5 concentrations at the CA60NR monitor are projected to decline more steeply than what the regional model suggests. The overall approach is to use CMAQ to model the impact of all sources at the grid resolution used in the attainment demonstrations, and to use AERMOD to quantify the elevated PM2.5 concentrations resulting from the proximity of the monitor to the emissions from vehicle and road dust resuspension along the freeway.

Approach to Model the Effect of Near-Road Sources

As the modeling guidance suggests, regional modeling may not be sufficient to represent the air pollution dynamics at near-road monitors and dispersion models can be used to determine primary PM2.5 impacts from on-road sources. Figure II-6-2 depicts how near-road sources contribute to PM2.5 concentrations around the monitor compared to how a regional model would quantify the grid cell-average impacts from near-road sources. While the measurements at the near-road monitor observe a large contribution from near-road sources, a regional model only observes those near-road impacts averaged over the entire area of the modeling grid cell, resulting in an overall smaller impact. Regional modeling using CMAQ represents the air quality resulting from the regional sources plus the grid cell-average impacts of the near-road sources, whereas dispersion modeling using AERMOD can resolve the steep gradients in PM2.5 impacts from near-road sources. Thus, the use of AERMOD is used to quantify the near-road increment portion of the impacts from near-road sources that are beyond the grid cell-average near-road impacts. Because of the proximity of the monitor to the freeway, it is reasonable to assume that the impacts on PM2.5 primarily result from direct PM2.5 emissions and that the near-road impacts on secondary PM2.5 are negligible.

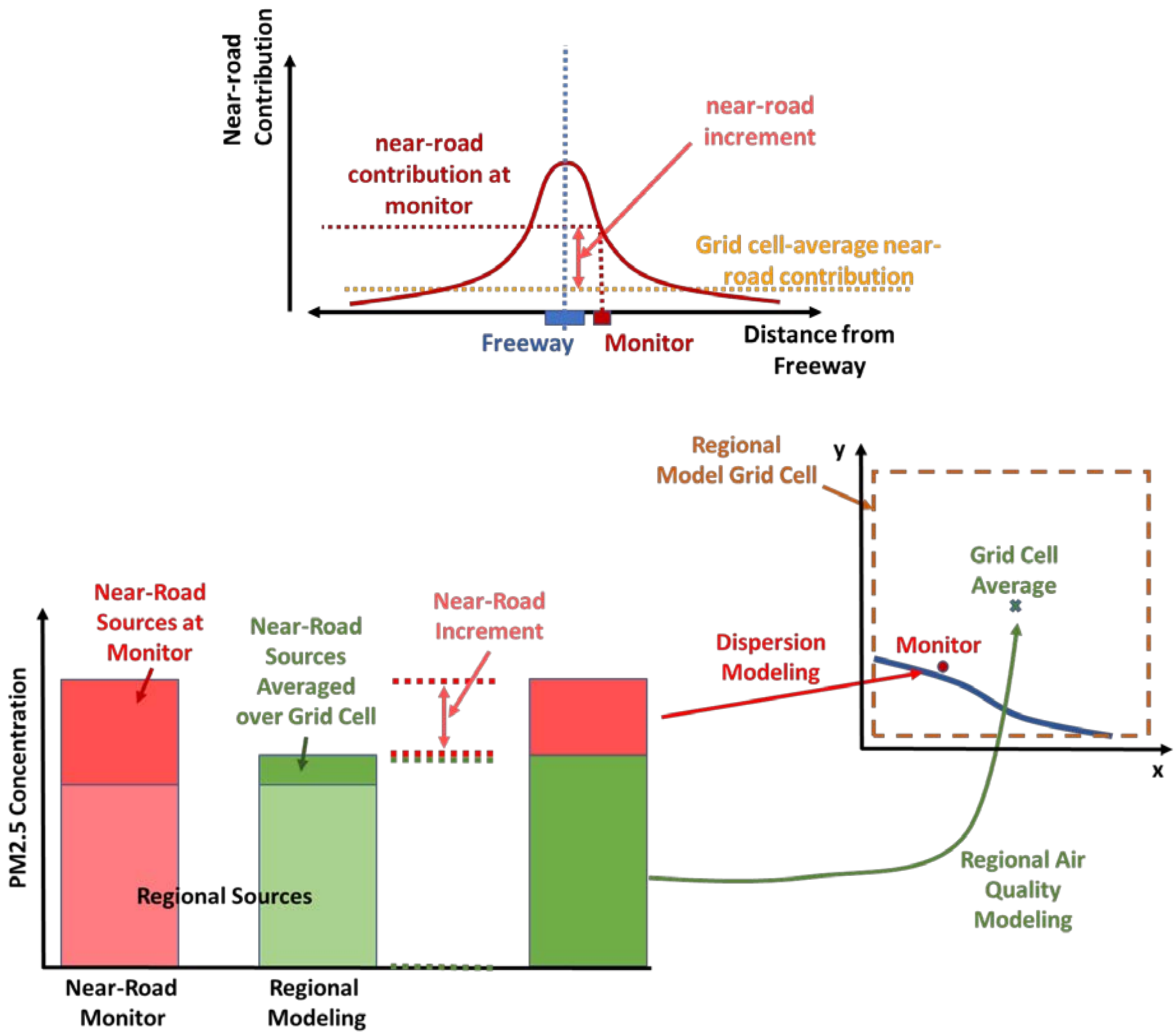


FIGURE II-6-2

SCHEMATICS OF THE HYBRID APPROACH TO INTEGRATE REGIONAL MODELING WITH DISPERSION MODELING OF NEAR-ROAD SOURCES

The receptor grid in the dispersion modeling setup spans the same area as the 4 km-by-4km regional modeling grid cell where the CA60NR monitor is located. The spacing of the receptors is 100 meters, with an additional receptor at the location of the monitor. The average of the concentrations at all receptors represents the receptor grid-average impact from near-road sources. The difference between the concentration at the CA60NR receptor monitor and the average across all dispersion modeling receptors is the AERMOD near-road increment (NRI_{AERMOD}):

$$C_{AERMOD,grid} = \frac{1}{N}\sum_{i=1}^{N} C_{AERMOD,i} \qquad \text{(II.6.1)}$$

$$NRI_{AERMOD} = C_{AERMOD,CA60NR} - C_{AERMOD,grid} \qquad \text{(II.6.2)}$$

where $C_{AERMOD,grid}$ is the near-road source contribution averaged over the AERMOD receptor grid, $C_{AERMOD,i}$ is the PM2.5 contribution at a given receptor *i* and *N* is the total number of receptors in the AERMOD modeling setup, and $C_{AERMOD,CA64NR}$ is the modeled near-road source contribution to PM2.5 concentration at the CA60NR monitor.

Alternatives for the determination of NRI

The magnitude of the NRI is a critical factor in the attainment demonstration for this near-road site. Because there are no speciated measurements at the CA60NR site, it is not possible to directly quantify the contribution of near-road sources to the overall PM2.5 measurements. Four potential approaches are considered to determine the NRI:

1) NRI based on AERMOD modeling, NRI_{AERMOD}, already described above.
2) NRI based on AERMOD for the monitor contribution, and CMAQ for the modeling grid cell average ($NRI_{AERMOD\text{-}CMAQ}$):

   ~~Thisapproach~~This approach is to calculate the NRI based on the concentrations calculated by AERMOD at the monitor and the near-road source contribution calculated using CMAQ at the CA60NR monitor cell. The calculation of the near-road source contribution to the CA60NR monitor cell ($C_{CMAQ,CA60NR}$) is calculated as follows:

$$C_{CMAQ,CA60NR} = C_{CMAQ,Base} - C_{CMAQ,NoCA60NR} \qquad \text{(II.6.3)}$$

   Where $C_{CMAQ,Base}$ is the PM2.5 concentration at the CA60NR monitor CMAQ grid cell in the base year simulation, and $C_{CMAQ,NoCA60NR}$ is the PM2.5 concentration in the simulation with all the base year emission sources included except for the near-road sources that are included in the AERMOD modeling setup. Then, this second alternative NRI, $NRI_{AERMOD\text{-}CMAQ}$, is calculated using the following expression:

$$NRI_{AERMOD-CMAQ} = C_{AERMOD,CA60NR} - C_{CMAQ,CA60NR} \qquad \text{(II.6.4)}$$

   This $NRI_{AERMOD\text{-}CMAQ}$ is used as the benchmark NRI, because the regional model (CMAQ) is the best tool available to determine the regional impacts from regional sources and which includes secondary formation of PM2.5, and dispersion modeling (AERMOD) is the best tool suited for short scale transport modeling typically used for source permitting.

3) NRI based on measured concentrations in nearby monitors:

As a third alternative, the NRI can be assessed by comparing PM2.5 levels at CA60NR with those at nearby monitoring stations. This approach was used in the attainment demonstration for annual PM2.5 in the Allegheny County, where there is a monitor that is in the vicinity of a large facility.[1] However, the case of CA60NR is different as there is not a single large facility affecting the monitor, but a collection of moving sources running along the CA-60 freeway. Three neighboring monitors, which are located within a 20-kilometer radius, are used in this approach: Mira Loma, Fontana and Rubidoux. It is important to note that the annual PM2.5 design value is calculated using speciated components of PM2.5. However, neither the CA60NR monitor nor the closest monitors at Mira Loma and Fontana have speciated measurements available. Consequently, the speciation profile of the NRI is estimated based on dispersion modeling results. The NRI based on measured PM2.5 at neighboring sites, $NRI_{Monitors}$, is calculated as follows:

$$NRI_{Monitors} = DV_{CA60NR} - \frac{1}{N}\sum_{i=1}^{N} DV_i \qquad \text{(II.6.5)}$$

Where DV_{CA60NR} is the design value observed at the CA60NR monitor, and DV_i is the design value observed at monitor *i*.

4) NRI based on the relative proportion of AERMOD and CMAQ modeled values ($NRI_{RelativeModel}$):

The fourth approach is to assume that the modeled $NRI_{AERMOD\text{-}CMAQ}$ ~~and~~plus the regional sources modeled by CMAQ ~~are in the same proportion as~~($C_{CMAQ,Base}$) correspond to the monitored ~~regional and local portions~~design value at the near-road monitor, DV_{CA60NR}. Then, the portion of the design value that corresponds to the near-road increment is defined by the ratio of the modeled $NRI_{AERMOD\text{-}CMAQ}$ to the total modeled concentration. This approach implies that the performance of CMAQ modeling regional sources and the performance of AERMOD modeling near-road sources are comparable.

The expression to calculate the $NRI_{RelativeModel}$ is as follows:

$$NRI_{RelativeModel} = DV_{CA60NR} \cdot \frac{NRI_{AERMOD-CMAQ}}{(NRI_{AERMOD-CMAQ} + C_{CMAQ,Base})} \qquad \text{(II.6.6)}$$

Each equation represents slightly different definitions of NRI. The four NRI approaches are later evaluated to establish uncertainty bounds for calculating future design values using hybrid modeling results.

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[1] Revision to the Allegheny County Portion of the Pennsylvania State Implementation Plan. Attainment Demonstration for the Allegheny County, PA PM2.5 Nonattainment Area, 2012 NAAQS. https://www.regulations.gov/search?filter=EPA-R03-OAR-2020-0157

The estimated NRI is then subtracted from the base year design value, and the remaining portion corresponds to the contribution of all regional sources plus the grid cell average contribution of the near-road sources. This second portion of the DV is referred as the regional component of the DV (RDV):

$$RDV = (\text{Base Year DV}) - NRI \qquad (II.6.7)$$

Once the NRI and RDV components are disaggregated from the measured design value, future design value can be estimated by applying two differentiated Relative Reduction Factors (RRF) to these two components. The RDV component is projected using the RRF calculated from regional air quality modeling (RRF_{CMAQ}), and the NRI is projected using the RRF calculated using the dispersion modeling results (RRF_{AERMOD}). Figure II-6-3 illustrates this procedure. The resulting future year design value is calculated as follows:

$$\text{Future DV} = RDV * RRF_{CMAQ} + NRI * RRF_{AERMOD} \qquad (II.6.8)$$

It is important to note that dispersion modeling is used to estimate the NRI, which is an increment from what the regional modeling simulates. Thus, the regional modeling set-up includes all near-road sources, to account for the grid cell average component of near-road sources. Conversely, the receptor grid-average obtained from AERMOD is subtracted from the concentrations estimated by AERMOD at the monitor site, to calculate the NRI_{AERMOD} and avoid double counting of the grid cell average impacts from near-road sources. This approach is described in a 5-step process below.

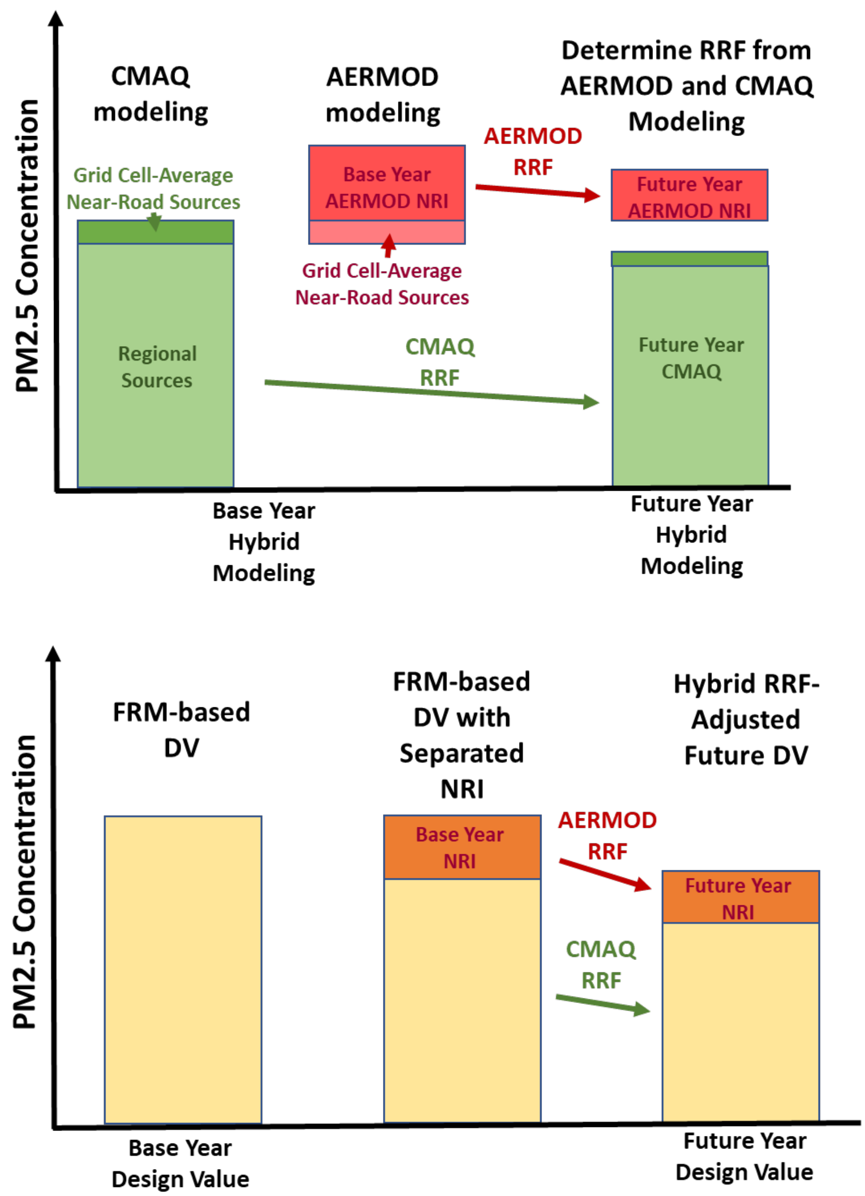


FIGURE II-6-3

DIAGRAM OF THE APPROACH TO PROJECT FUTURE PM2.5 CONCENTRATIONS USING RRF FOR REGIONAL MODELING AND DISPERSION MODELING OF NEAR-ROAD SOURCES

STEP 1: Conduct AERMOD dispersion modeling to determine the base year and attainment year speciated near-road increment.

The AERMOD modeling set-up is described in detail in the following section. The quarterly average contribution from near-road sources and the NRI_{AERMOD} for the base year is presented in Table II-6-1. Based on AERMOD modeling, the contribution from near-road sources averaged over the AERMOD receptor grid and averaged annually is 0.32 $\mu g/m^3$, whereas the annual average contribution of near-road sources at the CA60NR monitor is 3.13 $\mu g/m^3$. As a result, the estimated NRI_{AERMOD} annual average is 2.81 $\mu g/m^3$. The future NRI and RRF calculated from the dispersion modeling are presented in Table II-6-2.

TABLE II-6-1

BASE YEAR QUARTERLY AVERAGE CONTRIBUTION OF NEAR-ROAD SOURCES AVERAGED OVER THE RECEPTOR GRID AND AT THE CA60NR MONITOR, AND NEAR-ROAD INCREMENT (~~NRI~~NRI_{AERMOD}, APPROACH #1), USING AERMOD

AERMOD – Receptor Grid Average ($C_{AERMOD,grid}$) (μg/m³)					
	Q1	**Q2**	**Q3**	**Q4**	**Annual**
Sulfate	0.017	0.011	0.009	0.020	0.014
Nitrate	0.003	0.002	0.001	0.003	0.002
Ammonium	0.002	0.002	0.001	0.003	0.002
OC	0.068	0.042	0.037	0.078	0.056
EC	0.067	0.041	0.037	0.078	0.056
Salt	0.014	0.008	0.007	0.016	0.011
Other	0.223	0.135	0.119	0.252	0.182
Total Near-Road	0.39	0.24	0.21	0.45	0.32
AERMOD – At Monitor ($C_{AERMOD,CA60NR}$) (μg/m³)					
	Q1	**Q2**	**Q3**	**Q4**	**Annual**
Sulfate	0.132	0.136	0.135	0.142	0.136
Nitrate	0.021	0.022	0.021	0.023	0.022
Ammonium	0.019	0.020	0.019	0.020	0.020
OC	0.518	0.536	0.529	0.549	0.533
EC	0.515	0.532	0.525	0.555	0.532
Salt	0.106	0.109	0.108	0.111	0.108
Other	1.737	1.797	1.776	1.818	1.782
Total Near-Road	3.05	3.15	3.11	3.22	3.13
Near-Road Increment (NRI_{AERMOD}) (μg/m³)					
	Q1	**Q2**	**Q3**	**Q4**	**Annual**
Sulfate	0.115	0.126	0.125	0.122	0.122
Nitrate	0.018	0.020	0.020	0.020	0.019
Ammonium	0.016	0.018	0.018	0.017	0.018
OC	0.450	0.494	0.493	0.471	0.477
EC	0.448	0.490	0.489	0.476	0.476
Salt	0.092	0.101	0.101	0.095	0.097
Other	1.515	1.662	1.658	1.565	1.600
Total Near-Road	2.65	2.91	2.90	2.77	2.81

TABLE II-6-2

FUTURE YEAR QUARTERLY NEAR-ROAD INCREMENT (NRI) AND RELATIVE REDUCTION FACTORS CALCULATED USING AERMOD.

Future Year Near-Road Increment (μg/m³)					
	Q1	**Q2**	**Q3**	**Q4**	**Annual**
Sulfate	0.047	0.051	0.051	0.049	0.050
Nitrate	0.009	0.010	0.010	0.010	0.010
Ammonium	0.006	0.007	0.007	0.007	0.007
OC	0.253	0.279	0.278	0.261	0.268
EC	0.091	0.100	0.100	0.094	0.096
Salt	0.090	0.098	0.098	0.093	0.095
Other	1.475	1.617	1.612	1.533	1.559
Total Near-Road	1.97	2.16	2.16	2.05	2.08
Relative Reduction Factors (*RRF_{AERMOD}*) (non-dimensional)					
	Q1	**Q2**	**Q3**	**Q4**	**Annual**
Sulfate	0.408	0.408	0.408	0.404	0.407
Nitrate	0.518	0.518	0.518	0.515	0.517
Ammonium	0.377	0.377	0.377	0.371	0.375
OC	0.563	0.563	0.564	0.556	0.561
EC	0.204	0.204	0.204	0.197	0.202
Salt	0.972	0.972	0.972	0.978	0.974
Other	0.972	0.972	0.972	0.978	0.973
Total Near-Road	0.742	0.742	0.742	0.739	0.741

STEP 2: Determine the NRI.

As described above, we propose four alternatives to the calculation of NRI. Step 1 calculates the NRI_{AERMOD} used in the calculation of RRF_{AERMOD}.

The second alternative is to calculate the NRI using the grid cell-average near-road source contribution calculated with CMAQ. Two simulations are conducted to determine the contribution of near-road sources: (1) annual base year simulation with all emissions and (2) annual base year simulation that includes all emissions excluding the PM2.5 emissions from the near-road sources that are included in the AERMOD simulation. Then the difference in PM2.5 concentrations between the two simulations at the cell where CA60NR is located is the grid cell-average contribution of near-road sources, $C_{CMAQ,CA60NR}$. Then, the $NRI_{AERMOD\text{-}CMAQ}$ is calculated using equation II.6.4 using $C_{AERMOD,CA60NR}$ shown in Table II-6-1. The values for $C_{CMAQ,CA60NR}$ and $NRI_{AERMOD\text{-}CMAQ}$ are shown in Table II-6-3. The $NRI_{AERMOD\text{-}CMAQ}$ is larger than the NRI_{AERMOD} because the contribution from near-road sources estimated by CMAQ is smaller than the grid-cell average contribution calculated with AERMOD ($C_{AERMOD,grid}$).

TABLE II-6-3

NEAR-ROAD SOURCE CONTRIBUTION ESTIMATED BY CMAQ AND NEAR ROAD INCREMENT WITH GRID CELL AVERAGE CONTRIBUTION CALCULATED BY CMAQ ($NRI_{AERMOD\text{-}CMAQ}$, APPROACH #2).

Near-Road Source Contribution ($C_{CMAQ,CA60NR}$) (µg/m³)					
	Q1	Q2	Q3	Q4	Annual
Sulfate	0.010	0.005	0.000*	0.011	0.006
Nitrate	0.041	0.003	0.000*	0.030	0.019
Ammonium	0.008	0.000*	0.000*	0.005	0.003
OC	0.028	0.012	0.024	0.030	0.023
EC	0.035	0.018	0.018	0.041	0.028
Salt	0.008	0.004	0.020	0.008	0.010
Other	0.093	0.050	0.016	0.102	0.065
Total Near-Road	0.22	0.09	0.08	0.23	0.15
$NRI_{AERMOD\text{-}CMAQ}$ (µg/m³)					
	Q1	Q2	Q3	Q4	Annual
Sulfate	0.122	0.131	0.135	0.131	0.130
Nitrate	0.000*	0.018	0.021	0.000*	0.010
Ammonium	0.010	0.020	0.019	0.015	0.016
OC	0.490	0.524	0.506	0.519	0.510
EC	0.479	0.514	0.507	0.514	0.504
Salt	0.098	0.106	0.088	0.103	0.099
Other	1.645	1.747	1.760	1.716	1.717
Total Near-Road	2.84	3.06	3.04	3.00	2.98

*CMAQ estimated negative contribution to sulfate, nitrate, and ammonium, due to chemical interaction with organic aerosol precursors. Because AERMOD modeling only accounts for primary PM2.5, negative values are capped at 0.

The third alternative for the NRI is calculated using monitoring data. There are 19 PM2.5 FRM monitoring stations in the basin, although only four stations measure speciated PM. The basin includes distinct geographical features and localized sources that causes PM2.5 concentrations vary widely throughout the region. Because of the wide range of sources and PM2.5 concentrations across the basin, the NRI in this attainment demonstration is estimated by using observations at the CA60NR and the three closest monitors: Mira Loma, Fontana, and Rubidoux. These three monitors are located within a 20-kilometer radius from CA60NR. Out of the four monitors, only Rubidoux measures speciated PM2.5. Consequently, calculating speciated NRI is not possible from observations. Thus, the speciation of the NRI is based on the modeled speciated NRI using AERMOD. Table II-6-4 shows the quarterly average PM2.5 concentrations at the four monitors used to determine the NRI, the resulting NRI, and the quarterly speciation profiles calculated with AERMOD. The annual $NRI_{Monitors}$, estimated using monitoring data, is 1.64 µg/m³, which is 45% less than the $NRI_{AERMOD\text{-}CMAQ}$. Both estimates are subject to uncertainties and there is no direct way to determine the accuracy of the estimates due to the lack of direct measurements.

The validity of $NRI_{Monitors}$ relies on the assumption that all the neighboring monitors are surrounded by the similar regional sources, and the only difference between CA60NR and all other monitors is the presence of freeway CA-60. However, a brief inspection of the surroundings of the neighboring monitors reveals that the monitor at Fontana is 1 km from Fontana's Auto Speedway racetrack and close to industrial yards, and the Mira Loma monitor is less than 2 km downwind from a large Union Pacific railyard and within 500 meters from a railroad. Thus, it is gross assumption that the difference in PM2.5 between CA60NR and the rest of neighboring monitors expressed by the $NRI_{Monitors}$ is due to the contribution from freeway CA-60 alone.

TABLE II-6-4

NEAR-ROAD INCREMENT CALCULATED FROM OBSERVATIONS ($NRI_{Monitors}$, APPROACH #3) AND SPECIATION PROFILE FOR THE NRI BASED ON AERMOD MODELING.

Monitor	Distance	Q1	Q2	Q3	Q4	Annual
Ontario-Route 60 Near Road		13.45	12.36	14.65	15.46	13.98
Fontana	13.5 km	9.78	11.12	13.43	11.08	11.35
Rubidoux	18.8 km	10.55	11.51	13.02	13.44	12.13
Mira Loma	12.2 km	12.50	12.05	13.12	16.44	13.53
Near-Road Increment (μg/m³)		2.51	0.80	1.46	1.80	1.64
Near-Road Increment Speciation						
Sulfate		4.1%	4.1%	4.1%	4.2%	4.1%
Nitrate		0.7%	0.7%	0.7%	0.7%	0.7%
Ammonium		0.6%	0.6%	0.6%	0.6%	0.6%
OC		16.5%	16.4%	16.3%	16.4%	16.4%
EC		16.0%	15.9%	15.9%	16.3%	16.0%
Salt		3.5%	3.5%	3.5%	3.5%	3.5%
Other		58.7%	58.9%	59.0%	58.3%	58.7%
$NRI_{Monitors}$ (μg/m³)						
		Q1	**Q2**	**Q3**	**Q4**	**Annual**
Sulfate		0.109	0.034	0.063	0.080	0.071
Nitrate		0.017	0.005	0.010	0.013	0.011
Ammonium		0.016	0.005	0.009	0.011	0.010
OC		0.426	0.135	0.248	0.306	0.279
EC		0.424	0.134	0.246	0.310	0.278
Salt		0.087	0.028	0.051	0.062	0.057
Other		1.434	0.455	0.836	1.018	0.936
Total Near-Road		2.51	0.80	1.46	1.80	1.64

The fourth alternative is using the modeled NRI and CMAQ concentrations in relative terms to determine the portion of the design value that corresponds to the NRI, following equation II.6.6. The observed base year design value at the CA60NR monitor (DV_{CA60NR}) is shown in Table II-6-5. Equation II.6.6 requires the DV_{CA60NR} from Table II-6-5, the modeled concentrations by CMAQ at CA60NR shown in Table II-6-6 and the $NRI_{AERMOD\text{-}CMAQ}$ shown in Table II-6-3. The relative portion of PM2.5 species from $NRI_{AERMOD\text{-}CMAQ}$ with respect to total $NRI_{AERMOD\text{-}CMAQ}$ plus CMAQ concentrations, and the resulting $NRI_{RelativeModel}$ values are shown in Table II-6-6. The overall $NRI_{RelativeModel}$ is 1.80 μg/m^3, which is 40% less than the $NRI_{AERMOD\text{-}CMAQ}$, and slightly higher than the $NRI_{Monitors}$. As discussed earlier, because of the lack of direct speciated measurements at the CA60NR monitor, it is not possible to ascertain which of the four alternatives to the NRI is the most accurate. However, the range of values for NRI can provide a sense of uncertainty bounds in the modeling of future design values at the CA60NR.

TABLE II-6-5

SPECIATED DESIGN VALUE AT THE CA60NR MONITOR (DV_{CA60NR})

Base Year DV at CA60NR (μg/m^3)	Q1	Q2	Q3	Q4	Annual
Sulfate	0.697	1.654	1.984	1.009	1.336
Nitrate	3.025	2.613	1.951	3.112	2.675
Ammonium	1.102	1.188	0.991	1.135	1.104
OC	4.933	3.961	6.002	4.628	4.881
EC	0.933	0.502	0.766	1.165	0.842
Salt	0.418	0.354	0.319	0.303	0.349
Other	1.513	1.182	1.706	3.201	1.901
Water	0.628	0.706	0.729	0.697	0.690
Blank	0.2	0.2	0.2	0.2	0.2
Total	**13.45**	**12.36**	**14.65**	**15.45**	**13.98**

TABLE II-6-6

NEAR-ROAD ~~SOURCE CONTRIBUTION~~INCREMENT (*$NRI_{RelativeModel}$*, APPROACH #4) ESTIMATED BY CMAQ AND NEAR ROAD INCREMENT CALCULATED WITH GRID CELL AVERAGE CONTRIBUTION ESTIMATED BY CMAQ (*$NRI_{AERMOD\text{-}CMAQ}$*)

CMAQ Baseline at CA60NR ($C_{CMAQ,Base}$) (μg/m^3)					
	Q1	**Q2**	**Q3**	**Q4**	**Annual**
Sulfate	0.656	0.863	1.104	0.743	0.842
Nitrate	4.478	1.652	1.273	4.908	3.078
Ammonium	1.347	0.399	0.318	1.461	0.881
OC	6.500	4.404	5.697	7.604	6.051
EC	0.840	0.387	0.421	0.898	0.637
Salt	0.382	1.161	1.120	0.425	0.772
Other	2.505	1.611	1.740	2.959	2.204
Total CMAQ	16.71	10.48	11.67	19.00	14.46
$NRI_{AERMOD\text{-}CMAQ}/(C_{CMAQ,Base}+NRI_{AERMOD\text{-}CMAQ})$ (non-dimensional)					
	Q1	**Q2**	**Q3**	**Q4**	**Annual**
Sulfate	0.157	0.132	0.109	0.150	0.134
Nitrate	0.000	0.011	0.017	0.000	0.003
Ammonium	0.008	0.047	0.057	0.010	0.018
OC	0.070	0.106	0.082	0.064	0.078
EC	0.363	0.565	0.546	0.364	0.440
Salt	0.204	0.083	0.073	0.194	0.113
Other	0.377	0.423	0.495	0.367	0.410
$NRI_{RelativeModel}$ (μg/m^3)					
	Q1	**Q2**	**Q3**	**Q4**	**Annual**
Sulfate	0.109	0.218	0.216	0.152	0.174
Nitrate	0.000	0.029	0.032	0.000	0.015
Ammonium	0.008	0.056	0.057	0.012	0.033
OC	0.346	0.421	0.489	0.296	0.388
EC	0.339	0.283	0.419	0.424	0.366
Salt	0.085	0.030	0.023	0.059	0.049
Other	0.570	0.500	0.845	1.175	0.772
Total Near-Road	1.46	1.54	2.08	2.12	1.80

In summary, the four alternatives described above span the range of NRI from 1.64 $\mu g/m^3$ to 2.98 $\mu g/m^3$. While there are no direct measurements or any comprehensive study near the CA60NR that could provide a better estimate of the contribution of near-road sources to observed PM2.5, a recent study collected PM2.5 filter samples near two other southern California highways (I-5 and I-710), placing the samplers both upwind and downwind from the freeways.[2] Measurements over two weeks showed overall differences between upwind and downwind measurements ranging from 1 $\mu g/m^3$ to 3 $\mu g/m^3$, which are in the same range as the four alternatives for NRI.

STEP 3: Separate the NRI portion from the measured quarterly base year design value.

The quarterly averages of the base year design value are calculated following the methodology described in the U.S. EPA modeling guidance. Speciation at CA60NR is derived by interpolating the speciation profiles from the four CSN monitors in the basin. Then, the NRI is subtracted from the speciated base year design value to obtain RDV. In this example, $NRI_{AERMOD\text{-}CMAQ}$ is used, and the breakdown between NRI and RDV is shown in Table II-6-7. Note that the estimated NRI for crustal component Other is larger than the estimated portion from the calculated base year design value in quarters 2 and 3. Thus, the values for Other in $NRI_{AERMOD\text{-}CMAQ}$ in quarter 2 and quarter 3 are capped at the magnitude in the base year design value.

[2] Wang X., Gronstal S., Lopez B., Jung H., Chen A.L.-H., Wu G., Ho S.S.H., Chow J.C., Watson J.G., Yao Q., Yoon S., 2023. Evidence of non-tailpipe emission contributions to PM2.5 and PM10 near southern California highways. Environmental Pollution, 3017, 120691. https://doi.org/10.1016/j.envpol.2022.120691

TABLE II-6-7

DISAGGREGATION OF NEAR-ROAD INCREMENT FROM REGIONAL COMPONENT OF THE BASE YEAR DESIGN VALUE

Speciated Base Year DV (µg/m^3)	Q1	Q2	Q3	Q4	Annual
Sulfate	0.697	1.654	1.984	1.009	1.336
Nitrate	3.025	2.613	1.951	3.112	2.675
Ammonium	1.102	1.188	0.991	1.135	1.104
OC	4.933	3.961	6.002	4.628	4.881
EC	0.933	0.502	0.766	1.165	0.842
Salt	0.418	0.354	0.319	0.303	0.349
Other	1.513	1.182	1.706	3.201	1.901
Water	0.628	0.706	0.729	0.697	0.690
Blank	0.2	0.2	0.2	0.2	0.2
Total	**13.45**	**12.36**	**14.65**	**15.45**	**13.98**
$NRI_{AERMOD-CMAQ}$ (µg/m^3)	Q1	Q2	Q3	Q4	Annual
Sulfate	0.122	0.131	0.135	0.131	0.130
Nitrate	0.000	0.018	0.021	0.000	0.010
Ammonium	0.010	0.020	0.019	0.015	0.016
OC	0.490	0.524	0.506	0.519	0.510
EC	0.479	0.502	0.507	0.514	0.501
Salt	0.098	0.106	0.088	0.103	0.099
Other	1.513	1.182*	1.706*	1.716	1.529
Total Near-Road	**2.71**	**2.48**	**2.98**	**3.00**	**2.79**
Regional Component (RDV) (µg/m^3)	Q1	Q2	Q3	Q4	Annual
Sulfate	0.575	1.523	1.849	0.878	1.206
Nitrate	3.025	2.595	1.930	3.112	2.665
Ammonium	1.092	1.168	0.972	1.120	1.088
OC	4.443	3.437	5.496	4.109	4.371
EC	0.454	0.000	0.259	0.651	0.341
Salt	0.320	0.248	0.231	0.200	0.250
Other	0.000	0.000	0.000	1.485	0.371
Water	0.628	0.706	0.729	0.697	0.69
Blank	0.2	0.2	0.2	0.2	0.2
Total Regional	**10.74**	**9.88**	**11.67**	**12.45**	**11.18**

*Values capped at the values of Other in the speciated DV in quarters 2 and 3

STEP 4: Project future DV by applying AERMOD-based RRF to NRI and CMAQ-based RRF to the regional component RDV.

The AERMOD-based RRF is calculated in Step 1 and is presented in Table II-6-2. The CMAQ-based RRF is calculated following the same methodology used in the traditional attainment demonstration approach, as described in the U.S. EPA modeling guidance. Namely, the quarterly average of modeled concentrations for the base year and the attainment scenario are averaged over a 3-by-3 grid centered at the grid cell where the monitor is located. The quarterly average value for each PM2.5 species in the attainment case divided by the quarterly average for the base year is the RRF for each PM2.5 species. The calculated RRF values are shown in Table II-6-8.

TABLE II-6-8

CMAQ-BASED RELATIVE REDUCTION FACTORS (RRF) FOR THE MONITOR AT CA60NR

	Q1	Q2	Q3	Q4	Annual
Sulfate	1.053	1.013	1.007	1.023	1.017
Nitrate	0.518	0.622	0.688	0.477	0.571
Ammonium	0.532	0.559	0.672	0.482	0.566
OC	1.112	0.963	0.931	1.081	1.018
EC	0.71	0.644	0.654	0.696	0.686
Salt	1.015	1.044	1.053	1.031	1.034
Other	1.095	1.064	1.058	1.091	1.080

The AERMOD-based RRF is applied to the base year NRI and the CMAQ-based RRF is applied to the base year RDV. The resulting speciated concentrations, shown in Table II-6-9, represent the PM2.5 concentrations in the attainment scenario.

TABLE II-6-9

PROJECTED NRI (BASED ON $NRI_{AERMOD-CMAQ}$, APPROACH #2) AND REGIONAL COMPONENT IN THE ATTAINMENT SCENARIO

	Q1	Q2	Q3	Q4	Annual
Near-Road Increment (NRI) (µg/m³)					
Sulfate	0.050	0.054	0.055	0.053	0.053
Nitrate	0.000	0.010	0.011	0.000	0.005
Ammonium	0.004	0.007	0.007	0.006	0.006
OC	0.276	0.295	0.285	0.288	0.286
EC	0.097	0.102	0.104	0.101	0.101
Salt	0.095	0.103	0.086	0.100	0.096
Other	1.473	1.150	1.659	1.680	1.491
Total Near-Road	2.00	1.72	2.21	2.23	2.04
Regional Component (RDV) (µg/m³)					
Sulfate	0.605	1.543	1.862	0.898	1.227
Nitrate	1.567	1.614	1.328	1.484	1.498
Ammonium	0.581	0.653	0.653	0.540	0.607
OC	4.940	3.310	5.117	4.442	4.452
EC	0.322	0.000	0.169	0.453	0.236
Salt	0.325	0.259	0.243	0.207	0.258
Other	0.000	0.000	0.000	1.621	0.405
Total Regional	8.34	7.38	9.37	9.64	8.68

STEP 5: Add the future NRI and RDV components, calculate particle bound water and add blank to determine the future design value.

The future NRI and RDV components calculated in step 4 are added. Particle bound water is calculated following U.S. EPA modeling guidance, using a polynomial regression equation fitted to the equilibrium model Aerosol Inorganic Matter (AIM) as a function of sulfate, nitrate, and ammonium concentrations. The standard blank of 0.2 µg/m³ is added to the sum of all components to obtain the quarterly averages. The future annual design value is calculated as the average of the quarterly values. Table II-6-10 shows the calculated values, showing that the annual design value is 11.59 µg/m³, and thus demonstrating attainment of the annual PM2.5 standard.

TABLE II-6-10

PROJECTED ANNUAL PM2.5 DESIGN VALUE IN THE ATTAINMENT SCENARIO

	Q1	Q2	Q3	Q4	Annual
Future DV with $NRI_{AERMOD\text{-}CMAQ}$ (μg/m^3)					
Sulfate	0.655	1.596	1.917	0.951	1.280
Nitrate	1.567	1.623	1.339	1.484	1.503
Ammonium	0.585	0.661	0.660	0.545	0.613
OC	5.216	3.605	5.402	4.730	4.739
EC	0.419	0.102	0.273	0.554	0.337
Salt	0.420	0.362	0.329	0.307	0.355
Other	1.473	1.150	1.659	3.301	1.896
Water	0.409	0.839	0.855	0.557	0.665
Blank	0.2	0.2	0.2	0.2	0.200
Total	10.94	10.14	12.63	12.63	**11.59**

The future design value calculated using this hybrid approach is sensitive to the magnitude of NRI. Because emissions from on-road sources are expected to decline faster than the overall emissions in the basin, the NRI portion is projected to decline faster than the RDV. Table II-6-11 shows the future design value calculated using $NRI_{Monitors}$, which the smallest among the four alternative NRI values. Since the magnitude of $NRI_{Monitors}$ is smaller than $NRI_{AERMOD\text{-}CMAQ}$, the overall future DV increases. As a result, the DV calculated using $NRI_{Monitors}$ is 11.91 μg/m^3, higher than the DV calculated using $NRI_{AERMOD\text{-}CMAQ}$. Even though the DV calculated with a more conservative estimate of NRI is higher, this hybrid modeling approach demonstrates attainment of the annual PM2.5 standard.

TABLE II-6-11

PROJECTED ANNUAL PM2.5 DESIGN VALUE IN THE ATTAINMENT SCENARIO USING ALTERNATIVE ~~$NRI_{Monitor}$~~ $\underline{NRI_{Monitors}}$ (APPROACH #3)

	Q1	Q2	Q3	Q4	Annual
Future DV with ~~$NRI_{Monitor}$~~ $\underline{NRI_{Monitors}}$ (μg/m^3)					
Sulfate	0.664	1.655	1.960	0.983	1.315
Nitrate	1.567	1.625	1.341	1.485	1.504
Ammonium	0.584	0.663	0.663	0.546	0.614
OC	5.252	3.760	5.497	4.842	4.838
EC	0.448	0.264	0.390	0.656	0.440
Salt	0.421	0.368	0.332	0.309	0.357
Other	1.483	1.216	1.733	3.379	1.953
Water	0.413	0.877	0.881	0.576	0.687
Blank	0.2	0.2	0.2	0.2	0.2
Total	**11.03**	**10.63**	**13.00**	**12.98**	**11.91**

AERMOD Dispersion Modeling Set-Up

The dispersion modeling set-up is based on the American Meteorological society (AMS) and U.S. EPA Regulatory Model–AERMOD (Cimorelli et al., 2005)[3]. AERMOD is one of the official EPA dispersion models required to be used for State Implementation Plan (SIP) revisions for existing sources and for New Source Review (NSR) and Prevention of Significant Deterioration (PSD) programs (U.S. EPA, 2017[4]). It has been widely employed in environmental science and air quality management (e.g., Gibson et al., 2013,[5] Rood 2014[6]).

AERMOD incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain. The AERMOD modeling system consists of several key components, including (1) AERMET, a meteorological data preprocessor; (2) AERMAP, a terrain data preprocessor that incorporates complex terrain using USGS Digital Elevation Data; (3) AERSCREEN, a screening version of AERMOD; (4) AERSURFACE, a surface characteristics preprocessor; and (5) BPIPPRIM, a multi-building dimensions program incorporating the GEP (Good Engineering Practice) technical procedures for PRIME (Plume Rise Model Enhancements) applications (U.S. EPA, 2017).

The meteorological data used in AERMOD to simulate the dispersion of pollutants was from the Weather Research and Forecasting (WRF) model version 4.4.2, which was run at a spatial resolution of 4 km by 4 km. Extensive evaluation of the meteorological modeling performance is presented in Chapter 3 of Appendix II of this plan. The meteorological data was processed with Meteorological Model Input Formulator (MMIF) version 4.0, which prepares the data for input into AERMOD. The data was then further processed and adjusted by the AERMET preprocessor to prepare the meteorological data specifically for AERMOD. Mixing heights, which are crucial for the vertical dispersion of air pollutants, were calculated by AERMET. AERMET was run with the Bulk Richardson number option to estimate the

[3] Cimorelli, A. J., Perry, S. G., Venkatram, A., Weil, J. C., Paine, R. J., Wilson, R. B., ... & Brode, R. W. (2005). AERMOD: A dispersion model for industrial source applications. Part I: General model formulation and boundary layer characterization. Journal of Applied Meteorology and Climatology, 44(5), 682-693. https://doi.org/10.1175/JAM2227.1

[4] U.S. EPA, 2017, Air Quality Dispersion Modeling - Preferred and Recommended Models, Support Center for Regulatory Atmospheric Modeling (SCRAM), https://www.epa.gov/scram/air-quality-dispersion-modeling-preferred-and-recommended-models

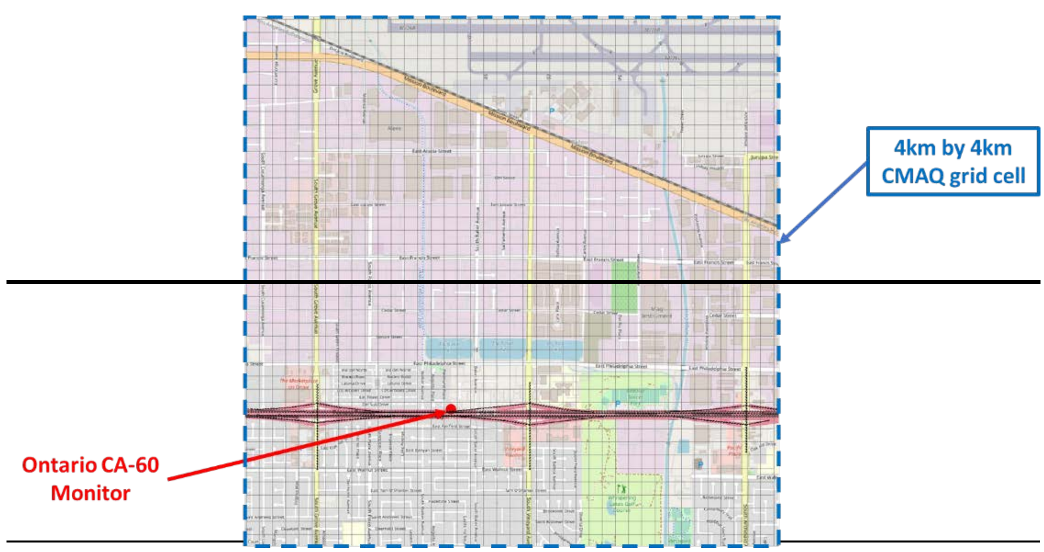
[5] Gibson, M. D., Kundu, S., & Satish, M. (2013). Dispersion model evaluation of PM2. 5, NOx and SO2 from point and major line sources in Nova Scotia, Canada using AERMOD Gaussian plume air dispersion model. Atmospheric Pollution Research, 4(2), 157-167. https://doi.org/10.5094/APR.2013.016

[6] Rood, A. S. (2014). Performance evaluation of AERMOD, CALPUFF, and legacy air dispersion models using the Winter Validation Tracer Study dataset. Atmospheric Environment, 89, 707-720. https://doi.org/10.1016/j.atmosenv.2014.02.054

vertical mixing height and it was configured to adjust the friction velocity (u*) but without any wind direction randomization.

AERMAP was used to process terrain data. In the case of the Drat PM2.5 Plan, 1 arcsecond National Elevation Dataset (NED) was used as the terrain data. Receptors are points where pollutant concentrations are calculated to assess the impact of emissions. In this setup, receptors were placed at 100-meter intervals over one CMAQ grid (4 km by 4 km). Additionally, there was one discrete receptor located at the CA60NR monitor. The receptors were positioned at a height of 4.9 meters above the ground, which matches the probe height of the CA60NR monitor. This ensures consistency in the measurements. Figure II-6-4 shows the receptor grid and location of CA60NR.

The modeling emission set-up only includes the emission sources along freeway CA-60 and its on- and off-ramps. Emission sources are grouped into 10 groups so that each category is modeled using distinctive emissions temporal and chemical profiles that can be tracked throughout the modeling. These emissions are derived from SCAG's vehicle activity dataset, which is also used in the regional modeling set-up. SCAG's dataset includes vehicle activity for 5 different vehicle classes: light and medium duty vehicles, light heavy-duty trucks, medium heavy-duty trucks, heavy heavy-duty trucks, and buses. EMFAC 2021 is used to calculate an aggregated emissions factor on a per-mile basis for these 5 groupings that includes exhaust, and tire and brake wear emissions. In addition, road dust emissions are estimated by using SCAG's vehicle activity and road information dataset and by using the road dust methodology described in Attachment H of Appendix III from the 2022 AQMP. In total, five vehicle categories and two emission processes per vehicle class for a total of ten sources of emissions. Figure II-6-5 shows the distribution of the primary PM2.5 emissions along the freeway CA-60 within the dispersion modeling domain.



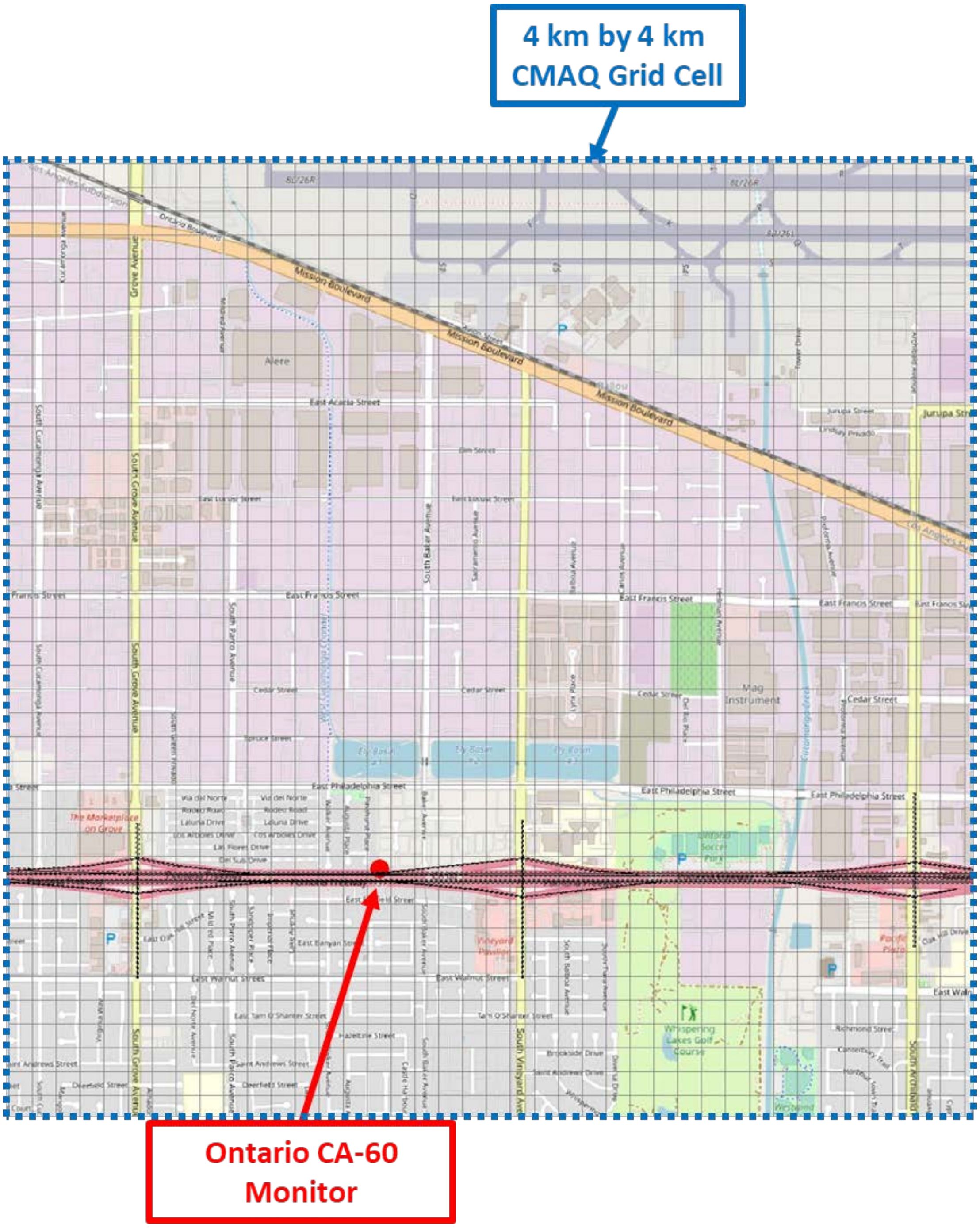
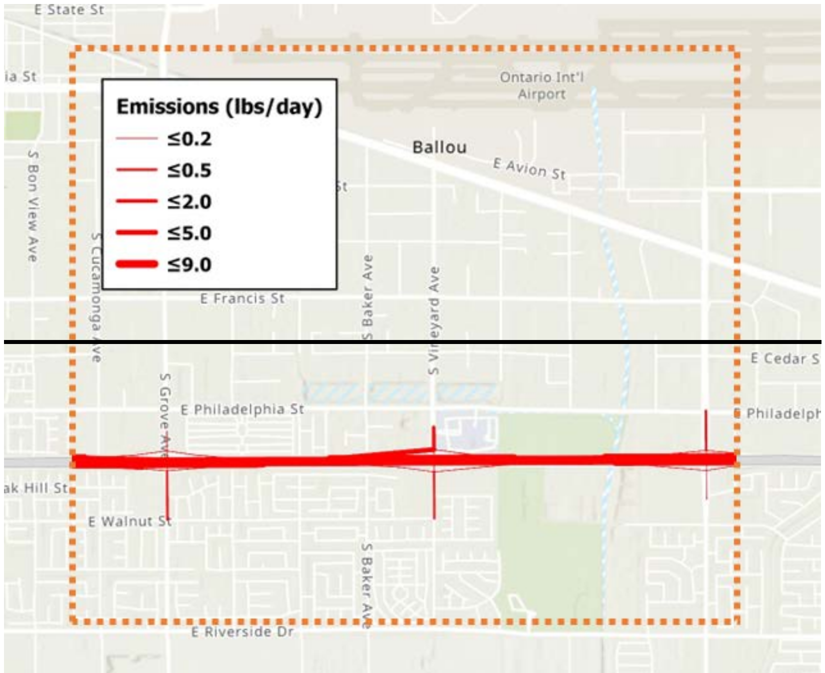


FIGURE II-6-4

DISPERSION MODELING DOMAIN SET-UP



E State St
Ontario Int'l Airport
Ballou
E Avion St
S Bon View Ave
S Cucamonga Ave
Emissions (lbs/day)
≤0.2
≤0.5
≤2.0
≤5.0
≤9.0
E Francis St
S Baker Ave
S Vineyard Ave
E Cedar S
S Grove Ave
E Philadelphia St
Philadelph
ak Hill St
E Walnut St
S Baker Ave
E Riverside Dr

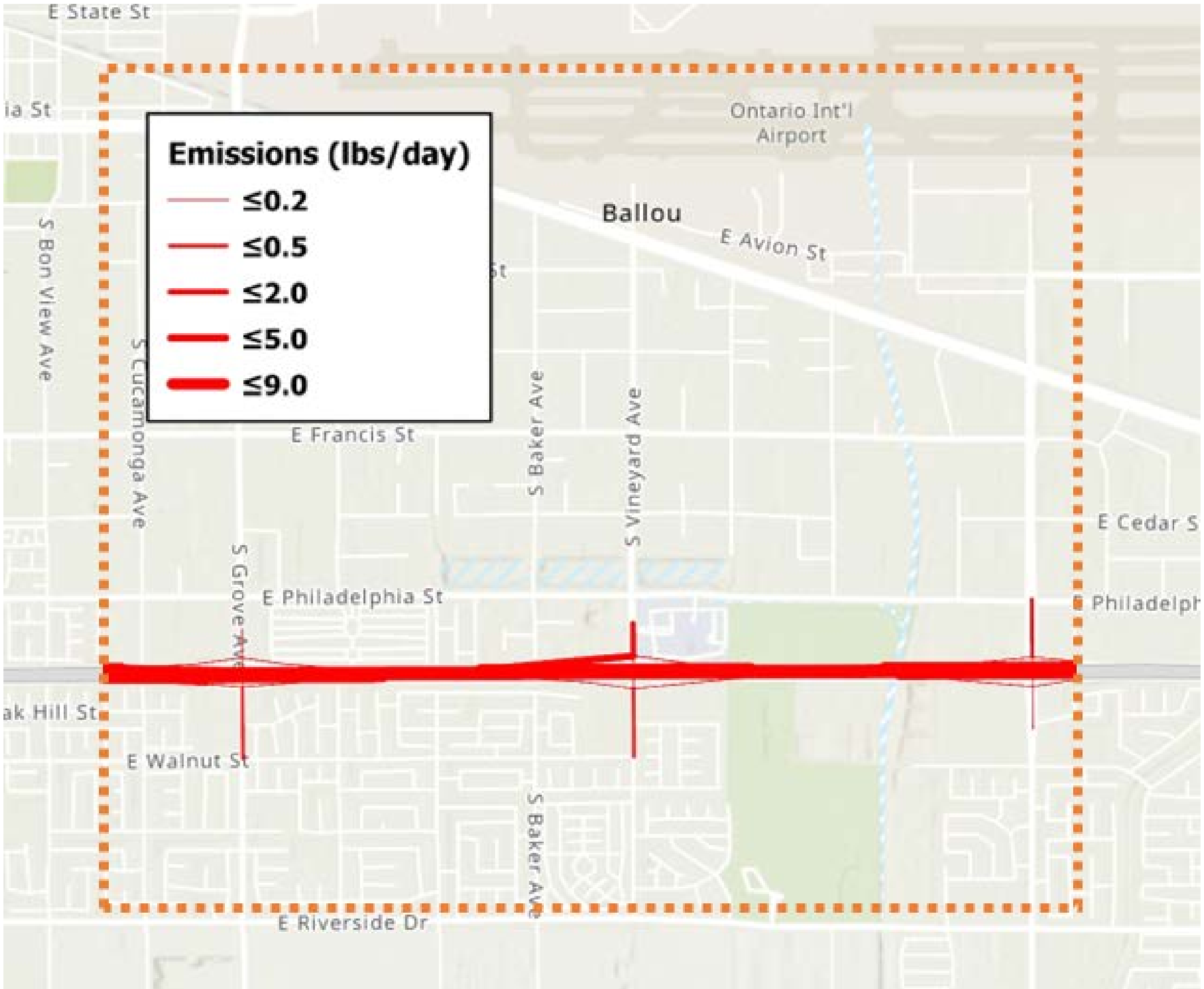


FIGURE II-6-5

SPATIAL DISTRIUTION OF ON-ROAD PRIMARY PM2.5 EMISSIONS IN THE DISPERSION MODELING DOMAIN

Concentrations of total PM2.5 for all 10 emission sources are calculated on an hourly basis for the entire year of 2018. Daily emissions are calculated using average-day emission factors for the total PM2.5. Temporal and chemical speciation profiles are applied as a post-processing step because both profiles are multipliers to the emissions. Because dispersion of pollutants is directly proportional to the emission flux, concentrations at different times and for different species are the product of the hourly estimated concentration and the temporal and chemical profile factors.

All emission sources were modeled as lines with constant emission rates. The initial vertical dimension for vehicle emissions was set at 5.1 meters, following examples from U.S. EPA's Conformity Hotspot

Guidance, Appendix J.3.[7] The release height of vehicle emissions was set at 2.6 meters per the guidance suggestion, whereas road dust emissions release height was set at 0.5 meters above ground level. Hourly POST files (Post-Processing File) were generated for different source groups. These files contain detailed information about pollutant concentrations and dispersion patterns over time and space and are used for subsequent temporal scaling and analysis.

Table II-6-12 lists the annual average PM2.5 emissions from vehicle exhausts and paved road dust along the CA-60 freeway within the 4km-by-4km CMAQ model grid cell where the monitoring station is located. The total PM2.5 emissions from vehicle exhaust significantly drop from 39.31 lbs/day in the base year 2018 to 20.11 lbs/year in the 2030 attainment scenario primarily due to the adoption of cleaner vehicles. In contrast, PM2.5 emissions from paved-road dust slightly increase from 25.73 lbs/day in 2018 to 27.29 lbs/day in 2030 because of higher vehicle activity rates in the future.

TABLE II-6-12. ANNUAL AVERAGE PM2.5 EMISSIONS ALONG CA-60 FREEWAY IN THE DISPERSION MODELING DOMAIN

	Annual Average PM2.5 Emissions (pounds per day)	
Source	**Base Year 2018**	**2030 Attainment**
Road Dust		
Light and Medium Duty Vehicles	11.3	9.8
Light Heavy-Duty Trucks	1.2	0.7
Medium Heavy-Duty Trucks	2.3	2.9
Heavy Heavy-Duty Trucks	10.8	13.9
Buses	0.0	0.0
Total Road Dust	25.7	27.3
Vehicle Emissions, Exhaust + Tire and Brake Wear		
Light and Medium Duty Vehicles	10.9	8.5
Light Heavy-Duty Trucks	3.1	1.9
Medium Heavy-Duty Trucks	7.6	1.5
Heavy Heavy-Duty Trucks	17.7	8.3
Buses	0.0	0.0
Total Vehicle Emissions	39.3	20.1
Total Emissions	**65.0**	**47.4**

[7] PM Hot-spot Guidance. Transportation Conformity Guidance for Quantitative Hot-spot Analyses in PM2.5 and PM10 Nonattainment and Maintenance Areas, Office of Transportation and Air Quality, U.S. Environmental Protection Agency, EPA-420-B-21-037

Figure II-6-6 presents the mass fractions of primary PM2.5 speciation in the near-road emission sources. Speciation for vehicle emissions changes from 2018 to the 2030 attainment scenario, because exhaust emissions decline and tire and brake wear emissions become a relatively larger contributor to total vehicle emissions. As shown, crustal components (including primary particulates containing silicon, calcium, aluminum, iron, and titanium) dominate emissions from paved road dust, accounting for approximately 90% of the total mass of paved road dust emissions and contribute significantly to emissions from light-duty vehicles, accounting for approximately 50%. Following crustal components, organic carbon (OC) is the next significant contributor to light-duty vehicle emissions, accounting for over 25% of the emissions. In heavy-duty vehicle emissions, elemental carbon (EC) is the largest contributor in 2018, followed by crustal components and OC. Because exhaust emissions from heavy-duty vehicles are substantially reduced in the future, the EC fraction declines substantially, and the tire and break wear contribution in the 2030 attainment becomes more prominent, increasing the crustal fraction.

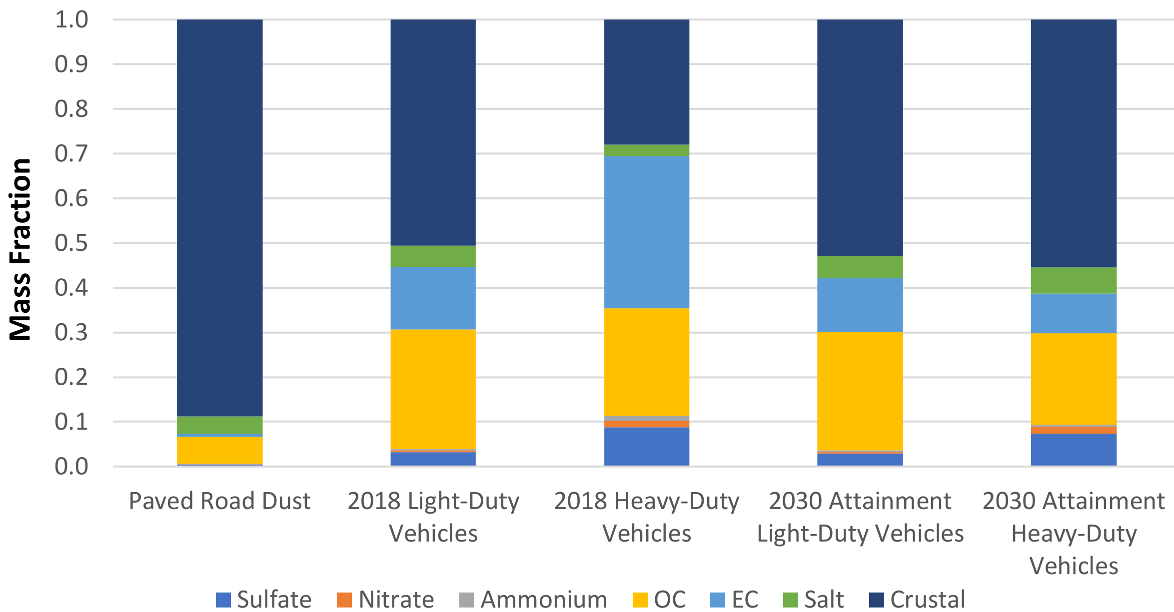
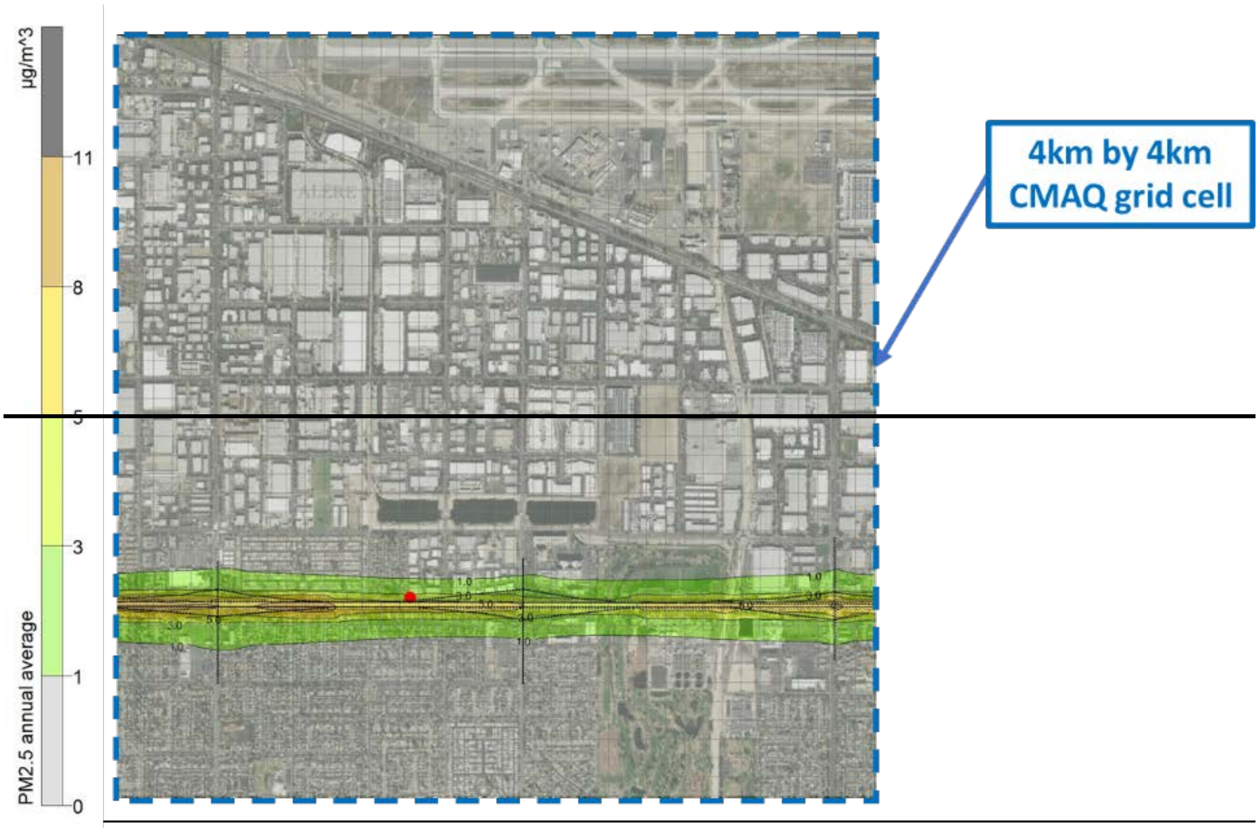


FIGURE II-6-6

SPECIATION OF NEAR-ROAD EMISSION SOURCES

PM2.5 simulation with AERMOD

Figure II-6-7 shows the average PM2.5 concentration map calculated by AERMOD that represents the contribution of the direct PM2.5 emissions from on-road sources. The results indicate that the most significant impacts of on-road emissions are concentrated along the freeway near off-ramps, and the dispersion of PM2.5 is highly localized within a 300-meter radius from the freeway. Specifically, on-road sources contribute 3.13 $\mu g/m^3$ to PM2.5 levels at the monitoring site, while the average contribution across the entire 4 km-by-4 km grid cell is 0.32 $\mu g/m^3$ (Figure II-6-8).



~~FIGURE II-6-7~~

~~ESTIMATES BASED ON DISPERSION MODELING OF THE CONTRIBUTION OF DIRECT PM2.5 EMISSIONS FROM CA-60 FREEWAY TO ANNUAL PM2.5 AROUND THE CA-60 NEAR-ROAD MONITOR~~

Figure II-6-8 shows the contribution of on-road sources to annual PM2.5 at the monitoring station and as a grid-wide average across the 4 km-by-4 km grid cell where the monitor is located. The difference between the contribution at the monitor and the grid average contribution is the near-road increment calculated by AERMOD (NRI_{AERMOD}). The contribution is disaggregated by chemical components, showing that primary PM2.5 species are the dominant contributors. Crustal species are emitted largely from dust resuspension, whereas OC and EC are emitted from vehicle exhaust. Projections for the future year 2030 with the addition of emission controls targeting vehicle exhaust emissions are also shown in Figure II-6-8. Because of the introduction of cleaner vehicles in the future, the contribution of vehicle exhaust to OC and EC is substantially reduced by 2030. However, the contribution to crustal species, which is proportional to vehicle activities, increases slightly due to increased vehicle miles travelled (VMT) from 2018 through 2030.

<u>4 km by 4 km</u>
CMAQ Grid Cell

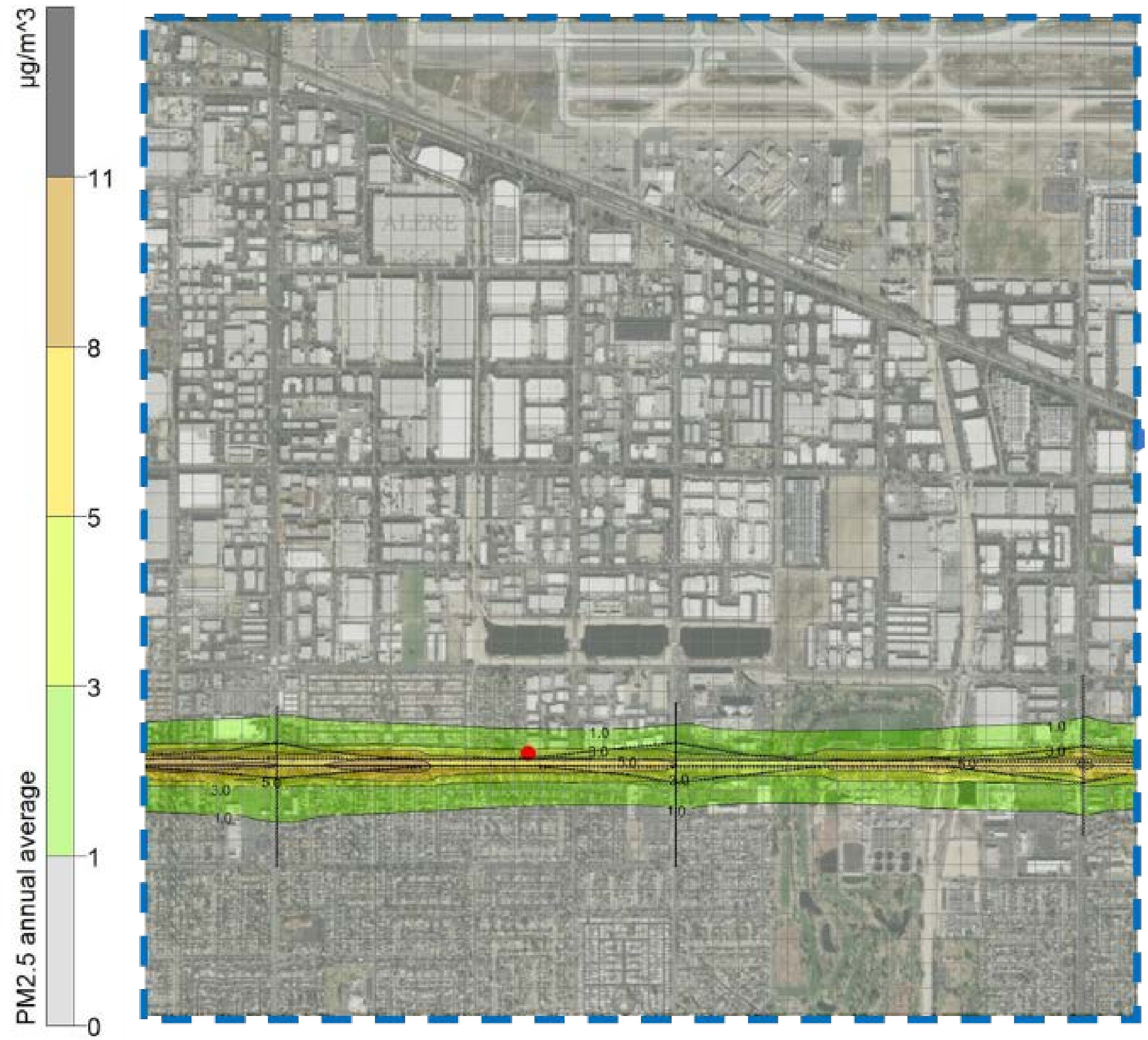


FIGURE II-6-7

ESTIMATES BASED ON DISPERSION MODELING OF THE CONTRIBUTION OF DIRECT PM2.5 EMISSIONS FROM CA-60 FREEWAY TO ANNUAL PM2.5 AROUND THE CA-60 NEAR-ROAD MONITOR

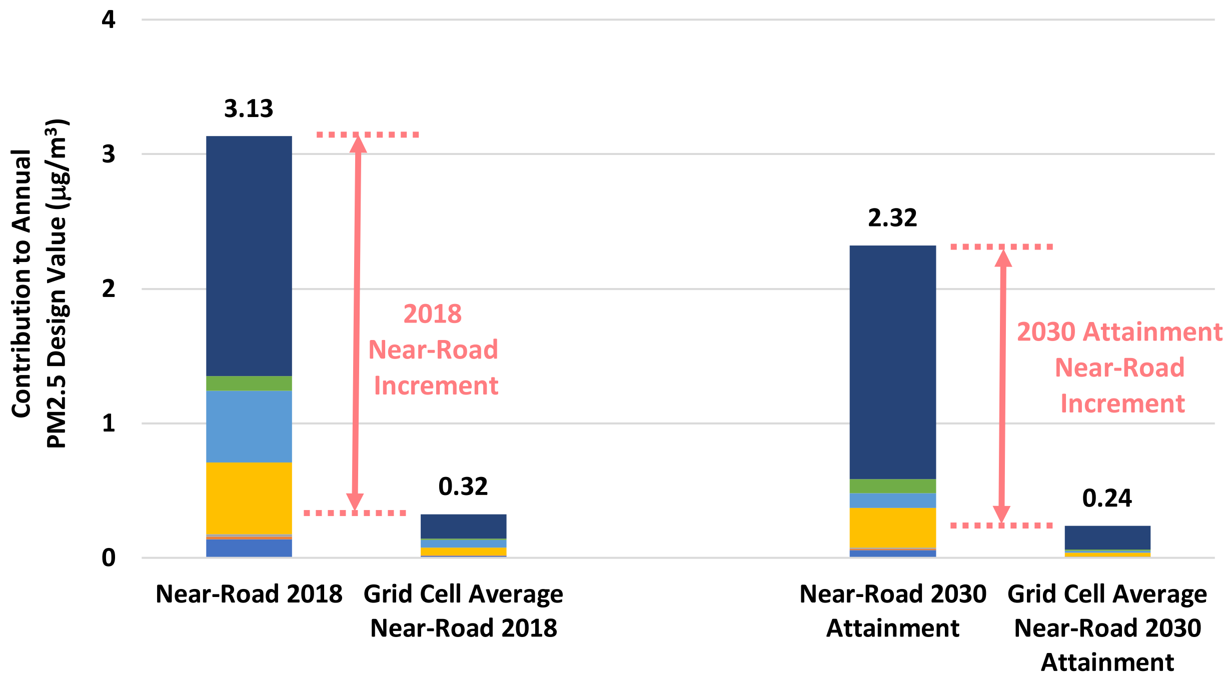


FIGURE II-6-8

CONTRIBUTION OF DIRECT PM2.5 EMISSIONS ESTIMATED BY DISPERSION MODELING FROM CA-60 FREEWAY TO ANNUAL PM2.5 AT THE CA-60 NEAR-ROAD MONITOR AND GRID AVERAGE, FOR BASE YEAR 2018 AND FUTURE YEAR 2030 CONTROL SCENARIO

Model Evaluation of Hybrid Model

The use of the combination of regional modeling with CMAQ and local source dispersion modeling with AERMOD is motivated by the fact that the regional model CMAQ can only predict changes in concentrations averaged over a 4 km-by-4 km cell, whereas AERMOD can model the steep gradients in primary PM2.5 that occur between the freeway and the nearby monitor. As described above, AERMOD is used to determine the near-road increment in PM2.5 that is caused by the monitor being close to route CA60. To assess the performance of this hybrid approach, observations at the monitor are compared to hybrid modeling results (C_{Hybrid}) defined as the CMAQ modeled PM2.5 plus the NRI calculated with AERMOD:

$$C_{Hybrid} = C_{CMAQ,Base} + NRI_{AERMOD-CMAQ} \qquad \text{(II.6.9)}$$

Equation II.6.9 is equivalent to the following expression:

$$C_{Hybrid} = C_{CMAQ,NoCA60NR} + C_{AERMOD,CA60NR} \qquad \text{(II.6.10)}$$

Where $C_{CMAQ,NoCA60NR}$ is the modeled concentrations from the simulation with all the near-road source emissions included in the AERMOD setup removed from base year emissions. The difference between $C_{CMAQ,Base}$ and $C_{CMAQ,NoCA60NR}$ represents the contribution of near-road sources estimated by CMAQ, $C_{CMAQ,CA60NR}$. The annual average contribution from CA60NR near-road sources to total PM2.5 estimated by CMAQ is shown in Figure II-6-9. The impact of those sources is limited within the grid cells surrounding the CA60NR station and ranging from 0.01 to 0.15 μg/m^3.

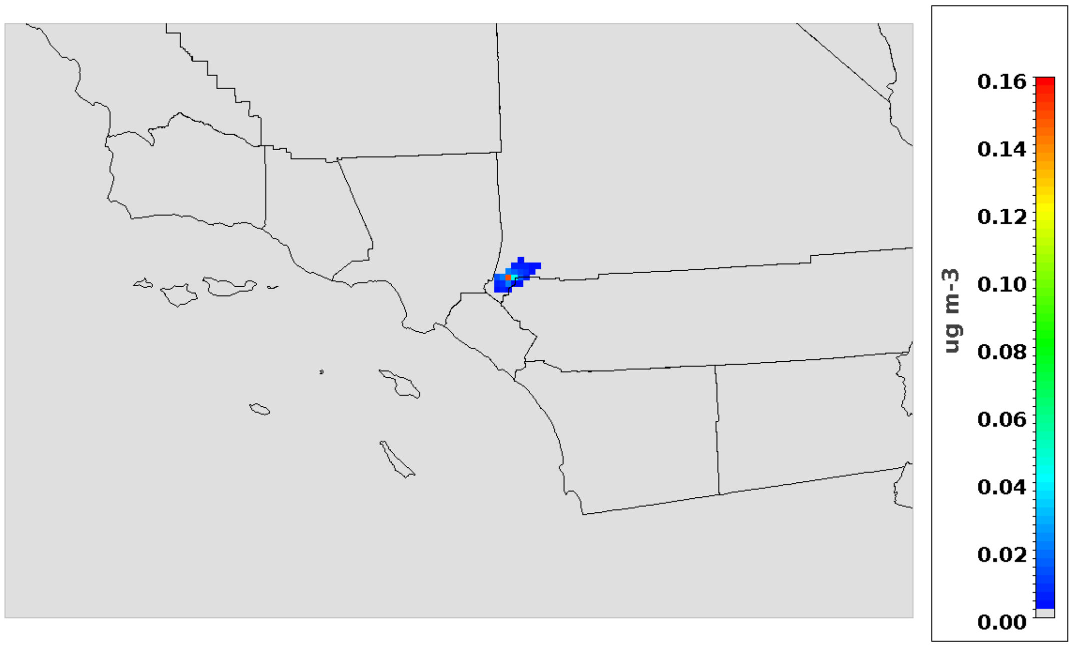


FIGURE II-6-9

CONTRIBUTION OF DIRECT PM2.5 EMISSIONS FROM NEAR-ROAD SOURCES AROUND CA60NR TO ANNUAL PM2.5 CONCENTRATIONS ESTIMATED BY CMAQ FOR BASE YEAR 2018

Figure II-6-10 shows the time series of daily PM2.5 comparing observations with modeled concentrations obtained with CMAQ and the hybrid modeling approach. In general, both CMAQ and the hybrid modeling approach capture the seasonal variation, showing higher concentrations in the first and fourth quarters of the month, and lower concentrations in spring and summer. Figure II-6-11 shows the daily near-road source contribution to CA60NR PM2.5 concentrations as modeled by AERMOD. As in the case of CMAQ modeling, PM2.5 concentrations modeled with AERMOD show higher peaks in the first and fourth quarters, due to stagnation that happens in colder months.

While seasonal trends are modeled reasonably well, the base CMAQ model overestimates PM2.5 concentrations, especially in the colder months. These biases may be attributed to biases in seasonal variations of emissions and/or mixing layer heights in the model. Because hybrid modeling adds approximately 3 μg/m^3 to the CMAQ base modeling to account for the contribution of the NRI, the hybrid modeling approach further overestimate PM2.5 concentrations, compared to CMAQ base modeling. As a result, hybrid modeling shows higher bias and error than the CMAQ base modeling. However, CMAQ underestimates PM2.5 concentrations in spring and summer, and the hybrid modeling approach shows improvements by narrowing the gaps between modeling and observations during the spring and summer seasons. Table II-6-13 shows the modeling performance metrics for both CMAQ and the hybrid modeling approach. The metric definitions are included in Chapter 5 of Appendix II.

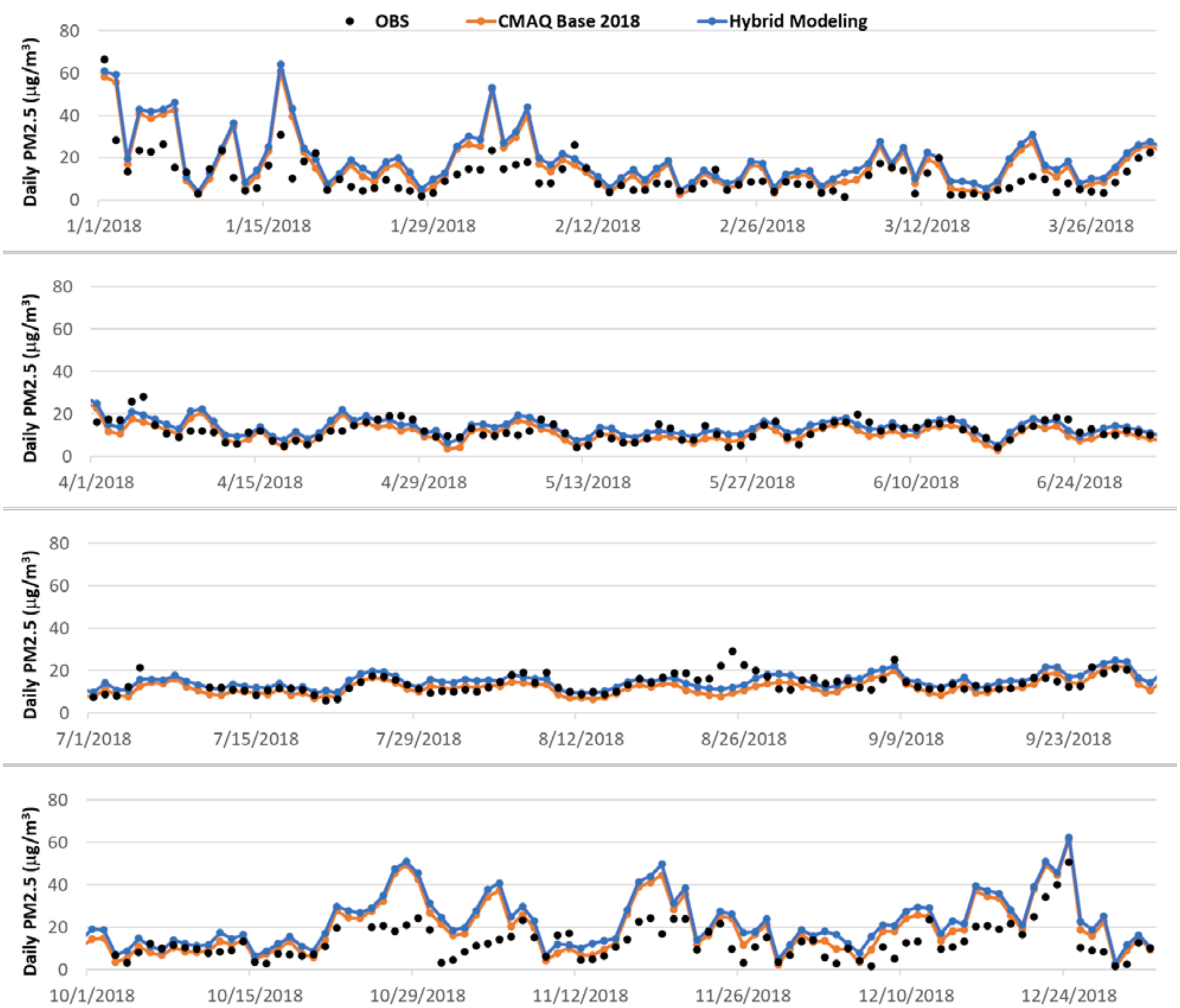


FIGURE II-6-10

DAILY PM2.5 AS OBSERVED AND SIMULATED WITH THE CMAQ AND AERMOD-CMAQ HYBRID MODELING SYSTEMS AT THE CA60NR MONITORING STATION IN 2018

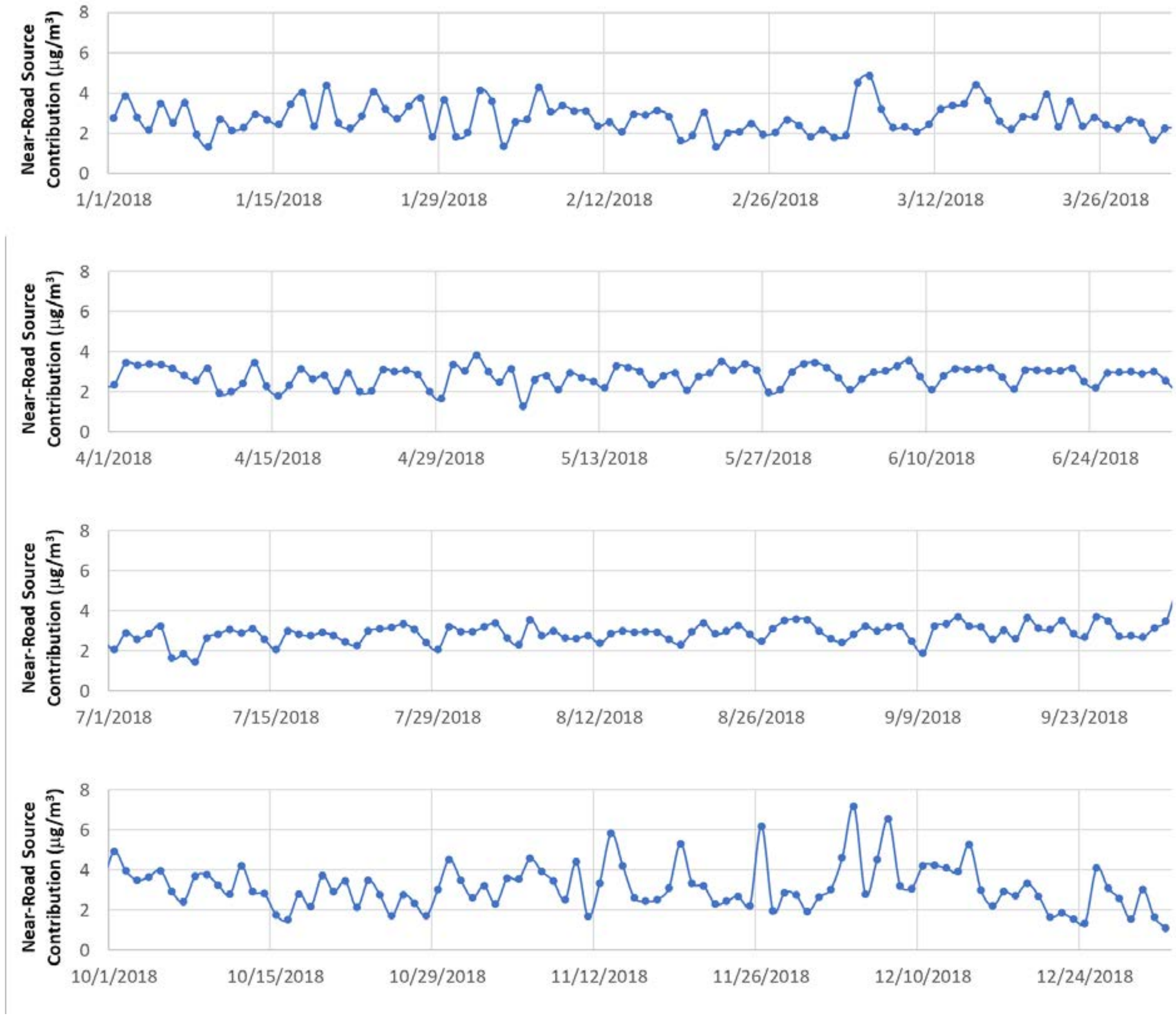


FIGURE II-6-11

DAILY CONTRIBUTION FROM NEAR-ROAD SOURCES TO DAILY PM2.5 AT THE CA60NR MONITOR AS MODELED BY AERMOD.

TABLE II-6-13. MODELING PERFORMANCE EVALUATION OF CMAQ AND HYBRID MODELING AT THE CA60NR MONITOR

CMAQ						
Period	**Obs**	**Average ($\mu g/m^3$)**	**Mean Bias ($\mu g/m^3$)**	**NMB (%)**	**Mean Error ($\mu g/m^3$)**	**NME (%)**
Annual	12.5	15.0	2.4	19%	5.1	41%
Q1	11.2	17.2	6.0	54%	7.1	63%
Q2	12.1	11.0	-1.1	-9%	2.8	23%
Q3	13.8	12.1	-1.8	-13%	3.0	22%
Q4	13.1	19.6	6.5	50%	7.4	57%
Hybrid						
Period	**Obs**	**Average ($\mu g/m^3$)**	**Mean Bias ($\mu g/m^3$)**	**NMB (%)**	**Mean Error ($\mu g/m^3$)**	**NME (%)**
Annual	12.5	17.7	5.2	41%	6.2	50%
Q1	11.2	19.7	8.5	76%	9.0	81%
Q2	12.1	13.7	1.6	13%	3.1	26%
Q3	13.8	14.9	1.1	8%	3.0	22%
Q4	13.1	22.5	9.5	73%	9.7	75%

Annual PM2.5 Design Values using the Hybrid Approach

The resulting future design values using the four different NRI estimates are compared to the DV calculated using the traditional approach and are shown in Figure II-6-12. While the traditional approach suggests that the CA-60 near-road monitor fails to attain the standard under the 2030 control scenario, the hybrid approach, designed to capture the steep gradients in direct PM2.5 concentrations around the freeway, shows that the projected annual PM2.5 concentration will be below the NAAQS of 12 $\mu g/m^3$. The hybrid approach using the $NRI_{AERMOD\text{-}CMAQ}$ based on AERMOD and CMAQ modeling projects the DV at 11.59 $\mu g/m^3$, demonstrating that CA60NR would meet the annual PM2.5 by a wide margin. The DV calculated using the NRI_{AERMOD} estimated purely from AERMOD modeling is projected to be 11.63 $\mu g/m^3$. The DV calculated using $NRI_{RelativeModel}$, based on combining both AERMOD and CMAQ modeling in relative terms to determine the NRI, is 11.75 $\mu g/m^3$. Even with the most conservative estimate of NRI based on monitoring data at neighboring sites, $NRI_{Monitor}$, the hybrid approach still shows that the DV at CA60NR would be 11.91 $\mu g/m^3$, well below the annual PM2.5 standard.

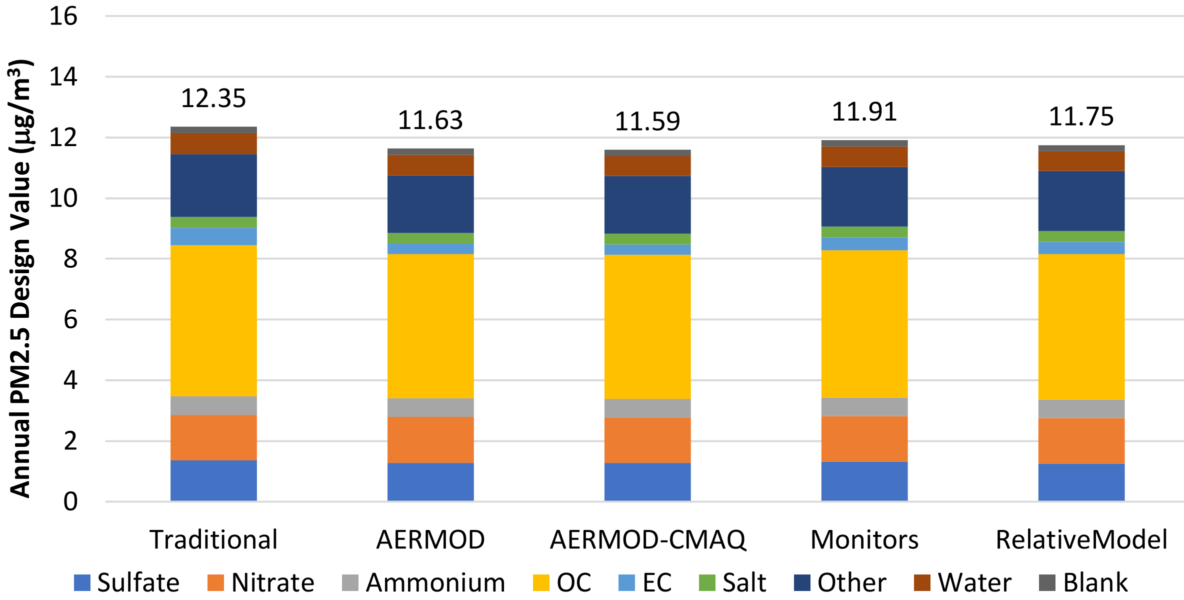


FIGURE II-6-12

COMPARISON OF DESIGN VALUE PROJECTIONS BETWEEN THE TRADITIONAL APPROACH AND THE HYBRID APPROACH USING DIFFERENT NRI ESTIMATES

Summary

The near-road monitoring site in Ontario (CA60NR) has recorded elevated PM2.5 levels since its data has been used for design value calculations in 2015. Annual PM2.5 concentrations at this near-road site consistently exceed those at the previous design site in Mira Loma, making CA60NR the new design site for annual PM2.5 in the South Coast Air Basin. However, accurately simulating PM2.5 and demonstrating potential future PM2.5 attainment at this near-road site are challenging due to substantial influence from nearby road-related sources and sub-grid scale spatial variation. This chapter focuses on the methodology and findings of PM2.5 attainment assessment at CA60NR by using a hybrid modeling system that combines a regional model (CMAQ) with a dispersion model (AERMOD). To address the unique challenges posed by near-road sites, a novel hybrid methodology is developed to quantify the contribution of PM2.5 emissions from vehicles and road dust to the near-road monitor's PM2.5 concentrations and to calculate the future annual PM2.5 design values using the hybrid approach. Results show that the hybrid approach estimates the future design value at the CA-60 near-road site is 11.59 ug/m3. Taking uncertainties into account to quantify the near-road increment, projections of design values at the Ontario CA-60 near-road site range between 11.59 and 11.91 µg/m^3, and even with the most conservative NRI, the Ontario CA-60 near-road site is expected to attain the annual PM2.5 standard. This affirms that with the controls proposed in the Plan, all the locations including Ontario CA-60 near-road in the South Coast Air Basin will attain the 2012 annual PM2.5 NAAQS in 2030.

Chapter 7

~~EXCEPTIONAL EVENT DEMOSTRATION~~

ATYPICAL EVENTS ANALYSIS

Introduction

The EPA Memorandum "Additional Methods, Determinations, and Analyses to Modify Air Quality Data Beyond Exceptional Events" (U.S. EPA, 2019)[1] published in 2019 establishes that ambient data that is not representative to characterize the base year design value may be excluded for the purposes of attainment demonstrations.

This report describes five 24-hour PM2.5 exceedances at the 60 Near Road monitor caused by Independence Day Fireworks that meet the exceptional event criteria established by the U.S. EPA (U.S. EPA, 2016[2]; U.S. EPA 2007[3]). The events occurred in the South Coast Air Basin, within the jurisdiction of the South Coast Air Quality Management District (South Coast AQMD). The table below shows a list of exceedances described in this report.

[1] Clarification Memo on Additional Methods, Determinations, and Analyses to Modify Air Quality Data Beyond Exceptional Events. 2019. Environmental Protection Agency. https://www.epa.gov/air-quality-analysis/clarification-memo-additional-methods-determinations-and-analyses-modify-air.
[2] October 3, 2016. "Treatment of Data Influenced by Exceptional Events." Fed. Reg. 68216 (40 C.F.R. pts 50 & 51): Vol. 81. https://www.epa.gov/sites/default/files/2018-10/documents/exceptional_events_rule_revisions_2060-as02_final.pdf.
[3] Environmental Protection Agency. March 22, 2007. "Treatment of Data Influenced by Exceptional Events." Fed. Reg. 13560 (40 C.F.R. pts 50 & 51): Vol. 72. https://www.govinfo.gov/content/pkg/FR-2007-03-22/pdf/E7-5156.pdf.

TABLE II-7-1:
EXCEEDANCES FOR 2016-2019 INDEPENDENCE DAY FIREWORKS.

Date	Local Site Name	AQS Site ID	POC	Parameter Code	Conc.*
2016-07-05	Ontario-Route 60 Near Road	06-071-0027	1	88101	49.5
2016-07-05	Ontario-Route 60 Near Road	06-071-0027	3	88101	55.9
2017-07-04	Ontario-Route 60 Near Road	06-071-0027	1	88101	39.2
2017-07-05	Ontario-Route 60 Near Road	06-071-0027	1	88101	67.8
2018-07-05	Ontario-Route 60 Near Road	06-071-0027	1	88101	55.7
2018-07-05	Ontario-Route 60 Near Road	06-071-0027	3	88101	70.6
2019-07-05	Ontario-Route 60 Near Road	06-071-0027	1	88101	57.7
2019-07-05	Ontario-Route 60 Near Road	06-071-0027	3	88101	71.2
*Conc. = Concentration ($\mu g/m^3$)					

Emissions from the 4^{th} and 5^{th} of July fireworks lead to high PM2.5 concentrations region-wide. Exceedances occurred at other monitors throughout the South Coast Air Basin on the same days that the exceedances that occurred at the Route 60 Near Road station. While these exceedances also increased annual PM2.5 design values at these other monitors, exclusion of these exceedances would not result in a reduced carrying capacity.

Fireworks Emissions

Fireworks use is ubiquitous across Southern California on Independence Day. Many municipalities host professional fireworks displays on the evening of July 4th to commemorate the holiday. In addition, there is a strong culture of using personal-use "backyard" fireworks on Independence Day, which are likely the dominant source of fireworks emissions throughout the region based on video evidence from aerial observations. For example, see KCAL News, "Fourth of July: Residents celebrate America's birthday with fireworks of their own" https://youtu.be/e08V6Sw0L4I. Transcript of KCAL news story from July 4, 2023:

> "Welcome back, I'm Suzie Suh. Now at 9:30, illegal fireworks going off all over the Southland, as you can see from our picture. Desmond Shaw is live in Skycal tonight, Desmond. Well Suzie, Happy 4th of July. I'll put up the Map Tracker for a bit to show where we are. At the 405 and 710 right now, looking to north towards Lynwood, Compton, South L.A., and look at this in the distance. It almost looks like a giant lightning storm. Those are all fireworks almost exclusively from illegal variety here. It's always so amazing to see this every year. Must be hundreds of thousands of pounds worth of illegal fireworks going off. I'm always reminded when LAPD or another agency discovers a big stash of fireworks that they haul offsite, it makes you wonder how many other stashes there must be out there to be able to ignite this many fireworks here. This has been going on for an hour; it's going to be going on for at least another couple hours. And of course, this layer is getting so thick you can practically taste the gunpowder in the air. This will be with us into the early morning hours. So, unfortunate for our air quality. Very impressive to look at, but don't forget that about 90% of this is not of the legal variety on this Independence Day evening. Live at Skycal overhead, I'm Desmond Shaw. Suzie, back to you in the studio".

Personal-use fireworks are illegal in Ontario, CA, and several neighboring cities, see

Table **II-7-2**. Personal-use fireworks are also illegal in several upwind cities throughout the Basin including the City of Los Angeles, the largest city in the region with nearly 4 million residents. However, ordinances prohibiting the use of these fireworks are difficult to enforce. Data are not available to quantify the use of illegal fireworks in the city of Ontario, CA or upwind areas. However, the city of Ontario, CA held a takeback event in June 2021 encouraging citizens to turn in illegal fireworks with no questions asked and a house exploded in March of 2021 due to illegal fireworks https://abc7.com/illegal-fireworks-ontario-takeback-explosion/10810827/, which suggests that citizens might not always abide by the fireworks ban. Personal-use fireworks are widely available to purchase in cities that do allow fireworks.

TABLE II-7-2:
EXAMPLE OF CITIES NEAR ONTARIO WITH PROHIBITION LAWS REGARDING CONSUMER-GRADE FIREWORKS.

City	Distance to 06-071-0027 site (miles)*	Link
Ontario, CA	0	https://www.ontarioca.gov/NoFireworks
Montclair, CA	5.3	https://www.cityofmontclair.org/fireworks/
Rancho Cucamonga, CA	5.4	https://www.cityofrc.us/news/all-fireworks-are-illegal-rancho-cucamonga
Jurupa Valley, CA	8.9	https://www.jurupavalley.org/467/Fireworks

* approximate distance

Professional Fireworks

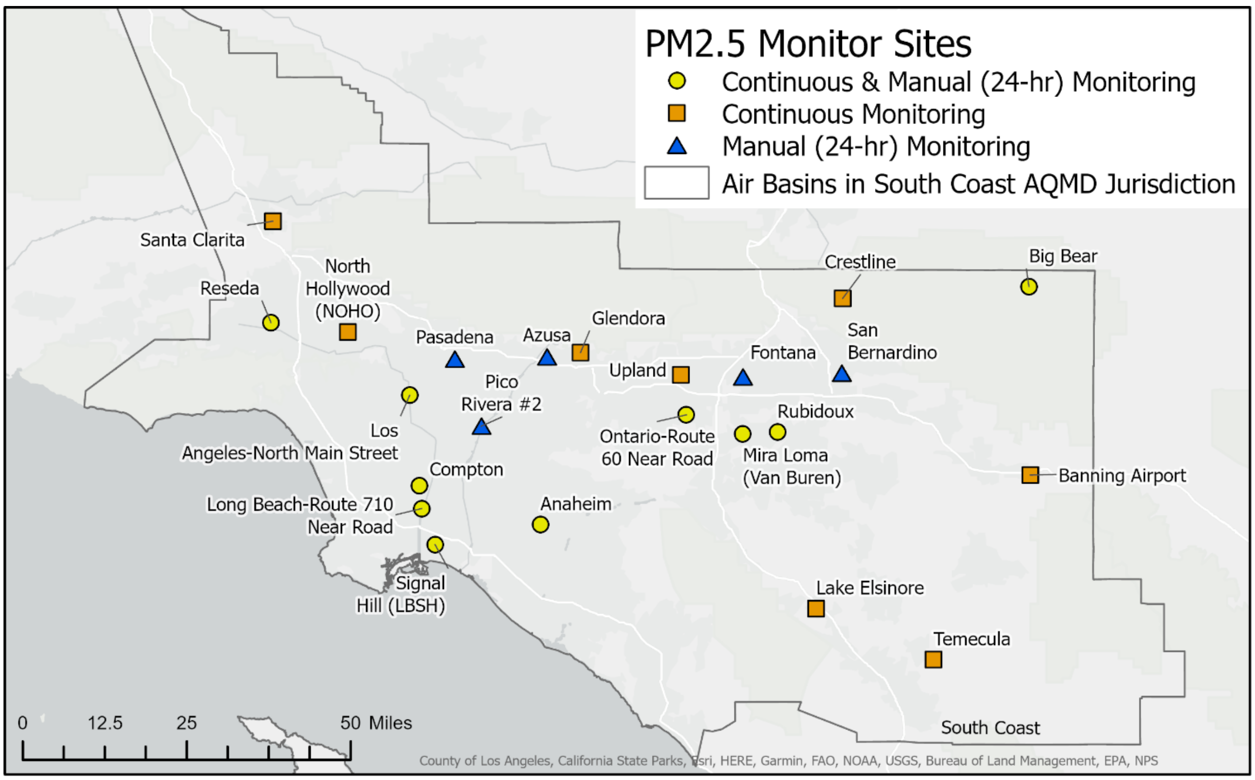
Table **II-7-3** shows several examples of professional fireworks displays in Ontario, CA and neighboring cities planned for 2023 and in recent years. While we don't have complete records for professional grade fireworks events ~~for 2016-2019~~, such events are typically an annual event around July 4. The Fontana Herald News reported in June 2020 that Rancho Cucamonga would still launch fireworks despite no spectators being allowed to gather due to the COVID-19 pandemic, https://www.fontanaheraldnews.com/entertainment/rancho-cucamonga-will-have-fireworks-show-on-july-4/article_6eb09f5e-afec-11ea-b6cc-e325e7aee8a6.html. The article indicates that Rancho Cucamonga's fireworks typically occur at the LoanMart Field, which is located approximately 6.3 miles from the Ontario-Route 60 Near Road monitoring station. In addition to the professional fireworks displays near the monitoring station, professional fireworks displays are common throughout upwind areas in the Los Angeles metropolitan area.

TABLE II-7-3:
EXAMPLE PAST PROFESSIONAL FIREWORKS DISPLAYS.

Date	Location	Distance to 06-071-0027 site (miles)*	Link
2023-07-04	Westwind Park (Ontario, CA)	1.3	https://www.ontarioca.gov/IndependenceDay
2023-07-01	Ruben S. Ayala Park (Chino, CA)	4.8	https://www.cityofchino.org/346/Fireworks-Spectacular
2023-07-04	Fairplex (Pomona, CA)	9.4	https://fairplex.com/kaboom/
2023-07-05	Cable Airport (Upland, CA)	6.8	https://www.uplandca.gov/4th-of-july-festivities
2022-07-04	LoanMart Field (Rancho Cucamonga, CA)	6.3	https://patch.com/california/banning-beaumont/calendar/event/20220704/1869836/4th-of-july-concert-fireworks-spectacular-2022-rancho-cucamonga
2022-07-04	Miller Park Amphitheater (Fontana, CA)	11.6	https://www.fontanaca.gov/2158/4th-of-July-Celebration
2022-06-25	Eastvale Community Park	6.5	https://patch.com/california/banning-beaumont/calendar/event/20220625/1873637/picnic-in-the-park-carnival-fireworks-2022-eastvale
2019-07-04	Los Angeles area		https://www.nbclosangeles.com/the-scene/fourth-of-july-fireworks-2019/133056/
2019-07-04 & 2019-07-05	Areas throughout the South Coast Air Basin and in the Coachella Valley		https://www.coronaca.gov/Home/Components/News/News/4066/17
2019-07-04	Throughout Los Angeles County		https://ktla.com/news/local-news/socal-air-pollution-spikes-amid-haze-of-july-4-fireworks-air-quality-advisory-issued/
2017-07-04	Inland Empire (CA)		https://iecn.com/4th-july-inland-empire-2017-watch-fireworks/

Historical Analysis

Figure II-7-1 shows a map of the regulatory PM2.5 monitors in the South Coast Air Basin. Figure II-7-2 through Figure II-7-13 show historical data during the 3-month period centered on July 4 and 5 for 2015-2019 for the Ontario-Route 60 Near Road, Mira Loma (Van Buren), Rubidoux, Anaheim, and Los Angeles-North Main monitoring stations. Data from stations other than Ontario-Route 60 Near Road are included to demonstrate the regional nature of these events. The data are plotted as both time series and boxplots. The lengths of the whiskers in the boxplots indicate the 1st and 99th percentiles. The exceedances in Table 1 are all anomalously high; all of the five exceedance events at the Ontario-Route 60 Near Road monitor are squarely above the 99th percentile. Hazard Mapping System (HMS)[4] and NASA Worldview were used to categorize the data as wildfire-impacted and non-wildfire impacted; the data were also categorized as July 4 or 5 and other days, leading to four groupings of data. Note that the data used to calculate the boxplots do not include any July 4 or 5 data. This set of figures demonstrate that across multiple years, exceedances during the summer predominantly occur on July 4 and July 5 or on days with evidence of wildfire impacts.



[4] National Oceanic and Atmospheric Administration, Office of Satellite and Product Operations, National Environmental Satellite, Data, and Information Service. 2023. "Hazard Mapping System Fire and Smoke Product." https://www.ospo.noaa.gov/Products/land/hms.html.

FIGURE II-7-1:
LOCATION OF ALL REGULATORY PM2.5 MONITORS IN THE SOUTH COAST AIR BASIN.

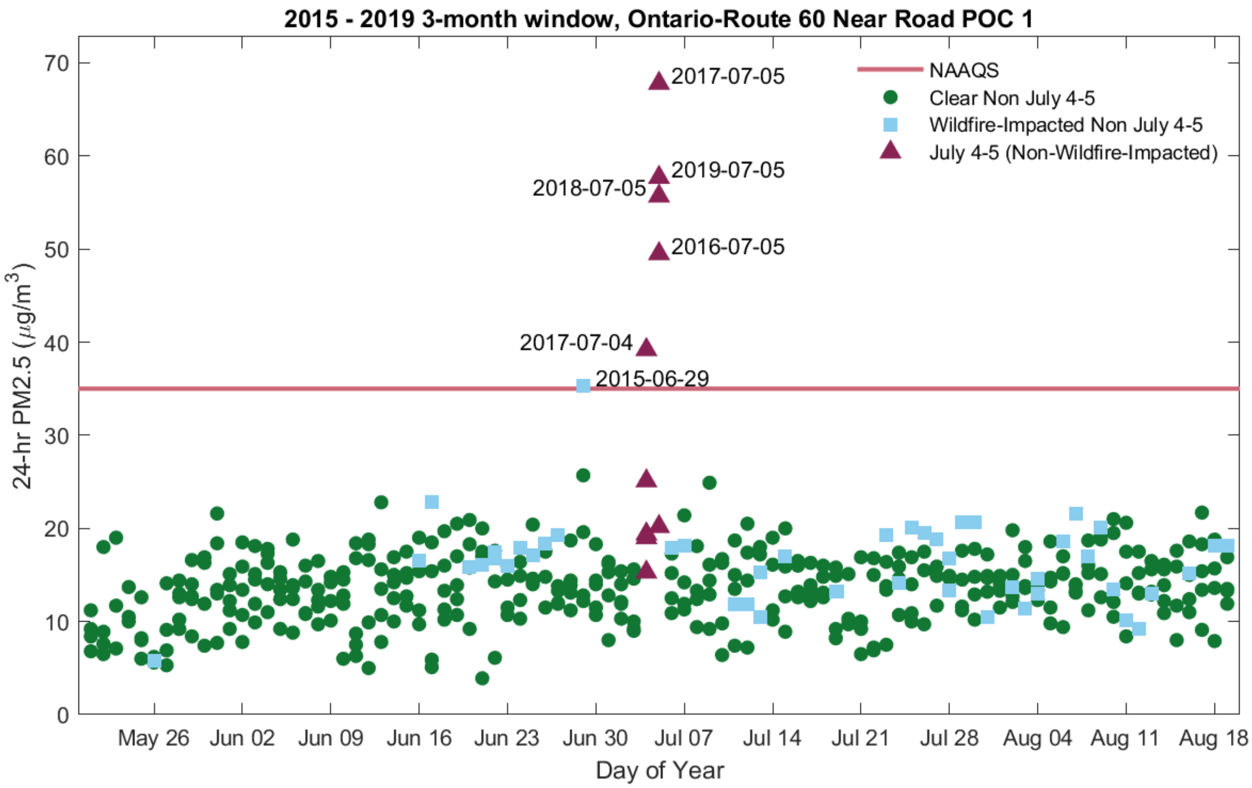


FIGURE II-7-2:
HISTORICAL DAILY PM2.5 DATA DURING THE 3-MONTH PERIOD CENTERED ON JULY 4 AND 5 FOR 2015-2019 AT THE 60 NEAR ROAD STATION (POC 1).
(THE FIVE EXCEEDANCE EVENTS THAT ARE THE SUBJECT OF THIS REPORT ARE LABELED WITH THE DATE OF THE EVENT AND INDICATED WITH A MAROON TRIANGLE. THE DATA ARE SEPARATED BY WILDFIRE/NON-WILDFIRE IMPACTS AND JULY 4 AND 5 OR OTHER DAYS. THE LINE IDENTIFIED AS "NAAQS" INDICATES THE 2006 24-HOUR PM2.5 STANDARD. HMS DID NOT IDENTIFY A SMOKE PLUME DURING THE ELEVATED VALUE RECORDED ON JUNE 29, 2015 POTENTIALLY DUE TO WIDESPREAD CLOUD COVER ACROSS THE REGION, HOWEVER, A LARGE WILDFIRE NEARBY IN THE SAN BERNARDINO MOUNTAINS CALLED THE LAKE FIRE LIKELY IMPACTED AIR QUALITY ON THIS DATE.)

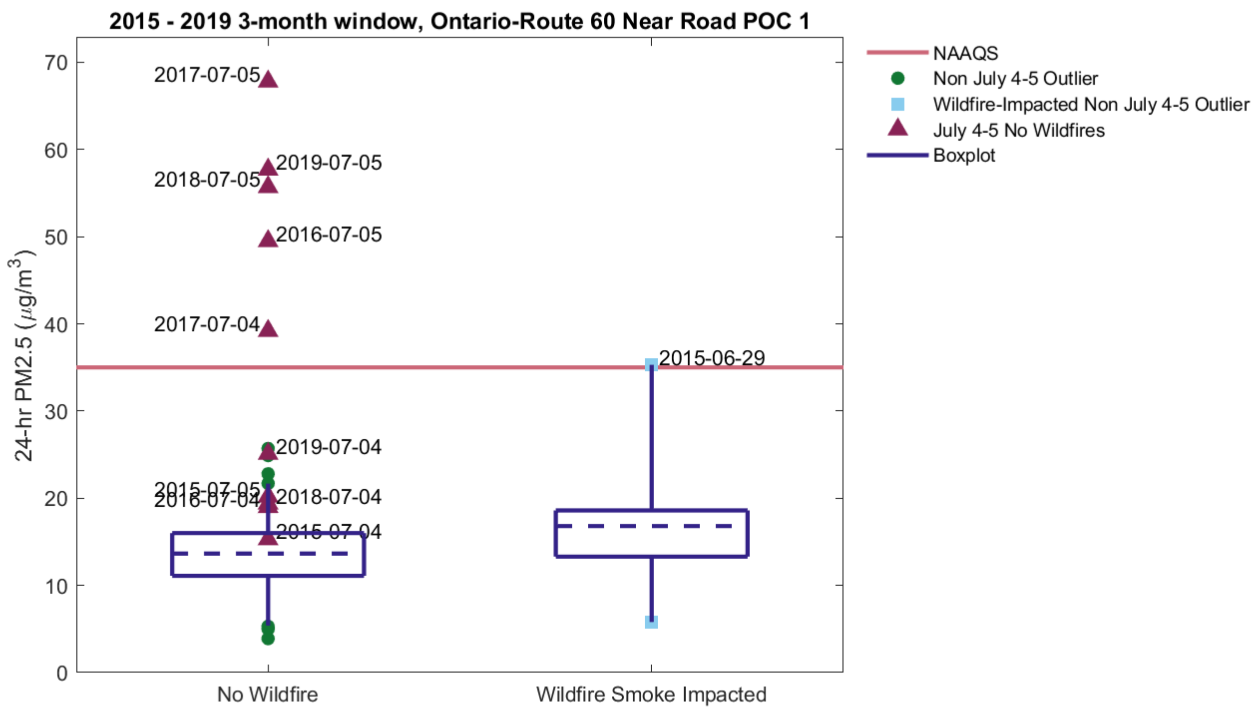


FIGURE II-7-3:

BOXPLOTS OF HISTORICAL DAILY PM2.5 DATA DURING THE 3-MONTH PERIOD CENTERED ON JULY 4 AND 5 FOR 2015-2019 AT THE 60 NEAR ROAD STATION (POC 1).

(THE DATA ARE SEPARATED BY WILDFIRE/NON-WILDFIRE IMPACTS AND JULY 4 AND 5 OR OTHER DAYS. NOTE THAT THE JULY 4 AND 5 DATA WERE NOT INCLUDED IN THE CALCULATION OF THE BOXPLOTS. THE LENGTHS OF THE WHISKERS INDICATE THE 1ST AND 99TH PERCENTILES OF THE NON-JULY-4/5 DATA. HMS DID NOT IDENTIFY A SMOKE PLUME DURING THE ELEVATED VALUE RECORDED ON JUNE 29, 2015 POTENTIALLY DUE TO WIDESPREAD CLOUD COVER ACROSS THE REGION, HOWEVER, A LARGE WILDFIRE NEARBY IN THE SAN BERNARDINO MOUNTAINS CALLED THE LAKE FIRE LIKELY IMPACTED AIR QUALITY ON THIS DATE)

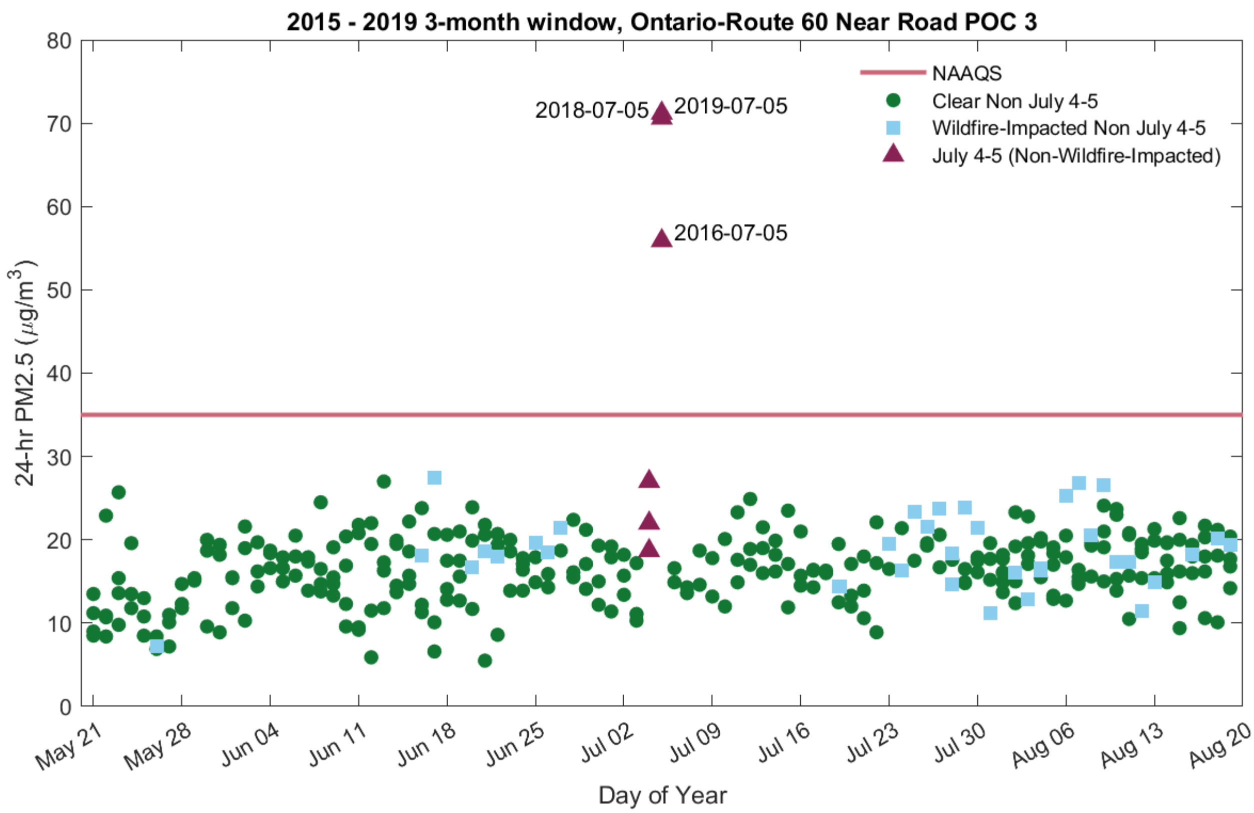


FIGURE II-7-4:
HISTORICAL DAILY PM2.5 DATA DURING THE 3-MONTH PERIOD CENTERED ON JULY 4 AND 5 FOR 2015-2019 AT THE 60 NEAR ROAD STATION (POC 3).
(THE DATA ARE SEPARATED BY WILDFIRE/NON-WILDFIRE IMPACTS AND JULY 4 AND 5 OR OTHER DAYS)

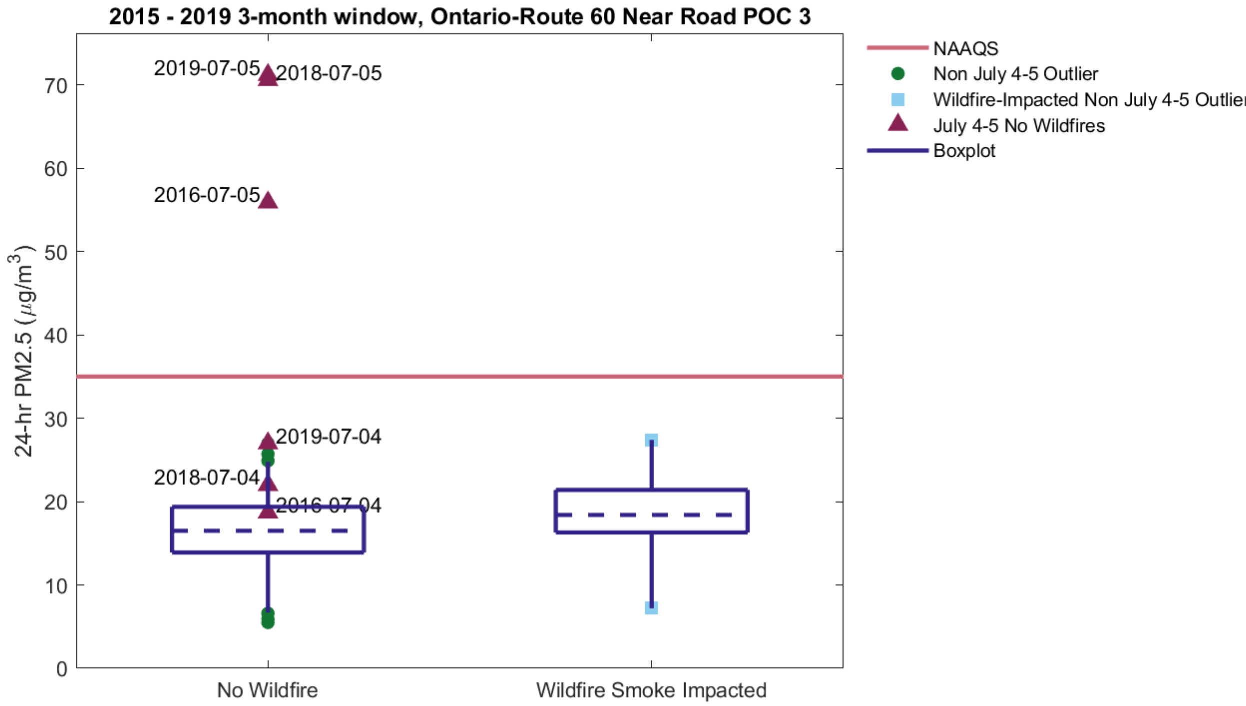


FIGURE II-7-5:

BOXPLOTS OF HISTORICAL DAILY PM2.5 DATA DURING THE 3-MONTH PERIOD CENTERED ON JULY 4 AND 5 FOR 2015-2019 AT THE 60 NEAR ROAD STATION (POC 3).

(THE DATA ARE SEPARATED BY WILDFIRE/NON-WILDFIRE IMPACTS AND JULY 4 AND 5 OR OTHER DAYS. NOTE THAT THE JULY 4 AND 5 DATA WERE NOT INCLUDED IN THE CALCULATION OF THE BOXPLOTS. THE LENGTHS OF THE WHISKERS INDICATE THE 1ST AND 99TH PERCENTILES OF THE NON-JULY-4/5 DATA)

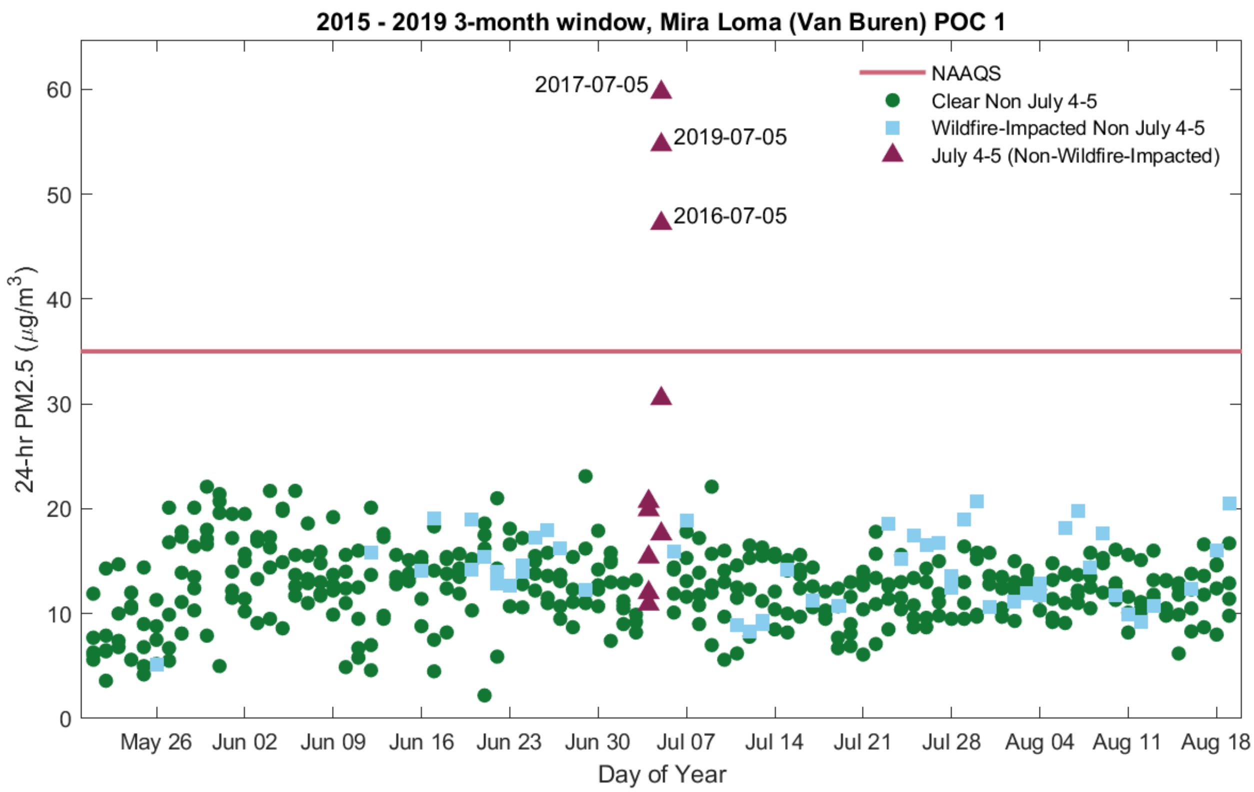


FIGURE II-7-6:
HISTORICAL DAILY PM2.5 DATA DURING THE 3-MONTH PERIOD CENTERED ON JULY 4 AND 5 FOR 2015-2019 AT THE MIRA LOMA (VAN BUREN) STATION (POC 1).
(THE DATA ARE SEPARATED BY WILDFIRE/NON-WILDFIRE IMPACTS AND JULY 4 AND 5 OR OTHER DAYS)

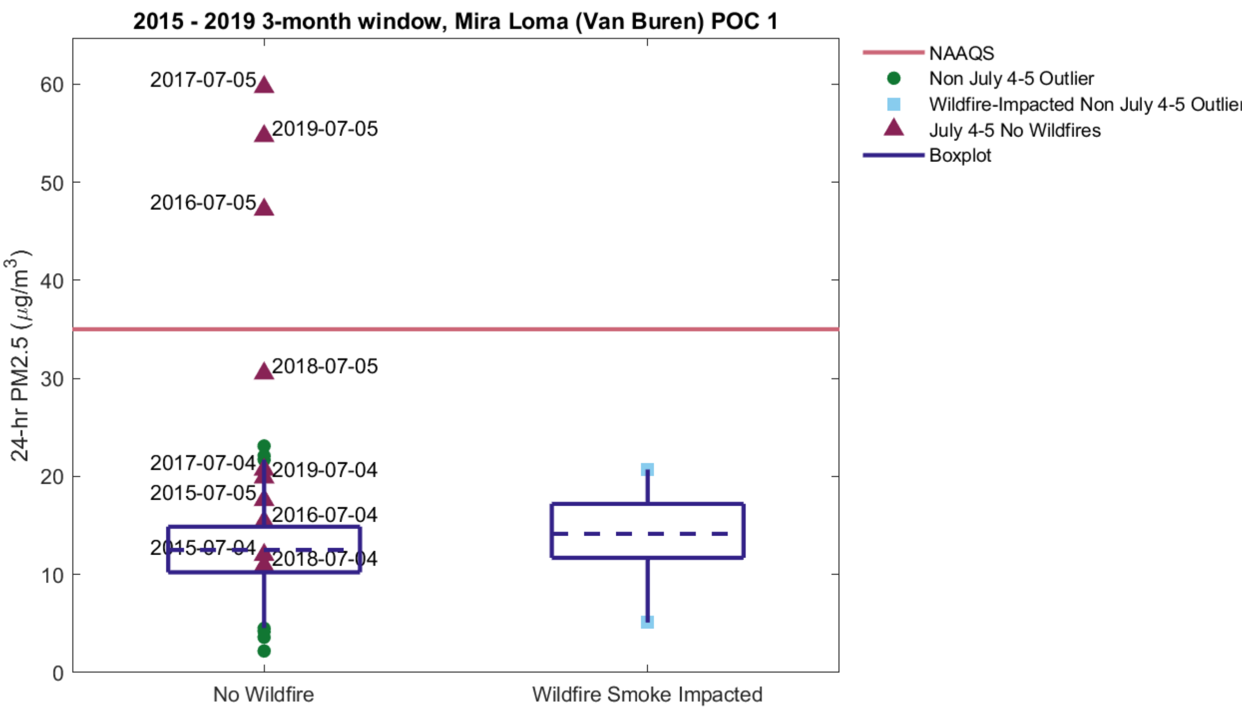


FIGURE II-7-7:

BOXPLOTS OF HISTORICAL DAILY PM2.5 DATA DURING THE 3-MONTH PERIOD CENTERED ON JULY 4 AND 5 FOR 2015-2019 AT THE MIRA LOMA (VAN BUREN) STATION (POC 1).

(THE DATA ARE SEPARATED BY WILDFIRE/NON-WILDFIRE IMPACTS AND JULY 4 AND 5 OR OTHER DAYS. NOTE THAT THE JULY 4 AND 5 DATA WERE NOT INCLUDED IN THE CALCULATION OF THE BOXPLOTS. THE LENGTHS OF THE WHISKERS INDICATE THE 1ST AND 99TH PERCENTILES OF THE NON-JULY-4/5 DATA)

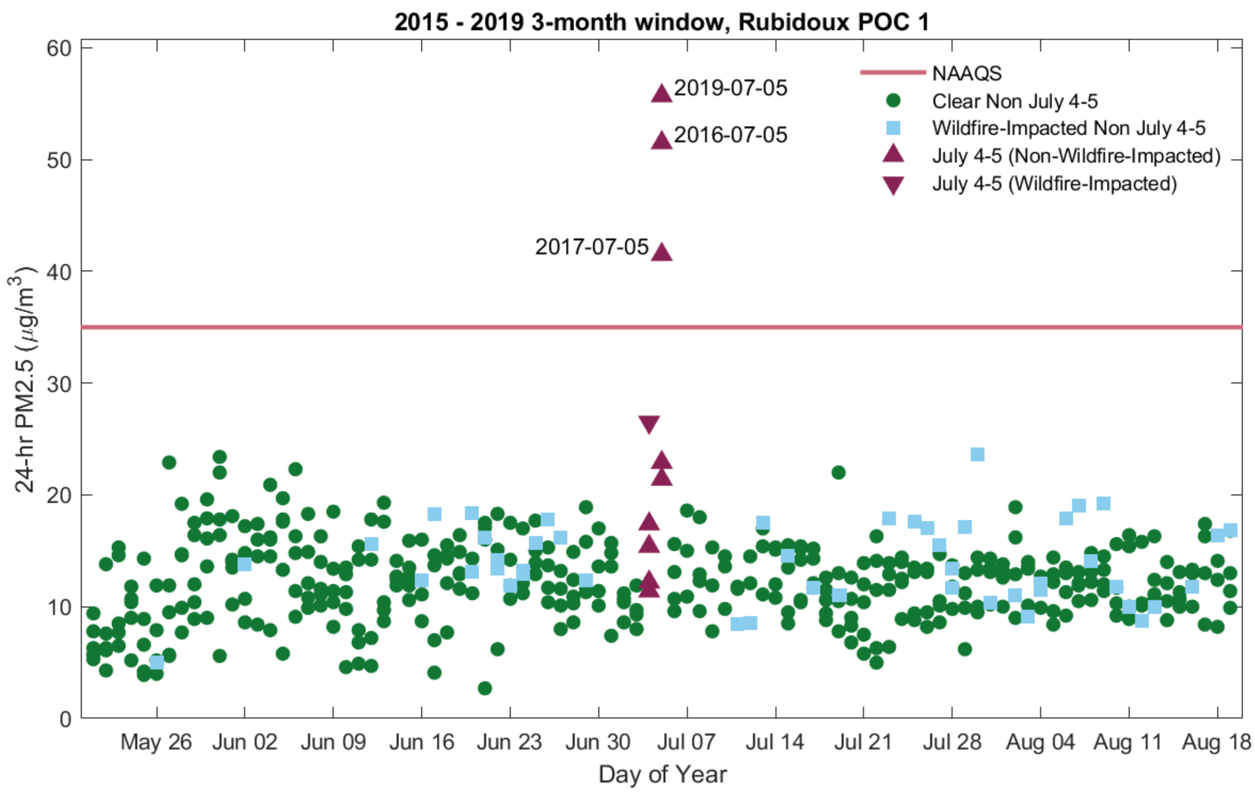


FIGURE II-7-8:

HISTORICAL DAILY PM2.5 DATA DURING THE 3-MONTH PERIOD CENTERED ON JULY 4 AND 5 FOR 2015-2019 AT THE RUBIDOUX STATION (POC 1).

(THE DATA ARE SEPARATED BY WILDFIRE/NON-WILDFIRE IMPACTS AND JULY 4 AND 5 OR OTHER DAYS)

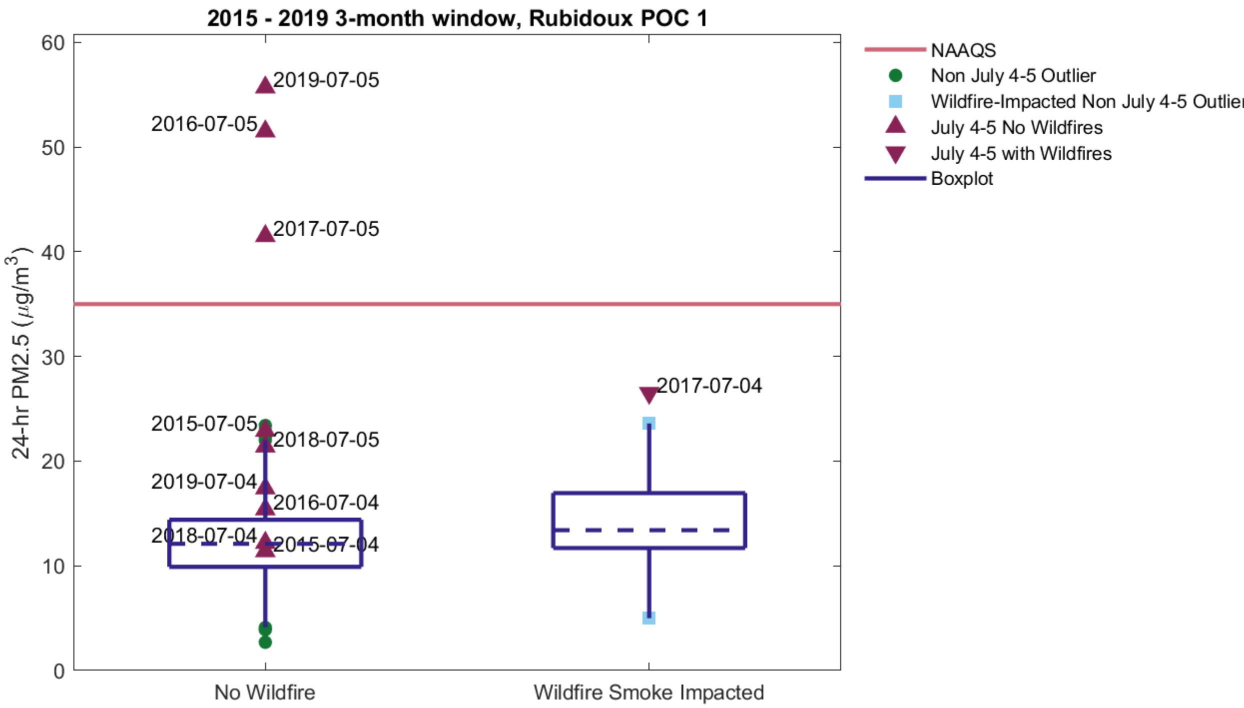


FIGURE II-7-9:

BOXPLOTS OF HISTORICAL DAILY PM2.5 DATA DURING THE 3-MONTH PERIOD CENTERED ON JULY 4 AND 5 FOR 2015-2019 AT THE RUBIDOUX STATION (POC 1).

(THE DATA ARE SEPARATED BY WILDFIRE/NON-WILDFIRE IMPACTS AND JULY 4 AND 5 OR OTHER DAYS. NOTE THAT THE JULY 4 AND 5 DATA WERE NOT INCLUDED IN THE CALCULATION OF THE BOXPLOTS. THE LENGTHS OF THE WHISKERS INDICATE THE 1ST AND 99TH PERCENTILES OF THE NON-JULY-4/5 DATA)

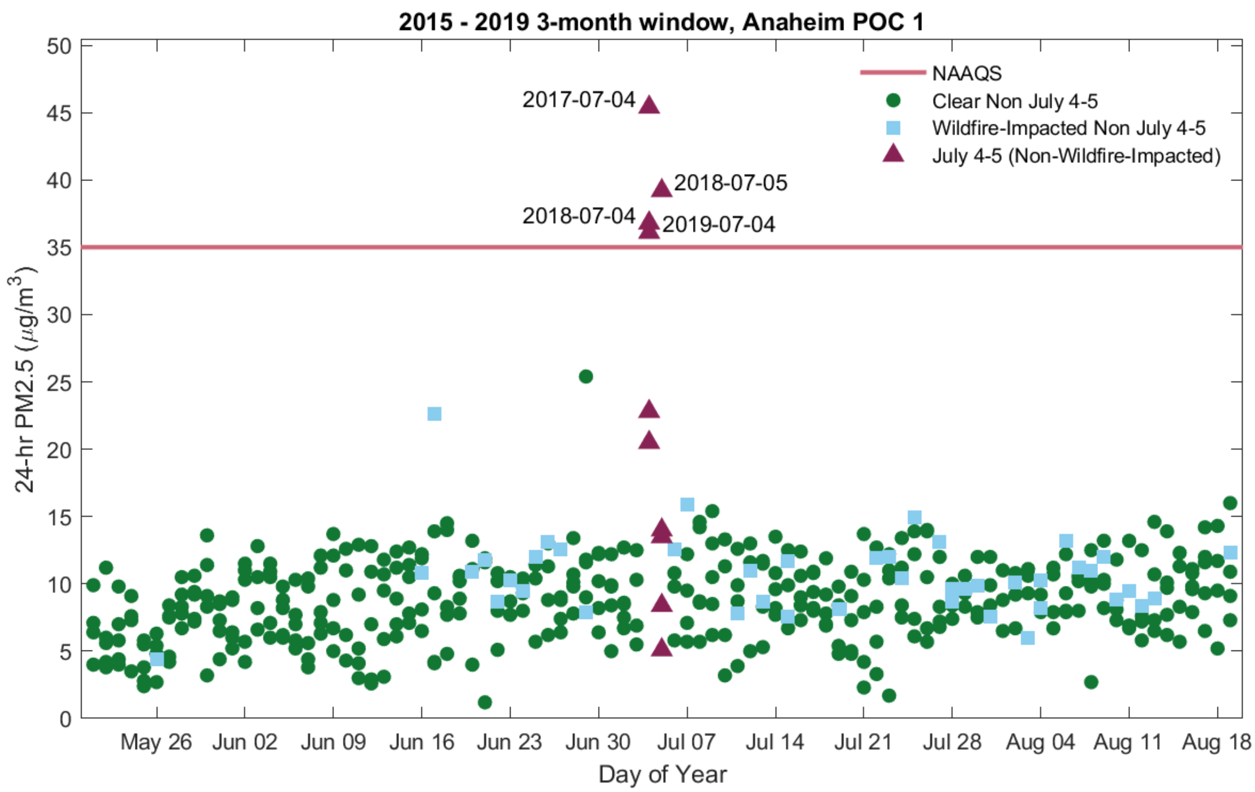


FIGURE II-7-10:

HISTORICAL DAILY PM2.5 DATA DURING THE 3-MONTH PERIOD CENTERED ON JULY 4 AND 5 FOR 2016-2019 AT THE ANAHEIM STATION (POC 1).

(THE DATA ARE SEPARATED BY WILDFIRE/NON-WILDFIRE IMPACTS AND JULY 4 AND 5 OR OTHER DAYS)

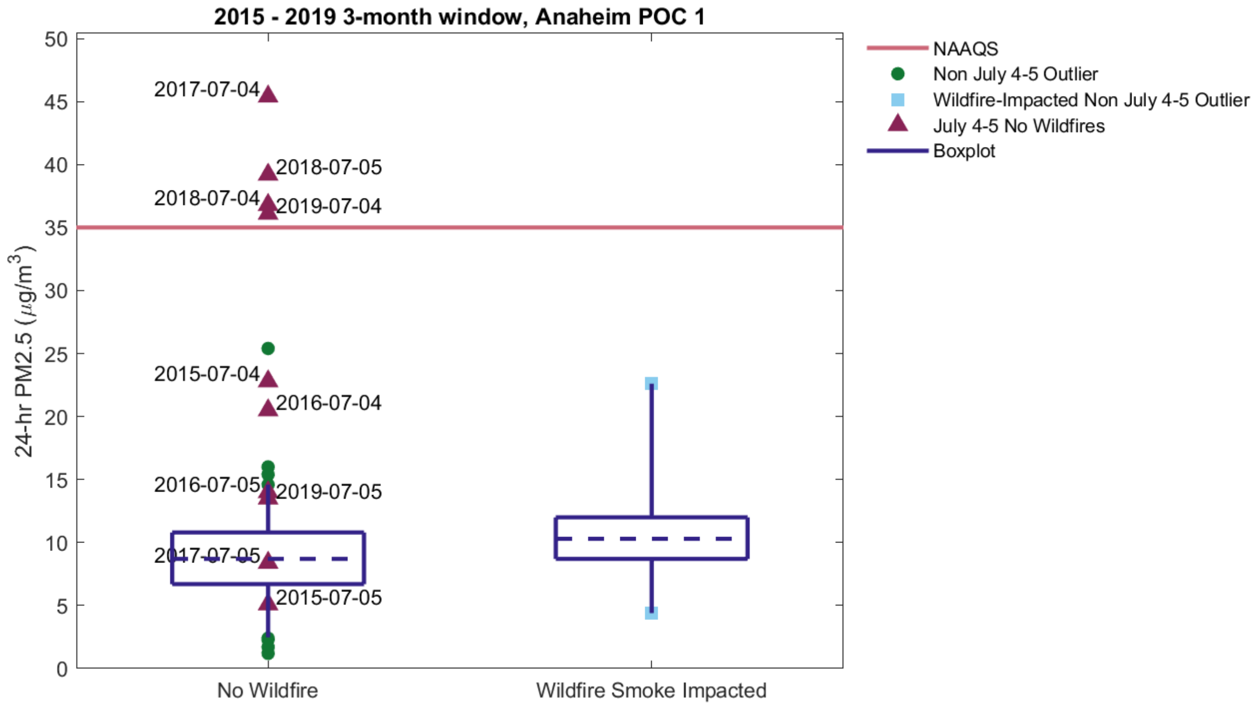


FIGURE II-7-11:

BOXPLOTS OF HISTORICAL DAILY PM2.5 DATA DURING THE 3-MONTH PERIOD CENTERED ON JULY 4 AND 5 FOR 2016-2019 AT THE ANAHEIM STATION (POC 1).

(THE DATA ARE SEPARATED BY WILDFIRE/NON-WILDFIRE IMPACTS AND JULY 4 AND 5 OR OTHER DAYS. NOTE THAT THE JULY 4 AND 5 DATA WERE NOT INCLUDED IN THE CALCULATION OF THE BOXPLOTS. THE LENGTHS OF THE WHISKERS INDICATE THE 1ST AND 99TH PERCENTILES OF THE NON-JULY-4/5 DATA)

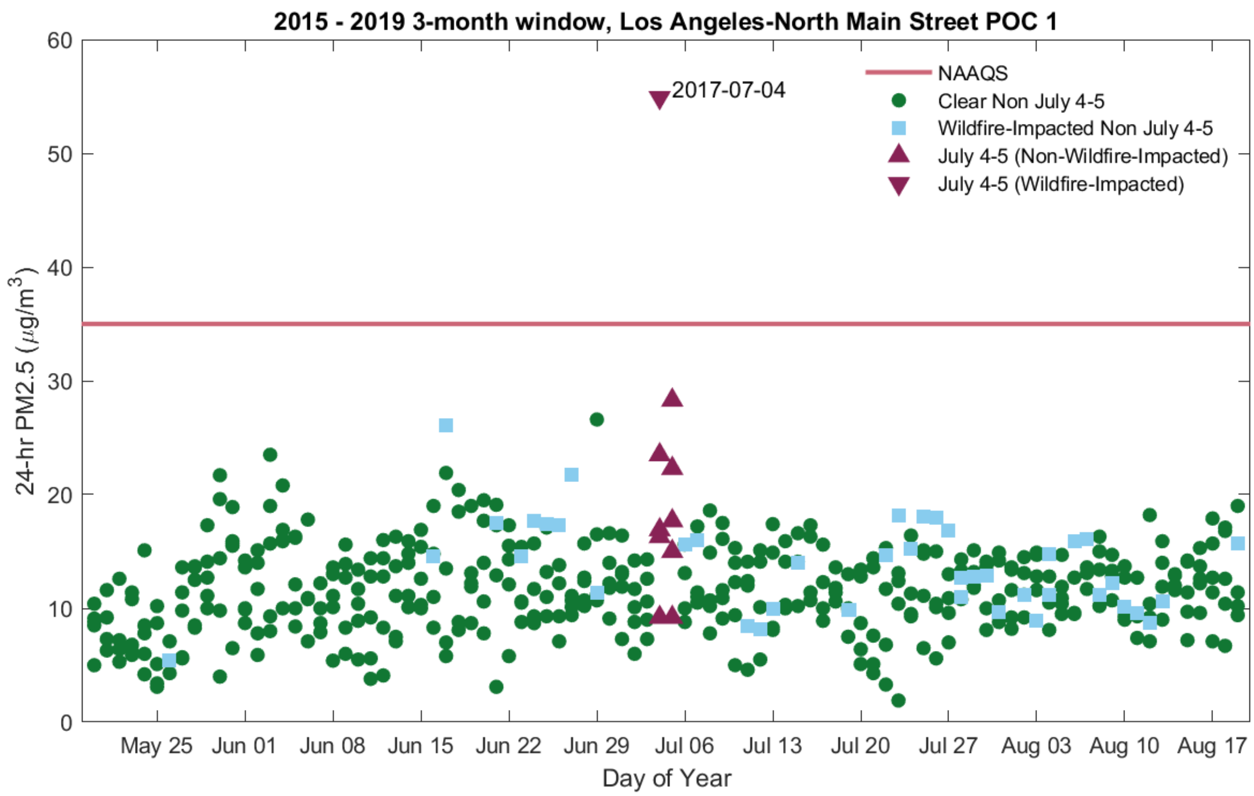


FIGURE II-7-12:

HISTORICAL DAILY PM2.5 DATA DURING THE 3-MONTH PERIOD CENTERED ON JULY 4 AND 5 FOR 2016-2019 AT THE LOS ANGELES-NORTH MAIN STATION (POC 1).

(THE DATA ARE SEPARATED BY WILDFIRE/NON-WILDFIRE IMPACTS AND JULY 4 AND 5 OR OTHER DAYS)

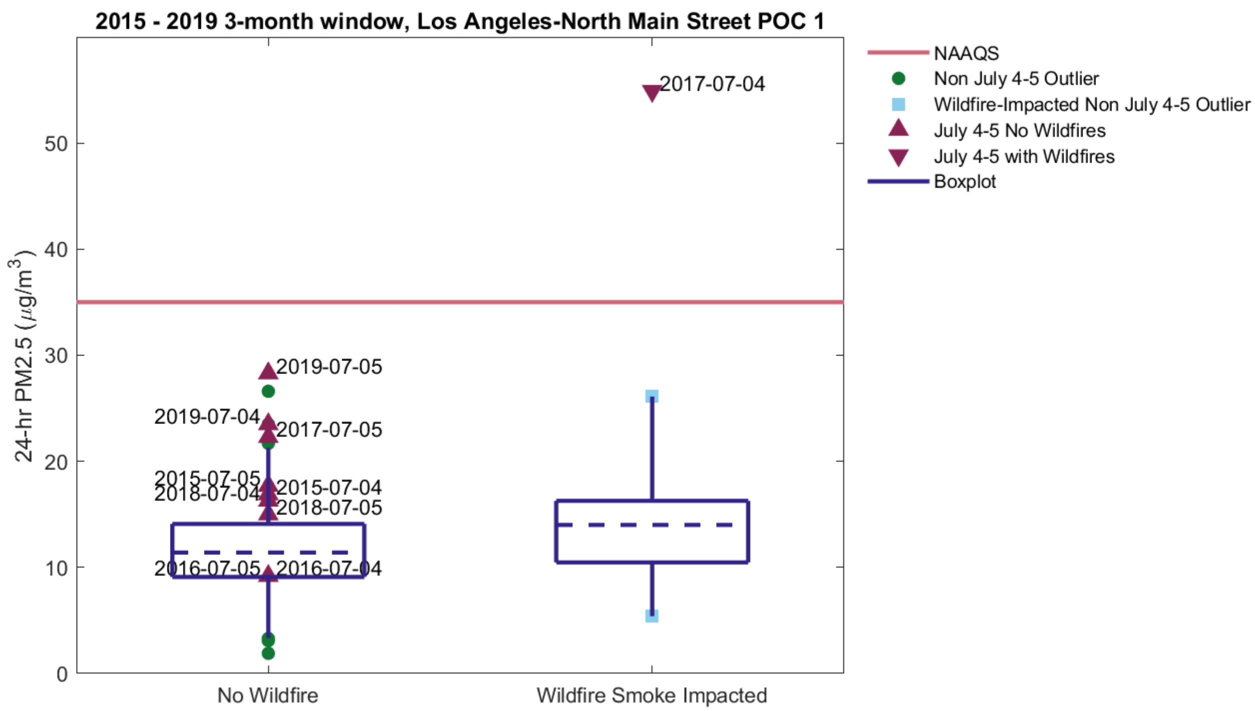


FIGURE II-7-13: BOXPLOTS OF HISTORICAL DAILY PM2.5 DATA DURING THE 3-MONTH PERIOD CENTERED ON JULY 4 AND 5 FOR 2016-2019 AT THE LOS ANGELES-NORTH MAIN STATION (POC 1).

(THE DATA ARE SEPARATED BY WILDFIRE/NON-WILDFIRE IMPACTS AND JULY 4 AND 5 OR OTHER DAYS. NOTE THAT THE JULY 4 AND 5 DATA WERE NOT INCLUDED IN THE CALCULATION OF THE BOXPLOTS. THE LENGTHS OF THE WHISKERS INDICATE THE 1ST AND 99TH PERCENTILES OF THE NON-JULY-4/5 DATA)

Fireworks Summary for 2016-07-05

As is documented earlier in this report, the use of personal fireworks is widespread throughout the Basin. Since personal fireworks are predominantly used in residential neighborhoods, residential land use serves as a proxy for locations of fireworks emissions. Residential land use from the 2019 annual land use dataset from the Southern California Association of Governments (SCAG; https://hub.scag.ca.gov/datasets/ea9fda878c1947d2afac5142fd5cb658_0/about) is shown in Figure II-7-14. Residential land use, along with mixed residential and commercial land use are shown in the map. HYSPLIT[5] back-trajectories using the National Oceanic and Atmospheric Administration (NOAA) High Resolution Rapid Refresh (HRRR) 3km meteorological model arriving 50m above the 60 Near Road monitoring station for July 4-5, 2016 are also shown in

[5] HYSPLIT Trajectories. 2023. NOAA Air Resources Laboratory. https://www.ready.noaa.gov/HYSPLIT_traj.php.

Figure II-7-14. All the back-trajectories originate over the Pacific Ocean and cross large residential areas of the South Coast Air Basin. Figure II-7-15 shows wind roses throughout the South Coast Air Basin for 9 PM on July 4 through 2 PM on July 5, 2016 using wind data from South Coast AQMD monitoring stations and local airports. The wind roses in Figure II-7-15 confirm the onshore wind pattern shown in the HYSPLIT back-trajectories in Figure II-7-14.

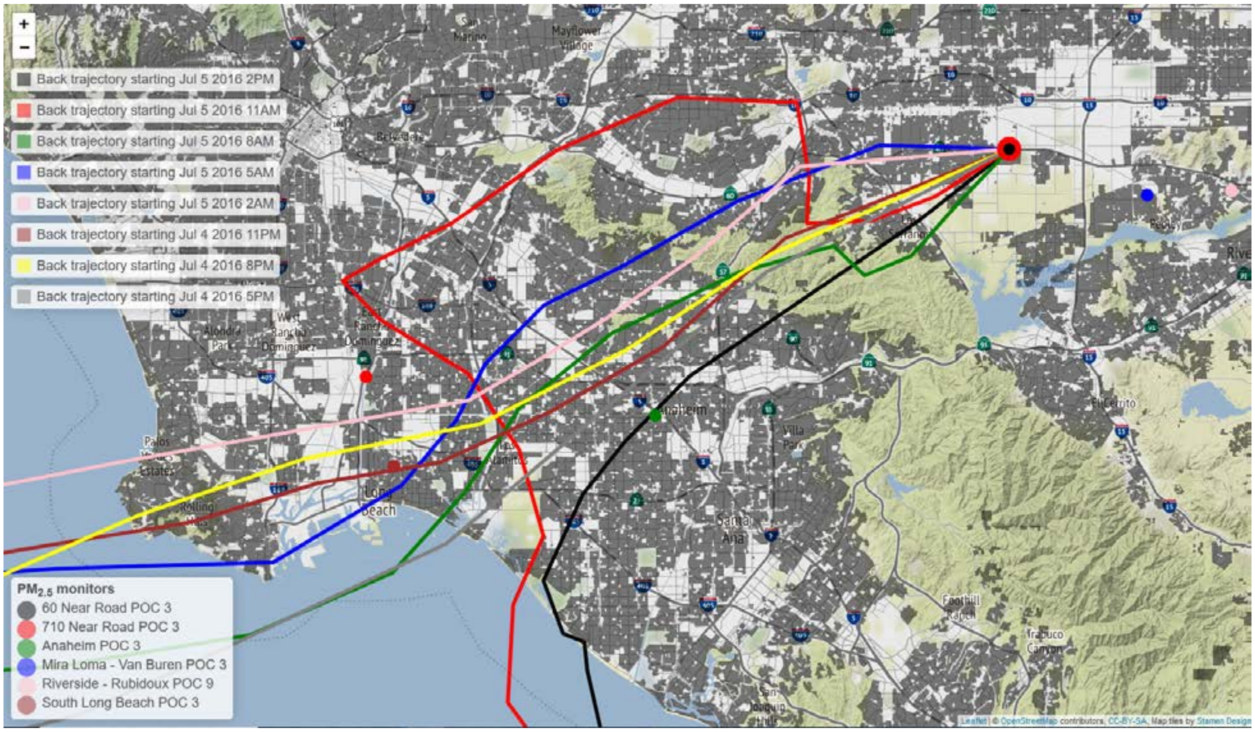


FIGURE II-7-14:
HYSPLIT BACK-TRAJECTORIES FROM 60 NEAR ROAD FOR JULY 4-5, 2016 OVERLAID ON A MAP OF THE SOUTH COAST AIR BASIN SHOWING RESIDENTIAL LAND USE (SHOWN IN GRAY).

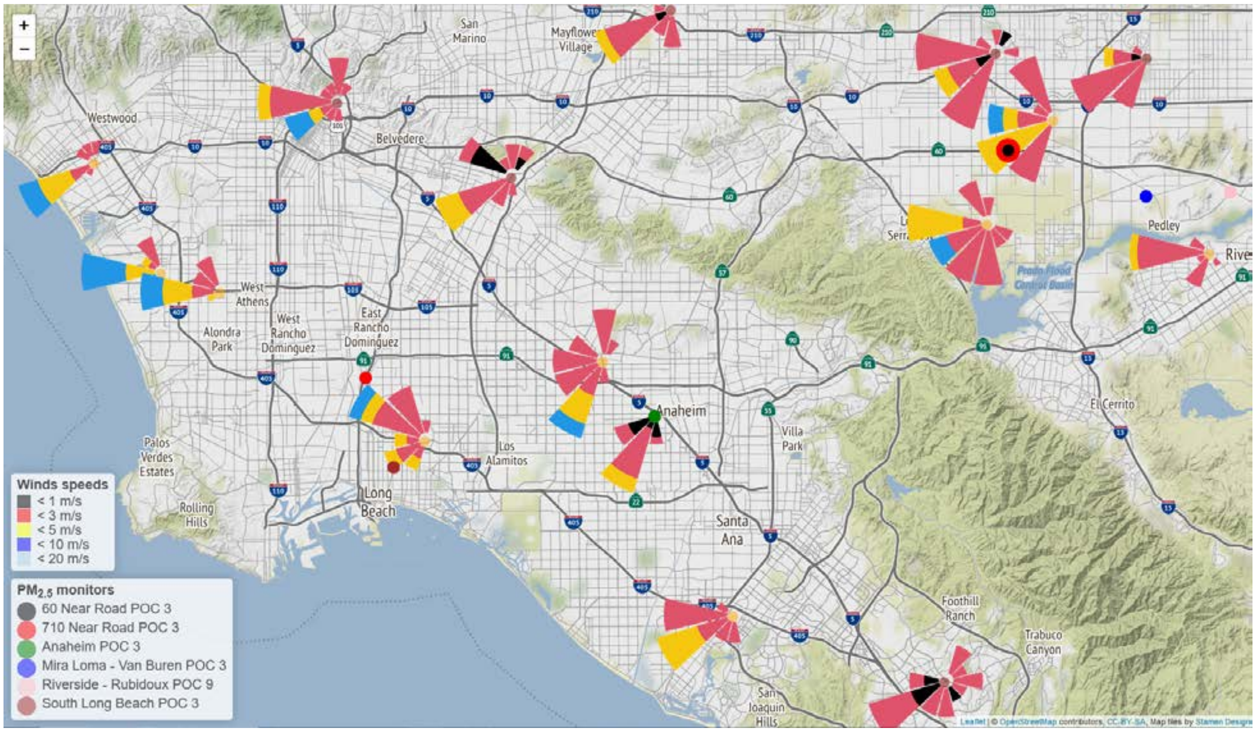


FIGURE II-7-15:
WIND ROSES FOR 9 PM ON JULY 4 THROUGH 2 PM ON JULY 5, 2016 THROUGHOUT THE SOUTH COAST AIR BASIN.

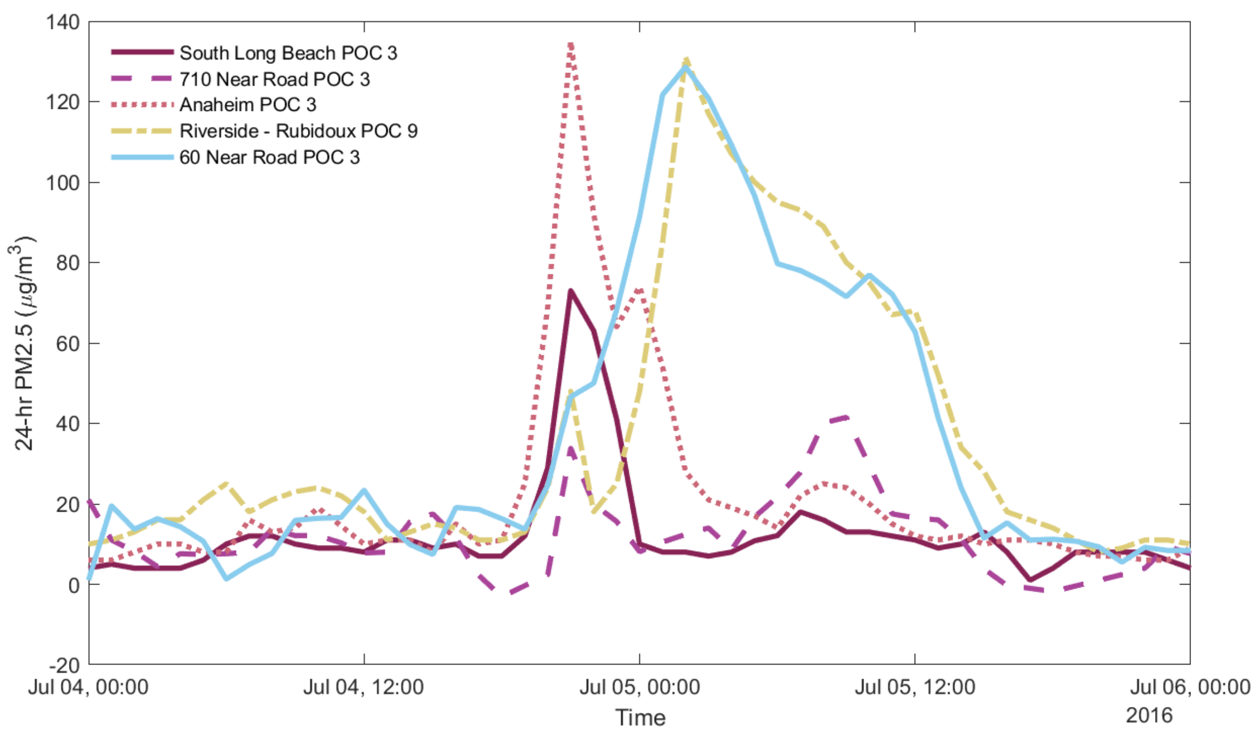


Figure II-7-16 shows time series plots of hourly PM2.5 data at selected stations with continuous PM2.5 instruments within the South Coast Air Basin for July 4-5, 2016. The concentrations peak at stations closer to the coast earlier than in inland areas (see Figure II-7-14 for monitor locations). This is consistent with the combination of 1) extensive fireworks use across the Basin, especially the most populated areas closer to the coast and 2) the dominant onshore flow that transports these emissions inland. The inland areas have local emissions as well as transported emissions from upwind areas.

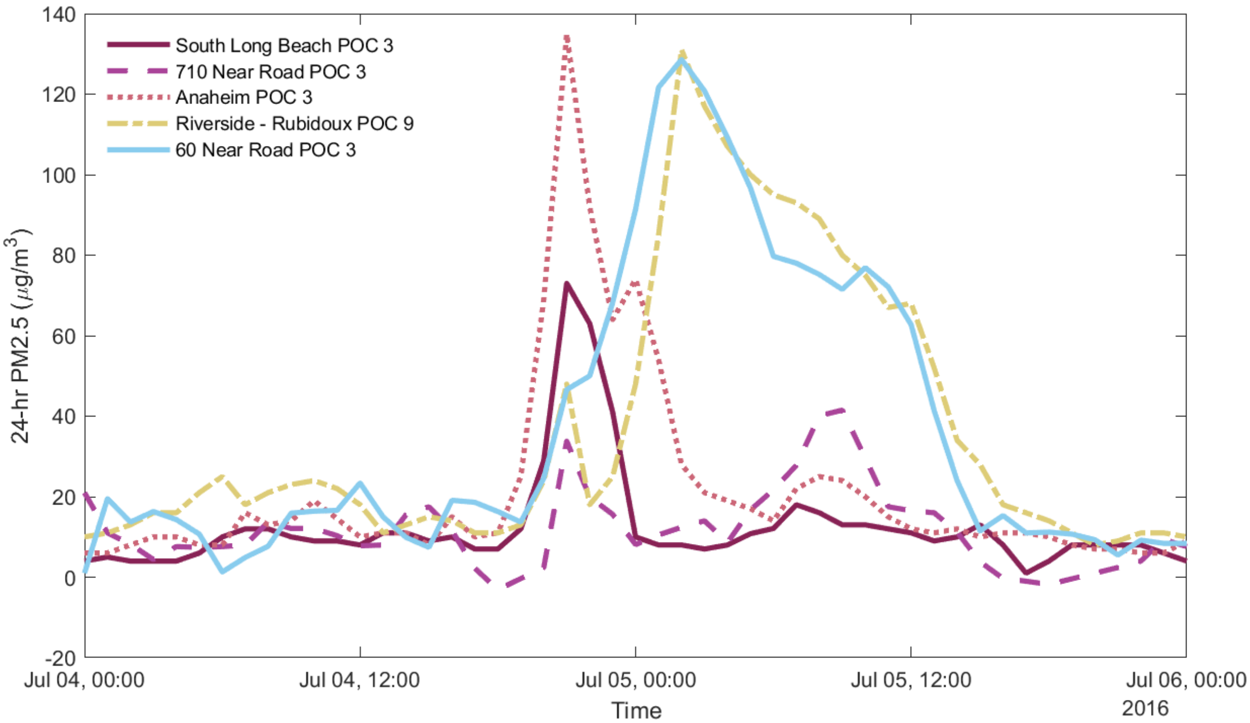


FIGURE II-7-16:
HOURLY TIME SERIES FOR JULY 4-5, 2016 FOR PM2.5 MONITORING STATIONS IN THE SOUTH COAST AIR BASIN.

Fireworks Summary for 2017-07-04 and 2017-07-05

Residential land use (a proxy for fireworks emissions locations) and HYSPLIT back-trajectories using the NOAA HRRR meteorological model arriving at the 60 Near Road monitoring station for July 4-5, 2017 are shown in Figure II-7-17. All the back-trajectories originate over the Pacific Ocean and cross large residential areas of the South Coast Air Basin. Figure II-7-18 shows wind roses throughout the South Coast Air Basin for 9 PM on July 4 through 2 PM on July 5, 2017 using wind data from South Coast AQMD monitoring stations and local airports. The wind roses in Figure II-7-18 confirm the onshore wind pattern shown in the HYSPLIT back-trajectories in Figure II-7-17.

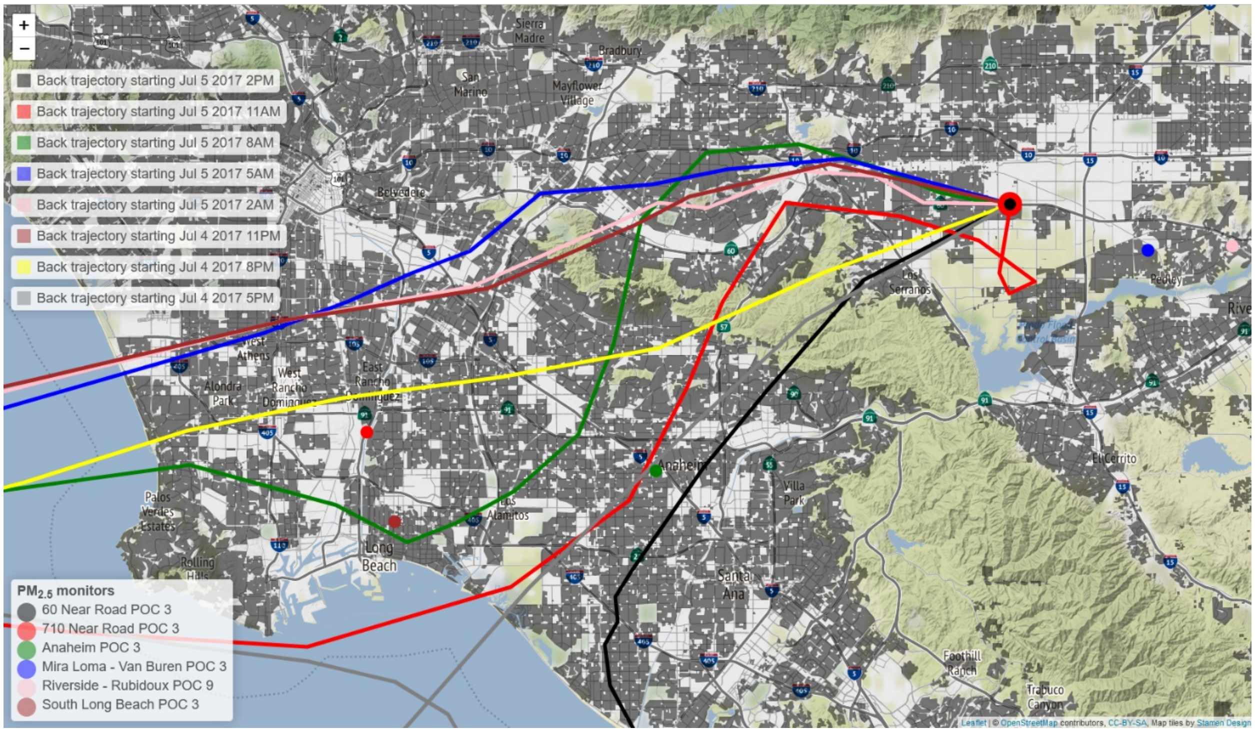


FIGURE II-7-17:
HYSPLIT BACK-TRAJECTORIES FROM 60 NEAR ROAD FOR JULY 4-5, 2017 OVERLAID ON A MAP OF THE SOUTH COAST AIR BASIN SHOWING RESIDENTIAL LAND USE (SHOWN IN GRAY).

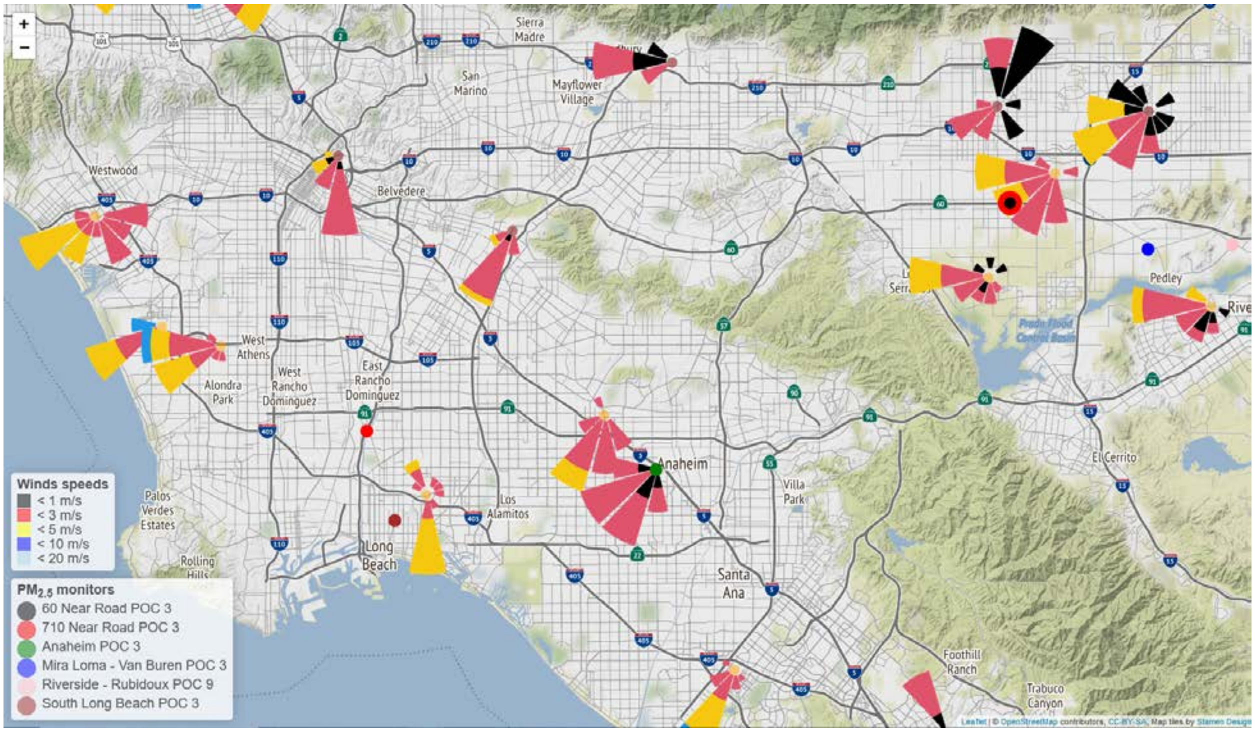


FIGURE II-7-18:
WIND ROSES FOR 9 PM ON JULY 4 THROUGH 2 PM ON JULY 5, 2017 THROUGHOUT THE SOUTH COAST AIR BASIN.

Figure II-7-19 shows time series plots of hourly PM2.5 data at selected stations with continuous PM2.5 instruments within the South Coast Air Basin for July 3-5, 2017. The concentrations peak at stations closer to the coast earlier than in inland areas (see Figure II-7-17 for monitor locations). This is consistent with the combination of 1) extensive fireworks use across the Basin, especially the most populated areas closer to the coast and 2) the dominant onshore flow that transports these emissions inland. The inland areas have local emissions as well as transported emissions from upwind areas.

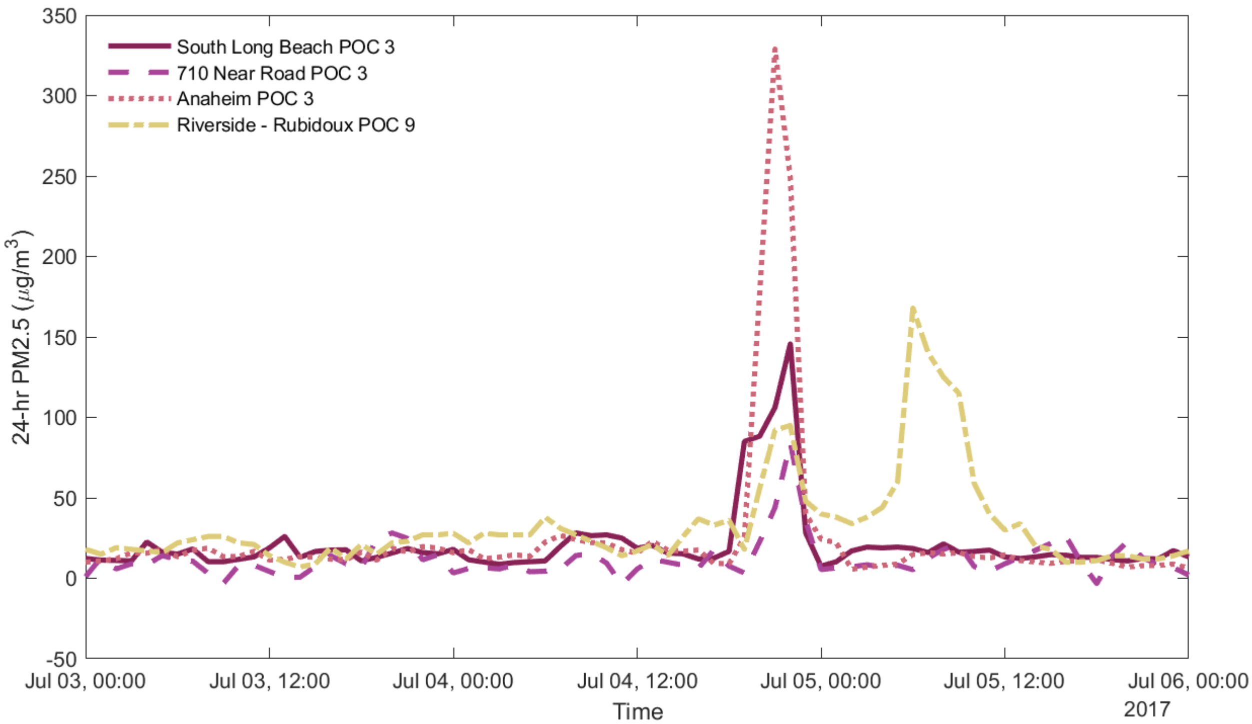


FIGURE II-7-19:
HOURLY TIME SERIES FOR JULY 3-5, 2017 FOR PM2.5 MONITORING STATIONS IN THE SOUTH COAST AIR BASIN.

Figure II-7-20 through Figure II-7-21 show time series plots of PM2.5 (left axes) and windspeed (right axes) for the stations shown in Figure II-7-19 that have co-located wind data. The PM2.5 concentrations tend to be the highest during the periods with lowest windspeeds. This is consistent with elevated nearby emissions, such as fireworks and reflects the emission patterns of fireworks, which are typically used at nightfall.

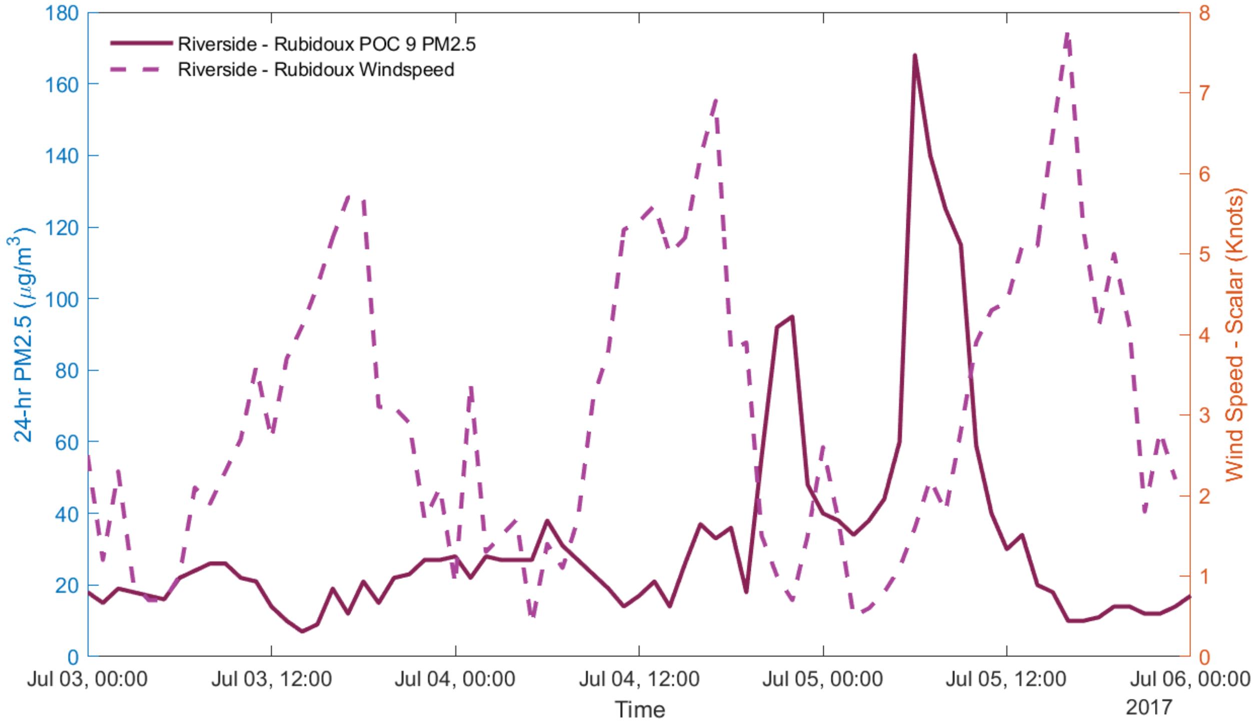


FIGURE II-7-20:
HOURLY PM2.5 AND WINDSPEED FOR JULY 3-5, 2017 AT THE RIVERSIDE - RUBIDOUX STATION.

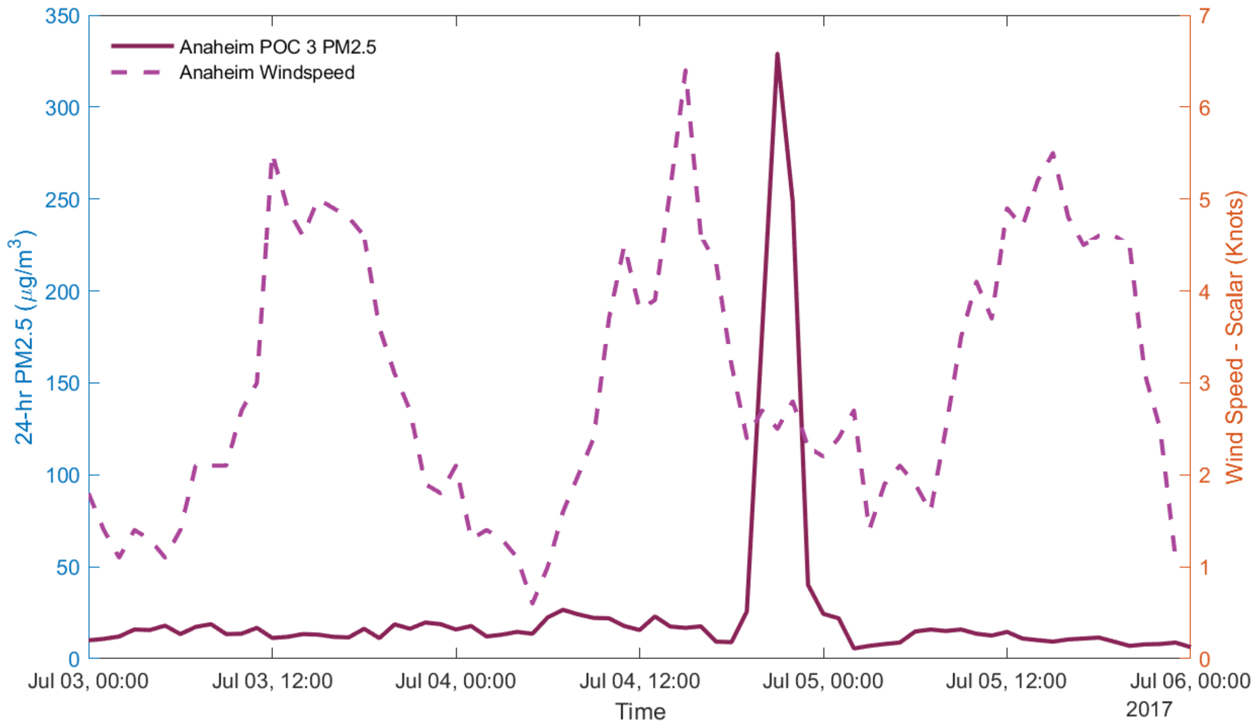


FIGURE II-7-21:
HOURLY PM2.5 AND WINDSPEED FOR JULY 3-5, 2017 AT THE ANAHEIM STATION.

Figure II-7-22 through Figure II-7-23 show scatter plots of PM2.5 versus hourly windspeed. This is the same data as shown in Figure II-7-20 through Figure II-7-21, except that the data are limited to 9 PM on July 4 through 5 PM on July 5, 2017 when we expect the greatest impacts from fireworks emissions. The NAAQS value (35 µg/m3) is shown as a horizontal line. Most PM2.5 measurements were below the NAAQS value whenever the winds were above approximately 5 knots, with the highest concentrations occurring at lower wind speeds. This pattern is consistent with elevated nearby emissions from fireworks accumulating to high concentrations during periods of lower ventilation and then diluting during periods of increased ventilation at higher windspeeds.

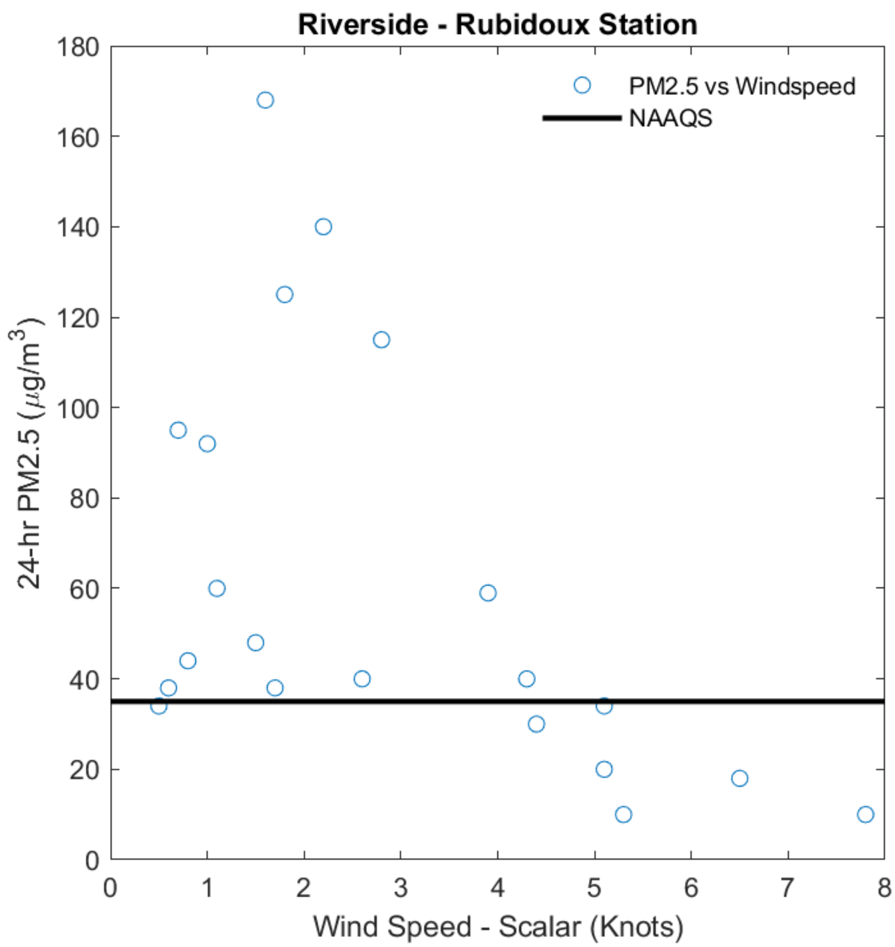


FIGURE II-7-22:
HOURLY PM2.5 VERSUS WINDSPEED FOR 9 PM ON JULY 4 THROUGH 5 PM ON JULY 5, 2017 AT THE RIVERSIDE - RUBIDOUX STATION.

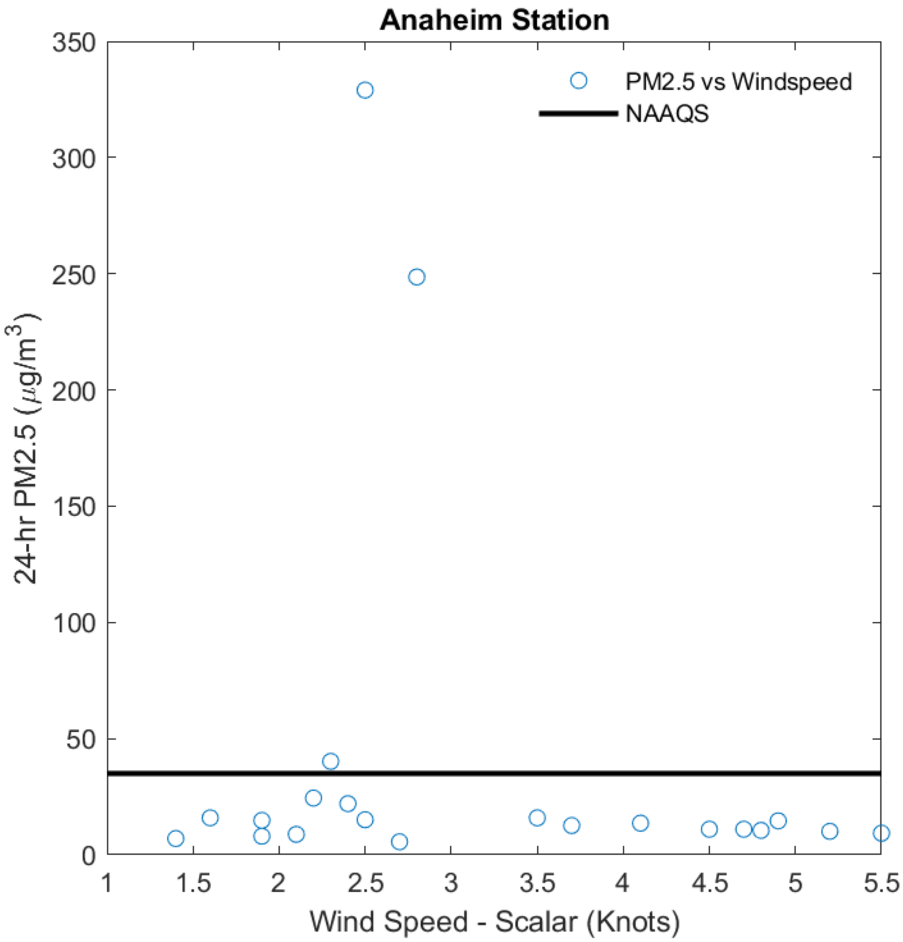


FIGURE II-7-23:
HOURLY PM2.5 VERSUS WINDSPEED FOR 9 PM ON JULY 4 THROUGH 5 PM ON JULY 5, 2017 AT THE ANAHEIM STATION.

Fireworks Summary for 2018-07-05

Residential land use (a proxy for fireworks emissions locations) and HYSPLIT back-trajectories using the NOAA HRRR meteorological model arriving at the 60 Near Road monitoring station for July 4-5, 2018 are shown in Figure II-7-24. All the back-trajectories originate over the Pacific Ocean or locally within the South Coast Air Basin and cross large residential areas of the South Coast Air Basin. Figure II-7-25 shows wind roses throughout the South Coast Air Basin for 9 PM on July 4 through 2 PM on July 5, 2018 using wind data from South Coast AQMD monitoring stations and local airports. The low windspeeds and onshore components shown in the wind roses in Figure II-7-25 are consistent with the meandering and ocean-sourced HYSPLIT back-trajectories in Figure II-7-24.

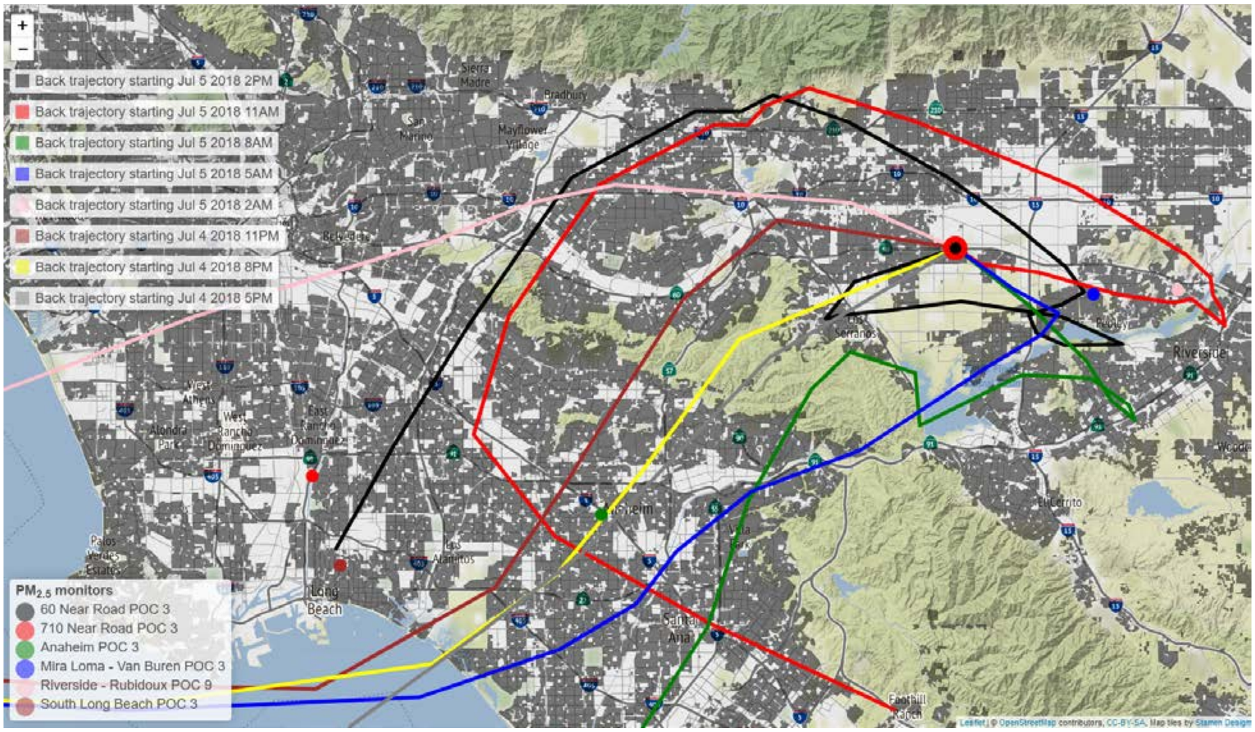


FIGURE II-7-24:

HYSPLIT BACK-TRAJECTORIES FROM 60 NEAR ROAD FOR JULY 4-5, 2018 OVERLAID ON A MAP OF THE SOUTH COAST AIR BASIN SHOWING RESIDENTIAL LAND USE (SHOWN IN GRAY).

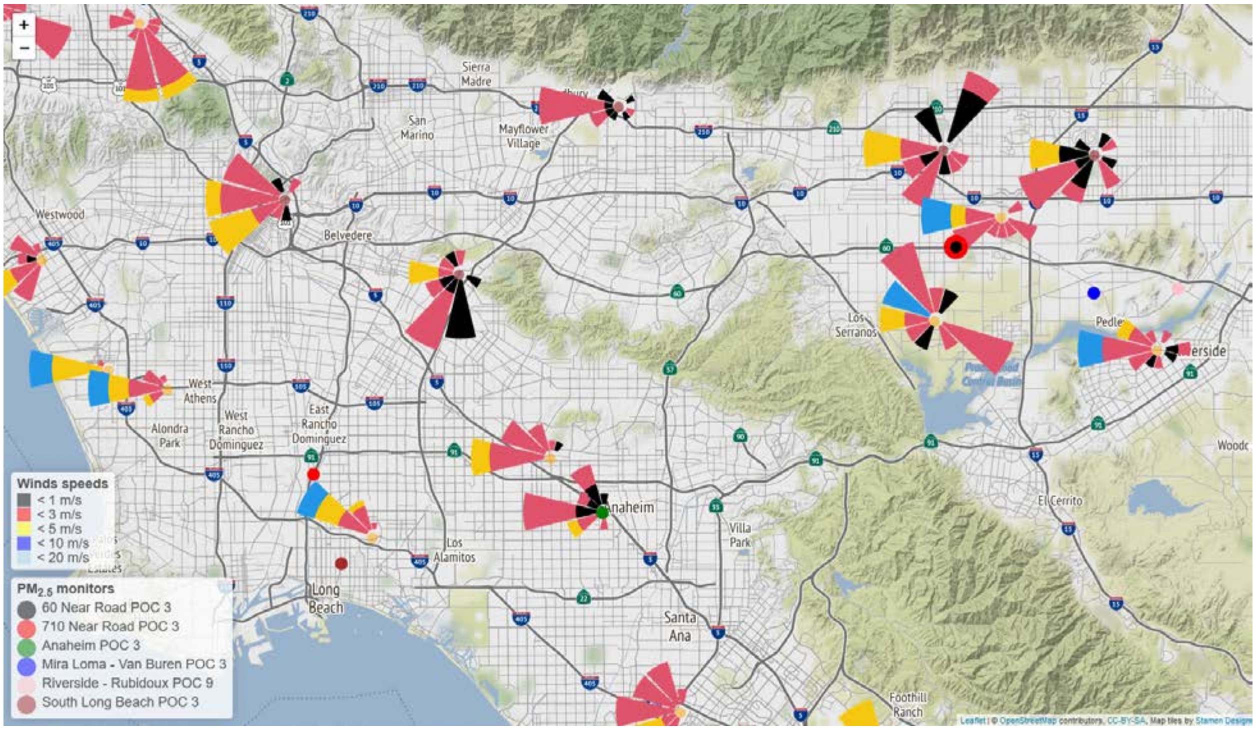


FIGURE II-7-25:
WIND ROSES FOR 9 PM ON JULY 4 THROUGH 2 PM ON JULY 5, 2018 THROUGHOUT THE SOUTH COAST AIR BASIN.

Figure II-7-26 shows time series plots of hourly PM2.5 data at selected stations with continuous PM2.5 instruments within the South Coast Air Basin for July 4-5, 2018. The concentrations peak at stations closer to the coast earlier than in inland areas (see Figure II-7-24 for monitor locations). This is consistent with the combination of 1) extensive fireworks use across the Basin, especially the most populated areas closer to the coast and 2) the dominant onshore flow that transports these emissions inland. The inland areas have local emissions as well as transported emissions from upwind areas.

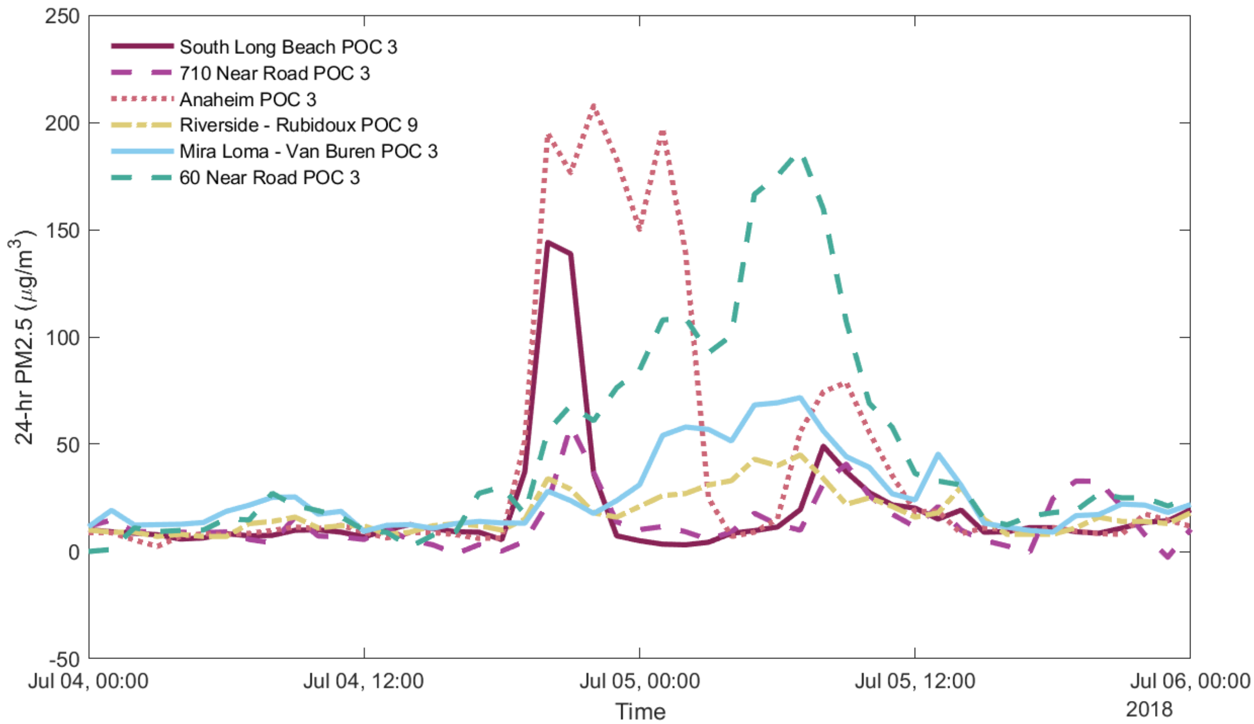


FIGURE II-7-26:
HOURLY TIME SERIES FOR JULY 4-5, 2018 FOR PM2.5 MONITORING STATIONS IN THE SOUTH COAST AIR BASIN.

Figure II-7-27 through Figure II-7-29 show time series plots of PM2.5 (left axes) and windspeed (right axes) for the stations shown in Figure II-7-26 that have co-located wind data. The PM2.5 concentrations tend to be the highest during the periods with lowest windspeeds. This is consistent with elevated nearby emissions, such as fireworks and reflects the emission patterns of fireworks, which are typically used at nightfall.

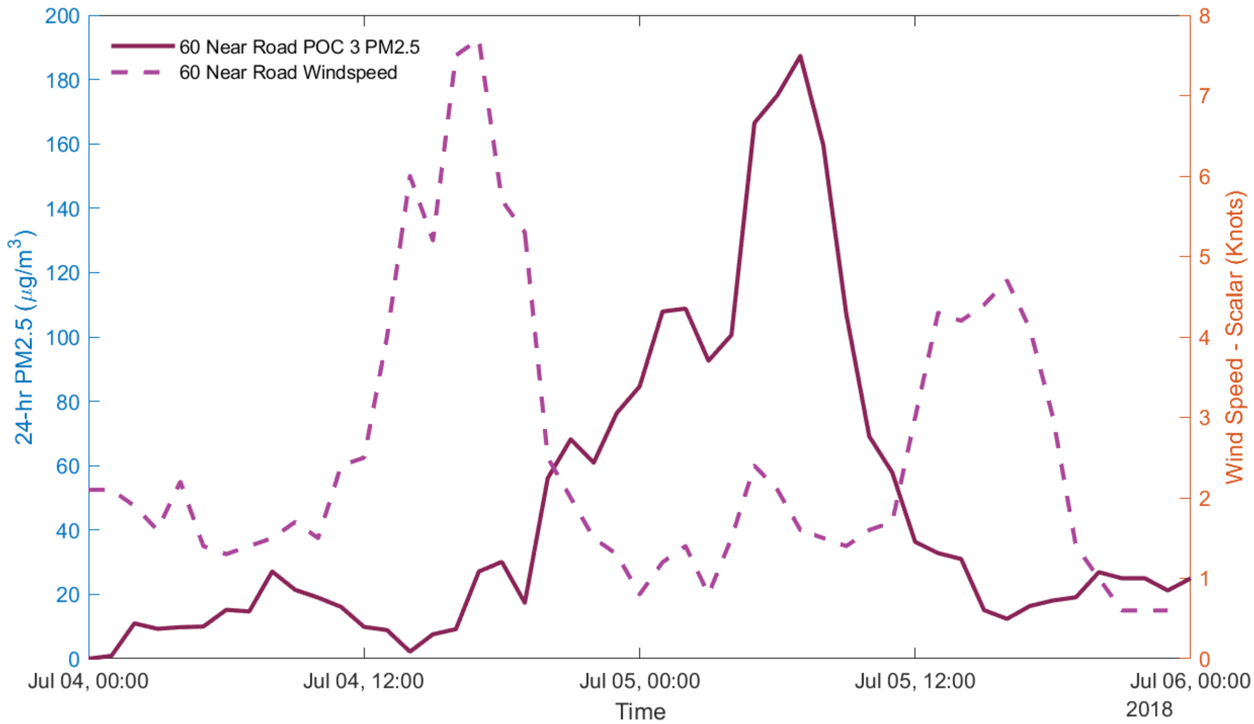


FIGURE II-7-27:
HOURLY PM2.5 AND WINDSPEED FOR JULY 4-5, 2018 AT THE 60 NEAR ROAD STATION.

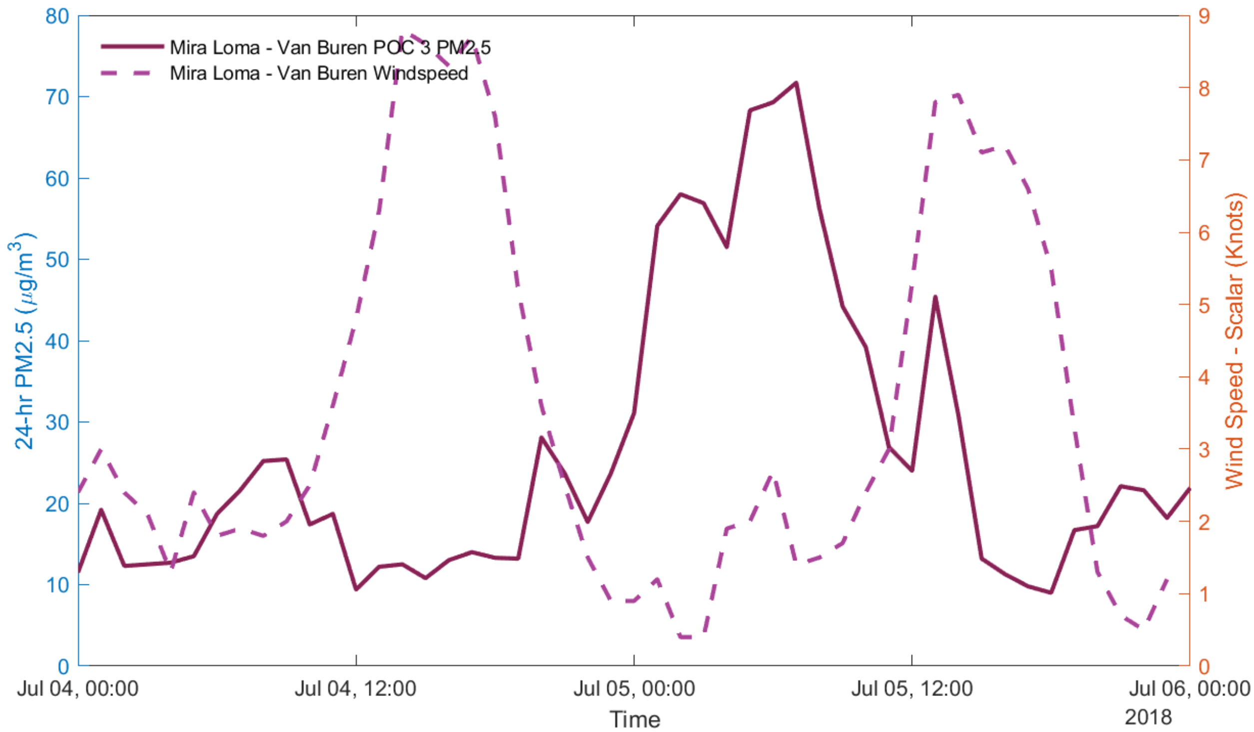


FIGURE II-7-28:
HOURLY PM2.5 AND WINDSPEED FOR JULY 4-5, 2018 AT THE MIRA LOMA – VAN BUREN STATION.

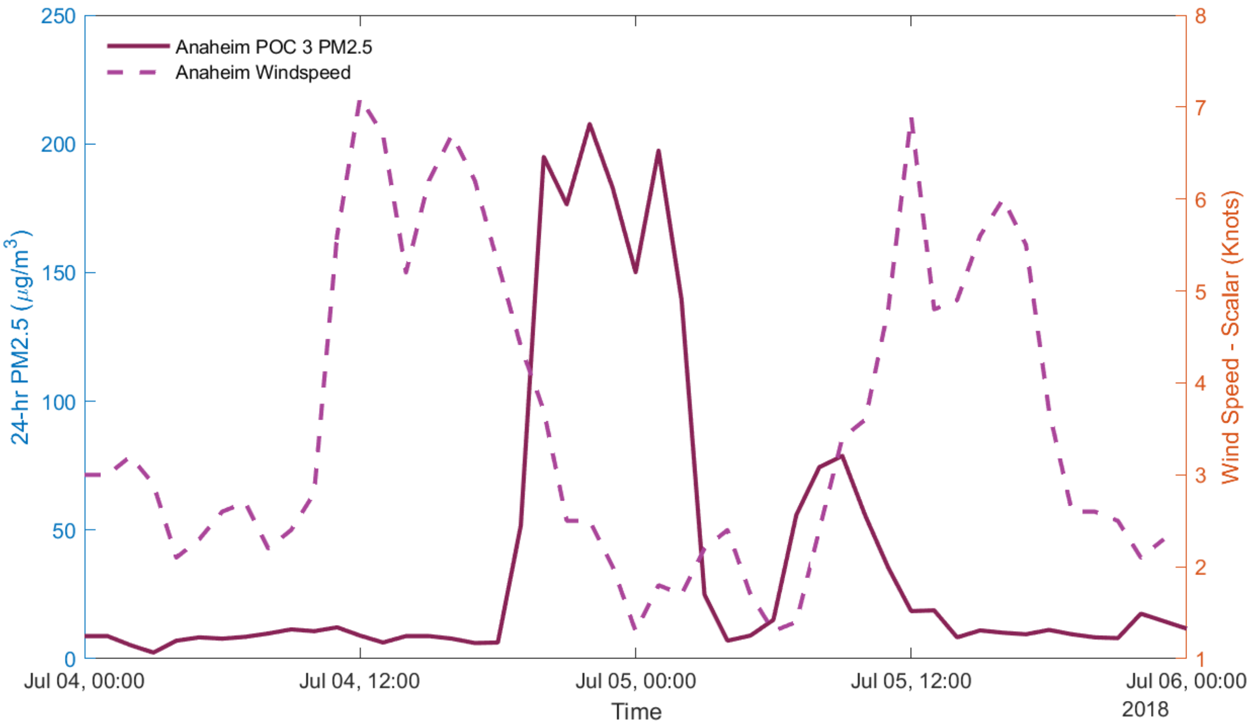


FIGURE II-7-29:
HOURLY PM2.5 AND WINDSPEED FOR JULY 4-5, 2018 AT THE ANAHEIM STATION.

Figure II-7-30 through Figure II-7-32 show scatter plots of PM2.5 versus hourly windspeed. This is the same data as shown in Figure II-7-27 through Figure II-7-29, except that the data are limited to 9 PM on July 4 through 5 PM on July 5, 2018 when we expect the greatest impacts from fireworks emissions. The NAAQS value (35 µg/m3) is shown as a horizontal line. Most PM2.5 measurements were below the NAAQS value whenever the winds were above approximately 5 knots, with the highest concentrations occurring at lower wind speeds. This pattern is consistent with elevated nearby emissions from fireworks accumulating to high concentrations during periods of lower ventilation and then diluting during periods of increased ventilation at higher windspeeds.

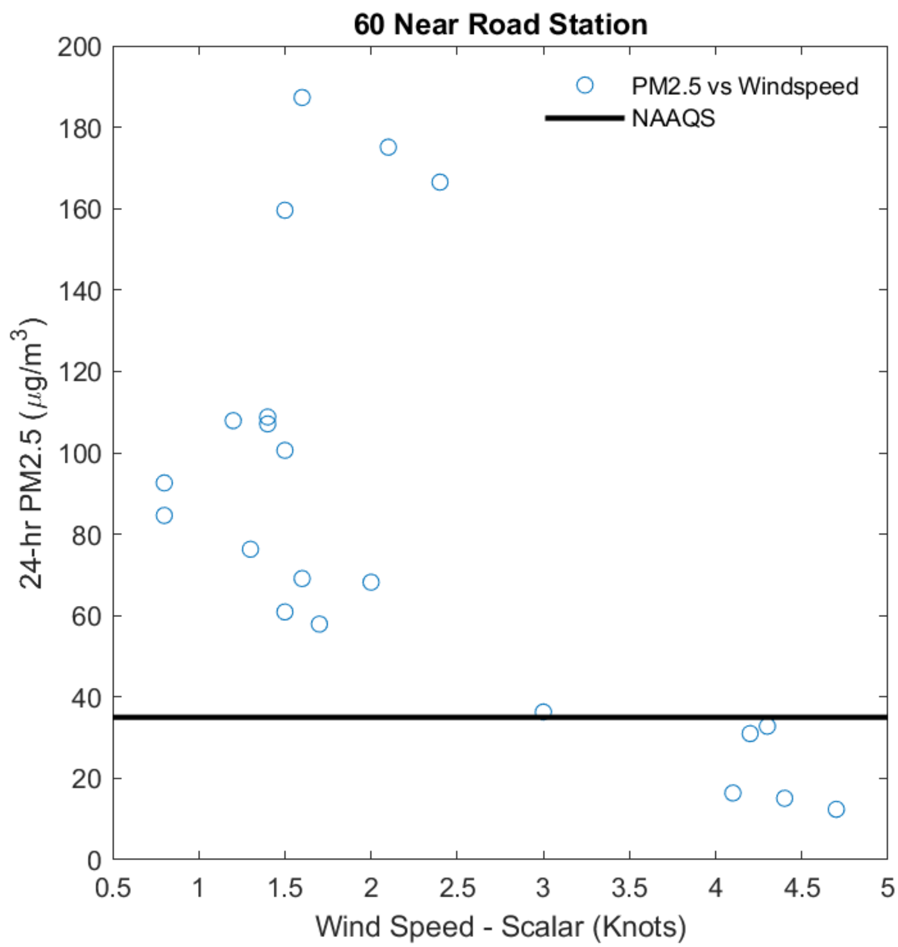


FIGURE II-7-30:
HOURLY PM2.5 VERSUS WINDSPEED FOR 9 PM ON JULY 4 THROUGH 5 PM ON JULY 5, 2018 AT THE 60 NEAR ROAD STATION.

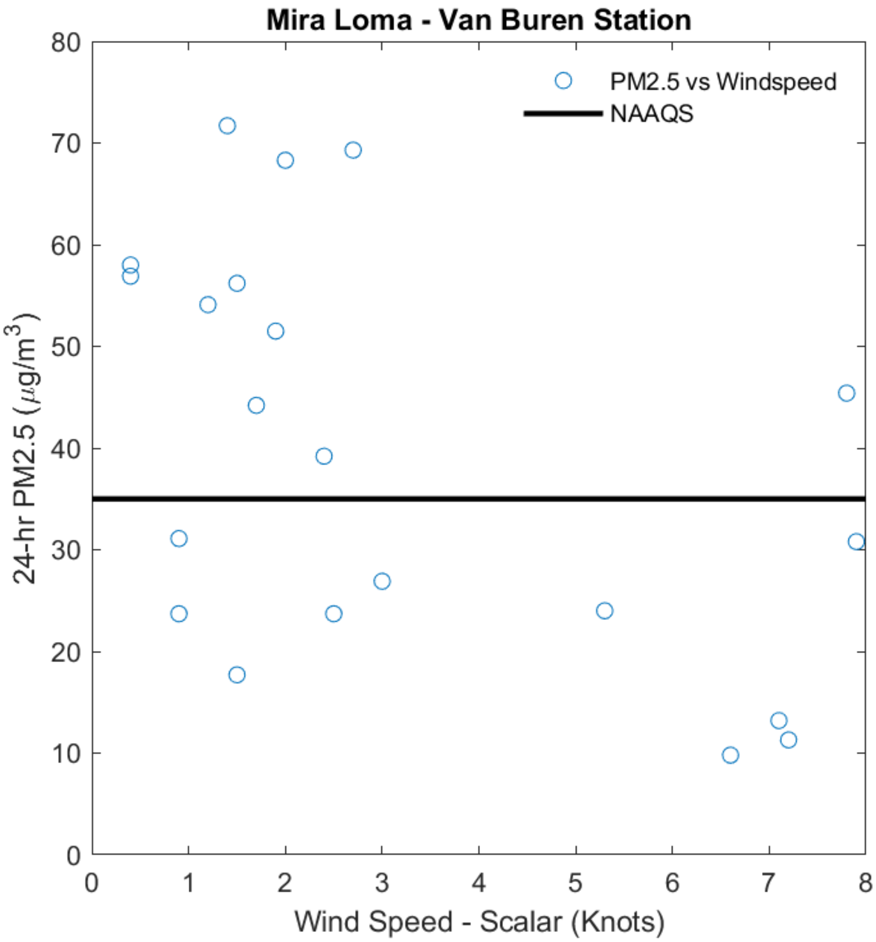


FIGURE II-7-31:
HOURLY PM2.5 VERSUS WINDSPEED FOR 9 PM ON JULY 4 THROUGH 5 PM ON JULY 5, 2018 AT THE MIRA LOMA – VAN BUREN STATION.

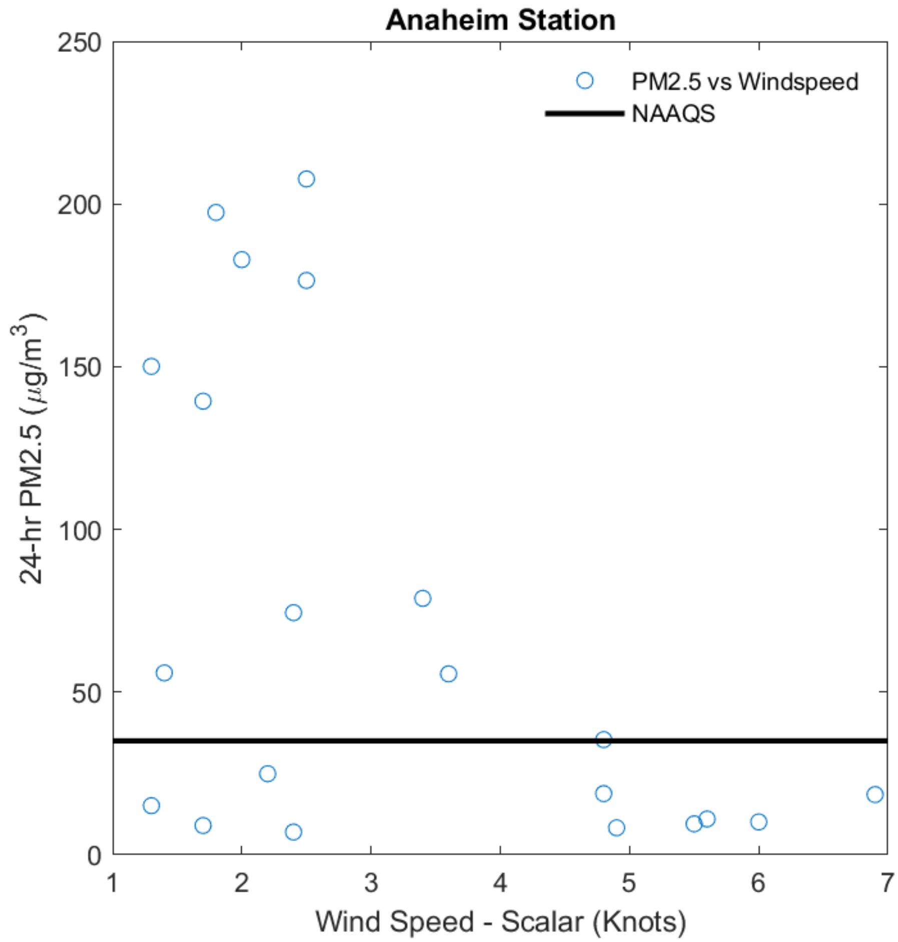


FIGURE II-7-32:
HOURLY PM2.5 VERSUS WINDSPEED FOR 9 PM ON JULY 4 THROUGH 5 PM ON JULY 5, 2018 AT THE ANAHEIM STATION.

Fireworks Summary for 2019-07-05

Residential land use (a proxy for fireworks emissions locations) and HYSPLIT back-trajectories using the NOAA HRRR meteorological model arriving at the 60 Near Road monitoring station for July 4-5, 2019 are shown in Figure II-7-33. All the back-trajectories originate over the Pacific Ocean and cross large residential areas of the South Coast Air Basin. Figure II-7-34 shows wind roses throughout the South Coast Air Basin for 9 PM on July 4 through 2 PM on July 5, 2019 using wind data from South Coast AQMD monitoring stations and local airports. The wind roses in Figure II-7-34 confirm the onshore wind pattern shown in the HYSPLIT back-trajectories in Figure II-7-33.

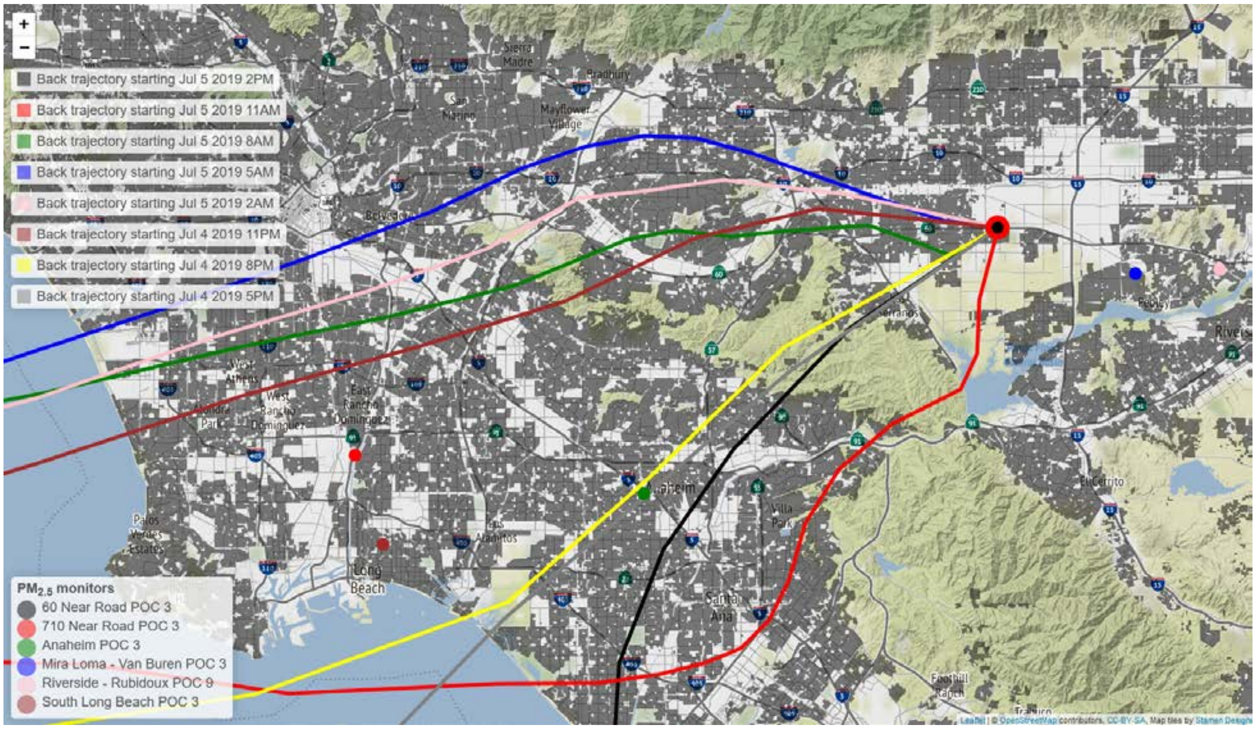


FIGURE II-7-33:
HYSPLIT BACK-TRAJECTORIES FROM 60 NEAR ROAD FOR JULY 4-5, 2019 OVERLAID ON A MAP OF THE SOUTH COAST AIR BASIN SHOWING RESIDENTIAL LAND USE (SHOWN IN GRAY).

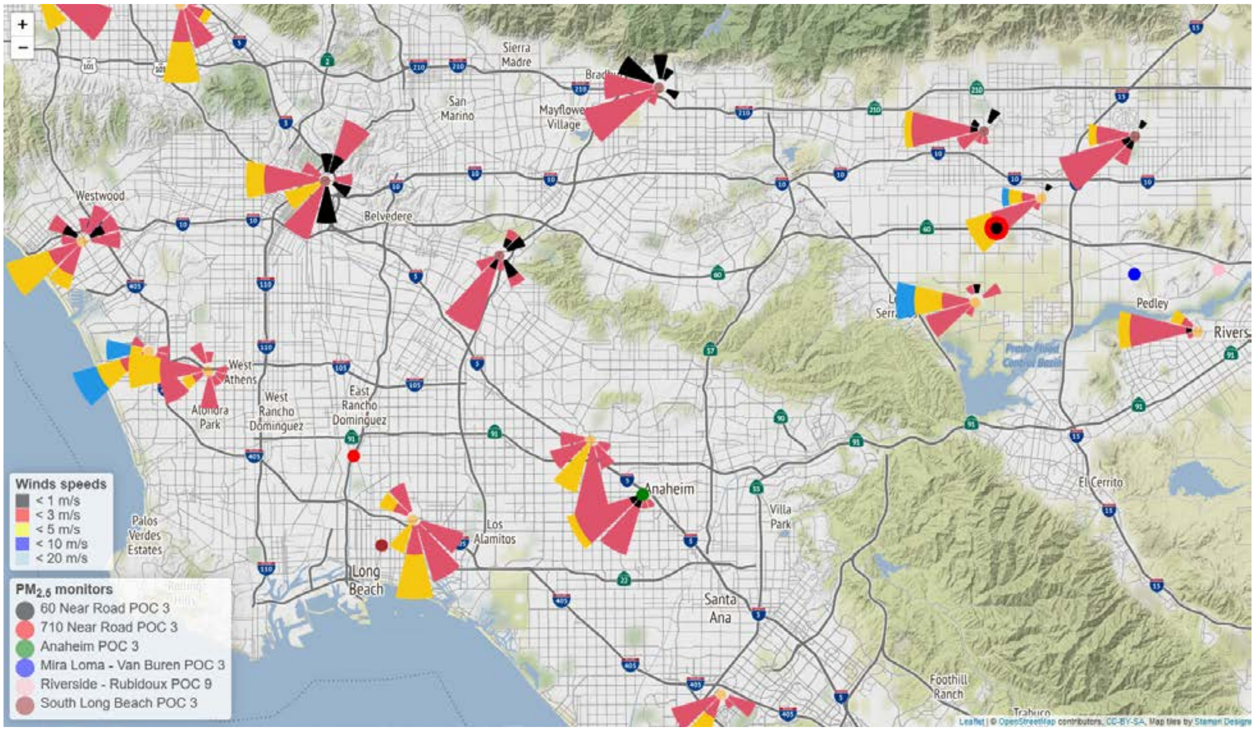


FIGURE II-7-34:
WIND ROSES FOR 9 PM ON JULY 4 THROUGH 2 PM ON JULY 5, 2019 THROUGHOUT THE SOUTH COAST AIR BASIN.

Figure II-7-35 shows time series plots of hourly PM2.5 data at selected stations with continuous PM2.5 instruments within the South Coast Air Basin for July 4-5, 2019. The concentrations peak at stations closer to the coast earlier than in inland areas (see Figure II-7-33 for monitor locations). This is consistent with the combination of 1) extensive fireworks use across the Basin, especially the most populated areas closer to the coast and 2) the dominant onshore flow that transports these emissions inland. The inland areas have local emissions as well as transported emissions from upwind areas.

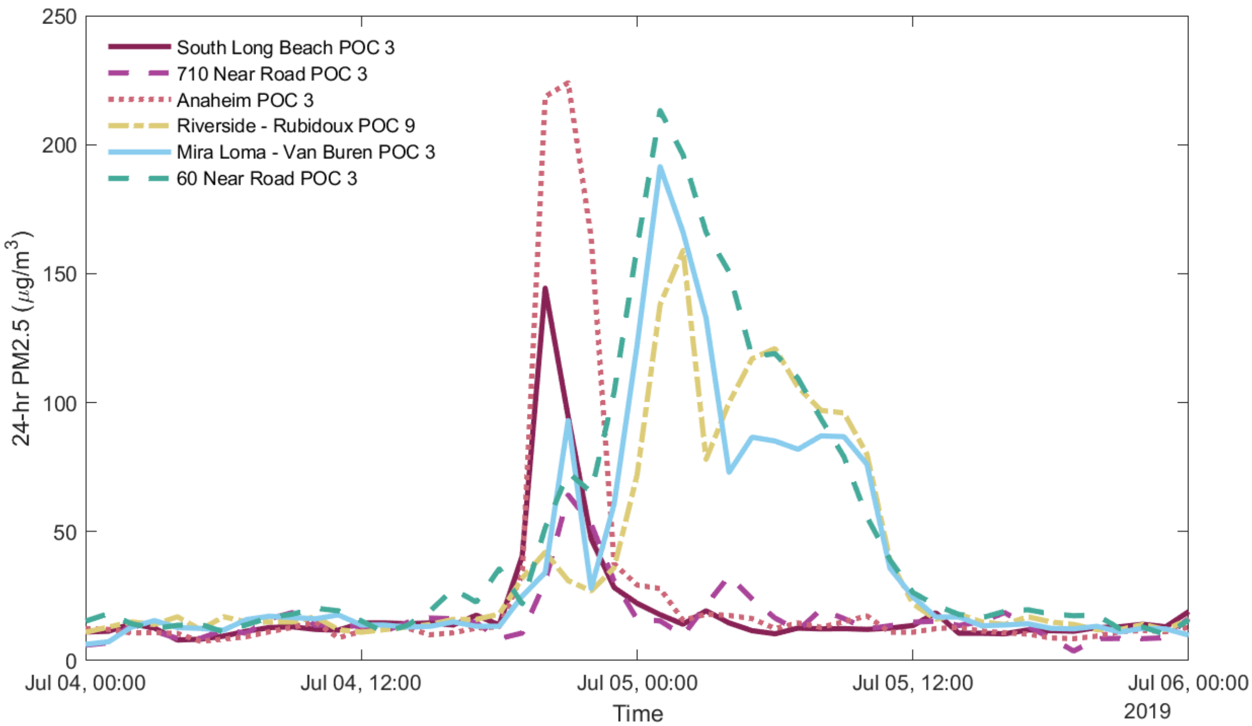


FIGURE II-7-35:
HOURLY TIME SERIES FOR JULY 4-5, 2019 FOR PM2.5 MONITORING STATIONS IN THE SOUTH COAST AIR BASIN.

Figure II-7-36 through Figure II-7-39 show time series plots of PM2.5 (left axes) and windspeed (right axes) for the stations shown in Figure II-7-35 that have co-located wind data. The PM2.5 concentrations tend to be the highest during the periods with lowest windspeeds. This is consistent with elevated nearby emissions, such as fireworks and reflects the emission patterns of fireworks, which are typically used at nightfall.

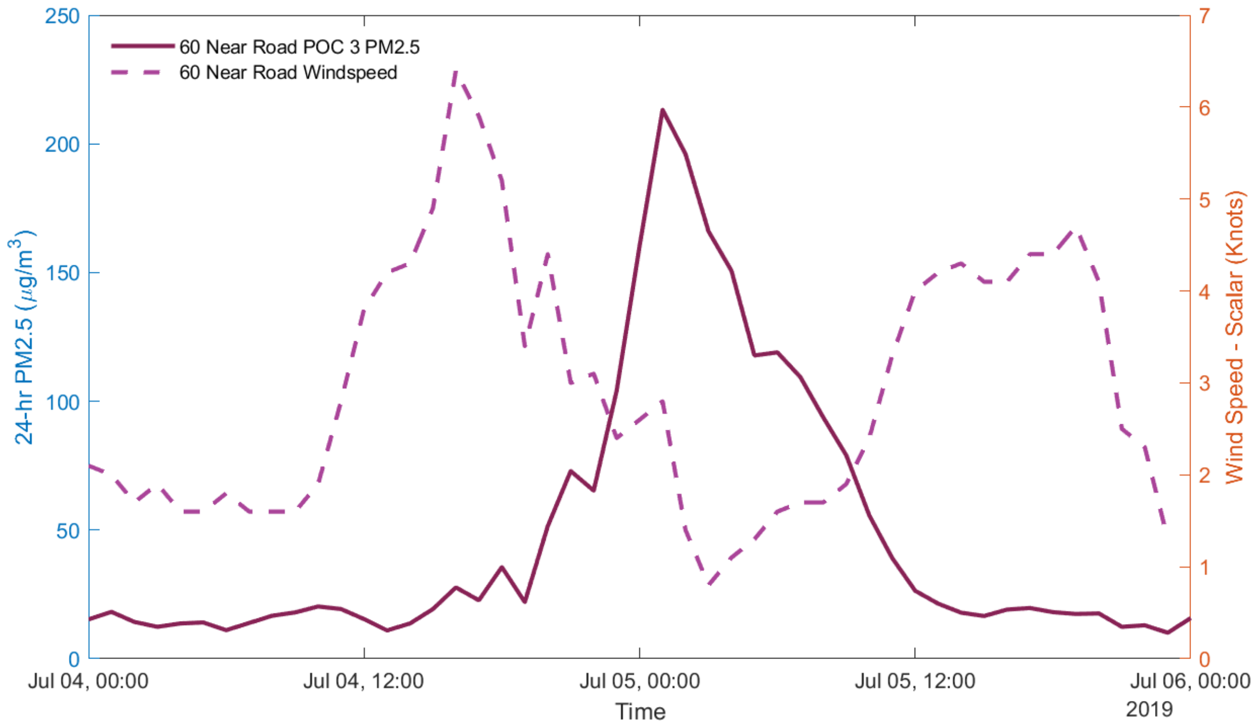


FIGURE II-7-36:
HOURLY PM2.5 AND WINDSPEED FOR JULY 4-5, 2019 AT THE 60 NEAR ROAD STATION.

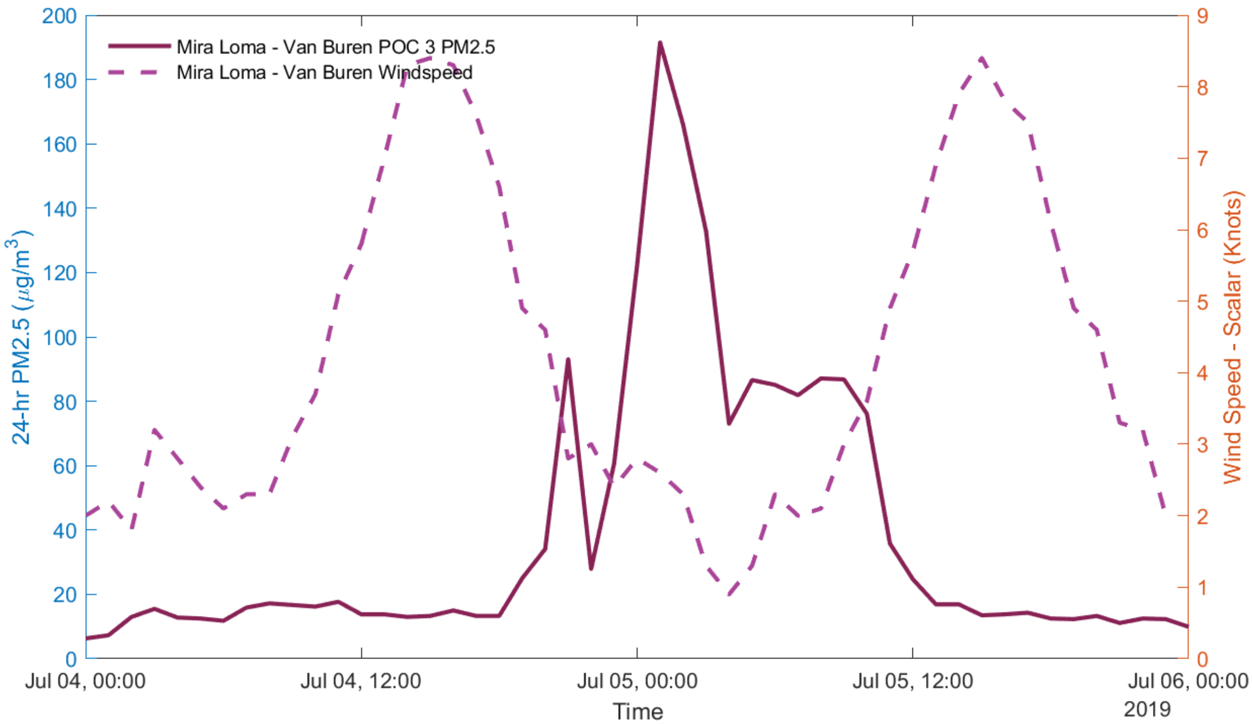


FIGURE II-7-37:
HOURLY PM2.5 AND WINDSPEED FOR JULY 4-5, 2019 AT THE MIRA LOMA – VAN BUREN STATION.

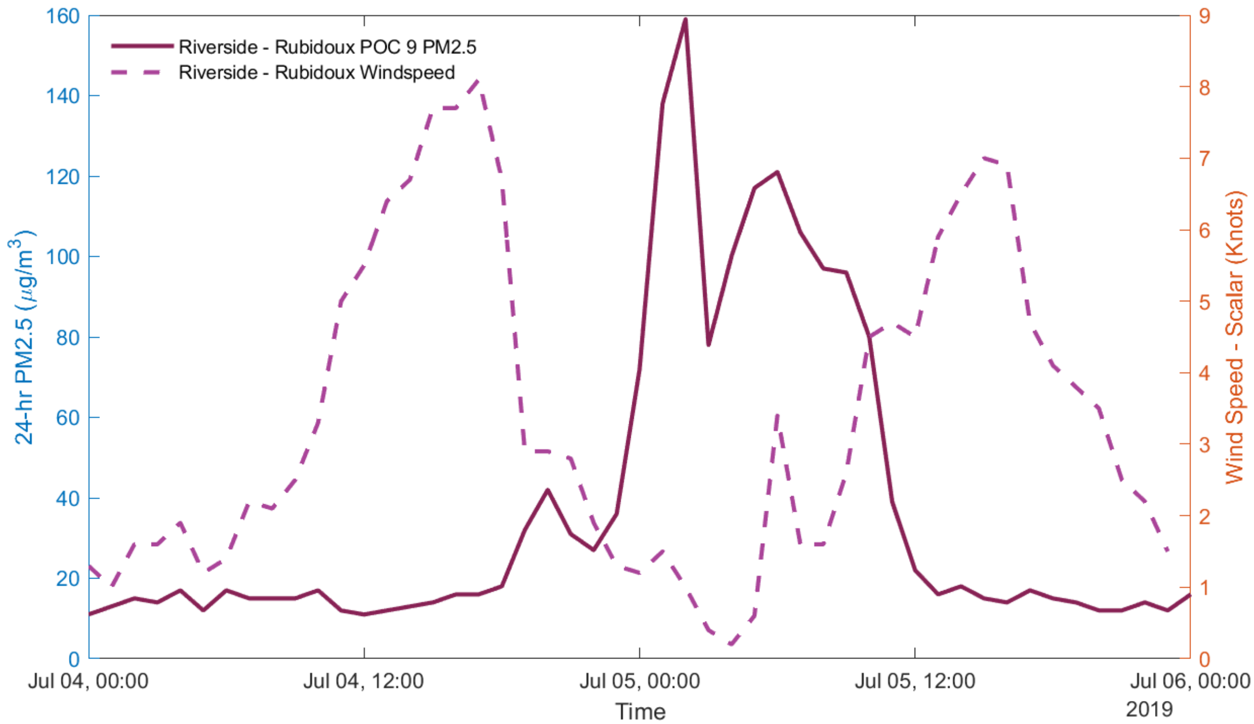


FIGURE II-7-38:
HOURLY PM2.5 AND WINDSPEED FOR JULY 4-5, 2019 AT THE RIVERSIDE - RUBIDOUX STATION.

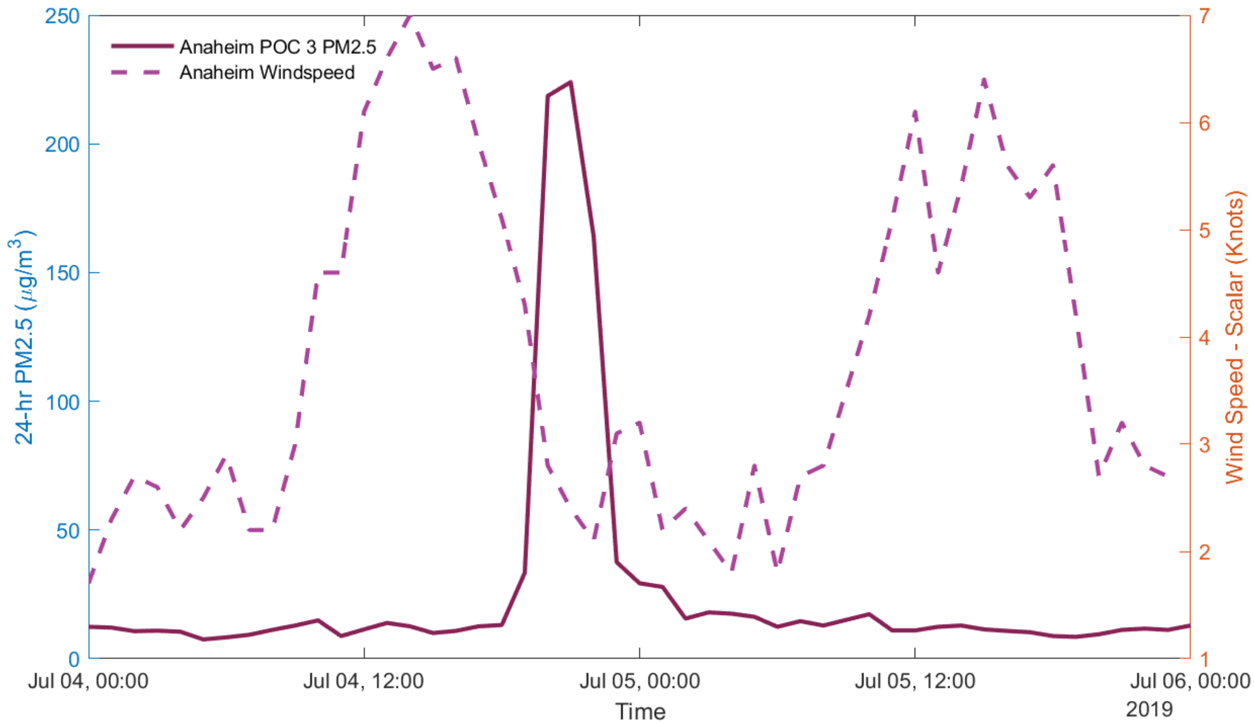


FIGURE II-7-39:
HOURLY PM2.5 AND WINDSPEED FOR JULY 4-5, 2019 AT THE ANAHEIM STATION.

Figure II-7-40 through Figure II-7-43 show scatter plots of PM2.5 versus hourly windspeed. This is the same data as shown in Figure II-7-36 through Figure II-7-39, except that the data are limited to 9 PM on July 4 through 5 PM on July 5, 2019 when we expect the greatest impacts from fireworks emissions. The NAAQS value (35 µg/m3) is shown as a horizontal line. Most PM2.5 measurements were below the NAAQS value whenever the winds were above approximately 5 knots, with the highest concentrations occurring at lower wind speeds. This pattern is consistent with elevated nearby emissions from fireworks accumulating to high concentrations during periods of lower ventilation and then diluting during periods of increased ventilation at higher windspeeds.

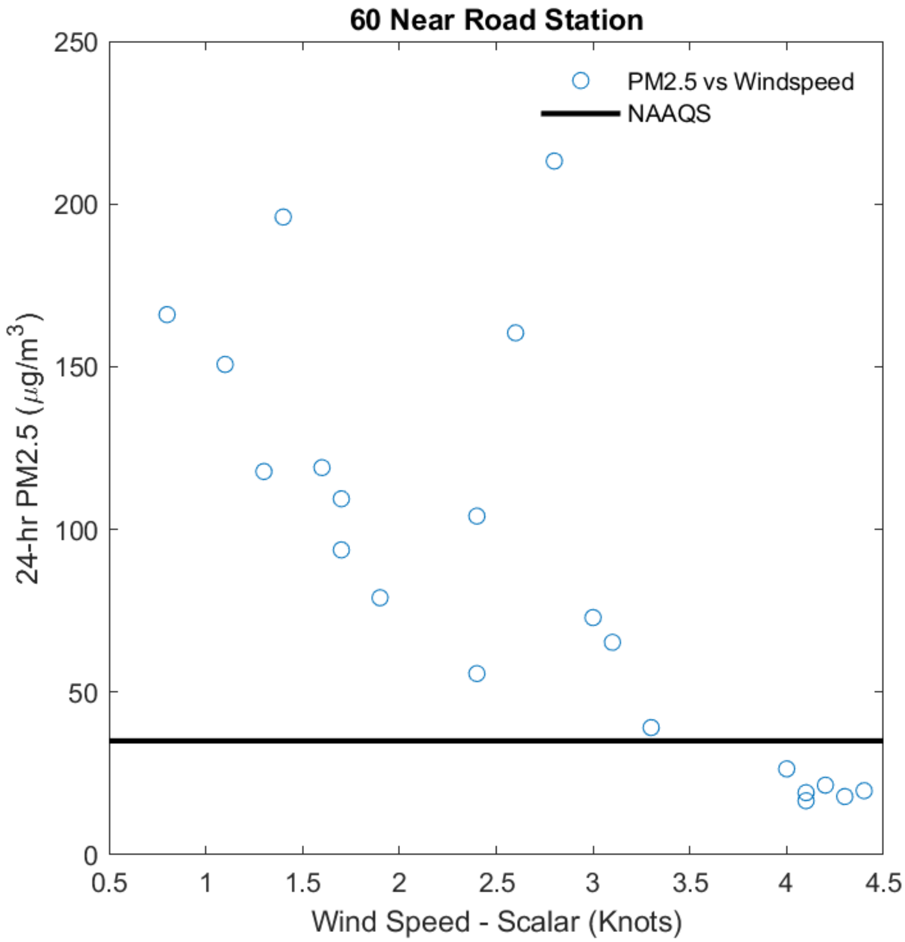


FIGURE II-7-40:
HOURLY PM2.5 VERSUS WINDSPEED FOR 9 PM ON JULY 4 THROUGH 5 PM ON JULY 5, 2019 AT THE 60 NEAR ROAD STATION.

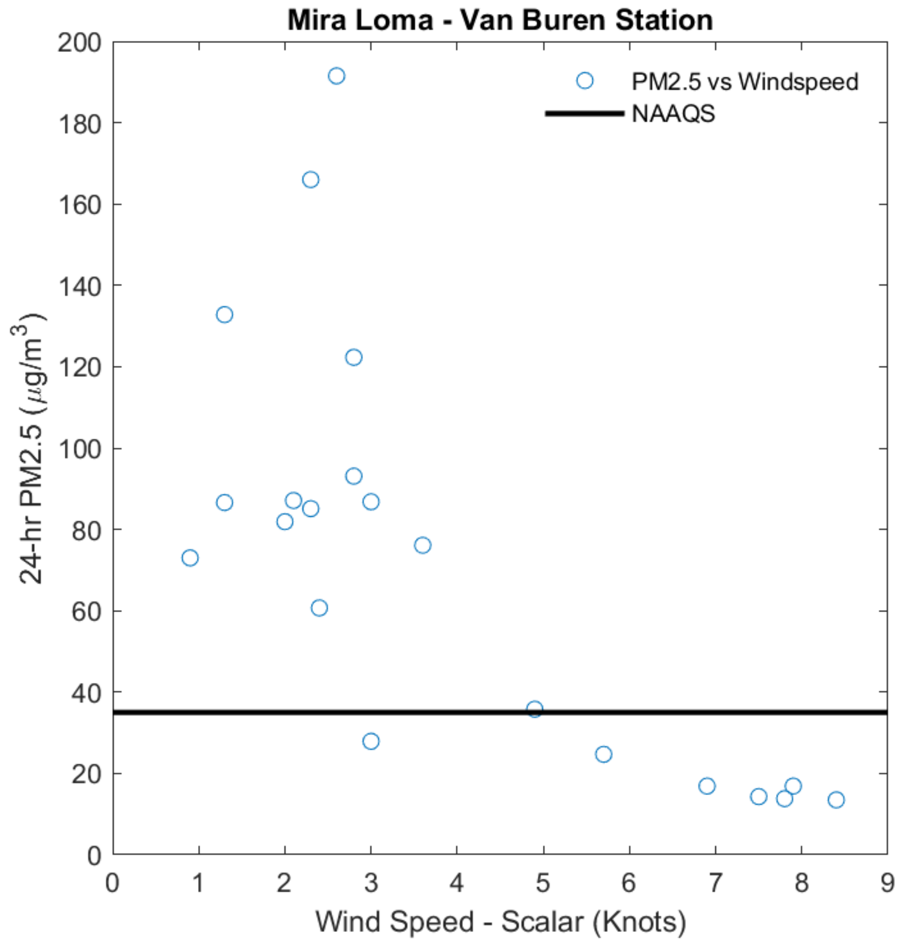


FIGURE II-7-41:
HOURLY PM2.5 VERSUS WINDSPEED FOR 9 PM ON JULY 4 THROUGH 5 PM ON JULY 5, 2019 AT THE MIRA LOMA – VAN BUREN STATION.

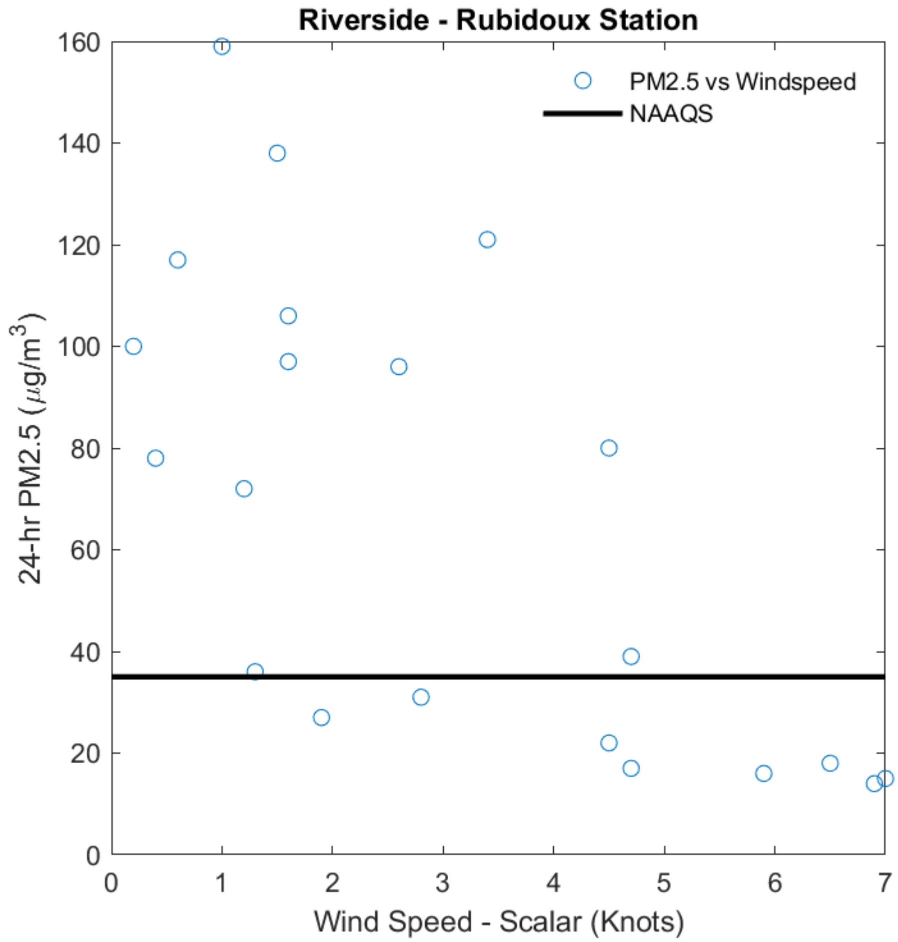


FIGURE II-7-42:
HOURLY PM2.5 VERSUS WINDSPEED FOR 9 PM ON JULY 4 THROUGH 5 PM ON JULY 5, 2019 AT THE RIVERSIDE - RUBIDOUX STATION.

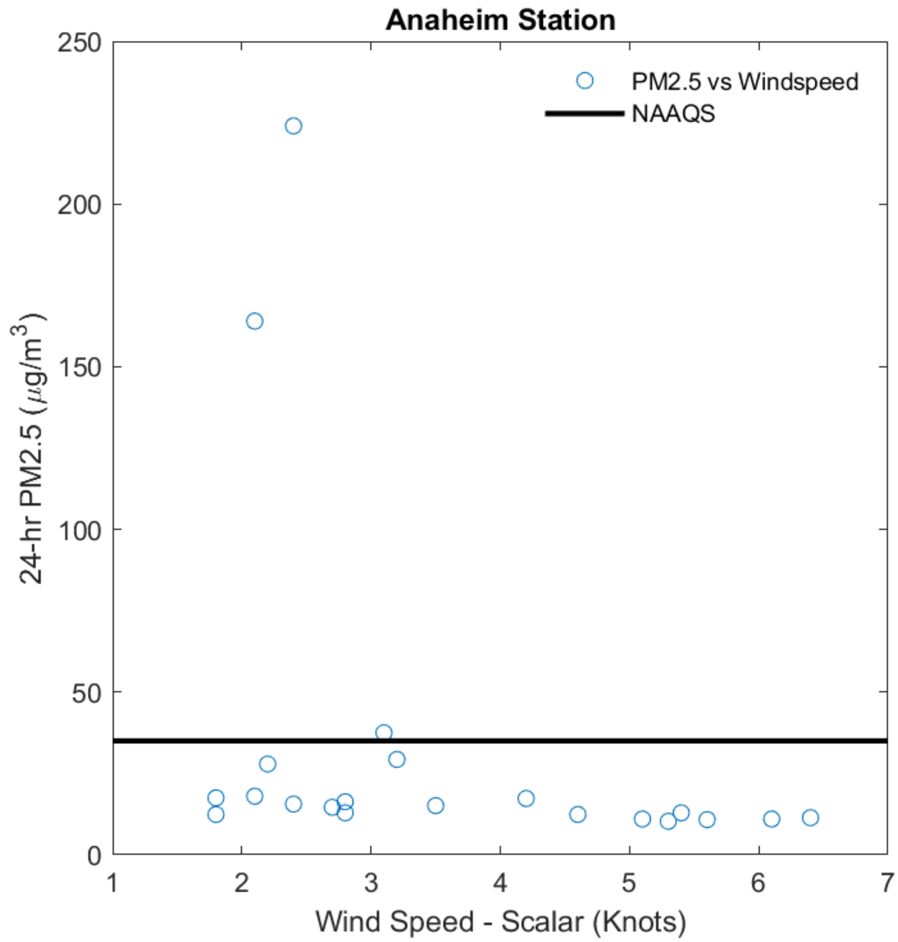


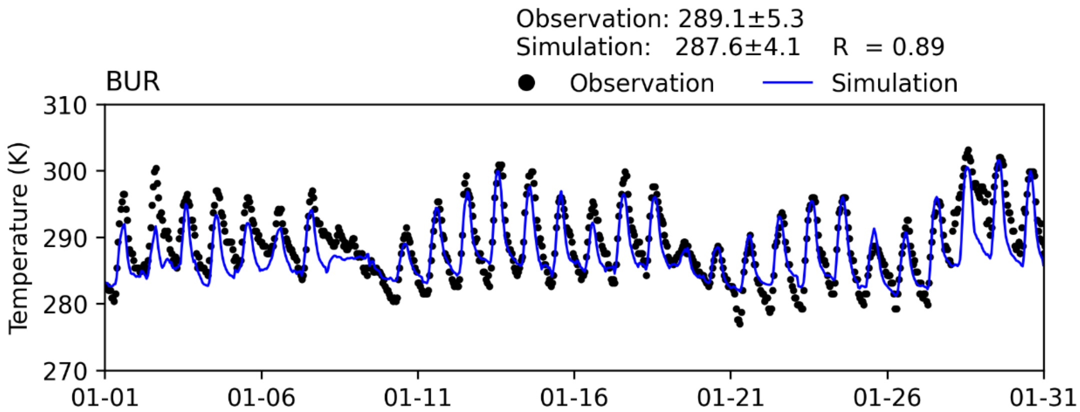
FIGURE II-7-43:
HOURLY PM2.5 VERSUS WINDSPEED FOR 9 PM ON JULY 4 THROUGH 5 PM ON JULY 5, 2019 AT THE ANAHEIM STATION.

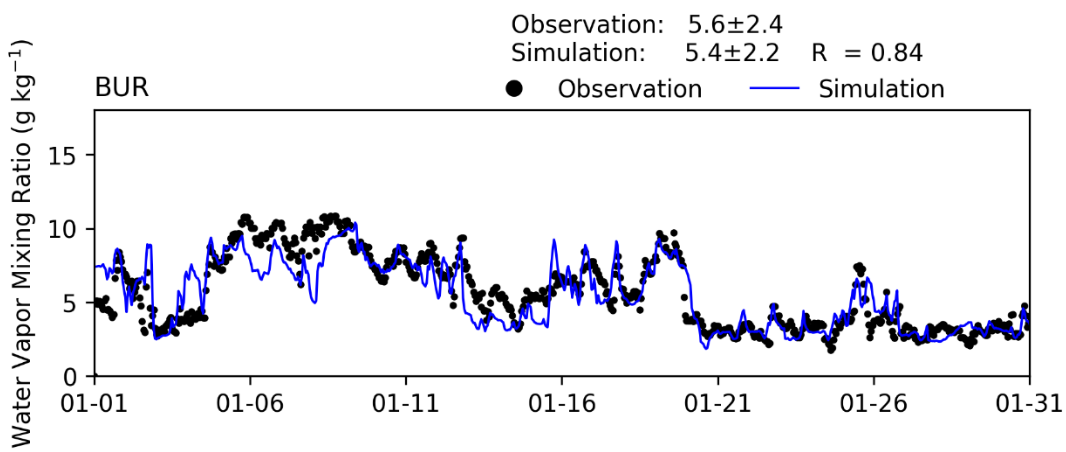
Conclusion

South Coast AQMD posits that the 24-hour PM2.5 exceedances listed in Table II-7-1 in this report qualify for exclusion for analyses estimating base and future year design values for the PM2.5 attainment demonstration because the ambient data are not representative to characterize base period concentrations (see Table 1 of U.S. EPA, 2019). The annual fireworks emissions during Independence Day celebrations throughout the South Coast Air Basin impacting PM2.5 concentrations on July 4-5 are atypical, extreme, and unrepresentative events compared to typical summer days.

Attachment 1

WRF MODEL PERFORMANCE TIME SERIES





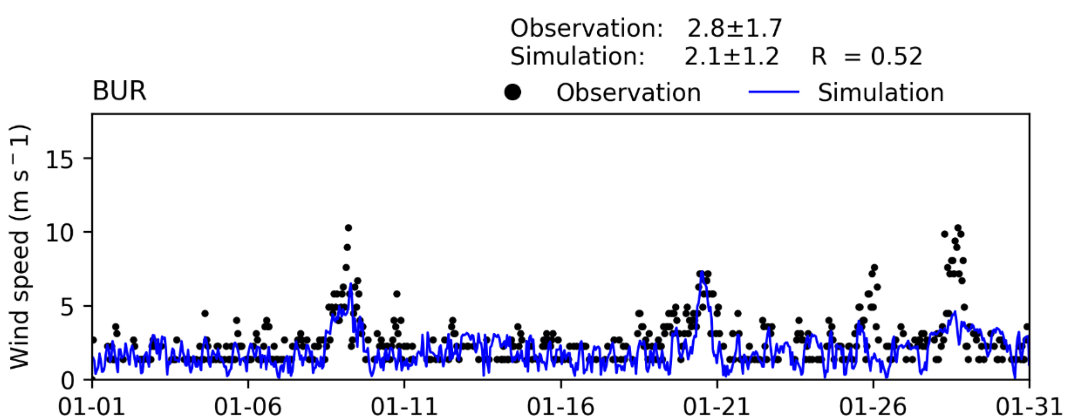


FIGURE V-A1
TIME SERIES OF HOURLY MEASUREMENTS AND WRF SIMULATIONS AT BURBANK AIRPORT (BUR) FOR JANUARY 2018

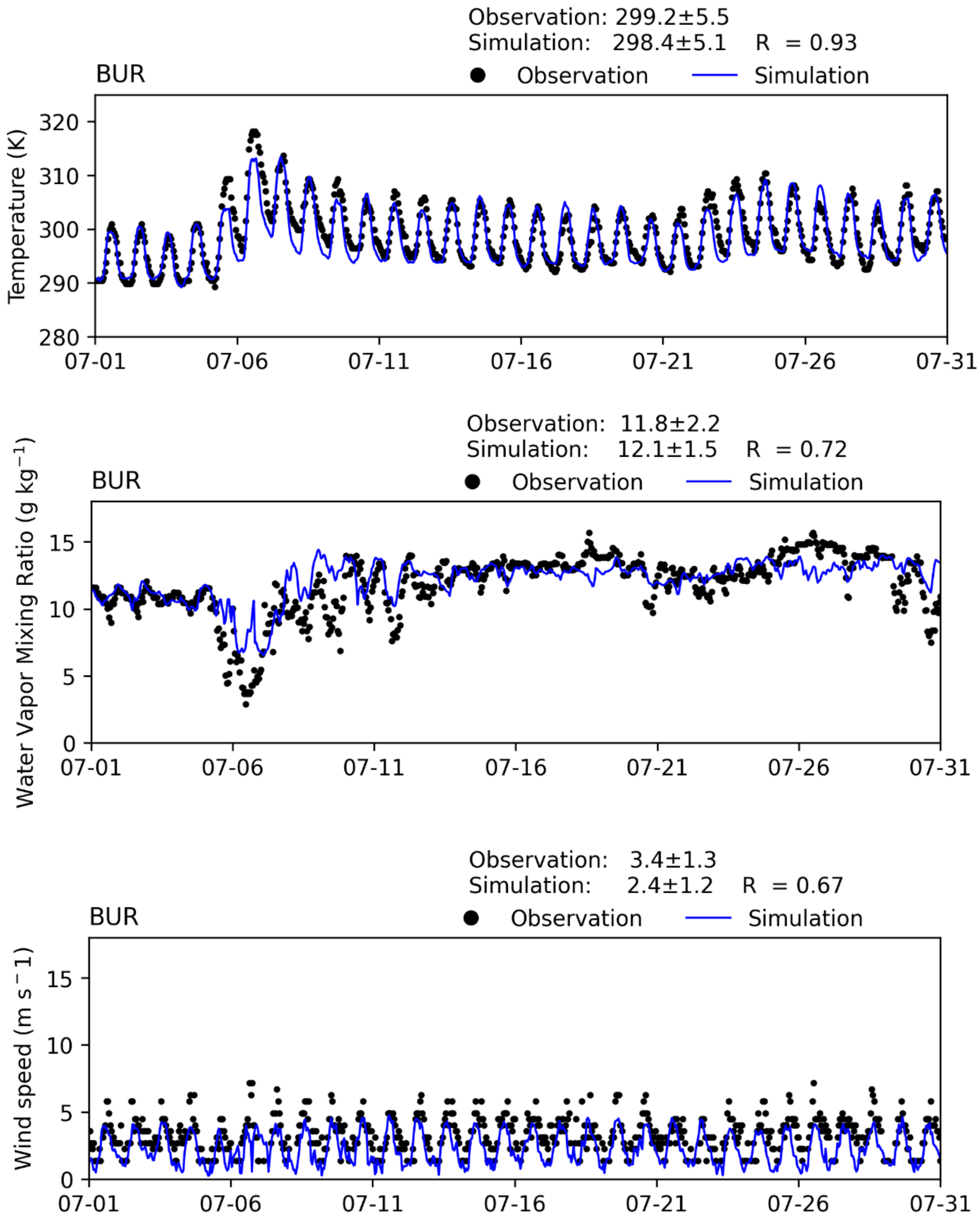


FIGURE V-A2

TIME SERIES OF HOURLY MEASUREMENTS AND WRF SIMULATIONS AT BURBANK AIRPORT (BUR) FOR JULY 2018

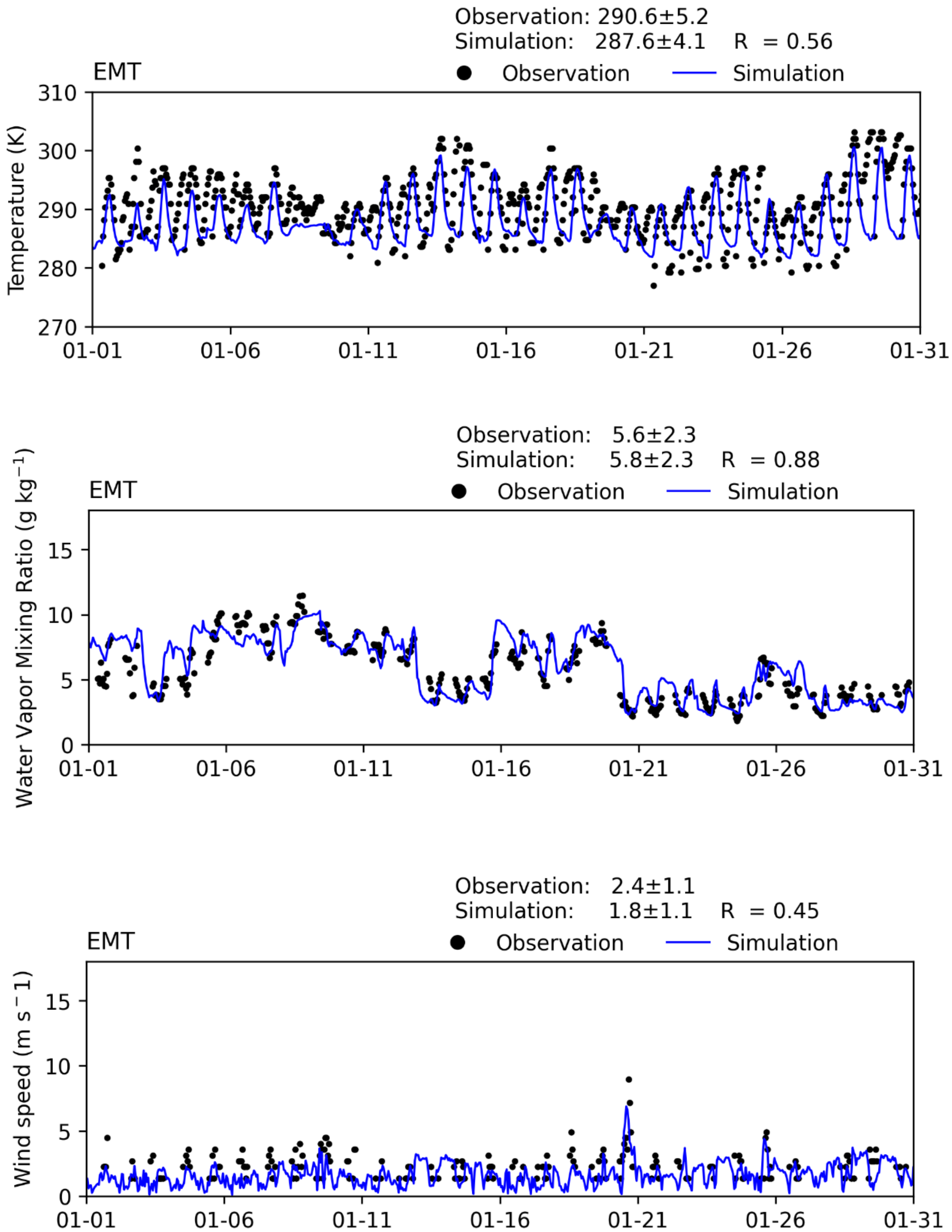


FIGURE V-A3

TIME SERIES OF HOURLY MEASUREMENTS AND WRF SIMULATIONS AT EI MONTE (EMT) FOR JANUARY 2018

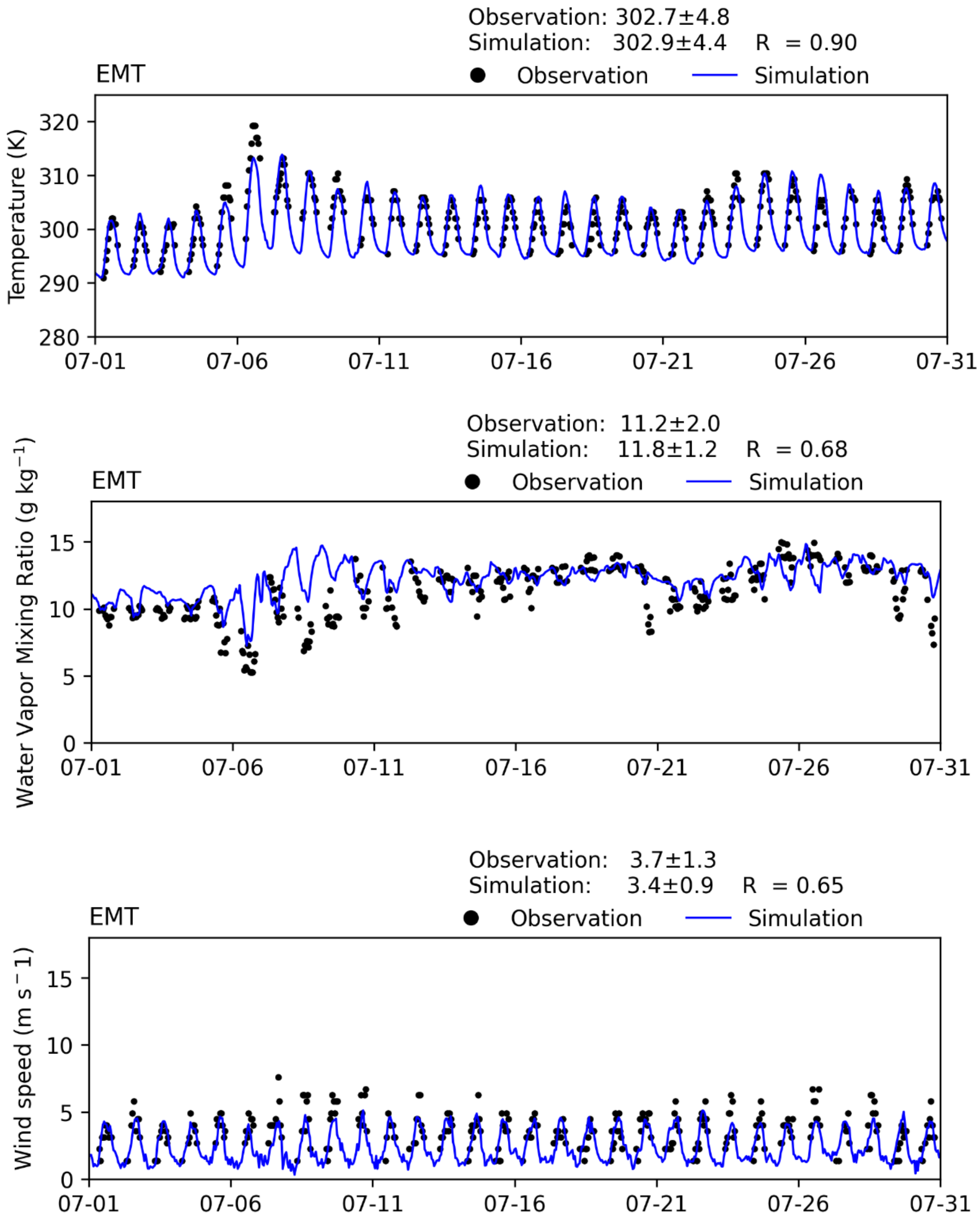


FIGURE V-A4

TIME SERIES OF HOURLY MEASUREMENTS AND WRF SIMULATIONS AT EI MONTE (EMT) FOR JULY 2018

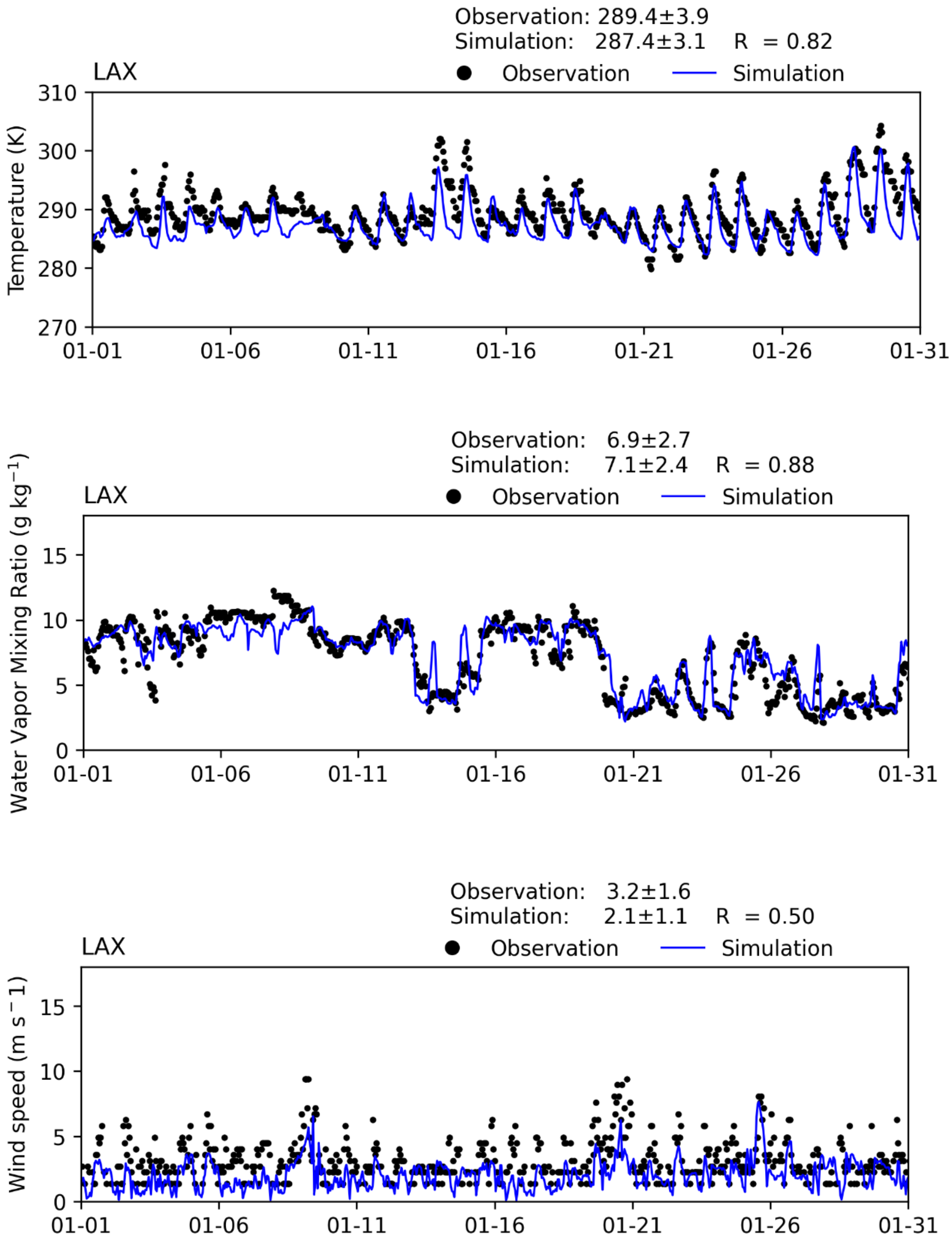


FIGURE V-A5

TIME SERIES OF HOURLY MEASUREMENTS AND WRF SIMULATIONS AT LOS ANGELES AIRPORT (LAX) FOR JANUARY 2018

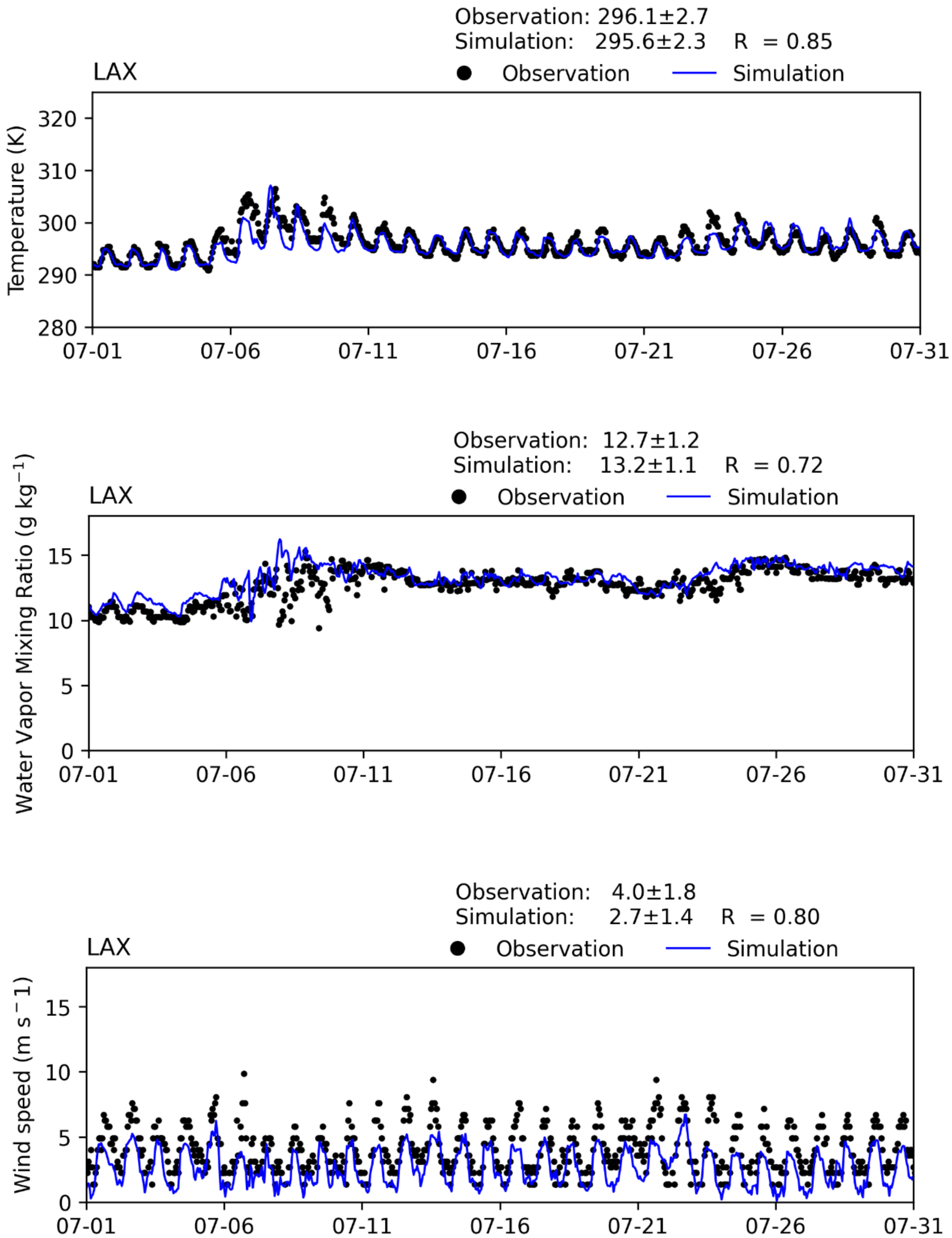


FIGURE V-A6
TIME SERIES OF HOURLY MEASUREMENTS AND WRF SIMULATIONS AT LOS ANGELES AIRPORT (LAX) FOR JULY 2018

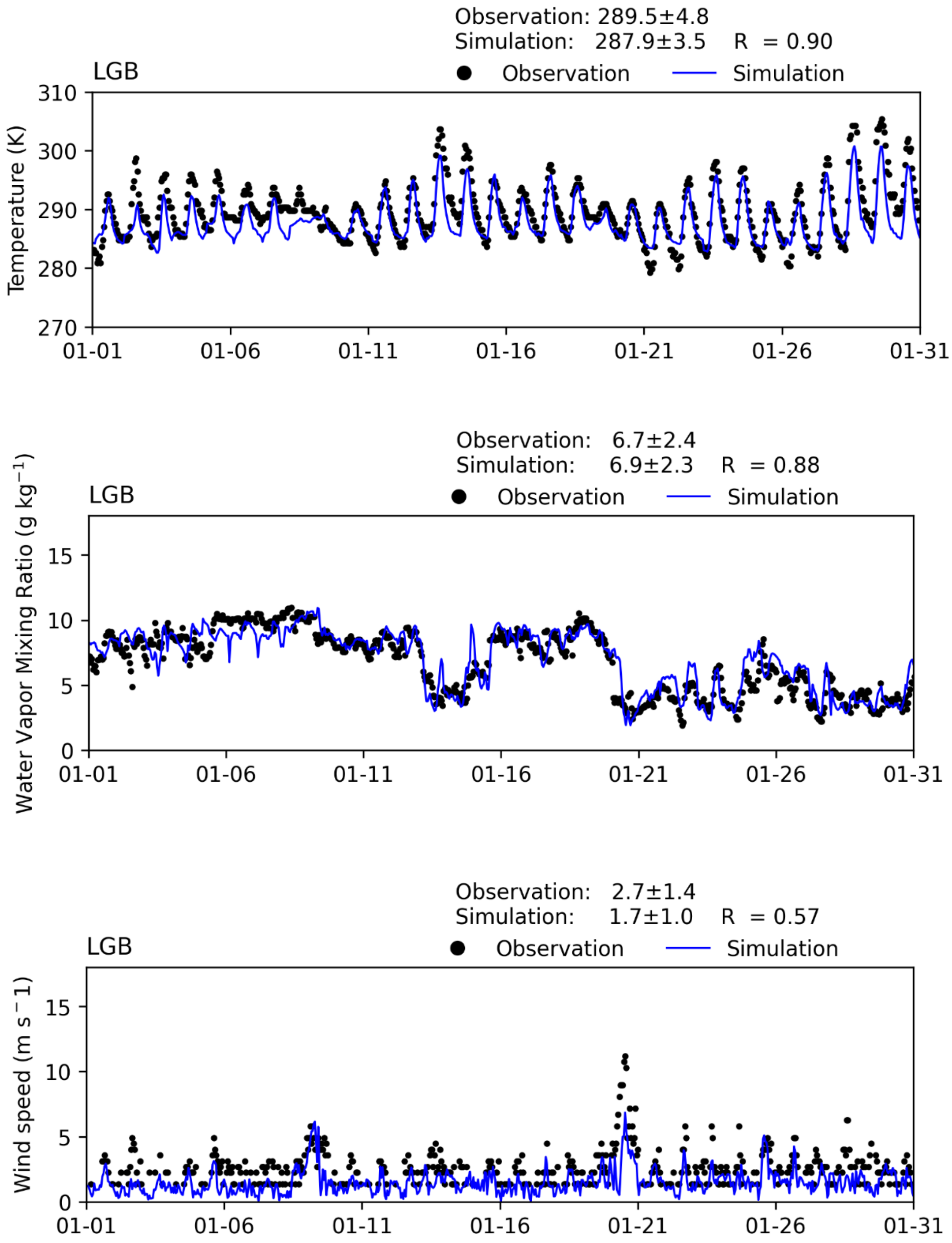


FIGURE V-A7
TIME SERIES OF HOURLY MEASUREMENTS AND WRF SIMULATIONS AT LONG BEACH AIRPORT (LGB) FOR JANUARY 2018

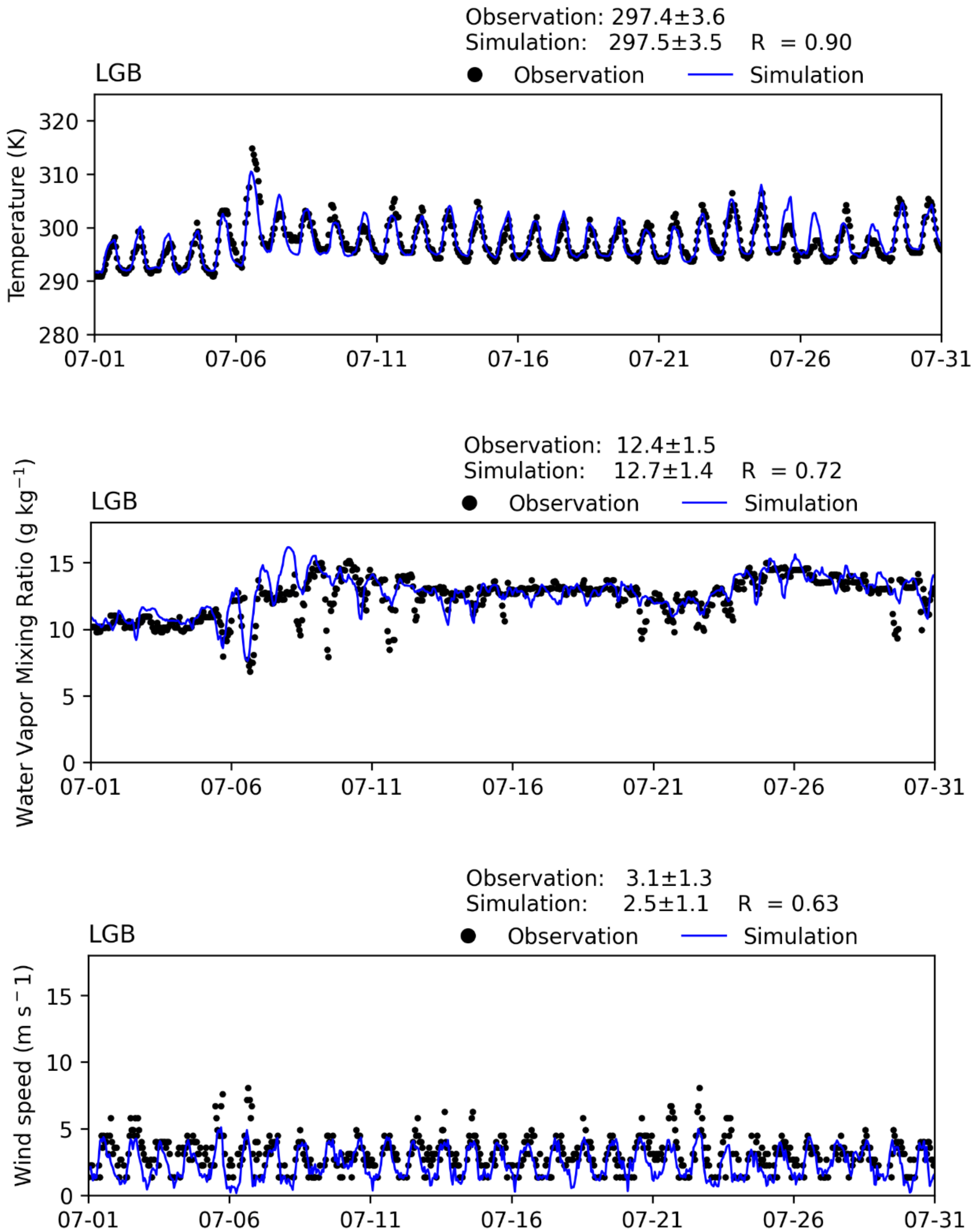


FIGURE V-A8
TIME SERIES OF HOURLY MEASUREMENTS AND WRF SIMULATIONS AT LONG BEACH AIRPORT (LGB) FOR JULY 2018

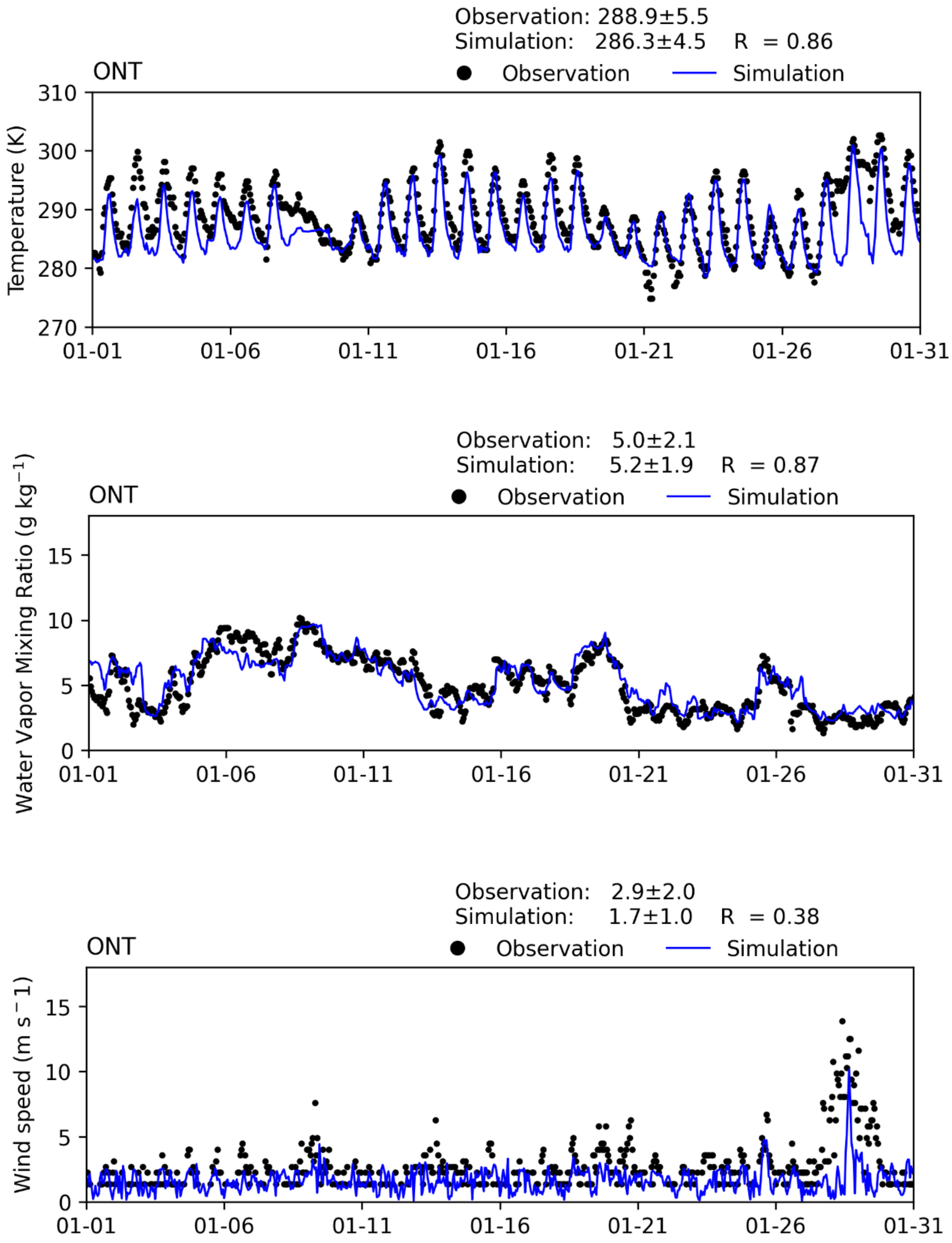
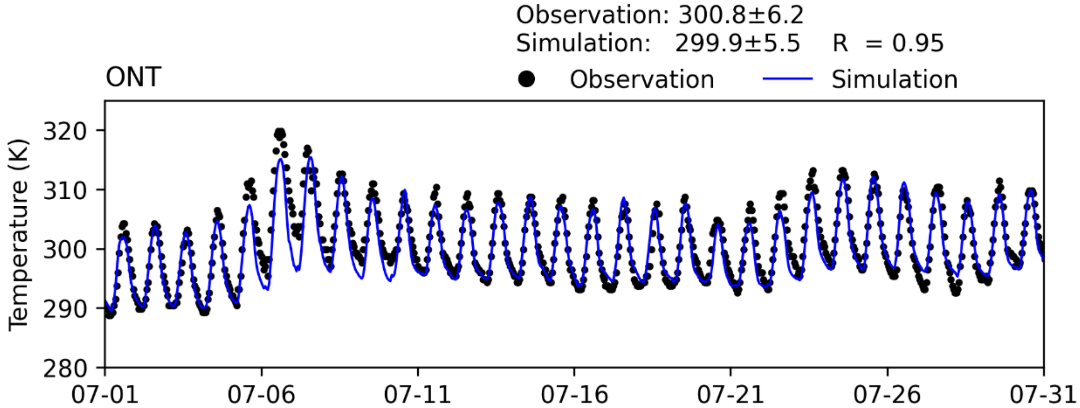
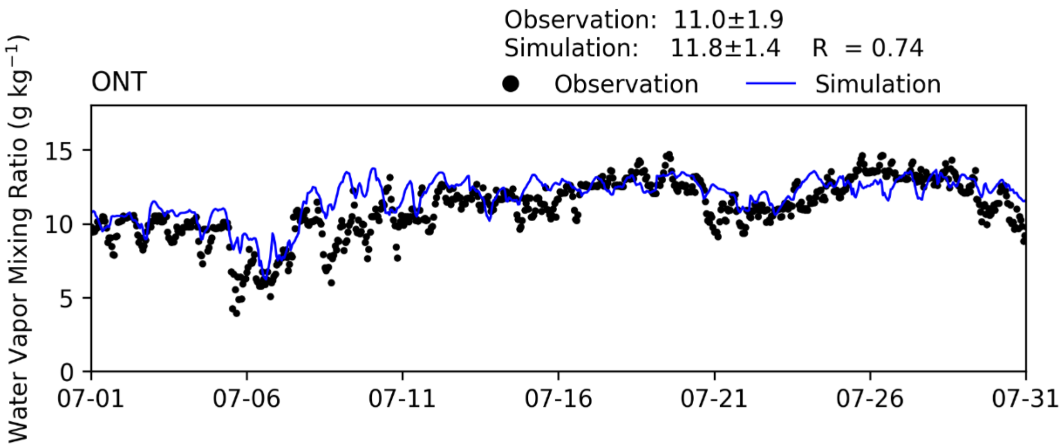


FIGURE V-A9
TIME SERIES OF HOURLY MEASUREMENTS AND WRF SIMULATIONS AT ONTARIO INTERNATIONAL AIRPORT (ONT) FOR JANUARY 2018





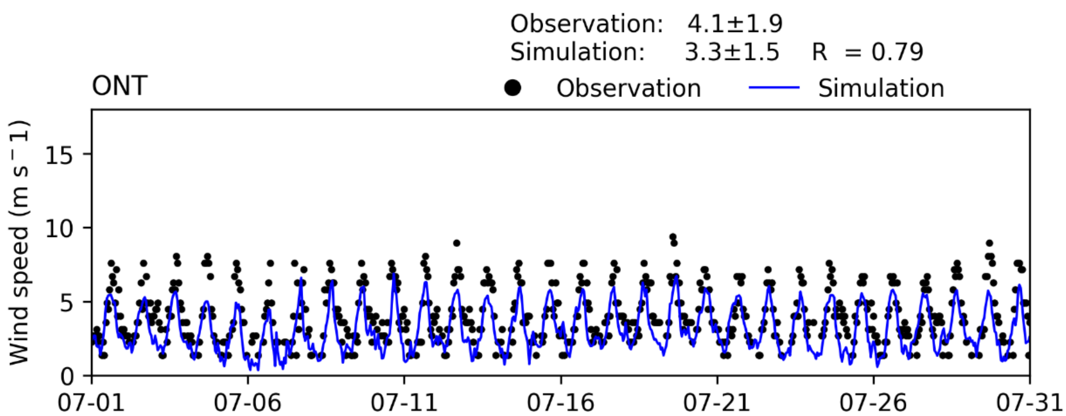


FIGURE V-A10

TIME SERIES OF HOURLY MEASUREMENTS AND WRF SIMULATIONS AT ONTARIO INTERNATIONAL AIRPORT (ONT) FOR JULY 2018

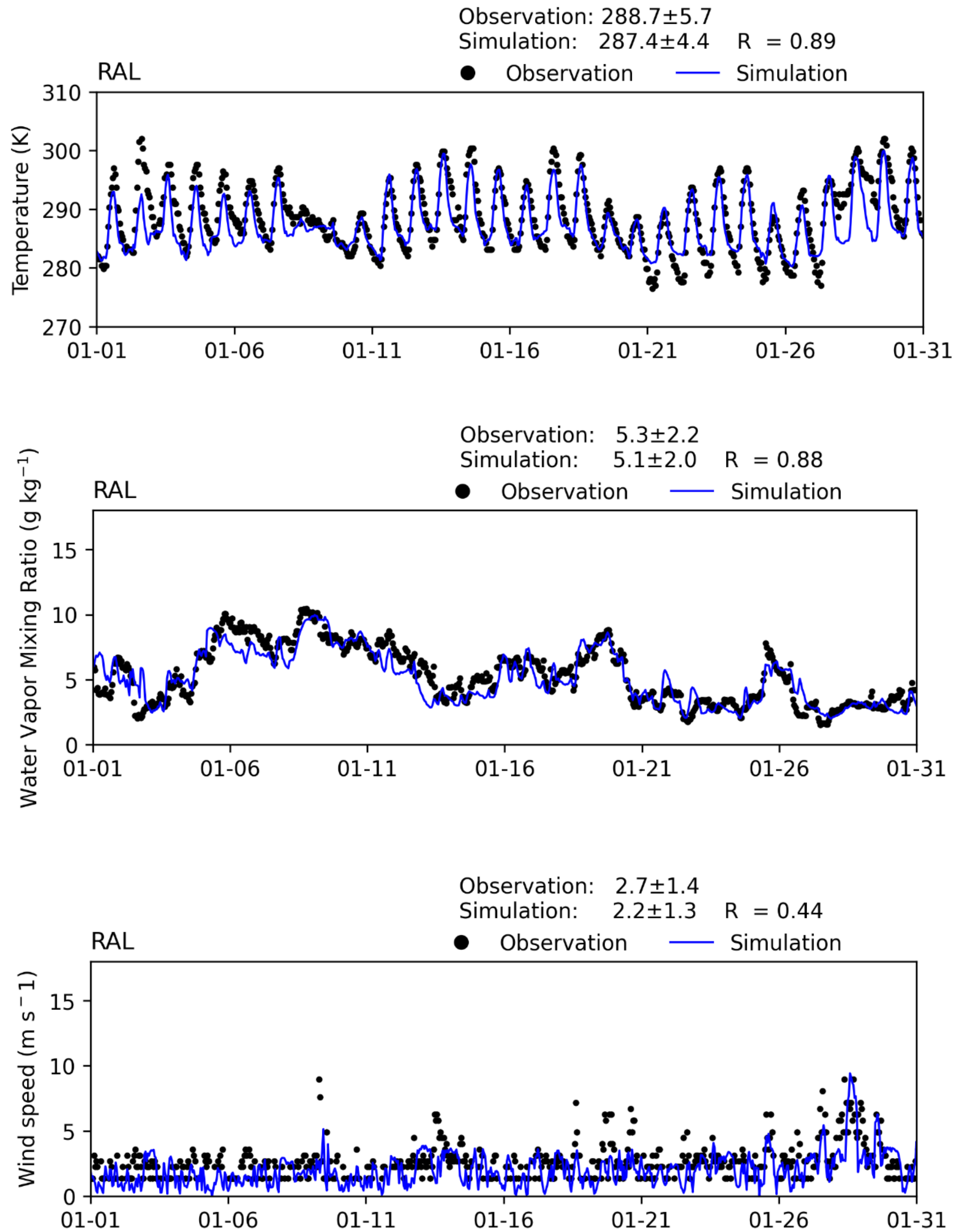


FIGURE V-A11
TIME SERIES OF HOURLY MEASUREMENTS AND WRF SIMULATIONS AT RIVERSIDE MUNICIPAL AIRPORT (RAL) FOR JANUARY 2018

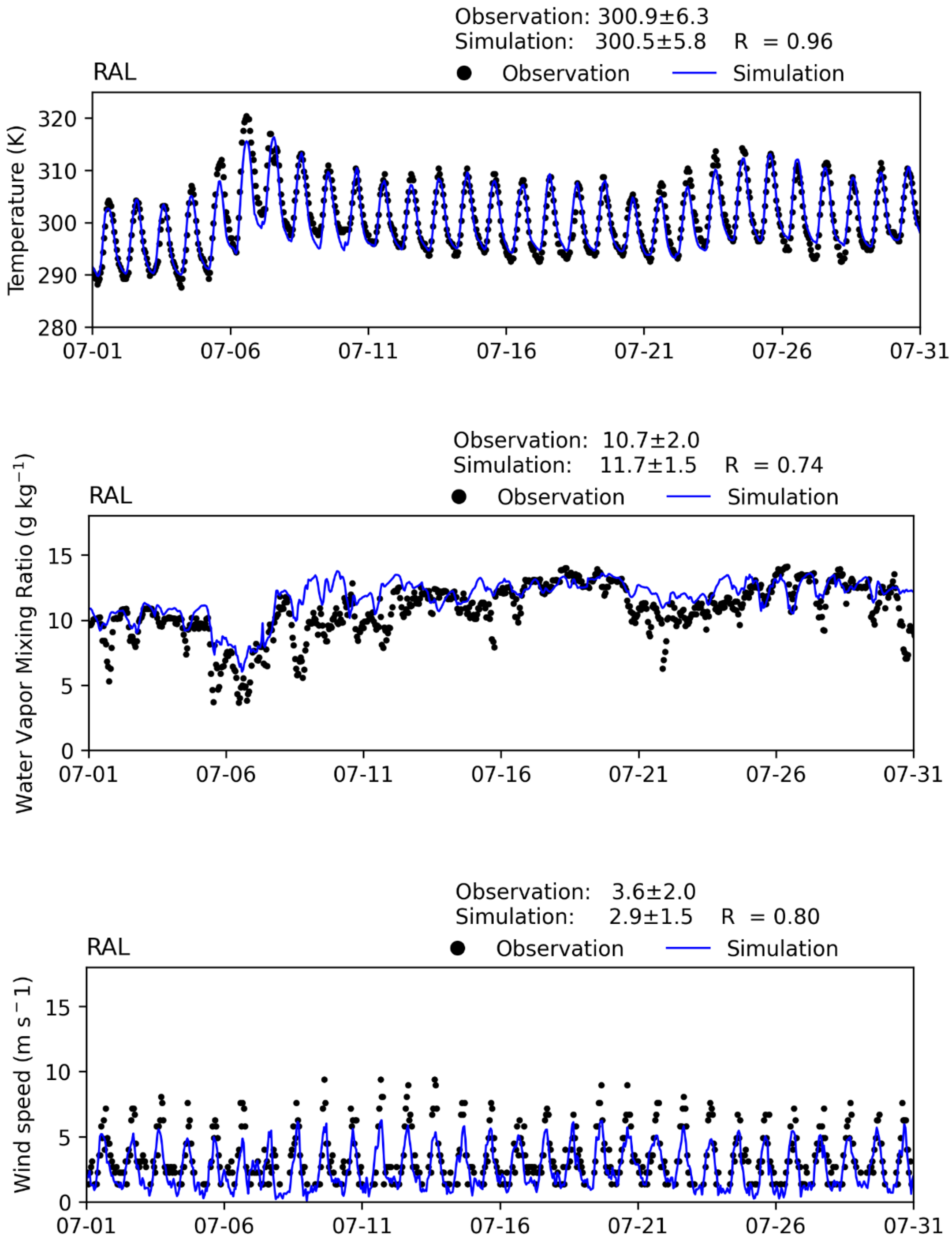


FIGURE V-A12

TIME SERIES OF HOURLY MEASUREMENTS AND WRF SIMULATIONS AT RIVERSIDE MUNICIPAL AIRPORT (RAL) FOR JULY 2018

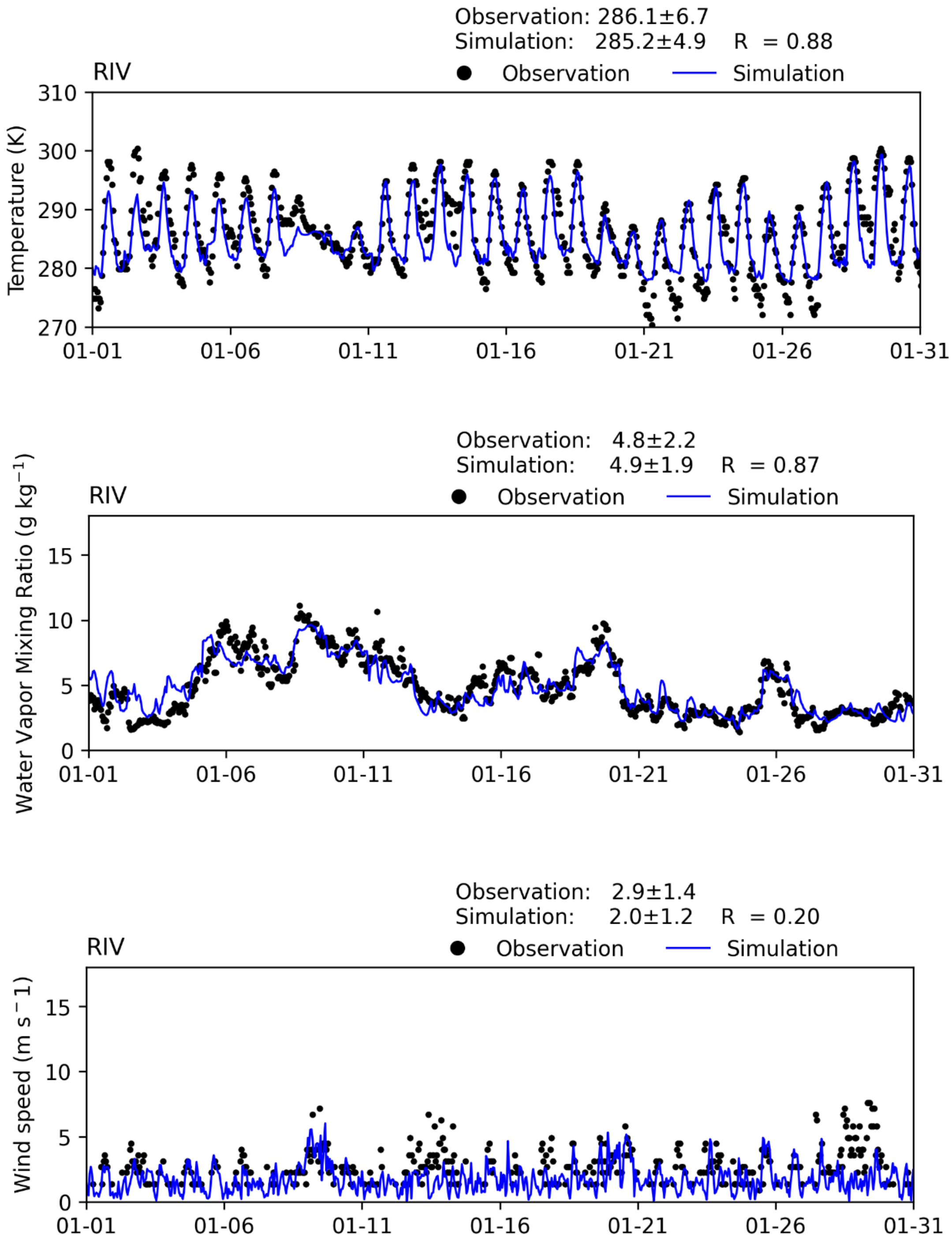


FIGURE V-A13

TIME SERIES OF HOURLY MEASUREMENTS AND WRF SIMULATIONS AT MARCH AIR RESERVE AIRPORT (RIV) FOR JANUARY 2018

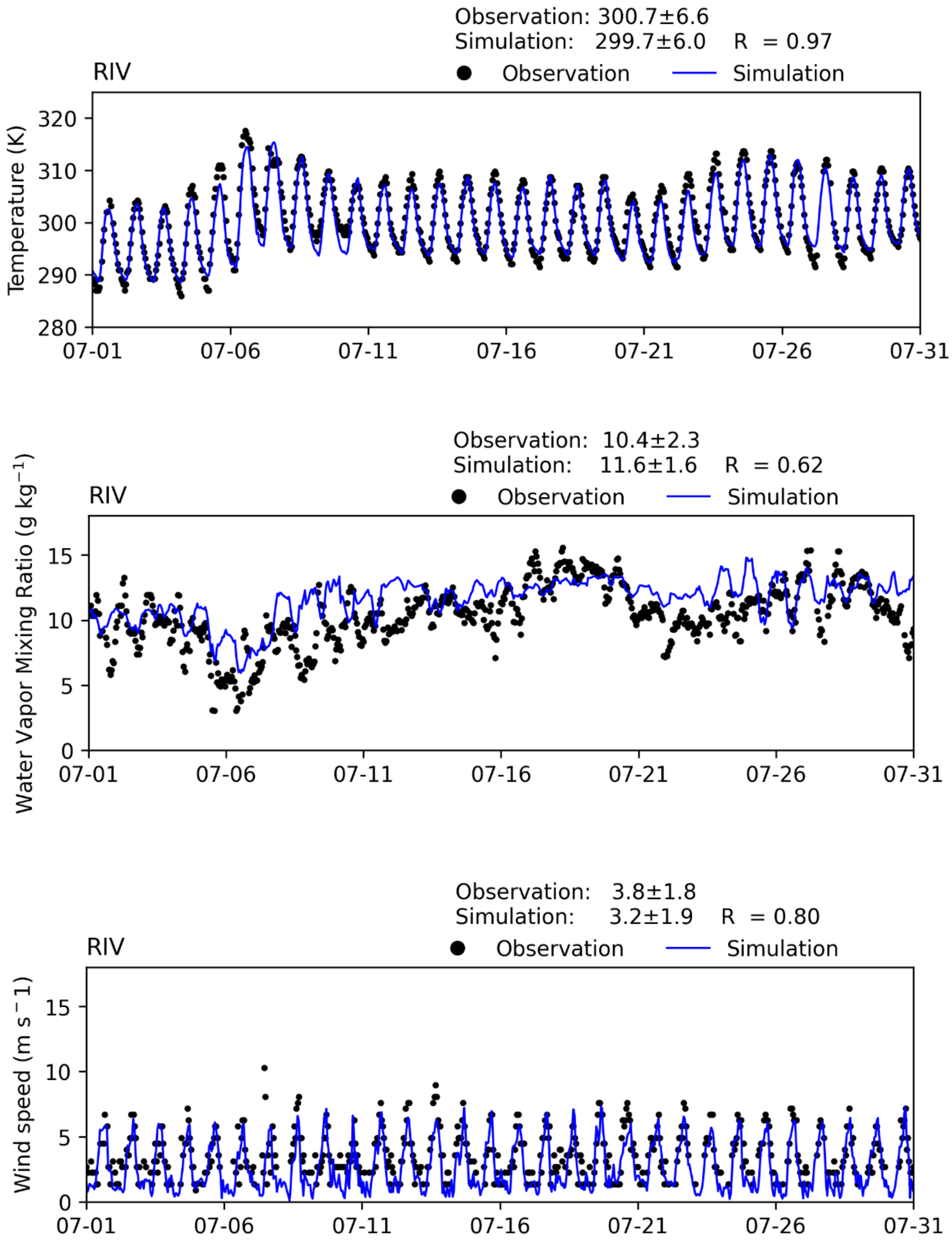
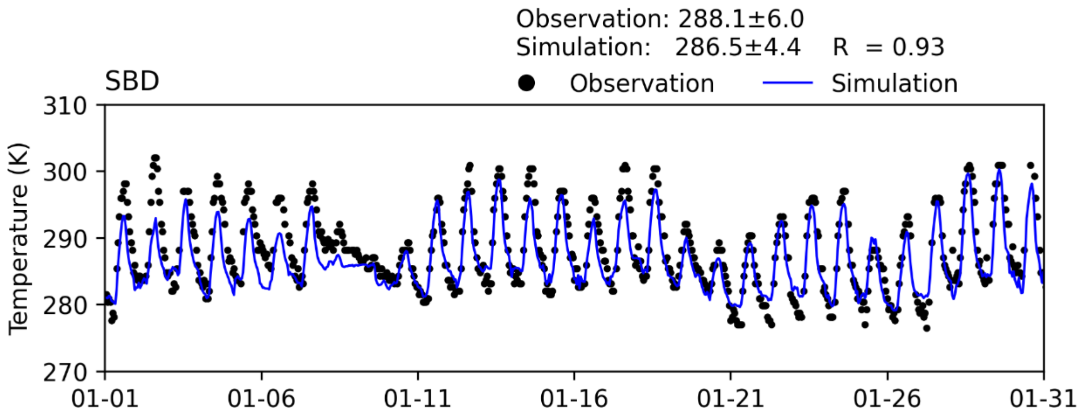
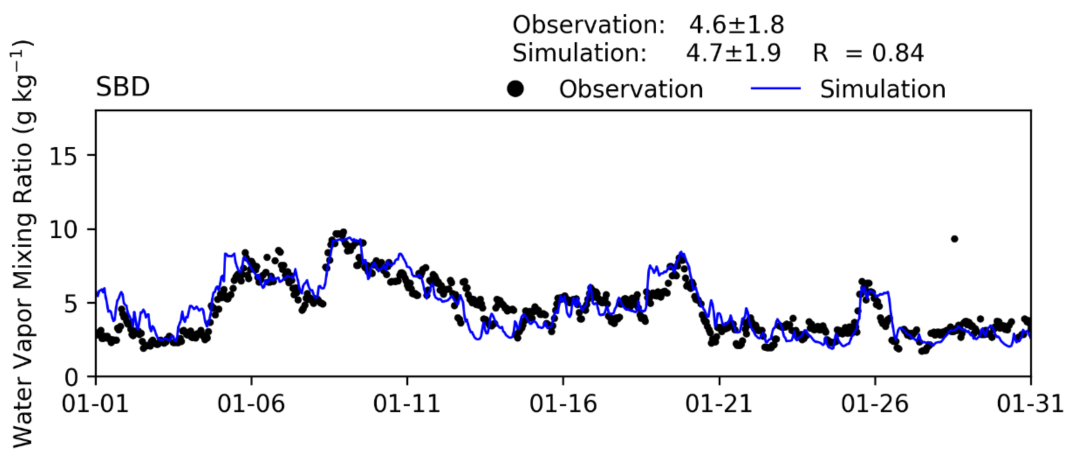


FIGURE V-A14

TIME SERIES OF HOURLY MEASUREMENTS AND WRF SIMULATIONS AT MARCH AIR RESERVE AIRPORT (RIV) FOR JULY 2018





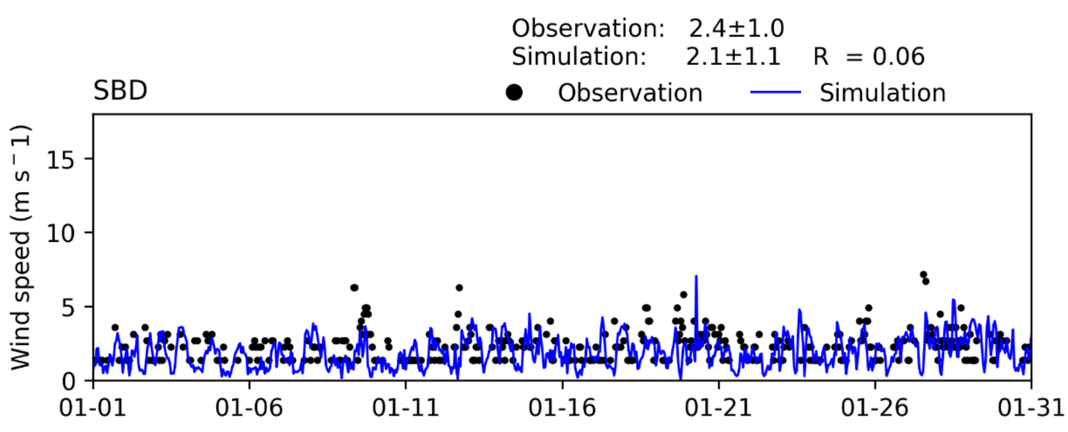


FIGURE V-A15
TIME SERIES OF HOURLY MEASUREMENTS AND WRF SIMULATIONS AT SAN BERNARDINO INTERNATIONAL AIRPORT (SBD) FOR JANUARY 2018

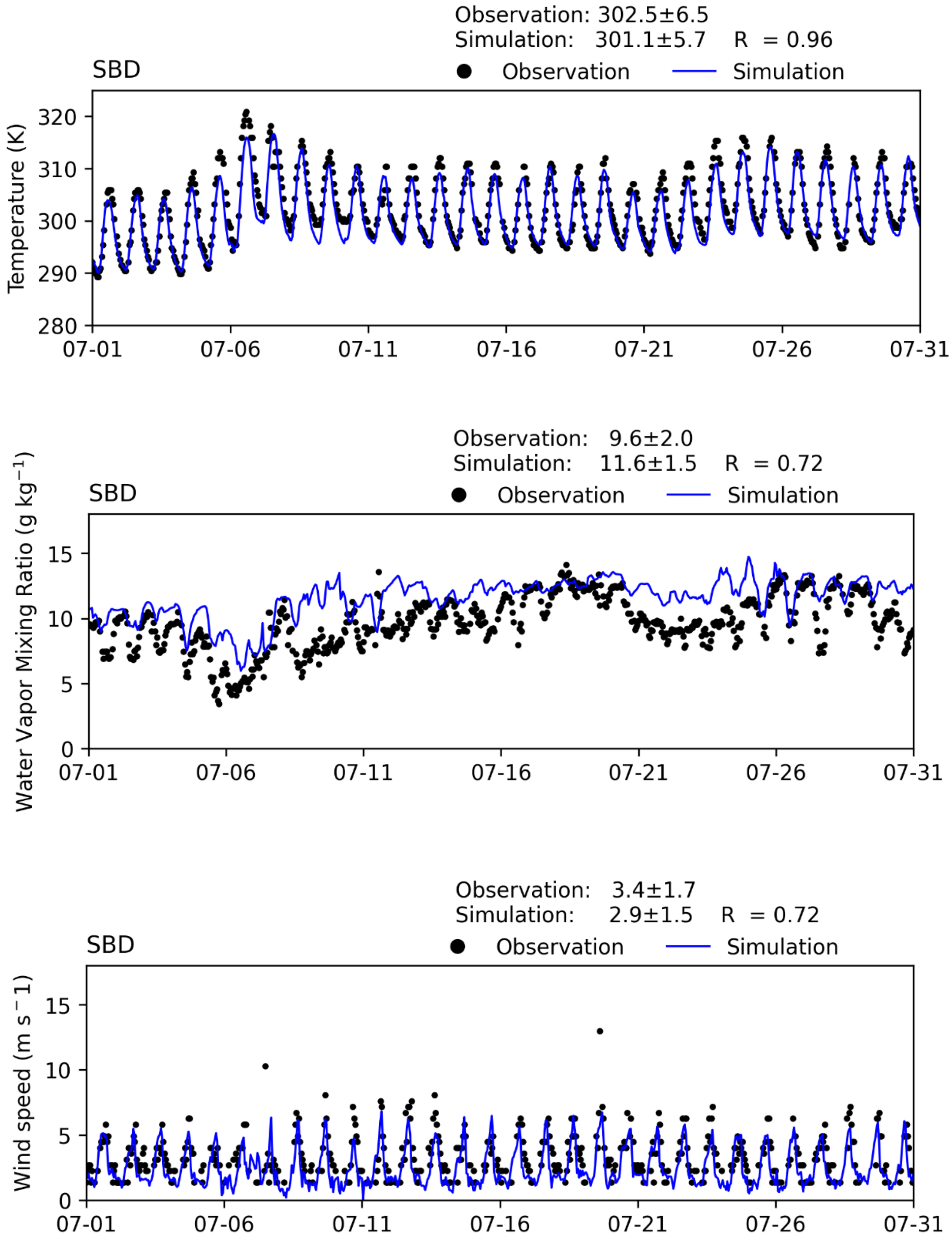


FIGURE V-A16
TIME SERIES OF HOURLY MEASUREMENTS AND WRF SIMULATIONS AT SAN BERNARDINO INTERNATIONAL AIRPORT (SBD) FOR JULY 2018

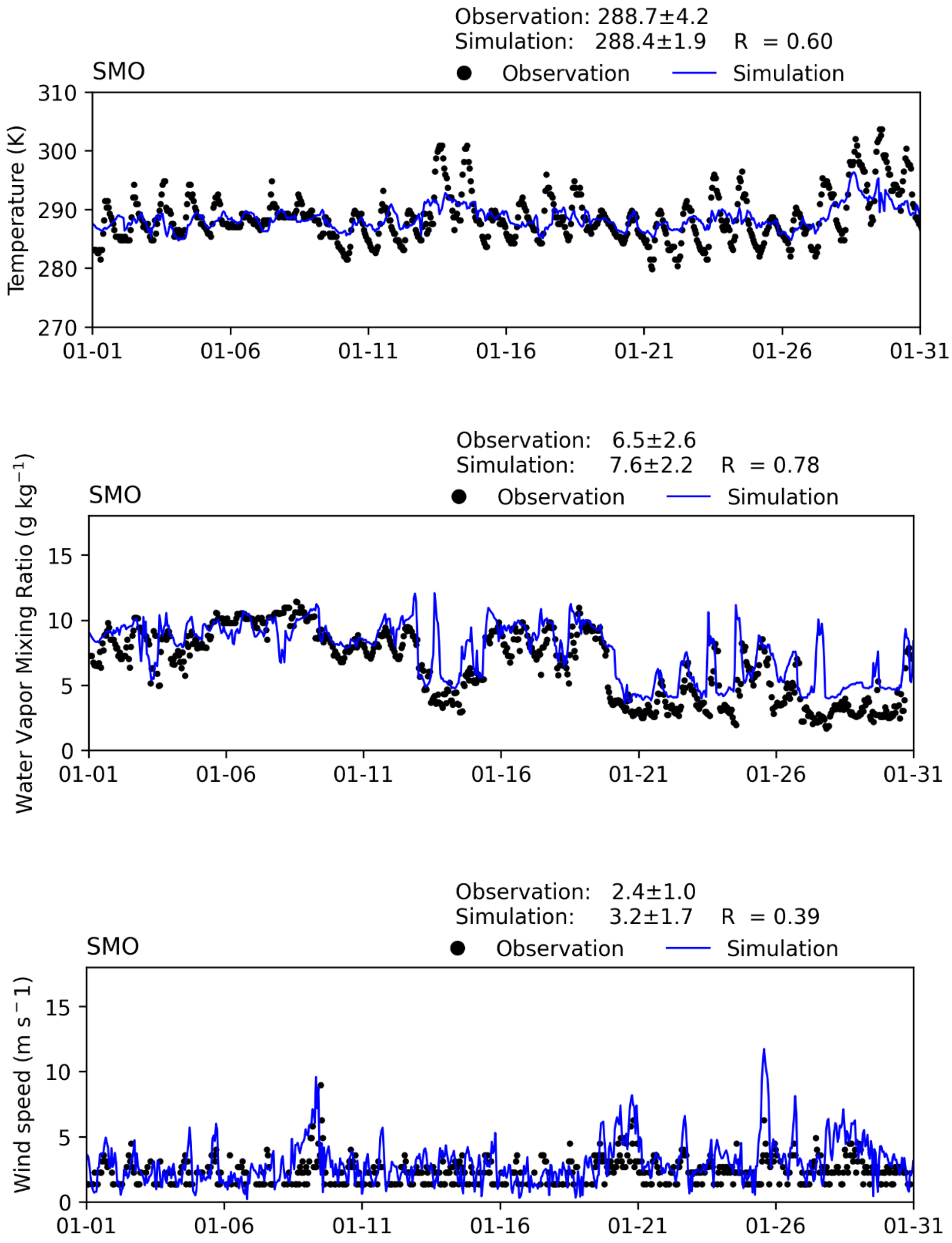


FIGURE V-A17
TIME SERIES OF HOURLY MEASUREMENTS AND WRF SIMULATIONS AT SANTA MONICA AIRPORT (SMO) FOR JANUARY 2018

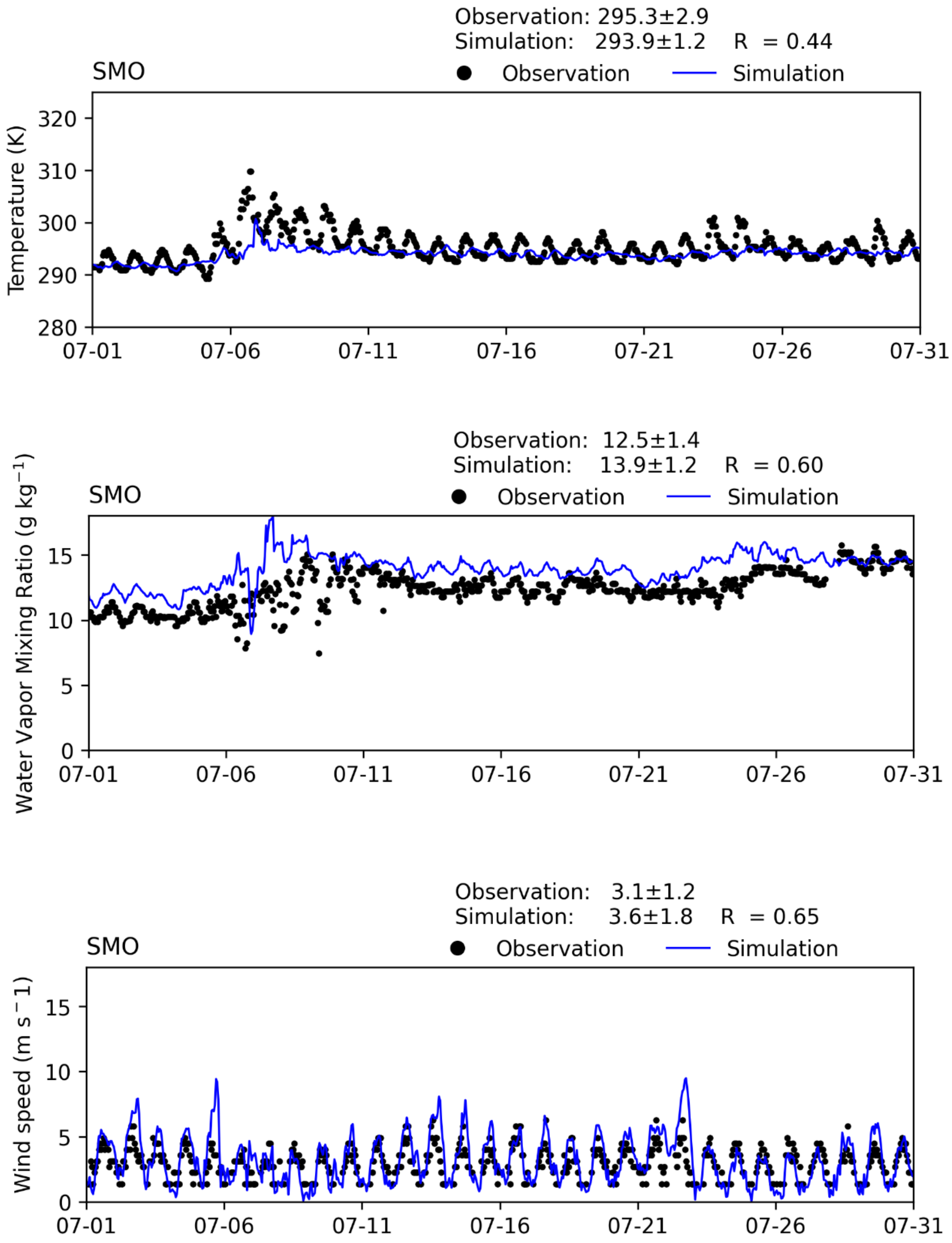


FIGURE V-A18
TIME SERIES OF HOURLY MEASUREMENTS AND WRF SIMULATIONS AT SANTA MONICA AIRPORT (SMO) FOR JULY 2018

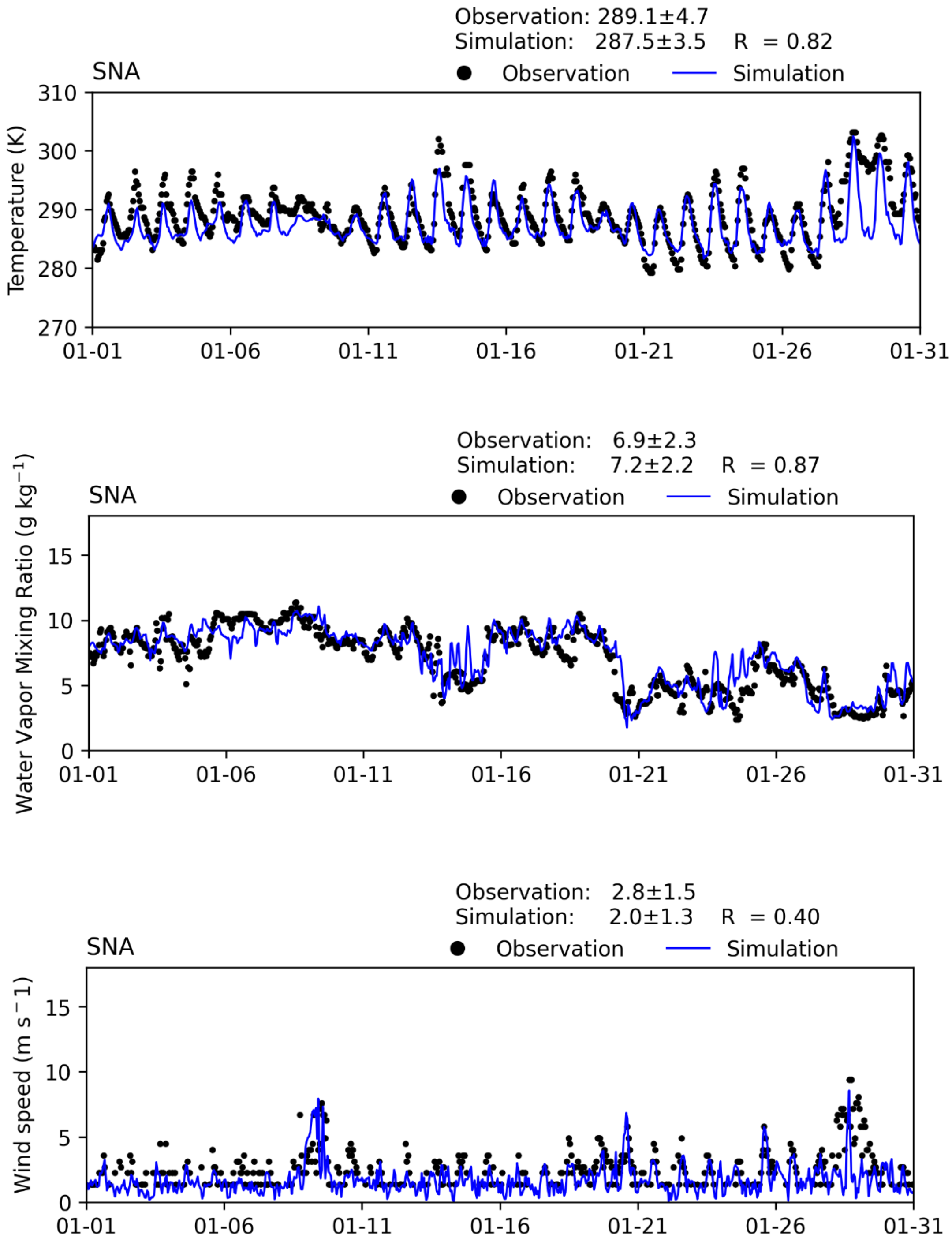


FIGURE V-A19

TIME SERIES OF HOURLY MEASUREMENTS AND WRF SIMULATIONS AT SANTA ANA JOHN WAYNE AIRPORT (SNA) FOR JANUARY 2018

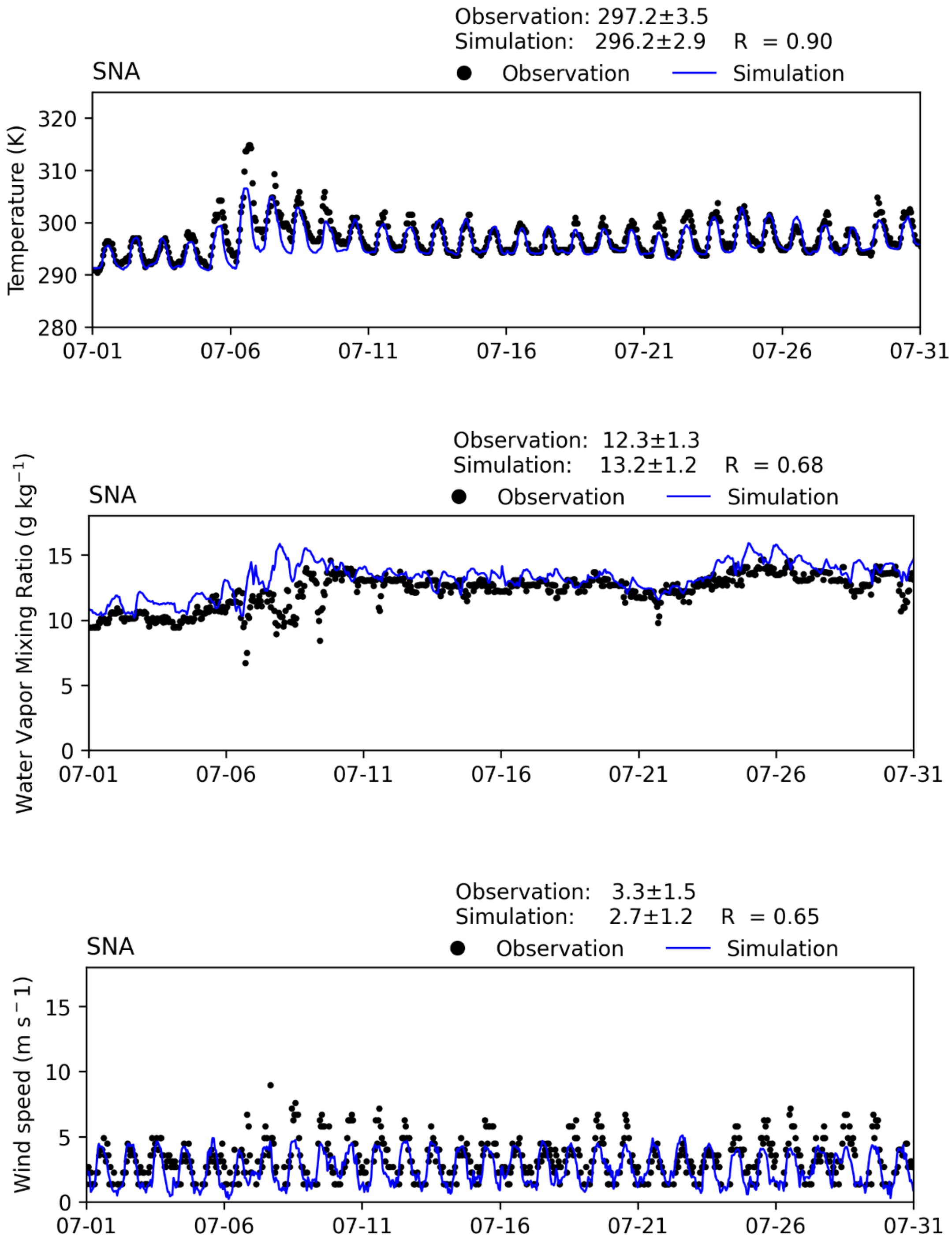


FIGURE V-A20
TIME SERIES OF HOURLY MEASUREMENTS AND WRF SIMULATIONS AT SANTA ANA JOHN WAYNE AIRPORT (SNA) FOR JULY 2018

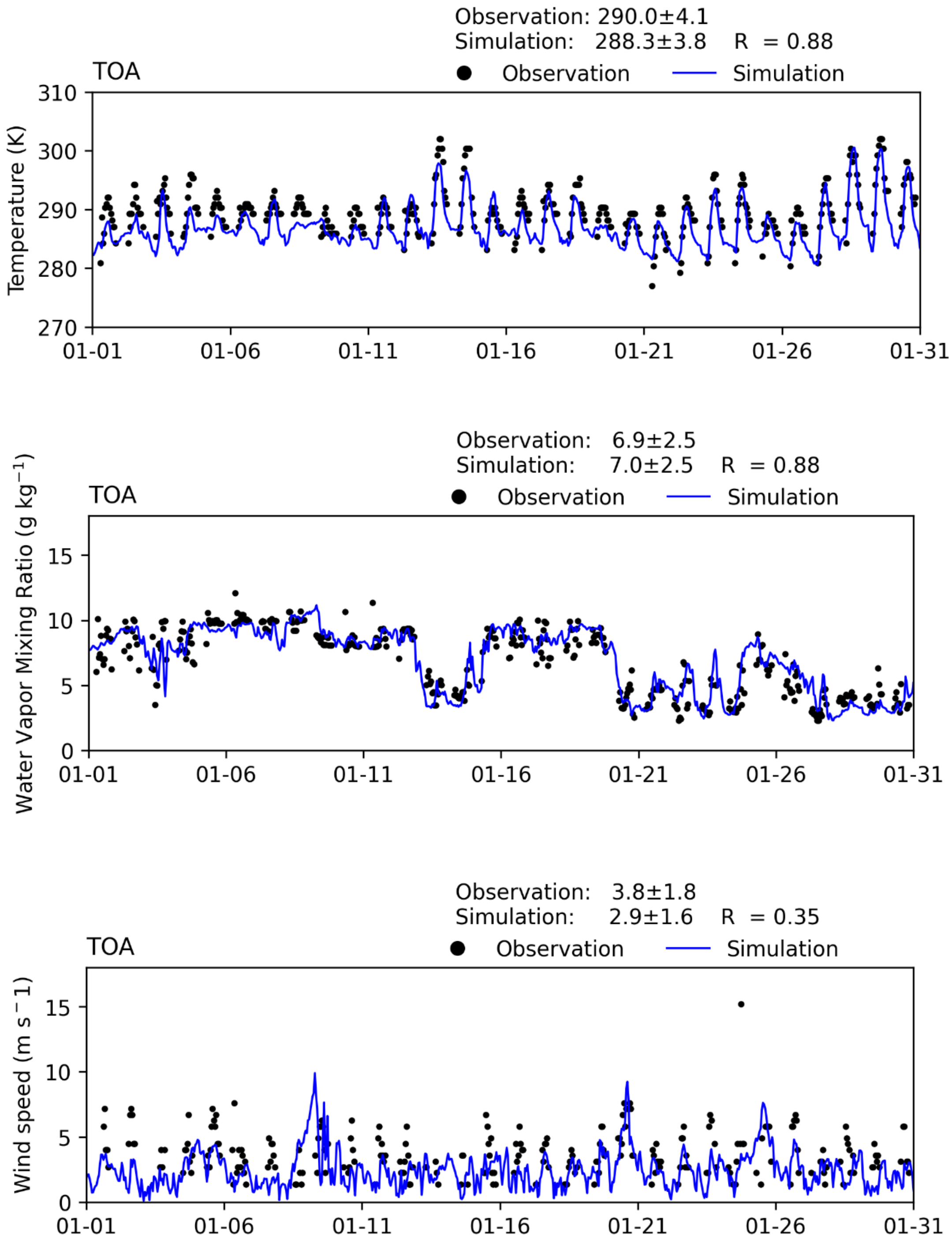


FIGURE V-A21

TIME SERIES OF HOURLY MEASUREMENTS AND WRF SIMULATIONS AT TORRANCE (TOA) FOR JANUARY 2018

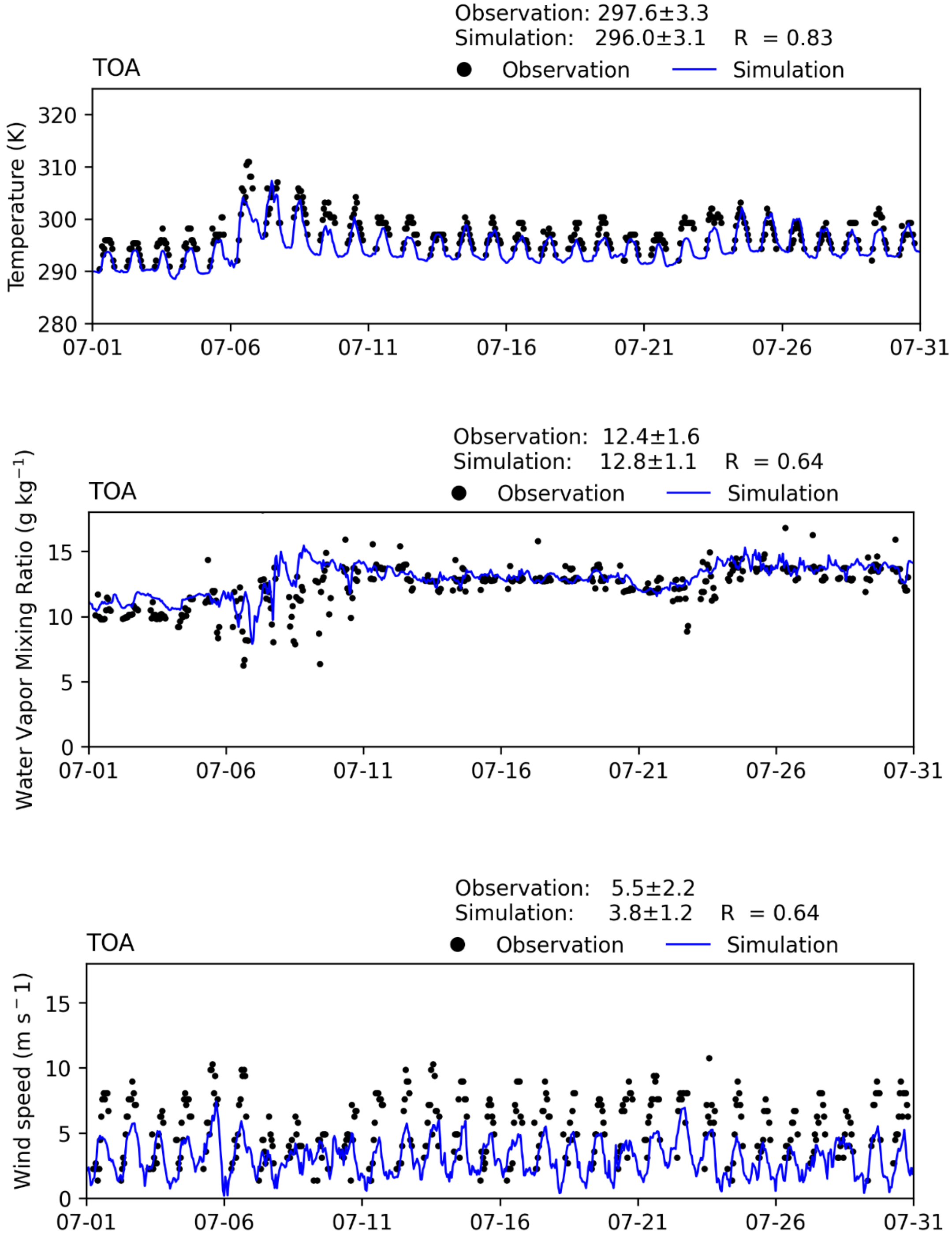


FIGURE V-A22
TIME SERIES OF HOURLY MEASUREMENTS AND WRF SIMULATIONS AT TORRANCE (TOA) FOR JULY 2018

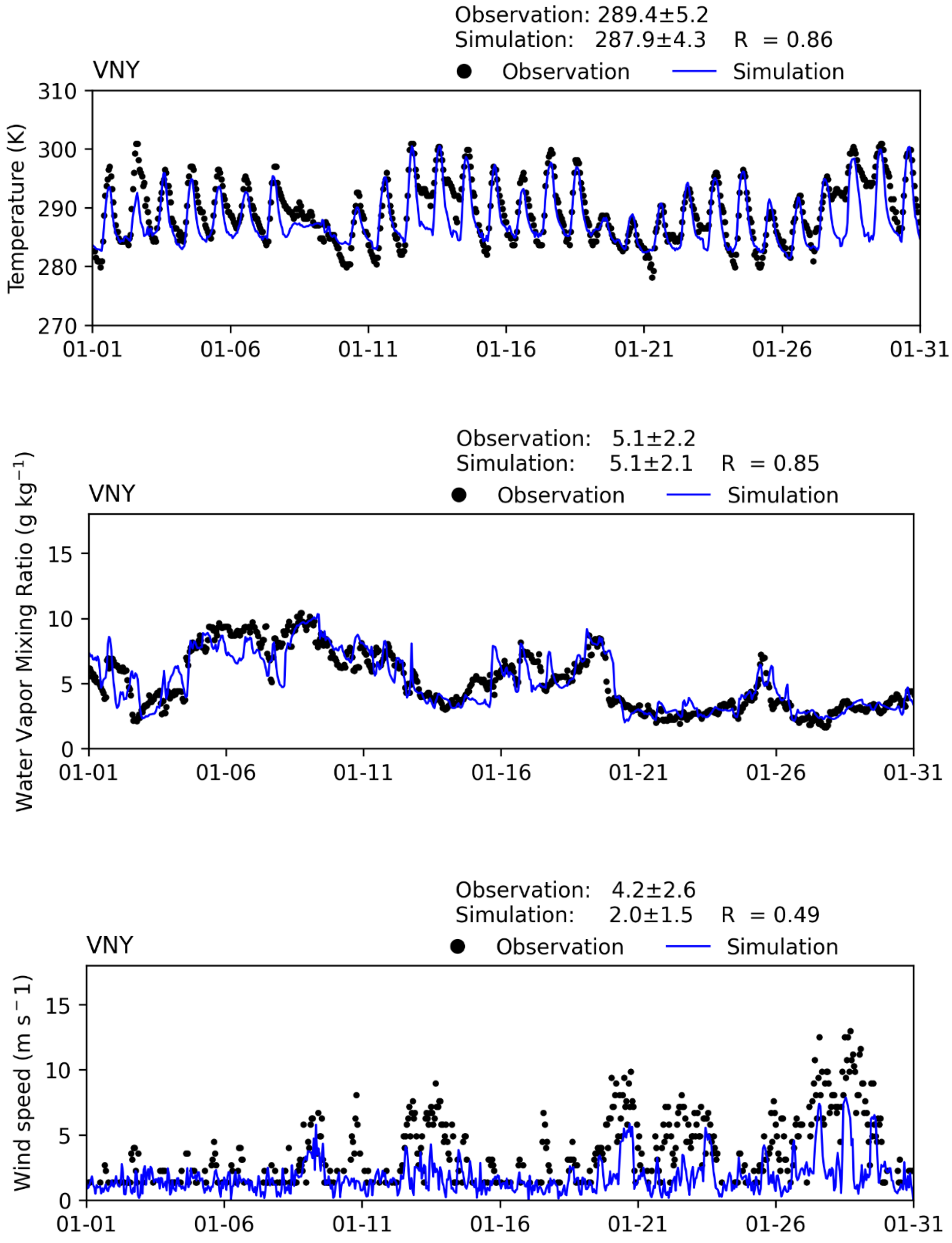
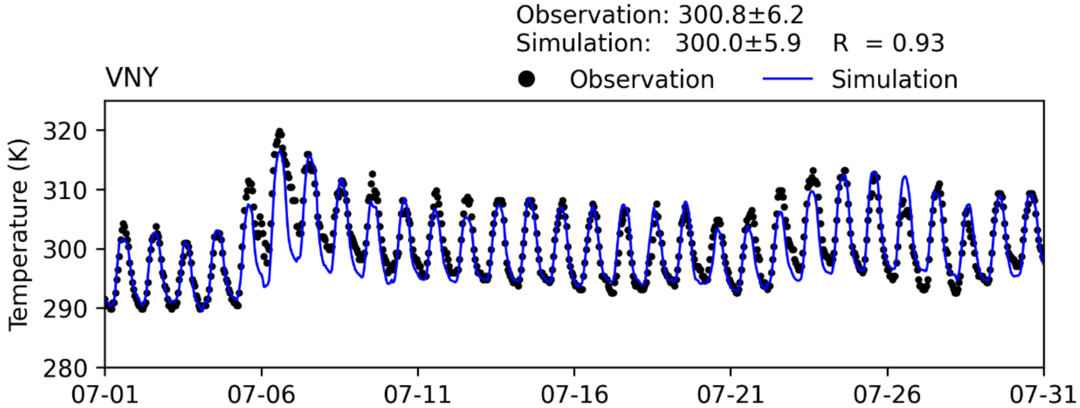
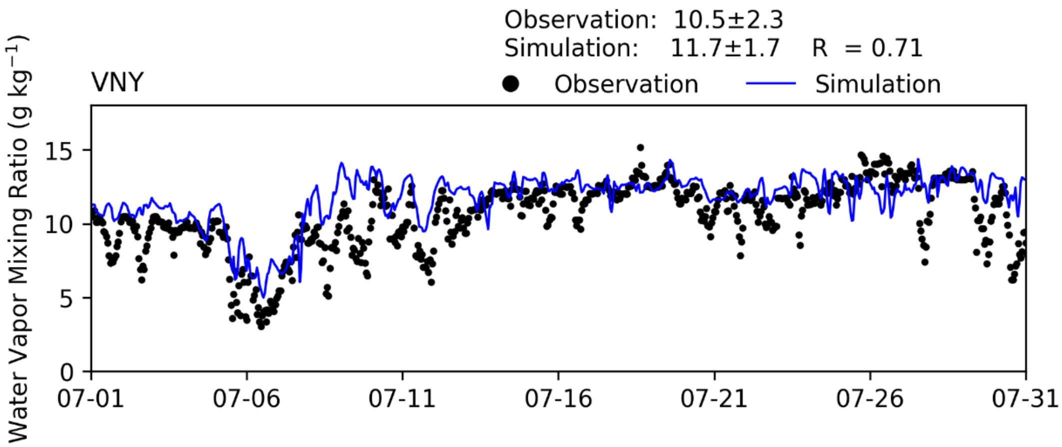


FIGURE V-A23

TIME SERIES OF HOURLY MEASUREMENTS AND WRF SIMULATIONS AT VAN NUYS AIRPORT (VNY) FOR JANUARY 2018





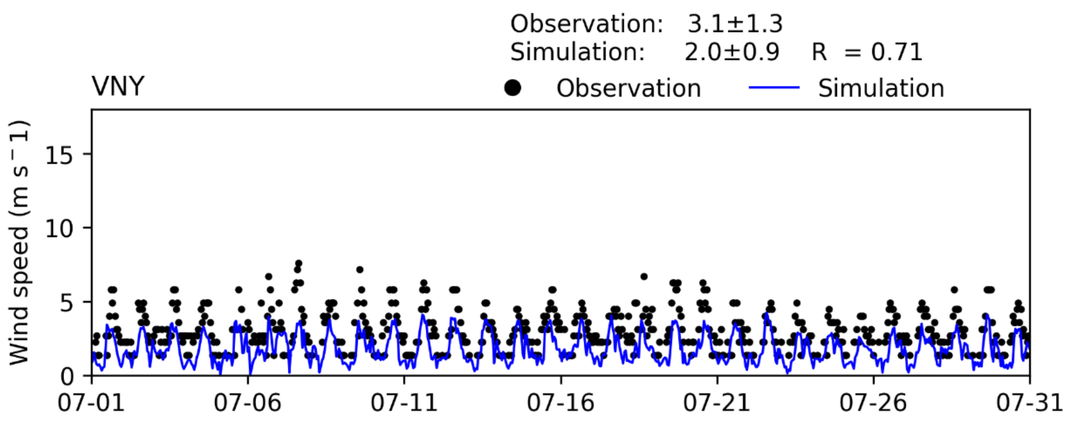


FIGURE V-A24
TIME SERIES OF HOURLY MEASUREMENTS AND WRF SIMULATIONS AT VAN NUYS AIRPORT WR(VNY) FOR JULY 2018

Attachment 2

CMAQ MODEL PERFORMANCE TIME SERIES

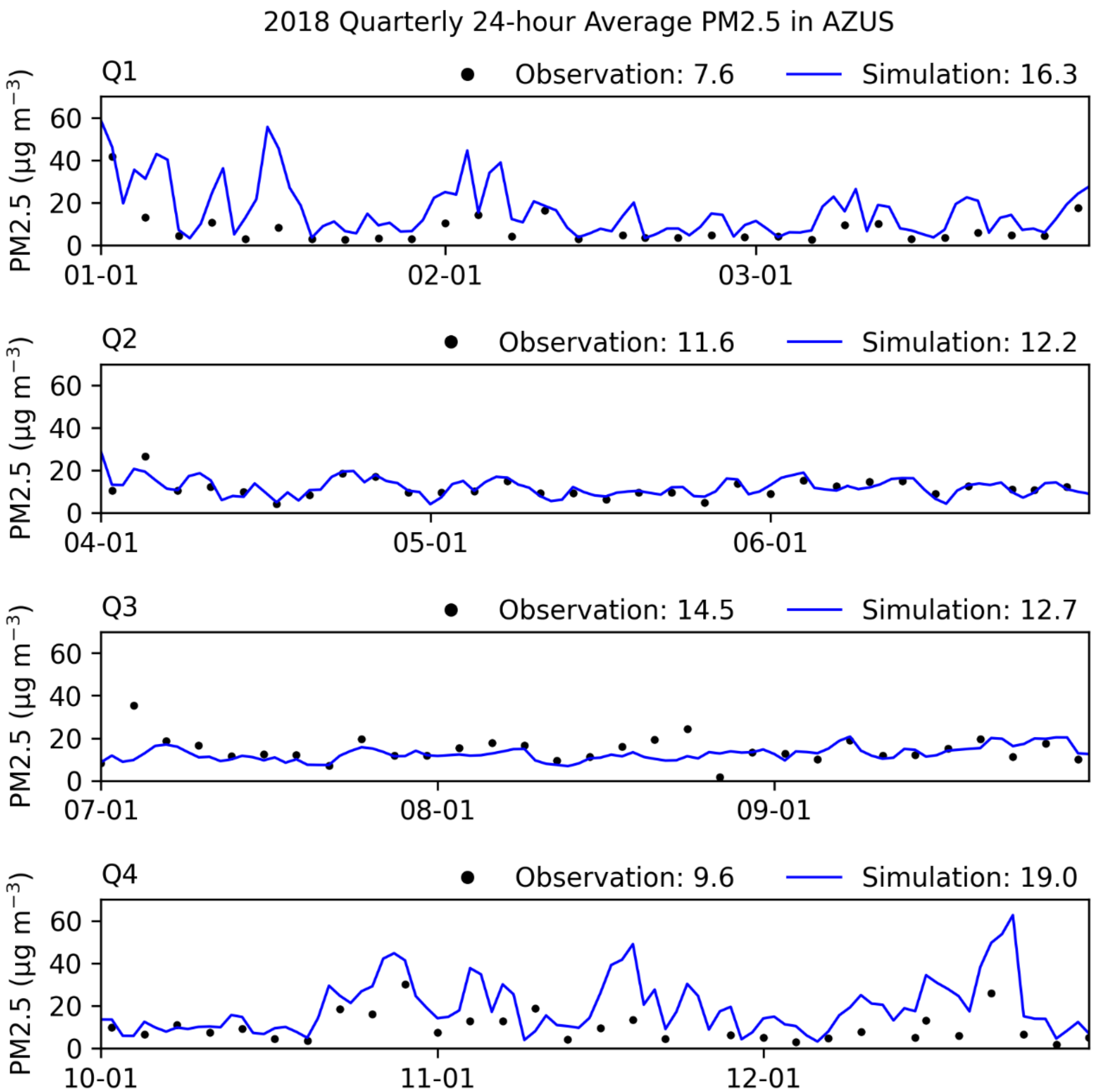


FIGURE 1

2018 Modelled and Measured 24-hour Average PM2.5 Concentrations in Azusa

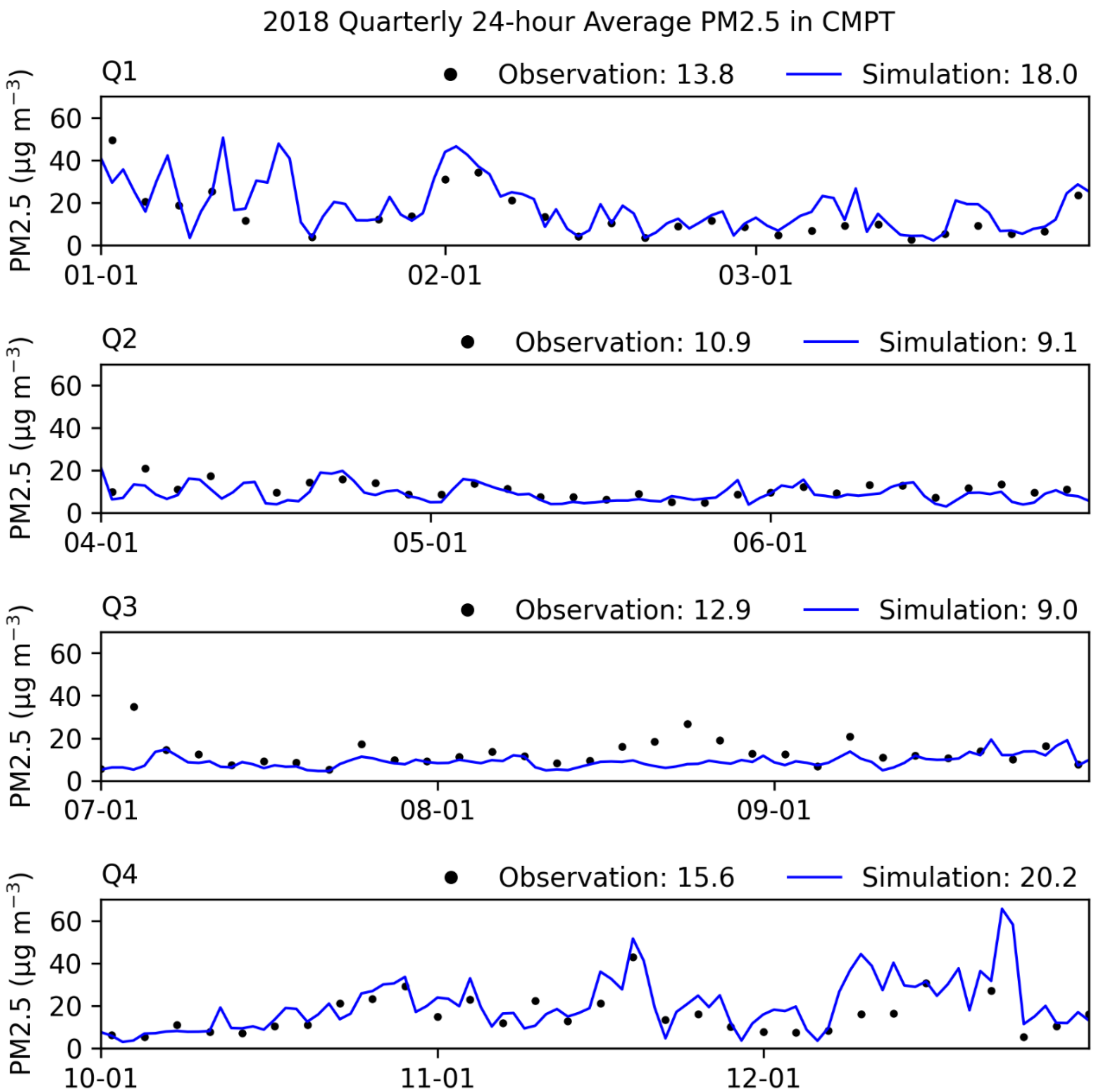


FIGURE 2

2018 Modelled and Measured 24-hour Average PM2.5 Concentrations in Compton

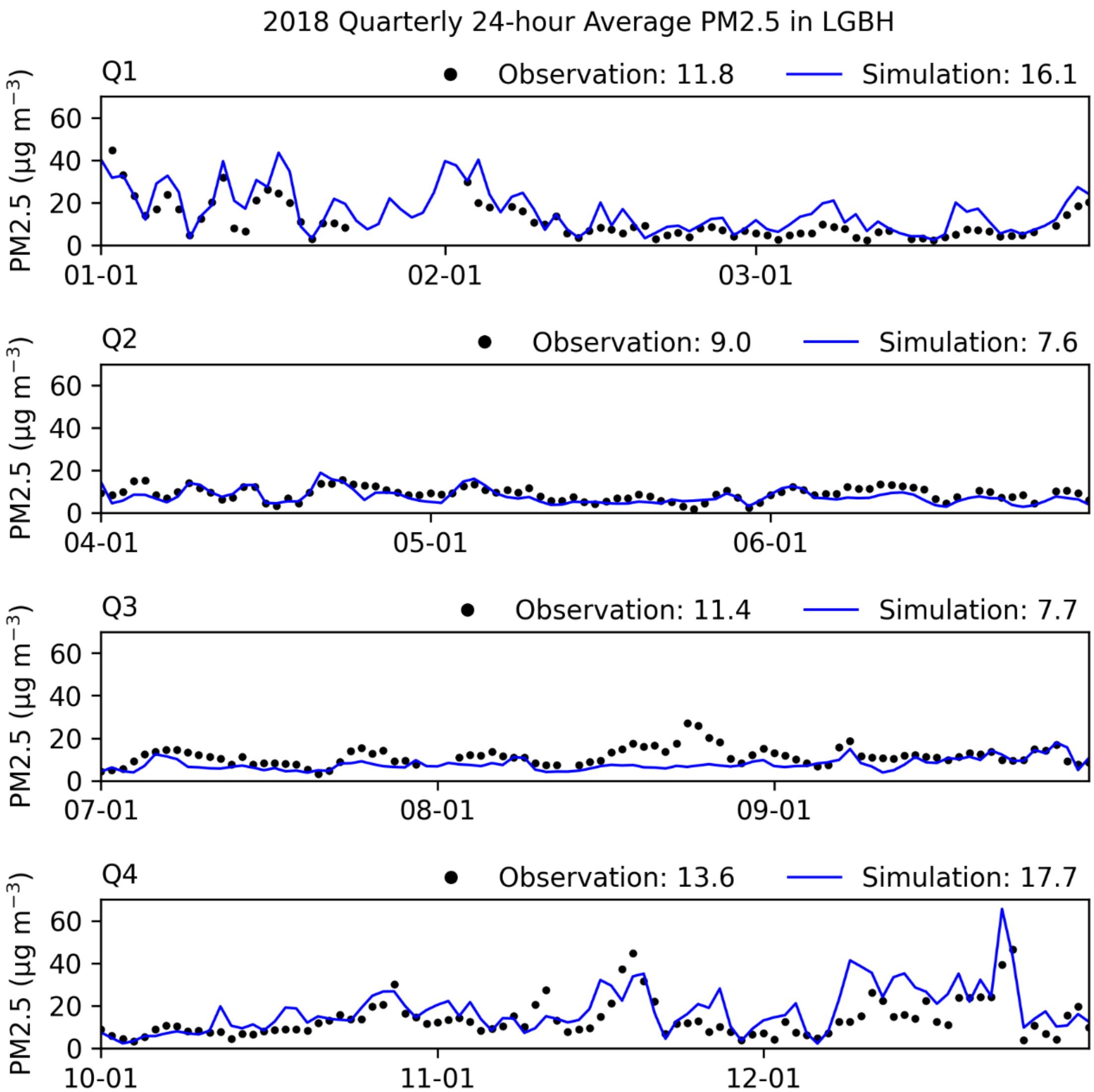


FIGURE 3

2018 Modelled and Measured 24-hour Average PM2.5 Concentrations in Long Beach

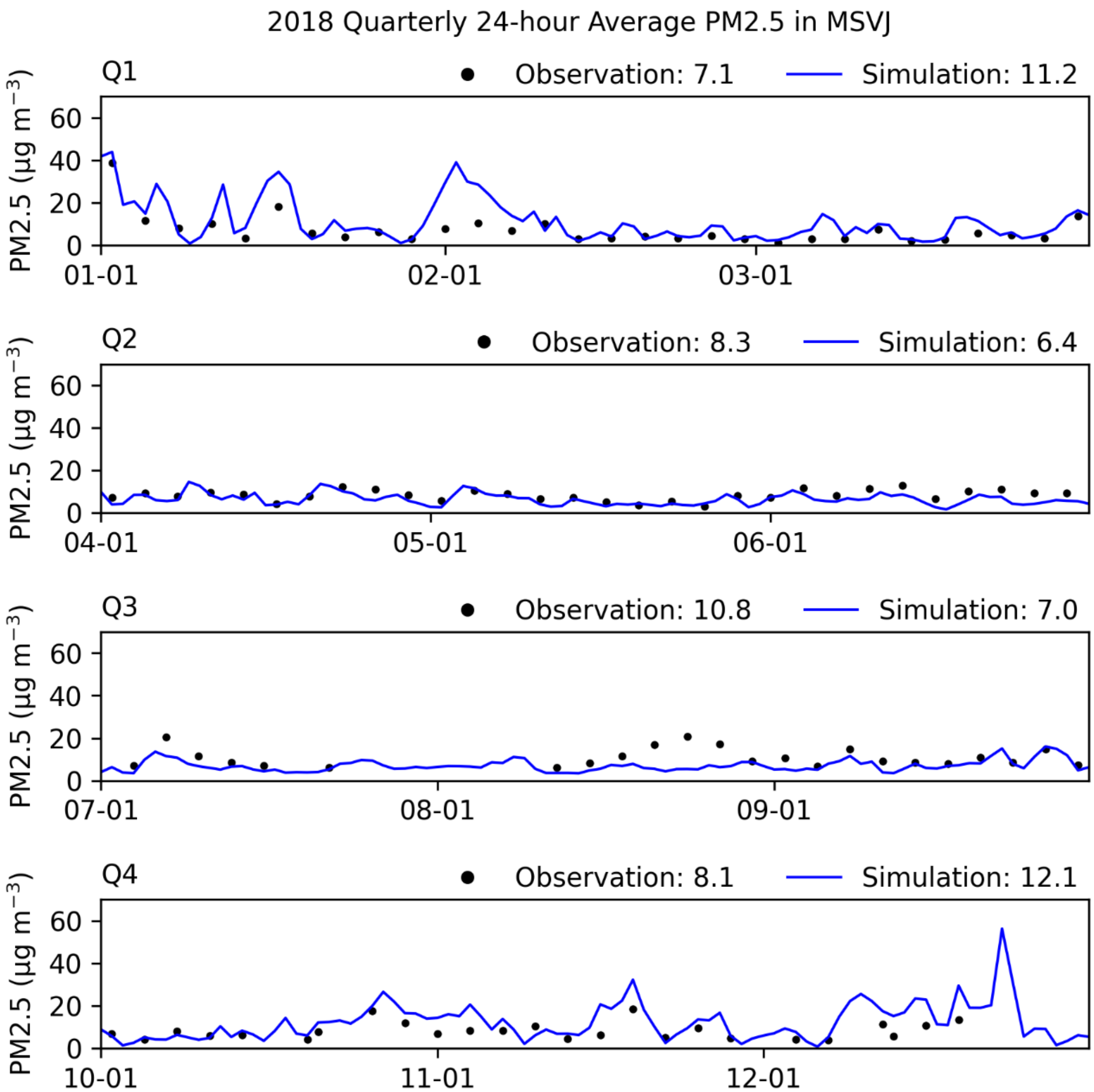


FIGURE 4

2018 Modelled and Measured 24-hour Average PM2.5 Concentrations in Mission Viejo

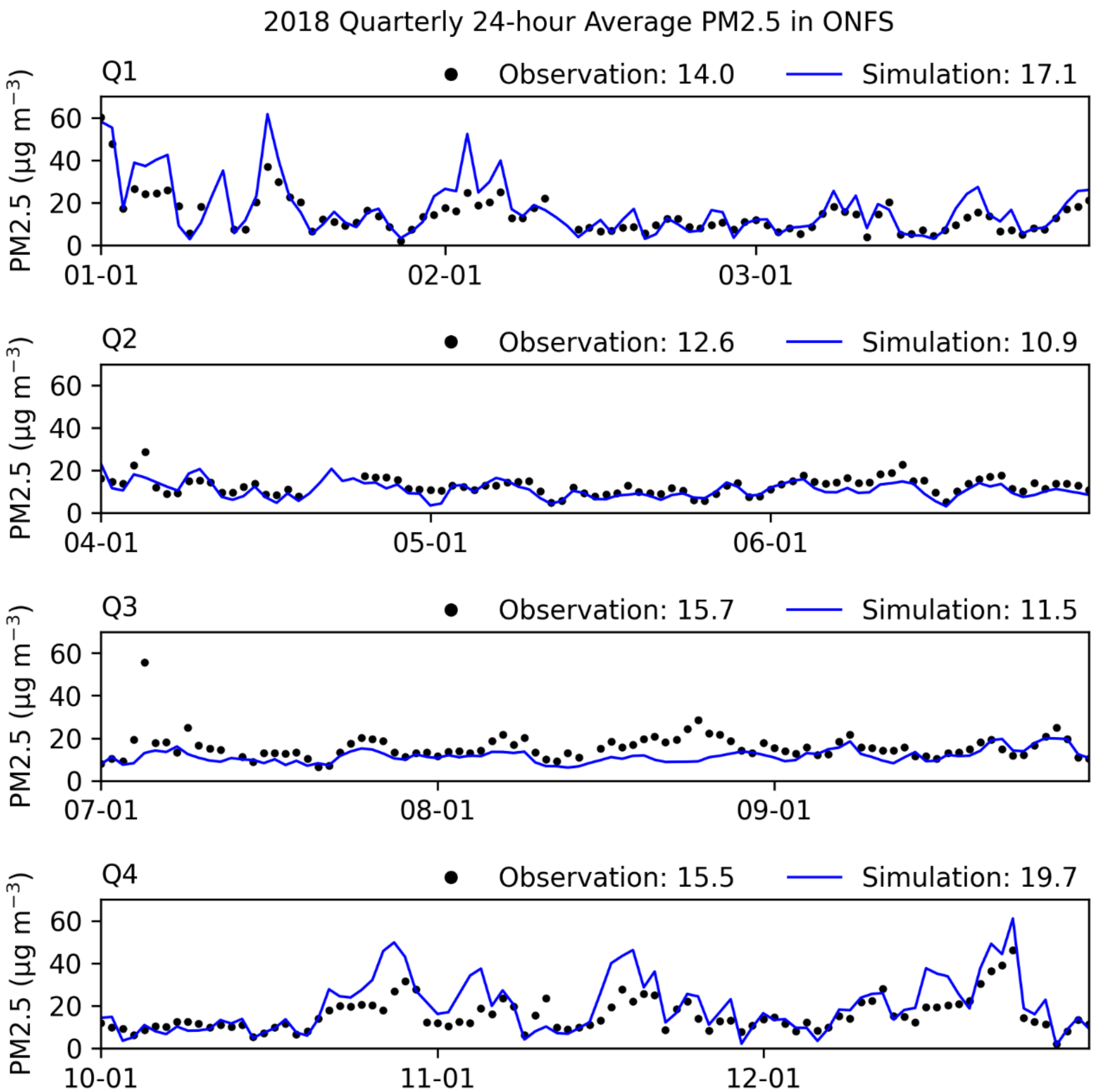


FIGURE 5

2018 Modelled and Measured 24-hour Average PM2.5 Concentrations in Ontario

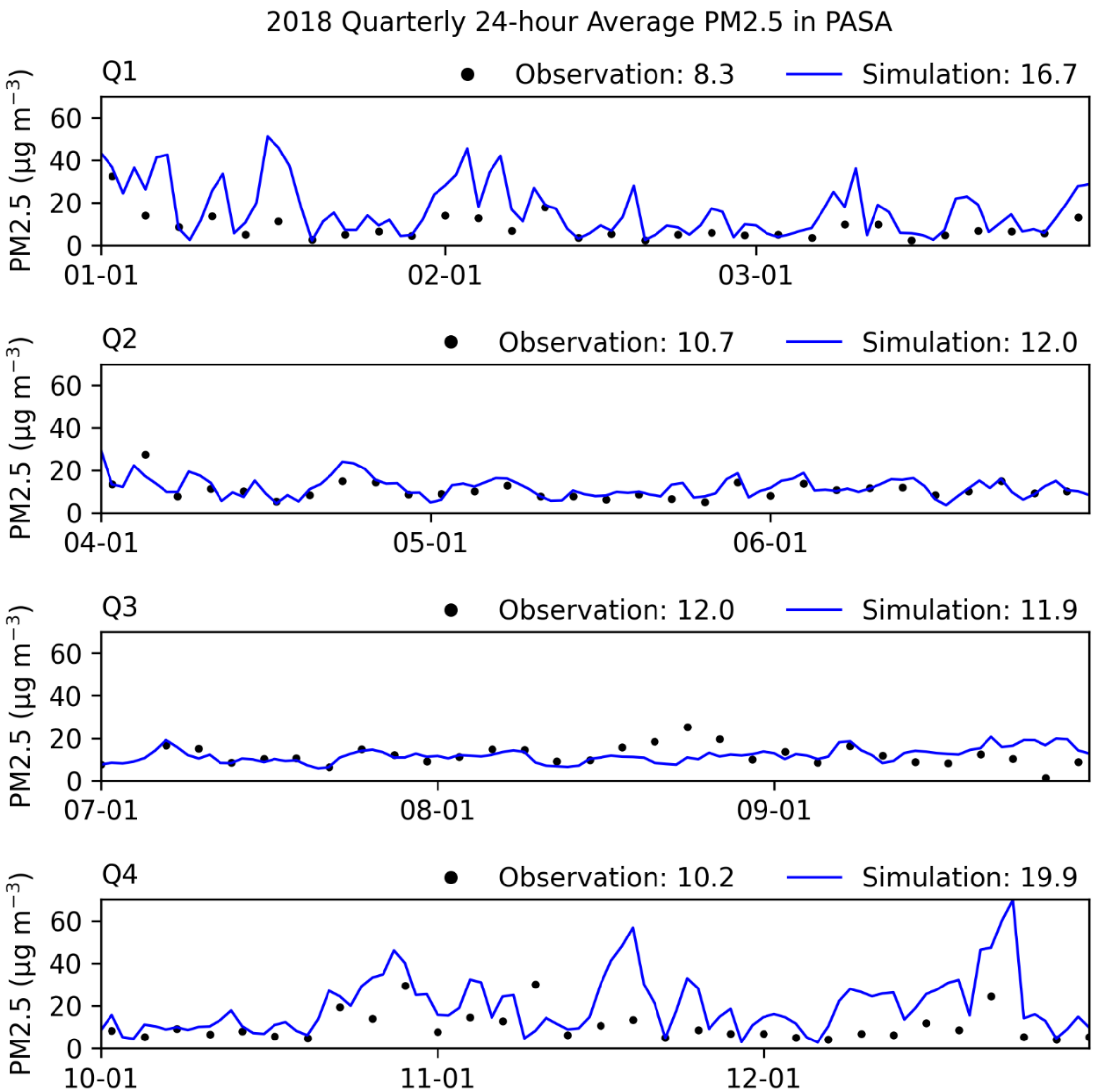


FIGURE 6

2018 Modelled and Measured 24-hour Average PM2.5 Concentrations in Pasadena

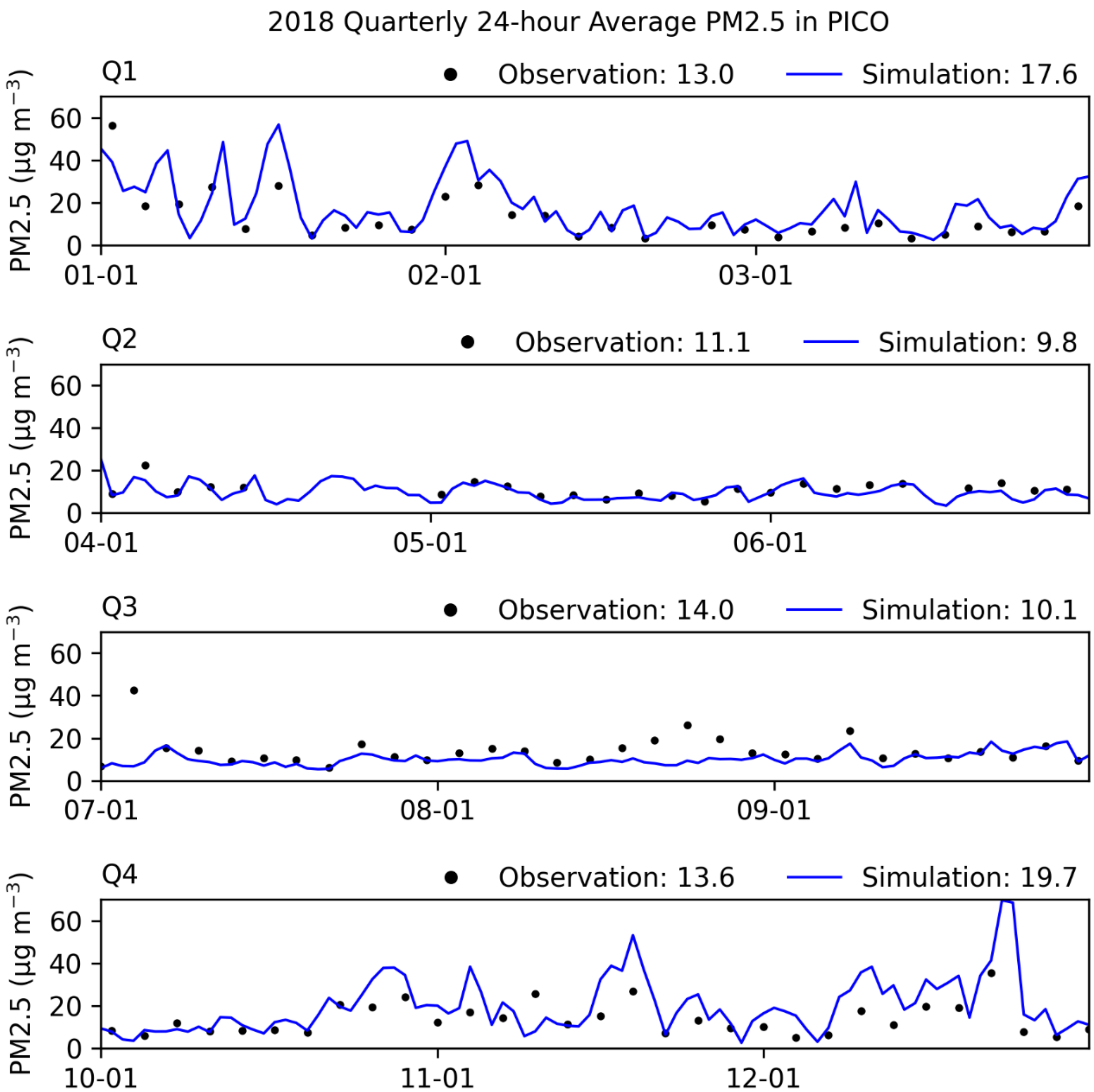


FIGURE 7

2018 Modelled and Measured 24-hour Average PM2.5 Concentrations in Pico Rivera

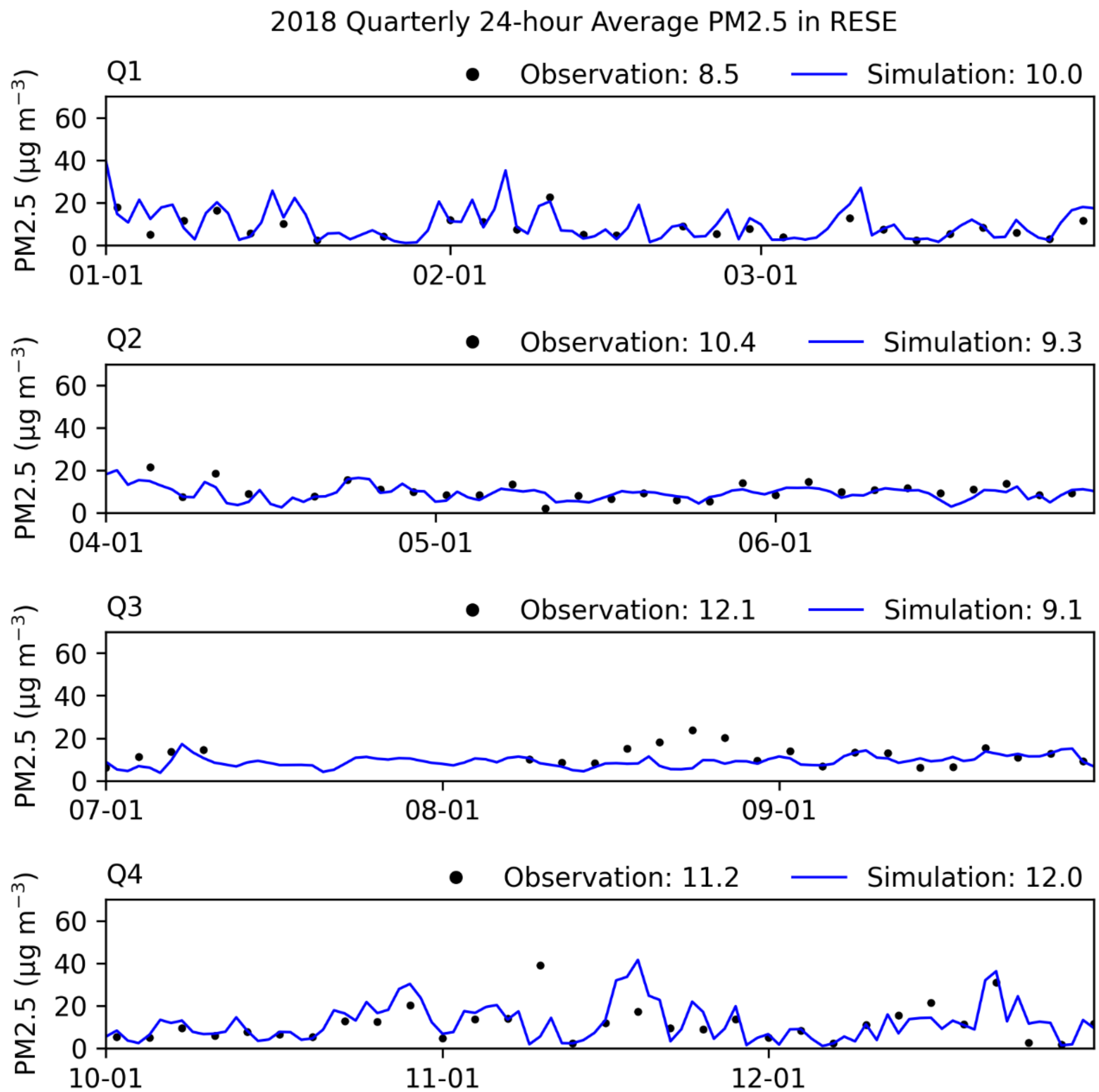


FIGURE 8

2018 Modelled and Measured 24-hour Average PM2.5 Concentrations in Reseda

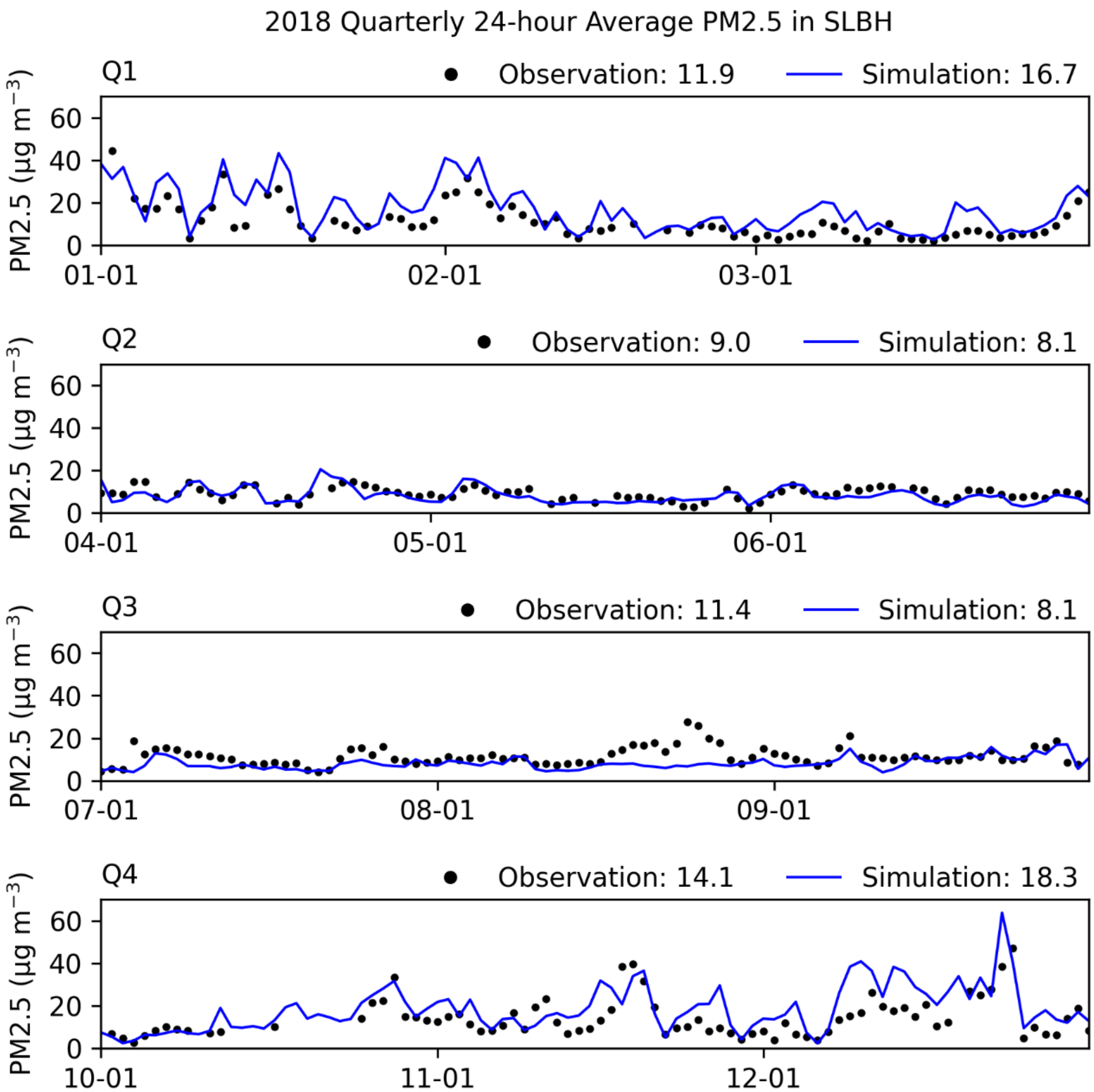


FIGURE 9

2018 Modelled and Measured 24-hour Average PM2.5 Concentrations in South Long Beach

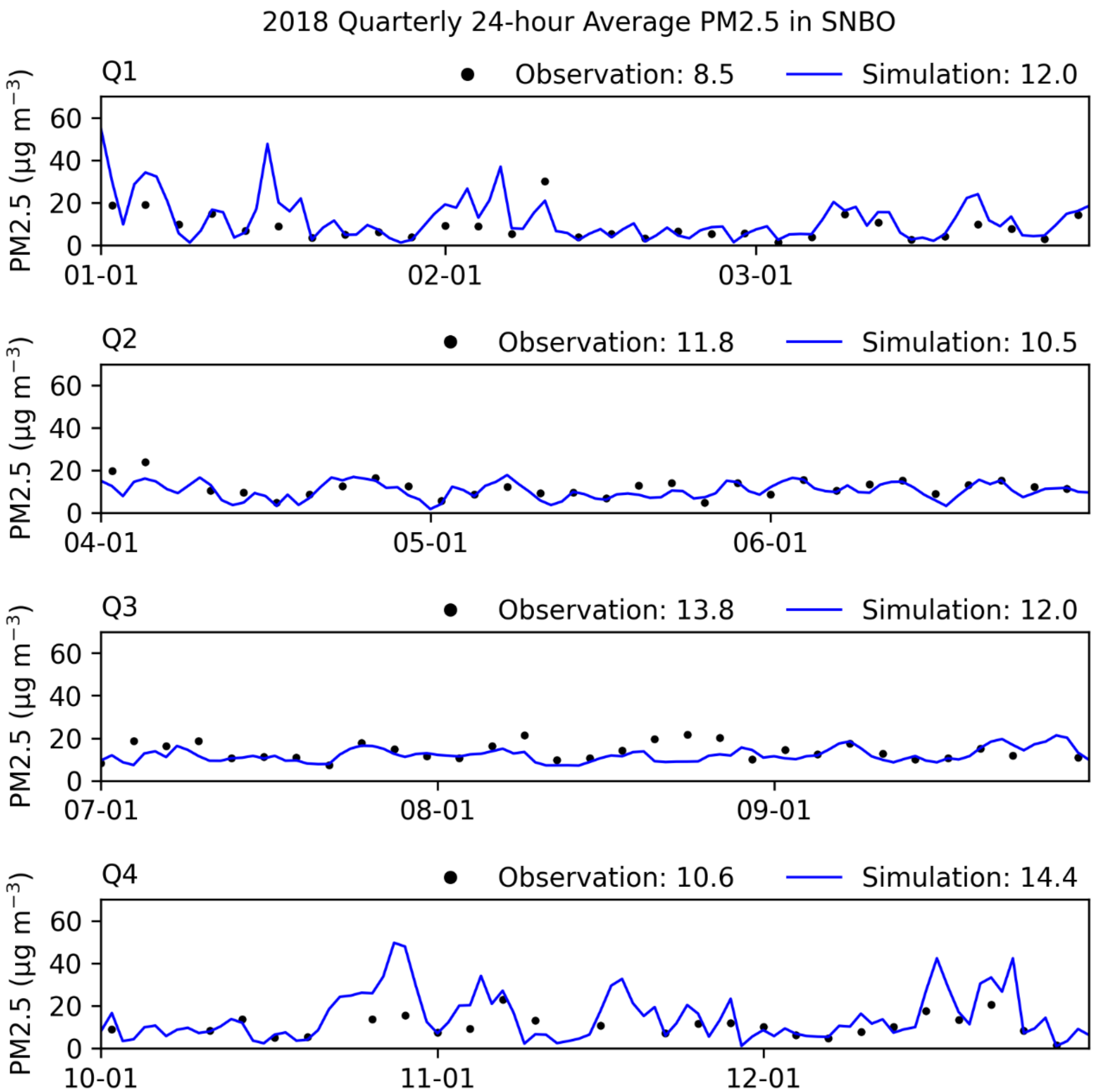


FIGURE 10

2018 Modelled and Measured 24-hour Average PM2.5 Concentrations in San Bernardino

Attachment 3

EMISSIONS REDUCTIONS SUMMARY FOR FUTURE CONTROL SCENARIOS

TABLE 1. EMISSIONS REDUCTIONS FROM THE PROPOSED CONTROL MEASURES FOR THE 2030 ATTAINMENT SCENARIO

Control Measures	Average composite CF[1]			2030 baseline (tons/day)			2030 remaining (tons/day)			2030 reduction (tons/day)		
	NOX	NH3	PM25	NOX	NH3	PM25	NOX	NH3	PM25	NOX	NH3	PM25
BCM-05: Emission Reductions from Emergency Standby Engines	0.91	1.00	0.73	3.96	0.01	0.15	3.60	0.01	0.11	0.36	0	0.04
BCM-06: Emission Reductions from Diesel Electricity Generating Facilities	0.92	1.00	1.00	2.06	0.52	0.34	1.90	0.52	0.34	0.16	0	0
BCM-07: Emission Reductions from Incinerators	0.29	1.00	1.00	1.13	0.24	0.05	0.33	0.24	0.05	0.81	0	0
TOTAL SOUTH COAST AQMD STATIONARY:	**0.81**	**1.00**	**0.93**	**7.15**	**0.77**	**0.54**	**5.83**	**0.77**	**0.50**	**1.33**	**0.00**	**0.04**
Zero-Emission Standard for Space and Water Heaters	0.79	1.00	0.76	12.07	0.01	1.71	9.49	0.01	1.30	2.58	0	0.41
TOTAL CARB STATIONARY:	**0.79**	**1.00**	**0.76**	**12.07**	**0.01**	**1.71**	**9.49**	**0.01**	**1.30**	**2.58**	**0.00**	**0.41**
Clean Mile Standard	1.00	1.00	1.00	24.37	14.69	2.47	24.33	14.69	2.47	0.04	0	0
On-Road Motorcycles New Emissions Standards	0.80	1.00	1.00	0.82	0.01	0.01	0.66	0.01	0.01	0.16	0	0
Advanced Clean Fleets	0.80	0.86	0.91	24.26	5.95	1.00	19.47	5.11	0.91	4.79	0.84	0.09
Zero Emission Trucks Measure	0.88	0.96	0.97	24.26	5.95	1.00	21.34	5.70	0.97	2.92	0.27	0.03
Advanced Clean Cars Program II	0.94	0.86	0.93	24.37	14.69	2.47	22.88	12.57	2.29	1.49	2.12	0.18
TOTAL CARB ONROAD:	**0.81**	**0.84**	**0.91**	**49.45**	**20.66**	**3.49**	**40.05**	**17.45**	**3.14**	**9.4**	**3.21**	**0.30**
EPA Clean Trucks Plan	0.97	1.00	1.00	24.26	5.95	1.00	23.65	5.95	1.00	0.61	0	0
TOTAL EPA ONROAD:	**0.97**	**1.00**	**1.00**	**24.26**	**5.95**	**1.00**	**23.65**	**5.95**	**1.00**	**0.61**	**0**	**0**

TABLE 1. EMISSIONS REDUCTIONS FROM THE PROPOSED CONTROL MEASURES FOR THE 2030 ATTAINMENT SCENARIO (CONCULDED)

Control Measures	Average composite CF[1]			2030 baseline (tons/day)			2030 remaining (tons/day)			2030 reduction (tons/day)		
	NOX	NH3	PM25	NOX	NH3	PM25	NOX	NH3	PM25	NOX	NH3	PM25
Cargo Handling Equipment Amendments	0.56	1.00	0.55	1.65	0.00	0.07	0.93	0.00	0.04	0.72	0.00	0.03
Spark-Ignition Marine Engine Standards	1.00	1.00	1.00	2.66	0.01	0.42	2.66	0.01	0.42	0.00	0.00	0.00
Commercial Harbor Craft Amendments	0.64	1.00	0.58	5.70	0.00	0.23	3.63	0.00	0.13	2.06	0.00	0.09
In-use Locomotive Regulation	0.44	1.00	0.32	17.58	0.01	0.35	7.68	0.01	0.11	9.90	0.00	0.24
Amendments to the In-Use Off-Road Diesel-Fueled Fleets Regulation	0.75	1.00	0.65	7.65	0.00	0.35	5.74	0.00	0.23	1.91	0.00	0.12
ZE Forklift Regulation	0.68	1.00	0.96	2.67	0.00	0.16	1.81	0.00	0.16	0.86	0.00	0.01
Tier 5 Off-Road New Compression-Ignition Engine Standards	0.95	1.00	0.96	5.34	0.02	0.13	5.09	0.02	0.12	0.25	0.00	0.01
Transport Refrigeration Unit Regulation Part I & II	0.58	1.00	0.28	4.97	0.00	0.16	2.86	0.00	0.04	2.11	0.00	0.12
TOTAL CARB OFFROAD:	**0.63**	**1.00**	**0.67**	**48.21**	**0.04**	**1.87**	**30.39**	**0.04**	**1.26**	**17.82**	**0.00**	**0.61**
Rule adopted/amened after 2022AQMP cut-off date										0.34	0.00	0.00
RECLAIM landing rules adjustments										2.86	0.00	0.00
TOTAL LINE ITMES ADJUSTMENT[2]:										**3.20**	**0.00**	**0.00**
GRAND TOTAL:	**0.83**	**0.96**	**0.97**	**210.31**	**79.31**	**54.05**	**175.37**	**76.10**	**52.69**	**34.94**	**3.21**	**1.36**

[1]Average Composite CF (control factor) for each measure defined as the ratio between remaining emission and baseline emission per pollutants.
[2]See Appendix I Tables I-2-2C through I-2-2E for details.

ATTACHMENT 4

LIST OF WILDFIRES THAT AFFECTED THE SOUTH COAST AIR BASIN IN 2020

2020 Wildfire impacts in South Coast Air Basin

This list includes all the events that triggered smoke advisories in the Basin. For the smoke advisory announcements, see the following site: https://www.aqmd.gov/home/news-events/news-and-media/2020-news-archives#

1. 58 Fire
    a. Burn dates: 2020-06-24 to 2020-06-27
        i. https://www.fire.ca.gov/incidents/2020/6/24/58-fire
2. Soledad Fire
    a. Burn dates: 2020-07-05 to 2020-07-10
        i. https://www.fire.ca.gov/incidents/2020/7/5/soledad-fire
3. Dam Fire
    a. Burn dates: 2020-07-30 to 2020-08-14
        i. https://www.fire.ca.gov/incidents/2020/7/30/dam-fire
4. Apple Fire
    a. Burn dates: 2020-07-31 to 2020-08-15 (90% contained)
        i. https://www.fire.ca.gov/incidents/2020/7/31/apple-fire
        ii. https://www.nbclosangeles.com/news/local/apple-fire-90-contained-33424-acres-burned-full-containment-set-for-monday/2413461/
    b. Articles/Info:
        i. https://www.nasa.gov/image-article/nasa-satellites-show-two-views-of-californias-apple-fire/
5. Lake Fire
    a. Burn dates: 2020-08-12 to 2020-09-28
        i. https://www.fire.ca.gov/incidents/2020/8/12/lake-fire
6. Ranch 2 Fire
    a. Burn dates: 2020-08-13 to 2020-10-05
        i. https://www.fire.ca.gov/incidents/2020/8/13/ranch-2-fire
7. Holser Fire
    a. Burn dates: 2020-08-17 to 2020-08-21 (95% contained)
        i. https://www.fire.ca.gov/incidents/2020/8/17/holser-fire
        ii. https://www.kclu.org/tags/holser-fire
    b. Note: this fire was in Ventura County, but South Coast AQMD issued a smoke advisory for it.
        i. http://www.aqmd.gov/docs/default-source/news-archive/2020/lake-and-holser-fires-aug19-2020.pdf?sfvrsn=9
8. Snow Fire
    a. Burn Dates: 2020-09-17 to 2020-11-16
        i. https://www.desertsun.com/story/news/2020/12/24/cal-fire-desert-water-agency-vehicle-sparked-snow-fire-september/4041755001/
9. Bobcat and El Dorado Fires
    a. Bobcat Fire:
        i. Burn dates: 2020-09-06 to 2020-10-13 (92% contained)
            1. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd868759.pdf
        ii. Articles/info:
            1. https://fire.lacounty.gov/bobcat-fire-status/

        2. https://www.nbclosangeles.com/news/california-wildfires/bobcat-fire-one-of-largest-in-la-history-grows-to-more-than-112000-acres/2432632/
  b. El Dorado Fire:
    i. Burn dates: 2020-09-05 to 2020-11-16
        1. https://www.fire.ca.gov/incidents/2020/9/5/el-dorado-fire
    ii. Aritcles/info:
        1. https://www.fs.usda.gov/research/sites/default/files/2023-05/el_dorado_narrative_final_508c.pdf
        2. https://wildfiretoday.com/tag/el-dorado-fire/

10. Silverado and Blue Ridge Fires
  a. Silverado Fire:
    i. Burn dates: 2020-10-26 to 2020-11-07
        1. https://www.fire.ca.gov/incidents/2020/10/26/silverado-fire
    ii. News articles:
        1. https://www.latimes.com/california/story/2020-10-26/silverado-fire-ignites-in-orange-county
        2. https://wildfiretoday.com/2020/11/12/report-released-on-burnover-of-firefighters-on-silverado-fire/
  b. Blue Ridge Fire
    i. Burn dates: 2020-10-26 to 2020-11-07
        1. https://www.fire.ca.gov/incidents/2020/10/26/blue-ridge-fire
    ii. News articles:
        1. https://wildfiretoday.com/2020/10/26/blue-ridge-fire-spreads-toward-yorba-linda-california/
        2. https://voiceofoc.org/2020/12/chino-hills-state-park-battered-from-recent-flames-in-blue-ridge-fire-this-year/

11. Airport Fire
  a. Burn dates: 2020-12-01 to 2020-12-12
    i. https://www.fire.ca.gov/incidents/2020/12/1/airport-fire

12. Bond Fire
  a. Burn dates: 2020-12-02 to 2020-12-10
    i. https://www.fire.ca.gov/incidents/2020/12/2/bond-fire

13. Sanderson Fire
  a. Burn dates: 2020-12-13 to 2020-12-14
    i. https://www.fire.ca.gov/incidents/2020/12/13/sanderson-fire

APPENDIX III

Stationary and Mobile Source BACM/MSM

Table of Contents

Introduction

The South Coast Air Basin (Basin) was reclassified from “moderate” to “serious” nonattainment for the 2012 annual PM2.5 National Ambient Air Quality Standard (NAAQS or standard) of 12 µg/m^3 effective December 9, 2020, with an attainment date of December 31, 2025.[1] Subpart 4 of the federal Clean Air Act (CAA) Part D specifies additional provisions for PM2.5 nonattainment areas. In particular, CAA Section 189(b) requires states to submit an attainment plan that meets “serious” area plan requirements and address attainment strategies for the 2012 annual PM2.5 standard.

Under CAA Section 189(b)(1)(B), a “serious” nonattainment area must demonstrate provisions to ensure that Best Available Control Measures (BACM), which includes Best Available Control Technology (BACT), for the control of PM from stationary sources are implemented no later than four years after the designation (or reclassification). In the Addendum to the General Preamble for the Implementation of Title I of the Clean Air Act Amendments of 1990 issued by U.S. EPA in 1994 (1994 Addendum),[2] BACM is defined as:

> “The maximum degree of emissions reduction achievable from a source or source category which is determined on a case-by-case basis, considering energy, economic and environmental impacts and other costs.”

Similarly, BACT is defined as:

> “An emission limitation which is based on the maximum degree of control that can be achieved. It is a case-by-case decision that considers energy, environmental and economic impact.”

The implementation of BACT is required for major stationary sources (i.e., sources that emit PM2.5 or any PM2.5 precursor in an amount exceeding 70 tons per year). BACT can be add-on control equipment or modification of the production processes or methods, including fuel cleaning or treatment and innovative fuel combustion techniques. In addition, BACT may be a design, equipment, work practice, or operational standard if imposition of an emissions standard is infeasible.

In addition to BACM and BACT, PM2.5 attainment plans must also include additional feasible measures that either assist with attainment or advance the attainment date by one year. Additional feasible measures may be implemented later than BACM/BACT but before the statutory “serious” area attainment date.

The control measure assessment for this plan seeks to evaluate the technological and economic feasibility of potential BACM and to identify additional feasible measures. The demonstration generally involves an analysis of South Coast AQMD’s control requirements as they compare to those in other jurisdictions. Other sources such as U.S. EPA guidance documents are also consulted. When South Coast AQMD’s

[1] 85 FR 71264

[2] 59 FR 41998, 42010

control requirements meet the BACM/BACT definition, no further analysis is required. When a regulation or control measure from another air basin or from U.S. EPA guidance is identified as more stringent than South Coast AQMD's regulation, the measure is analyzed for technological and economic feasibility. While South Coast AQMD is not required to adopt a measure just because it was adopted in another region, the rationale for rejecting such measures must be presented.

In addition to implementing BACM/BACT and additional feasible measures, "serious" nonattainment areas that request an extension under CAA Section 188(e) are required to demonstrate that the attainment plan includes the Most Stringent Measures (MSM). U.S. EPA defines MSM as:

> "The maximum degree of emission reduction that has been required or achieved from a source or source category in any other attainment plans or in practice in any other states and that can feasibly be implemented in the area seeking the extension."

U.S. EPA notes that, "in some cases it may be possible for the MSM requirement to result in no more controls and no more emissions reductions in an area than result from the implementation of BACM and BACT." This is because the approach to identify potential MSM largely follows that of a BACM/BACT analysis except that more stringent criteria must be applied to reject Potential Control Measures (PCMs) based on technological or economic infeasibility. Therefore, staff first conducted a BACM/BACT analysis to identify a list of PCMs which were then analyzed by applying MSM criteria as detailed in the Control Measure Assessment section.

The 2016 AQMP included a BACM demonstration, which served both the 2006 and 2012 PM2.5 NAAQS. U.S. EPA approved the BACM demonstration for all sources of direct PM2.5 and PM2.5 precursors for the purposes of the 2006 PM2.5 NAAQS in accordance with the requirements of CAA Section 189(b)(1)(B) and 40 CFR 51.1010.[3] As this represents the latest approved BACM demonstration for a PM2.5 NAAQS for the Basin, it was used as a starting point for this BACM demonstration. This demonstration sought to build upon and update the 2016 AQMP BACM demonstration, reflecting recent improvements in control technologies and identifying potential areas for improvements in South Coast AQMD rules. The analysis began with an overview of key PM stationary source categories which were identified through an examination of the emissions inventory. The applicable South Coast AQMD rules and corresponding rules in other air districts were also evaluated. Next, a multi-step process involving an evaluation of a wide range of sources was conducted to identify a list of PCMs. Finally, the PCMs were assessed for their technological and economic feasibility in the Control Measure Assessment section.

Identifying Key PM Source Categories

U.S. EPA recommends that the BACM analysis begin with a current detailed emissions inventory of the various sources that emit direct PM2.5 and PM2.5 precursors. Chapter 3 and Appendix III present a comprehensive emissions inventory which satisfies U.S. EPA's requirements. For the purposes of

[3] 84 FR 3305

demonstrating BACM, control measures targeting only PM2.5, NOx, and NH3 were considered. However, although NOx and NH3 emissions contribute to PM2.5, air quality modeling demonstrates that direct PM2.5 emissions have the greatest impact on ambient PM2.5 concentrations. Therefore, identifying the top stationary source categories of direct PM2.5 emissions was taken as the first step and presented in Figure III-1.

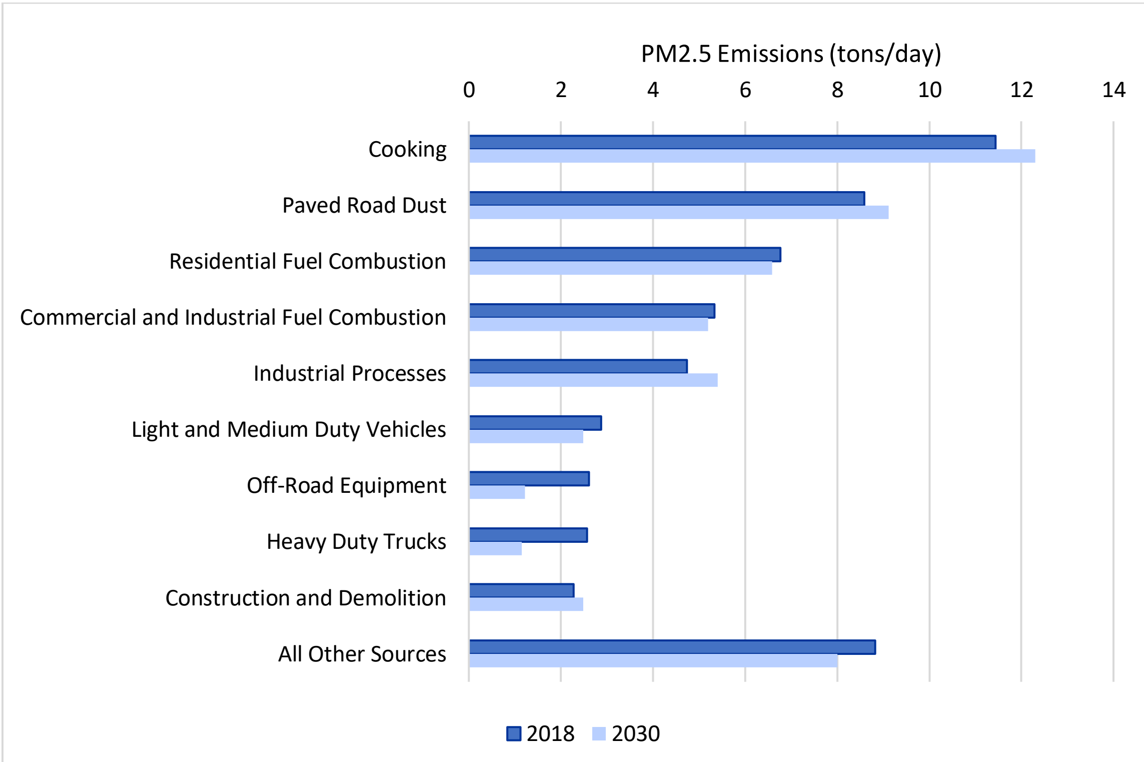


FIGURE III-1

TOP STATIONARY SOURCE CATEGORIES OF DIRECT PM2.5 EMISSIONS IN 2018 AND 2030

The top three stationary source categories are cooking, paved road dust, and residential fuel combustion. Emissions from the latter category are dominated by wood combustion while cooking emissions are dominated by restaurant charbroilers. Based on this analysis, staff selected the following three stationary source categories for an in-depth control measure analysis:

- Residential Wood Combustion
- Paved Road Dust
- Commercial Cooking

In addition, Farming Operations – Livestock Waste, was selected as a key PM stationary source category after staff became aware of U.S. EPA's proposed disapproval of several plan elements in San Joaquin Valley Air Pollution Control District's (SJVAPCD) 2018 PM2.5 Plan.[4] A central issue in U.S. EPA's proposed

[4] 87 FR 60494

disapproval relates to SJVAPCD's BACM analysis for NH3 control measures at Confined Animal Facilities. Livestock waste is the primary NH3 emission source at these facilities. Staff determined that an in-depth evaluation of existing rule requirements was warranted for this source category.

Existing Rules and Potential Control Measures for Key PM Source Categories

Existing rule requirements for the four key stationary sources identified in the previous section are summarized below. PCMs were identified by comparing existing control measures to the requirements in federal and state regulations and guidance, as well as the analogous rules in other air districts and agencies.

Residential Wood Combustion

Existing rule

South Coast AQMD Rule 445 Wood-Burning Devices (Amended October 27, 2020)

Rule 445 was first adopted in 2008 to reduce the emissions of particulate matter from wood-burning devices. The rule establishes requirements for the sale, operation, and installation of these devices. Specifically, Rule 445:

- Prohibits the installation of wood burning devices in new developments;
- Requires that wood-burning devices sold or installed for existing residential and commercial developments (additions, remodels, etc.) to be U.S. EPA certified or equivalent;
- Prohibits the burning of any product not intended for use as a fuel (e.g., trash) in a wood-burning device and requires commercial firewood sellers to only sell seasoned firewood (20 percent or less moisture content) from July through February; and
- Imposes a mandatory winter burning curtailment program that extends from November 1 through the end of February.

In addition to these regulatory requirements, South Coast AQMD has also implemented the Healthy Hearths™ program that includes a comprehensive education and outreach effort as well as financial incentives to encourage the public to switch to cleaner, gaseous-fueled hearth products.[5] This program has incentivized the conversion of more than 10,000 wood-burning fireplaces to gas or electric fireplaces and continues to provide up to $1,600 per unit for low-income households.

[5] http://www.aqmd.gov/home/programs/community/community-detail?title=wood-device-incentive-program

South Coast AQMD continues to implement a wood-burning curtailment program through Rule 445. As a consequence of *Bahr v. EPA*, 836 F.3d 1218 (9th Cir. 2016), Rule 445 was amended in June 2020 to establish PM2.5 contingency provisions that would be automatically triggered in the event that the U.S. EPA determines that the Basin failed to meet any RFP requirement, meet any quantitative milestone, submit a quantitative milestone report, or attain a PM2.5 NAAQS by the attainment date. The amendment also expanded the curtailment program to the entire Basin instead of using a source-receptor specific approach. U.S. EPA's finding of failure to attain the 2006 24-hour PM2.5 standard by 2019 triggered the contingency provision and lowered the curtailment threshold from 30 to 29 μg/m^3.[6] In October 2020, the rule was amended to add ozone contingency provisions that would be triggered in the event that the U.S. EPA determines that the Basin failed to meet an RFP milestone or attain an ozone NAAQS by the applicable deadline. The contingency provision for applicable ozone NAAQS ~~will~~ expanded the curtailment season from the existing November through February to September through April. U.S. EPA approved the latest amendment of Rule 445 on March 8, 2022, excluding paragraph (g), "Ozone Contingency Measures," and paragraph (k), "Penalties," as satisfying PM2.5 contingency requirements.[7]

Federal and State rules and regulations

On March 16, 2015, U.S. EPA finalized the amendments for New Source Performance Standards (NSPS) for New Residential Wood Heaters (40 CFR Part 60 Subpart AAA).[8] The 2015 NSPS significantly lowered the certification emission limits for wood-burning heaters to 4.5 g/hr in Phase I (on or after May 15, 2015) and 2.0 g/hr in Phase II (on or after May 15, 2020). In April 2020, U.S. EPA amended the 2015 NSPS for New Residential Wood Heaters to include minimum requirements for pellet fuels, sell-through provisions, and a clarification of prohibited fuels.[9] The PM emission limits remained unchanged. Rule 445 references the NSPS for emission standards in the definition of U.S. EPA certified wood-burning heaters and is therefore as stringent as the newly promulgated NSPS.

Colorado, Idaho, Michigan, Oregon, Washington, Wisconsin, and Vermont require or provide incentives for cleaner wood-burning devices.[10] Oregon requires that uncertified solid fuel burning devices located at a residential property be removed, destroyed and reported to the state when the home is sold.[11] However, heating devices (e.g., fireplaces, masonry heaters, central furnaces, etc.) are exempt.

Analogous rules in other air districts

<u>SJVAPCD Rule 4901 Wood Burning Fireplaces and Wood Burning Heaters (Amended June 20, 2019)</u>

San Joaquin Valley Air Pollution Control District (SJVAPCD) Rule 4901 includes a tiered mandatory curtailment program that establishes different curtailment thresholds for each county based on the type

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[6] 85 FR 57733
[7] 87 FR 12866
[8] 80 FR 13672
[9] 85 FR 18448
[10] https://www.epa.gov/burnwise/ordinances-and-regulations-wood-burning-appliances
[11] https://www.oregon.gov/deq/FilterDocs/10aq011heatsmart.pdf

of devices. During a level one episodic wood-burning curtailment, operation of wood-burning fireplaces and unregistered wood-burning heaters is prohibited, but properly operated, registered wood-burning devices are allowed to be used. During a level two episodic woodburning curtailment, operation of any wood-burning device is prohibited. In the ''hot spot'' counties of Madera, Fresno, and Kern, the level one PM2.5 threshold is 12 µg/m^3, and the level two PM2.5 threshold is 35 µg/m^3. In the remaining counties in the San Joaquin Valley (San Joaquin, Stanislaus, Merced, Kings, and Tulare), the level one PM2.5 threshold is 20 µg/m^3, and the level two PM2.5 threshold is 65 µg/m^3. Areas within the San Joaquin Valley that do not have natural gas service are not subject wood burning curtailment.

Rule 4901 prohibits the sale or transfer of any real property which contains wood-burning heaters (i.e., wood stove, pellet-fueled wood burning heater, or wood burning fireplace insert) that are not U.S. EPA Phase II certified. Rule 4901 also prohibits remodeling of a fireplace or chimney where the total cost exceeds $15,000 and a local building permit is required, unless a gas-fueled, electric, or U.S. EPA certified device is installed that meets requirements in Title 40 CFR Part 60 Subpart AAA. Finally, wood-burning fireplaces are not allowed to be newly installed in areas with natural gas service at or below 3,000 feet elevation.

<u>SMAQMD Rule 417 Wood Burning Appliances (Adopted October 26, 2006)</u>

Staff evaluated the requirements of Sacramento Metro Air Quality Management District (SMAQMD) Rule 417 and found no requirements that were more stringent than those already incorporated in Rule 445.

<u>BAAQMD Regulation 6 Rule 3 Wood-Burning Devices (Amended November 20, 2019)</u>

Under Bay Area Air Quality Management District (BAAQMD) Regulation 6-3, the BAAQMD can issue a Winter Spare the Air Alert and require a Mandatory Burn Ban when air quality is forecast to be unhealthy due to elevated levels of fine particulate matter with some exemptions that allow wood-burning. The rule provides for limited exemptions in the following areas: (i) sole source of heat, (ii) non-functional, permanently installed heater, and (iii) loss of natural gas and/or electric power. In 2019, BAAQMD revised its wood-burning rule to provide for curtailments year-round with a curtailment threshold of 35 µg/m^3. Regulation 6-3 prohibits remodeling of a fireplace or chimney where the total cost exceeds $15,000 and a local building permit is required, unless a gas-fueled, electric, or U.S. EPA certified device is installed that meets requirements in Title 40 CFR Part 60 Subpart AAA. Regulation 6-3 requires exempt households whose sole source of heat is a wood-burning device to have U.S. EPA certified devices.

<u>Utah Wood Burning Curtailment Program – Department of Environmental Quality's Division of Air Quality Utah Administrative Code R307-302 Solid Fuel Burning Devices</u>

The Utah wood burning curtailment program is geographically based with curtailment limited to the nonattainment counties of Box Elder, Cache, Davis, Salt Lake, Tooele, Utah, and Weber. The curtailment threshold is set at 25 µg/m^3 PM2.5 24-hour concentration. Similar to SJVAPCD Rule 4901, only counties specified in the public notification of curtailment are required to curtail wood burning.

Puget Sound Clean Air Agency Article 13: Solid Fuel Burning Device Standards (Adopted 11/10/88, amended 10/25/12) or Chapter 173-433 Washington Administrative Code

For the Tacoma-Pierce (TP) region, curtailment is limited based on device certification and location. TP certified stoves are those certified by U.S. EPA or Oregon state which can be up to 25 years old. Curtailment is classified as Stage 1 or Stage 2 air quality burn bans. Under Stage 1, where a PM2.5 ambient concentration of 35 µg/m^3 within a 48-hour time is forecast, uncertified wood-burning device use is prohibited for King and Kitsap counties. Additionally, a Stage 1 curtailment applies to Pierce and Snohomish counties if a PM2.5 ambient concentration of 30 µg/m^3 within a 72-hour time is forecast. As of October 2015, the sale or use of uncertified wood stoves is prohibited, so Stage 1 burn bans would mostly apply to fireplaces. A Stage 2 air quality burn ban, which includes all device types, may be declared if air quality is worsening rapidly. Air quality bans are also geographically based in that they may be called on a county and sub-county level. Pierce county now has three different air quality burn ban zones, that can be declared independently for burn day bans.

City of Portola, Plumas County, Wood Burning Rule – Chapter 15.10 of the City of Portola Municipal Code (Amended 10/13/21)

The City of Portola has a wood stove and fireplace ordinance which mandates episodic wood-burning curtailment from November to February whenever the Northern Sierra AQMD determines that the 24-hour average PM2.5 concentrations may exceed 30 µg/m^3 and when adverse meteorological conditions are expected to persist. The ordinance contains a contingency provision which was recently triggered due to the Plumas County nonattainment area failing to attain the 2012 annual PM2.5 standard.[12] The contingency provision expanded the curtailment season to September through April and lowered the curtailment threshold to 20 µg/m^3 when adverse meteorological conditions are expected to persist. The contingency provision will remain in effect until a new attainment plan addressing the 2012 annual PM2.5 standard is submitted to U.S. EPA.

Evaluation

Staff identified multiple provisions in other districts' rules which are potentially more stringent than those in South Coast AQMD Rule 445. Analyses of each of those provisions are presented below.

1. The curtailment threshold of 29 µg/m^3 is higher than that in other districts' rules.

The level one curtailment thresholds in SJVAPCD Rule 4901 are lower than the curtailment threshold in South Coast AQMD Rule 445. However, in contrast to the county-specific approach in Rule 4901, the prohibition on wood-burning in Rule 445 is Basin-wide and applies to all solid fuel devices, regardless of certification. Rule 4901 permits the operation of U.S. EPA certified and registered wood-burning heaters during a level one curtailment period. Similarly, the City of Portola municipal code chapter 15.10 permits the operation of U.S. EPA certified wood-burning devices during curtailment.

[12] 87 FR 80076

~~The differences in regulatory approaches make a direct comparison between Rule 445 and other agencies' rules difficult as a quantitative matter. However, some general inferences can be made to assess the stringency of different rules qualitatively. For example, d~~Direct comparison between Rule 445 and SJVAPCD Rule 4901 requires looking at SJVAPCD's full curtailment (65 µg/m^3 threshold) to account for both all device types and all geographic locations, as Rule 445 does (at a 29 µg/m^3 threshold). In the Basin, for the years 2016 through 2019, the PM2.5 24-hour ambient concentration exceeded 65 µg/m^3 two days during the wood-burning season, and exceeded the 35 µg/m^3 standard on 56 days, including 7 days when PM2.5 concentrations were affected by wildfire smoke. With 480 days during the Basin's wood-burning season between 2016 and 2019, this represents only 0.4 percent and 12 percent of the days, respectively, that a No-Burn Day would have been declared if SJVAPCD Rule 4901 Level Two Episodic Curtailment ~~requirements~~ were in effect in the Basin. In contrast, South Coast AQMD declared no-burn days, which applied to the entire Basin, on 22 percent of days during the same period. Since Rule 445 does not differentiate between registered or unregistered devices or individual counties, if a SJVAPCD Level Two Episodic Curtailment were in effect in the Basin, it would have resulted in fewer curtailment days and consequently an increase in ambient PM2.5 emissions. The curtailment exemption for areas without natural gas service is another issue to consider. While Rule 445 contains a similar exemption, the South Coast Air Basin is a heavily urbanized area with widespread availability of natural gas service. On the contrary, the San Joaquin Valley has larger rural and undeveloped areas, and a significant portion of those areas do not have natural gas service. For example, most residences in Madera County do not have natural gas service.[13] Therefore, although the exemption itself is similar, San Joaquin Valley likely has a higher proportion of the population that qualifies for this exemption and therefore greater amounts of wood burning occur in the San Joaquin Valley on curtailment days.

Staff also evaluated wood burning curtailment programs implemented in other jurisdictions. Although Utah's curtailment is nominally lower (25 µg/m^3) than the Basin's, only counties specified in the public notification of curtailment are required to curtail wood burning. In this regard, Utah's program is similar to that in SJVAPCD and is less stringent than the Basin-wide approach in Rule 445. BAAQMD has a similar curtailment approach as South Coast AQMD (not limiting either device type or location), but BAAQMD has a higher curtailment threshold (35 µg/m^3). The City of Portola municipal code chapter 15.10 is less stringent in several ways compared to Rule 445. First, certified devices are exempt from curtailment. Additionally, curtailment requires not only that forecasted PM2.5 exceed a numeric value but also that adverse meteorological conditions will persist as determined by the National Weather Service. Rule 445 does not have a provision requiring the persistence of adverse meteorological conditions. Additionally, the contingency measure in Portola's code, which temporarily lowered the threshold to 20 µg/m^3, will sunset once a new attainment plan is submitted to the U.S. EPA and the threshold will revert to 30 µg/m^3. Rule 445 does not contain a sunset provision for contingency measures.

A quantitative analysis, presented in Attachment C, was conducted to provide a robust comparison of the curtailment programs in Rule 445 and SJVAPCD Rule 4901. The analysis demonstrated that the current 29 µg/m^3 is as stringent as the SJVAPCD Rule 4901 using Source Receptor Area (SRA) as a geographical unit

[13] https://ww2.valleyair.org/media/jkhaefnp/06-pm25-contingency-measure-sip-revision.pdf

to define hotspot in a similar way that SJVAPCD R4901 defined. The South Coast Air Basin has 35 SRAs , of which population is larger than a county in SJVAPCD's jurisdiction. In addition, our daily forecast is provided for individual SRA's while SJVAPCD provide one forecast value to an entire county except two counties that are divided to two subareas each. Therefore, SRA is the equivalent unit to the SJVAPCD's county. However, per the suggestion from U.S. EPA Region 9, South Coast AQMD will consider lowering the Basin-wide curtailment threshold in Rule 445 to 25 µg/m^3. Therefore, control measure BCM-18 proposes to lower the residential wood burning curtailment threshold to 25 µg/m^3 while, a~~A~~s a whole, South Coast Rule 445 is at least as stringent as wood-burning curtailment rules adopted in other areas since no wood-burning device (registered or unregistered, or in any geographic location) may be operated on any day during the wood-burning season if the ambient PM2.5 24-hour concentration is forecast to equal or exceed 29 µg/m^3. ~~In addition, a quantitative analysis, presented in Attachment C, was conducted to provide a robust comparison of the curtailment programs in Rule 445 and SJVAPCD Rule 4901.~~

2. The wood-burning curtailment season in Rule 445 (November-February) is narrower than that in BAAQMD Regulation 6, Rule 3 (year-round).

The majority of wood-burning activities in the Basin occur during November-February with reduced activity during the shoulder months of September, October, March and April. Rule 445 has a contingency provision to expand the curtailment season to the shoulder months. The contingency provision to extend the curtailment season will be triggered upon the issuance of a final determination by U.S. EPA that the South Coast Air Basin has failed to:

(A) meet a Reasonable Further Progress (RFP) requirement in an approved attainment plan for an applicable ozone NAAQS; or

(B) attain an applicable ozone NAAQS by the applicable attainment date.

The Basin, due to its climate, has virtually no residential wood-burning during the summer and, as such, expanding the curtailment program year-round would have no air quality benefit. This is supported by temporal allocation factors used in air quality modeling which reveal that there are no residential wood burning emissions for May-September. Conversely, the climate within the BAAQMD jurisdiction is appreciably cooler during the summer and wood-burning is more prevalent year-round (see Figure III-2).[14] Given that difference, a year-round wood-burning curtailment program would be expected to yield additional emission reductions in the BAAQMD, but not in the Basin.

[14] National Weather Service. https://www.weather.gov/wrh/Climate?wfo=mtr

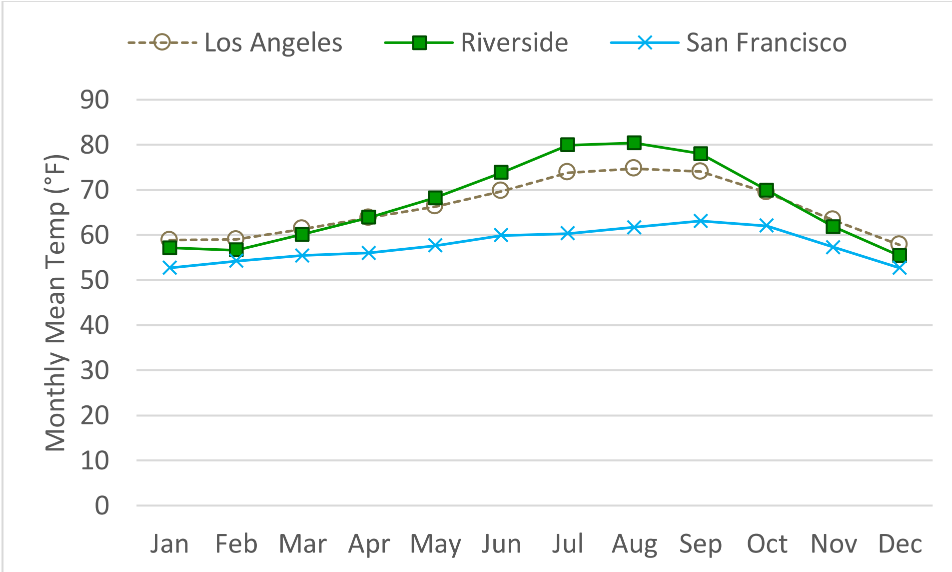

FIGURE III-2
MONTHLY MEAN TEMPERATURE IN LOS ANGELES, RIVERSIDE, AND SAN FRANCISCO BASED ON 2000-2023 DATA

Overall, Rule 445 is as stringent as BAAQMD's Regulation 6, Rule 3 since virtually no reductions will be achieved from a year-round curtailment due to the lack of wood-burning activities during summer months.

3. Other districts do not have a low-income exemption for households with an alternative source of heat.

Removal of the low-income exemption was identified as a control method to reduce PM emissions and it is evaluated further in the Appendix IV-A BCM-18.

4. Rule 445 contains an exemption from curtailment requirements for devices above 3,000 feet.

Due to atmospheric dynamics and transport, emissions from mountain communities above 3,000 feet likely have minimal to no impact on air quality in populated communities in the Basin. This is especially true on cold winter nights since a shallow boundary layer that is only a few hundred feet deep or less is present. Any emissions from the mountain communities above 3,000 feet will enter the residual layer and will not entrain down to the surface layer due to thermal stratification. On the next day when the mixing layer is developed and entrained to the residual layer, prevailing surface wind shifts to onshore flow (from the sea toward mountain summit), which will disperse the wood smoke laden air further away from the Basin.

Additionally, rural mountain communities in the Basin above 3,000 feet experience significant challenges in heating their homes during winter, especially those that may not have access to reliable natural gas or electricity service. Therefore, removing this exemption would jeopardize public safety as homes can become snowed in and residents must have a reliable means to heat their homes.

One option staff considered involved requiring U.S. EPA certified devices to qualify for the elevation-based exemption from curtailment. However, there are concerns as to whether households in rural mountain communities have the financial resources to procure and install such devices as many of these households are likely low-income. The cost concern is further elaborated under item 5. Staff does not consider it economically feasible to mandate U.S. EPA certified devices to qualify for the exemption.

5. Rule 445 does not have a provision requiring U.S. EPA certified devices to qualify for the sole source of heat exemption.

Data suggests that a very limited number of households in the Basin use wood as a fuel. In Los Angeles County, approximately 5,914 households burn wood as a primary source of heat out of an approximate total of 3,375,587 households (0.18 percent) according to U.S. Census data.[15] The limited applicability of the sole-source of heat exemption suggests that the small emission reductions from requiring these households to have U.S. EPA certified devices would have an inconsequential impact on air quality. Additionally, many households subject to the sole source exemption are low-income and therefore do not have the financial resources to purchase a U.S. EPA certified wood stove. Costs for these units vary but can easily exceed $4,000 without considering installation costs. If the wood stove is replacing an existing unit, then installation costs depend on the condition and compatibility of the exhaust pipe. If a new pipe is required, installation costs can exceed $2,000. The high cost burden for low-income households combined with the minimal emission reductions that would be achieved suggest that this measure is not economically feasible.

6. Rule 445 does not have a provision requiring replacement of uncertified devices upon transfer or sale of a property.

To enforce this provision, SJVAPCD Rule 4901 requires sellers of residential property to submit documentation regarding the wood-burning devices located on the property even if there are none. However, the requirement to replace uncertified devices only applies to wood-burning stoves and inserts, and does not extend to fireplaces. According to the emissions inventory, 97 percent of wood-burning devices in the Basin are fireplaces. Furthermore, wood stoves and inserts tend to be more prevalent in colder and higher altitude regions. As stated in the previous section, the emissions from wood burning in these areas are not anticipated to significantly impact PM2.5 air quality in the Basin, particularly in areas already characterized by high PM2.5 levels. As such, applying the resale requirement in Rule 4901 to the Basin would not result in appreciable additional emission reductions and, for most home sales, enacting the resale provision in Rule 445 would lead to no emission reductions.

Staff is further concerned with the level of effort required for the small number of uncertified stoves and inserts in homes being sold. Given the much greater housing stock in the Basin relative to the SJVAPCD, South Coast AQMD would not have the resources to implement such a program. In addition, staff has

[15] United States Census Bureau - B25040: HOUSE HEATING FUEL - Census Bureau Table

faced strong resistance from trade and building association groups as well as realtor associations due to the high cost of mandating and enforcing such a program.

In lieu of implementing this provision, South Coast AQMD has instead focused on incentives to convert wood-burning fireplaces to gaseous fueled and will consider to expanding the program to electric devices. South Coast AQMD has incentivized the conversion of more than 10,000 fireplaces to gaseous fueled, where practicable, and continues to do so by providing up to $1,600 per unit in areas that typically see the highest concentrations of ambient PM2.5. The voluntary incentive program is currently being successfully implemented and staff is exploring ways to expand eligibility criteria to further encourage voluntary participation. Since the resale provision in Rule 4901 does not require removal or upgrade of fireplaces, the incentive approach has been more effective at achieving emission reductions in the Basin.

7. Rule 445 does not have provisions addressing major remodels of fireplaces and chimneys.

SJVAPCD Rule 4901 requires installation of a U.S. EPA certified, gas-fueled, or electric device during a remodel of a fireplace or chimney that exceeds $15,000 and requires a building permit. BAAQMD Regulation 6-3 has a similar provision. Under Rule 445, remodels are permitted if a health or safety issue exists and the wood-burning device is repaired within its existing footprint.[16,17] ~~However~~While~~,~~ Rule 445 does not have explicit provisions addressing major remodels of fireplaces or chimneys, it does ~~-~~restrict the sale, supply, and installation of wood burning devices~~unlike rules in other air districts~~.

The provisions in other districts' rules referencing remodels that exceed $15,000 and require a building permit suggest a substantial change to the appearance and/or functional utility of the fireplace. An example of such a change would be a homeowner who intends to demolish an existing fireplace to install a larger fireplace. In this instance, Rule 445 section (d)(2) is as stringent as, if not more stringent than, SJVAPCD Rule 4901 section 5.3 and BAAQMD Regulation 6, Rule 3 section 307 by requiring replacement units to be a U.S. EPA certified insert, masonry or pellet fueled heater, or a gaseous-fueled fireplace. Masonry and pellet fueled stoves have very low emission factors similar to U.S. EPA certified units. Importantly, Rule 445 does not have an up to $15,000 cost exemption or building permit requirement to trigger the requirements under (d)(2). Rule 445 always requires a less polluting alternative when replacing any wood burning device. Rule 445 is also more stringent because it prohibits the sale or installation of anything other than the listed types, which applies regardless of the size of project or whether it needs a building permit. Rule 445 is likely more enforceable as a sale/installation ban, imposed on companies, than provisions addressing individual residential building projects.

[16] http://www.aqmd.gov/docs/default-source/rule-book/support-documents/rule-445/detailed-rule-445-information.pdf?sfvrsn=13

[17] South Coast AQMD, Final Staff Report for Proposed Amended Rule 445 – Wood-Burning Devices. June 5, 2020

Farming Operations – Livestock Waste

Existing rules

Emissions from livestock waste in farming operations are regulated by Rules 223 and 1127.

South Coast AQMD Rule 223 Emission Reduction Permits for Large Confined Animal Facilities (Adopted June 2, 2006)

Rule 223 requirements apply to large Confined Animal Facilities (CAFs) above certain size thresholds. Dairies with at least 1,000 milking cows, poultry facilities with at least 650,000 birds, and horse facilities with at least 2,500 horses qualify as large CAFs. Pertaining to manure management, the dairy provisions require that owners/operators implement at least six of 12 corral measures, two of seven solid manure or separated solids handling measures, one of eight liquid manure handling measures, and two of four land application measures. A poultry large CAF owner/operator must implement at least one of seven solid manure or separated solids handling measures, and one of eight liquid manure handling measures.

South Coast AQMD Rule 1127 Emission Reductions from Livestock Waste (Adopted August 6, 2004)

Rule 1127 was adopted on August 6, 2004 to reduce emissions of ammonia, VOC, and PM10 emissions from dairy livestock waste. Rule 1127 applies to dairy farms with 50 or more cows, heifers, and/or calves and to manure processing operations, such as composting operations and anaerobic digesters. Rule 1127 requires the implementation of Best Management Practices (BMPs) to minimize fugitive dust, ammonia, and VOC emissions. Manure disposal is permitted only if the destination is a manure processing facility designed to reduce ammonia and VOC emissions from unprocessed manure, agricultural land within the South Coast AQMD approved for the spreading of manure, or a combination of the above options.

Federal and State rules and regulations

There are no federal or State regulations describing BACM for this source category. However, in 2017, U.S. EPA and the United States Department of Agriculture (USDA) published a reference guide that provides a compilation of control measures that achieve emission reductions from livestock and poultry operations.[18]

Analogous rules in other air districts

SJVAPCD Rule 4570 Confined Animal Facilities (Amended October 21, 2010)

Rule 4570 limits emissions of VOC and NH3 from Confined Animal Facilities. Rule 4570's regulatory thresholds include facilities with at least 500 milking cows, 3,500 beef cattle, 7,500 calves, heifers, or other cattle, 400,000 heads of chicken and ducks, 100,000 heads of turkey, 3,000 heads of swine and horses, and 15,000 heads of sheep, goats, or any combination of the two. Rule 4570 is more stringent regarding applicability than Rule 223 for milk cows (1,000 milk cows in South Coast AQMD vs. 500 milk cows in

[18] https://www.epa.gov/sites/default/files/2017-01/documents/web_placeholder.pdf

SJVAPCD), and for chickens and ducks (650,000 birds in South Coast AQMD vs. 400,000 birds in SJVAPCD). Rule 4570 also made certain feed and housing menu items mandatory for dairies and poultry facilities. However, South Coast AQMD Rule 1127 has lower applicability thresholds for cows, heifers and/or calves. Rule 223 also has a lower applicability for horse facilities (2,500 in South Coast AQMD vs. 3,000 in SJVAPCD), however there are no CAFs with greater than 2,500 horses in San Joaquin Valley.[19]

For corral mitigation measures in dairy operations, Rule 4570 has nine mitigation measures, six of which are mandatory and one additional measure that is required from the remaining three. South Coast AQMD Rule 223 requires at least six control measures from 10 Class One mitigation measures and two Class Two mitigation measures. For one Class One mitigation measure – inspect water pipes and troughs and repair leaks – South Coast AQMD Rule 223 has a higher frequency requirement than SJV Rule 4570. In addition, South Coast AQMD Rule 1127, which applies to dairies with 50 or more cows, requires facilities to choose at least five of the seven corral mitigation measures. Rule 4570 contains two solid waste control measures, from which facilities are required to choose at least one. South Coast AQMD Rule 223 has four Class One mitigation measures and three Class Two mitigation measures, from which facilities are required to choose at least two. With regard to liquid waste mitigation measures in dairies, operators are required to choose at least one of the four mitigation measures listed in Rule 4570. South Coast AQMD Rule 223 has five Class One mitigation measures and three Class Two mitigation measures, from which facilities are required to choose at least one. South Coast AQMD Rule 1127 requires that manure removed must be either treated at an approved manure processing operation or applied on agricultural land with local approval.

BAAQMD Regulation 2 Rule 10 Large Confined Animal Facilities (Adopted July 19, 2006)

Rule 2-10 is a permit rule that limits emissions of VOCs, NOx and PM10 from large CAFs. The applicability threshold is the same as in South Coast AQMD Rule 223. Rule 2-10 requires Reasonably Available Control Technology (RACT) to be implemented for a large CAF.

SMAQMD Rule 496 Large Confined Animal Facilities (Adopted August 24, 2006)

Rule 496 applies to large CAFs with the same regulatory threshold as South Coast AQMD Rule 223. Regarding corral mitigation measures in dairies, Rule 496 has 15 Class One mitigation measures and three Class Two mitigation measures from which facilities are required to choose at least six. South Coast AQMD Rule 223 requires the same number of control measures (at least six) from ten Class One mitigation measures and two Class Two mitigation measures. For controlling emissions from solid waste, Rule 496 requires the dairy operators to choose at least two mitigation measures from five Class One mitigation measures and three Class Two mitigation measures; South Coast AQMD Rule 223 has four Class One mitigation measures and three Class Two mitigation measures, from which facilities are required to choose at least two. Regarding liquid waste mitigation measures, Rule 496 has five Class One mitigation measures and five Class Two mitigation measures, from which facilities are required to choose at least

[19] San Joaquin Valley Air Pollution Control District 2018 Serious Area Plan for the 2012 Annual PM2.5 Standard, Appendix C. https://www.valleyair.org/pmplans/documents/2018/pm-plan-adopted/C.pdf

one. South Coast AQMD Rule 223 has similar requirements at which operators are required to choose at least one measure from five Class One mitigation measures and three Class Two mitigation measures.

ICAPCD Rule 217 Large Confined Animal Facilities Permits Required (Amended February 9, 2016)

Imperial County Air Pollution Control District (ICAPCD) Rule 217 was adopted on October 10, 2006 and limits ammonia and VOC emissions from large confined animal facilities.[20] Following adoption of the 2016 amendment, the requirements are now equally stringent to SJVAPCD Rule 4750, and thus the applicability thresholds are lower than those in South Coast AQMD Rule 223.[21]

Evaluation

SJVAPCD Rule 4750 and ICAPCD Rule 217 have lower applicability thresholds than South Coast AQMD Rule 223. Staff evaluated the feasibility and effectiveness of lowering the rule applicability thresholds for dairies and poultry facilities. Staff also evaluated the control measures provided in the U.S. EPA and USDA reference guide. The evaluation can be found in the Control Measure Assessment section.

Paved Road Dust

Existing rules

Emissions from paved road dust are regulated by multiple South Coast AQMD rules.

South Coast AQMD Rule 1186 PM10 Emissions from Paved and Unpaved Roads and Livestock Operations (Amended July 11, 2008)

Rule 1186 controls emissions of particulate matter from paved and unpaved public roads, and livestock operations. It establishes requirements to prevent material from being deposited on roadways and also requires local jurisdictions to procure certified street sweeping equipment. Rule 1186 requires new or widened roads to be constructed with curbing or, as an alternative, paved shoulders. Local governments are also required to remove material deposited onto roads as a result of wind, water erosion, or by other means, and are also required to use only South Coast AQMD Rule 1186-certified street sweepers which have a minimum pick-up efficiency of 80 percent and limit entrained PM10 emissions to no more than 200 mg/m. Rule 1186 also requires unpaved access connections and unpaved feed lane access areas in livestock operations to be treated. All grinding activities are limited to 2 to 5 p.m. if visible emissions are detected.

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[20] https://apcd.imperialcounty.org/wp-content/uploads/2020/01/1RULE217.pdf

[21] San Joaquin Valley Air Pollution Control District 2018 Serious Area Plan for the 2012 Annual PM2.5 Standard, Appendix C. https://www.valleyair.org/pmplans/documents/2018/pm-plan-adopted/C.pdf

South Coast AQMD Rule 1157 PM10 Emission Reductions from Aggregate and Related Operations (Amended September 8, 2006)

Rule 1157 requires access improvements which are intended to reduce the amount of material tracked out from a facility onto surrounding paved public roads.

South Coast AQMD Rule 403 Fugitive Dust (Amended June 3, 2005)

Rule 403 requires access improvements for sites greater than 5 acres and all material tracked out from applicable sources must be removed at the conclusion of the workday or at any time it extends more than 25 feet from a site.

South Coast AQMD Rule 403.2 Fugitive Dust from Large Roadway Projects (Adopted June 3, 2022)

Rule 403.2 reduces potential fugitive dust impacts to communities near large roadway projects and prohibits certain large roadway project activities that generate dust and are in close proximity to sensitive receptors and areas of public exposure. Rule 403.2 includes additional requirements related to dust control, notification to nearby receptors, project signage, and recordkeeping.

Federal and State rules and regulations

Staff evaluated the requirements of U.S. EPA's Fugitive Dust Background Document and Technical Information Document for BACM and found no requirements that were more stringent than those already incorporated in the South Coast AQMD rules for this source category.[22]

There are no State regulations/policies describing BACM for this source category.

Analogous rules in other air districts

SJVAPCD Rule 8061 Paved and Unpaved Roads (Amended August 19, 2004)

SJVAPCD Rule 8061 establishes a minimum sweeping frequency of once per month for roads with paved curbs that have been determined to have the greatest potential for dirt and silt loadings. For unpaved roads, on any unpaved road segment with 26 or more Annual Average Daily Traffic (AADT), the owner/operator shall limit visible dust emission to 20 percent opacity and comply with the requirements of a stabilized unpaved road or shall implement an APCO-approved Fugitive PM10 Management Plan. Within an urban area, Rule 8061 requires that all new roads be paved. For existing paved roads in urban areas with unpaved shoulders, Rule 8061 requires paving or stabilizing a 4-foot shoulder on 50% of the roads with the highest AADT.

[22] https://nepis.epa.gov/Exe/ZyPDF.cgi/2000JCJE.PDF?Dockey=2000JCJE.PDF

SMAQMD Rule 403 Fugitive Dust (Adopted August 3, 1977)

Staff evaluated the requirements of SMAQMD Rule 403 and found no requirements that were more stringent than those already incorporated in the South Coast AQMD rules for this source category.

BAAQMD has no rule for this source category.

Evaluation

Staff evaluated the feasibility and effectiveness of establishing minimum street sweeping frequencies and enhancing street cleaning for roads with higher silt loadings. The evaluation can be found in the Control Measure Assessment section.

Commercial Cooking

Existing rule

South Coast AQMD Rule 1138 Control of Emissions from Restaurant Operations (Adopted November 14, 1997)

South Coast AQMD regulates VOC and PM emissions from chain-driven charbroilers through Rule 1138. Rule 1138 covers chain-driven charbroilers cooking 875 pounds of meat or more per week, applicable to mostly large (fast food) chain operations. The rule requires the installation of flameless catalytic oxidizers, or equivalent control devices, to chain-driven charbroilers. Currently, under-fired charbroilers are not regulated by Rule 1138.

Federal and State rules and regulations

There are no federal or State regulations/policies describing BACM for this source category.

Analogous rules in other air districts and local agencies

SJVAPCD Rule 4692 Commercial Charbroiling (Amended June 21, 2018)

Rule 4692 reduces PM emissions by requiring catalytic oxidizers for chain-driven charbroilers cooking 400 pounds of meat or more per week. This threshold is more stringent than South Coast AQMD Rule 1138 which applies to chain-driven charbroilers cooking 875 pounds of meat or more per week. Rule 4692 requires that chain-driven charbroilers be equipped with a catalytic oxidizer that achieves minimum control efficiencies of 83 percent for PM10 and 86 percent for VOCs. Catalytic oxidizers certified by South Coast AQMD are also deemed compliant. In its 2018 amendment, SJVAPCD expanded Rule 4692 applicability to include under-fired charbroilers. Operators of under-fired charbroilers are required to submit a one-time report and register the equipment in lieu of obtaining a permit. There are no registration and reporting requirements for under-fired charbroilers in Rule 1138. However, there are limited filing requirements for owners or operators of commercial charbroilers under Rule 222.

BAAQMD Regulation 6, Rule 2 Commercial Cooking Equipment (Adopted December 5, 2007)

Regulation 6-2 requires controls on chain-driven charbroilers and under-fired charbroilers meeting the requirements of: exempting less than 400 lbs of meat per week for chain-driven charbroilers and exempting less than 800 lbs of meat per week for under-fired charbroilers; installation of a certified catalytic oxidizer emitting 1.3 lbs of PM10 and 0.32 lbs of VOC per 1,000 lbs of beef cooked, or a control device emitting 0.74 lbs of PM10 per 1,000 lbs of beef cooked for chain-driven charbroilers; PM10 emissions limit no more than 1.0 lb per 1,000 lbs of beef cooked and installation of a certified control device for new and existing under-fired charbroilers. These emission limits are similar to the limits that would be achieved by a South Coast AQMD certified catalytic oxidizer.

BAAQMD does have a lower exemption limit for chain-driven charbroilers (400 lb or less of beef cooked per week) in comparison to South Coast AQMD (875 lb or more per week). However, South Coast AQMD Rule 1138 is applicable to all types of meat (e.g., fish, chicken, pork, etc.). While beef (e.g., hamburger and steak) does have the highest amount of PM and VOC emissions per pound, a large portion of the overall types of meat cooked include meats other than beef. In the Bay Area, 58 percent of meat charbroiled is not beef.[23] Furthermore, the BAAQMD exemption threshold of 800 lb or less of beef for under-fired charbroilers is very close to the 875 lb or less exemption for chain-driven charbroilers since, at this volume of throughput, charbroilers tend to be chain-driven and not under-fired and a permit may be required.

Finally, no under-fired charbroiler emissions control device meeting the requirements of BAAQMD Regulation 6 Rule 2 has been certified in the Bay Area~~ and there is no active enforcement of this provision~~.[24]

New York City Department of Environmental Protection (NYC DEP), Title 24 of the Administrative Code, Section 24-149.4 Commercial Char Broilers (Amended May 6, 2016)

Passed in May 2016, this code requires the installation of a control device which is certified to provide at least 75 percent emission reductions for new under-fired charbroilers and for any new or existing chain-driven charbroiler used to cook 875 lbs or more of meat per week. Registration and the payment of a $100 administration fee are required for existing charbroiler units. Consideration of control requirements for existing under-fired charbroilers was pushed back due to feasibility questions and higher cost of retrofitting existing operations. Based on conversations with NYC DEP, there has been no active enforcement of the under-fired charbroiler provisions in this code.[25]

City of Aspen, Colorado, Administrative Code Section 13.08.100. Restaurant Grills

This code applies to commercial charbroilers installed after April 25, 1983. Charbroilers installed after April 25, 1983 but before January 1, 1993 are required to be equipped with an emission control device

[23] 2007 Bay Area Air Quality Management District Staff Report, Regulation 6, Rule 2: Commercial Cooking Equipment

[24] Telephone call with ~~Eric Pop,~~Compliance and Enforcement staff at BAAQMD, 5/5/23

[25] Email correspondence with staff at NYC DEP, 9/14/23

that reduces uncontrolled PM10 emissions by at least 90 percent if the charbroiler is used to cook high-fat-content meat. All charbroilers newly installed on or after January 1, 1993 are subject to PM10 emissions control at 90 percent efficiency, unless a charbroiler is replaced with another charbroiler that is less than or equal to the cooking surface of the charbroiler being replaced.

Ventura County Air Pollution Control District Rule 74.25 Restaurant Cooking Operations

All chain-driven charbroilers cooking over 875 lbs meat/week require catalytic oxidizers. Staff did not identify any more stringent provisions than those in Rule 1138.

Evaluation

Staff assessed the potential emission reduction opportunities of lowering the regulatory threshold for chain-driven charbroilers. The evaluation can be found in the Control Measure Assessment section. As of September 2023, staff confirmed that jurisdictions with measures in place that require installing control devices for under-fired charbroilers (BAAQMD and NYC DEP) do not have any known installations that meet the applicable measure requirements. As these jurisdictions were not able to identify an example of an installed certified control device, it makes it difficult to demonstrate that available technologies could achieve emission reductions in practice. Therefore, staff does not propose a potential control measure for under-fired charbroilers. Nevertheless, South Coast AQMD will continue discussions and collaboration with other air districts and CARB to continually assess the state of control technology for under-fired charbroilers.

Identifying Potential Control Measures

While the previous section focused on an in-depth analysis of several key PM source categories, the BACM demonstration is required to identify potential opportunities to reduce emissions across all applicable source categories. To accomplish this, U.S. EPA recommends that nonattainment air districts first identify the emission reduction programs that have already been implemented at the federal, state or local air district level. Next, U.S. EPA recommends that air districts examine additional control measures adopted for other nonattainment areas to attain the ambient air quality standards as expeditiously as practicable. To demonstrate that South Coast AQMD has considered all available measures, a multi-step analysis that consulted various sources was conducted. The following sections summarize the analysis.

Step 1 – Other Districts' Control Measures

This portion of the analysis focused on the identification of air districts' rule requirements that are more stringent than those in South Coast AQMD rules. A detailed evaluation of South Coast AQMD rule requirements can be found in Attachment A. It shows that, in general, South Coast AQMD's current rules and regulations are equivalent to or more stringent than those developed by other air districts. However, in some areas, existing source-specific rules may be amended to lower exemption thresholds and/or emissions standards, promote cleaner technologies, or add additional best management practices. The key findings are summarized in Table III-1, while the Control Measure Assessment section contains an in-depth feasibility discussion for each measure.

TABLE III-1
AIR DISTRICTS' RULE REQUIREMENTS THAT ARE MORE STRINGENT THAN THOSE IN SOUTH COAST AQMD RULES

Rule #	Evaluation
223	SJVAPCD Rule 4570 has lower applicability thresholds than those in Rule 223 for milk cows (1,000 milk cows in South Coast AQMD vs. 500 milk cows in SJVAPCD), and for chickens and ducks (650,000 birds in South Coast AQMD vs. 400,000 birds in SJVAPCD). Staff evaluated the feasibility and effectiveness of extending rule applicability to dairies and certain poultry facilities using a lower size threshold, and the assessment can be found in the Control Measure Assessment section.
445	SJVAPCD Rule 4901 and BAAQMD Regulation 6, Rule 3 have more stringent requirements. For details, refer to the previous section. Staff analyzed the feasibility of incorporating the more stringent requirements and the assessment can be found in the Control Measure Assessment section.
1111	BAAQMD Regulation 9, Rule 4 establishes a zero NOx emission limit for new natural gas-fired space heaters with a capacity < 175,000 Btu/hr beginning in 2029, which is more stringent than the 14 ng/J NOx emission limit in Rule 1111. Staff evaluated the feasibility and effectiveness of lowering the emission limit and the assessment can be found in the Control Measure Assessment section.
1117	SJVAPCD Rule 4353 contains emission limits for PM10 which are not in Rule 1117. Staff evaluated the feasibility of incorporating these emission limits and the assessment can be found in the Control Measure Assessment section.
1121	BAAQMD Regulation 9, Rule 6 establishes a zero NOx emission limit for new natural gas-fired water heaters and boilers, which is more stringent than the NOx emission limits in Rule 1121. Implementation of the zero NOx limit follows a phased approach depending on the capacity, but all new heaters and boilers up to 2 MMBtu/hr are required to comply by 2031. Staff evaluated the feasibility and effectiveness of lowering the emission limit and the assessment can be found in the Control Measure Assessment section.
1138	SJVAPCD Rule 4692 has a lower applicability threshold (400 vs. 875 lbs of meat or more per week in South Coast AQMD) for chain-driven charbroilers. BAAQMD Regulation 6, Rule 2 applies to under-fired charbroilers with combined total grill surface area of at least 10 square feet, purchasing 1,000 lbs of beef or more per week, and cooking 800 lbs of beef per week. Staff evaluated the feasibility of lowering the regulatory threshold of chain-driven charbroilers from 875 to 400 lbs of meat or more per week and extending applicability to under-fired charbroilers. The assessment can be found in the Control Measure Assessment section.
1146	SJVAPCD Rule 4320 has more stringent NOx emission limits than Rule 1146 for boilers, steam generators, and process heaters greater than or equal to 5 MMBtu/hr. For natural gas-fired boilers between 5 and 20 MMBtu/hr, the NOx limit is 5 ppm in Rule 4320, while

Rule #	Evaluation
	the corresponding NOx limits are 7 to 9 ppm in Rule 1146. In addition, for natural gas-fired units that are greater than 20 MMBtu/hr, the NOx limit is 2.5 ppm in Rule 4320 compared to 5 ppm in Rule 1146. Unlike Rule 1146, which sets mandatory emission limits, Rule 4320 has an option for facilities to pay an annual emission mitigation fee in lieu of meeting the NOx limits. Staff evaluated the feasibility of lowering emission limits in Rule 1146 and the assessment can be found in the Control Measure Assessment section.
1186	SJVAPCD Rule 8061 requires municipalities to sweep paved roads at least once per month with PM10 efficient units. For unpaved roads, on any unpaved road segment with 26 or more AADT, the owner/operator shall limit visible dust emission to 20 percent opacity and comply with the requirements of a stabilized unpaved road, or shall implement an APCO-approved Fugitive PM10 Management Plan. Within an urban area, this rule requires all new roads to be paved. Staff evaluated the feasibility of these requirements and the assessment can be found in the Control Measure Assessment section.

The following sections present an in-depth analysis of SIPs from other 2012 annual PM2.5 NAAQS nonattainment areas (see Table III-2). South Coast AQMD staff evaluated the control measures in these SIPs and analyzed the corresponding adopted or amended rules, if applicable. Evaluation of the control strategies for these nonattainment areas is a critical component of this BACM demonstration and ensures that South Coast AQMD incorporates the most effective PM2.5 measures being applied across the nation.

TABLE III-2

2012 ANNUAL PM2.5 NAAQS NONATTAINMENT STATUS AND ATTAINMENT YEAR

NONATTAINMENT AREA	2012 Annual PM2.5 Standard	
	Classification	Attainment Year
Los Angeles-South Coast Air Basin, CA	Serious	2025
San Joaquin Valley, CA	Serious	2025
Plumas County, CA	Serious	2025
Imperial County, CA	Moderate	2021
Allegheny County, PA	Moderate	2021

PM2.5 Nonattainment Areas, as of 1/30/2023, are posted in https://www3.epa.gov/airquality/greenbook/kbtcw.html.

San Joaquin Valley, CA

On November 15, 2018, San Joaquin Valley APCD adopted the 2018 PM2.5 Plan to address U.S. EPA's 1997 (annual, 15 µg/m^3 and 24-hour, 65 µg/m^3), 2006 (24-hour, 35 µg/m^3), and 2012 (annual, 12 µg/m^3) PM2.5 standards.[26] The plan committed to adopt the following eight regulatory control measures.

- SJVAPCD Rule 4311 Flares

  Rule 4311 controls emissions from flares at oil and gas production facilities, sewage treatment plants, waste incineration and petroleum refining operations. Flare operators are required to submit flare minimization plans, perform extensive monitoring and record keeping, submit reports of planned and unplanned flaring activities, and meet petroleum refinery SO2 performance targets. In its 2018 PM2.5 Plan, SJVAPCD committed to pursue 0.05 tpd of additional NOx emissions reductions.

  Rule 4311 was amended on December 17, 2020 and has NOx and VOC emissions limits that are 0.018 to 0.06 lbs/MMBtu and 0.008 to 0.038 lbs/MMBtu, respectively. South Coast AQMD Rule 1118 (Control of Emissions from Refinery Flares; amended 7/7/17) requires flare minimization plans, reports of planned and unplanned flaring activities, and record keeping for petroleum refineries. South Coast AQMD Rule 1118.1 (Control of Emissions from Non-Refinery Flares; adopted in January 2019, limits NOx emissions at 0.018 to 0.06 lbs/MMBtu and VOC emissions at 0.008 to 0.038 lbs/MMBtu from non-refinery flare gases, including digester gas, landfill gas, produced gas, and other flare gas. The NOx limits in South Coast AQMD Rule 1118.1 are as stringent as those in SJVAPCD Rule 4311.

- SJVAPCD Rule 4306 Boilers, Steam Generators, and Process Heaters – Phase 3 and Rule 4320 Advanced Emission Reduction Options for Boilers, Steam Generators, and Process Heaters Greater than 5.0 MMBtu/hr.

  A wide range of industries are subject to Rules 4306 and 4320, including electrical utilities, cogeneration, oil and gas production, petroleum refining, manufacturing and industrial processes, food and agricultural processing, and service and commercial facilities. The 2018 PM2.5 Plan considered potential measures including lowering emission limits and further lowering the more stringent advanced emission reduction option limit.

  Both Rule 4306 and Rule 4320 were amended on December 17, 2020 to include the latest generation of ultra-low NOx burners, SCR, and low NOx burners combined with SCR. Rule 4306 has tiered NOx emissions requirements. Tier 1 limits are required until December 30, 2023 and Tier 2 limits are enforced beginning December 31, 2023. For Tier 1 units operated on natural gas with a rated heat input equal to or less than 20 MMBtu/hr, a NOx limit of 9 ppm for thermal fluid

[26] https://www.valleyair.org/pmplans/documents/2018/pm-plan-adopted/2018-Plan-for-the-1997-2006-and-2012-PM2.5-Standards.pdf

heaters with a total rated heat input between 5 and 20 MMBtu/hr to be implemented by 2023–2029. Rule 4320 requires fire-tube boilers and all other equipment greater than 20 MMBtu/hr to meet 2.5 ppm NOx limit by 2023.

South Coast AQMD Rule 1146 (Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters; amended 12/4/20) currently limits NOx emissions from thermal fluid heaters to 12 ppm. While 9 ppm is feasible for new burners upon replacement, the 12 ppm NOx emission limit was established at the time of rule development. Lowering the emission limit from 12 ppm to 9 ppm for retrofits involves higher costs ranging from $58,000 to $523,000 per ton of NOx reduced.[27] SJVAPCD Rule 4320 provides the flexibility to comply with the lower NOx emission limit through paying an annual mitigation fee as an option in lieu of meeting the limit, whereas the emission limits in Rule 1146 are mandatory.

- SJVAPCD Rule 4354 Glass Melting Furnaces

Rule 4354 limits emissions of NOx, CO, VOC, SOx, and PM10 from glass manufacturing plants that make flat glass (window and automotive windshields), container glass (bottles and jars), and fiberglass (insulation). SJVAPCD committed to pursue the potential reductions of NOx emissions for container glass furnaces using ultra-low NOx control technologies such as catalytic filtration, oxy-fuel combined with SCR, and other methods.

Rule 4354 was amended on December 16, 2021 and requires container glass melting furnaces to meet a 1.5 lbs of NOx limit per ton of glass produced until December 31, 2023. On and after January 1, 2024, the phase I NOx limit is 1.1 lbs per ton of glass produced and the phase II NOx limit is 0.75 lbs per ton of glass produced. For the same type of glass melting furnaces, the SOx emission limit is 1.1 lbs per ton of glass produced until December 31, 2023 and 0.85 lbs per ton of glass produced on and after January 1, 2024.

South Coast AQMD Rule 1117 (Emissions from Container Glass Melting and Sodium Silicate Furnaces; amended 6/5/20) has comparable emission limits of NOx and SOx for container glass melting furnaces. Through 2023, NOx (0.75 lbs per ton of glass produced) and SOx (1.1 lbs per ton of glass produced) emission limits in Rule 1117 are at least as stringent as or even more stringent than Rule 4354. After 2024, the NOx emission limit in Rule 1117 is as stringent as that in Rule 4354. SJVAPCD Rule 4354 has other emissions limits for CO, VOC, and PM10 which are not in Rule 1117.

[27] http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2022-air-quality-management-plan/final-2022-aqmp/appendix-vi.pdf?sfvrsn=12

- SJVAPCD Rule 4692 Commercial Charbroiling

  The control measure included in the 2018 PM2.5 Plan sought to achieve additional emission reductions from commercial under-fired charbroilers through an incentive-based approach to fund the installation of controls for commercial under-fired charbroilers within urban boundaries in hot-spot areas, with a future year regulatory requirement to encourage participation by Valley businesses. As of April 2023, only one restaurant had completed a retrofit installation of under-fired charbroiler control technology as part of the Valley's incentive program.[28]

  Rule 4692 was amended on June 21, 2018, but requirements to install controls for under-fired charbroilers were not included in the rule. The details of the rule requirements are explained in the Cooking-Commercial Charbroiling section of Existing and Potential Control Measures for Key PM Source Categories.

- SJVAPCD Rule 4901 Wood Burning Fireplace and Wood Burning Heaters

  The control measure included in the 2018 PM2.5 Plan sought potential enhancements to its wood-burning curtailment program including lowering curtailment levels, enhanced levels of incentives, prohibiting wood-burning devices in new construction, enhanced outreach and education efforts, and new requirements for significant remodels of a fireplace or chimney.

  Rule 4901 was amended on June 20, 2019. The details of the rule requirements are explained in the Residential Fuel Combustion – Wood Combustion – Wood Stoves section of Existing and Potential Control Measures for Key PM Source Categories.

- SJVAPCD Rule 4352 Solid Fuel-Fired Boilers, Steam Generators and Process Heaters

  Rule 4352 limits NOx and CO emissions from any boiler, steam generator or process heater that is fired on solid fuel including municipal solid waste (MSW), biomass, and other solid fuels.

  Rule 4352 was amended on December 16, 2021 to lower NOx limits to 110 ppm on MSW and 65 ppm on biomass and all others, averaged over 24-hours, on and after January 1, 2024. South Coast AQMD Rule 1146 sets a NOx emission limit at 40 ppm on any non-gaseous fueled unit, averaged over 15 minutes, which is more stringent than the NOx limits set in Rule 4352.

- SJVAPCD Rule 4550 Conservation Management Practices (CMP)

  Rule 4550, adopted in 2004, targets fugitive particulate emissions from agricultural operations (e.g., tillage practices, land preparation activities, etc.) to bring the Valley into attainment of the PM10 NAAQS. San Joaquin Valley APCD committed to evaluate the feasibility and effectiveness of control measures to achieve additional PM2.5 emission reductions from tilling and other land

[28] Email from Kyle Matsumura, SJVAPCD on April 17, 2023

preparation activities based on the research and through additional incentives under Rule 4550. However, there have been no recent amendments to Rule 4550 that would trigger reassessment of the rule provisions as they relate to those in South Coast AQMD rules.

South Coast AQMD Rule 403 aims to reduce the amount of PM entrained in the atmosphere as a result of man-made fugitive dust sources by requiring actions to prevent, reduce or mitigate fugitive dust emissions. Rule 1186 further reduces PM emissions from livestock operations.

- SJVAPCD Rule 4702 Internal Combustion Engines

  Rule 4702 applies to any internal combustion engine (ICE) rated at 25 bhp or greater and limits NOx, CO, VOC, and SOx emissions from applicable units including agricultural engines. In the 2018 PM2.5 Plan, SJVAPCD sought to further reduce NOx emissions from both agricultural and non-agricultural ICEs to the extent that such controls are technologically and economically feasible. Rule 4702 was amended on August 19, 2021 to establish emission limits for two engine ratings – one rated at least 25 bhp and up to 50 bhp and the other greater than 50 bhp. Stationary engines rated at up to 50 bhp must meet applicable requirements and emission limits specified in 40 CFR 60 Subparts IIII and JJJJ. Engines rated at greater than 50 bhp have separate emission limits by ignition type. Spark-ignited engines used in Agricultural Operations (AO) are required to meet 11 ppm NOx for rich-burn by 12/31/2023 and 43 ppm NOx for lean-burn engines by 12/31/2029 or 12 years after engine installation, whichever comes later. Non-AO spark-ignited engines are required to meet as low as 11 ppm NOx for both rich-burn and lean-burn engines with a full implementation date of 12/31/2023. South Coast AQMD Rule 1110.2 applies to all stationary and portable engines over 50 bhp and requires an 11 ppm NOx limit.

Plumas County, CA

Plumas County is part of the Northern Sierra AQMD. Staff did not identify any control measures to incorporate into the 2012 annual PM2.5 BACM analysis.

Imperial County, CA

South Coast AQMD staff reviewed Imperial County APCD's 2018 PM2.5 Plan and found no control measures that can potentially be incorporated into the 2012 annual PM2.5 BACM analysis.[29]

Allegheny County, PA

Pennsylvania Department of Environmental Protection (PADEP) submitted the Allegheny County Area PM2.5 Plan[30] on September 30, 2019, on behalf of Allegheny County Health Department (ACHD), in order to meet the applicable CAA requirements for the 2012 annual PM2.5 NAAQS. U.S. EPA approved most

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[29] https://apcd.imperialcounty.org/wp-content/uploads/2020/01/2018-IC-PM25SIP.pdf
[30] https://downloads.regulations.gov/EPA-R03-OAR-2020-0157-0004/content.pdf

required elements of the Allegheny County Area PM2.5 Plan, except for the contingency measures element of the plan, which U.S. EPA conditionally approved.[31] Staff reviewed the RACM analysis[32] and found the following measures to be potentially applicable to this BACM analysis.

- Commercial Cooking

  Allegheny County has no existing control requirements for commercial cooking but evaluated HEPA filters for under-fired charbroilers as a technologically feasible emission control technology. The estimated cost-effectiveness was $16,348 per PM2.5 ton reduced, and full implementation was anticipated to take 5 years. South Coast AQMD staff evaluated requiring the installation of fabric filters and other control technology for under-fired charbroilers in the Control Measure Assessment section.

- Fuel Combustion (Residential Wood)

  Allegheny County has programs in place for residential wood stove and fireplace use, including wood stove change-out and "bounty" programs to replace existing wood stoves with new EPA-certified wood stoves, and a fireplace conversion program that offers discounts for fireplace inserts. The sale, installation, or purchase of non-Phase 2 outdoor wood-fired boilers is prohibited after May 31, 2011. An outdoor "no burn" policy is also in place when Air Quality Action Days are predicted.

  Allegheny County noted in its analysis that some communities have required the removal and destruction of old wood stoves upon the sale of a home (e.g., Mammoth Lakes, CA; Washoe County, NV; and Jacksonville, OR). South Coast AQMD evaluates requiring replacement or removal of old wood-burning devices upon the sale or transfer of a property as discussed in the Control Measure Assessment section.

- Fugitive Dust

  Dust suppressant applications are currently required at various locations within Allegheny County. Technologically feasible control measures include paving unpaved roads and unpaved parking lots and prohibiting the construction of new unpaved roads. Based on 80 percent rule penetration with unpaved roads representing 24 percent of the fugitive dust inventory, 0.19 tpd of PM2.5 emission reductions were estimated with this analysis. Cost-effectiveness was calculated based on SJVAPCD Rule 8061 to range between $2,450 and $6,725 per PM2.5 ton reduced and full implementation was anticipated one year after rule enactment.

  South Coast AQMD Rule 1186 regulates vehicle trips on paved and unpaved public roads and at livestock operations and requires different control methods including certified street sweepers,

[31] 86 FR 26388
[32] https://downloads.regulations.gov/EPA-R03-OAR-2020-0157-0014/content.pdf

chemical stabilizers, and dust suppressants to reduce fugitive PM10 emissions from roads. Between 1998 and 2006, Rule 1186 required annual treatment of unpaved public roads by either paving at least 1 mile of such roads, applying chemical stabilizer to 2 miles of such roads, or limiting vehicle speeds at 15 mph and/or installing speed bumps every 500 ft on 3 miles of such roads. Maintenance is required for chemically stabilized unpaved roads, but no such maintenance is required for paved roads. Paving unpaved public or private roads with maintenance of existing paved roads and prohibiting construction of new unpaved roads within urban areas is a potential control measure and the feasibility is assessed in the Control Measure Assessment section.

Step 2 – U.S. EPA's Technical Support Documents

Newly adopted/amended rules to be incorporated into the California SIP have to be submitted for U.S. EPA's review and approval. U.S. EPA prepares Technical Support Documents (TSDs) that review the State's submittals of rules to be approved in the SIP, outline the CAA requirements for U.S. EPA to approve such submittal, and provide evaluation and recommendation for action on the State's submittals. TSDs include U.S. EPA's suggestions for future rule revisions that could be considered as potential control measures. In the 2016 AQMP, U.S. EPA's TSDs finalized by December 2015 were reviewed as part of the 2016 AQMP BACM demonstration. Staff identified the following TSDs that have been issued since the 2016 AQMP:

- Rule 1111 (Reduction of NOx Emissions from Natural Gas-Fired, Fan Type Central Furnaces; Approved March 29, 2016)
- Rule 1118 (Control of Emissions from Refinery Flares; Approved September 22, 2022)
- Rule 1118.1 (Control of Emissions from Non-Refinery Flares; Approved December 19, 2022)
- Rule 1147 (NOx Reductions from Miscellaneous Sources; Approved December 28, 2016)
- Rule 1153.1 (Emissions of Oxides of Nitrogen from Commercial Food Ovens; Approved December 28, 2016)
- Rule 1168 (Adhesives and Sealant Applications; Approved February 24, 2021)

Of these TSDs, Rules 1118, 1118.1, and 1153.1 contained suggested rule amendments by U.S. EPA.

Below are U.S. EPA's TSD recommendations for SIP-approved South Coast AQMD Rule 1118.

> "Rule 1118 subparagraph (j) provides the Executive Officer the authority to approve another ASTM method. Without further specificity regarding how this authority will be exercised, it could functionally allow for a revision of the SIP without complying with the process for SIP revisions required by the CAA. As a result, this undermines the enforceability of the submission, constitutes a SIP deficiency, and conflicts with CAA Section 110. To resolve this deficiency, we recommend that Rule 1118 be amended to remove this clause, or the district would include sufficient detail in advance of the time of approval of the SIP provision, showing that the exercise of the director's

> discretion will not interfere with other CAA requirements. Another resolution would be for the language to include a requirement that the alternative test method also is federally approved."

Rule 1118 was amended on January 6, 2023 to address U.S. EPA's concern and now includes CARB and U.S. EPA approval for ASTM standards. Below are U.S. EPA's TSD recommendations for SIP-approved South Coast AQMD Rule 1118.1.

> "The following revisions are not currently the basis for rule disapproval, but are recommended for the next time the rule is amended. In Section (d)(3)(B), an owner or operator shall submit a Notification of Intent to the Executive Officer when the flare or flare station's annual percent capacity is greater than the applicable threshold for two consecutive calendar years. According to the Final Staff Report after July 1st, 2024, most, if not all, of the flares and flare stations would have made changes to meet the thresholds listed in the rule; and ideally any exceedance of the thresholds in the rule would be uncommon. Therefore, we are recommending that in the future, after one calendar year (instead of the current 2 years) that a flare or flare station's annual percent capacity is greater than the applicable threshold listed in Table 2 – Annual Capacity Thresholds, the owner or operator shall submit a Notification of Intent to the Executive.
>
> In South Coast AQMD Rule 1118, BAAQMD Rule 12-11, BAAQMD Rule 12-12, SBCAPCD Rule 359, and SJVAPCD Rule 4311 there is a requirement that a pilot flame or an automatic ignition is operating at the time when combustible gases are vented through the flare. The NESHAP Subpart A for General Provisions § 60.18- General control device and work practice requirements and NSPS Subpart A for General Provisions § 63.11 – Control device and work practice requirements, both require flares to have a pilot flame present during flaring. Even though pilot flames or auto ignition are present during flaring in the non-refinery flares in South Coast, we recommend that this requirement be added during the next rule amendment."

Below are U.S. EPA's TSD recommendations for SIP-approved South Coast AQMD Rule 1153.1.

> "In section (c)(1), consider adopting a lower NOx limit similar to the limit in San Joaquin Valley APCD Rule 4309 for the next time rule revision. San Joaquin Valley APCD Rule 4309 (Dryers, Dehydrators, and Ovens) contains a NOx limit of 4.3 ppm at 19 percent oxygen for applicable units and is lower than the NOx emission limit of 60 ppm at 3 percent oxygen (6.5 ppm at 19 percent oxygen) in Rule 1153.1 for units run at temperatures greater than 500 °F."

Rule 1153.1 was amended on August 4, 2023, ~~to address~~ as part of the Regional Clean Air Incentives Market (RECLAIM) transition to a command-and-control regulatory structure. The recently amended rule established new Best Available Retrofit Control Technology (BARCT) limits for all commercial food ovens which includes dryers, smokehouses, cooking ovens, and coffee roasters. The rule also establishes new zero- emission limits for several categories. All applicable units are now required to meet a NOx limit of 30 ppm at 3 percent oxygen regardless of operating temperature. In addition, several categories are required to meet a zero- emission limit at a future date. The recent rule amendments address U.S. EPA's concerns regarding the NOx limit since the NOx limits for Rule 1153.1 are more stringent than those in San Joaquin Valley APCD's Rule 4309.

Based on the above recommendations, and considering recent rule amendments, staff did not identify any new PCMs that could be considered in this analysis.

Step 3 – Potential Control Measures from Previous Plans

BACM/BACT is a moving target that changes over time as new technologies and products become feasible and cost-effective. For this BACM demonstration, therefore, PCMs from previous plans were reassessed considering the latest emissions inventory, current state of technology, and cost data. Staff revisited the BACM evaluation for the 2012 annual PM2.5 standard and the Reasonably Available Control Measures (RACM) evaluation for the 2015 8-hour ozone standard in the 2016 and 2022 AQMPs, respectively. From the 2016 AQMP, staff identified several PCMs that were either rejected as infeasible or were otherwise not included and adopted as control measures. From the 2022 AQMP, one potential RACM that was determined to be technologically infeasible was reassessed. All remaining measures were not applicable based on precursor demonstrations, were incorporated into rule requirements, or were included as commitment in the plan. Precursor demonstrations presented in Appendix VI of this Plan evaluated the contribution of individual PM2.5 precursor to ambient PM2.5 levels. According to U.S. EPA's guidance and their implementation rule, the precursors with less than significant contribution are allowed to exclude exempted from control strategy analysis. As VOC and SOx are not significant precursors in this PM2.5 Plan, VOC and SOx measures were not considered. Table III-3 provides a summary of all measures that were reviewed and an explanation why some measures were omitted in this BACM demonstration.

The following section provides short descriptions of the control measures that were reconsidered in this analysis. A detailed analysis for each control measure is included in the Control Measure Assessment section.

TABLE III-3
SUMMARY OF PCMS REVIEWED IN THE 2016 AND 2022 AQMPS

PCM	Applicable AQMP	Reconsidered in this BACM demonstration?	If not, reason why
Lowering NOx emission limits for boilers, steam generators, and process heaters	2022 AQMP	Yes, PCM 15	
VOC Emission Reductions from Cooling Towers	2022 AQMP	No	Precursor demonstration for VOC
Lowering NOx emission limit for commercial food ovens	2022 AQMP	No	Rule 1153.1 was amended on 8/4/2023 to address this PCM

PCM	Applicable AQMP	Reconsidered in this BACM demonstration?	If not, reason why
Additional Enhancement in Reducing Existing Residential Building Energy Use	2016 and 2022 AQMPs	No	Included in control strategy; see ECC-03
Lowering VOC Emission Limit for Gasoline Bulk Terminals	2016 and 2022 AQMPs	No	Precursor demonstration for VOC
Lowering VOC Emission Limit for Auto and Light-Duty Truck Assembly	2016 and 2022 AQMPs	No	Precursor demonstration for VOC; Rule 1115 amended in March 2022 to address this PCM
Lowering VOC Limits Interior Body Sprays for Metal Container, Closure, and Coating Operations	2016 and 2022 AQMPs	No	Precursor demonstration for VOC
Co-Benefits from Existing Residential and Commercial Building Energy Efficiency Measures	2016 and 2022 AQMPs	No	Included in control strategy; see ECC-02
Co-Benefit Emission Reductions from GHG Programs, Policies, and Incentives	2016 and 2022 AQMPs	No	Included in control strategy; see ECC-01
Emission Reductions from Replacement with Zero or Near-Zero NOx Appliances in Commercial and Residential Applications	2016 AQMP	Yes, PCM 1	
Emission Reductions from Cooling Towers	2016 AQMP	Yes, PCM 3	
Ammonia Emission Reductions from NOx Controls	2016 AQMP	No	Ammonia slip limits are established through permitting. Additionally, this measure is included in the control strategy; see BCM-05.

PCM	Applicable AQMP	Reconsidered in this BACM demonstration?	If not, reason why
Further Emission Reductions from Agricultural, Prescribed, and Training Burning	2016 AQMP	Yes, PCM 5	
Emission Reductions from Non-Refinery Flares	2016 AQMP	No	Rule 1118.1 was adopted on January 4, 2019 to address this PCM
Further Emission Reductions from Commercial Cooking	2016 AQMP	Yes, PCM 6	
Further Emission Reduction from Fugitive Dust Sources	2016 AQMP	Yes, PCM 7	
Further Emission Reductions from Wood Burning Fireplaces and Wood Stoves	2016 AQMP	Yes, PCM 8	
Emission Reductions from Greenwaste Composting	2016 AQMP	Yes, PCM 9	
Emission Reduction of PM from Asphalt Manufacturing	2016 AQMP	Yes, PCM 10	
Emission Reduction of PM from Wood Pulp and Paper	2016 AQMP	Yes, PCM 11	
Emission Reduction of VOC and NOx Through Reformation and Process Modification for Cutback Asphalt	2016 AQMP	Yes, PCM 12	
Emission Reductions from Manure Management Strategies	2016 AQMP	Yes, PCM 13	

Emission Reductions from Replacement with Zero or Near-Zero NOx Appliances in Commercial and Residential Applications

This measure sought emission reductions through a zero NOx standard for new commercial and residential water and space heaters. It has been updated based on recent amendments to BAAQMD Regulation 9 Rules 4 and 6. The measure examines the feasibility of introducing zero NOx emission limits following a phased approach that depends on the appliance size and type.

Emission Reductions from Cooling Towers

This measure sought reductions of PM from industrial cooling towers by requiring use of the latest drift eliminator technologies. The control measure would reduce PM2.5 emissions from evaporative cooling towers by requiring all units to upgrade their drift eliminators to more efficient drift eliminators that keep drift losses to less than 0.001 percent of the recirculating water flow rate. Newly constructed cooling towers have demonstrated an ultra-low drift rate of 0.0005 percent. This drift rate has been achieved in practice and could be considered BACT for new construction. Although efficiency improvements are achievable through use of the newer drift eliminators, the proportion of PM2.5 in the overall drift is fairly small compared to the PM10 fraction (PM2.5 estimated at ~3 percent of PM10).

Further Emission Reductions from Agricultural, Prescribed, and Training Burning

This control measure sought further PM emission reductions from certain categories of open burning including agricultural and prescribed (e.g., forestry service) burning activities. Reducing agricultural burning by incentivizing alternatives (e.g., chipping/grinding or composting) is possible. Additional considerations were given to aligning burn prohibitions with any potential changes to the Rule 444 no burn day provisions which could further reduce open burning emissions during peak PM2.5 episodes. Burning alternatives such as chipping/grinding or composting are widely available in the Basin.

Further Emission Reductions from Commercial Cooking

South Coast AQMD Rule 1138 regulates VOC and PM emissions from restaurant operations by requiring the installation of flameless catalytic oxidizers, or equivalent control devices, to chain-driven charbroilers. Although under-fired charbroilers are another source of emissions from restaurant operations, no cost-effective control technology was identified for this type of equipment at the time of rule adoption. Staff continued efforts to find cost-effective and technologically feasible controls for the restaurant industry. Retrofitting control devices at existing restaurants may require a complete system overhaul including fire suppression, ventilation, and electrical components. The 2016 AQMP specified that this measure would serve as an attainment contingency measure. Therefore, it was not included in the attainment control strategy.

Further Emission Reduction from Fugitive Dust Sources

South Coast AQMD Rule 1186 establishes requirements to prevent material from being deposited on roadways and requires local jurisdictions to procure certified street sweeping equipment. Under Rule 1186, certified street sweepers must have a pick-up efficiency greater than or equal to 80 percent and achieve entrained PM10 emissions of less than or equal to 200 mg/m. This control measure sought further PM emission reductions from entrained road dust, one of the major direct PM2.5 sources due to the large number of roadways and high traffic volumes in the region. Most cities in the Basin have regular street sweeping schedules so the emission reduction from mandating street sweeping frequency is expected to be minimal.

Further Emission Reductions from Wood-Burning Fireplaces and Wood Stoves

Rule 445 is designed to reduce PM emissions from wood-burning devices. The rule establishes requirements for the sale, operation, and installation of wood-burning devices. This control measure sought to include a provision that would apply to uncertified wood-burning devices during the sale or transfer of property similar to that in SJVAPCD Rule 4901.

Lowering the Curtailment Threshold in Rule 445

Under South Coast AQMD Rule 445, Basin-wide curtailment is mandatory when PM2.5 concentrations are forecast to exceed 29 $\mu g/m^3$ from November through February. The South Coast AQMD curtailment threshold applies to all solid fuel devices, including wood-based residential cooking devices. This control measure sought to evaluate the feasibility of lowering the curtailment threshold to achieve further emission reductions.

Emission Reduction of PM from Asphalt Manufacturing

This control measure was based on U.S. EPA's 2012 version of the Menu of Control Measures.[33] The measure estimated a control efficiency of 99 percent in an asphalt manufacturing facility equipped with a fabric filter or baghouse placed in parallel inside of an enclosure. Asphalt manufacturing in the South Coast AQMD is currently regulated under Rule 1157 and Rule 1155, which require the use of filters. Rule 1157 targets all aggregate and related operations but does not require enclosure for all transfer points and activities. However, Rule 1155 regulates all baghouses (including those at asphalt manufacturing facilities), except for those with a filter area less than 100 sq. ft. and requires no visible emissions at any time except for start-up and shutdown. Enclosures and baghouses are generally technologically feasible. The standard (0.01 gr/dscf) for baghouses in asphalt manufacturing facilities was set forth in Rule 1155 and was fully implemented in 2013.

[33] https://www3.epa.gov/ttn/naaqs/pdfs/MenuOfControlMeasures.pdf

Emission Reduction of PM from Wood Pulp and Paper

This control measure was based on U.S. EPA's 2012 version of the Menu of Control Measures.[34] The measure estimated a control efficiency of 95 percent in wood pulp and paper facilities equipped with dry/wet electrostatic precipitators (ESPs). Currently, there are five permitted recycled paper and paperboard manufacturing facilities in South Coast AQMD. An electrostatic precipitator (ESP) is predominantly used to control PM emissions from Kraft recovery furnaces used at paper manufacturing facilities that process virgin raw materials. For the recycled material manufacturing facilities, little or no PM is emitted from the pulp dryer.

Emission Reductions from Greenwaste Composting

This control measure sought emission reductions of VOC and NH3 from composting of greenwaste, foodwaste, and agricultural waste streams. Evaluated control approaches included improved emissions characterization via inventory and emission factor development, anaerobic digestion, pollution prevention technology, and restrictions for direct applications of uncomposted, chipped or ground non-curbside greenwaste to public lands.

Reformulation and Process Modification for Cutback Asphalt

The measure sought to examine the feasibility of requiring warm-mix asphalt. Warm-mix asphalt would reduce natural gas use by an estimated 20 to 25 percent from reduced processing and transportation temperatures compared to hot-mix asphalt. Although the reduction in natural gas use was found to reduce NOx emissions, studies revealed mixed results for VOC emissions from warm-mix compared to hot-mix asphalt.

Emission Reductions from Manure Management Strategies

This measure sought NH3 emission reductions by lowering the applicability thresholds in Rule 223 to be as stringent as those in SJVAPCD Rule 4750 for confined animal facilities. It also explored the feasibility of additional mitigation measures for livestock waste to further reduce NH3 emissions.

Lowering Emission Limits for Boilers, Steam Generators, and Process Heaters

This measure is derived from the 2022 AQMP RACM demonstration and is based on the more stringent NOx limits for boilers, steam generators, and process heaters greater than or equal to 5 MMBtu/hr in SJVAPCD Rules 4306 and 4320 compared to those in Rule 1146. For details on the emission limits, refer to the discussion regarding Rules 4306 and 4320 in Step 3 - Control Measures in Other Nonattainment Areas.

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[34] Ibid

Step 4 – U.S. EPA's Menu of Control Measures

The Menu of Control Measures (MCM)[35] compiled by the State and Local Programs Group within U.S. EPA's Office of Air Quality Planning and Standards, was developed to provide information useful in the development of local emission reduction and NAAQS SIP scenarios. U.S. EPA's MCM provides a broad listing of emission reduction measures to assist states in identifying and evaluating potential measures. The measures are based in part on the results of a literature review of the current and proposed measures of various air quality agencies, including CARB, California air districts, the Ozone Transport Commission, the Lake Michigan Air Directors Consortium, and others. For each source category, one or more emission reduction measures, the respective control efficiency, and cost effectiveness are provided.

At the time of writing, the MCM published on September 22, 2022 was the latest version available and it was therefore selected for this analysis. Staff reviewed the control measures for point and nonpoint sources of PM2.5, NH3, and NOx. The review identified four measures from the MCM that exceeded the requirements of existing rules, were not included in the 2022 AQMP, and were not otherwise identified as part of this BACM demonstration. The identified measures are as follows:

- Increasing the fuel moisture for prescribed burns
- Requiring electrostatic precipitators, fabric filters, and scrubbers for various industrial and commercial processes
- Requiring Selective Catalytic Reduction (SCR) of NOx for incinerators
- Requiring extended absorption to reduce NOx from nitric acid manufacturing

Proposed Rule 1165, Control of Emissions from Incinerators, is under development and will include NOx emission limits for incinerators consistent with the control efficiency specified in the MCM. There are no nitric acid manufacturing facilities located in the South Coast Air Basin and thus this measure was not evaluated. Staff evaluated the remaining control measures for potential emission reductions in the Basin and the assessment can be found in the Control Measure Assessment section.

Step 5 – U.S. EPA's Guidance Documents

In March 2013, the U.S. EPA revised its document "*Strategies for Reducing Residential Wood Smoke*"[36] to provide new information and tools to help state, tribal, and local air officials reduce fine particle pollution from residential wood smoke. The document provides a comprehensive list of strategies to help identify appropriate wood smoke reduction measures. A combination of regulatory, voluntary, and educational strategies is encouraged to ensure a successful wood smoke program with measurable emission reductions. U.S. EPA recommends that each area determine the most appropriate measures given the

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[35] https://www.epa.gov/air-quality-implementation-plans/menu-control-measures-naaqs-implementation
[36] https://www.epa.gov/sites/default/files/documents/strategies.pdf

nature and extent of their problem. Table III-4 is a list of regulatory options outlined in the guidance document, and the corresponding control strategies (where applicable) in South Coast AQMD.

TABLE III-4
U.S. EPA LIST OF REGULATORY OPTIONS FOR REDUCING RESIDENTIAL WOOD SMOKE AND SOUTH COAST AQMD CURRENT CONTROL STRATEGIES

U.S. EPA Suggested List of Regulatory Options	South Coast AQMD Control Strategies
1. Wood-Burning Curtailment Programs	Rule 445 enacts a mandatory winter wood-burning curtailment when PM2.5 concentrations are forecasted to exceed 29 µg/m^3.
2. Opacity and Visible Emission Limits	South Coast AQMD Rule 401 does not have a "no visible emissions" requirement. Instead, Rule 401 requires the Ringelmann Chart No. 1 or an equivalent (10 percent) opacity limit.
3. Wood Moisture Content	Rule 445 requires a commercial firewood seller to only sell seasoned wood (≤20 percent moisture) from July 1 through the end of February the following year.
4. Removal of Old Wood Stove Upon Resale of a Home	Currently, South Coast AQMD does not require the removal and destruction of old wood stoves upon the resale of a home. For further analysis of this regulatory option, refer to the discussion under Key PM Source Categories.
5. Require EPA Certification	For existing residential and commercial developments (additions, remodels, etc.), Rule 445 requires wood-burning devices sold or installed to be U.S. EPA certified or equivalent. Newly installed fireplaces must be gaseous-fueled or electric.
6. Ban the Use of Non-EPA-Certified Wood Stoves	Currently, South Coast AQMD does not prohibit the use of non-EPA certified wood stoves that have been installed in existing homes and businesses prior to the adoption of Rule 445. For further analysis of this regulatory option, refer to the discussion under Key PM Source Categories.
7. Restrictions on Wood-Burning Devices in New Construction	Rule 445 prohibits the installation of all wood-burning devices in new construction.
8. Hydronic Heater Rules	The use of hydronic heaters is very uncommon in South Coast AQMD; further restrictions on these devices would therefore not be expected to result in emission reductions.
9. Requirements for Wood-burning Fireplaces	For existing residential and commercial developments (additions, remodels, etc.), Rule 445 requires wood-burning devices sold or installed to be U.S. EPA certified or equivalent. Incentives are available to replace wood-burning devices with cleaner alternatives in some neighborhoods.

U.S. EPA Suggested List of Regulatory Options	South Coast AQMD Control Strategies
10. State/Tribal/Local Wood-Heating Emission Standards	U.S. EPA's New Source Performance Standards (NSPS) have the most stringent emission limit across the nation for residential wood heaters.
11. NSPS for New Residential Wood Heating Appliances	Rule 445 defines U.S. EPA certified heaters as those that comply with Title 40 Code of Federal Regulations, Part 60, Subpart AAA, March 16, 2015, or any subsequent revision. The NSPS for wood heating appliances are codified under this subpart.

In addition to the regulatory programs listed in Table VI-A-10, the South Coast AQMD has implemented the Healthy Hearths™ program that includes a comprehensive education and outreach effort to encourage the public to switch to cleaner, gaseous-fueled hearth products. An incentive program for cleaner hearth appliances is ongoing to encourage the public to switch to cleaner hearth products, including gaseous-fueled devices that are exempt from burning curtailments.[37] As part of the Healthy Hearths™ initiative, the "Check Before You Burn" program is designed to protect public health by reducing harmful wood smoke from residential wood-burning from November 1 through the end of February. Daily air quality forecast information can be found online on the South Coast AQMD's "Check Before You Burn" map, through e-mail messages, or a toll-free number. Rule 445 also contains labeling requirements for commercial firewood or other wood-based fuel sellers to notify the public of South Coast AQMD's Check Before You Burn program.

Summary of Potential Control Measures

After thorough review of the above listed sources, South Coast AQMD staff identified the following PCMs for stationary sources listed in Table III-5. The PCMs were assessed for technological and economic feasibility in the Control Measure Assessment section.

TABLE III-5
POTENTIAL STATIONARY SOURCE CONTROL MEASURES

#	Potential Control Measure	Target Pollutant	South Coast AQMD Current Control	Source of Information
1	Replacement with Zero NOx Space and Water Heaters in Commercial and Residential Applications	NOx	Rules 1111 and 1121	Step 1 – Other Districts' Control Measures; Step 3 – Potential Control Measures from Previous Plans

[37] http://www.aqmd.gov/home/programs/community/community-detail?title=wood-device-incentive-program

#	Potential Control Measure	Target Pollutant	South Coast AQMD Current Control	Source of Information
2	Glass Melting and Sodium Silicate Furnaces	PM2.5	Rule 1117	Step 1 – Other Districts' Control Measures
3	Cooling Towers	PM2.5	Not Applicable	Step 3 – Potential Control Measures from Previous Plans
4	Livestock Waste at Confined Animal Facilities	NH3	Rule 223	Step 1 – Other Districts' Control Measures
5	Agricultural, Prescribed, and Training Burning	PM2.5	Rule 444	Step 3 – Potential Control Measures from Previous Plans
6	Commercial Cooking - Charbroilers	PM2.5	Rule 1138	Step 1 – Other Districts' Control Measures Areas; Step 3 – Potential Control Measures from Previous Plans
7	Paved Road Dust	PM2.5	Rule 1186	Step 3 – Potential Control Measures from Previous Plans
8	Wood-Burning Fireplaces and Wood Stoves	PM2.5	Rule 445	Step 1 – Other Districts' Control Measures; Step 3 – Potential Control Measures from Previous Plans
9	Organic Waste Composting	NH3	Rule 1133.3	Step 3 – Potential Control Measures from Previous Plans
10	Asphalt Manufacturing	PM2.5	Rule 1157	Step 3 – Potential Control Measures from Previous Plans
11	Wood Pulp and Paper	PM2.5	Not Applicable	Step 3 – Potential Control Measures from Previous Plans
12	Reformulation and Process Modification for Cutback Asphalt	NOx	Rule 1108	Step 3 – Potential Control Measures from Previous Plans
13	Unpaved Lots, Roads, and Shoulders	PM2.5	Rule 1186	Step 1 – Other Districts' Control Measures; Step 4 – U.S. EPA's Menu of Control Measures
14	Industrial and Commercial Combustion Processes	PM2.5	Not Applicable	Step 4 – U.S. EPA's Menu of Control Measures
15	Lowering Emission Limits for Boilers, Steam Generators, and Process Heaters	NOx	Rule 1146	Step 3 – Potential Control Measures from Previous Plans

In addition to the above analyses, SCAG, CARB, and South Coast AQMD staff have completed the following analyses to meet the requirements of the CAA:

- BACM and MSM demonstrations conducted by CARB and SCAG for mobile sources and transportation control measures are included in Appendices III-B and IV-B, respectively.

- Cost-effectiveness analyses and schedules for implementation for each of the stationary source and mobile source control measures, if available, are provided in Chapter 4, and Appendix IV-A for South Coast AQMD's control measures and Appendix IV-B for CARB's control measures, respectively.

Conclusion

As required by the CAA and U.S. EPA's PM2.5 Implementation Rule, South Coast AQMD staff evaluated and analyzed a wide range of sources to develop a comprehensive list of PCMs. PCMs from the 2016 AQMP, potential RACM from the 2022 AQMP, attainment plans in other jurisdictions, rules and regulations implemented by other air districts, and multiple resources published by U.S. EPA were consulted. In general, South Coast AQMD's existing rules and regulations were found to require the most stringent level of control. There were, however, limited instances where rules could be strengthened to achieve further reductions. This resulted in the identification of 15 PCMs for which the technological and economic feasibility was assessed. A comprehensive assessment of all PCMs is presented in the next section of this Appendix.

CONTROL MEASURE ASSESSMENT

Introduction

The PCMs identified in the preceding section are evaluated to advance South Coast AQMD's emission control strategies. A comprehensive feasibility analysis is conducted for all PCMs. Each measure is independently assessed to determine whether it can be considered as BACM, an additional feasible measure, or MSM while complying with U.S. EPA's requirements.[38] U.S. EPA requires that BACM be adopted and the controls be partially or fully implemented within four years of reclassification to "serious" nonattainment. Since the South Coast Air Basin was reclassified effective December 2020, the area has until December 2024 to partially or fully implement BACM. If the analysis concludes that a measure cannot be feasibly implemented within this timeframe, it is reassessed as an additional feasible measure, or one that can be implemented by 2025, the statutory "serious" area attainment year. Finally, measures that cannot be implemented as either BACM or additional feasible measures are reassessed as potential MSM. While this analysis is allowed to consider technological and economic feasibility, U.S. EPA recommends that the analysis "apply more stringent criteria for determining the feasibility of potential MSM than that described for BACM and BACT."[39] Furthermore, the feasibility analysis for potential MSM must consider the longer timeframe allowed for implementation (up to 4 years after the statutory "serious" area attainment date). For measures that cannot be feasibly implemented as MSM, a reasoned justification for rejecting the potential MSM is included.

The emissions inventories, emission reduction estimates, and cost-effectiveness are based on the best information available at this time. Quantified emissions and estimated reductions are based on a variety of data sources, including, but not limited to, the emissions inventory presented in Chapter 3 and Appendix I of this Plan, South Coast AQMD's Annual Emissions Reporting program, archived equipment statistics obtained from South Coast AQMD's past rulemaking, and data libraries of public energy policy and planning agencies and utilities (e.g., California Public Utilities Commission, California Energy Commission, Southern California Edison, etc.). Staff commits to refine these estimates as new information becomes available during subsequent rulemaking and control measure implementation.

[38] 81 FR 58009
[39] Ibid

Potential Control Measure 1 - Emission Reductions from Replacement with Zero NOx Space and Water Heaters in Commercial and Residential Applications

Target Pollutant

NOx

Synopsis

This control measure, based on recent amendments to BAAQMD Regulation 9, seeks NOx emission reductions through a zero NOx standard for new commercial and residential water and space heaters. Zero NOx requirements would follow a phased approach that depends on the appliance size and type. This control measure applies to manufacturers, distributors, sellers, installers and purchasers of these appliances.

Potential Emission Reduction

The 2030 baseline inventory is 12.22 tpd of NOx for this source category.

Estimated emission reductions are 2.58 tpd by 2030.

Technological Feasibility

There are currently a wide variety of zero NOx electric heat pump water heaters and heat pump space conditioning (heating and cooling) systems available on the market that operate on a 240-volt circuit.[40,41]

A limited number of space and water heaters are also available for residences that only have 120-volt service (see Table III-6). Manufacturers are actively developing new heat pump systems and it is therefore expected that the number of new models will increase substantially over the next several years.

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[40] Energy Star Certified Water Heaters. https://www.energystar.gov/productfinder/product/certified-water-heaters/results
[41] Energy Star Certified Central Heat Pumps. https://www.energystar.gov/productfinder/product/certified-central-heat-pumps/results

TABLE III-6
COMMERCIALLY AVAILABLE 120-VOLT SPACE AND WATER HEATERS

Manufacturer	Model	Type
Pioneer	WYT012ALFI19RL, WYT009ALFI19RL (and others)	Space heater
Hessaire	H12E1	Space heater
LG	LS120HXV2, LS090HXV2	Space heater
Mitsubishi	MZ-JP12WA, MZ-JP09WA	Space heater
Fujitsu	9RL2, 12RL2	Space heater
General Electric	AS09CRA, AS12CRA	Space heater
Senville	LETO series	Space heater
MRCOOL	DIY-12-HP-115B	Space heater
LBG Products	LBH12ATO, LBH09ATO	Space heater
AUX	Inverter series	Space heater
Daizuki	DXTH12C416-20	Space heater
Nyle Water Heating Systems	E8	Water heater
Rheem	ProTerra (Plug-In)	Water heater

Economic Feasibility

A comprehensive cost analysis for residential and commercial space and water heating appliances was conducted as part of the 2022 State SIP Strategy, Appendix A: Economic Analysis.[42] These measures were determined to be economically feasible with a cost-effectiveness value of $496,600/ton NOx.

Summary Table

Type of Analysis	Emission Reduction	Technological Feasibility	Economic Feasibility	Feasible Measure
BACM/BACT	2.58 tpd of NOx by 2030	No	No	No
Additional feasible measure		No	No	No
MSM		~~Feasible~~Yes	~~Feasible~~Yes	Yes

For the purposes of satisfying MSM, this measure is included in CARB's commitment as the Zero-Emission Standard for Space and Water Heaters with implementation beginning January 1, 2030. Independent of MSM, South Coast AQMD's control measures BCM-01 and BCM-02, which overlap with CARB's measure, are also included in the PM2.5 Plan since these measures will implement before CARB's measure and also

[42] https://ww2.arb.ca.gov/sites/default/files/2022-09/2022_State_SIP_Strategy_App_A.pdf

target accelerated turnover of appliances through incentives. A comparison of South Coast AQMD control measures and BAAQMD rules targeting space and water heaters is shown in Table III-7. In many cases, South Coast AQMD's proposed rules implement zero emission requirements ahead of BAAQMD's rules.

TABLE III-7
COMPARISON OF SOUTH COAST AQMD CONTROL MEASURES AND BAAQMD RULES REGULATING NOX EMISSIONS FROM SPACE AND WATER HEATERS

Category	South Coast AQMD BCM-01 and BCM-02 Proposed Control*	BAAQMD Rules 9-4 & 9-6
Residential Space Heating (< 175,000 Btu/hr)	(1) 0 ng/J by 1/1/20~~29~~26 (new buildings) ~~where feasible,~~ and 1/1/2028 (existing buildings)~~7 ng/J where not~~ (2) incentivize zero emission technologies with a focus on electric panel upgrades needed for older homes	0 ng/J by 1/1/2029
Commercial Space Heating (> 175,000 Btu/hr)	0 ng/J by 1/1/2026 (new buildings) and 1/1/2028 (existing buildings)~~---~~	---
Residential Water Heating (< 75,000 Btu/hr)	(1) 0 ng/J by 1/1/2026 (new buildings) and 1/1/2028 (existing buildings)~~0 ng/J by 1/1/2029 where feasible, 5 ng/J where not~~ (2) incentivize zero emission technologies with a focus on electric panel upgrades needed for older homes	0 ng/J by 1/1/2027
Commercial Water Heating (≥75,000 Btu/hr and ≤2 MMBtu/hr)	0 ng/J between 1/1/2026 and 1/1/2033 following a ~~---~~phased approach that depends on the size and temperature of the heater	0 ng/J by 1/1/2031

*Implementation dates are based on preliminary rule concepts and are subject to change. Refer to: https://www.aqmd.gov/docs/default-source/rule-book/Proposed-Rules/1111-and-1121/par-1111-and-1121-wgm4-april-2024.pdf?sfvrsn=14 and https://www.aqmd.gov/docs/default-source/Agendas/ssc/ssc-agenda-3-15-2024.pdf.

Potential Control Measure 2 – Emission Reductions from Glass Melting and Sodium Silicate Furnaces

Target Pollutant

PM2.5

Synopsis

In the South Coast Air Basin, there are two facilities that operate a total of two container glass melting furnaces and one sodium silicate furnace. These furnaces are subject to NOx and SOx emission limits in South Coast AQMD Rule 1117; however, Rule 1117 does not enforce PM10 emission limits unlike SJVAPCD Rule 4353, which sets a limit at 0.20 lb/ton for container glass furnaces. A significant fraction of PM10 emissions from these facilities is emitted as PM2.5. This measure therefore seeks to evaluate the feasibility of requiring glass melting and sodium silicate furnaces to meet PM10 emission limits.

Potential Emission Reduction

The 2030 baseline inventory is 0.0641 tpd of PM2.5 for this source category.

Potential emission reductions are 0 tpd.

Technological Feasibility

It is technologically feasible to achieve the emission limit specified in SJVAPCD Rule 4353 for gas-fired container glass melting furnaces. The feasibility is further supported by an identical emission limit enforced at the federal level.[43] However, there are no applicable federal emission limits for sodium silicate furnaces and the PM10 emission limits in SJVAPCD Rule 4353 also do not apply to sodium silicate furnaces.

Economic Feasibility

It is economically feasible to achieve a PM10 emission limit of 0.20 lb/ton for container glass melting furnaces.

Summary Table

Type of Analysis	Emission Reduction	Technological Feasibility	Economic Feasibility	Feasible Measure*
BACM/BACT	0 tpd PM2.5	Yes~~Feasible~~	Yes~~Feasible~~	No
Additional feasible measure		Yes~~Feasible~~	Yes~~Feasible~~	No
MSM		Yes~~Feasible~~	Yes~~Feasible~~	No

[43] CFR Title 40, Chapter I, Subchapter C, Part 60, Subpart CC

* While this measure is technologically and economically feasible in practice it is currently infeasible due to other considerations.

Other Considerations

Staff reviewed source test results, conducted between 2018 and 2022, for the two container glass furnaces and all source tests measured an emission factor ≤ 0.20 lb PM/per ton (see Table III-8). Since actual emission rates comply with both SJVAPCD Rule 4353 and the federal limit, no further emission reductions would occur by incorporating a PM10 emission limit for container glass furnaces in Rule 1117. Therefore, staff concludes that this control measure is not warranted.

TABLE III-8
PM SOURCE TEST RESULTS FOR GLASS MELTING FURNACES AT OWENS-ILLINOIS (FACILITY ID: 7427)

Test Date	Furnace	PM Result (lb PM/ton produced)
11/9/2022	B	0.08
12/8/2021	B	0.15
10/6/2020	B	0.04
12/19/2018	B	0.05
11/7/2022	C	0.20
12/7/2021	C	0.18
10/7/2020	C	0.08
11/16/2018	C	0.06

Potential Control Measure 3 - Emission Reductions from Cooling Towers

Target Pollutant

PM2.5

Synopsis

This measure would seek reductions of PM2.5 from industrial cooling towers by requiring operators to use the latest drift eliminator technologies. Reducing PM2.5 emissions from cooling towers could involve a simple upgrade: requiring all units to install more efficient drift eliminators. These upgraded eliminators would ensure that drift losses are kept to a minimum, specifically less than 0.001 percent of the re-circulating water flow rate. This not only reduces emissions but also leads to significant water savings. Currently, industrial cooling towers are required to submit information on total dissolved solids (TDS) via a registration filing under Rule 222 - Filing Requirements for Specific Emission Sources Not Requiring a Written Permit Pursuant to Regulation II. The information that has been collected would be evaluated during the rule development process and used to allow PM2.5 emissions to be calculated. Appendix IV-A of the 2016 AQMP contained a potential control measure to reduce cooling tower PM emissions but concluded that PM2.5 emission reductions were not cost-effective. The 2016 AQMP did, however, include Control Measure BCM-02 (Emission Reductions from Cooling Towers) so this PM2.5 Plan also includes a control measure, BCM-13, that proposes a further evaluation of cooling tower PM2.5 emissions.

In addition to the high costs, a recent study conducted for the California Energy Commission (CEC) found that cooling towers may act as scrubbers for surrounding areas and emit negative emissions of coarse particulate matter (between 2.5 and 10 microns), and potentially have the same effect on PM2.5 emissions.[44] The study also found that drift eliminators may vastly outperform their efficiency specifications. These findings should be examined prior to implementing controls.

Potential Emission Reduction

Potential emission reduction is to be determined.

Technological Feasibility

Newly constructed cooling towers have demonstrated ultra-low drift rates of 0.0005 percent. However, overall drift eliminator efficiencies and cooling tower effects on emissions in surrounding areas should be further examined prior to implementing controls.

Economic Feasibility

The 2016 AQMP included a cost estimate of $1.37 million to retrofit a local refinery cooling tower with a high efficiency drift eliminator. The reduction in total PM, PM10, and PM2.5 was also previously estimated at approximately 173, 11, and 0.4 tons per year, respectively. Cost effectiveness for BCM-02 in the 2016 AQMP was estimated at approximately $15,000 per ton of PM10, but was determined not cost-effective for reducing PM2.5 at over $400,000 per ton. Adjusting previous AQMP cost assumptions to 2022 costs would result in a cost-effectiveness estimate higher than $400,000 per ton of PM2.5. Additionally, it is

[44] Wexler, A., Wallis, C. D., Chuang, P., and Leandro, M. (2023). Assessing Particulate Emissions from Power Plant Cooling Towers. https://www.energy.ca.gov/publications/2023/assessing-particulate-emissions-power-plant-cooling-towers

possible that the cost effectiveness may be even higher if the existing drift elimination efficiencies installed at cooling towers are greater than specified, as outlined in the CEC study.

Summary Table

Type of Analysis	Emission Reduction	Technological Feasibility	Economic Feasibility	Feasible Measure
BACM/BACT	TBD	Yes	No	No
Additional feasible measure		Yes	No	No
MSM		Yes	No	No

Other Considerations

South Coast AQMD has determined that further evaluation is required prior to implementing this control measure. Control measure BCM-13 proposes development of an emissions inventory, equipment universe, and improved emission factors for cooling towers.

References

South Coast Air Quality Management District. (2017). 2016 Air Quality Management Plan, Appendix IV-A Stationary and Mobile Source Control Measures. (Published March 2017).

United States Environmental Protection Agency. (2015). *Compilation of Air Pollutant Emission Factors (AP-42), Fifth Edition, Volume I: Stationary Point and Area Sources, Chapter 5.1 Petroleum Refining*. https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors.

Wexler, A., Wallis, C. D., Chuang, P., and Leandro, M. (2023). Assessing Particulate Emissions from Power Plant Cooling Towers. https://www.energy.ca.gov/publications/2023/assessing-particulate-emissions-power-plant-cooling-towers

Potential Control Measure 4 - Emission Reductions from Livestock Waste at Confined Animal Facilities

Target Pollutant

NH3

Synopsis

There are two components to this control measure. The first component seeks to lower the applicability threshold in South Coast AQMD Rule 223 to align with the more stringent thresholds in SJVAPCD Rule 4570 (1,000 milk cows in South Coast AQMD vs. 500 milk cows in SJVAPCD, and 650,000 birds in South

Coast AQMD vs. 400,000 birds in SJVAPCD). The second component seeks to introduce more stringent requirements to reduce ammonia emissions at dairies and other Confined Animal Facilities (CAFs).

Given the larger presence of dairies and CAFs in SJV, South Coast AQMD consulted U.S. EPA's recent actions on SJVAPCD's 2018 PM2.5 SIP to develop a comprehensive list of ammonia control strategies that apply to this source category. U.S. EPA published a proposed rule on December 29, 2021 to approve SJVAPCD's 2018 Serious Area Plan for the 2012 annual PM2.5 NAAQS.[45] However, based on adverse public comments, U.S. EPA reversed course and proposed disapproval of several plan requirements on October 5, 2022.[46] A central issue in U.S. EPA's proposed disapproval relates to SJVAPCD's BACM analysis for Rule 4570. U.S. EPA referenced several research studies and guidance documents for ammonia reductions from CAFs that were not evaluated as part of the process to develop potential control measures. One of the referenced guidance documents was developed by U.S. EPA and the U.S. Department of Agriculture (USDA) in 2017 and is titled "*Agricultural Air Quality Conservation Measures: Reference Guide for Poultry and Livestock Production Systems.*"[47] After consulting these sources, a comprehensive list of mitigation measures with the potential to reduce ammonia emissions from CAFs was developed (see Table III-9).

TABLE III-9
POTENTIAL AMMONIA CONTROL MEASURES FOR CONFINED ANIMAL FACILITIES (CAFS)

	Measure	Reference	Source
Nutrition and Feed Management			
1	Group and phase feeding; feed additives; feed processing, storage & delivery; dietary formulation changes	Agricultural Air Quality Conservation Measures, Reference Guide for Poultry and Livestock Production Systems	USDA-EPA
2	Reduce protein content; phase feeding; increase grazing time	The Impact of Ammonia Emissions from Agriculture on Biodiversity	*Rand Europe and the Royal Society, Guthrie*, S., et al. 2018. doi: 10.7249/RR2695
3	Phase-feed crude protein (beef steers)	Effects of Phase-Feeding of Crude Protein on Performance, Carcass Characteristics, Serum Urea Nitrogen Concentrations, and Manure Nitrogen of Finishing Beef Steers	*J. of Animal Science*, Cole, N. A., et al. 2006. doi: 10.2527/jas.2006-150
4	Reduce crude protein (beef cattle)	Reducing Crude Protein in Beef Cattle Diet Reduces Ammonia Emissions from Artificial Feedyard Surfaces	*J. of Environmental Quality*, Todd, R. W., et al. 2006. doi: 10.2134/jeq2005.0045

[45] 86 FR 74310
[46] 87 FR 60494
[47] https://www.epa.gov/sites/default/files/2017-01/documents/web_placeholder.pdf

	Measure	Reference	Source
5	Reduce dietary crude protein (beef cattle)	Influence of Dietary Crude Protein Concentration and Source on Potential Ammonia Emissions from Beef Cattle Manure	*J. of Animal Science*, Cole, N.A., et al. 2005. doi: 10.2527/2005.833722x
6	Reduce dietary crude protein (pigs)	The Influence of Diet Crude Protein Level on Odour and Ammonia Emissions from Finishing Pig Houses	*Bioresource Technology*, Hayes, E.T. 2004. doi: 10.1016/s0960-8524(03)00184-6
7	Reduce dietary protein	Reducing Dietary Protein Decreased the Ammonia Emitting Potential of Manure from Commercial Dairy Farms	*The Professional Scientist*, Hristov, A. N., 2015. doi: 10.15232/pas.2014-01360
Animal Confinement/Housing			
8	Litter amendments and manure additives; oil spraying/sprinkling; wet scrubbers; windbreaks and shelterbreaks	Agricultural Air Quality Conservation Measures, Reference Guide for Poultry and Livestock Production Systems	USDA-EPA
9	Scrub air; wash floors; increase outdoor grazing; floor design (slats, grooves, v-shaped gutters, sloping floors); acclimatize barn (insulation, auto-controlled natural ventilation); cool manure surface, acidify slurry / shift chem. balance from ammonia to ammonium; straw bedding for cattle housing	The Impact of Ammonia Emissions from Agriculture on Biodiversity	*Rand Europe and the Royal Society,* Guthrie, S., et al. 2018. doi.10.7249/RR2695
10	Clean lanes at dairies	Ammonia Fluxes from Animal Housing at a California Free Stall Dairy	California State University, Fresno Center for Irrigation Technology and Plant Science Depts., Beene, M. et al. 2005.
11	Clean lanes at dairies	Assessment of Reactive Organic Gases and Amines from a Northern California Dairy Using the USEPA Surface Emissions Isolation Flux Chamber	14th USEPA Annual Emissions Inventory Conference, Las Vegas, Schmidt, C. E., et al. 2005.
12	Corrals: constantly manage corrals	Dairy Air Emissions Report: Summary of Dairy Emission Estimation Procedures	Card, T. and Schmidt, C. 2006. Final Report to California Air Resource Board.

	Measure	Reference	Source
13	Corrals: frequency of corral manure management	2008 Dairy Emissions Study: Summary of Dairy Emission Factors and Emission Estimation Procedures	Schmidt, C. Card, T. 2009. August 2009. Final Report to San Joaquin Valley Air Pollution Control District.
14	Enclosed barns with biofiltration systems	Clearing the Air: Mitigating the Impact of Dairies on Fresno County's Air Quality and Public Health	California Institute for Rural Studies, Kresge. 2007.
15	Scrape /flush freestall lanes	Reduction of ammonia emissions from dairy cattle cubicle houses via improved management- or design-based strategies: A modeling approach	*Science of the Total Environment*, Mendes, L.B., et al. 2017. doi: 10.1016/j.scitotenv.2016.09.079
16	Separate urine/manure with 3 percent floor slope	Ammonia Emission from a Double-Sloped Solid Floor in a Cubicle House for Dairy Cows	*J. of Agricultural Engineering Research*, Braam, C.R., 1997. doi: 10.1006/jaer.1997.0215
Manure Management/Storage			
17	Manure storage covers; solid-liquid separation; oxygenation of liquid manure lagoons; composting; anaerobic digester	Agricultural Air Quality Conservation Measures, Reference Guide for Poultry and Livestock Production Systems	USDA-EPA
18	Solid cover; floating cover; natural crust; floating crust; replace lagoons with deep tanks; storage bags	The Impact of Ammonia Emissions from Agriculture on Biodiversity	*Rand Europe and the Royal Society, Guthrie*, S., et al. 2018. doi: 10.7249/RR2695
19	Anaerobic digesters	Clearing the Air: Mitigating the Impact of Dairies on Fresno County's Air Quality and Public Health	California Institute for Rural Studies, Kresge. 2007.
20	Cover manure piles	Emissions of Ammonia, Nitrous Oxide and Methane from Cattle Manure Heaps: Effect of Compaction and Covering	*Atmospheric Environment*, Chackdick, D.R. 2005. doi: 10.1016/j.atmosenv.2004.10.012
21	Farm lagoon effects on environmental health; sprayfields effect on environmental health	Cesspools of Shame: How Factory Farm Lagoons and Sprayfields Threaten Environmental and Public Health	Marks, R. Natural Resources Defense Council and the Clean Water Network, 2001.
Land Application			

	Measure	Reference	Source
22	Timing of land application; injection; incorporation; banding	Agricultural Air Quality Conservation Measures, Reference Guide for Poultry and Livestock Production Systems	USDA-EPA
23	Incorporate manure into soil (within minute, 4 hours, or 24 hours); lower slurry pH to 6 or less; band spreading; trailing hose; trailing shoe; injector	The Impact of Ammonia Emissions from Agriculture on Biodiversity	*Rand Europe and the Royal Society, Guthrie*, S., et al. 2018. doi: 10.7249/RR2695
24	Dilute liquid manure applied to land	Managing Dairy Manure in the Central Valley of California	University of California Division of Agriculture and Natural Resources Committee of Experts on Dairy Manure Management, 2005.
25	Incorporate manure into soil	Ammonia Volatilization from Manure Application	Atia, A. Agri-Facts. Agriculture Stewardship Division Alberta Agriculture and Food. 2008.

Brief descriptions of the measures listed in Table 4 that reduce NH3 emissions from livestock waste are provided below. Measures previously considered as part of the 2016 AQMP are also discussed.

Dietary Manipulation/Feed Additives

Dietary formulation changes involve changes in feed ingredients or ration formulations to provide essential nutrients to meet animal requirements while minimizing excess amounts of nutrients. Dietary manipulation such as lowering the protein content and including high-fiber ingredients is a potential method to decrease ammonia emissions from monogastric animals' and ruminants' manure. However, lowering the dietary protein content of dairy cattle negatively impacts milk production according to UC Davis Extension Specialist Dr. Peter Robinson.[48]

Group and Phase Feeding

Group and phase feeding practices involve separating animals by age or production state (phase), and/or by sex to provide diets that more closely match the different nutritional needs of each phase and sex to avoid providing excess nutrients in diets.

Litter Amendments and Manure Additives

[48] A list of selected scientific publications by Peter Robinson, PhD is available on the UC Davis website at: https://animalscience.ucdavis.edu/people/faculty/peter-robinson/Articles/Scientific-Publications

Litter amendments and manure additives address the generation of emissions by changing manure properties to prevent emissions from forming. Commonly used litter amendments and manure additive categories include: (1) chemicals (i.e., acidifiers); (2) adsorbents; and (3) biological compounds (i.e., microbes or enzymes).

Oil Spray/Sprinkling

Vegetable oil (crude canola, purified canola, flax, corn, sunflower or soybean oils) is sprayed into the air in animal production areas, and particles that stick to the droplets settle onto the building surfaces. While this practice originated as a measure to reduce PM emissions, smaller reductions of hydrogen sulfide and NH_3 emissions have also been observed with the use of oil sprinkling.

Biofilters

A biofilter is an air filtration and odor mitigation system that channels building exhaust through a mixture of organic materials (e.g., compost, wood chips) that support microbial growth. An air distribution system distributes the pollutant-laden air from the building exhaust to the biofilter bed (media) where microorganisms living on the biofilter media break down the pollutant gases into carbon dioxide (CO_2), water and salts.

Wet scrubbers

Wet scrubbers can be used to reduce emissions from mechanically ventilated animal production houses. The wet scrubbers used in animal production operations are usually custom designed and use either water droplets or chemical (e.g., acidic) droplets to capture pollutants.

Windbreaks and Shelterbreaks

Using upwind windbreaks or shelterbreaks can reduce exchange of fresh air over animal housing and manure storages, which can reduce the potential for emissions from these sources.

Manure Storage Covers

Manure is often stored prior to land application – either as a liquid or slurry in open earthen basins or tanks or as a solid in stacks or piles. Emissions are generated due to biological activity within the decomposing manure. Air exchange caused by wind passing over these storages is a source of emissions as pollutants are drawn by diffusion from areas of higher concentration (manure storages) to areas of lower concentration (fresh air). Additionally, the direct transport of pollutants from these storages by the wind is another source of emissions. The use of a cover allows producers to significantly limit the release and transport of these emissions.

Solid-Liquid Separation

The decomposition of manure solids during the anaerobic storage of liquid or slurry manures lead to increased emissions. For manure streams handled as a slurry, separation of the solid and liquid portions prior to storage, additional treatment and/or land application may reduce emissions.

Oxygenation of Liquid Manure Lagoons

Lagoons that treat and store manure as a liquid or slurry can be designed as either anaerobic or aerobic lagoons. As the manure in the lagoon decomposes anaerobically, it releases emissions. If sufficient oxygen is provided to the system, aerobic bacteria can break down these organic compounds into simpler forms.

Composting

Composting is a biological method of decomposition of manure in a controlled manner that involves maintaining specific carbon to nitrogen (C:N) ratios, moisture levels, temperature and aeration levels. Similar to the benefits of aeration for liquid or slurry manure, properly managed compost operations can reduce ammonia emissions from solid manure. Finished compost is a stable product that can serve as a valuable soil amendment.

Anaerobic Digester

Anaerobic digestion (AD) is a process in which microorganisms break down manure, but unlike composting, AD occurs in the absence of oxygen, or anaerobically. While AD occurs naturally in traditional manure storage and treatment lagoons under anaerobic conditions, it is usually incomplete and inefficient. By using a higher loading rate, incorporating mixing, heating the process and maintaining a consistent volume, anaerobic digestion will maximize reductions.

Timing of Land Application

Timing of land management practices such as application according to agronomic recommendation and application under cool and calm weather conditions can reduce emissions. Agronomic application is the application of nutrients to meet crop needs, including the timing of those nutrient needs. By matching crop needs to available nutrients, over-application of nitrogen can be reduced, which will minimize subsequent NH3 and N2O emissions.

Additionally, temperature, humidity, wind speed and precipitation influence the rate of NH3, PM and odor losses. The application of manure during cool, calm weather with higher humidity will decrease the amount of NH3 volatilized from the manure. Applying nutrients in the spring prior to planting when crops are ready to utilize the nitrogen can reduce NH3 emissions compared to applying in the fall. Light precipitation events following application can also decrease NH3 volatilization by binding NH3 to soil clays.

Injection

Manure from animal production facilities is usually applied to fertilize crops on land. Liquid and/or slurry manure (e.g., manure from swine, dairy production) is injected beneath the soil surface at a minimum depth of four inches by a tractor-pulled tank wagon or dragline injection system to conserve nitrogen.

Incorporation

Incorporation involves mixing manure or litter with surface soil at a minimum depth of four inches such that at least 80 percent of applied manure is covered with soil. Broadcasting manure, either solid or liquid, without incorporation results in the highest emissions. Incorporation may be accomplished by using standard agricultural practices (e.g., tandem-disk tillage) or other equivalent practices that provide 80 percent soil coverage.

Banding

Banding of manure involves the application of liquid manure in narrow bands either directly from a spreader hose or through a sliding shoe that rides along the soil surface. Banding allows relatively low-pressure manure application with less soil disturbance than incorporation. Reduced volatilization of gases from the low pressure application results in reductions of NH3 emissions.

Potential Emission Reduction

Table III-10

2030 Baseline Emissions from Livestock Waste

Facility type	NH3 Emissions (tpd)
Dairy Cattle	5.08
Range Cattle	0.13
Poultry - Layers	0.28
Swine	0.02
Sheep	0.08
Horses	0.51
Goats and Others	0.05
Total	**6.13**

As shown in Table III-10, the total inventory for this source category is 6.13 tpd of NH3 in 2030, yet dairy cattle are responsible for over 80 percent of those emissions. Lowering Rule 223 applicability thresholds results in an estimated 5 percent NH3 emission reduction (from additional 46,000 cows regulated relative to a threshold reduction from 1,000 cows to 500 and 650,000 chickens to 400,000). Thus, the estimated reduction from lowering the thresholds in Rule 223 for dairy cattle and poultry layers is 0.27 tpd.

Emission reductions are estimated for the incorporation of solid cattle manure within 24 hours and acidifying amendments for poultry litter. Assuming that 2.8 percent of dairy cattle NH3 emissions are from solid manure land application and high-disturbance land incorporation within 24 hours reduces NH3 emissions by 75 percent, the NH3 reductions are estimated to be 0.11 tpd.[49] Regarding acidifying

[49] Ammonia: Supplemental Information for EPA in Support of 15 µg/m^3 Annual PM2.5 Standard, CARB. March 2023

amendments, a recent study found that an application rate of 98 kg of aluminum sulfate per 100 square meters incorporated into poultry litter reduced overall ammonia emissions from poultry broilers by 35 percent.[50] Assuming the same control efficiency for poultry layers results in NH3 emission reductions of 0.098 tpd.

Technological Feasibility

Lowering Rule 223 applicability thresholds is technologically feasible. The remainder of the feasibility assessment concerns the mitigation measures listed in Table III-9.

It is not feasible for all CAFs to implement the same mitigation measures due to various factors, such as infrastructure, conditional use permits, water quality regulations, production contracts, and other limitations. Furthermore, CAFs in the Basin face unique challenges including hot, dry summers, drought conditions, and strict water regulations, which render some measures infeasible. The mitigation measures included in Rule 223 provide the owners and operators of CAFs much needed flexibility to choose the mitigation measures that make the best environmental and economic sense for their facility, while maximizing the amount of emission reductions. Nonetheless, the mitigation measures listed in Table III-9 provide potential opportunities to further reduce emissions.

CARB recently conducted an exhaustive feasibility analysis of the mitigation measures listed in Table III-9.[51] This feasibility analysis was relied upon as a screening tool to identify which of the mitigation measures deserve increased scrutiny in South Coast AQMD's analysis. CARB identified the following measures with theoretical potential to further reduce emissions from dairies and poultry operations:

1. Incorporation of solid cattle manure within 24 hours

   Land incorporation reduces NH3 emissions by decreasing the exposed surface area of manure. Rule 223 includes land incorporation of all manure within 72 hours of removal as a Class One Mitigation Measure. It is technologically feasible to reduce the window from 72 hours to 24 hours while allowing exceptions (e.g., for extreme weather). High-disturbance land incorporation, which requires chisel plowing followed by secondary tillage with a disk harrow or field cultivator, is expected to achieve the greatest reductions.

2. Acidifying amendments for poultry litter

   Ammonia is a weak base and reducing the pH of litter binds ammonia and reduces its volatilization. Aluminum sulfate, also known as alum, is a common compound used to treat poultry litter to reduce ammonia emissions and bind phosphorous to prevent runoff. It is technologically feasible to require the application of alum to poultry litter.

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[50] Anderson, K.; Moore, P.A., Jr.; Martin, J.; Ashworth, A.J. (2020) Effect of a New Manure Amendment on Ammonia Emissions from Poultry Litter. *Atmosphere*, *11*, 257. https://doi.org/10.3390/atmos11030257
[51] Ammonia: Supplemental Information for EPA in Support of 15 µg/m^3 Annual PM2.5 Standard, CARB. March 2023

Economic Feasibility

The cost-effectiveness for high-disturbance incorporation of solid manure is estimated to range from \$26,400/ton to \$256,840/ton depending on whether only additional labor is required or a custom farm service must be used.[52]

The application rate of alum on a per bird basis is 0.074 kg/bird[53] and the South Coast Air Basin NH_3 emission factor for poultry layers is 0.19 lbs/head-year. Assuming a 35 percent reduction in NH_3 emissions, the reduction is equivalent to 0.067 lbs/head-year. The application cost is estimated as \$0.63/head.[54] Alum must be applied prior to placing each flock and it is assumed that there is one poultry layers flock per year. Therefore, the cost-effectiveness is calculated as follows:

\$0.63/head ÷ 0.067 lbs/head-year x 2,000 lb/ton = \$18,806/ton

Summary Table

Type of Analysis	Emission Reduction	Technological Feasibility	Economic Feasibility	Feasible Measure
BACM/BACT	0.48 tpd of NH3 by 2030	No	No	No
Additional feasible measure		No	No	No
MSM		Yes~~Feasible~~	Yes~~Feasible~~	Yes - partial

This PCM has been incorporated into the control strategy as BCM-08. For the purposes of satisfying MSM, South Coast AQMD commits to consider lowering the applicability threshold in Rule 223. As the Basin was reclassified to "serious" nonattainment effective December 2020, the deadline for implementation of BACM is December 2024. During that time, South Coast AQMD has developed multiple SIP revisions, including this PM2.5 Plan. ~~Independent of MSM, the feasibility of the mitigation measures will be further explored during rulemaking.~~ Considering South Coast AQMD's robust, ~~extensive and thorough rulemaking~~legally mandated public process and noticing requirements, rulemaking for this measure cannot be feasibly ~~implemented~~ completed ~~within 4 years of reclassification~~by December 2024, ~~,~~ nor can it be ~~implemented~~ completed by 2025, the statutory "serious" area attainment year. In addition, the time for CAFs to apply for permits and implement mitigation measures must be considered. It is unreasonable to expect that this measure could be adopted and implemented within the time constraints for BACM and additional feasible measures. However, considering the 5-year extension of the attainment year pursuant to CAA section 188(e), this measure can be feasibly implemented in whole or in part by 2030.

Independent of MSM, this measure will further assess the feasibility of the mitigation measures discussed, including acidifying amendments for poultry litter and high disturbance incorporation of cattle manure.

[52] Ibid
[53] Ibid
[54] Ibid

Potential Control Measure 5 - Further Emission Reductions from Agricultural, Prescribed, and Training Burning

Target Pollutant

PM2.5

Synopsis

This control measure would seek further emission reductions from certain categories of open burning including agricultural and prescribed (e.g., forestry service) burning activities, as well as training burns. Agricultural burning involves the collection and combustion of vegetation produced from the growing and harvesting of crops. Prescribed burning is the planned burning of vegetation, usually conducted by a fire agency or the forest service to mitigate wildfire impacts or control plant disease and pests. Training burns are conducted by fire departments to practice suppressing fires. Rule 444 includes a Basin-wide no-burn provision when forecasted AQI is expected to exceed 150 in any area of the Basin. If the Basin-maximum forecasted AQI does not exceed 150, prescribed burning is prohibited in areas with AQI values exceeding 100 but agricultural burning is still prohibited for the entire Basin. While this provision controls episodic emissions on days with the worst air quality, it does not produce emission reductions on an annual basis since burning activities are shifted to other days.

PM2.5 emission reductions from agricultural burning can be achieved through incentivizing the use of alternatives (e.g., chipping/grinding or composting), with priority for eliminating burn projects located near sensitive receptors. The alternatives will produce emissions directly (e.g., chipping and grinding) or indirectly (e.g., transport of material to composting facilities) although they are still anticipated to result in a net emission reduction.

Potential Emission Reduction

The 2030 baseline emission inventory is 0.27 tpd of PM2.5 for prescribed and training burns.

The 2030 baseline emission inventory is 0.0086 tpd of PM2.5 for agricultural burning.

Technological Feasibility

Burning alternatives such as chipping/grinding or composting are widely available for agricultural applications.

The Menu of Control Measures developed by the U.S. EPA also recommends the inclusion of a provision to require higher fuel moistures during prescribed burns. For forestry burning, this is intended to decrease emissions by decreasing the amount of fuel burned and can be accomplished by either removing lighter and drier fuels or burning in early spring when moisture levels are naturally higher. There are renewed efforts to drastically increase the number of acres treated by prescribed fire in order to reduce the air quality impacts of increasingly intense wildfires caused by years of drought due to climate change and past forest management practices that have allowed the accumulation of the understory in forests throughout the west. Forest management, whether through chipping and griding or prescribed fire, reduces overall emissions by reducing the intensity and available fuel of wildfires occurring on recently treated lands.

The distinct wet and dry seasons in the South Coast Air Basin along with poor summertime air quality that may restrict prescribed fire for nearly half of a year in some locations make finding suitable conditions for prescribed fire extremely challenging for fire agencies. Further restricting the number of days available for prescribed fire by setting fuel moisture requirements is inconsistent with the goal of increasing the number of acres treated by prescribed fire and may result in higher intensity wildfires, increased threats to life and property, and increased emissions that occur from fires that burn on untreated lands. Similarly, restricting training burns runs counter to the goal of wildfire containment as experienced firefighting crews need to rapidly mobilize in the event of wildfires. Further restricting their ability to train will hamper those efforts. Therefore, this provision in the Menu of Control Measures is not technologically feasible for prescribed and training burns.

Economic Feasibility

The cost-effectiveness of this measure as it applies to agriculture has not been estimated. However, costs to implement burning alternatives would be expected to be higher due to equipment and labor costs. Agricultural burning is much more prevalent in the SJVAPCD (36 percent of statewide emissions compared to <1 percent in the South Coast Air Basin).[55] The extent of burning is reported to CARB on an annual basis based on the acreage of crops cleared to produce a burn pile. In 2022, there were only 10.1 acres cleared for agricultural burning in the Basin.[56] By comparison, there were 33,451 acres cleared in 2022 for agricultural burning in the SJVAPCD.[57] Due to the high incremental cost associated with chipping and grinding, SJVAPCD provides incentives ranging from $300/acre to $1,300/acre depending on the crop and whether soil incorporation is included.[58] The extremely limited extent of agricultural burning combined with the high cost of alternatives suggest that this measure is economically infeasible and has no practical air quality benefit. Nevertheless, South Coast AQMD commits to perform outreach to the entities that perform agricultural burns to raise awareness of alternatives such as chipping and grinding.

[55] https://ww2.arb.ca.gov/sites/default/files/2021-02/Staff_Recommendations_SJV_Ag_Burn.pdf
[56] South Coast AQMD Open Burn Program Log Book
[57] Email from Leland Villalvazo, SJVAPCD, September 11, 2023
[58] https://www.valleyair.org/Board_meetings/GB/agenda_minutes/Agenda/2021/August/final/10.pdf

Summary Table

Type of Analysis	Emission Reduction	Technological Feasibility	Economic Feasibility	Feasible Measure
BACM/BACT	TBD	No	No	No
Additional feasible measure		No	No	No
MSM		No	No	No

Control measure BCM-17 involves a wildfire prevention program that seeks to incentivize hand-thinning, mechanical thinning, and chipping and grinding to mitigate excess fuels in urban-wild-interface areas of the San Bernardino National Forest. The scope of the measure is limited to a pilot project to further assess the effectiveness of incentive programs.

Potential Control Measure 6 - Further Emission Reductions from Commercial Cooking - Charbroilers

Target Pollutant

PM2.5

Synopsis

Rule 1138 regulates VOC and PM emissions from restaurant operations by requiring the installation of flameless catalytic oxidizers, or equivalent control devices, to chain-driven charbroilers. The Rule covers chain-driven charbroilers cooking 875 pounds of meat or more per week, applicable mostly to large restaurant chains. Although under-fired charbroilers are another source of emissions from restaurant operations, no cost-effective control technology was identified for this type of equipment at the time of rule adoption. In the decade following adoption of Rule 1138, staff reported to the Governing Board regarding under-fired charbroiler control technology assessments, but amending the rule was determined to be infeasible. In 2008, staff reinitiated rule development for charbroilers and held a series of working group meetings and a public workshop. Rule amendment was again concluded to be infeasible due to the lack of affordable control technologies.

Staff has conducted an analysis of the state of PM control technology as well as potentially more stringent requirements in some of the other air districts. SJVAPCD Rule 4692 reduces PM emissions by requiring catalytic oxidizers for chain-driven charbroilers cooking 400 pounds of meat or more per week. This threshold is more stringent than that in Rule 1138 which applies to chain-driven charbroilers cooking 875 pounds of meat or more per week. Staff commits to evaluate the feasibility of lowering the applicability threshold for chain-driven charbroilers in Rule 1138.

Finally, SJVAPCD amended Rule 4692 to require registration and reporting for under-fired charbroilers. SJVAPCD Rule 4692 requires a one-time report for all commercial under-fired charbroilers submitted. Information required include typical details (name, location of establishment), number and size of cooking surface of all underfired charbroilers, type of fuel, type and pounds of meat cooked on a weekly basis, operating hours of cooking operation, flow rate (in cubic feet per minute, or CFM) of hood or exhaust system, manufacturer, and model of any installed pollution control devices (particulates, kitchen smoke, and/or odors). See below for the information that must be provided:[59]

- Name and location of the commercial cooking operation;
- Number and size, in cooking surface square feet, of all underfired charbroilers at the commercial cooking operation;
- Type of fuel used to heat the underfired charbroiler(s);
- Type and quantity, in pounds, of meat cooked on the underfired charbroiler(s) on a weekly basis for the previous 12-month period;
- Daily operating hours of the commercial cooking operation;
- Flowrate (cubic feet per minute) of hood or exhaust system(s) serving each underfired charbroiler; and
- The manufacturer and model of any installed pollution control devices designed for the reduction of particulates, kitchen smoke and/or odor.

South Coast AQMD Rule 222 also requires that all charbroilers in the South Coast jurisdiction be registered and provide sufficient data as determined by South Coast AQMD to determine compliance. Registrations must be renewed annually and refiled if there is a change of ownership/name/location.

Staff does not interpret registration and reporting requirements as an applicable MSM. This is because these requirements are purely administrative and do not achieve emission reductions. Nevertheless, staff commits to consider a registration program to improve the accuracy of the emissions inventory for charbroilers.

Potential Emission Reduction

The 2030 baseline inventory is 9.13 tpd of PM2.5 for this source category.

Potential emission reductions for lowering the rule applicability threshold for chain-driven charbroilers cannot be determined due to a lack of updated data with meat cooked throughput.

Technological Feasibility

It is technologically feasible to lower the rule applicability threshold for chain-driven charbroilers.

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[59] SJVAPCD Rule 4692 Commercial Charbroiling (Adopted March 21, 2002; Amended September 17, 2009; Amended June 21, 2018)

Economic Feasibility

While the number of chain-driven charbroilers that would be affected by lowering the threshold is unknown, SJVAPCD Rule 4692 already enforces the lower threshold so it is reasonable to conclude that this control measure is economically feasible.

Summary Table

Type of Analysis	Emission Reduction	Technological Feasibility	Economic Feasibility	Feasible Measure
BACM/BACT	TBD	No	No	No
Additional feasible measure		No	No	No
MSM		Yes	Yes	Yes

This PCM has been incorporated into the control strategy as BCM-12. As the Basin was reclassified to "serious" nonattainment effective December 2020, the deadline for implementation of BACM is December 2024. During that time, South Coast AQMD has developed multiple SIP revisions, including this PM2.5 Plan. Considering South Coast AQMD's robust, legally mandated public process and noticing requirements, rulemaking for this measure cannot be feasibly completed by December 2024, nor can it be completed by 2025, the statutory "serious" area attainment year. In addition, the time for affected restaurants to install and operate catalytic oxidizers must be considered. It is unreasonable to expect that this measure could be adopted and implemented within the time constraints for BACM and additional feasible measures. However, considering the 5--year extension of the attainment year pursuant to CAA section 188(e), this measure can be feasibly implemented in whole or in part by 2030. ~~Considering South Coast AQMD's extensive and thorough rulemaking public process, BCM-12 cannot be feasibly implemented within 4 years of reclassification, nor can it be implemented by 2025, the statutory "serious" area attainment year. However, considering the 5 year extension of the attainment year pursuant to CAA section 188(e), BCM-12 can be feasibly implemented in whole or in part by 2030.~~

Potential Control Measure 7 - Further Emission Reductions from Paved Road Dust

Target Pollutant

PM2.5

Synopsis

This measure would seek further PM2.5 emission reductions from fugitive dust sources, primarily paved roads. While fugitive dust emissions from agriculture and construction are primarily in the coarse size fraction (PM10-2.5), entrained paved road dust is a major direct PM2.5 source due to the large number of roadways and high traffic volumes in the region. South Coast AQMD Rule 1186 - PM10 Emissions from

Paved and Unpaved Roads, and Livestock Operations establishes requirements to prevent material from being deposited on roadways and requires local jurisdictions to procure certified street sweeping equipment.[60]

Most cities in the Basin have routine street sweeping frequencies of once or twice per week due to stormwater regulations. Specifically, existing National Pollution Discharge Elimination System (NPDES) permits required under the Clean Water Act currently specify street sweeping frequencies as part of a comprehensive program to reduce debris from entering storm drains.[61] Thus, regulations are currently in place to require street sweeping at specified frequencies with South Coast AQMD-certified equipment. Accordingly, the BACM analysis included in the 2016 AQMP concluded the South Coast AQMD's existing rules and regulations are equivalent to, or more stringent than other districts' rules and regulations and met the BACM requirements. The 2016 AQMP did, however, include Control Measure BCM-03 (Further Emission Reductions from Paved Road Dust Sources) that proposed a review of current South Coast AQMD Rule requirements to determine if additional emission reductions could be achieved. Therefore, this PM2.5 Plan includes control measure BCM-14 that proposes an additional evaluation of paved road dust emissions.

Potential controls may include establishing increased sweeping frequencies for freeways and highways, establishing new test protocols to measure both PM2.5 and PM10 road dust emissions from sweepers, and requiring use of the most efficient sweepers with the lowest dust entrainment rates.

Potential Emission Reduction

The 2030 baseline inventory is 9.11 tpd of PM2.5 for this source category.
Potential emission reduction from this control measure is TBD.

Technological Feasibility

Studies that examine the effect of street sweeping on PM levels are scarce. A recent study in Chiayi City, Taiwan concluded that street sweeping combined with street washing is effective at reducing ultrafine particle concentrations.[62] Another study conducted in Krakow, Poland found that street sweeping followed by intensive washing reduced road dust PM2.5 by 20-33 percent.[63] However, due to the tendency for the South Coast Air Basin to experience extreme drought, street washing is infeasible. Additionally, NPDES regulations prohibit street washing. Thus, these studies are not applicable to our region. The only studies identified as potentially applicable to our region found that closed system

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[60] http://www.aqmd.gov/docs/default-source/rule-book/support-documents/rule-1186/certified-street-sweepers-equipment-list.pdf?sfvrsn=2
[61] City of Fullerton, 2015. Contact with Ty Richter, Street Supervisor, City of Fullerton, September 2015.
[62] Do the Street Sweeping and Washing Work for Reducing the Near-ground Levels of Fine Particulate Matter and Related Pollutants? https://doi.org/10.4209/aaqr.220338
[63] Impact of Street Sweeping and Washing on the PM10 and PM2.5 Concentrations in Cracow (Poland) https://ros.edu.pl/index.php?view=article&id=740:043-ros-v21-r2019&catid=51&lang=pl

regenerative air sweepers are more efficient and less polluting compared to vacuum and mechanical brush sweepers.[64,65]

Mandating increased street sweeping frequencies has unknown impacts on PM2.5 levels. Therefore, a pilot project along with a comprehensive atmospheric measurement campaign would be needed to assess the effectiveness of street sweeping frequency and technology as a method to reduce ambient PM2.5. New test protocols that evaluate the PM2.5 performance of sweepers, such as those in Toronto and Europe,[66,67] may be needed as well.

Economic Feasibility

Street sweeping costs vary greatly based on the number of miles and frequencies and whether the work is conducted with in-house or contracted resources. A survey of several large cities conducted in 2018 determined that the median annual cost of street sweeping was $52.31 per curb mile.[68] The cost of mandating increased street sweeping frequencies can be substantial considering that the City of Los Angeles alone has over 230,000 curb miles to maintain. A pilot project would provide further insight into the cost-effectiveness of this measure.

Summary Table

Type of Analysis	Emission Reduction	Technological Feasibility	Economic Feasibility	Feasible Measure
BACM/BACT	TBD	No	No	No
Additional feasible measure		No	No	No
MSM		Yes	No	No

Other Considerations

South Coast AQMD has determined that further evaluation is required prior to fully implementing this control measure. Control measure BCM-14 proposes a pilot project to assess the effectiveness of increased street sweeping using regenerative air sweepers.

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[64] https://www.tymco.com/wp-content/themes/va/pdf/Cleanroads-APWAReporter-092007.pdf
[65] ECORP Consulting, Inc. Strategic Street Sweeping Study prepared for Coachella Valley Association of Governments. November 2022.
[66] https://www.toronto.ca/wp-content/uploads/2018/02/94cd-CRCA_PM-Efficiency-Protocol-May2016.pdf
[67] https://www.eu-nited.net/eunited+aisbl/municipal-equipment/sweepers-/index.html
[68] https://sfbos.org/sites/default/files/BLA_Report_Street_Cleaning_Cost_Survey_062518.pdf

Potential Control Measure 8 - Further Emission Reductions from Wood-Burning Fireplaces and Wood Stoves

Target Pollutant

PM2.5

Synopsis

Rule 445 currently implements robust controls designed to reduce PM2.5 emissions from wood-burning devices. During wood-burning season, PM2.5 mandatory burning curtailment (No-Burn days) may be declared by the Executive Officer based on PM2.5 air quality forecast. However, there is an exemption for low-income households defined as "any household that receives financial assistance through reduced electric or gas bills from an electric or natural gas utility based on household income levels." There are two financial assistance programs in California: Family Electric Rate Assistance (FERA) and California Alternate Rates for Energy (CARE). Staff estimated that 15-20 percent of single-family households qualify for CARE over an inland range covering Los Angeles and Orange Counties.[69] This is potentially a lower bound estimate of the households qualifying for the low-income exemption in Rule 445 since the qualified income thresholds are slightly higher for FERA than CARE. In addition, this PCM evaluates the feasibility of the proposed curtailment threshold of 25 µg/m3.

Potential Emission Reduction

The 2030 baseline inventory is 4.82 tpd of PM2.5 for all wood-burning devices.

~~Potential emission reductions have not been estimated.~~

Technological Feasibility

It is technologically feasible to lower the curtailment threshold and remove the low-income exemption for households with an alternative source of heat.

Economic Feasibility

Removing the low-income exemption from the mandatory curtailment would result in indeterminate cost increases to the impacted community. However, this control measure does not propose to modify existing curtailment exemptions provided to sole source of heat households or those not serviced by natural gas.

[69] Net Emissions Analysis Tool (NEAT) documentation. http://www.aqmd.gov/home/air-quality/clean-air-plans/air-quality-mgt-plan/neat-main

~~This potential control measure would~~Removal of the low-income exemption and the lower curtailment threshold would not affect economic feasibility since season woods cost higher than natural gas in The Basin and majority of wood burning are ~~effectively only apply to~~ ambiance burning. ~~in low-income households~~. Therefore, it is economically feasible.

Summary Table

Type of Analysis	Emission Reduction	Technological Feasibility	Economic Feasibility	Feasible Measure
BACM/BACT	0.33 tpd PM2.5~~TBD~~	No	No	No
Additional feasible measure		No	No	No
MSM		~~Feasible~~Yes	~~Feasible~~Yes	Yes

This PCM has been incorporated into the control strategy as BCM-18. As the Basin was reclassified to "serious" nonattainment effective December 2020, the deadline for implementation of BACM is December 2024. During that time, South Coast AQMD has developed multiple SIP revisions, including this PM2.5 Plan. Considering South Coast AQMD's robust, legally mandated public process and noticing requirements, rulemaking for this measure cannot be feasibly completed by December 2024, nor can it be completed by 2025, the statutory "serious" area attainment year. In addition, the "serious" area plan submitted to the U.S. EPA in 2017 demonstrated Rule 445 satisfying BACM requirements at the time of the submittal. Due to unforeseen circumstances, the plan was withdrawn effective in June 2023 and a new BACM demonstration in conjunction with a new attainment strategy was developed. Given the short timeline from the new BACM demonstration to the statutory BACM implementation timeline, December 2024, it is not feasible to implement this measure as BACM. However, considering the 5 year extension of the attainment year pursuant to CAA section 188(e), this measure can be feasibly implemented in whole or in part by 2030. ~~Considering South Coast AQMD's extensive and thorough rulemaking public process, this measure cannot be feasibly implemented within 4 years of reclassification, nor can it be implemented by 2025, the statutory "serious" area attainment year. However, considering the 5 year extension of the attainment year pursuant to CAA section 188(e), this measure can be feasibly implemented by 2030.~~

Potential Control Measure 9 - Emission Reductions from Organic Waste Composting

Target Pollutant

NH3

Synopsis

This proposed control measure would seek emission reductions of NH3 from composting of organic waste (i.e., greenwaste, foodwaste, and agricultural waste streams). Control approaches include pollution prevention technology, anaerobic digestion in lieu of composting, and restrictions for direct application of uncomposted, chipped or ground greenwaste (e.g., compostable mulch) to public lands.

California has passed legislation to divert organic waste from landfills including AB 1826 (Mandatory Commercial Organics Recycling; Chesbro, Chapter 727, Statutes of 2014) and SB 1383 (Short-Lived Climate Pollutants; Lara, Chapter 395, Statutes of 2016). SB 1383 sets statewide targets to reduce disposal of organic waste in landfills by 75 percent from 2014 levels and to save at least 20 percent of currently disposed surplus food for consumption by 2025.[70] SB 1383 organic waste mandates are implemented by local jurisdictions with oversight from California's Department of Resources Recycling and Recovery (CalRecycle). CalRecycle conducted a formal rulemaking process through collaboration with other stakeholders that resulted in regulations for organic waste management programs. Organic waste includes a broad range of waste categories such as food, green material, landscape and pruning waste, organic textiles and carpets, lumber, wood, paper products, printing and writing paper, manure, biosolids, digestate, and sludges that will be diverted from landfills and taken to the appropriate organic waste recovery facilities. Local jurisdictions must have their organic waste management programs in effect by January 1, 2022 and are required to take enforcement against noncompliance starting January 1, 2024.[71]

According to Table 2-3 of CalRecycle's Final Environmental Impact Report, 46 new or expanded compost facilities and 24 new or expanded anaerobic digester facilities would be required in the South Coast Air Basin by 2030 to process the diverted waste.[72] While overall Short-Lived Climate Pollutant emissions are expected to decline, emissions from processing of organic waste via composting and anaerobic digestion are expected to grow. Organic waste may contain pathogen infections and is known to increase NH3 emissions, if not composted properly. Therefore, this control measure proposes minimum composting standards to eliminate pathogens and minimize NH3 emissions. It also seeks to evaluate emerging technologies to further control emissions from organic waste.

Potential Emission Reduction

The 2030 baseline inventory is 0.67 tpd of NH3 for this source category. Emission reductions were not estimated.

Technological Feasibility

Pollution Prevention Technology

Rule 1133.3 requires 80 percent control of VOC and NH3 emissions for a greenwaste composting pile containing greater than 10 percent foodwaste. Emerging pollution prevention technologies are able to process these waste materials without the microbial decomposition of organic materials, concurrently

[70] https://calrecycle.ca.gov/organics/slcp/
[71] An Overview of SB 1383's Organic Waste Reduction Requirements. https://www2.calrecycle.ca.gov/Docs/Web/115800
[72] CalRecycle Final Environmental Impact Report. https://www2.calrecycle.ca.gov/Docs/Web/119973

killing pathogens and thereby minimizing VOC and NH3 generation from the process. As an example, ~~ReGreen~~ Regreen ~~International Solutions~~Technology~~, Inc.~~ (~~ReGreen~~Regreen) systemss~~s~~ can handle and process organic material and municipal solid waste into a stable byproduct such as animal feed, soil amendments/fertilizers, or clean-burning energy pellets. ~~Another example is Waste Management (WM's) proprietary Centralized Organic Recycling equipment (CORe®) process that recycles commercial and institutional pre- and post-consumer foodwaste into an Engineered BioSlurry (EBS®) that is added to wastewater treatment plant anaerobic digesters to increase the production of biogas.~~

Anaerobic Digestion

Anaerobic digestion is a process through which bacteria digest organic matter such as animal manure, wastewater biosolids (e.g., municipal sewage sludge), and foodwaste in the absence of oxygen. Anaerobic digestion for biogas takes place in a sealed vessel called ~~a~~ reactor, which is designed and constructed in various shapes and sizes specific to the site and feedstock conditions. These reactors contain complex microbial communities that digest the waste and produce resultant biogas and other useful coproducts (i.e., solid and liquid portions of the digestate). There are two types of anaerobic digester (AD) systems. Dry AD has a higher content of total solids greater than 15 percent and is best if feedstock is rich in greenwaste (up to 50 percent greenwaste). Wet AD has a lower content of total solids less than 15 percent and is best if the feedstock has no greenwaste. Dry AD generally requires larger and adjacent composting area, providing lower biogas yield and producing more solid digestate than in the wet AD system. Co-digestion is a wet AD system in which ~~M~~multiple organic materials can be ~~combined~~ digested in one digester. Co-digested materials include manure, foodwaste (pre- and post-consumer), crop residues, and fats, oils and greases (FOG) from restaurant grease traps, and many other sources. Co-digestion can increase biogas production from low-yielding or difficult-to-digest organic waste. There is one co-digestion facility operating in Los Angeles County that receives foodwaste and sewage sludge to produce biogas for Compressed Natural Gas (CNG) transportation fuel and electricity.[73] This co-digestion facility uses Waste Management (WM's) proprietary Centralized Organic Recycling equipment (CORe®) process that recycles commercial and institutional pre- and post-consumer foodwaste into an Engineered BioSlurry (EBS®) that is added to wastewater treatment plant ADs to increase the production of biogas. There are also four standalone anaerobic digestion facilities operating in the South Coast AQMD jurisdiction, which accept and process foodwaste and other organic wastes.[74]

Composting of Chipped Greenwaste Used for Land Application

Shredded curbside and non-curbside greenwaste, if not composted properly, may increase NH3 and VOC emissions or pathogen infections when used as ground cover. Emissions can be reduced by having those materials go through the active phase of composting for at least 15 days. Approximately 85 percent of NH3 emissions occur during the first 15 days of the 22-day active phase composting period required by

[73] https://www.lacsd.org/services/solid-waste-programs/food-waste-recycling
[74] https://www2.calrecycle.ca.gov/Docs/Web/115971. Updated March 2023

Rule 1133.3.[75,76] In addition, California Code of Regulations, Title 14, Section 17868.3 requires a pathogen reduction period of 15 days for a windrow composting process. Therefore, NH3 emissions can be reduced from shredded green material applied to public lands (e.g., for erosion control) by imposing restrictions such that chipped and ground greenwaste undergoes a minimum of 15 days of active phase composting before land application. Staff previously estimated NH3 emissions from curbside greenwaste composting feedstock piles at 0.017 lbs/wet ton-day. However, emissions from a layer of land-applied shredded greenwaste materials have not been investigated and thus warrant further research. Emission reductions are estimated to be 0.08 tpd (see BCM-10 for details).

Economic Feasibility

Only the “Composting of Chipped Greenwaste Used for Land Application” ~~The~~ portion of this potential control measure ~~seeking reductions of uncomposted chipped and ground greenwaste~~ is considered economically feasible and has an estimated cost-effectiveness of $91,200 per ton of NH3 reduced (in 2022 dollars; refer to BCM-10 in Appendix IV-A). For the other portions of this potential control measure, “Pollution Prevention Technology” and “Anaerobic Digestion,” there is a lack of sufficient data on capital costs and emission controls to determine cost-effectiveness. Thus, staff estimated cost-effectiveness based upon available cost data and conservative assumptions as follows.

Pollution Prevention Technology

Estimated equipment costs for pollution prevention technology (e.g., ~~ReGreen~~ Regreen Technology) are expected to range between $300,000 and $400,000 for a unit that supports up to 0.5 tons/hour of feed. For full scale applications, a 5 tons/hour unit costs up to $3.6 million (for capital costs only; operational costs are not included). Sufficient data is not available on how much emission reductions can be achieved from such a pollution prevention technology. Assuming a 5 tons/hour unit operates for 8 hours a day and 250 workdays a year, this unit can process 10,000 tons of mulch per year for a unit cost of $360 per ton of mulch processed. Assuming this technology can entirely replace the composting operation and achieve NH3 emission reductions at a rate of 80 percent control efficiency from the full phases of composting, the emission reductions would be 0.54 tons and cost-effectiveness ~~is~~would be $1.9 million per ton of NH3 reduced (in 2022 dollars). The high capital cost is an impediment for widespread adoption and therefore the portion of this potential control measure related to pollution prevention technology is economically infeasible.

Anaerobic Digestion

As described in the previous section, there are anaerobic digestion plants operating in the Basin. However, sufficient data is not available on the costs and how much emission reductions can be achieved from such an anaerobic digestion or co-digestion. The cost of building a biogas facility can vary widely depending on

[75] Card, T.R. and C.E. Schmidt, 2006. Air emissions source test: Jepson Prairie Organics Compost Facility, Vacaville, CA. Report to NorCal Waste Systems, Inc.
[76] Card, T.R. and C.E. Schmidt, 2009. Northern Recycling Zamora Compost Facility Air Emissions Source Test. Report to Yolo Solano AQMD

a number of factors, including the size of the facility, the type of feedstock used, and the location of the facility to list a few, and is in general estimated to be $400 (a simple farm installation) to $1,500 (a municipal unit with waste sorting and biogas purification systems) per wet ton of material processed (capital costs only; operational costs are not included).[77] Greenwaste is typically not considered suitable for co-digestion because it is difficult to digest and yields low production of biogas. However, for the sake of this cost-effectiveness analysis, it was assumed very conservatively that chipped and ground mulch is a sole feedstock to co-digestion that achieves 80 percent of NH3 emission control efficiency from anaerobic digestion that replaces the full phases of composting. The average~~d~~ control cost per ton of mulch processed is $950 (as an average of the above cost range). This is about 2.6 times higher than the per ton cost ($360) of a pollution prevention technology and the cost-effectiveness is $5.0 million per ton of NH3 reduced (in 2022 dollars). The high cost-effectiveness is an impediment for widespread adoption of this technology and therefore the anaerobic digestion portion of this potential control measure is economically infeasible.

Summary Table

Type of Analysis	Emission Reduction	Technological Feasibility	Economic Feasibility	Feasible Measure
BACM/BACT	0.08 tpd NH3~~TBD~~	No	No	No
Additional feasible measure		No	No	No
MSM		Yes~~Feasible~~	Yes~~Feasible~~	Yes - partial

The "Composting of Chipped Greenwaste Used for Land Application" portion of this potential control measure that is considered MSM has been incorporated into control measure BCM-10. As the Basin was reclassified to "serious" nonattainment effective December 2020, the deadline for implementation of BACM is December 2024. During that time, South Coast AQMD has developed multiple SIP revisions, including this PM2.5 Plan. Considering South Coast AQMD's robust, legally mandated public process and noticing requirements, rulemaking for this measure cannot be feasibly completed by December 2024, nor can it be completed by 2025, the statutory "serious" area attainment year. In addition, the time for composting facilities to expand their capacity to accommodate increased amounts of greenwaste must be considered. It is unreasonable to expect that this measure could be adopted and implemented within the time constraints for BACM and additional feasible measures. However, considering the 5-–year extension of the attainment year pursuant to CAA section 188(e), this measure can be feasibly implemented in whole or in part by 2030. ~~Considering South Coast AQMD's extensive and thorough rulemaking public process, BCM-10 cannot be feasibly implemented within 4 years of reclassificationby December 31, 2024, the deadline for implementation of BACM, nor can it be implemented by 2025, the statutory "serious" attainment year. However, considering the 5 year extension of the attainment year pursuant to CAA section 188(e), BCM-10 can be feasibly implemented in whole or in part by 2030.~~

[77] https://www.biogasworld.com/news/reduce-the-costs-of-biogas-plant/

Potential Control Measure 10 - Emission Reduction of PM from Asphalt Manufacturing

Target Pollutant

PM2.5

Synopsis

This measure is derived from the 2012 version of U.S. EPA's Menu of Control Measures.[78] It estimates a control efficiency of 99 percent in an asphalt manufacturing facility equipped with a fabric filter, or baghouse placed in parallel inside of an enclosure. Rule 1157 - PM10 Emission Reductions from Aggregate and Related Operations targets all aggregate and related operations, but does not require enclosure for all transfer points and activities. However, Rule 1155 regulates all baghouses (including those at asphalt manufacturing facilities), except for those with a filter area less than 100 ft^2 and requires no visible emissions at any time except for start-up and shutdown.

Potential Emission Reduction

The 2030 baseline inventory is ~~0.18~~0.008 tpd of PM2.5 for this source category. Emission reductions have not been estimated at the transfer points and will need to be evaluated further.

Technological Feasibility

Enclosures and baghouses are generally technologically feasible. The standard (0.01 gr/dscf) for baghouses in asphalt manufacturing facilities was set forth in Rule 1155 and was fully implemented in 2013. Materials collected in a permitted PM control device must be discharged for disposal or brought back to the process through a controlled material transfer system to prevent fugitive emissions during material transfer. Such methods include, but are not limited to, shrouding or use of dust suppressant to stabilize the material. The purpose of this requirement is to control discharge of baghouse dust and prevent unwanted fugitive emissions during material transfer. Since most baghouse dusts are brought back to the process, a controlled material transfer system will help prevent fugitive emissions during material transfer.

[78] https://www3.epa.gov/ttn/naaqs/pdfs/MenuOfControlMeasures.pdf

Economic Feasibility

Asphalt manufacturing in the South Coast AQMD is currently regulated under Rule 1157 and Rule 1155, which require the use of filters. Baghouses are not considered economically feasible at the transfer points and activities not covered by Rule 1157 and Rule 1155. The potential emission reductions at the transfer points need to be further evaluated in order to estimate the economic feasibility or cost-effectiveness, as no data has been collected to understand the emissions at these points. However, given the emissions subject to this source category is very small, the emission reduction potential is anticipated to be de minimis, which will likely put cost effectiveness values to be very high and make this measure economically infeasible. ~~based on the low emission inventory and the relative costs for replacement at $27,000 per bag every three to five years.~~

Summary Table

Type of Analysis	Emission Reduction	Technological Feasibility	Economic Feasibility	Feasible Measure
BACM/BACT	< 0.008 tpd PM2.5~~TBD~~	Yes~~Feasible~~	~~Not Feasible~~To Be Determined	No
Additional feasible measure		Yes~~Feasible~~	~~Not Feasible~~To Be Determined	No
MSM		Yes~~Feasible~~	To Be Determined~~Not Feasible~~	No

Potential Control Measure 11 - Emission Reduction of PM from Wood Pulp and Paper

Target Pollutant

PM2.5

Synopsis

This measure is derived from the 2012 version of U.S. EPA's Menu of Control Measures,[79] which estimated a control efficiency of 95 percent in wood pulp and paper facilities equipped with dry/wet electrostatic precipitators (ESP). Currently, there are five permitted paper and paperboard manufacturing facilities in

[79] https://www3.epa.gov/ttn/naaqs/pdfs/MenuOfControlMeasures.pdf

South Coast AQMD, although all rely on recycled materials. There is no source-specific control measure targeting this source category.

Potential Emission Reduction

The 2030 baseline inventory is 0.039 tpd of PM2.5 for this source category.

Potential emission reduction is not determined. Emission reduction techniques would need to be considered on a site-specific basis.

Technological Feasibility

An ESP is predominantly used to control PM emissions from kraft recovery furnaces used at paper manufacturing facilities that process virgin raw materials. However, manufacturing facilities in South Coast AQMD only process recycled paper and paperboard. For the recycled manufacturing facilities, very little PM is emitted from the pulp dryer, and control techniques for the paper machine vents are considered impractical because of the high moisture content, high volume of the vent exhaust gases, and the minimal pollutant concentrations.[80] As such, ESP control on PM is not technologically feasible for the recycled paper and paperboard manufacturing facilities located within South Coast AQMD.

Economic Feasibility

The control equipment for PM emissions is not expected to be cost-effective for recycled paper and paperboard manufacturing because of very high air flow from the exhaust vents on the roof top of a building where paper machine is situated, and low emission reduction potential.

Summary Table

Type of Analysis	Emission Reduction	Technological Feasibility	Economic Feasibility	Feasible Measure
BACM/BACT	N/A	No	No	No
Additional feasible measure		No	No	No
MSM		No	No	No

Staff is not aware of this control measure having been implemented in another nonattainment area or having been achieved in practice in another state for recycled paper manufacturing facilities. This PCM therefore does not meet U.S. EPA's definition of MSM.

[80] A&WMA, 2000. Air Pollution Engineering Manual, Second Edition, Air & Waste Management Association, page 804

Potential Control Measure 12 - Emission Reduction of NOx through Reformulation and Process Modification for Cutback Asphalt

Target Pollutant

NOx

Synopsis

This measure is derived from the 2012 version of U.S. EPA's Menu of Control Measures,[81] which estimated a control efficiency of 100 percent based on the use of reformulated products and the modification of processes associated with cutback asphalt manufacturing to reduce fugitive VOC emissions. In addition, the proposed process would reduce natural gas use by an estimated 20 to 25 percent from reduced processing and transportation temperatures. The reduction in natural gas use results in NOx emission reductions. Cutback asphalt is regulated under Rule 1108 which requires that cutback asphalt contains ≤ 0.5 percent by volume organic compounds at 260°C or lower.

Potential Emission Reduction

Emissions and emission reductions are TBD.

Technological Feasibility

Recent studies on warm-mix asphalt (WMA) have shown reductions in smoke and odors, lower emissions, improved workability, better working conditions and better performance.[82] The study findings recommend that use of WMA be encouraged and that water-based WMA technologies should be closely monitored in mix-design and quality control/quality assurance testing to avoid moisture related issues. While WMA use may result in little or no reductions in VOC emissions, the reduced temperatures associated with WMA (approximately 20 percent lower than traditional hot-mix asphalt (HMA)) has been shown to result in a 20 to 25 percent reduction in energy usage.[83] WMA use is increasing throughout California, the U.S., and Europe. A survey by the National Asphalt Pavement Association found that nearly

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[81] https://www3.epa.gov/ttn/naaqs/pdfs/MenuOfControlMeasures.pdf

[82] D. Jones, F. Farshidi, J. Harvey; Warm-Mix Asphalt Study: Summary Report on Rubberized Warm-Mix Asphalt Research (Summary Report UCPRC-SR02013-03), March 2014

[83] South Coast AQMD, Technology Assessment – Rule 1108 Cutback Asphalt, June 2008

one third of all asphalt pavement mix production in the U.S. is WMA, an increase of 577 percent since 2009.[84]

Economic Feasibility

The cost of plant modifications to produce WMA range from $30,000 to $50,000. Additionally, the chemistry used to bind the aggregate is approximately $3 to $5 per ton more expensive than HMA. However, many facilities realize a cost savings from the process because of reduced fuel and labor costs. The WMA makes compaction easier, and the lower temperatures result in reduced transportation costs. Additionally, facilities realize a cost savings from higher reclaimed asphalt pavement content. Overall, there is no expected cost increase.

Summary Table

Type of Analysis	Emission Reduction	Technological Feasibility	Economic Feasibility	Feasible Measure*
BACM/BACT	TBD	Yes~~Feasible~~	Yes~~Feasible~~	No
Additional feasible measure		Yes~~Feasible~~	Yes~~Feasible~~	No
MSM		Yes~~Feasible~~	Yes~~Feasible~~	No

* While this measure is technologically and economically feasible in practice it is currently infeasible due to other considerations.

Other Considerations

In a white paper developed by the South Coast AQMD in 2008, staff concluded that lower-energy warm mix asphalt technologies were promising in reducing energy use and reducing NOx and VOC emissions. Nonetheless, the impact of mix and structural design, material processing requirements, construction procedures, and quality control specifications were not yet fully evaluated. In the last few years, WMA has been increasingly popular in the United States. Caltrans promotes the use of WMA because of its many improvements over HMA. In its April 2013 publication, Caltrans reported a 30 percent potential fuel savings and an 18 percent reduction in the overall GHG emissions associated with WMA.[85] The University of California Pavement Research Center (UCPRC) investigated the performance of rubberized WMA and found that in a controlled environment, rubberized WMA have better workability, and could result in potential energy savings and safer working conditions compared to HMA.[86] WMA suppliers reported 19–50 percent VOCs reduction and 60–70 percent NOx reduction in plant emissions in Europe, although

[84] National Asphalt Pavement Association, Steady Increase in Sustainability of Asphalt Pavements, http://www.asphaltpavement.org/index.php?option=com_content&view=article&id=1077:steady-increase-in-sustainability-of-asphalt-pavements&catid=24:napa-news4&Itemid=767, accessed January 19, 2016.

[85] California Department of Transportation. Caltrans Activities to Address Climate Change: Reducing Greenhouse Gas Emissions and Adapting to Impacts. April 2013. Retrieved from: http://www.dot.ca.gov/hq/tpp/offices/orip/climate_change/documents/Caltrans_ClimateChange Rprt-Final_April_2013.pdf

[86] Jones, D., Wu, R., Barros, C. and Peterson, J. Research Findings on the Use of Warm-Mix. February 213. http://ra-foundation.org/wp-content/uploads/2013/02/040-PAP_060.pdf

increased emissions of VOCs and CO were observed in the United States.[87] Although the overall performance of WMA seemed promising, mixed results were revealed on the potential emission reductions in a field test. UCPRC measured VOCs and semi-volatile organic compounds (SVOCs) emissions from WMA and HMA at the pavement surface during construction. Results showed that depending on the mix type and the temperature inside the chamber, total reactive organic gases (ROG) emission flux of WMA could be higher or lower than HMA.[11] Based on current information, the emission reduction of WMA technology is still uncertain and the potential increase in VOC emissions needs to be further investigated. Although VOCs are not a significant PM2.5 precursor in the South Coast Air Basin, the Basin is in “extreme” nonattainment of multiple ozone NAAQS and potential increases in VOC emissions must be carefully evaluated. Therefore, staff suggests further evaluation of the emission reduction and cost-effectiveness for WMA technology prior to being considered as BACM/MSM.

Potential Control Measure 13 - Paving Unpaved Lots, Roads, and Shoulders

Target Pollutant

PM2.5

Synopsis

This measure will examine the feasibility of reducing PM2.5 emissions from well-traveled or highly used unpaved lots, roads, and other surfaces by applying paving materials. Although the South Coast Air Basin is a highly urbanized environment, there are areas with unpaved surfaces that are used by vehicles, equipment and/or other activities that generate airborne particulate matter emissions, including PM2.5. In total, there are approximately 1,900 miles of unpaved roads in the Basin. However, not all of these roads are well-traveled or highly used. The focus of this measure would be to reduce dust and PM2.5 emissions from unpaved surfaces located in high traffic areas that are produced by moderate to high vehicle and/or machinery activity. This includes, but is not limited to, unpaved parking lots near warehouses as well as unpaved areas used by mobile homes or other vehicles/equipment on a frequent basis. This measure does not include paving in natural or protected lands. The following sites with unpaved surfaces may be considered: roads, traffic areas, parking lots, staging or assembly areas, mobile home parks, equipment storage lots, runways, loading and unloading areas, and/or roads and other areas on agricultural lands. The following activities are not considered by this proposed control measure: routine maintenance and rehabilitation projects, and/or paving activities that are part of new development projects.

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[87] U.S. Department of Transportation, Washington, DC, USA. Warm-Mix Asphalt: European Practice; International Technology Scanning Program, FHWA-PL-08-007. February 2008

Unlike SJVAPCD Rule 8061, South Coast AQMD's rules do not currently prohibit the construction of new unpaved roads in urban areas. Therefore, this measure will also examine the feasibility incorporating this prohibition into South Coast AQMD rule requirements.

Potential Emission Reduction

The 2030 baseline inventory is 1.67 tpd of PM2.5 for this source category.

Estimated emission reductions are TBD.

Technological Feasibility

Roadway paving is a common activity and occurs regularly throughout the Basin in construction projects and other community improvement initiatives. Other air districts have implemented unpaved road dust control measures that include paving as one method of controlling particulate matter emissions. Some have established traffic thresholds that would trigger the paving requirements set therein, and methodologies for PM emissions quantification.[88,89] The South Coast AQMD has recently developed a Paving Project Plan for the Eastern Coachella Valley as part of the AB 617 Community Air Protection Program (CAPP), which has been approved by CARB. This plan was developed in response to community concerns related to particulate matter emissions from unpaved surfaces in the community of Eastern Coachella Valley. This paving plan includes an emissions reduction quantification methodology based on Vehicle Miles Traveled (VMT).[90] The quantification methodology has been approved by CARB and can be applied to this PCM for paving of unpaved surfaces in the Basin.

This PCM focuses on unpaved surfaces that are adjacent to high-traffic areas or highly used by vehicles and equipment causing the production of airborne particulate matter emissions, including PM2.5. An additional quantification methodology may be necessary to estimate the emissions reduced by paving surfaces based on square footage or similar measure within unpaved lots that are not open to through traffic, such as warehousing operations. The amount and locations of unpaved surfaces that would benefit from this PCM are currently unknown, however South Coast AQMD is aware of several locations that could benefit from this PCM based on high truck traffic areas, goods movement corridors, warehouse locations, as well as through concerns raised by the AB 617 communities and information provided by various other sources. For example, the AB 617 community of San Bernardino/Muscoy has identified unpaved areas associated with trucking and warehousing adjacent to Route 66/Cajon Blvd. as a high traffic

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[88] San Joaquin Valley Air Pollution Control District Rules 8061– Paved and Unpaved Roads, August 2004 and 8071 – Unpaved Vehicle and Equipment Traffic Areas, September 2004 https://www.valleyair.org/rules/currntrules/r8061.pdf; https://www.valleyair.org/rules/currntrules/r8071.pdf

[89] Imperial County Air Pollution Control District Rule 214.2 – Paving Unpaved Roads Emission Reduction Credits, April 2017 https://apcd.imperialcounty.org/wp-content/uploads/2020/01/1RULE214-2.pdf

[90] South Coast AQMD Final Paving Project Plan ECV, September 2022 http://www.aqmd.gov/docs/default-source/ab-617-ab-134/steering-committees/eastern-coachella-valley/final-ecv-paving-project-plan.pdf?sfvrsn=8

unpaved area that may benefit from paving. An example of an unpaved surface in the Basin that is currently being used by trucks for parking is provided in Figure III-3.

FIGURE III-3
UNPAVED TRUCK LOT IN TORRANCE, CA

The method of implementation of this measure may include regulatory or incentive-based approaches. The Road Paving Plan for the ECV may offer a blueprint for funding paving opportunities in 617 communities within the Basin through incentives, but regulatory requirements may be necessary in non-617 areas or where incentive funding is otherwise unavailable.

Economic Feasibility

The cost projections of paving unpaved areas vary due to materials used for paving, be it asphalt, concrete, or some combination, and the need for striping, curbing, and other improvements. The Fugitive Dust Handbook published by the Western Regional Air Partnership estimates the costs of paving one mile of unpaved road at $44,100/mile-year with an estimated useful life of 25 years; a similar cost estimate for paving unpaved lots $0.23/square foot-year for a useful life of 25 years, though these costs have likely increased since publication.[91] CARB's Unpaved Road Dust, Non-Farm Roads Methodology estimated the total unpaved city and county road miles for the Basin at 167.3 miles, though 'high-traffic' and adjacency to AB 617 communities were not limiting factors in these estimates.[92] Using these figures, a high cost

[91]Western Regional Air Partnership Fugitive Dust Handbook, 2006 https://www.wrapair.org/forums/dejf/fdh/content/FDHandbook_Rev_06.pdf

[92] California Air Resources Board Miscellaneous Process Methodology 7.10, Unpaved Road Dust, Non-Farm Roads, 2012 https://ww3.arb.ca.gov/ei/areasrc/fullpdf/full7-10_2012.pdf

estimate for paving the total unpaved city and county land in the Basin would be approximately $184 million, though again these are total miles not 'high-traffic' miles, so the total unpaved lot area that would be considered by this PCM would be significantly smaller. This methodology estimates that the tons of PM/year reductions of paving the total road miles at 553.3 tons/year, or 1.52 tpd for an estimated cost effectiveness figure of $13,334/ton. If only 10 percent of the road miles is paved this could result in a reduction of 55 tons/year of PM. While most unpaved roads are in public jurisdictions, many unpaved lots are private land and this distinction will be key to implementation of this PCM, as well defining high-traffic and distance to affected populations or AB 617 adjacency.

As the surface area of private unpaved high-traffic lots in the Basin is unknown, any incentive funding or cost-effectiveness estimates for the total unpaved area that this PCM may address is not known, and this uncertainty presents a barrier to feasibility. In addition, this PCM must be considered in the context of climate-related drought conditions and heatwaves frequently experienced in the Basin. Paving surfaces that would otherwise allow for underground aquifers to replenish during rainstorms must be acknowledged as a potential cost when assigning cost-effectiveness or designating areas for applicability to this PCM. Paving unpaved surfaces, especially in urban areas, also creates heat island effects resulting in higher temperatures than outlying areas. In densely urbanized areas, paved roads absorb and re-emit the sun's heat more than natural landscapes becoming "islands" of higher temperatures relative to outlying areas. The costs of less permeable areas for surface drainage and heat island effects are unknown at this time. Therefore, South Coast AQMD has determined that this PCM requires further evaluation before committing to an adoption schedule and emission reductions.

Summary Table

Type of Analysis	Emission Reduction	Technological Feasibility	Economic Feasibility	Feasible Measure
BACM/BACT	TBD	Yes~~Feasible~~	No	No
Additional feasible measure		Yes~~Feasible~~	No	No
MSM		Yes~~Feasible~~	No	No

Other Considerations

South Coast AQMD has determined that further evaluation is required prior to implementing this control measure. Control measure BCM-19 proposes to develop an inventory of unpaved roads and parking lots within urban areas in the Basin and assess the suitability for paving. The proximity to AB 617 communities will be considered.

Potential Control Measure 14 - PM Controls for Industrial and Commercial Combustion Processes

Target Pollutant

PM2.5

Synopsis

This measure is based on U.S. EPA's Menu of Control Measures, which lists various control technologies (e.g., electrostatic precipitators, Venturi scrubbers, and fabric filters) for large heaters, boilers, and generic industrial combustion processes. Due to the South Coast Air Basin's "extreme" nonattainment status for all ozone standards, South Coast AQMD is required to implement clean fuels for boilers pursuant to CAA Section 182(e)(3). U.S. EPA most recently approved the clean fuels for boilers compliance demonstration as meeting applicable requirements for the 2015 ozone standard.[93] As implemented by Rules 1146, 2002, 2004, and 1303, the use of solid fuels, residual oil, and diesel for boilers is effectively prohibited. As a result, industrial and commercial combustion processes in the South Coast Air Basin typically burn natural gas or process gas, which is estimated to reduce over 90 percent of PM2.5 emissions compared to residual oil.[94]

Staff identified only one commercial application of stationary source diesel combustion in the Basin, which are engines that supply emergency backup power. All such engines > 50 horsepower are regulated by Rule 1470. Furthermore, new or modified units with ≥ 1,000 horsepower compression ignition engines are required to meet updated Lowest Achievable Emissions Rate (LAER) and BACT guidelines which require that the units achieve U.S. EPA's Tier 4 Final emission standards.[95] Existing Tier 2 units can achieve Tier 4 Final emission limits through the use of Diesel Particle Filters (DPF) and SCR.

This measure seeks to examine the feasibility of requiring further PM2.5 exhaust controls for natural gas and diesel fueled stationary source combustion processes.

Potential Emission Reduction

The 2030 baseline inventory is 5.20 tpd of PM2.5 for this source category.

Emission reductions cannot be estimated since emission reductions are already achieved in practice via implementing LAER and BACT requirements and existing rules.

Technological Feasibility

Natural gas is one of the cleanest burning of the commonly used fossil fuels (such as coal and oil) or biomass (such as wood and straw). PM emissions are negligible with natural gas fired boilers and heaters because of the low sulfur (less than 0.1 percent sulfur) and low ash content. PM emissions from natural gas combustion include both "filterable" and "condensable" portions of PM. Filterable PM is the portion of total PM that exists in the stack in either the solid or liquid state and can be captured by conventional PM control device such as filters, cyclones, ESPs or scrubbers. Condensable PM is the portion of the total PM that exists in vapor phase at stack conditions but condenses into PM in the cooler ambient air.

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[93] 88 FR 29539

[94] https://pm25.harcresearch.org/assets/FinalReport.pdf

[95] http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2022/2022-sept2-030.pdf?sfvrsn=6You

Condensable PM is composed of organic and inorganic compounds and of submicron size. For industrial and commercial boilers, condensable PM has the same order of magnitude emission rates as filterable PM.[96]

There are limitations that make it technologically infeasible to install a PM control device for industrial and commercial natural gas combustion processes. First, filterable PM emissions from natural gas combustion are typically low to negligible because of the low sulfur and ash content and thus, installing a control equipment would not result in a significant reduction in PM2.5 emissions. Second, condensable PM exists as a gas in the stack and would not be effectively captured by bag filters or ESPs. Staff is not aware of PM2.5 controls being required or achieved in practice elsewhere in the United States for natural gas fired heaters and boilers.

Stationary emergency diesel combustion engines are used only for emergency purposes, such as backup power generation. Stationary emergency diesel engines are required to be certified to meet Tier 3 and Tier 4 emission limits based on the engine size, model year, and application pursuant to the U.S. EPA's National Emission Standards for Hazardous Air Pollutants (NESHAP) for stationary reciprocating internal combustion engines.[97] Stationary emergency diesel combustion engines with ≥ 1,000 horsepower are already subject to meeting updated LAER through BACT as required by Regulation XIII – New Source Review. Since these stationary emergency combustion engines are already required to meet the LAER Tier 4 Final emissions standards and are addressed by BACT, there is no further potential for reductions and therefore, further PM exhaust control is technologically infeasible.

Economic Feasibility

Due to low to negligible emission reduction potential with a PM control device for natural gas fired boilers and heaters, installing a PM control device may not be cost-effective. Due to little to no potential for further PM reductions from stationary emergency diesel engines, PM control for these operations is not cost-effective.

Summary Table

Type of Analysis	Emission Reduction	Technological Feasibility	Economic Feasibility	Feasible Measure
BACM/BACT	N/A	No	No	No
Additional feasible measure		No	No	No
MSM		No	No	No

Staff is not aware of this control measure having been implemented in another nonattainment area or having been achieved in practice in another state for natural gas fueled boilers and heaters. This PCM therefore does not meet U.S. EPA's definition of MSM. Staff also reviewed U.S. EPA's Technical Support

[96] https://www3.epa.gov/ttn/chief/old/ap42/ch01/s04/final/c01s04_oct1996.pdf
[97] https://www.epa.gov/stationary-engines/fact-sheet-final-amendments-emission-standards

Document (TSD) for the San Joaquin Valley contingency measures Federal Implementation Plan (FIP).[98] In the infeasibility justification TSD, U.S. EPA notes that "there are no known add-on particulate matter control devices in use" for natural gas fired boilers, steam generators, and process heaters and that New Source Performance Standards (NSPS) typically do not set particulate matter limits for natural gas-fired units. U.S. EPA did not consider this to be a potential control measure in the FIP.

Potential Control Measure 15 - Lowering NOx Emission Limits for Boilers, Steam Generators, and Process Heaters

Target Pollutant

NOx

Synopsis

South Coast AQMD Rule 1146 (Emissions of Oxides of Nitrogen from Industrial, Institutional and Commercial Boilers, Steam Generators, and Process Heaters; Amended December 4, 2020) establishes NOx emission limits for boilers, steam generators, and process heaters equal to or greater than 5 million British thermal units per hour (MMBtu/hr) rated heat input capacity. San Joaquin Valley APCD Rule 4320 (Advanced Emission Reduction Options for Boilers, Steam Generators, and Process Heaters Greater than 5.0 MMBtu/hr; Amended December 17, 2020) has more stringent NOx emission limits than South Coast AQMD Rule 1146 for boilers, steam generators, and process heaters greater than or equal to 5 MMBtu/hr. For natural gas-fired boilers between 5 and 20 MMBtu/hr, the NOx limit is 5 ppm in Rule 4320, while the corresponding NOx limits are 7 to 9 ppm via ultra-low NOx burner (ULNB) in Rule 1146. In addition, for natural gas-fired units that are greater than 20 MMBtu/hr, the NOx limit is 2.5 ppm in Rule 4320. This limit is lower than the one for South Coast, which is a NOx limit of 5 ppm via selective catalyst reduction (SCR) for natural gas burning Group I units (greater than or equal to 75 MMBtu/hr) and Group II units (greater than or equal to 20 and less than 75 MMBtu/hr). Rule 4320 has an option for facilities to pay an annual emission mitigation fee in lieu of meeting the NOx limits specified in the rule, until the NOx limits can be met. While Rule 4320 provides the flexibility to comply through mitigation fees, Rule 1146 includes mandatory emission limits.

Potential Emission Reduction

Estimated emission reductions are TBD.

[98] https://www.regulations.gov/document/EPA-R09-OAR-2023-0352-0034

Technological Feasibility

NOx emissions from boilers, steam generators, and process heaters can be controlled with combustion modifications such as ULNB system or with post-combustion controls such as SCR. SCR is used to control NOx emissions from combustion sources such as boilers and process heaters. ~~It~~ SCR uses a precious metal catalyst that selectively reduces NOx in the presence of ammonia. However, incomplete reactions of NOx and ammonia result in emissions of unreacted ammonia (also known as ammonia slip). Depending on the type of combustion equipment utilizing SCR technology, the amount of ammonia slip can vary between less than 5 ppm when the catalyst is fresh and 20 ppm at the end of the catalyst life. SCR technology is considered to be ~~a Best Available Retrofit Control Technology (~~BARCT~~)~~, if cost-effective, for controlling NOx emissions from existing combustion sources such as boilers and process heaters. SCR technology is scalable and generally utilized for units greater than or equal to ~~10~~20 MMBtu/hr due to capital and operating costs associated. Based on the information obtained through vendor discussions, achieving 5 ppm NOx limit with an ULNB without a SCR is feasible only for certain applications such as Group III units and for new installations, and an SCR system would be needed to achieve a NOx limit below 5 ppm. Staff met with ClearSign™, a manufacturer of next generation ULNB technology as a potential option for achieving below a 5 ppm NOx level with ULNB only. The vendor stated that a 2.5 ppm NOx level can potentially be achieved in smaller units less than 20 MMBtu/hr that do not have varying fuel composition such as a firetube boiler using natural gas – these small boilers typically operate around 300 °F. It may not be feasible for units that operate at higher temperatures to perform lower than 5 ppm. Based on information provided and equipment surveyed, 7 to 9 ppm is a feasible NOx target with ULNB technology for Group I and II units. Other factors such as whether the unit is natural draft, force draft, fuel composition, operating temperature, and the number of burners will impact the NOx levels that can be feasibly achieved. There is currently no existing ULNB technology available that can solely achieve a 2.5 ppm NOx limit for Group I and II units. A combination of SCR and ULNB are the only technologies that can potentially achieve a 2.5 ppm NOx level consistently. In order for Group I and II to achieve a sub 5 ppm NOx level, the units will need to be evaluated for ULNB and SCR. Units in the size range typically have more than one burner and will have a higher cost than Group III units. The higher cost of NOx control will impact the overall cost-effectiveness.

The NOx emission limit specified in Rule 1146 for natural gas-fired Group I units (i.e., units greater than or equal to 75 MMBtu/hr) is 5 ppm, which is met with the use of SCR. In addition, existing permitted, natural gas-fired Group II units (i.e., units between 20 and 75 MMBtu/hr) in South Coast AQMD are equipped with SCR. Based on the information obtained through vendor discussions, it is potentially feasible for some retrofit units to meet a NOx limit of 4 ppm or less through SCR control. However, there are several technical limitations for SCR retrofits to meet 4 ppm or less, such as the age, flow, and size of the catalyst bed of the existing SCR system. Another technical limitation is a potentially higher ammonia slip may occur to achieve a lower NOx limit. The typical ammonia slip permit limit on the existing SCR system is at 5 ppm. The existing catalyst bed might not be large enough to comply with both the lower NOx limit and the 5 ppm ammonia slip permit limit. For example, NOx emissions of 2.5 ppm could be potentially feasible for some units, but the level of ammonia slip might also be higher (i.e., 10 ppm). The most significant constraint is the inadequate safety margin between the permitted limit and the actual emissions to account for fluctuations in external factors, such as ambient temperature or fuel heat input (i.e., gas Btu).

For natural gas-fired Group III units between 5 and 20 MMBtu/hr, the NOx emission limits specified in South Coast AQMD Rule 1146 are 7 to 9 ppm, which are primarily achieved through the use of ultra-low NOx burners. Based on the information obtained through vendor discussion, ULNB replacements on existing units could potentially meet 7 ppm or less and achieving the 5 ppm NOx limit without SCR is only feasible for certain applications and for new installations. Therefore, achieving a NOx limit of 5 ppm as specified in San Joaquin's rule would not be feasible and/or cost-effective for burner retrofits of all existing units.

San Joaquin Valley APCD Rule 4320's Tier 2 NOx limits require units between 5 and 20 MMBtu/hr input rating to meet 5 ppm and units with greater than a 20 MMBtu/hr input rating to meet 2.5 ppm by December 21, 2023, with an option to comply with a mitigation fee. In San Joaquin Valley, a very small subset of the universe between 5 and 20 MMBtu/hr is currently permitted with a NOx emission limit of 5 ppm. In addition, only one unit is currently permitted with a NOx emission limit of 2.5 ppm, which is equipped with low NOx burners and an SCR system. According to San Joaquin Valley APCD's final draft staff report,[99] the 5 ppm and 2.5 ppm NOx limits in Rule 4320 may be not achievable for all units due to space limitations and economic considerations. Most affected units have typically had several layers of controls and can only reach these new limits with post-combustion controls including SCR. Therefore, both 5 ppm and 2.5 ppm NOx emission limits are rather considered technology-forcing limits and in lieu of meeting these technology-forcing limits, facility operators can pay an annual emission mitigation fee until their units become ready to comply with the limits.

Based on the staff's analysis as well as the information from San Joaquin Valley's staff report, staff concluded that achieving the emission limits of 5 ppm or lower (e.g., 2.5 ppm) is not available for all applicable units in this source category in South Coast AQMD and thus, is not a technologically feasible measure. <u>However, burner manufacturers such as ClearSign™ are currently in development of next generation ULNB replacements for Group I and Group II units that can potentially achieve sub 5 ppm NOx levels at a much lower cost. The next generation ULNB technology is not commercially available for Group I and Group II units at the moment.</u> Proposed Control Measure L-CMB-02 addresses emissions from boilers subject to Rule 1146 as part of the 2022 AQMP. Staff will continue to monitor and assess feasibility of obtaining a lower NOx limit for boilers which is to be addressed as part of L-CMB-02.

Economic Feasibility

<u>Based on vendor feedback and estimates, the most-cost-effective options to meet a NOx level below 5 ppm without ammonia is next generation ULNB technology; this technology is currently not commercially available for Group I and Group II units. The current technology to achieve a NOx level below 5 ppm will require a combination of ULNB and SCR technologies or replacement with a brand-new unit which may not be feasible or cost-effective for all applications.</u> To be determined once the lower emission limits become technologically feasible to be implemented for this source category.

[99] https://www.valleyair.org/Board_meetings/GB/agenda_minutes/Agenda/2020/December/final/13.pdf

Summary Table

Type of Analysis	Emission Reduction	Technological Feasibility	Economic Feasibility	Feasible Measure
BACM/BACT	TBD	Not ~~feasible~~	To Be Determined	No
Additional feasible measure		Not ~~Feasible~~	To Be Determined	No
MSM		Not ~~Feasible~~	To Be Determined	No

South Coast Air Basin Attainment Plan for the 2012 Annual PM2.5 Standard

Appendix III

ATTACHMENT A: EVALUATION OF SOUTH COAST AQMD RULES

ATTACHMENT A-1

EVALUATION OF SOUTH COAST AQMD RULES AND REGULATIONS – PM RULES

Rule No.	Rule Title	Current Rule Requirements	Other Agencies' Rules and Federal Guidance[a] That Are More Stringent	BACM Evaluation
404	Particulate Matter - Concentration (Amended 2/7/86)	Atmospheric discharge from any source is required to meet the PM limits varying from 0.01 gr/dscf to 0.19 gr/dscf depending on exhaust flow rates.	Bay Area, Regulation 6, Rule 1 (Adopted 8/1/18) contains a maximum PM limit of 0.15 gr/dscf. There are differences in the applicability of this rule compared to Rule 404.	South Coast AQMD Rule 404 varies in stringency when compared to other Districts' requirements. Overall, Rule 404, when considered with Rule 405, meets BACT.
405	Solid Particulate Matter – Weight (Amended 2/7/86)	Atmospheric discharge from any source is required to meet the PM limits varying from 0.45 kg/hr to 13.6 kg/hr depending on process weight.	n/a[b]	Meets BACT.
444	Open Burning (Amended 7/12/13)	Contains requirements and prohibitions for open burning to minimize emissions and smoke impacts to the public; allows open burning on permissive burn days, provided a permit and burn authorization is obtained; establishes burn plan requirements for prescribed burns; sets daily maximum burn acreage for agricultural and prescribed burning.	San Joaquin Valley Rule 4103 (Amended 4/15/10) contains additional best management practices compared to Rule 444 such as best management practices to control open burning of weeds. Bay Area, Reg 5, sets requirements for open burning, and forbids recreational burning during curtailment periods.	In its TSD for the approval of Rule 444 into the California SIP published in 2013, EPA determined that with the exception of provisions about banning the burning of specific crops, Rule 444 is generally as stringent as or more stringent than analogous rules in other California Districts. Controls that address agricultural burning emissions are considered in the Control Measure Assessment section. Overall, Rule 444 provides BACT level of control for this source category.
445	Wood-Burning Devices (Amended 10/27/20)	No wood-burning device is allowed in any new development, unless it is a U.S. EPA certified wood-burning heater, a pellet-fueled wood-burning heater, a masonry heater, or a dedicated gaseous-fueled fireplace. PM2.5 mandatory burning curtailment (no-burn day) is declared in area < 3,000 ft above mean seal level and Basin-wide if daily PM2.5 is forecast to exceed 30 µg/m3 or an applicable concentration as set forth in PM2.5 Contingency Measures during wood-burning season from November to February. If the Basin fails to meet RFP requirement, meet any quantitative milestone, submit a quantitative milestone report, or attain the applicable PM2.5 standard by attainment date, seasonal wood-burning curtailment threshold could go down as low as 26 µg/m3. Rule does not apply to: residential/commercial properties where a wood-burning device is the sole source of heat; a low income household; residential/commercial properties with no existing natural gas service within 150 ft of the property line; residential/commercial properties located ≥ 3,000 ft AMSL; or ceremonial fires exempted under Rule 444.	San Joaquin Valley Rule 4901 (amended 6/20/19) effective 1/1/20, prohibits sale or transfer of a real property that has a wood-burning heater unless it is either EPA Phase II certified, is a pellet-fueled wood-burning heater exempt from EPA certification, or is rendered permanently inoperable and removed from the property. Effective 1/1/20, remodel of wood-burning fireplace or chimney where total cost exceeds $15,000 and local building permit is required, shall install only a gas-fueled, electric, exempt, or EPA certified wood burning heater at the time of installation.	Rule 445 does not contain resale and remodel provisions as does SJVAPCD Rule 4901. Staff thoroughly evaluates these and other provisions in Appendix III.

Rule No.	Rule Title	Current Rule Requirements	Other Agencies' Rules and Federal Guidance[a] That Are More Stringent	BACM Evaluation
1117	Emissions from Container Glass Melting and Sodium Silicate Furnaces (Amended 6/5/20)	There are no PM10 emission limits in Rule 1117.	San Joaquin Valley Rule 4353 contains a PM10 emission limit of 0.20 lbs per ton glass produced for container glass and flat glass.	Staff considered introducing PM10 emission limits in Rule 1117 and the assessment can be found in the Control Measure Assessment section.
1133, 1133.1	Rule 1133 - Composting and Related Operations – General Administrative Requirements (Adopted 1/10/03) Rule 1133.1 – Chipping and Grinding Activities (Amended 7/8/11)	Rule 1133 is an administrative rule that requires composting, chipping, and/or grinding facilities to register with the District. These facilities provide information such as types and amounts of feedstocks produced, and a description of the processes used at the facility. This information is updated annually. Rule 1133.1 establishes holding or processing time requirements for green waste and food waste chipping and grinding activities. The rule's objective is to prevent inadvertent decomposition occurring during chipping and grinding activities.	n/a[b]	Rule 1133.1 was amended in 2011 to better manage stockpile operations associated with chipping and grinding activities, which is to be consistent with current greenwaste material processing requirements established in Title 14 of the California Code of Regulations. Rule 1133.1 meets BACT.
1137	PM10 Reduction From Woodworking Operations (Adopted 2/1/02)	Require that woodworking operations send sawdust emissions either directly to a baghouse filter, or to a pneumatic conveyance device that leads to a baghouse filter.	n/a[b]	Meets BACT.
1138	Control Of Emissions From Restaurant Operations (Adopted 11/14/97)	Control Of Emissions From Restaurant Operations (Adopted 11/14/97)	Ventura Rule 74.25 (Adopted 10/12/04) has equivalent requirements as in Rule 1138. Bay Area Rule 2 of Regulation 6 (12/5/07) has emission standards of 0.74 lbs PM10 and 0.32 lbs VOC per thousand pounds of meat cooked for all chain-driven charbroilers; 1.0 lbs PM10 per thousand pounds of meat cooked for all under-fired charbroilers with combined total grill surface area of at least 10 square feet. San Joaquin Rule 4692 requires catalytic oxidizers for chain-driven charbroilers cooking 400 pounds of meat or more per week. This threshold is more stringent than Rule 1138 which applies to chain-driven charbroilers cooking 875 pounds of meat or more per week. Rule 4692 also requires that catalytic oxidizers achieve an 86% VOC and 83% PM reduction. Finally, Rule 4692 requires registration and reporting requirements for under-fire d charbroilers.	Most BAAQMD under-fired charbroiler facilities are too small to trigger the under-fired charbroiler requirements. The lower applicability threshold in SJVAPCD Rule 4692 is evaluated in the Control Measure Assessment section.
1140	Abrasive Blasting (Amended 8/2/85)	Set standards for the abrasives and require a visible emission evaluation to determine the impact of abrasive blasting operations on visibility.	n/a[b]	Rule 1140 is substantively similar to the California Code of Regulations, Title 17, Subchapter 6 — Abrasive Blasting provisions, which have been adopted by most California Air Districts. State law prohibits more stringent requirements. As such, Rule 1140 meets BACT.
1155	Particulate Matter Control Devices (Amended 5/2/14)	PM standards for PM control devices at 0.01 gr/dcsf for existing large baghouses >7500 square feet and best operational practices to reduce PM emissions.	n/a[b]	Meets BACT.

Rule No.	Rule Title	Current Rule Requirements	Other Agencies' Rules and Federal Guidance[a] That Are More Stringent	BACM Evaluation
1156	PM10 Emission Reductions from Cement Manufacturing Facilities (Amended 3/6/09)	PM standards for PM control devices (0.01 gr/dcsf for existing and 0.005 gr/dcsf for new devices) and best operational practices to reduce PM emissions from aggregate and related operations	n/a[b]	Meets BACT.
1157	PM10 Emissions Reductions from Aggregate and Related Operations (Amended 9/8/06)	Good operational practices to reduce PM emissions from aggregate and related operations. Establish source specific performance standards (no dust emissions exceeding 20 percent opacity, or no dust emissions exceeding 50 percent opacity, or no dust plume beyond 100 feet from any emission source, etc.) and specifying operational PM10 controls for various types of equipment, processes, storage piles, internal roadways at aggregate and related operations, and track-out of materials onto paved public roads	EPA promulgated standards for new hot mix asphalt facilities in Title 40, Chapter I, Part 60, Subpart I of the Code of Federal Regulations (40 CFR Part 60, Subpart I). Subpart I assigns a 20 percent opacity limit and a 90 mg/dscm (micrograms/dry standard cubic meter) PM content for fugitive emissions.	In its TSD for the approval of Rule 1157 into the California SIP published in 2011, EPA determined that Rule 1157 generally had the most stringent requirements and concluded that Rule 1157 fulfills BACM. Overall, Rule 1157 is as stringent as or more stringent than the other Districts' rules and meets the BACT requirements for this source category.
1186	PM10 Emissions from Paved and Unpaved Roads, and Livestock Operations (Adopted 7/11/08)	Requires good management practice such as clean-up of spills on public roadways, post-event street cleaning, routine sweeping using certified street sweeping equipment, new or widened roads to have improved road shoulders and treatment of livestock feed access lanes and cessation of hay grinding activities during high winds, etc.; Establish unpaved road treatment schedule for local jurisdictions in the Basin.	SJVAPCD Rule 8061 requires municipalities to sweep paved roads at least once per month with PM10 efficient units. For unpaved roads, on any unpaved road segment with 26 or more AADT, the owner/operator shall limit visible dust emission to 20% opacity and comply with the requirements of a stabilized unpaved road, or shall implement an APCO-approved Fugitive PM10 Management Plan; Within an urban area, requires all new roads to be paved.	In its TSD for the approval of Rule 1186 into the California SIP published in 2011, EPA determined that the requirements to ensure continued compliance added in the 2008 amendment further strengthens the SIP-approved version of this rule, which was determined to meet the BACM provisions. For the majority of the categories, Rule 1186 is as stringent as or more stringent than the other Districts' rules and provides BACT level of control. Potential measures to further reduce paved road dust emissions are considered in the Control Measure Assessment section.

[a] Other agencies' rules and regulations amended/adopted before March 2023 are included in this updated BACM evaluation.

[b] There are no analogous requirements in other air agencies that are more stringent than the South Coast AQMD rule being evaluated.

ATTACHMENT A-2

EVALUATION OF SOUTH COAST AQMD RULES AND REGULATIONS – NOx RULES

Rule No	Rule Title	Current Rule Requirements	Other Agencies' Rules and Federal Guidance[a] That Are More Stringent	BACM Evaluation
476	Steam Generating Equipment (Amended 10/8/76)	For equipment with maximum heat input rate > 50 MMBTU/hr, NOx emission limits are 125 ppm at 3% O2 on gas-fired equipment and 225 ppm at 3% O2 on liquid or solid-fired equipment, averaged over 15 minutes. In South Coast AQMD, one facility (Long Beach City SERFF) has 3 combustors subject to NOx limit of 150 ppm (24-hr average) per 40 CFR Part 60 Subpart Ea and Eb.	Maryland (Section 26.11.08 Control of Incinerators) NOx emission limits for two applicable facilities are 140 and 150 ppm respectively at 24-hr average, and 105 and 145 ppm respectively at 30-day average.	Steam generating equipment in South Coast AQMD is subject to requirements similar to those in Maryland on a 24-hr average basis (140 to 150 ppm in Maryland vs. 150 ppm in South Coast). The 2022 AQMP includes control measure L-CMB-09 which will further reduce NOx emissions at the Long Beach City SERFF with implementation scheduled by 2030. This measure is included in the PM2.5 Plan as BCM-07.
1110.2	Emissions from Gaseous- and Liquid-Fueled Engines (Amended 11/1/19)	The following NOx limits apply to all stationary and portable engines over 50 bhp. Stationary, non-emergency engines and biogas (landfill and digester gas) engines: • 11 ppm NOx New non-emergency engines with electrical generators: • 0.07 lbs NOx/MW-hr (or 2.5 ppm NOx) General low-useage engines: • 36 ppm NOx, engines ≥500 hbp • 45 ppm NOx, engines <500 hbp Low-usage biogas engines: • 36 x ECF ppm NOx, engines ≥500 hbp • 45 x ECF ppm NOx, engines <500 hbp	n/a[b]	Meets BACT.
1111	Reduction of NOx Emissions from Natural-Gas-Fired, Fan-Type Central Furnaces (Amended 10/1/21)	The maximum NOx limit from fan-type central furnaces is 40 ng/J. On or after 10/1/12, NOx limit is 14 ng/J for residential and commercial fan-type central furnaces. Mobile home furnaces NOx limit is lowered to 14 ng/J by 10/1/18. Alternate compliance plan with mitigation fees with varying compliance dates.	BAAQMD Regulation 9, Rule 4 establishes a zero NOx emission limit for new natural gas-fired space heaters with a capacity < 175,000 Btu/hr beginning in 2029.	BAAQMD's zero emission limits are further evaluated in Appendix III.
1117	Emissions from Container Glass Melting and Sodium Silicate Furnaces (Amended 6/5/21)	The following emission limits apply. • 0.75 lbs NOx/ton of glass pulled averaged over 30 days • 0.50 lbs NOx/ton of product pulled averaged over 30 days for sodium silicate furnaces • 30 ppmv NOx at 3% O2 or 0.036 lb/MMBTU of heat for auxiliary combustion equipment	n/a[b]	Meets BACT/BACM.
1118	Control of Emissions from Refinery Flares	• Operators must operate all flares in a manner that minimizes flaring	n/a[b]	Meets BACT/BACM.

Rule No	Rule Title	Current Rule Requirements	Other Agencies' Rules and Federal Guidance[a] That Are More Stringent	BACM Evaluation
	(Amended April 5, 2024)	• For hydrogen clean service flares, establishes a NOx performance target 0.3 lbs. per million standard cubic feet of hydrogen production capacity • LPG flares are required to comply with a throughput threshold of 15,000 MMBtu/year • Requires payment of mitigation fees and submission of a Flare Minimization Plan is performance targets are exceeded		
1118.1	Control of Emissions from Non-Refinery Flares (Adopted 1/4/19)	Flare gas NOx emission limits range from 0.018 lbs/MMBtu for produced gas to 0.025 lbs/MMBtu for major digester gas and landfill gas. All other flare gas including minor digester gas is required NOx emission limits at 0.06 lbs/MMBtu. Organic liquid storage has NOx emission limit at 0.25 lbs/MMBtu and organic liquid loading has NOx limit at 0.034 lbs/1,000 gallons loaded.	n/a[b]	Meets BACT/BACM.
1121	Control of Nitrogen Oxides from Residential Type, Natural Gas-Fired Water Heaters (Amended 9/3/04)	For natural gas-fired water heaters rated <75,000 Btu/hr, NOx emission limits: • 55 ppm for mobile home • 30 ppm for residential home • 15 ppm for water heaters ≤50 gallons	BAAQMD Regulation 9, Rule 6 establishes zero NOx emission limits.	BAAQMD's zero emission limits are further evaluated in Appendix III.
1134	Emissions of Oxides of Nitrogen from Stationary Gas Turbines (Amended 2/4/22)	Requirements that will remain in effect until 2024: Standard = Reference Limit x (Unit Efficiency/25%), where reference limit depends on size of units, varying from 9 ppm to 25 ppm. New emission limits become effective 1/1/24: • Liquid fuel turbines located on Outer Continental Shelf (OCS): 30 ppm NOx / 5 ppm NH3 • Natural gas, combined cycle turbine: 2 ppm NOx / 5 ppm NH3 • Natural gas, simple cycle turbine: 2.5 ppm NOx / 5 ppm NH3 • Produced gas: 9 ppm NOx / 5 ppm NH3 • Produced gas turbine located on OCS: 15 ppm NOx / 5 ppm NH3 Other: 12.5 ppm NOx / 5 ppm NH3.	San Joaquin Rule 4703 (Amended 9/20/07) has standards from 5–50 ppm depending on size of units. Combined cycle units > 10 MW has limit of 3 ppm.	NOx emissions range has a lower limit in San Joaquin Rule 4703 (5 ppm) than South Coast Rule 1134 (9 ppm), while the upper limit is lower in South Coast Rule 1134 (25 ppm) than San Joaquin Rule 4703 (50 ppm). Therefore, for the majority of the categories, Rule 1134 is as stringent as the other District's rules. In early 2019, South Coast AQMD staff performed a BARCT analysis based on technological and economic feasibility, and established BARCT emission limits for equipment subject to Rule 1134. As such, Rule 1134 reflects up to date BARCT requirements, which is equivalent to BACT.
1135	Emissions of Oxides of Nitrogen from Electricity Generating Facilities (Amended 1/7/22)	Electricity generating facilities (EGF) have NOx emission limits at 5 ppm for boilers (at 3% O2), 2 ppm for combined cycle gas turbines, and 2.5 ppm for simple cycle gas turbines (at 15% O2) that are fired on natural gas. Internal combustion engines firing diesel limit NOx emissions at 45 ppm (at 15% O2). All NOx limits are 60 minute averages.	n/a[b]	Meets BACT.
1146, 1146.1	Rule 1146 - Emissions of Oxides of Nitrogen from Industrial, Institutional, and	Rule 1146 NOx emission limits for industrial/commercial boilers, steam generators, and process heaters ≥ 5 MMBtu/hr:	San Joaquin Valley Rules 4306 and 4320 (Amended 12/17/20) require NOx limits for boilers, steam	Rules 1146/1146.1 currently limit NOx emissions from thermal fluid heaters to 12 ppm, while the Rule 4306 Tier 2 NOx limit is 9 ppm. Based on the Rules 1146/1146.1 staff

Rule No	Rule Title	Current Rule Requirements	Other Agencies' Rules and Federal Guidance[a] That Are More Stringent	BACM Evaluation
	Commercial Boilers, Steam Generators, and Process Heaters (Amended 12/4/20) Rule 1146.1 - Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters (Amended 12/7/18)	• Gaseous fuel: 30 ppm • Non-gaseous fuel: 40 ppm • Landfill gas: 25 ppm • Digester gas: 15 ppm • Atmospheric units (5–10 MMBtu/hr): 12 ppm • Group I (≥75 MMBtu/hr burning natural gas): 5 ppm • Group II (≥20 & <75 MMBtu/hr with gaseous fuels) ▪ Fire-tube boilers with previous limits 5–9 ppm: 7 ppm ▪ All other units (with previous limits 5–12 ppm): 9 ppm ▪ All others: 5 ppm • Group III (≥5 & <20 MMBtu/hr with gaseous fuels) ▪ Fire-tube boilers with previous limits 9–12 ppm: 7 ppm ▪ All others: 9 ppm • Thermal fluid heaters: 12 ppm. Rule 1146.1 NOx emission limits for industrial/commercial boilers, steam generators, and process heaters between 2-5 MMBtu/hr: • Landfill gas: 25 ppm • Digester gas: 15 ppm • Atmospheric units (5–10 MMBtu/hr): 12 ppm • Fire-tube boilers: 7 ppm • Natural gas units: 9 ppm • Thermal fluid heaters: 12 ppm • All other units: 30 ppm Rules 1146/1146.1's compliance dates: • Non-RECLAIM facilities • 12/7/18 • 12/7/33 with a permit limit ≤ 20 ppm • 1/1/22 with a permit limit > 20 ppm • RECLAIM facilities ▪ 12/7/33 with a permit limit ≤ 20 ppm 1/1/22 with a permit limit > 20 ppm	generators, and process heaters ≥ 5 MMBtu/hr. Rule 4306 Tier 2 NOx limits by 2023–2029: • Category A (>5–20 MMBtu/hr): ▪ Thermal fluid heaters: 9 ppm San Joaquin Valley Rule 4320 (Amended 12/17/20) provides advanced emission reduction options: (1) meet the specific NOx emission limits, (2) pay an annual emissions fee, or (3) comply with low-use provision. Rule 4320 Tier 2 NOx limits are technology-forcing limits with compliance deadline by 2023: • Category A (>5–20 MMBtu/hr): ▪ Fire-tube boilers: 5 ppm ▪ Thermal fluid heaters: 9 ppm ▪ All others: 5 ppm • Category B (>20 MMBtu/hr): ▪ Fire-tube boilers >20–75 MMBtu/hr: 2.5 ppm ▪ All others >20–75 MMBtu/hr: 2.5 ppm ▪ All others >75 MMBtu/hr: 2.5 ppm	report, an emission limit of 12 ppm was feasible for retrofits at the time of rule development, but an emission limit of 9 ppm is feasible for new burners upon replacement. For lowering the emission limit from 12 ppm to 9 ppm, the cost-effectiveness ranges from $58,000 to $523,000 per ton of NOx reduced based on the assumption of 10–90% operating capacity of the thermal fluid heaters at different heat capacity sizes. Therefore, due to high cost-effectiveness of a 9 ppm emission limit, the 12 ppm NOx emission limit in Rule 1146 series is considered the BARCT level of control for the thermal fluid heaters. In general, the emission limits in San Joaquin Valley Rule 4320 are more stringent than those in Rule 1146 for boilers >5 MMbtu/hr. The NOx limits in Rule 4320 are technology-forcing limits with an option to comply by paying an annual emission fee in lieu of meeting the limits. Because Rule 4320 provides the flexibility to comply through mitigation fees, it is not evaluated against Rule 1146, which includes mandatory emission limits. A more extensive analysis to evaluate the feasibility of these emission limits is presented in the Control Measure Assessment section.
1146.2	Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers and Process Heaters (Amended 12/7/18)	Applicable to natural gas-fired water heaters, boilers, and process heaters with heat rating ≤2 MMBTU/hr. As of January 1, 2010, any Type II unit between 400,000 Btu/hr and 2 MMBtu/hr is required to meet a 20 ppm NOx limit, and as of January 1, 2012, any Type I unit (except pool heaters) ≤400,000 Btu/hr is required to meet 20 ppm NOx limit. Effective January 1, 2000, new Type I units including pool heaters are required to meet the 55 ppm NOx limit, and new Type II units are required 30 ppm NOx limit.	n/a[b]	Meets BACM.

Rule No	Rule Title	Current Rule Requirements	Other Agencies' Rules and Federal Guidance[a] That Are More Stringent	BACM Evaluation
1147	NOx Reductions from Miscellaneous Sources (Amended 5/6/22)	Multiple NOx emission limits for gas and liquid fuel fired units. For unit heat rating ≥ 325,000 Btu/hr: • Gaseous fuel-fired equipment, including burnoff furnaces and incinerators with or without integrated afterburners, have 20-60 ppm NOx emission limits depending on application, process temperature, and implementation timeframes. • Micro-turbines must achieve 9 ppmv NOx. • Asphalt manufacturing must achieve 40 ppmv NOx. Liquid fuel fired units are set at 40 ppm at process temperatures below 1,200 degrees Fahrenheit and 60 ppm above 1,200 degrees Fahrenheit.	n/a[b]	Meets BACT.
1153.1	Rule 1153.1 - Emissions of Oxides of Nitrogen from Commercial Food Ovens (Amended 8/4/23)	Commercial in-use food ovens set Phase I NOx limits at 30 ppm, except for tortilla ovens with IR burners the NOx limit is 15 ppm. Phase II zero emission limits for certain equipment types.	n/a[b]	Meets BACT.
1179.1	Emission Reductions from Combustion Equipment at Publicly Owned Treatment Works Facilities (Adopted 10/2/20)	Rule 1179.1 NOx emission limits for digester gas units at publicly owned treatment works facilities: 1) Digester gas or dual fuel boilers/process heaters • 90% digester gas >2 MMBtu/hr: 15 ppm • 100% natural gas >2 MMBtu/hr: 9 ppm • 100% natural gas ≤2 MMBtu/hr: 30 ppm 2) Turbines • 60% digester gas ≥0.3 MW: 18.8 ppm • 100% natural gas, simple cycle ≥0.3 MW: 2.5 ppm • 100% natural gas, combined cycle ≥0.3 MW: 2 ppm • Digester gas/dual fuel/natural gas <0.3 MW: 9 ppm 3) Digester gas and dual fuel engines • Engines >50 hp: 11 ppm	San Joaquin Valley Rules 4306 and 4320 (Amended 12/17/20) require NOx limits for boilers fired on digester gas >5–20 MMBtu/hr to be at 9 ppm.	For boilers fired on digester gas, the NOx limit in Rule 1179.1 (15 ppm) is not as stringent as the limit in San Joaquin Valley Rules 4306/4320 (9 ppm). 2022 AQMP control measure L-CMB-08 seeks to lower the NOx limit to 9 ppm by requiring ultra-low NOx burners for digester gas fueled boilers. Staff analysis determined that L-CMB-08 cannot be feasibly implemented until after 2030.
2002	Allocations for Oxides of Nitrogen (NOx) and Oxides of Sulfur (SOx) (Amended 10/5/18)	Includes facility allocations for NOx for Regional Clean Air Incentives Market (RECLAIM) facilities. Each RECLAIM facility is required to have adequate RECLAIM trading credits (RTCs) to offset its quarterly and annual NOx emissions. Emission reduction target is set by decreasing level of allocations, and these RECLAIM allocations are established and updated based on Best Available Retrofit Control Technology (BARCT) emission limits. RECLAIM NOx emission limits for refinery boilers, heaters, and steam generators are: • <20 MMBtu/hr: 12 ppm • 20–40 MMBtu/hr: 9 ppm • >40 MMBtu/hr: 2 ppm	San Joaquin Valley Rule 4306 (Amended 12/17/20) requires Tier 2 NOx limits for refinery boilers, steam generators, and process heaters ≥ 5 MMBtu/hr as follows with compliance deadline by 2023: • ≤40 MMBtu/hr: ○ Boilers: 30 ppm & 5 ppm upon replacement San Joaquin Valley Rule 4320 (Amended 12/17/20) provides advanced emission reduction options, whereby either (1) meet the specific NOx emission limits, (2) pay an annual emissions fee, or (3) comply with low-use provision. Rule 4320 Tier 2 NOx limits for refinery units	Refinery boilers and heaters are currently regulated under RECLAIM (Regulation XX) in the South Coast AQMD. For the units ≤40 MMBtu/hr, NOx emission limits are at 9–12 ppm, while San Joaquin Valley Rule 4306 NOx limits are at 30 ppm and 5 ppm upon replacement at the end of the useful life of the equipment to increase the cost-effectiveness of the requirement. Therefore, the NOx limits in Rule 2002 are more stringent than in Rule 4306 for existing units. Because Rule 4320 has an option to comply through mitigation fees, it is not evaluated against Rule 2002. As the RECLAIM program transitions to the command-and-control regulatory structure, refinery boilers are required to meet NOx emission limits under Rule 1109.1 (Emissions of Oxides of Nitrogen from Petroleum Refineries and Related

Rule No	Rule Title	Current Rule Requirements	Other Agencies' Rules and Federal Guidance[a] That Are More Stringent	BACM Evaluation
			are technology-forcing limits with compliance deadline by 2023 as follows: • Boilers/process heaters >5–40 MMBtu/hr: 5 ppm	Operations), adopted 11/5/21. Rule 1109.1 requires boilers <40 MMBtu/hr to be 40 ppm on or before 7/1/22 and 5 ppm afterwards. These limits were determined from a comprehensive BARCT assessment that took both technological feasibility and cost-effectiveness into account. Lowering the NOx limit for refinery boilers to 30 ppm was not cost-effective. Refer to Rules 1146 and 1146.1 for the evaluation of non-refinery units. Overall, staff concludes that South Coast AQMD's RECLAIM NOx emission limits for refinery boilers and heaters are at least as stringent as San Joaquin Valley Rule 4306, and meet BACT.

[a] Other agencies' rules and regulations amended/adopted before March 2023 are included in this updated BACM evaluation.

[b] There are no analogous requirements in other air agencies that are more stringent than the South Coast AQMD rule being evaluated.

ATTACHMENT A-3

EVALUATION OF SOUTH COAST AQMD RULES AND REGULATIONS – NH3 RULES

Rule No	Rule Title	Current Rule Requirements	Other Agencies' Rules and Federal Guidance[a] That Are More Stringent	BACM Evaluation
223	Emissions Reduction Permits From Large Confined Animal Facilities (Adopted 6/2/06)	Sets permit requirement for new and modified LCAF facilities. Specifies mitigation options by animal and facility type for: • Feed and silage handling, • Milk parlor operations, • Corrals and free stall barn operations, • Handling of manure and solids, • Handling of manure in liquid form • Land application of liquid or solid manure	SJVAPCD Rule 4570 is more stringent regarding applicability than Rule 223 for milk cows, (1,000 milk cows in South Coast AQMD vs 500 milk cows in SJVAPCD), and for chickens and ducks (650,000 birds in South Coast AQMD vs. 400,000 birds in SJVAPCD). However, that is partly mitigated by South Coast AQMD Rule 1127 which has a much lower applicability thresholds of 50 or more cows, heifers and/or calves. Rule 223 also has a lower applicability for horse facilities (2,500 in South Coast AQMD vs. 3,000 in SJVAPCD). Rule 4570 sets comparable permit requirements and mitigation measures.	Staff evaluated the potential to achieve further NH3 emission reductions from livestock waste in the Control Measure Assessment section.
1127	Emission Reductions from Livestock Waste (Adopted 8/6/04)	Requires Good housekeeping practices for dairy farms with 50 or more cows, heifers and/or calves. Note: The South Coast AQMD adopted Rule 223 in June 2006 to reduce emissions for large confined animal facilities. Rule 223 includes series of best management practices that are more stringent than those required by Rule 1127.	Sacramento Rule 496 – Large Confined Animal Facilities (Adopted 8/24/06), has more stringent control and good management practices than South Coast Rule 1127 (e.g. venting to control system with at least 80% control efficiency). The more stringent requirements are targeted towards silage emissions, which is not applicable in South Coast for dry feed lot operations. SJVAPCD Rule 4565 and 4566 sets comparable permit requirements and mitigation measures. SJVAPCD 4570 has required best management practices for manure management and other areas to reduce VOC and ammonia emissions. Note that direct comparison with Rule 1127 is difficult due to the significant differences in source operations (dry feed lot in South Coast vs. flushing and lagoon operations in San Joaquin, the focus on corral waste control in South Coast AQMD vs. feed and silage and milk parlor in SJVAPCD, etc). In addition, SJV Rule 4570 applies to all types of confined animal facilities, while Rule 1127 applies only to dairies with a much lower applicability threshold.	Staff evaluated the potential to achieve further NH3 emission reductions from livestock waste in the Control Measure Assessment section.
1133.2, 1133.3	Emission Reductions from Co-Composting Operations (Adopted 1/10/03), Emission Reductions from Greenwaste Composting Operations (Adopted 7/8/11)	Various performance standards. Air pollution control must have 80% control efficiency or greater. Existing operations must reduce up to 70% baseline VOC and ammonia emissions. Baseline emission factors are 1.78 lbs VOC/ton throughput and 2.93 lbs NH3/ton throughput.	San Joaquin Rule 4565 – Biosolids, Animal Manure, and Poultry Litter Operations (Adopted 3/15/07) and Rule 4566 – Organic Material Composting Operations (Adopted 8/18/11) have various operational requirements for these operations as well as the operators who landfills, composts, or co-composts these materials. The applicability of Rules 4565/4566 is	South Coast AQMD Rule 1133.2 is more stringent than San Joaquin's Rule 4565 for larger co-composting facilities and less stringent for smaller co-composting facilities. While South Coast AQMD Rule 1133.2 requires either 70 or 80% overall emission reductions from all parts of composting process, San Joaquin's Rule 4565 requires add-on controls to apply only to the active composting phase. Rule 1133.2 also

Rule No	Rule Title	Current Rule Requirements	Other Agencies' Rules and Federal Guidance[a] That Are More Stringent	BACM Evaluation
		Rule 1133.3 establishes operational best management practices (BMPs) for greenwaste composting operations. If the facility processes more than 5,000 tons per year of foodwaste, any active phase of composting containing more than 10% foodwaste, by weight, must use an emission control device with an overall control efficiency of at least 80% by weight of VOC. For operations less than 5000 tons/year, require the composting piles to be covered, watered, and turned, or operated with measures that reduce at least 40% VOC emission and 20% NH3 emissions.	broader than the applicability of Rule 1133.3. In addition, Rules 4565/4566 include additional mitigation measures to control VOC from composting active piles (e.g. maintain minimum oxygen concentration of 5%, moisture content of 40%-70%, carbon to nitrogen ratio of 20-1).	has more stringent requirements for in-vessel composting. San Joaquin's rule does not address chipping & grinding as does Rule 1133.1. Overall, Rules 1133.2 and 1133.3 are as stringent as or more stringent than other Districts' rules, and meet the BACT requirement for this source category. Staff evaluated the potential to achieve further NH3 emission reductions from composting in the Control Measure Assessment section.

[a] Other agencies' rules and regulations amended/adopted before March 2023 are included in this updated BACM evaluation.

South Coast Air Basin Attainment Plan for the 2012 Annual PM2.5 Standard

Appendix III

ATTACHMENT III-B: MOST STRINGENT MEASURES ANALYSIS OF CARB'S CONTROL PROGRAMS

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Executive Summary

The Clean Air Act (the Act) specifies required levels of emission controls in a State Implementation Plan (SIP), depending upon the severity of the air quality problem and amount of time in which a nonattainment area needs to meet the PM2.5 standard. The State has conducted this analysis for each State-regulated source category emitting direct PM2.5 and relevant precursors in the South Coast Air Basin (South Coast). The suite of control measures that is currently being implemented by California Air Resources Board (CARB or Board) ~~– both the current control program and new measures proposed for the South Coast –~~ satisfiesy the applicable Most Stringent Measures (MSM) control requirements for the 2024 12 µg/m3 annual PM2.5 Plan. This analysis finds that California's mobile source control program is the most stringent and far-reaching suite of mobile source control measures that is currently implemented in the nation meeting the required levels of emissions controls. Furthermore, California has committed to adopting numerous new measures for mobile sources as well as setting a zero-emission standard for residential and commercial space and water heaters~~,~~ which go beyond MSM requirements and will~~, when it goes into effect, would~~ be the most stringent of any state regulation ~~of its kind~~for each applicable category in the U.S., and ~~would~~ exceed the stringency of federal requirements.

In conducting this analysis, CARB staff followed a four-step process of assessing California's control program. First, CARB staff identified mobile source and residential and commercial building appliance emissions as a significant contributor to ambient PM2.5 levels. Next, CARB staff identified potential control measures for each mobile source sector and the appliance sector, including an analysis of California's control program, other control measures in practice throughout the nation, control measures suggested by the public, and reconsideration of control measures that were previously considered to be infeasible (as applicable). Staff then assessed the stringency and feasibility of the potential control measures that were identified. And finally, while many of the measures identified in this analysis have already been adopted by CARB and submitted in the California SIP, additional control measures have been included in the 2022 State Strategy for the State Implementation Plan (2022 State SIP Strategy)[1] and will be commitments in the proposed South Coast SIP for the 2024 12 µg/m3 annual PM2.5 Plan. CARB's current control programs are already the most stringent in the country and thus meet MSM requirements; all 2022 State SIP Strategy measure commitments go beyond MSM requirements.

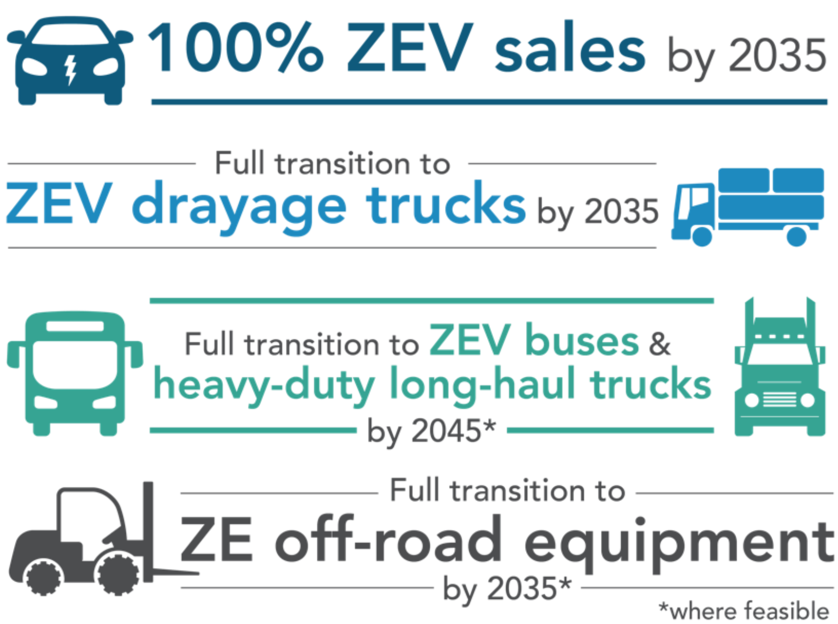
Given the severity of California's air quality challenges and the need for ongoing emission reductions, CARB has implemented the most comprehensive mobile source emissions control program in the nation. In aggregate, California's comprehensive suite of new vehicle and engine emission standards, in-use control measures, fuel specifications, and incentive programs for mobile sources represent the most stringent level of controls in the nation, and achieve the maximum feasible emission reductions

[1] 2022 State SIP Strategy https://ww2.arb.ca.gov/resources/documents/2022-state-strategy-state-implementation-plan-2022-state-sip-strategy

for this category. CARB's comprehensive program relies on five fundamental approaches:

- Stringent emissions standards that minimize emissions from new vehicles and equipment;
- In-use programs that target the existing fleet and require the use of the cleanest vehicles and emissions control technologies;
- Cleaner fuels that minimize emissions during combustion;
- Incentive programs that remove older, dirtier vehicles and equipment and replace those vehicles with the cleanest technologies; and,
- Driving to zero-emissions for engines and powertrains where feasible, in accordance with the Governor's Executive Order N-79-20[2].

Figure 1: Transition from Combustion



This multi-faceted approach has spurred the development of increasingly cleaner technologies and fuels, and achieved significant emission reductions across all mobile source sectors that go far beyond national programs or programs in other states. These efforts extend back to the first mobile source regulations adopted in the 1960s, and predate the Act of 1970, which established the basic national framework for controlling air pollution. In recognition of the pioneering nature of CARB's efforts, the Act provides California unique authority to regulate mobile sources more stringently than the federal government by providing a waiver of preemption for its new vehicle emission standards

[2] California Executive Order N-79-20 https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf

for on-road vehicles and engines under Section 209(b), and authorizations for new off-road emission standards under Section 209(e)(2). These waiver and authorization provisions preserve a pivotal role for California in the control of emissions from new motor vehicles and engines, recognizing that California serves as a laboratory for setting mobile source emission standards. Since then, CARB has consistently sought and obtained waivers and authorizations for its new motor vehicle and off-road regulations. CARB's history of progressively strengthening standards as technology advances, coupled with the waiver and authorization process requirements, ensures that California's regulations remain the most stringent in the nation.

In 1998, CARB identified diesel particulate matter as a toxic air contaminant. Since then, CARB adopted numerous regulations aimed at reducing exposure to diesel particulate matter while concurrently providing reductions in oxides of nitrogen (NOx) from freight transport sources like heavy-duty diesel trucks, transportation sources like passenger cars and buses, and off-road sources like large construction equipment. Phased implementation of these regulations will continue to produce emission reduction benefits through 2030 and beyond, as the regulated fleets are retrofitted, and as older and dirtier portions of the fleets are replaced with newer and cleaner models at an accelerated pace.

Further, CARB and South Coast Air Quality Management District (South Coast AQMD) staff work closely on identifying and distributing incentive funds to accelerate cleanup of vehicles and engines. Key incentive programs include the Low Carbon Transportation, Air Quality Improvement Program, VW Mitigation Trust, Community Air Protection, Carl Moyer Program, Goods Movement Program, Clean Off-Road Equipment (CORE) and Funding Agricultural Replacement Measures for Emission Reductions (FARMER). These incentive-based programs work in tandem with regulations to accelerate deployment of cleaner technology.

California's programs are the most stringent in the nation for each category CARB regulates:

- California's control measures for the passenger vehicle fleet includes new vehicle emission standards, fuel specifications, and the most rigorous in-use inspection program for on-road light-and medium-duty vehicles in the country. The suite of on-road light-duty vehicle control measures included in the South Coast's plan is anticipated to achieve the maximum feasible emission reductions possible, and is comprised of the most stringent level of control measures for this category in the nation.

- California's heavy-duty on-road vehicle and engine control program is comprised of the most stringent emission standards for new engines in the nation (i.e., new vehicle tailpipe emission and evaporative emission standards; certification, testing, and verification requirements; warranty and useful life requirements, and OBD system requirements). Additionally, to reduce in-use emissions and accelerate fleet turnover to cleaner engines, California's in-use control measures include, in aggregate, the most stringent inspection and maintenance program, idling requirements, and legacy fleet requirements for on-road heavy-duty fleets in the nation. Finally, California's clean diesel regulations provide the most stringent emission controls in the nation for conventional and renewable diesel fuels and diesel substitute fuels. The suite of on-road heavy-duty control measures that will be included in the South Coast's plan is anticipated to achieve the maximum feasible emission reductions possible, and is comprised of the most stringent level of control measures for this category in the nation.

- California's off-road engine and equipment control program includes the most stringent emission standards for new engines in the nation, comprehensive in-use fleet requirements to address emissions from the legacy fleets, and the cleanest off-road diesel fuel specifications in the nation. California's in-use control measures are national models for aggressive and successful efforts to reduce in-use emissions and accelerate fleet turnover to cleaner engines. In aggregate, the suite of off-road mobile source control measures that will be included in the South Coast's plan is anticipated to achieve the maximum feasible emission reductions possible, and is comprised of the most stringent level of control measures for this category in the nation.

- California's space and water heaters will include the most stringent emission standards of any state in the nation. For the first time, CARB will be setting an emission standard for space heaters and water heaters, to go into effect in 2030. CARB would adopt a statewide zero greenhouse gas (GHG) emission standard, which would have criteria pollutant co-benefits. Beginning in 2030, 100 percent of sales of new space heaters and water heaters would need to comply with the emission standard.~~,~~ Because no other state in the country has such a requirement, this emission standard would go beyond MSM requirements and would be the most stringent level of control measures for this category of any state in the nation.

Section I. Clean Air Act Requirements for Emission Control Measures

The particulate matter provisions in the Act establish a step-wise process for classifications and attainment dates:

- The first step is a Moderate area SIP, with an initial attainment date six years after the area is designated nonattainment;
- If attainment within six years is impracticable given the severity of the PM2.5 challenge in that area, then U.S. EPA re-classifies the area to Serious, and establishes requirements for a second SIP submittal that must show attainment within 10 years after the area was originally designated nonattainment.
- If the Serious area cannot show attainment within 10 years, the state can request an additional five-year extension if most stringent measures are in place and the State has met their obligations for the standard.

Likewise, the Act specifies a step-wise process for the required level of emission controls in a SIP, depending upon the severity of the air quality problem and amount of time a nonattainment area needs to meet the PM2.5 standard:

- For a Moderate nonattainment area, the required level of control is Reasonably Available Control Measures (RACM).[3]
- For a Serious PM2.5 nonattainment area, Best Available Control Measure (BACM) is the required level of control. U.S. EPA defines BACM to be the maximum degree of emission reductions achievable from a source or source category determined on a case-by-case basis considering energy, economic, and environmental impacts.[4]
- For a Serious PM2.5 nonattainment area for which air quality modeling demonstrates that the area cannot practicably attain by the end of the tenth calendar year (i.e. designated as “Serious with Extension”), MSM is the required level of control.[5] U.S. EPA defines MSM as, “the maximum degree of emission reductions that has been required or achieved from a source or source category in any other attainment plans or in practice in any other states and that can feasibly be implemented in the area.”[6] MSM is also inclusive of BACM requirements.
- For a Serious PM2.5 nonattainment area that has not attained by the applicable attainment date (i.e., designated as “Serious – 5% Plan”), the required level of control is also MSM.[7]

The South Coast is a Serious nonattainment area for its upcoming SIP for the 12 µg/m^3 annual PM2.5 standard discussed in this plan and will include an extension beyond ten years.

[3] RACM requirements are addressed in the Moderate SIP for the South Coast. For further information see https://ww2.arb.ca.gov/our-work/programs/california-state-implementation-plans/nonattainment-area-plans/south-coast-air
[4] U.S. EPA 1994 Addendum to the General Preamble p. 42010
[5] 40 CFR 51.1010(b)(2)(i)
[6] See U.S. EPA “Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements” pp. 326 July 2016 https://www.epa.gov/sites/production/files/2016-07/documents/pm25-naaqs-implementation-final-preamble-rule-signature.pdf
[7] 40 CFR 51.1003(c)(2)(i)

REQUIRED STRINGENCY OF CONTROL MEASURES

Based on the South Coast's current classification for 12 µg/m^3 annual PM2.5 standard, Table 1 describes the level of control measures required. The control measures for this plan must satisfy U.S. EPA's increasingly stringent Most Stringent Measures (MSM) requirements.

Table 1: Stringency of Control Measures Required[8]

Standard	Classification	Type of Plan	Control Measure Requirements
12 µg/m3 Annual (2012 Standard)	Serious with Extension	Most Stringent Measures (MSM)	**Most Stringent Measures** "The state shall identify, adopt, and implement the most stringent control measures that… can be feasibly implemented in the area." 40 CFR 51.1010(b)

DEFINING MOST STRINGENT MEASURES

MSM is the level of stringency required for the 12 µg/m^3 annual PM2.5 standard. The Act defines MSM as, "any permanent and enforceable control measure that achieves the most stringent emissions reductions in direct PM2.5 emissions and/or emissions of PM2.5 plan precursors from among those control measures which are either included in the SIP for any other National Ambient Air Quality Standard (NAAQS), or have been achieved in practice in any state, and that can feasibly be implemented in the relevant PM2.5 NAAQS nonattainment area."[9]

U.S. EPA guidance indicates that MSM is inclusive of the requirements and process for determining BACM.[10] The Act defines BACM as, "any technologically and economically feasible control measure that can be implemented in whole or in part within four years after the date of reclassification of a Moderate PM2.5 nonattainment area to Serious and that generally can achieve greater permanent and enforceable emissions reductions in direct PM2.5 emissions and/or emissions of PM2.5 plan precursors from sources in the area than can be achieved through the implementation of RACM on the same source."[11] U.S. EPA has further clarified that BACM-level of controls are:[12]

- The maximum degree of emissions reductions achievable from a source or source category, which is determined on a case-by-case basis considering energy, economic and environmental impacts;
- More stringent than RACM, but less stringent than the lowest achievable emission rate (LAER), which doesn't take into consideration the cost effectiveness of implementing a particular control measure;

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[8] The proposed South Coast SIP has been developed to provide the necessary elements for the for the 12 µg/m3 Annual PM2.5 Standard, for which the South Coast is classified as nonattainment. This appendix has been developed to meet a subset of these requirements; namely the requirement that staff demonstrate that the control strategies for the South Coast's plan for the 12 µg/m3 Annual PM2.5 Standard satisfy U.S. EPA's requirements for Serious area attainment plan control strategy requirements, as set forth in § 51.1010, for the source categories of: mobile sources, and residential and commercial building appliances.

[9] Code of Federal Regulations (CFR) Title 40 – Protection of Environment § 51.1000 – Definitions https://www.gpo.gov/fdsys/pkg/CFR-2017-title40-vol2/xml/CFR-2017-title40-vol2-sec51-1000.xml

[10] U.S. EPA 2001 *Final TSD for Maricopa County PM10 Nonattainment Area*. Available at https://www3.epa.gov/region9/air/phoenixpm/pdf/tsd0901.pdf

[11] Code of Federal Regulations (CFR) Title 40 – Protection of Environment § 51.1000 – Definitions https://www.gpo.gov/fdsys/pkg/CFR-2017-title40-vol2/xml/CFR-2017-title40-vol2-sec51-1000.xml

[12] U.S. EPA 1994 "Addendum to the General Preamble" pp. 42009 -42013

- Additive to RACM, as BACM will generally consist of a more extensive implementation of RACM measures; and
- Inclusive of Best Available Control Technology (BACT).

U.S. EPA defines BACT similarly to BACM as an emission limitation based on the, "maximum degree of reduction of each pollutant emitted from or which results from any major emitting facility, which the permitting authority, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such facility through application of production processes and available methods, systems, and techniques." [13] BACT is also at least as stringent as new source performance standards (NSPS) and national emissions standards for hazardous air pollutants (NESHAPs)[14]

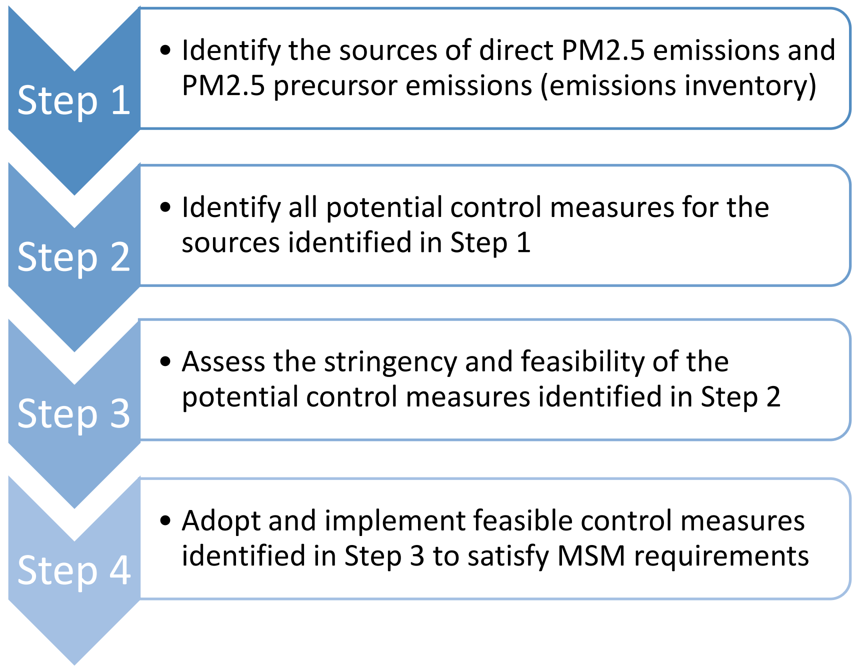
MSM is inclusive of the requirements for BACM, but with an additional step, comparing the potential MSMs identified against the measures already adopted in the area to determine if the existing measures are the most stringent.[15] Furthermore, U.S. EPA guidance defined MSM as "the maximum degree of emission reduction that has been required or achieved from a source or source category in any other attainment plans or in practice in any other states and that can feasibly be implemented in the area seeking the extension, such as what LAER represents for new or modified sources under the New Source Review permit program."[16]

[13] 42 U.S. Code § 7479 – Definitions https://www.gpo.gov/fdsys/pkg/USCODE-2011-title42/html/USCODE-2011-title42-chap85-subchapI-partC-subparti-sec7479.htm See § 7479(3) BACT
[14] U.S. EPA 1994 "Addendum to the General Preamble" pp. 42009 -42013
[15] U.S. EPA 2001 *Final TSD for Maricopa County PM10 Nonattainment Area*. Available at https://www3.epa.gov/region9/air/phoenixpm/pdf/tsd0901.pdf
[16] U.S. EPA 1994. *Addendum to the General Preamble*, 59 FR 41998 page 42010

Section II. Process for Determining MSM

U.S. EPA prescribes a four-step process for the identification and determination of whether the control measures satisfy the Serious area attainment plan control strategy requirements.

Figure 2: Process for Determining MSM



The process for identifying MSM generally follow the same steps as the process for identifying BACM.[17] This is because the Serious area attainment plan control strategy requirements described in § 51.1010 are additive as the plans become more stringent. That is to say, the MSM requirements are inclusive of the requirements for BACM, with additional requirements added to reflect the increased stringency in control levels that result from a bump-up in classification.[18]

This process starts with identifying the sources of PM2.5 emissions (both direct and precursor emissions); then expands the analysis in Step 2 to identify all potential control measures that would reduce emissions. Step 3 begins to narrow the scope of analysis by refining the list of all potential control measures to determine which of the control measures are sufficiently stringent to meet the applicable MSM requirements, and to identify which are technically and economically feasible. The final step to adopt any control measures identified through this process, if they are feasible to implement in the South Coast.

Table 2 delves more deeply into this process, showing each required element in the steps listed above for both of the applicable PM2.5 Standards.

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[17] In accordance with U.S. EPA's prescribed process described in the *TSD for the Maricopa County Serious Area PM10 Plan – 24-Hour Standard* (U.S. EPA 2001), which states, "Given this similarity between the BACM requirement and the MSM requirement, we believe that determining MSM should follow a process similar to determining BACM, but with one additional step, to compare the potentially most stringent measure against the measures already adopted in the area to determine if the existing measures are most stringent." Document is available at: https://www3.epa.gov/region9/air/phoenixpm/pdf/tsd0901.pdf

[18] § 51.1003(b)(2)(iii) requires that a submittal requesting a Serious area attainment date extension that is simultaneous with the Serious area attainment plan shall meet the most stringent measure (MSM) requirements set forth at § 51.1010(b), in addition to the BACM and BACT and additional feasible measure requirements set forth at § 51.1010(a)". For more details, see the Serious area attainment plan control strategy requirements identified in 40 CFR § 51.1010(a)(5), § 51.1010(b)(5), and § 51.1010(c)(5)

Table 2: MSM Requirements

Standard	12 ug/m3 Annual PM2.5 Standard (2012)
Classification	Serious with Extension
Control Strategy	MSM
Step 1: Identify sources of direct PM2.5 and precursor emissions (emissions inventory)	Required "The state shall identify all sources of direct PM2.5 emissions and sources of emissions of PM2.5 precursors in the nonattainment area in accordance with the emissions inventory requirements…" § 51.1010(b)(1)
Step 2: Identify all potential control measures	Required "The State shall identify all potential control measures to reduce emissions from all sources of direct PM2.5 emissions and sources of emissions of PM2.5 plan precursors" § 51.1010(b)(2)
Step 2(a): Begin with the area's current control measures	Recommended[19] "A state… should be able to start its process using the work already undertaken for the nonattainment area's RACM and BACM demonstrations and to make updates to the list of potential control measures"
Step 2(b): Survey other states and nonattainment areas for additional potential control measures	Required "The state shall identify the most stringent measures for reducing direct PM2.5 and PM2.5 plan precursors adopted into any SIP or used in practice to control emissions in any state" § 51.1010(b)(2)(i)
Step 2(c): Reconsider and reassess any measures previously rejected	Required "The state shall reconsider and reassess any measures previously rejected by the state during the development of any previous Moderate area or Serious area attainment plan control strategy" § 51.1010(b)(2)(ii)
Step 3: Assess potential control measures' stringency and feasibility	Required
Step 3(a): Evaluate stringency	Required MSM control levels required
Step 3(b): Assess technological and economic feasibility	Required "The state may make a demonstration that a measure identified… is not technologically or economically feasible to implement in whole or in part by 5 years after the applicable attainment date for the area, and may eliminate such whole or partial measure from further consideration" § 51.1010(b)(3) Assess the technological and economic feasibility of public measure suggestions submitted to CARB as potential control measures
Step 4: If found to be economically and technologically feasible, adopt control measures	Required "The state shall identify, adopt, and implement the most stringent control measures that are included in the attainment plan for any state or are achieved in practice in any state, and can be feasibly implemented in the area" § 51.1010(b)

[19] See U.S. EPA "Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements" July 2016 https://www.epa.gov/sites/production/files/2016-07/documents/pm25-naaqs-implementation-final-preamble-rule-signature.pdf

Step 1: Source Category Emissions of Direct PM2.5, NOx, and Ammonia

The first step required in the MSM evaluation process is to identify and quantify the sources of PM2.5, including direct PM2.5 emissions and emissions of precursor pollutants.

Mobile sources, and the fossil fuels that power them, continue to contribute a majority of NOx emissions, a significant precursor to the formation of particulate matter. On- and off-road heavy-duty mobile sources that burn diesel fuels, including trucks and off-road equipment, also directly emit PM2.5, as do sources primarily regulated at the federal and/or international level, including locomotives, ocean-going vessels, and aircraft. In the South Coast, air quality measurements and modeling have shown that emissions from mobile sources – cars, trucks, and a myriad of off-road equipment – are a significant contributor to ambient PM2.5 levels. Overall, mobile sources contribute to approximately 81 percent of NOx emissions, 17 percent of direct PM2.5 emissions, and 25 percent of ammonia emissions in the South Coast. In addition to directly emitted PM2.5, South Coast AQMD modeling demonstrated that gaseous precursors such as NOx and ammonia are the key precursors to atmospheric formation of PM2.5 in the South Coast, while VOC and SOX do not contribute significantly to ambient PM2.5 levels exceeding the NAAQS.

The formation of ammonia is a byproduct during the operation of a three-way catalyst (TWC). A TWC operates at near stoichiometric conditions, varying from slightly rich to slightly lean. Ammonia is generally formed during the slightly rich phase. Compressed Natural Gas (CNG) engines exhibit much higher ammonia than do gasoline engines. For diesel engines, ammonia emissions are inherently low as they do not use TWC technology. But newer engines employ Selective Catalytic Reduction (SCR). This technology uses ammonia for NOx aftertreatment. Unreacted ammonia can be emitted as part of this process (ammonia slip). Estimates of ammonia in emissions inventory models are informed by in-use data collected from dynamometer tests or portable emissions measurement systems (PEMS). Current on-road assumptions are documented in Section 3.3 of the EMFAC2021 technical documentation.[20] CARB programs that drive mobile sources to zero-emission vehicles and engines, including regulations such as the Advanced Clean Cars, Advanced Clean Trucks, and the Advanced Clean Fleets Regulations, will provide ammonia emission reduction benefits.

Residential and commercial buildings in California are the source of about 66 tpd NOx statewide due to natural gas combustion.[21] Nearly 90 percent of building NOx emissions are due to space and water heating, with the remaining 10 percent attributable to cooking, clothes drying, and other miscellaneous end uses. Space and water heating comprise nearly 90 percent of all building-related natural gas demand. Buildings also contribute to approximately 25 percent of California’s GHG emissions when accounting for fossil fuels consumed onsite and through electricity demand as well as refrigerants

[20] https://ww2.arb.ca.gov/sites/default/files/2021-08/emfac2021_technical_documentation_april2021.pdf
[21] CARB’s Criteria Emission Inventory CEPAM: 2019 Version - Standard Emission Tool

used in air conditioning systems and refrigerators. The fuels we use and burn in buildings, primarily natural gas, for space and water heating contribute significantly to building-related criteria pollutant and GHG emissions, and provide an opportunity for substantial emissions reductions where zero-emission technology is available.

Steps 2 and 3: Identification and Evaluation of Potential MSM Control Measures

The second and third steps required in the MSM evaluation process have been grouped together in this chapter so that the control measures for each sector can be more cohesively identified and evaluated.

STEP 2: IDENTIFICATION OF POTENTIAL MSM CONTROL MEASURES

Step 2 calls for the identification of all possible control measures for each of the sources of PM2.5 and NOx identified in Step 1.[22] To satisfy the Act's MSM requirements, this is a three-part process.

Step 2(a): California's Control Measures

The identification of all potential control measures begins with an analysis of California's control program. Due in part to the severity of its air quality needs, and in part to unique authority provided under the Act, California's mobile source controls go far beyond other states' and even national programs, and thus provides an excellent starting place in identifying a comprehensive range of mobile source control measures, as required by the Act. This approach also aligns with U.S. EPA guidance, which suggests starting the identification process with any controls previously identified in prior Moderate or Serious SIPs for the nonattainment area.[23]

Step 2(b): Other States' and Nonattainment Areas' Control Measures

The second component required to identify all potential MSM control measures is the identification of any additional control measures used in other states or nonattainment areas, and an assessment of their stringency relative to the control measures in the proposed South Coast SIP.[24, 25] The purpose is to identify whether there are additional potential MSM control measures used to control mobile emissions of direct PM2.5 and/or NOx in other states or nonattainment areas that are more stringent than the measures included in the proposed South Coast SIP. If this assessment finds that there are more stringent measures in use elsewhere – and if they are found to be sufficiently stringent and technically and economically feasible to implement in the South Coast (see Step 3) – the Act requires that any such measures are adopted and implemented

[22] In a departure from previous SIP guidance, EPA guidance indicates that are no *de minimis* source categories for this plan. Thus, emissions of direct PM2.5 and PM2.5 precursors (i.e. NOx) from all mobile source categories must be controlled in the South Coast, and meet the applicable MSM requirements. See U.S. EPA April 2016 "SIP Requirements Rule" 81 FR 58010 https://www.gpo.gov/fdsys/pkg/FR-2016-08-24/pdf/2016-18768.pdf

[23] U.S. EPA "Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements" July 2016

[24] § 51.1010(a)(2)(i), § 51.1010(b)(2)(i), and § 51.1010(c)(2)(i)

[25] U.S. EPA "Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements" July 2016

in the South Coast's plan (see Step 4), in order to meet the requirements that the area, "attain the standard as expeditiously as practicable."[26]

Identification

U.S. EPA guidance provides recommendations for possible resources to assist in the search for other control measures used in other states or nonattainment areas, including:[27]

- Other states' control programs (including those measures identified in U.S. EPA's list of national, state and/or local air quality agencies' control measures);[28]
- U.S. EPA's "Menu of Control Measures" for PM2.5; [29] and
- U.S. EPA's mobile-specific control measures for PM2.5.[30]

Beyond these suggested resources, CARB staff has also taken additional steps to identify any additional control measures currently in use in jurisdictions outside of California. This process included inquiries to U.S. EPA staff in Region 9, as well as inquiries to CARB technical staff that are engaged in developing control strategies across a wide range of sources throughout the agency, including passenger vehicles, heavy-duty trucks and buses, off-road equipment, and fuels. Furthermore, CARB staff has performed internet searches of other jurisdictions' control measures to ensure that our research process for this appendix identifies any control programs that have been more recently developed and which therefore may not otherwise be reflected in the abovementioned resources specified by U.S. EPA.

Assessment

In order to identify the most stringent suite of control measures currently, "adopted into any SIP or used in practice to control emissions in any state,"[31] CARB staff has identified in the tables included in Section IV Step 2(b) the most stringent suite of control measures in the nation, for each source category. Staff has assessed the relative stringency of measures based on the efficiency of a given measure or control technology to reduce the level of emissions from that source category – for example, by comparing the technical capacity for a given control measure to reduce in-use emissions from the on-road heavy-truck fleet, relative to other potential control measures that target the same emission source(s) for reductions. This assessment demonstrates that, for each source category, the suite of control measures included in

[26] § 51.1010(b)(4) and § 51.1004(a)(3)
[27] U.S. EPA April 2016 "SIP Requirements Rule" 81 FR 58010 https://www.gpo.gov/fdsys/pkg/FR-2016-08-24/pdf/2016-18768.pdf
[28]U.S. EPA https://www.epa.gov/pm-pollution/epa-summaries-and-reports-several-state-and-local-pm-control-measures. Accessed April 24, 2018
[29] U.S. EPA 2016 "*Menu of Control Options*" Accessed April 2018 at https://www.epa.gov/air-quality-implementation-plans/menu-control-measures-naaqs-implementation
[30] U.S. EPA https://www.epa.gov/advance/control-measures-programs-pm. Accessed April 24, 2018
[31] Per MSM requirements in 40 CFR § 51.1010(b)(2)(i) and § 51.1010(c)(2)(i), which call for the identification of the most stringent suite of control measures in any state or nonattainment area.

the proposed South Coast SIP are, in aggregate, the most stringent that are in use in any state or adopted into any SIP and in many cases go beyond MSM requirements.

Step 2(c) Reconsideration and reassessment of any control measures previously rejected as infeasible

The final component required to identify all potential MSM control measures is to reconsider and reassess any control measures proposed in prior Moderate or Serious SIPs for the South Coast that were previously rejected as infeasible.[32]

CARB staff reviewed all previous South Coast PM2.5 SIPs[33] and found that we did not identify any mobile source control measures as infeasible in previous Moderate or Serious attainment plan control strategies for the South Coast.

During the public process for the 2022 State SIP Strategy, community-based organizations and members of the public suggested additional control measures that CARB could develop. Some of the public member suggestions have been integrated into measures committed to in the 2022 State SIP Strategy, while CARB staff is exploring the feasibility of a few remaining suggestions. The public measure suggestions, and any applicable resultant measures within the 2022 State SIP Strategy, are discussed below, and discussed in more detail in Section IV, Step 3(b): Evaluation of Feasibility, for each relevant source category.

Light-Duty Public Measure Suggestions:

- Enhanced Transportation Choices
  CARB staff is continuing to explore this suggested measure and how it can meet the Act requirements for SIP measure approvability.

- Enhanced Bureau of Automotive Repair Consumer Assistance Program
  CARB staff is continuing to explore this suggested measure and how it can meet the Act requirements for SIP measure approvability.

- Light-Duty Vehicle Fleet Regulation
  CARB staff is continuing to explore this suggested measure. CARB staff anticipate that the recently adopted Advanced Clean Cars II regulation, along with existing CARB regulations and current State incentive programs, achieve a significant amount of the benefits that this suggested measure would accomplish.

Medium- and Heavy-Duty Public Measure Suggestions:

- On-Road Heavy-Duty Vehicle Useful Life Regulation
  CARB staff has developed the Zero-Emission Trucks measure in response to receiving this public measure suggestion.

[32] Identification of any control measures that were previously rejected as infeasible in prior Moderate or Serious SIPs for the area is a requirement for MSM, not BACM. See 40 CFR § 51.1010(b)(2)(ii) and § 51.1010(c)(2)(ii)
[33] See CARB's list of South Coast Air Quality Management Plans at: https://ww2.arb.ca.gov/our-work/programs/california-state-implementation-plans/nonattainment-area-plans/south-coast-air

- Additional Incentive Programs: Zero-Emission Trucks
  CARB staff has developed the Zero-Emission Trucks measure in response to receiving this public measure suggestion.

Facility-Based Public Measure Suggestion:

- Indirect Source Rule
  CARB staff has been investigating the feasibility and potential benefits of this suggested measure, and is continuing to explore this suggested measure and how it can meet the Act requirements for SIP measure approvability. Nonetheless, CARB staff have included an Indirect Source Rule as one potential element of the Zero-Emission Trucks measure.

Commercial and Residential Building Appliances Public Measure Suggestion:

- Additional Building Emission Standards
  CARB staff has developed the Zero Emission Standard for Space and Water Heaters measure in response to receiving this public measure suggestion.

Other Public Measure Suggestions:

In addition to the above-described public measure suggestions for source categories included in this analysis, CARB also received additional public measure suggestions for categories that are not included in the scope of this analysis. This includes public measure suggestions for stationary sources (the BACT/BARCT Determination public measure suggestion) and for pesticides (the Pesticide Regulation public measure suggestion). The Pesticide Regulation public measure was developed into a measure for the 2022 State SIP Strategy, but which is not described in this analysis because ROG emissions are not a significant precursor emission to PM formation in the South Coast.

STEP 3: EVALUATION OF STRINGENCY AND FEASIBILITY

While the focus of Step 2 is on expanding the scope of analysis to ensure that all possible control measures are identified and incorporated into a list of potential MSM control measures, Step 3 focuses on narrowing that list to identify and discard from further consideration any measures that do not satisfy the applicable requirements for stringency and feasibility. Step 3 therefore calls for an evaluation of each of the potential MSM control measures identified in Step 2, in order to evaluate first whether they satisfy the required level of stringency of each control measure; and secondly, whether they are technically and economically feasible to implement in the South Coast.

Step 3(a): Evaluating Stringency

For a potential control measure to meet the definition of MSM, CARB staff must demonstrate that the measure satisfies stringency requirements in terms of both:

(i) the efficiency of a given measure or control technology to reduce the level of emissions from a specific mobile source, relative to emission controls in place in other states and nonattainment areas; and

(ii) the timing of when each control measure will begin to be implemented, relative to each plan's timing milestones and deadlines.

The Act defines feasibility in terms of both technological and economic feasibility. For the purposes of this analysis of control measures, the Act defines technological feasibility as, **"**factors including but not limited to a source's processes and operating procedures, raw materials, physical plant layout, and potential environmental impacts such as increased water pollution, waste disposal, and energy requirements."[34] Economic feasibility considerations include capital costs, operating and maintenance costs, and cost effectiveness of the measure.[35] Much of the assessment required to evaluate the efficiency of the level of control provided by a given control measure or technology is included in Step 2(b), wherein CARB staff analyzes the control measures in the South Coast's plan relative to those in other states and nonattainment areas.

The assessment of stringency also includes elements of timing, particularly regarding when a control measure will be implemented. U.S. EPA states that MSM should be implemented, "as expeditiously as practicable".[36] U.S. EPA also clarified the requirement for the analyses of the potential control measures, stating that the analysis should include a determination of the earliest date by which a control measure or technology can be implemented in whole or in part.[37] For the PM2.5 standard discussed in this plan, Table 3 summarizes the required levels of control measures, and the required timeframe for implementation in order to meet the definition of MSM.

Table 3: Implementation and Timing Requirements for MSM

Standard	12 ug/m3 Annual PM2.5 Standard (2012)
Classification Status	Serious with Extension
Type of Plan Required	MSM
Control Measure Requirements	MSM
Definition of MSM (regarding timing)	MSM: implemented in whole or in part by 5 years after the applicable attainment date for the area[38]
Attainment deadline	2030
Timeframe for Implementation	MSM if implemented $\leq$ 2035

Comparing the Stringency of the South Coast's Plan to the Current Control Program

The final step called for in U.S. EPA's process to demonstrate that the suite of control measures included in the proposed 2024 12 µg/m3 annual PM2.5 Plan satisfy the stringency definition for MSM is to compare the measures included in the South Coast's plan against the measures already adopted in the proposed South Coast SIP to

[34] 40 CFR § 51.1010(a)(3)(i)
[35] 40 CFR § 51.1010(a)(3)(ii)
[36] U.S. EPA, 2001 *Final TSD for Maricopa County PM10 Nonattainment Area* (page 31). Available at https://www3.epa.gov/region9/air/phoenixpm/pdf/tsd0901.pdf
[37] 87 FR 60494
[38] 40 CFR § 51.1010(b)(3)

determine if the existing control measures alone are more stringent.[39] CARB staff has compared the current control program to the control measures included in the South Coast's Plan, and has found that:

- The suite of control measures in the South Coast's proposed 2024 12 µg/m3 annual PM2.5 Plan include all of the potential MSM measures identified through the processes described above, including measures in the current control program, and new measure commitments that go beyond MSM requirements.
- The suite of control measures in the South Coast's plan is more stringent than the existing control program alone because the plan encompasses both the existing suite of control programs and the new measures committed to in the 2016 and 2022 State SIP Strategies that have yet to be adopted. The new measures exceed the stringency of the current control program for control requirements applying to all mobile source categories, including the passenger vehicle fleet, the on-road heavy-duty fleet, and off-road equipment and engines, as well as residential and commercial building appliances source categories.

Step 3(b): Determination of Technical and Economic Feasibility

The second half of the required process for evaluating the potential MSM measures is an assessment of their economic and technical feasibility. As part of this process, the Act directs that the state may eliminate any control measures identified in Step 2 from further consideration if it is demonstrated to be technologically or economically infeasible to implement in the South Coast within the specified timeframes.

Per U.S. EPA's guidance and precedence, this requirement is not required to be applied unless a potential MSM control measure is rejected from inclusion in the SIP on the grounds of feasibility.[40] Nonetheless, CARB staff has conducted an initial assessment of technical feasibility for many of the mobile source control measures in the 2016 State SIP Strategy, and the 2022 State SIP Strategy, as well as through the technology assessments that CARB staff has conducted in collaboration with the South Coast AQMD. These Technology Assessments identified the current technological potential for more stringent emission control measures for on- and off-road heavy-duty applications, together with the fuels necessary to power them, along with ongoing review of advanced vehicle technologies for the light-duty sector.[41]

Additionally, an economic impact analysis was conducted for the newly proposed measures that were committed to in the 2022 State SIP Strategy.[42] Furthermore, all control measures that are regulatory in nature must also undergo a rule-specific, rigorous public review process when proposed by staff and/or approved by the Board, as specified by the Administrative Procedures Act (APA). These requirements include

[39] U.S. EPA's 2001 *Final TSD for Maricopa County PM10 Nonattainment Area* see page 32. Available at https://www3.epa.gov/region9/air/phoenixpm/pdf/tsd0901.pdf

[40] See page 400 of U.S. EPA's 2001 *Technical Support Documentation for Maricopa County PM10 Nonattainment Area* https://www3.epa.gov/region9/air/phoenixpm/pdf/tsd30102.pdf where EPA staff explain that they are applying to Maricopa County's SIP the decision from a Phoenix Serious SIP not to apply this requirement if no potential control measures are rejected.

[41] Technology and Fuel Assessments http://www.arb.ca.gov/msprog/tech/tech.htm

[42] CARB 2022 "2022 State SIP Strategy Appendix A: Economic Analysis" https://ww2.arb.ca.gov/resources/documents/2022-state-strategy-state-implementation-plan-2022-state-sip-strategy

an Initial Statement of Reasons (ISOR) prepared for each proposed CARB regulation, an Environmental Analysis to satisfy California Environmental Quality Act (CEQA) requirements, and an Economic Analysis, including a Standardized Regulatory Impact Assessment (SRIA) for any proposed regulation has an economic impact exceeding $50 million.

While these processes occur beyond the requirements addressed in this plan, these requirements ensure there will be further opportunity for public and stakeholder input, as well as ongoing technology review and a more refined assessment of costs and environmental impacts as the measures move through CARB's public process for development into proposed regulations.

Step 4: Adopt and Implement Feasible Control Measures

The final step required by this step-wise process is to adopt and implement the feasible control measures identified in Step 3, in order to satisfy MSM requirements. Board adoption of the proposed South Coast SIP for the 12 µg/m³ annual PM2.5 standard – including the control measures described in the 2022 State SIP Strategy – will satisfy the requirements of Step 4.

Section III. Step 1: Emissions of Direct PM2.5, NOx, and Ammonia

Table 4 shows the mobile source emissions of direct PM2.5, and Tables 5 and 6 show the mobile source emissions of NOx, and ammonia, the key precursors to secondary formation of PM2.5 in the South Coast.[43]

Table 4: Direct PM2.5 Emissions (tpd) from Mobile Sources in the South Coast

	2018	2030
On-Road Light-Duty Vehicles	2.4	2.1
On-Road Heavy-Duty Vehicles	3.2	1.6
Off-Road Federal and International Sources	1.7	1.8
Aircraft	0.7	0.7
Railroad	0.3	0.4
Ocean-Going Vessels	0.6	0.7
Off-Road Equipment	3.6	2.0
Total Direct PM2.5 from Mobile Sources	**10.8**	**7.4**

**Numbers may not add up due to rounding.*

Table 5: NOx Emissions (tpd) from Mobile Sources in the South Coast

	2018	2030
On-Road Light-Duty Vehicles	56.5	19.7
On-Road Heavy-Duty Vehicles	129.8	30.4
Off-Road Federal and International Sources	64.4	74.7
Aircraft	17.1	24.5
Railroad	15.1	17.7
Ocean-Going Vessels	32.2	32.6
Off-Road Equipment	72.6	37.9
Total NOx from Mobile Sources	**323.3**	**162.6**

**Numbers may not add up due to rounding.*

Table 6: Ammonia Emissions (tpd) from Mobile Sources in the South Coast

	2018	2030
On-Road Light-Duty Vehicles	2.4	12.3
On-Road Heavy-Duty Vehicles	3.2	8.8
Off-Road Federal and International Sources	1.7	0.0
Aircraft	0.7	0.0
Railroad	0.3	0.0
Ocean-Going Vessels	0.6	0.0
Off-Road Equipment	3.6	0.1
Total Ammonia from Mobile Sources	**10.8**	**21.3**

**Numbers may not add up due to rounding.*

[43] Data from SCAQMD, 2023. CEPAM version 101B

It is important to note that these tables reflect only a subset of the total emissions in the South Coast, and do not reflect emissions from stationary and areawide sources.

Many residential appliances, such as water heaters and furnaces, use natural gas or liquefied petroleum gas (fossil fuel) as a fuel source. These appliances have the potential to emit NOx during combustion. While emissions from buildings represent a small component of total PM2.5 and precursor emissions, water and space heaters comprise a large portion of total building-related emissions.

Section IV. Steps 2 and 3: Identification and Evaluation of Potential Control Measures

The second and third steps required in the MSM evaluation process – the identification of potential MSM control measures, and the evaluation of their stringency and feasibility – have been grouped together so that CARB staff can more cohesively identify and analyze control measures for each sector. The sectors analyzed include mobile sources (which are further broken down into sub-categories of passenger vehicles, on-road heavy-duty trucks and buses, and off-road mobile sources), and residential and commercial building appliances.

SECTION 209 WAIVER AND AUTHORIZATION AUTHORITY

Before delving into the sector-specific analysis, however, it is important to discuss the unique position California holds within the Act. In recognition of California's early efforts and extent of air quality challenges, the State has unique authority to regulate emissions from some mobile source categories more stringently than the federal government under the Act's §209(b) waiver provision and §209(b) authorization provision. This waiver provision also allows California to seek a waiver from U.S. EPA to enact more stringent emission standards for passenger vehicles and heavy-duty trucks. While U.S. EPA has primary authority for interstate trucks, aircraft, ships, locomotives, and some farm and construction equipment, the authorization provision allows California to seek authorization from U.S. EPA to enact more stringent emission standards for certain off-road vehicles and engines.

Due to California's unique waiver and authorization authority under the Act, no other state or nonattainment area has the authority to promulgate mobile source emission standards at levels that are more stringent than the federal standards. Other states can elect to match either the federal standards or the more stringent California standards. As such, no state or nonattainment area has a more stringent suite of mobile source emission control programs than California, implying a de-facto level of control at the level of MSM for CARB's current programs.

Over nearly five decades, CARB has consistently sought waivers and authorizations for its new motor vehicle regulations and has received waivers and authorizations for over 100 regulations. The most recent California standards and regulations that have received waivers and authorizations are:

- The Advanced Clean Cars (ACC) Regulations for light-duty vehicles (including the Zero-Emission Vehicle (ZEV) and the Low-Emission Vehicle III (LEV III) Regulations);
- On-Board Diagnostics II Requirements;
- The Advanced Clean Trucks Regulation;
- The Zero-Emission Airport Shuttle Bus Regulation;
- The Zero-Emission Power Train Certification;
- Heavy-Duty On-Board Diagnostics (HD OBD);
- The Heavy-Duty Vehicle and Engine Regulation;

- Heavy-Duty Vehicle and Engine Emission Warranty and Maintenance Provisions;
- Heavy-Duty Truck Idling Requirements;
- The Heavy-Duty Tractor-Trailer Greenhouse Gas (GHG) Standards;
- The In-Use Off-Road Diesel Fleets Regulation;
- The Non-Road Compression Ignition (CI) Regulation;
- The Large Spark Ignition (LSI) Engine and Fleets Regulation;
- The Portable Diesel Equipment Air Toxics Control Measure (ATCM);
- The Portable Equipment Registration Program (PERP);
- The Small Off-Road Equipment (SORE) Regulation;
- The Commercial Harbor Craft (CHC) Regulation;
- The Transport Refrigeration Unit (TRU) ATCM;
- The Off-Highway Recreational Vehicles Regulation;
- The Mobile Cargo Handling Equipment (CHE) Regulation; and
- The Spark Ignition Marine Engine and Boat Regulation.

Further, CARB has recently submitted waiver and authorization requests for:

- The Heavy-Duty Omnibus Regulation;
- The Small-Off Road Engine Standard (2021 Amendments);
- The Commercial Harbor Craft (CHC) Regulation (2022 Amendments); and
- The Transport Refrigeration Unit (TRU) Regulation Phase I (2022 Amendments).

CARB's history of progressively strengthening standards as technology advances, coupled with the waiver and authorization process requirements, ensures that California's regulations remain the most stringent in the nation, and that necessary emission reductions from the mobile sector continue. This provision preserves a critical role for California in the control of emissions from new motor vehicles, recognizing that California plays an important leadership role and serves as a "laboratory" state for more stringent motor vehicle emission standards. For example, CARB's LEV I and LEV II, and the ZEV Programs have resulted in the production and sales of over 1.5 million of ZEVs in California since first adopted them in 1990.

Additionally, CARB's 2022 State SIP Strategy[44] has developed and evaluated potential strategies for mobile source categories under CARB's regulatory authority that will contribute to expeditious attainment of the standards. This effort builds on the measures and commitments already made in CARB's multi-pollutant planning effort that have identified the pathways forward to achieve the State's many air quality, climate, and community risk reduction goals: the 2016 State SIP Strategy, and the 2020 Mobile Source Strategy.

With the 2022 State SIP Strategy, CARB explored and proposed an unprecedented variety of new measures to reduce emissions from the sources under our authority using all mechanisms available. The measures included in the 2022 State SIP Strategy encompass actions to establish requirements for cleaner technologies (both zero-emissions and near zero-emissions), deploy these technologies into the fleet, and

[44] CARB 2022 State Strategy for the State Implementation Plan (2022 State SIP Strategy) https://ww2.arb.ca.gov/resources/documents/2022-state-strategy-state-implementation-plan-2022-state-sip-strategy

to accelerate the deployment of cleaner technologies through incentives. As such, the measures included in the 2022 State SIP Strategy have been identified to push beyond the stringency of controls required in the current control program, and ~~have been developed to achieve~~ thus go beyond MSM requirements. ~~definition of emission controls that achieve, "the maximum degree of emission reduction… that can be feasibly implemented in the area."[45]~~

The California regulations that comprise this rigorous suite of control measures are described in more detail in the following sections.

~~[45] U.S. EPA definition of MSM from the 2001 *Final TSD for Maricopa County PM10 Nonattainment Area* (page 31). Available at https://www3.epa.gov/region9/air/phoenixpm/pdf/tsd0901.pdf~~

On-Road Light-Duty Vehicles

On-road light-duty vehicles, often referred to as passenger vehicles, include motorcycles, passenger cars, and light to mid-sized trucks and SUVs. The vast majority of these vehicles currently have gasoline powered internal combustion engines, however this sector is projected to increasingly rely on electric drive vehicles of varying types (e.g. battery electric, plug-in hybrid, or fuel cell electric vehicles).

STEP 2(A): CALIFORNIA'S LIGHT-DUTY CONTROL MEASURES

Since setting the nation's first motor vehicle exhaust emission standards in 1966 that led to the first pollution controls, California has dramatically tightened emission standards for light-duty vehicles. Through CARB regulations, today's new cars pollute 99 percent less than their predecessors did in 1975. In 1970, CARB required auto manufacturers to meet the first standards to control NOx emissions along with hydrocarbon emissions, which together form smog. The simultaneous control of emissions from motor vehicles and fuels led to the use of cleaner-burning reformulated gasoline (RFG) that has removed the emissions equivalent of 3.5 million vehicles from California's roads.

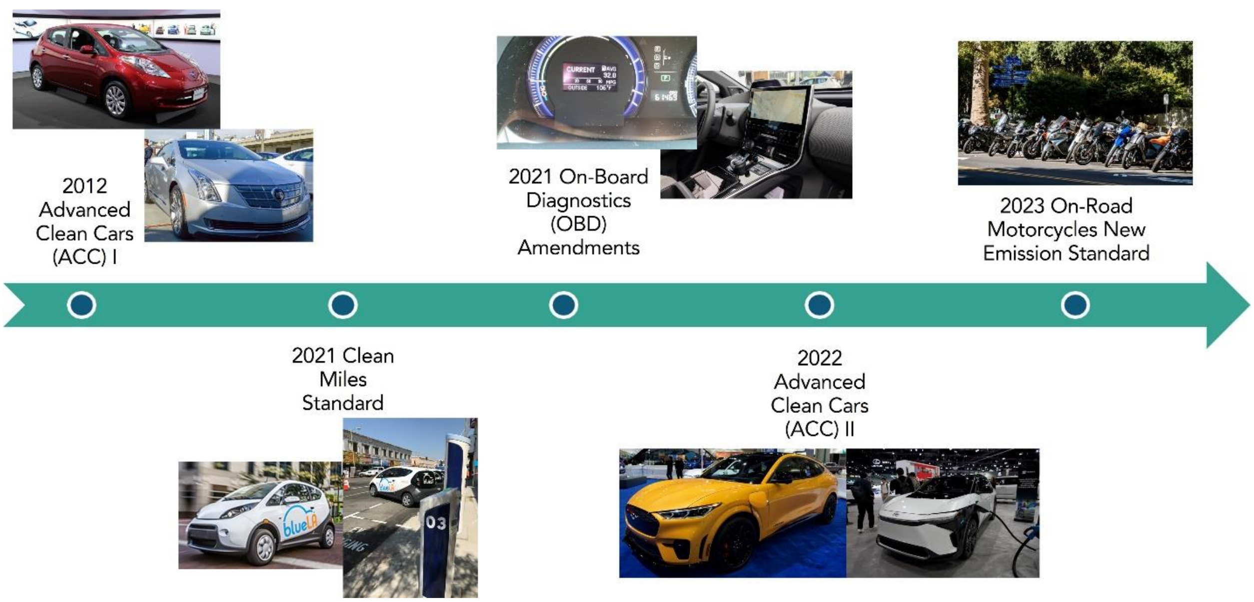
Light- and medium-duty vehicles are currently regulated under California's ACC program, which includes the LEV III and ZEV programs. The ACC program combines the control of smog, soot-causing pollutants, and greenhouse gas emissions into a single coordinated package of requirements for model years 2015 through 2025. Since CARB first adopted it in 1990, the Low Emission Vehicle Program (LEV and LEV II) and Zero-Emission Vehicle (ZEV) Program have resulted in the production and sales of over 1.5 million (ZEVs) in California. Advanced Clean Cars 2 (ACC2), a measure from the 2016 State SIP Strategy, is a significant effort critical to meeting air quality standards that was adopted in August 2022. ACC2 has the goal of cutting emissions from new combustion vehicles while taking all new vehicle sales to 100 percent zero-emission no later than 2035.

For passenger vehicles, the 2022 State SIP Strategy includes actions to increase the penetration of ZEVs by targeting ride-hailing services offered by transportation network companies through the Clean Miles Standard regulation in order to reduce GHG and criteria pollutant emissions, and promote electrification of the fleet. For motorcycles, the 2022 State SIP Strategy proposes more stringent exhaust and evaporative emissions standards along with zero-emissions sales thresholds. The primary goal of the On-Road Motorcycle New Emissions Standard measure is to reduce emissions from new, on-road motorcycles by adopting more stringent exhaust and evaporative emissions standards along with zero-emissions sales thresholds.

CARB is also active in implementing in-use programs for owners of older dirtier vehicles to retire them early. The "car scrap" programs, like Clean Cars 4 All and Clean Vehicle Rebate Project provide monetary incentives to replace old vehicles with zero-emission vehicles. Other California programs and goals, such as the 2012 Governor's Executive Order to put 1.5 million zero-emission vehicles on the road by 2025 – which was attained two years early in 2023 – have produced substantial and cost-effective emission reductions from the light-duty vehicle sector.[46]

Taken together, California's emission standards, fuel specifications, and incentive programs for on-road light- and medium-duty vehicles represent all measures that are technologically and economically feasible within California. As a result of these efforts, light-duty vehicle emissions in the South Coast have been reduced significantly since 1990 and will continue to go down through 2030. From today, light-duty vehicle NOx emissions are projected to decrease by nearly 65 percent by 2030.

Figure 3: Light-Duty Control Measures



NEW VEHICLE STANDARDS

Emission Standards and ZEV Requirements

California is the only state with the authority to adopt and enforce emission standards for new motor vehicle engines that differ from the federal emission standards, which enables CARB to develop more stringent motor vehicle control measures than other states. Adopted in 2012, the ***ACC I*** program is a suite of regulations that ensure emission reductions from the State's passenger vehicle fleet. In 2013, U.S. EPA issued a waiver for the ACC I Program.[47]

CARB's ACC I program has in recent years been a major driver of turnover to and zero and near-zero emission vehicles in the light-duty sector, providing significant emission reduction benefits. ACC I brought together three major regulations that were previously separate, combining the control of criteria pollutants and greenhouse gas emissions into

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[46] California Office of Governor, April 2023. "California Surpasses 1.5 Million ZEVs Goal Two Years Ahead of Schedule" https://www.gov.ca.gov/2023/04/21/california-surpasses-1-5-million-zevs-goal-two-years-ahead-of-schedule/

[47] U.S. EPA 2013 "California State Motor Vehicle Pollution Control Standards; Advanced Clean Car Program; Final Notice of Decision" Federal Register January 9, 2013 Volume 78, Number 6 pp. 2211 – 2145. https://www.gpo.gov/fdsys/pkg/FR-2013-01-09/pdf/2013-00181.pdf

a single coordinated set of requirements for light-duty vehicles of model years 2015 through 2025.

- Two of these regulations, the ***LEV III GHG*** and ***LEV III Criteria Emission*** rules, are fleet average performance standards for new vehicles that provide for continued annual emission reductions as the stringency increases through 2025. When fully phased-in, these requirements will achieve near-zero emission levels from new light-duty vehicles. These programs apply to the entire light-duty fleet by setting an average emissions requirement across all new vehicles that creates inherent market flexibility for compliance.

- The third regulation, the ***ZEV Regulation***, focuses on advanced technology development and fleet penetration of ZEVs (i.e. battery electric vehicles and hydrogen fuel cell vehicles), and plug-in hybrid electric vehicles (PHEVs) in order to enable manufacturers to successfully meet 2018 and subsequent model year requirements. The ZEV regulation ensures that advanced electric drive technology is commercialized and brought to production scale for cost reductions by 2025, in order to ensure that these low-emission technology vehicles transition from demonstration phase to full commercialization in a reasonable timeframe to meet long-term emission reductions goals. The ZEV amendments for 2018 and subsequent model years in the ACC program are intended to achieve commercialization through simplifying the regulation and pushing technology to higher volume production in order to achieve cost reductions.

The ACC I program has ushered in a new zero emission passenger transportation system. The success of this program is evident: California is the world's largest market for Zero Emission Vehicles (ZEVs), with 119 passenger vehicle models available today, including battery-electric, plug-in hybrid electric, and fuel cell electric vehicles.[48] A wide variety are now available at lower price points, attracting new consumers. In April 2023, the Governor's 2012 target of 1.5 million ZEVs on the road by 2025 was attained two years early, facilitated in part by $2 billion in ZEV incentive funding and rebates that have been distributed to Californians through programs like the Clean Vehicle Rebate Project and Clean Cars 4 All.[49] Approximately 21 percent of all new cars sold in California in 2023 have been ZEVs. Californians, who drive only 10 percent of the nation's cars, account for over 40 percent of all zero-emission car sales in the country. The U.S. makes up about half of the world market. This movement towards commercialization of advanced clean cars has occurred due to CARB's ZEV requirements, part of ACC, which affects passenger cars and light-duty trucks.

In support of California's transition to zero-emission vehicles, in 2020, Governor Newsom signed Executive Order N 79 20,[50] which established a goal that 100 percent of California sales of new passenger cars and trucks be zero-emission by 2035. With this order and many other recent actions, Governor Newsom has recognized that air pollution remains a challenge for California that requires bold action. Zero-emission

[48] VELOZ, February 2023 "Electric Vehicle Market Report, Q4 2022" https://www.veloz.org/ev-market-report/

[49] California Office of Governor, April 2023. "California Surpasses 1.5 Million ZEVs Goal Two Years Ahead of Schedule" https://www.gov.ca.gov/2023/04/21/california-surpasses-1-5-million-zevs-goal-two-years-ahead-of-schedule/

[50] Executive Order N-79-20 https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf

vehicle commercialization in the light-duty sector is well underway. Longer-range battery electric vehicles are coming to market that are cost-competitive with gasoline fueled vehicles and hydrogen fuel cell vehicles are now also seeing significant sales. Autonomous and connected vehicle technologies are being installed on an increasing number of new car models. A growing network of retail hydrogen stations is now available, along with a rapidly growing battery charger network.

Advanced Clean Cars II (ACC II), a measure in the 2016 State SIP Strategy that was adopted by the CARB Board in August 2022, imposes the next level of low-emission and zero-emission vehicle standards for model years 2026-2035 that contribute to meeting federal ambient air quality ozone standards and California's carbon neutrality targets. The ACC II regulations will rapidly scale down emissions of light-duty passenger cars, pickup trucks and SUVs starting with the 2026 model year through 2035. The ACC II regulation also takes the State's already growing zero-emission vehicle market and robust motor vehicle emission control rules and augments them to meet more aggressive tailpipe emissions standards and ramp up to 100 percent zero-emission vehicles by 2035 for all new passenger cars, trucks and SUVs sold in California. ACC II is two-pronged: it will drive the sales of zero emission vehicles (ZEV) and the cleanest-possible plug-in hybrid-electric vehicles (PHEV) to 100-percent in California by the 2035 model year through its ***Zero Emission Vehicle (ZEV) Regulation***, while also reducing smog- and PM-forming emissions from new Internal Combustion Engine Vehicles (ICEVs) through the ***Low Emission Vehicle (LEV) IV Regulation***.

The LEV IV regulation will further increase the stringency of CARB's criteria pollutant emission standards for light- and medium-duty vehicles for MY 2026 – 2035. LEV IV consists of multiple components:

- Prevents potential emission backsliding of ICEVs that is otherwise possible under the existing regulations by applying the exhaust and evaporative emission fleet average standards exclusively to combustion engines. Although the NMOG+NOx fleet average for light-duty vehicles remains at 30 mg/mi for MY 2026-2035, the medium-duty vehicle fleet average declines from 178 mg/mi to 150 mg/mi for Class 2b and from 247 mg/mi to 175 mg/mi for Class 3. Additionally, LEV IV eliminates the composite standard option for SFTP emissions to ensure maximum emissions control on all test cycles.
- For light-duty vehicles, lowers the maximum NMOG+NOx exhaust emission rate from 160 mg/mi in MY 2025 to 70 mg/mi in MY 2029; the US06 PM emission rate from 6 mg/mi to 3 mg/mi; and evaporative running loss emission rates from 0.05 g/mi to 0.01 g/mi. For medium-duty vehicles, lowers the maximum NMOG+NOx exhaust emission rate from 250 mg/mi in MY 2025 to 170 mg/mi in MY 2028 for Class 2b and from 400 mg/mi to 230 mg/mi for Class 3.
- Reduces cold start emissions by applying the emission standards to a broader range of in-use driving conditions. (Starts after the vehicle engine has been shut-off for more than 12 hours are considered cold starts.)
- Medium-duty vehicles with gross combined weight rating above 14,000 lbs. would also be subject to in-use test standards to capture emissions while towing.

CARB will further increase the stringency of sales requirements for ZEVs and PHEVs through the ACC II program's ZEV regulation, which will require manufacturers to deliver for sale increasing percentages of ZEVs and PHEVs as a portion of their overall product deliveries between model years 2026 and 2034 and reach 100-percent ZEVs in 2035 (and after). ACC II also includes innovative charging and ZEV assurance measures, which include ZEV warranty and durability requirements, serviceability, and battery labeling requirements.

Break and Tire Wear

Vehicles emit inhalable particles from two major sources: the exhaust system, which has been extensively characterized and regulated; and non-exhaust sources including brake wear, tire and road wear, clutch wear and road dust resuspension. The non-exhaust sources have not been regulated because they are difficult to measure and control. However, with increasingly stringent standards for exhaust emissions, the non-exhaust fraction has become increasingly important. Model predictions suggest that traffic-related emissions of both $PM_{2.5}$ and PM_{10} will eventually be dominated by non-exhaust sources.

Additionally, there is concern that exposure to these particles may increase in California because proposed regional land use and transportation plans may lead to denser cities and a higher proximity of people to major roadways. Under the ACC program, the regenerative braking of ZEVs and PHEV results in lower PM emissions from brake wear and thus provides non-exhaust PM2.5 emission benefits. As increasing numbers of ZEVs enter the fleet, which are characterized by regenerative braking and lower rolling resistance tires, these technologies offer opportunities to reduce PM2.5 emissions from the passenger vehicle fleet.

Clean Miles Standard

The ***Clean Miles Standard (CMS)*** regulation, which was adopted by CARB in 2021 and will be implemented by the California Public Utilities Commission (CPUC), is a regulation to reduce GHG emissions from ride-hailing services offered by transportation network companies (TNCs), on a per--passenger mile basis, and promote electrification of the fleet by setting an electric vehicle mile target. TNCs provide on-demand rides through a technology--based platform that connects passengers with drivers using personal or rented vehicles.

The CMS includes two annual targets – an eVMT target as well as a GHG target in the metric of g CO2/PMT. The eVMT target would require TNCs to achieve 90 percent eVMT by 2030. The GHG target would require TNCs to achieve 0 g CO2/PMT by 2030 through electrification as well as other strategies, including increasing shared rides on their platform, improving operational efficiency (route planning and reduced mileage without passengers), and obtaining optional GHG credits. Optional GHG credits may be requested by the TNCs and approved by the CPUC for ride-hailing trips that are connected to mass transit through a verified booking process, and for investing in bicycle and sidewalk infrastructure projects that support active transportation.

On-Board Diagnostic (OBD) Systems

OBD systems serve an important role in helping to ensure that engines and vehicles maintain low emissions throughout their full life. OBD systems are designed to identify when a vehicle's emission control systems or other emission-related computer-controlled components are malfunctioning, causing emissions to be elevated above the vehicle manufacturer's specifications. Many states currently use the OBD system as the basis for passing and failing vehicles in their inspection and maintenance programs, as is exemplified by California's Smog Check Program. For light-duty vehicles, all 2000 and newer MY vehicles are inspected by accessing the OBD system to verify that no emission-related faults are present.

California's first ***On Board Diagnostics Regulation (OBD I)*** required manufacturers to monitor some of the emission control components for passenger vehicles, light- and medium- duty vehicles, starting with the 1988 model year. In 1989, CARB adopted ***OBD II***, which required 1996 and subsequent model year passenger cars, light-duty trucks, and medium-duty vehicles and engines to be equipped with second-generation OBD systems, which standardized the system and addressed the shortcomings of the OBD I requirements (OBD I requirements monitored only a few of the emission-related components on a vehicle). U.S. EPA granted CARB a waiver of preemption for the OBD II regulation in 2016.[51]

The Board has modified the OBD II regulation in regular updates since initial adoption to address manufacturers' implementation concerns and, where needed, to strengthen specific monitoring requirements. Most recently, the Board amended the regulation in 2021 to require manufacturers to implement Unified Diagnostic Services (UDS) for OBD communications, which will provide more information related to emissions-related malfunctions that are detected by OBD systems, improve the usefulness of the generic scan tool to repair vehicles, and provide needed information on in-use monitoring performance. UDS implementation would be required for all 2027 and subsequent model year light- and medium-duty vehicles and engines, as well as some heavy-duty vehicles and engines.

Emissions Standards for Motorcycles

While representing a relatively small fraction of the emissions coming from the passenger vehicle fleet, CARB has also taken a comprehensive control approach for emissions from motorcycles. For the most part, motorcycles are on-road two-wheeled, self-powered vehicles with engine displacements of 50 cubic centimeters (cc) or greater. First adopted in 1975, ***California's On-Road Motorcycle Regulation*** obtained its first waiver of preemption from U.S. EPA in 1976. The 1975 regulation set emission standards for all motorcycles with engine displacements of at least 50 cc. The ***1998 Amendments to the California Motorcycle Regulation*** affected only Class 3 motorcycles (280 cc or greater) and set a Tier I and Tier II standard for 2004 and 2008

[51] U.S. EPA 2016 "California State Motor Vehicle Pollution Control Standards; Malfunction and Diagnostic System Requirements for 2004 and Subsequent Model Year Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles and Engines; Final Notice of Decision" https://www.gpo.gov/fdsys/pkg/FR-2016-11-07/pdf/2016-26861.pdf November 7, 2016 Federal Register Volume 81, Number 215 pp. 78143-78149

model years, respectively. While CARB has the same emission standard as the federal standard, the California standard applies to engines starting in 2008 rather than 2010 under the federal requirement. The California Motorcycle Regulation controls both exhaust emission standards and test procedures for on-road motorcycles and motorcycle engines. U.S. EPA granted CARB a waiver of preemption for the 1998 amendments in August 2006.[52] California's motorcycle exhaust emission test procedures are adopted from U.S. EPA's exhaust test procedures (CFR title 40, part 86, subparts E and F).

Since the 1990s, more stringent exhaust emissions standards have been developed by ~~other~~ jurisdictions outside of the United States ~~around the world~~, most notably the European Union's EU5 standard which became effective in 2020. These stringent exhaust standards have prompted the development of cleaner motorcycles than what are currently required in California, or anywhere in the nation. Thus, the 2022 State SIP Strategy includes the ***On-Road Motorcycle New Emission Standard*** measure, CARB's latest commitment to reduce emissions from motorcycles. While CARB's existing motorcycle evaporative standards are on par with most other jurisdictions around the world, additional evaporative reductions are technically feasible and other vehicle categories regulated by CARB have adopted much lower evaporative emissions standards. For example, CARB's Off Highway Recreational Vehicle (OHRV) category, which includes vehicles closely related to motorcycles such as off-highway motorcycles, requires lower evaporative emissions limits with more robust test methods. Since 2017, CARB has been working closely with many other jurisdictions in the spirit of trying to achieve harmonization where possible on lower and more robust motorcycle emissions standards. Specifically, CARB has worked closely with U.S. EPA, Environment Climate Change Canada, the European Union, and the United Nations. California also currently has no inspection and maintenance program for motorcycles. CARB has determined that tampering with emissions controls is a significant problem for this category.

The On-Road Motorcycle New Emissions Standard is anticipated to reduce emissions from new, on-road motorcycles (motorcycles) by adopting more stringent exhaust and evaporative emissions standards along with zero-emissions sales thresholds. The exhaust standards would be more stringent than current U.S. EPA standards and largely harmonized with European Union 5 (EU 5) standards. The evaporative standards would be more stringent than current U.S. EPA and EU 5 standards. This measure will also require an increase in new Zero-Emissions Motorcycle (ZEM) sales, starting at 10 percent in 2028 and progressing to 50 percent in 2035. CARB staff is in the process of developing new exhaust emissions standards for hydrocarbons (HC), NOx, CO and nonmethane HC (NMHC) that achieve a large degree of harmonization with more aggressive current European motorcycle emissions standards. CARB would also develop new evaporative emissions standards that largely harmonize with more aggressive current CARB OHRV emissions standards.

[52] https://www.epa.gov/state-and-local-transportation/vehicle-emissions-california-waivers-and-authorizations See Code of Federal Regulations Volume 71, Number 149 pp. 44027-44029

REDUCING IN-USE EMISSIONS

Inspection and Maintenance (I/M) Program

Although new vehicles sold in California are the cleanest in the world, the millions of passenger vehicles on California roads, and the increasing miles they travel each day make them our single greatest source of NOx emissions. While the new vehicles in California may start out with very low emissions, improper maintenance or faulty components can cause vehicle emission levels to sharply increase. Studies estimate that approximately 50 percent of the total emissions from late-model vehicles are excess emissions, meaning that they are the result of emission-related malfunctions.

California's ***Smog Check Program*** works to ensure that the vehicles remain as clean as possible over their entire life. The Bureau of Automotive Repair (BAR) is the State agency charged with administration and implementation of the Smog Check Program. The Smog Check Program is designed to reduce air pollution from California registered vehicles by requiring periodic inspections for emission-control system problems, and by requiring repairs for any problems found. In 1998, the Enhanced Smog Check program began in which Smog Check stations relied on the BAR-97 Emissions Inspection System (EIS) to test tailpipe emissions with either a Two-Speed Idle (TSI) or Acceleration Simulation Mode (ASM) test depending on where the vehicle was registered. For instance, vehicles registered in urbanized areas received an ASM test, while vehicles in rural areas received a TSI test.

In 2009, the following requirements were added in to improve and enhance the Smog Check Program, making it more inclusive of motor vehicles and effective on smog reductions:

- Low pressure evaporative test;
- More stringent pass/fail cutpoints;
- Visible smoke test; and
- Inspection of light- and medium-duty diesel vehicles.

The next major change in the Smog Check Program was due to AB 2289, adopted in October 2010, a new law restructuring California's Smog Check Program, streamlining and strengthening inspections, increasing penalties for misconduct, and reducing costs to motorists. This new law, supported by CARB and BAR, promised faster and less expensive Smog Check inspections by talking advantage of the second generation of OBD software installed on all vehicles. The new law also directs vehicles without this equipment to high-performing stations, helping to ensure that these cars comply with current emission standards. This program will reduce consumer costs by having stations take advantage of diagnostic software that monitors pollution-reduction components and tailpipe emissions. Beginning mid-2013, testing of passenger vehicles using OBD was required on all vehicles model years 2000 or newer.

In the South Coast, Smog Check requirements are consistent with the most stringent of any other I/M program in the nation. Biennial, change of ownership, and initial registration Smog Check inspections ensure that the in-use passenger vehicle fleet continues to operate as cleanly as possible. Additionally, a portion of vehicles must receive their biennial Smog Check inspections at STAR certified test only or test/repair stations that are required to meet high inspection-based standards.

Based on recent CARB analysis in support of the Smog Check Performance Standard Modeling and Program Certification for the 70 Parts Per Billion 8-hour Ozone Standard (CARB Board meeting, March 23, 2023), the Smog Check Program meets the federal I/M requirements for all applicable nonattainment areas classified as Moderate or above, including the South Coast, San Joaquin Valley, Coachella Valley, Western Mojave Desert, San Diego County, Sacramento Metro, Eastern Kern, and Ventura County nonattainment areas, and the 75 parts per billion 8-hour ozone standard for the San Diego County and Eastern Kern nonattainment areas.

CARB staff's discovery of Volkswagen's (VW's) use of illegal defeat devices—software designed to cheat on emissions tests—in certain 2009 to 2016 model year diesel cars that were sold in California illustrates the success and stringency of California's program to control emissions from the in-use passenger vehicle fleet, and to identify excess in-use emissions. Due to the discovery of VW's emissions cheating scandal and subsequent actions to remediate the environmental damages caused by these vehicles' excess emissions, the VW Environmental Mitigation Trust provides about $423 million for California to fund projects that accelerate the turnover of mobile sources to cleaner, lower-emitting vehicles and engines.

REDUCING VEHICLE MILES TRAVELLED (VMT)

In addition to the potential measures described above to control emissions from on-road mobile sources, reducing vehicle miles traveled (VMT) is also necessary to directly and immediately reduce mobile source NOx and ROG emissions. CARB works cooperatively with other State agencies, and the local air districts, metropolitan planning organizations (MPOs), and other local entities to implement the Sustainable Communities and Climate Protection Program and related efforts. This involves developing, adopting, and implementing Sustainable Communities Strategies (SCS), which include VMT reduction targets as required under Senate Bill 375. That said, reducing VMT is difficult; many factors influence an individual's travel choices, and these choices interact with one another in a complex manner that is not always well understood. In the 2020 Mobile Source Strategy, CARB identified several strategies that could be undertaken to assist in achieving additional reductions and support implementation of regional SCSs. Building on the strategies identified in the 2020 MSS, in the 2022 State SIP Strategy, CARB committed to the ***Enhanced Regional Emission Analysis in SIPs*** measure, which will reduce VMT from on-road mobile sources through a Transportation Control Measure (TCM), a strategy to reduce emissions or concentration of air pollutants by reducing the number of vehicle trips or VMT or improving traffic flow. This measure was originally proposed as a public measure suggestion, based on the input from community-based organizations and members of the public. During the development of the 2022 State SIP Strategy, CARB staff developed this public measure suggestion into a SIP measure commitment.

CARB is considering the following measures to further reduce ROG and NOx emissions from on-road motor vehicles by reducing VMT:

- Change MVEB Development Process:
  CARB would evaluate the existing MVEB development process, including tools and the latest planning assumptions used in the analysis. Based on the review, CARB could modify the framework for developing MVEBs when considering how to address gaps in emissions reductions needed to demonstrate attainment of different NAAQS. This framework could explore additional emissions reductions from the on-road sector to attain the 70 ppb 8-hour ozone standard and progress towards State air quality goals. This framework would need to ensure that the MVEB is consistent with other applicable requirements such as emission inventory, reasonable further progress, control measures, and attainment demonstration.
- RACM Analysis:
  CARB would compile a comprehensive list of TCMs implemented or considered by federal, state, regional, and local agencies. This list would provide more choices and new measures subject to RACM analysis for potential inclusion as an enforceable measure in the SIP. This effort may also evaluate the emission reduction potential, feasibility, and cost-effectiveness of each TCM on the list. In addition, CARB could consider providing a quantification methodology to improve and standardize the RACM analysis as part of SIPs across air districts. In pursuing this measure, CARB would work in a collaborative effort with U.S. EPA, California MPOs, and air districts to develop the guidance and implement each potential TCM identified through the RACM.
- Update Guidance for CMAQ and Motor Vehicle Fees:
  CARB would update the methodology and guidelines for estimating the cost-effectiveness of some of the most widely implemented transportation-related air quality projects using CMAQ and motor vehicle fees. Further, these guidelines would establish methods to quantify emission benefits and cost-effectiveness of new available transportation options and technologies. This update may also include critical inputs associated with emissions estimation to streamline the quantification of cost-effectiveness of various transportation projects. This action will accelerate the penetration of new strategies and maximize the emissions reductions from the transportation sector in the near-term. CARB would work with FHWA, the California Department of Transportation, MPOs, and air districts in pursuing this measure.

FUELS

Cleaner fuel has an immediate impact in reducing emissions from the mobile source, and thus represent an important component in reducing NOx and ROG emissions from the passenger vehicle fleet. California's stringent air quality programs treat motor vehicles and their fuels holistically (as a system, rather than as separate components). As a result, CARB's fuels programs achieve significant reductions in criteria emissions from gasoline-fueled vehicles used in California.

California's Reformulated Gasoline program (CaRFG) sets stringent standards for California gasoline that produced cost-effective emission reductions from gasoline-powered vehicles resulting in California gasoline being the cleanest in the world. California's cleaner-burning gasoline regulation is one of the cornerstones of the State's efforts to reduce air pollution and cancer risk. Reformulated gasoline is fuel that meets specifications and requirements established by CARB. The results from cleaning up fuel can have an immediate impact as soon as it is sold in the State. Vehicle manufacturers design low-emission vehicles to take full advantage of cleaner-burning gasoline properties.

The CaRFG program has been implemented in three phases:

- Phase 1, which was implemented in 1991, eliminated lead from gasoline and set regulations for deposit control additives and reid vapor pressure (RVP).
- Phase 2 CaRFG (CaRFG2 in 1994) set specifications for sulfur, aromatics, oxygen, benzene, T50, T90, Olefins, and RVP and established a Predictive Model.
- The final and current phase, Phase 3 CaRFG, eliminated, in 1996, the use of methyl-tertiary-butyl-ether in California gasoline.

The use of cleaner-burning gasoline in the South Coast has been required since March 1996. ***Phase 3 CaRFG*** also revised specifications for Phase 3 gasoline that reduces ozone precursor emissions (including aromatic hydrocarbons and olefins) by ~15 percent and toxic air contaminant emissions by about 40 percent, compared with CaRFG2. The regulation strengthened specification requirements for cleaner-burning gasoline, including:

- Reduced sulfur content. Sulfur inhibits the effectiveness of catalytic converters. Cleaner-burning gasoline enables catalytic converters to work more effectively and further reduce tailpipe emissions.
- Reduced benzene content. Benzene is known to cause cancer in humans. Cleaner-burning gasoline has about one-half the benzene of earlier gasoline, thus reducing cancer risks.
- Reduced levels of aromatic hydrocarbons (ozone precursor).
- Reduced levels of olefins (ozone precursor).
- Reduced reid vapor pressure, which ensures that gasoline evaporates less readily.
- Two specifications for reduced distillation temperatures, which ensure the gasoline burns more completely, and
- Use of an oxygen-containing additive, such ethanol, which also helps the gasoline burn more cleanly.

STEP 2(B): OTHER STATES' AND NONATTAINMENT AREAS' LIGHT-DUTY CONTROL MEASURES

Table 7 summarizes the most stringent control measures currently in use in any state or nonattainment that have been identified and discussed for on-road light-duty vehicles. Each of the measures identified in this table are discussed in more detail in this section, below.

Table 7: Comparison of Stringency – Light-Duty Measures

CARB Control Programs Compared to Federal Standards and Control Programs in Other States and Nonattainment Areas

Type of Control Measure	Most Stringent Control Program Identified	Summary of Findings from Analysis	Other Jurisdiction(s) Analyzed
On-Road Light-Duty Vehicles			
New Vehicle Standards			
New Vehicle Standards: Emissions standards (passenger cars)	LEV III program (CARB) MY 2015 - 2025 (part of Advanced Clean Cars I program) LEV IV program (CARB) MY 2026 - 2035 (part of Advanced Clean Cars II program)	17 states have adopted California's Low Emission Vehicle III (LEV III) program, which set fleet average criteria pollutant performance standards for new light- and medium-duty vehicles for MY 2015 - 2025 CARB will further increase the stringency of CARB's criteria pollutant emission standards with LEV IV program, a part of ACC II, for MY 2026 – 2035. LEV IV consists of these components: • Prevents potential emission backsliding of ICEVs that is otherwise possible under the existing regulations by applying the exhaust and evaporative emission fleet average standards exclusively to combustion engines. Although the NMOG+NOx fleet average for light-duty vehicles remains at 30 mg/mi for MY 2026-2035, the medium-duty vehicle fleet average declines from 178 mg/mi to 150 mg/mi for Class 2b and from 247 mg/mi to 175 mg/mi for Class 3. Additionally, LEV IV eliminates the composite standard option for SFTP emissions to ensure maximum emissions control on all test cycles. • For light-duty vehicles, lowers the maximum NMOG+NOx exhaust emission rate from 160 mg/mi in MY 2025 to 70 mg/mi in MY 2029; the US06 PM emission rate from 6 mg/mi to 3 mg/mi; and evaporative running loss emission rates from 0.05 g/mi to 0.01 g/mi. For medium-duty vehicles, lower the maximum NMOG+NOx exhaust emission rate from 250 mg/mi in MY 2025 to 170 mg/mi in MY 2028 for Class 2b and from 400 mg/mi to 230 mg/mi for Class 3. • Reduces cold start emissions by applying the emission standards to a broader range of in-use driving conditions. (Starts after the vehicle engine has been shut-off for more than 12 hours are considered cold starts.) • Medium-duty vehicles with gross combined weight rating above 14,000 lbs. would also be subject to in-use test standards to capture emissions while towing.	17 States have adopted the LEV III requirements of ACC I under the provisions of Section 177: • NY, MA, VT, ME, PA, CT, RI, WA, OR, NJ, MD, DE, CO, MN, NV, VA, and NM LEV IV regulations will control emissions of criteria pollutants from the exhaust and fuel systems of conventional motor vehicles. They would apply to vehicles produced and delivered for sale in California beginning with the 2026 model year. They are more stringent than the existing federal Tier 3 standards for the same pollutants from motor vehicles for the 2025 and subsequent model years that were set by the U.S. EPA. Five other states have adopted the new LEV IV from ACC2 under Section 177: MA, OR, WA, VT, and NY
New Vehicle Standards:	ZEV program (CARB) MY 2015 - 2025 (part of Advanced Clean Cars I program)	15 states have matched California's current ZEV Regulation for battery electric vehicles (BEVs), hydrogen fuel cell vehicles (FCEVs), and plug-in hybrid electric vehicles (PHEVs).	15 states have adopted the ZEV requirements of ACC I under the provisions of Section 177:

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Type of Control Measure	Most Stringent Control Program Identified	Summary of Findings from Analysis	Other Jurisdiction(s) Analyzed
On-Road Light-Duty Vehicles			
Zero-emission Requirements (passenger cars)	ACC II's ZEV Program (CARB) MY 2026 – 2035 (part of Advanced Clean Cars II program)	CARB will further increase the stringency of sales requirements for ZEVs and PHEVs through the ACC II program's ZEV regulation, which will require manufacturers to deliver for sale increasing percentages of ZEVs and PHEVs as a portion of their overall product deliveries between model years 2026 and 2034 and reach 100-percent ZEVs in 2035 (and after). ACC II also includes innovative charging and ZEV assurance measures, which include ZEV warranty and durability requirements, serviceability, and battery labeling requirements	• NY, MA, VT, ME, CT, RI, WA, OR, NJ, MD, CO, MN, NV, VA, and NM Five other states have adopted the new ZEV standards from ACC2 under Section 177: MA, OR, WA, VT, and NY There are no comparable federal standards for sales of zero-emission vehicles.
New Vehicle Standards: On-Board Diagnostic (OBD) systems requirements	California OBD II Requirements (CARB)	CARB's On-Board Diagnostic II (OBD II) Systems Requirements exceed Federal requirements in stringency. OBD II ensures that the in-use fleet continues to operate as cleanly as possible.	In practice, virtually all vehicles sold in the U.S. are designed and certified to meet California's OBD II requirements, regardless of where in the U.S. they are sold.
New Vehicle Standards: Emissions standards (Motorcycles)	California's On-Road Motorcycle Regulation (CARB) Future Measure: *On-Road Motorcycle New Emissions Standards (CARB)*	CARB's emission standards and in-use testing for on-road motorcycles (California's On-Road Motorcycle Regulation) set a Tier I and Tier II standard for 2004 and 2008 model years, respectively, for Class 3 motorcycles (280 cc or greater). California's evaporative emission limits for motorcycles exceed the stringency of any other in the nation, while exhaust emission a limits and test procedures are consistent with U.S. EPA's. The 2022 State SIP Strategy committed to the On-Road Motorcycle New Emission Standard, which will further reduce emissions from new-on-road motorcycles through the adoption of more stringent exhaust and evaporative emissions standards along with zero-emissions sales thresholds. The exhaust standards would be more stringent than current U.S. EPA standards and largely harmonized with European Union 5 (EU 5) standards. The evaporative standards would be more stringent than current U.S. EPA and EU 5 standards. This measure will also require an increase in new Zero-Emissions Motorcycle (ZEM) sales, starting at 10 percent in 2028 and progressing to 50 percent in 2035. *(Note: CARB has committed to pursue the On-Road Motorcycle New Emissions Standard measure, but this measure has yet to be proposed to the Board for approval/adoption)*	California is the only state with emission control requirements for on-road motorcycles that exceed the stringency of U.S. EPA requirements.
In-Use Emission Controls			
In-Use Emission Controls: Inspection and maintenance program (I/M program)	Smog Check Program (CARB and administered by the California Department of Consumer Affairs' Bureau of Automotive Repair)	The Inspection / Maintenance (I/M) Program testing and in-use emission controls in the South Coast are consistent with the most stringent of any other I/M program in the nation. Biennial, change of ownership, and initial registration Smog Check inspections ensure that the in-use passenger vehicle fleet continues to operate as cleanly as possible. Additionally, a portion of vehicles must receive their biennial Smog Check inspections at STAR certified test only or test/repair stations that are required to meet high inspection-based standards.	32 states and areas have an I/M program in at least a portion of their state or area (AZ, CO, CA, CT, DE, GA, ID, IL, IN, LA, ME, MD, MA, MO, NV, NH, NJ, NM, NC, NY, OH, OR, PA, RI, UT, TN, TX, VA, VT, WA, WI, and DC).

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Type of Control Measure	Most Stringent Control Program Identified	Summary of Findings from Analysis	Other Jurisdiction(s) Analyzed
On-Road Light-Duty Vehicles			
		Based on recent CARB analysis in support of the Smog Check Performance Standard Modeling and Program Certification for the 70 Parts Per Billion 8-hour Ozone Standard (CARB Board meeting, March 23, 2023), the Smog Check Program meets the federal I/M requirements for all applicable nonattainment areas classified as moderate or above, including the South Coast Air Basin, San Joaquin Valley, Coachella Valley, Western Mojave Desert, San Diego County, Sacramento Metro, Eastern Kern, and Ventura County nonattainment areas, and the 75 parts per billion 8-hour ozone standard for the San Diego County and Eastern Kern nonattainment areas.	
In-Use Emission Controls: Fleet Rules	Clean Miles Standard (CARB)	The Clean Miles Standard (CMS) regulation, which was adopted by CARB in 2021, is to reduce GHG emissions from ride-hailing services offered by transportation network companies (TNCs), on a per--passenger mile basis, and promote electrification of the fleet by setting an electric vehicle mile target. TNCs provide on-demand rides through a technology--based platform that connects passengers with drivers using personal or rented vehicles. The CMS includes two annual targets – an eVMT target as well as a GHG target in the metric of g CO2/PMT. The eVMT target would require TNCs to achieve 90 percent eVMT by 2030. The GHG target would require TNCs to achieve 0 g CO2/PMT by 2030 through electrification as well as other strategies, including increasing shared rides on their platform, improving operational efficiency (route planning and reduced mileage without passengers), and obtaining optional GHG credits. Optional GHG credits may be requested by the TNCs and approved by the CPUC for ride-hailing trips that are connected to mass transit through a verified booking process, and for investing in bicycle and sidewalk infrastructure projects that support active transportation.	CARB staff is unaware of any other state or jurisdiction with VMT reduction programs via Transportation Network Companies (TNCs).
In-Use Emission Controls: Transportation Control Measure (TCM) Reducing Vehicle Miles Travelled (VMT)	Future Measure: *Enhanced Regional Emission Analysis in SIPs (CARB)*	CARB is considering the following measures to further reduce ROG and NOx emissions from on-road motor vehicles by reducing VMT: • Change MVEB Development Process: CARB would evaluate the existing MVEB development process, including tools and the latest planning assumptions used in the analysis. Based on the review, CARB could modify the framework for developing MVEBs when considering how to address gaps in emissions reductions needed to demonstrate attainment of different NAAQS. • RACM Analysis: CARB would compile a comprehensive list of TCMs implemented or considered by federal, state, regional, and local agencies to provide more choices and new measures for potential inclusion as an enforceable measure in the SIP. This effort may also evaluate the emission reduction potential, feasibility, and cost-effectiveness of each TCM on the list, and/or provide a quantification methodology to improve and standardize the RACM analysis as part of SIPs across air districts. • Update Guidance for CMAQ and Motor Vehicle Fees: CARB would update the methodology and guidelines for estimating the cost-effectiveness of some of the most widely implemented transportation-related air quality projects using CMAQ and motor vehicle fees. Further, these guidelines would establish methods to quantify	CARB staff is unaware of any other state or jurisdiction that is reducing VMT through similar programs.

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Type of Control Measure	Most Stringent Control Program Identified	Summary of Findings from Analysis	Other Jurisdiction(s) Analyzed
On-Road Light-Duty Vehicles			
		emission benefits and cost-effectiveness of new available transportation options and technologies. This update may also include critical inputs associated with emissions estimation to streamline the quantification of cost-effectiveness of various transportation projects. *(Note: CARB has committed to pursue the Enhanced Regional Emission Analysis in SIPs measure, but this measure has yet to finalized)*	
Fuel Controls			
Gasoline Standards	CaRFG Phase 3 (CARB)	The CaRFG Phase III program requires that California gasoline is the lowest-emitting and cleanest-burning in the nation. It includes more stringent requirements for emission controls than the applicable federal standard (U.S. EPA's RFG Phase II). Relative to federal gasoline, CARB's reformulated gasoline program reduces NOx emissions by 15 percent and TACs by 50 percent.	U.S. EPA RFG Phase II is currently required in nonattainment areas in 17 states and the District of Columbia (including the South Coast) • Areas of CA, CT, DE, the District of Columbia, IL, IN, MD, NJ, NY, PA, TX, VA, WI Other "opt in" areas for Federal RFG Phase II • Entire states: CT and DE • Portions of states: IL, KT, MD, ME, MA, MS, NH, NJ, NY, RI, TX, VA

NEW VEHICLE STANDARDS

Emission standards and ZEV Regulation

CARB's new vehicle standards for on-road light-duty vehicles are consistent with the most stringent of any other area in the nation. Due to constraints in the Act, California is the only state that can set new vehicle standards (including control measures such as emission standards, ZEV sales mandates, warranty provisions, and on-board diagnostic (OBD) requirements) that are more stringent than U.S. EPA's national standards. Other states can adopt California programs for which U.S. EPA has provided California with waivers.[53] These states are also known as the "Section 177 States" in reference to this provision of the Act. The ability to set more stringent controls than U.S. EPA, however is unique to California, and thus ensures that the California current control measures for new vehicle and engine standards are at least equal in stringency to the most stringent controls in the nation.

As a result of CARB's efforts, and as provided for in the Act, other states have now adopted elements of CARB's ACC I program, including seventeen states that have adopted the equivalent of CARB's LEV III program, and fifteen states that have adopted the equivalent of CARB's ZEV program, as listed below in Table 8.

[53] The Clean Air Act allows other states to adopt California's on- and off-road vehicle or engine emission standards under section 209 of the Clean Air Act. Section 209 requires, among other things, that such standards be identical to the California standards for which a waiver or authorization has been granted. States are not required to seek U.S. EPA approval to adopt standards identical to the California standards that have received a waiver or authorization.

Table 8: ACC I Section 177 States: LD Emission Standards and ZEV Regulation

Section 177 States	2012 ZEV (MY 2015 – 2025)	2012 LEVIII (MY 2015 – 2025)
Colorado	X	X
Connecticut	X	X
Delaware		X
Maine	X	X
Maryland	X	X
Massachusetts	X	X
Minnesota	X	X
Nevada	X	X
New Jersey	X	X
New Mexico	X	X
New York	X	X
Oregon	X	X
Pennsylvania		X
Rhode Island	X	X
Washington	X	X
Vermont	X	X

Additionally, five other states have adopted the requirements of ACC II, including the LEV IV and ZEV requirements: Massachusetts, Oregon, Washington, Vermont, and New York.

On-Board Diagnostics (OBD) Requirements

California's OBD requirements for on-road light-duty vehicles are consistent with the most stringent of any other area in the nation. CARB's OBD II program requires that all 1996 and newer model year gasoline and alternate fuel passenger cars and trucks are required to be equipped from the factory with an OBD II system. All 1997 and newer model year diesel fueled passenger cars and trucks are required to meet the OBD II requirements.

U.S. EPA also requires all 1996 and newer model year passenger cars and trucks sold in any state to meet the U.S. EPA OBD requirements.[54] While U.S. EPA's OBD requirements differ slightly from California's OBD II requirements, virtually all vehicles sold in the U.S. are designed and certified to meet the more stringent California's OBD II requirements, regardless of where in the U.S. they are sold.[55] U.S. EPA issued a waiver for California's OBD II program in November 2016, indicating that the California OBD II system requirements are at least as protective of public health as U.S. EPA's OBD requirements.[56]

[54] CARB 2015 "On-Board Diagnostic II (OBD II) Systems - Fact Sheet / FAQs" https://www.arb.ca.gov/msprog/obdprog/obdfaq.htm
[55] CARB 2009 https://www.arb.ca.gov/msprog/smogcheck/march09/transitioning_to_obd_only_im.pdf
[56] U.S. EPA 2016 "California State Motor Vehicle Pollution Control Standards; Malfunction and Diagnostic System Requirements and Enforcement for 2004 and Subsequent Model Year Passenger Cars, Light Duty Trucks, and Medium Duty Vehicles and Engines; Notice of Decision" https://www.gpo.gov/fdsys/pkg/FR-2016-11-07/pdf/2016-26861.pdf Federal Register Vol. 81, No. 215 pp. 78143

Motorcycle emission standards and in-use emissions testing

CARB’s emission standards and in-use testing for on-road motorcycles exceeds the stringency of any other in the nation. CARB’s emission standards and in-use testing for on-road motorcycles (California’s On-Road Motorcycle Regulation) set a Tier I and Tier II standard for 2004 and 2008 model years, respectively, for Class 3 motorcycles (280 cc or greater). California’s evaporative emission limits for motorcycles exceed the stringency of any other in the nation, while exhaust emission a limits and test procedures are consistent with U.S. EPA’s.

The 2022 State SIP Strategy committed to the On-Road Motorcycle New Emission Standard measure, which will further reduce emissions from new-on-road motorcycles through the adoption of more stringent exhaust and evaporative emissions standards along with zero-emissions sales thresholds. The exhaust standards would be more stringent than current U.S. EPA standards and largely harmonized with the EU 5 standards. The evaporative standards would be more stringent than current U.S. EPA and EU 5 standards. This measure will also require an increase in new Zero-Emissions Motorcycle sales, starting at 10 percent in 2028 and progressing to 50 percent in 2035.

California is the only state with emission control requirements for on-road motorcycles that exceed the stringency of U.S. EPA requirements.

REDUCING IN-USE EMISSIONS

The I/M Program testing and in-use emission controls in the South Coast are consistent with the most stringent of any other I/M program in the nation. California’s Smog Check Program is designed to reduce air pollution from California-registered passenger vehicles by requiring periodic inspections for emission control system problems, and by requiring repairs for any problems found. In California, technicians are required to perform an OBD II check (visual and functional) during the Smog Check inspection. On board, self-diagnostic equipment monitors a passenger vehicle’s control components to ensure they are functioning correctly. Specifically, the technician visually checks to make sure the warning light is functional, and then the Smog Check test equipment communicates with the on-board computer for fault information. If a fault is currently causing the light to be on, the malfunctioning component must be repaired in order to pass the inspection.

- Stringency and Frequency of I/M Program

  The I/M Program testing and in-use emission controls in the South Coast are consistent with the most stringent of any other I/M program in the nation. Biennial, change of ownership, and initial registration Smog Check inspections ensure that the in-use passenger vehicle fleet continues to operate as cleanly as possible. This is as frequent as Smog Check requirements as any other part of California and is consistent with the most stringent of any other area in the nation, and is the same frequency as the other Extreme nonattainment area for ozone in the country, the San Joaquin Valley and the Coachella Valley. Additionally, a portion of vehicles must receive their biennial Smog Check inspections at STAR certified test only or test/repair stations that are required to meet high inspection-based standards.

Thirty-two other states and local areas have an I/M program in at least a portion of their state that is also consistent with the federal I/M program.

- Effectiveness of Inspection and Testing Methodology

Nearly every state besides California that has an I/M program currently relies exclusively on vehicle OBD II system inspections as the basis for its emission inspections of 1996 and newer vehicles.[57] Only California and Colorado still use tailpipe testing: Colorado relies on tailpipe testing exclusively; California's Smog Check Program currently includes two overlapping inspection procedures. Under California's Smog Check program, each 1996 and newer model year vehicles vehicle is subjected to a tailpipe emission test, and also to an inspection of its OBD II system, which independently monitors the performance of the vehicle's emission control systems and related components during everyday driving.

U.S. EPA acknowledges the viability of OBD II inspections by providing full emission credits to state I/M programs that are based on OBD II only inspections. While U.S. EPA and CARB have generally found that OBD II systems are more effective in detecting emission-related malfunctions on in-use vehicles compared to existing tailpipe testing procedures, the Smog Check Program utilizes both approaches – erring on the side of increased stringency – to ensure each vehicle passes both tests.[58]

Furthermore, to ensure that California's Smog Check Program remains as effective as possible, CARB has committed in the 2016 State SIP Strategy to work with BAR staff to perform a joint agency, comprehensive evaluation of California's in use performance focused inspection procedures and, if necessary, make improvements to increase the Smog Check Program's effectiveness. CARB will conduct a study to further evaluate California's in-use performance inspection procedures through analysis of the Smog Check database and vehicle sampling obtained through BAR's Random Roadside Inspection Program. This will, as necessary: inform improvements in inspection test procedures; address program fraud; improve the effectiveness and durability of emission related repair work; and improve the regulations governing the design of in-use performance systems on motor vehicles.

FUELS

U.S. EPA administers federal RFG regulations requiring that gasoline sold in various areas of the country with poor air quality meet standards for federal reformulated gasoline. Most gasoline sold in California is subject to the federal RFG standards as well as having to meet the CaRFG standards. All diesel fuel sold in California is subject to both California and federal standards. These standards work complimentarily.

[57] CARB 2009 https://www.arb.ca.gov/msprog/smogcheck/march09/transitioning_to_obd_only_im.pdf

[58] California's Smog Check data indicates that vehicles are more than twice as likely to fail an OBD II-based inspection than the required tailpipe emissions test. CARB 2009 https://www.arb.ca.gov/msprog/smogcheck/march09/transitioning_to_obd_only_im.pdf

Since 1995, U.S. EPA has required federal RFG to be used in the worst-polluted areas in the nation – including the South Coast and other California nonattainment areas (Federal RFG Phase I 1995 requirements). Effective in 2000, U.S. EPA increased the stringency of the federal RFG requirements under the RFG II program. In 2014, U.S. EPA adopted its most recent amendments, Tier 3 Fuel standards, which require lower sulfur content in gasoline to a maximum of 10 ppm beginning in 2017 on an annual average basis, and lower Reid Vapor Pressure to zero, reducing fuel vapor emissions to near zero levels. The program also reduces PM emissions by approximately 70 percent, and NOx and VOCs emissions by approximately 80 percent, relative to the former federal Phase II levels (which were set in 1995). Sulfur content in gasoline is reduced from 30 parts per million (ppm) to 10 ppm on average.

In aggregate, the Tier 3 RFG requirements bring federal gasoline fuel controls in line with those already in place in California. However, CARB's gasoline specifications under the CaRFG requirements are still more stringent than the federal program. CARB significantly controls NOx emissions under requirements in CaRFG Phase 3 that are not mirrored by comparably stringent controls on NOx emissions under the federal RFG Phase 3 requirements. Relative to federal gasoline, CARB's reformulated gasoline program reduces NOx emissions by 15 percent and TACs by 50 percent. Additionally, CARB requires sulfur contents to be capped at 10 ppm, rather than an annual average of 10 ppm as required federally.

Beyond the Federal requirements described above, the Act also allows states to adopt unique fuel programs to meet local air quality needs, which are referred to as Boutique Fuel Programs. Most of these programs set lower gasoline volatility requirements than the federal standards, and most are effective for only part of the year. As of January 19, 2017, U.S. EPA provided as snapshot of these programs that had been approved in SIPs,[59] which are listed below in Table 9 below. Table 9 also compares the stringency of the boutique fuel requirements in these areas to CARB's CaRFG Phase 3. This comparison shows that the CaRFG Phase 3 program requires that California gasoline is the lowest-emitting and cleanest-burning in the nation.

[59] U.S. EPA, 2017 https://19january2017snapshot.epa.gov/gasoline-standards/state-fuels_.html

Table 9: Boutique Gasoline Fuel Programs in the U.S.

Type of Fuel Control	State	Comparison to CaRFG Phase 3
Reid Vapor Pressure (RVP) of 7.8 psi	PA and IN (year-round) TX (May 1 – Oct 1)	CaRFG Phase III sets flat limits of RVP of 7.0 psi (oxygenated fuels) and 6.9 psi (non-oxygenated fuels)
RVP of 7.0 psi	KS, MI, MO, TX	CaRFG Phase III sets flat limits of RVP of 7.0 psi (oxygenated fuels) and 6.9 psi (non-oxygenated fuels)
Cleaner Burning Gasoline (Summer)	AZ	As of 2005, AZ requires CARB's CaRFG Phase III in certain areas
Cleaner Burning Gasoline (non-Summer)	AZ	As of 2005, AZ requires CARB's CaRFG Phase III in certain areas
Winter Gasoline (aromatics & sulfur)	NV	In 1999, Clark County (Las Vegas) adopted California sulfur and aromatics limits

STEP 3(A): EVALUATION OF STRINGENCY: LIGHT-DUTY CONTROL MEASURES

Step 3(a) calls for an evaluation of each of the potential control measures identified in Step 2, in order to evaluate their stringency and determine whether they meet all applicable requirements to satisfy the definitions of MSM as discussed in Section 1 and Section 2.

As shown in Table 7 in Step 2(b), CARB's light-duty control measures are the most stringent in the nation. This comparison between CARB's control measures and the measures currently in place at the federal level and/or within other states and jurisdictions illustrates the stringency of the current CARB on-road light-duty vehicle control program, which meets the stringency requirements of MSM.

Furthermore, CARB staff have conducted an analysis of the timing of the mobile source control measures committed to in the 2022 State SIP Strategy, which go beyond the stringency of the current control program as it is now being implemented and thus beyond MSM. Many of these measures are still in their development phases and are not yet being implemented; the development timeline, however, is critical to allowing industry and technological advancements to progress sufficiently such that the newly emerging technologies called for in these regulatory actions (most of which are technology-inducing regulations) have sufficient time to attain market readiness. Table 10, below, discusses the timeframe considerations for each of the applicable light-duty control measures, and indicates why a more expedited timeframe is neither technologically nor economically feasible. For these reasons, the measures meet the MSM requirement of being phased in as "expeditiously as practicable" and go beyond MSM requirements in terms of stringency.

Table 10: Light-Duty Control Measures Stringency and Timeline for Implementation

Measures	Implementation Begins	12 ug/m3 Annual PM2.5 Standard (2012)
New Passenger Vehicle Standards		
Advanced Clean Cars (ACC) (Includes both LEV III and ZEV Program)	ongoing	MSM
Advanced Clean Cars 2 (ACC 2) (Includes both LEV IV and Amendments to the ZEV Program)	2026	MSM
Recently amended in 2022 to require that new vehicle sales are 100% ZEV by 2035, the ACC program requires increasingly stringent standards for gasoline cars and passenger trucks. The currently adopted standards and requirements, including the zero-emission requirements of ACC 1 and ACC 2, are technology-forcing and are the most stringent in the nation; further stringency would not be feasible. An accelerated timeline would also not be feasible as new car standards need years of lead time to be developed, certified, manufactured, and implemented.		
In-Use Emission Control Measures		
On-Board Diagnostics II (OBD II)	ongoing	MSM
Recently amended in 2021 to require program updates that address cold start emissions and diesel PM monitoring, many of the regulatory changes to OBD II are phased-in through 2027 to allow sufficient lead time for the necessary technological development, manufacturing, testing, certification, and implementation for the requisite hardware and software changes; accelerated timelines would not be feasible. OBD II requirements are the most stringent in the nation; further stringency would not be feasible.		
Smog Check	ongoing	MSM
Amended in 2010 to enhance program efficacy with new technologies and test methods. California Smog Check requirements are the most stringent passenger vehicle inspection and maintenance in the nation; further stringency would not be feasible.		
Control Measures to Reduce Vehicle Miles Traveled (VMT)		
Clean Miles Standard (2022 State SIP Strategy measure, adopted in 2021)	2023	MSM
Recently adopted in 2021 to set eVMT and GHG requirements for transportation network companies (TNCs). The Clean Miles Standard's zero-emissions technology requirements are the most stringent standard in the nation; further stringency would not be feasible. An accelerated timeline would also not be feasible as standards and fleet requirements need lead time to be implemented.		
Motorcycle Control Measures		
California On-Road Motorcycle Regulation	ongoing	MSM
On-Road Motorcycle New Emission Standards (2022 State SIP Strategy measure with commitment)	2025	Beyond MSM
Proposed amendments to California's on-road motorcycle program would require more stringent exhaust emissions standards that would harmonize with European standards, with a Board hearing date anticipated in 2023. Amendments may also include evaporative emissions standards and ZEM sales thresholds. With these amendments, the stringency of CARB's motorcycle program will exceed the stringency of any other U.S. jurisdiction, and will rely on recent developments in emission control technologies; further stringency would not be feasible. Accelerated timelines would also not be feasible as new standards need years of lead time for staff to evaluate feasibility, and for compliant motorcycle technologies to be developed, certified, and implemented.		
Fuels Control Measures		
California's Reformulated Gasoline (CaRFG) Phase III	ongoing	MSM
Amended in 2003 to require the removal of MTBE, and to included refinery limits and cap limits. CARB's gasoline standards and requirements are the most stringent in the world; it is not feasible to require further stringency of fuel specifications.		

STEP 3(B): EVALUATION OF FEASIBILITY: LIGHT-DUTY CONTROL MEASURES

Step 3(b) calls for an assessment of the feasibility of implementing any measure that is not included in the proposed South Coast SIP, but which is identified as a potential MSM control measure in Step 2. During the public process for the 2022 State SIP Strategy, CARB staff received public measure suggestions for additional potential light-duty measures, as described below:

- Light-Duty Vehicle Fleet Regulation
  This measure would involve CARB developing a regulation to implement fleet requirements for public and rental passenger vehicle fleets. This could take the form similar to the recently adopted Clean Miles Standard, which requires an increasing number of electric miles service for ride hailing platforms, or it could take the form of a more traditional fleet rule that mandates the purchase of ZEVs. CARB has a suite of regulations in place to control emissions from light-duty vehicles, and continues to pursue new regulatory actions, in addition to incentives and other complementary programs that can help to accelerate emissions reductions. One such action is the recently adopted Advanced Clean Cars II program, which sets manufacturer sales requirements and continues to drive introduction of ZEVs into the light-duty fleet. Even so, additional fleet average requirements could potentially support a faster rate of transition to zero-emissions, especially in public and private passenger vehicle fleets, which are particularly suited for electrification.

  CARB staff is continuing to explore this suggested measure. CARB staff anticipate that the recently adopted ***Advanced Clean Cars II regulation***, along with existing CARB regulations and current State incentive programs, achieve a significant amount of the benefits that this suggested measure would accomplish. For this reason, it was not included as a measure in the 2022 State SIP Strategy.

- Enhanced Bureau of Automotive Repair Consumer Assistance Program
  This measure would involve CARB working with BAR to enhance the Consumer Assistance Program by expanding the eligibility threshold and/or amounts of funding offered for consumers towards repair assistance and vehicle replacement options. BAR has in place a Consumer Assistance Program[60] to offer eligible low-income consumers repair assistance and vehicle retirement options to help reduce emissions and improve air quality. The repair assistance program currently offers up to $1,200 for emissions-related repairs which correct problems contributing to a vehicle's failure to pass a Smog Check inspection. The vehicle retirement option currently offers income-eligible consumers $1,500 to retire their vehicle.

  CARB staff is continuing to explore this suggested measure and how it can meet the Act requirements for SIP measure approvability. For this reason, it is not included as a measure in the 2022 State SIP Strategy. Nonetheless, the recently

[60] Bureau of Automotive Repair (BAR) Consumer Assistance Program https://www.bar.ca.gov/consumer/consumer-assistance-program

adopted ***Advanced Clean Cars II regulation***, along with existing CARB regulations and current State incentive programs such as the ***Clean Cars 4 All Program***, achieve a significant amount of the benefits that this suggested measure would accomplish. Furthermore, the Clean Cars 4 All Program is under development for statewide expansion and will continue to focus on supporting the lowest income and disadvantaged communities.

- Enhanced Transportation Choices
  This suggested measure or measures would have CARB work with State and local transportation planning organizations, local governments, and communities to advance VMT reductions via enhanced choice. As the bulk of mobile source emissions come from existing vehicles, measures that provide Californians with additional choices as alternatives to using their personal vehicles, e.g. walking, biking, taking public transit, and/or adopting other transportation modes, at least some of the time, can significantly reduce emissions.

  Control measures for consideration could include, but are not limited to, travel demand management programs, incentive programs that fund enhanced transportation planning, or zoning changes that encourage dense, walkable, infill development. CARB staff is continuing to explore this suggested measure and how it can meet the Clean Air Act requirements for SIP measure approvability. For this reason, a SIP measure incorporating this suggestion was not integrated into the 2022 State SIP Strategy. Nonetheless, CARB is pursuing VMT reductions via other approaches, including through the ***Enhanced Regional Emission Analysis in State Implementation Plans measure***, which was committed to in the 2022 State SIP Strategy.

CARB staff continue to investigate the feasibility and potential emission reductions of these public measure suggestions, as well as whether they would meet the U.S. EPA's approvability criteria for SIP measures. Due to feasibility and approvability issues, these suggestions have not yet been formally developed into SIP control measures.

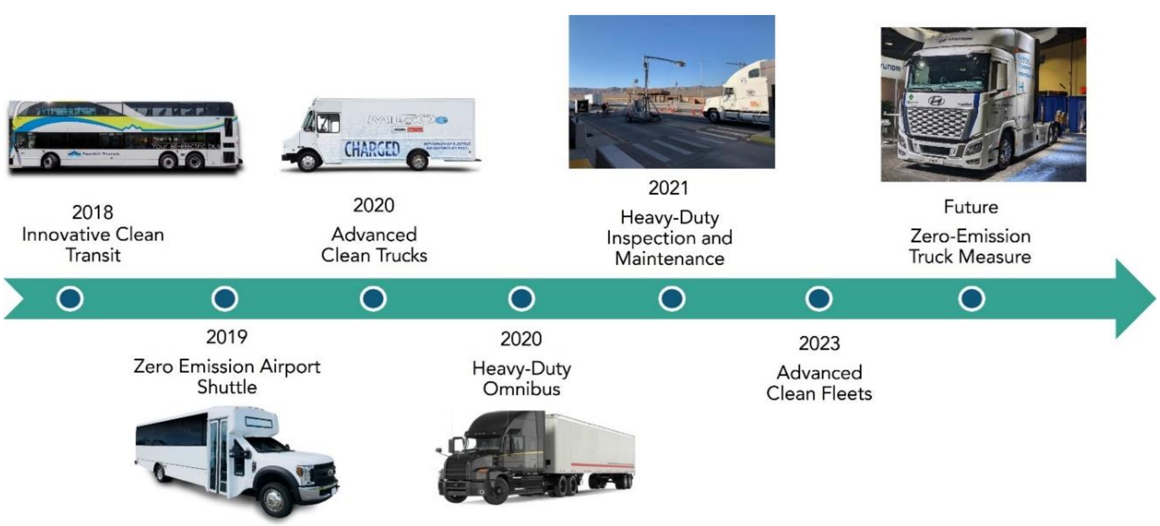
On-Road Medium- and Heavy-Duty Vehicles

On-road heavy-duty vehicles include buses and trucks over 8,500 pounds gross vehicle weight rate (GVWR), and include heavier pick-up trucks and walk-in vans, as well as a wide range of vocational and drayage trucks (big-rig trucks) and buses. These vehicles are one of the fastest growing transportation sectors in the United States, responsible for about 32 percent of total statewide NOx emissions, and are a significant source of statewide diesel PM and GHG emissions. The majority of these vehicles operate on diesel-cycle engines, especially in the higher weight classes. Gasoline and natural gas Otto-cycle spark-ignited engines are also used in heavy-duty trucks, to a lesser extent, and primarily in the lower weight classifications.

STEP 2(A): CALIFORNIA'S MEDIUM- AND HEAVY-DUTY CONTROL MEASURES

Through ongoing efforts, CARB has developed the most stringent and successful heavy-duty vehicle emission control program in the world. CARB has numerous programs currently in place to control emissions from medium- and heavy-duty vehicles including the Truck and Bus Regulation, Heavy-Duty Omnibus, Advanced Clean Trucks, as well as incentive programs such as the widely successful Carl Moyer Program. In addition, CARB recently adopted the Heavy-Duty Inspection and Maintenance regulation, a 2016 State SIP Strategy measure. Regulatory programs include requirements for increasingly tighter new engine standards, address vehicle idling, certification procedures, on-board diagnostics, emission control device verification, and requires accelerated turnover of the in-use fleet to cleaner, lower-emitting emission control and engine technologies. Due to the benefits of CARB's longstanding heavy-duty mobile source program, emissions in the South Coast from this source category have been reduced significantly since 1990, and will continue to decrease through 2030. From today, medium- and heavy-duty NOx emissions are projected to decrease by over 76 percent in 2030, emissions of direct PM are projected to decrease by approximately 28 percent in the same timeframe.

Figure 4: Heavy-Duty Control Measures



The major regulatory and programmatic control measures that provide emission reductions in the on-road heavy-duty mobile source category are described below.

NEW VEHICLE AND ENGINE STANDARDS

Heavy-duty engine emission standards (mandatory standards)

California is the only state with the authority to adopt and enforce emission standards for new motor vehicle engines that differ from the federal emission standards. A central element of CARB's heavy-duty diesel vehicle program is requiring that new trucks, buses and on-road diesel engines meet increasingly stringent engine emission standards. CARB has phased-in implementation of these increasingly stringent ***new heavy-duty vehicle and engine emission standards*** since the mid 1980's, resulting in significant emission reductions.

As shown in

Table **11**, California PM and NOx engine emission standards have historically been more stringent than applicable federal standards on several occasions, as indicated in the darker shaded portions of the table. In these instances, California has, functioning as a ‘laboratory’ state, paved the way for later federal increases in the stringency of PM and NOx emission standards. These standards reflect the increased efficiency in control technologies over time, as innovations in vehicles, engines, and emission-capturing technology progress. Since 1990***,*** heavy-duty engine NOx emission standards have become dramatically more stringent, dropping from 6 grams per brake horsepower-hour (g/bhp-hr) in 1990 down to a 0.2 g/bhp-hr NOx standard, which took effect in 2010. Due to these requirements, new heavy-duty trucks sold since 2010 emit 98 percent less NOx and PM2.5 than new trucks sold in 1986.

On August 26, 2005, CARB obtained a waiver from the federal preemption for the Engine Standards for 2007 and Subsequent Model Year Heavy-Duty Diesel Engines/Vehicles regulation, which generally aligned California’s mandatory heavy-duty emission exhaust standards with the federal standards for 2007 and subsequent model year vehicles and engines. Subsequent mandatory exhaust emission standards for heavy-duty engines that CARB has developed and adopted have aligned with federal standards until the 2021 ***Heavy-Duty Omnibus Regulation***, a measure in the 2016 State SIP Strategy, which further reduced California’s NOx and PM limits for MY 2024 and subsequent years. When fully implemented in 2027, the Omnibus regulation will set NOx emission limits at 0.020 (miles ≤ 435,000), and 0.035 (435,000 - 600,000 miles), and PM emission limits at 0.005 g/bhp-hr.

Table 11: Adopted California and Federal Heavy-Duty Engine Emission Standards

(for compression-ignition engines, shown in g/bhp-hr)

Model Year	California NOx		Federal NOx	California PM		Federal PM	
	General	Urban Buses		General	Urban Buses	General	Urban Buses
1985 -86	10.7		10.7	n/a		n/a	
1987	6.0		10.7	0.60		n/a	
1988 - 89	6.0		10.7	0.60		0.60	
1990	6.0		6.0	0.60		0.60	
1991 - 92	5.0		5.0	0.25	0.10	0.25	
1993	5.0		5.0	0.25	0.10	0.25	0.10
1994 - 95	5.0	5.0 3.50 - 0.50 Optional (1995+)	5.0	0.10	0.07	0.10	0.07
1996 - 97	5.0	4.0 2.50 - 0.50 Optional	5.0	0.10	0.05* *(*0.07 in-use)*	0.10	0.05* *(*0.07 in-use)*
1998 - 03	4.0 2.50 - 0.50 Optional		4.0	0.10 0.03 – 0.01 Optional (2002+)	0.05* *(*0.07 in-use)*	0.10	0.05* *(*0.07 in-use)*
2004 - 06	2.0	0.50 - 0.01	2.0	0.10 0.03 – 0.01 Optional	0.01	0.10	0.05* *(*0.07 in-use)*
2007 - 09	0.20* *phased-in (*fleet avg ~1.2)*	0.20	0.20* *phased-in (*fleet avg ~1.2)*	0.01		0.01	
2010 - 14	0.20		0.20	0.01		0.01	
2015 - 23	0.20 0.10 – 0.02 Optional		0.20	0.01		0.01	
2024 - 26	0.050 (0.020 Optional)		0.20	0.005		0.01	
2027 - 30	0.020 (miles ≤ 435,000), and 0.035 (435,000 - 600,000 miles) (0.010 Optional)		0.035	0.005		0.005	
2031+	0.020 (miles ≤ 435,000), and 0.040 (435,000 - 800,000 miles) (0.010 Optional)		0.035	0.005		0.005	

The Omnibus Regulation implemented two key measures in the 2016 State SIP Strategy: the Low-NOx Engine Standard, and the Lower In-Use Emission Performance Level measures. The Omnibus Regulation established stringent NOx and PM engine emission standards that, when fully implemented, will be 90 percent below current levels on existing certification cycles, and lower NOx standards on new certification cycles to control emissions over a broader range of vehicle operation, including idling, low load, and highway operation. In addition, the Omnibus Regulation revised the heavy-duty in-use testing program to make it more effective in ensuring compliance with the in-use emission standards over a broader range of vehicle operation and lengthened the useful life and emissions warranty period requirements to reflect the longevity of heavy-duty vehicles.

To support the Omnibus rulemaking, CARB, in partnership with federal and local air agencies and the heavy-duty engine industry, have funded over $5 million worth of research contracts with South Research Institute (SwRI) to evaluate various engine and emission control strategies to reduce NOx emissions from heavy-duty engines by 90 percent without or with minimal GHG impacts. The results from these contracts referred to as the Stage 1,[61] Stage 2,[62] and Stage 3[63] Heavy-Duty Low NOx Programs formed the bases for supporting the Omnibus Regulation. In addition, CARB had also contracted with the National Renewable Energy Laboratory to conduct a cost analysis for compliance with CARB's proposed lower NOx exhaust emission standards on current certification test cycles and a new low-load certification test cycle, as well as cost associated with increasing the useful life and emission warranty period requirements.[64]

Optional heavy-duty engine emission standards

In addition to mandatory NOx standards, CARB has also adopted several generations of ***optional lower NOx standards*** over the past 15 years. The optional standards allow local air districts and CARB to preferentially provide incentive funding to buyers of cleaner trucks, which encourages the development of cleaner engines, which in turn paves the way for future lower-NOx emission standards.

- From 1998 to 2003, optional NOx standards ranged from 0.5 g/bhp-hr to 2.5 g/bhp-hr, at 0.5 g/bhp-hr increments, which was much lower than the mandatory 4 g/bhp-hr limit.
- Starting in 2004, engine manufacturers could choose to certify to optional NOx + non--methane hydrocarbon (NMHC) standards ranging from 0.3 g/bhp-hr to 1.8 g/bhp-hr, at 0.3 g/bhp-hr increments, which was significantly below the mandatory 2.4 g/bhp-hr NOx+NMHC standard.
- In ongoing efforts to go beyond federal standards and achieve further reductions, CARB adopted in 2013 the ***Optional Reduced Emissions Standards for Heavy-Duty Engines*** regulation, which established the new generation of optional NOx emission standards for heavy-duty engines, and a certification pathway for a new generation of requirements for heavy-duty engines. Starting in 2015, engine manufacturers could certify to three optional NOx emission standards of 0.1 g/bhp-hr, 0.05 g/bhp-hr, and 0.02 g/bhp-hr (i.e., 50 percent,

[61] SwRI, 2017. "Evaluating Technologies and Methods to Lower NOx Emissions from Heavy-Duty Vehicles, Final Report" https://ww2.arb.ca.gov/sites/default/files/classic/research/apr/past/13-312.pdf

[62] SwRI, 2020. "Heavy-Duty Engine Low-Load Emission Control Calibration, Low-Load Test Cycle Development, and Evaluation of Engine Broadcast Torque, and Fueling Accuracy During Low-Load Operations, Final Report" https://www.arb.ca.gov/lists/com-attach/1-hdomnibus2020-VDdXMFIhU2IAWQIw.pdf

[63] SwRI, 2021. "Further development and Validation of Technologies to Lower NOx Emissions from Heavy-Duty Vehicles, Final Report" https://www.arb.ca.gov/lists/com-attach/79-hdomnibus2020-Uj4AaQB2Aj8FbAhw.pdf

[64] NREL, 2020. "On-Road Heavy-Duty Low-NOx Technology Cost Study" https://www.nrel.gov/docs/fy20osti/76571.pdf

75 percent, and 90 percent lower than then-current mandatory standard of 0.2 g/bhp-hr). This optional standard has resulted in substantial investments in California's heavy-duty fleets over the past decade in order to adopt modern, lower-emitting vehicles and equipment.

- Most recently, in ***2021, the Heavy-Duty Omnibus Regulation*** lowered CARB's optional NOx emission standards to 0.020 g/bhp-hr for MY 2024-26 and to 0.010 g/bhp-hr for MY 2027+.

Zero-Emission Truck Standards

Although ZEV technologies are not as mature for heavy-duty trucks as they are in the passenger vehicle sector, Class 3 - 7 delivery trucks and urban buses provide opportunities for the deployment of zero-emission technologies in targeted applications, due to their duty cycle, are well-suited to the initial introduction of heavy-duty zero-emission engines. Transit buses, last mile delivery vehicles, and airport shuttle buses are typically operated on short-distance fixed routes and are centrally housed and may be captive to a District – characteristics that make these applications ideally suited to deploying zero-emission vehicles in targeted heavier applications, preceding broader penetration in the heavy-duty engine market. These initial deployments provide a foundation for subsequent migration of zero-emission technology to other heavier platforms, in order to continue to expand heavy-duty ZEV requirements in the long term, especially in certain vocational classes and fleets that are under California regulatory authority.

In June 2020, CARB adopted the ***Advanced Clean Trucks Regulation (ACT),*** a measure in the 2016 State SIP Strategy, which is a first of its kind regulation requiring medium- and heavy-duty manufacturers to produce ZEVs as an increasing portion of their sales beginning in 2024. This regulation is expected to result in roughly 100,000 ZEVs by 2030, and nearly 300,000 ZEVs by 2035. The Advanced Clean Trucks Regulation is part of a holistic approach to accelerate a large-scale transition of zero-emission medium-and heavy-duty vehicles from Class 2b to Class 8. The regulation has a manufacturer sales requirement that requires manufacturers who certify Class 2b-8 chassis or complete vehicles with combustion engines to sell zero-emission trucks as an increasing percentage of their annual California sales from 2024 to 2035. By 2035, zero-emission truck/chassis sales would need to be 55 percent of Class 2b – 3 truck sales, 75 percent of Class 4 – 8 straight truck sales, and 40 percent of truck tractor sales. U.S. EPA recently issued a waiver of preemption for the Advanced Clean Trucks Regulation in March 2023.

In analyzing the feasibility of this regulation, CARB staff analyzed what types of trucks are currently suitable for electrification, the amount and variety of commercially available zero-emission trucks, as well as the cost of charging and ownership of battery electric trucks. Currently, medium- and heavy-duty electric drivetrains are well suited to operating in congested urban areas for stop-and-go driving where conventional engines are least efficient. Battery-electric and fuel-cell electric trucks, buses, and vans already are being used by fleets that operate locally and have predictable daily use where the trucks return to base to be charged or fueled. There are more than 70 different models of zero-emission vans, trucks and buses that already are commercially available from several manufacturers. Most trucks and vans operate less than 100 miles per day and several zero-emission configurations are available to serve that need. As technology advances, zero-emission trucks will become suitable for more applications. Most major truck manufacturers have announced plans to introduce market ready zero-emission trucks in the near future. The electricity cost to charge battery electric trucks varies based on how fast you charge, the utility rate, and the time of day. In many cases, a fleet owner who also owns charging stations and charges trucks overnight can have little to no net electricity costs after the Low Carbon Fuel Standard (LCFS) credits in California are included. Zero-emission trucks have higher upfront costs but have lower operating costs than conventional trucks. Currently, the total cost of ownership in California can be comparable to conventional trucks for certain duty cycles without grants or rebates. As battery prices fall and technology continues to improve, the total cost of ownership is expected to become more favorable. Incentives are currently available to offset some or all of the higher vehicle capital costs and some of the early infrastructure costs to help fleets begin transitioning to zero-emission vehicles now.

To date, six other states have adopted the California requirements of the Advanced Clean Trucks regulation under the provisions of Section 177 of the Act: Massachusetts, Vermont, New Work, New Jersey, Washington, and Oregon. 17 states, the District of Columbia, and the Province of Quebec, Canada, also have medium- and heavy-duty ZEV commitments.

Warranty Requirements and Useful Life

In 1978, CARB adopted ***Emission Warranty Regulations*** to clarify the rights and responsibilities of individual motor vehicle and engine owners, motor vehicle and engine manufacturers, and the service industry. The emission warranty is used to cover any repairs needed to correct defects in materials or workmanship which would cause an engine or vehicle not to meet its applicable emission standards. In 1982, CARB adopted regulations that established California’s first in-use recall program. These regulations were intended to reduce vehicular emissions by ensuring that noncompliant vehicles are identified, recalled, and repaired to comply with the applicable emission standards and regulations during customer use, and to encourage manufacturers to improve the design and durability of emission control components to avoid the expense of a recall. Throughout the 1980's CARB adopted several regulations, such as the Emission Warranty Information Reporting program, which work in conjunction with the warranty regulations to identify malfunctioning emission control components and encourage repair. In 1982 and 1984, U.S. EPA promulgated heavy-duty vehicle useful life and warranty requirements identical to those adopted in California. Both U.S. EPA and CARB require that heavy-duty vehicles meet emission standards throughout their useful life periods. The current heavy-duty vehicle emission warranty period is 100,000 miles for all categories of heavy-duty vehicles with GVWR greater than 14,000 lbs.

Since the 2007 model year, all on-road heavy-duty diesel vehicles and heavy-duty diesel engines have been subject to stringent PM and NOx emission standards. Manufacturers have met these standards by equipping new heavy-duty diesel engines with diesel particulate filters (DPF) for control of PM, and beginning with the 2010 model year have also included systems for controlling NOx using exhaust gas recirculation (EGR) and selective catalytic reduction systems. These emission control systems can reduce NOx emissions by more than 95 percent and PM emissions by more than 99 percent. Therefore, if these components fail, an individual engine's and vehicle's emissions can dramatically increase. It is therefore crucial that these emission control systems continue to function as designed throughout a vehicle's life to ensure emissions remain low.

To update the on-road heavy-duty diesel vehicles warranty period, which had not changed substantially in California for almost 40 years (trucks were required to be covered by only a 5 year, 100,000 mile, or 3,000 hour emissions warranty period, whichever first occurred), CARB amended the warranty regulation for on-road heavy-duty vehicles with GVWR greater than 14,000 pounds in 2018 with the ***Amendments to California Emission Control System Warranty Regulations and Maintenance Provisions Regulation.*** For model year 2022 and later engines, these amendments lengthened existing warranty periods and maintenance provisions to better reflect the longevity and usage of modern vehicles, and to help ensure adequate durability and proper maintenance of the engine and emission controls. For MY 2022 - 2026, the useful life requirements for are the same for CARB and federal regulations. U.S. EPA warranty provisions cover 100,000 miles, or 5 years / 3,000 hours, for Class 4 – 8 trucks; California's more stringent warranty provisions cover:

- Class 8: 350,000 miles, or 5 years
- Class 6 – 7: 150,000 miles, or 5 years
- Class 4 – 5: 110,000 miles, or 5 years

The amendments also updated the minimum maintenance intervals so that vehicle owners do not inadvertently negate the proposed lengthened warranty periods, and explicitly link the heavy-duty On-Board Diagnostic (HD OBD) system to the definition of warranted parts, to help take full advantage of all of the tools available for ensuring the control of in-use emissions and to be consistent with the long-established link existing for light- and medium-duty vehicles.

Emissions warranties are intended to provide a level of assurance to the vehicle owner that the engine and its associated emission control systems are unlikely to experience defects in materials and workmanship that could result in the engine not performing as required. If such defects do occur during the warranty period, the manufacturer is liable for fixing them. Lengthened warranty periods may also reduce incidences of tampering and mal-maintenance. For example, there would be little incentive for a vehicle owner to tamper with the vehicle's emission control system, such as by coring out a DPF or bypassing a catalyst, when the manufacturer is obligated to pay for any defect-related repairs. Furthermore, vehicle owners would also have more of an incentive to timely perform scheduled maintenance so as not to void their lengthened warranty. Additionally, lengthened warranty periods are needed to protect heavy-duty vehicle owners from potentially high repair costs under the requirements of CARB's recent amendments to the Periodic Smoke Inspection Program (PSIP) and Heavy-Duty

Vehicle Inspection Program (HDVIP), which include much stricter opacity limits intended to spur more vehicle owners to make timely engine repairs and replace DPFs.

CARB analyses of feasibility found evidence supporting the need for longer minimum warranties within manufacturers' warranty claim data for heavy-duty vehicles, as well as from recent CARB testing of in-use heavy-duty vehicles. Specifically, CARB's test programs had identified numerous heavy-duty vehicles with mileages within their applicable regulatory useful life periods, but beyond their warranty period, that had NOx emission levels significantly above their applicable certification standards.

In 2020, the ***Heavy-Duty Omnibus Regulation*** further amended the warranty and useful life provisions for heavy-duty engines. To help ensure emission controls are well-maintained and repaired when needed, and to help ensure more durable emission control systems, the Omnibus Regulation extends the criteria pollutant emissions warranty and useful life period requirements for heavy-duty vehicles and engines, as shown in Table 12**: Useful Life Periods** and Table 13**: Warranty Periods**. The revisions would be phased-in beginning with the 2027 model year engines with the final phase-in occurring in 2031.

Table 12: Useful Life Periods

Model Year	Useful Life (miles)			
	Class 4 – 5 Diesel	Class 6 – 7 Diesel	Class 8 Diesel	Heavy-Duty Otto
Current – 2026	110,000 miles 10 years	185,000 miles 10 years	435,000 miles 10 years 22,000 hours	110,000 miles 10 years
2027–2030	190,000 miles 12 years	270,000 miles 11 years	600,000 miles 11 years 30,000 hours	155,000 miles 12 years
2031 and subsequent model years	270,000 miles 15 years	350,000 miles 12 years	800,000 miles 12 years 40,000 hours	200,000 miles 15 years

Table 13: Warranty Periods

Model Year	Warranty (miles)			
	Class 4 – 5 Diesel	Class 6 – 7 Diesel	Class 8 Diesel	Heavy-Duty Otto
Current – 2026	110,000 miles 5 years	150,000 miles 5 years	350,000 miles 5 years	50,000 miles 5 years
2027–2030	150,000 miles 7 years / 7,000 hours	220,000 miles 7 years / 11,000 hours	450,000 miles 7 years 22,000 hours	110,000 miles 7 years / 6,000 hours
2031 and subsequent model years	210,000 miles 10 years / 10,000 hours	280,000 miles 10 years / 14,000 hours	600,000 miles 10 years 30,000 hours	160,000 miles 10 years / 8,000 hours

OBD Requirements

In addition to new vehicle emission standards for the heavy-duty fleet, CARB's suite of control measures also includes actions to ensure that the in-use fleet continues to operate as cleanly as possible through requiring that new vehicles come equipped with in-use inspections and on-board self-diagnostic equipment. OBD systems are designed to identify when a vehicle's emission control systems or other emission-related computer-controlled components are malfunctioning, causing emissions to be elevated above the vehicle manufacturer's specifications.

The first generation of OBD systems (referred to as OBD I) applied to medium-duty vehicles. OBD I was implemented by CARB in 1988 and required monitoring of only a few of the emission-related components on the vehicle. In 1989, CARB adopted regulations requiring a second generation of OBD systems (OBD II) that standardized the system and addressed the shortcomings of the OBD I requirements and required that all 1996 and newer medium-duty vehicles and engines to be equipped with OBD II systems.

In 2004, CARB adopted the first regulation requiring OBD systems on heavy-duty vehicles, knowns as the Engine Manufacturer Diagnostic (EMD) regulation. The EMD Regulation required manufacturers of heavy-duty engines and vehicles to implement diagnostic systems on all 2007 and subsequent MY on-road heavy-duty engines. The EMD Regulations were much less comprehensive than the OBD II regulations and were intended for heavy-duty manufacturers to achieve a minimum level of diagnostic capability. In 2005, CARB adopted ***Heavy-Duty Specific OBD Requirements (HD OBD)***, which applied to 2010 and subsequent model year heavy-duty engines and vehicles (i.e., vehicles with a gross vehicle weight rating greater than 14,000 pounds). This regulation required by 2013 that all heavy-duty engines offered for sale in California come equipped with OBD systems. U.S. EPA issued a waiver of preemption for the California 2010 Model Year Heavy-Duty Vehicle and Engine On-Board

Diagnostic Standards in 2008, and has also issued two subsequent waivers for amendments CARB has made to the heavy-duty OBD requirements in later years to increase the stringency of these requirements.[65]

The emission “thresholds” for faults that must be detected by OBD systems are typically either a multiple of the exhaust emission standard (e.g., 2.0 times the applicable standard), or an additive value above the standards (e.g., 0.2 g/bhp-hr above the applicable standards). For the most important emission control systems such as the PM filter and SCR system, the OBD regulation specifies malfunction criteria and emission thresholds for detecting a malfunction and illuminating the MIL based on emission increases (defined by additive and multiplicative factors) relative to the emission standard. For example, on 2016 and subsequent MY diesel engines, the OBD system must be designed to detect an SCR catalyst malfunction when the catalyst has deteriorated to the point that the engine's emissions are exceeding the NOx standard by more than 0.2 g/bhp-hr (e.g., cause NOx emissions to exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.20 g/bhp-hr).

Under ***the Heavy-Duty Omnibus Regulation***, NOx emission standards will, upon full implementation with MY 2027 and later years, be reduced to a tenth of the current 0.20 g/bhp-hr standard, and PM standards to one half of today’s standard. Because the OBD emission thresholds are often defined as an additive or multiplicative function of the standard, without amendments to the OBD threshold requirements, the OBD thresholds would similarly be reduced along with the proposed standards (e.g., the NOx threshold would become 2.0 times the new lower emission standard). While detection of faults at these proportionally lower levels will likely be required in the future as it will be necessary to ensure the maximum benefits of the proposed standards are maintained in-use, the engine manufacturers have expressed concern about not knowing with certainty what impact the lower standards will have on their OBD monitoring capability. As such, the engine manufacturers have requested interim relief until they have more certainty on what emission thresholds are achievable. To address engine manufacturers’ concerns regarding not knowing with certainty at what emission levels their OBD systems will be able to detect faults, CARB staff is amending both the HD OBD Regulation and the OBD II Regulation (for engines used in medium-duty vehicles) with the Omnibus Regulation, which will provide an interim level of relief for manufacturers by maintaining OBD thresholds for NOx and PM effectively at the same levels as required for today’s standards. With this relief, engine manufacturers can first focus on the necessary emission control solutions to meet the current standards before turning to improvements that may be necessary to ensure robust detection of faults at the lower emission levels. Omnibus also requires updates to address cold start emissions and diesel PM monitoring.

<u>REDUCING IN-USE EMISSIONS</u>

While increasingly stringent standards for new vehicles and engines collectively ensure that new vehicles are as clean as possible, older, higher-emitting heavy-duty vehicles

[65] U.S. EPA 2012 “California State Motor Vehicle Pollution Control Standards; Amendments to the California Heavy-Duty Engine On-Board Diagnostic Regulation; Waiver of Preemption; Final Notice of Decision” Federal Register Volume 77, Number 237 pp. 73459-73461 https://www.gpo.gov/fdsys/pkg/FR-2012-12-10/pdf/2012-29792.pdf

with long useful lifecycles can remain on the road for many years. To address this legacy fleet, CARB has adopted heavy-duty vehicle in-use control measures to significantly reduce PM2.5 and NOx emissions from existing diesel vehicles operating in California. These measures fall within three categories: measures that utilize inspections and maintenance programs in order to improve in-use emission performance levels; truck idling requirements; and fleet turnover rules.

Inspection and Maintenance (I/M) Program

CARB also adopted a suite of control measures to lower in-use emission performance levels to ensure that the heavy-duty vehicles in the in-use fleet continue to operate at their cleanest possible level.

Opacity Limits

The ***Heavy-Duty Vehicle Inspection Program (HDVIP)***, adopted into law in 1988, requires heavy-duty vehicles to be inspected for smoke opacity (i.e., excessive smoke), tampering, and engine certification label compliance. Any heavy-duty vehicle operating in California, including vehicles registered in other states and foreign countries, may be inspected. Inspections are performed by CARB inspection teams at border crossings, California Highway Patrol weigh stations, fleet facilities, and randomly selected roadside locations.

To ensure that in-use heavy-duty vehicles continue to operate at their cleanest possible level CARB's 2018 amendments to the ***Periodic Smoke Inspection Program (PSIP)*** and HDVIP programs lowered the opacity limits for on-road heavy-duty trucks beyond the existing opacity limits (40 and 55 percent), which were no longer adequate to identify and require repairs of vehicles operating with damaged PM emission control components – even vehicles with heavily damaged and malfunctioning emission control systems emit exhaust at opacity levels below those opacity limits. To tighten these standards, and further control emissions form the many HD vehicles operating in California emitting excess PM emissions, staff developed lower opacity limits which reflect the current emission control technology equipped on today's HD diesel vehicles. ***The 2018 Amendments to the Periodic Smoke Inspection Program (PSIP)*** require all California-based fleets of two or more heavy-duty diesel vehicles over 6,000 pounds GVWR with engines over four years old are required to perform annual smoke opacity tests (1998 and newer diesel vehicles between 6,000–14,000 pounds GVWR subject to biennial smog check are not subject to PSIP). Allowable levels of Smoke Opacity are shown in Table 14 below.

Table 14: Allowable Levels of Smoke Opacity

Engines Equipped with a DPF	
5% Opacity Limit	
Pre-2007 Model Year (MY) Engines without a DPF	
1997– 2006 MY Engines	20% Opacity Limit
1991–1996 MY Engines	30% Opacity Limit
Pre-1991 MY Engines	40% Opacity Limit
Engines Equipped with a Level 2 Verified Diesel Emission Control Strategy (VDECS)	
20% Opacity Limit	
Two-Engine Cranes Driven by a non-DPF Off-Road Engine	
40% Opacity Limit	

The amendments also help to improve the identification and repair of malfunctioning PM emission control components on HD diesel vehicles in California. Lowering the opacity limits to the newer levels helps to ensure that the opacity limits are more representative of current PM emission control technology, and that vehicles operating with malfunctioning PM emission control components are more readily identified and repaired.

I/M Testing

All heavy-duty vehicles in California are subject to in-use inspections in order to control excessive smoke emissions and tampering. The ***Periodic Smoke Inspection Program (PSIP)***, adopted in 1990, requires heavy-duty vehicle fleet owners to conduct annual smoke opacity inspections of their vehicles, and have them repaired if excessive smoke emissions are observed. In addition, CARB has the authority to randomly audit these fleets, by reviewing the owners' maintenance and inspection records, and conducting opacity inspections on a representative sample of the vehicles. The current PSIP opacity limits are the same as for HDVIP (40 and 55 percent).

To ensure that in-use heavy-duty vehicles continue to operate at their cleanest possible level, the ***2020 Heavy-Duty Omnibus Regulation*** amended the Heavy-Duty In-Use Testing (HDIUT) Program by revising procedures to better represent heavy-duty vehicle operations in real world conditions, establishing clearer criteria for engine family pass/fail determination, and requiring OBD data during testing to verify the condition of the test vehicle and sensors. These amendments apply to 2024 and subsequent model year engines, and replace the current NTE-based methodology with a new three-bin moving average windows-based methodology. The three bins cover idle, low load, and medium to high load operation. Compliance would be determined by comparing the average NOx emissions for each bin to the in-use threshold, defined as one and a half times the applicable standard for the model year.

The Omnibus Regulation also established a new standardized methodology for demonstrating durability. The standardized methodology increases the default break-in period from the current 125 hours to 300 hours for on-road heavy-duty diesel engines, and requires standardized certification cycles for engine and aftertreatment system aging in order to validate component durability and determine exhaust emissions deterioration factors. It also requires additional engine aging (i.e., increased durability hours) compared to what existing certification requirements, allowing manufacturers to use accelerated aging cycles for a portion of the useful life demonstration for aftertreatment systems, provided that those manufacturers periodically submit in-use emissions data generated from their on-road heavy-duty diesel engines.

Additionally, heavy-duty vehicles registered in California are now required to demonstrate annual compliance with HD I/M program requirements in order to register with the Department of Motor Vehicles, under ***the Heavy-Duty Inspection and Maintenance Program (HD I/M).*** Senate Bill 210 (Leyva, Chapter 298, Statutes of 2019) directed CARB to develop and implement a comprehensive heavy-duty vehicle inspection and maintenance regulation requiring periodic vehicle emissions testing and reporting on nearly all heavy-duty vehicles operating in California. The Board approved the HD I/M regulation on December 9, 2021, with implementation to be phased in starting January 2023. Combining periodic vehicle testing with other emissions monitoring and expanded enforcement strategies, the HD I/M regulation ensures that vehicles' emissions control systems are properly functioning when traveling on California's roadways, and that polluting, poorly maintained heavy-duty vehicles operating in California are quickly identified and repaired. At full implementation, the HD I/M regulation will require heavy-duty vehicles to undergo periodic emissions testing to reduce PM and NOx emissions, and to protect communities most impacted by air pollution.

Beginning in January 2023, CARB is using roadside emissions monitoring devices (REMD) to screen for vehicles that may have high emissions. Vehicles flagged as potential high emitters may be required to undergo follow-up vehicle compliance testing to ensure they are operating with properly functioning emissions control systems. If a vehicle is identified as a potential high emitter through REMD, the owner will receive a Notice to Submit to Testing (NST) from CARB. Upon receival, they will have 30 calendar days to submit to CARB a passing HD I/M compliance test performed by a HD I/M tester. The type of HD I/M compliance test a vehicle will undergo depends on whether it is equipped with OBD or not. OBD-equipped vehicles are required to undergo a scan of the engine's OBD data using a CARB-validated OBD test device. Diesel vehicles and diesel hybrids with 2013 and newer model year engines have OBD systems. For alternative fuel vehicles, 2018 and newer model year engines have OBD systems. Non-OBD vehicles, i.e., those that don't meet the engine model year requirements, are required to undergo a smoke opacity test and a visual inspection of the vehicle's emissions control equipment, referred to as the Vehicle Emissions Control Equipment Inspection. Vehicles that are currently subject to PSIP must still perform their annual compliance inspections.

Starting in mid-2023, vehicle owners will be required to create owner accounts in CARB's HD I/M database, verify the vehicles in their fleets, and pay the first annual compliance fee for each vehicle. Once enforcement begins, vehicle owners that don't comply with these requirements may be cited for non-compliance and/or have their DMV vehicle registrations blocked. Upon enforcement of the requirements to establish owner accounts with vehicle information as described above, freight contractors and brokers must verify that heavy-duty vehicles they contract with for services are in compliance with the HD I/M regulation. This also includes public agencies that contract for heavy-duty truck services. Furthermore, seaport and railyard facilities must also verify compliance with the HD I/M regulation for vehicles that enter their facilities.

HD I/M periodic compliance testing for all vehicles that operate in California will start no earlier than January 1, 2024. Upon implementation of HD I/M periodic compliance testing, nearly all vehicles will be required to undergo twice per year testing with results submitted to CARB. On-road agricultural vehicles and California-registered motorhomes only will be required to undergo testing once per year. Three years after the start of HD I/M periodic compliance testing, OBD equipped vehicles will be required to undergo testing four times per year. On-road agricultural vehicles and California-registered motorhomes will remain on the once per year testing frequency, even if equipped with OBD.

Idling Requirements

To reduce idling emissions from new heavy-duty diesel vehicles and emissions from auxiliary power units used as alternatives to heavy-duty vehicle idling, the Airborne Toxic Control Measure (ATCM) to Limit Diesel-Fueled Commercial Motor Vehicle Idling ***(Heavy-Duty Diesel Vehicle Idling Reduction Program)*** requires, among other things, that drivers of diesel-fueled commercial motor vehicles with gross vehicle weight ratings greater than 10,000 pounds, including buses and sleeper berth equipped trucks, not idle the vehicle's primary diesel engine longer than five minutes at any location. First adopted in July 2004 and subsequently amended, the regulation consists of new engine and in-use truck requirements and emission performance requirements for technologies used as alternatives to idling the truck's main engine. Under the new engine requirements, 2008 and newer model year heavy-duty diesel engines need to be equipped with a non-programmable engine shutdown system that automatically shuts down the engine after five minutes of idling. In 2012, U.S. EPA issued a waiver of preemption for the most recent amendments made to the Idling Reduction Program in 2006, beginning in model year 2008.[66] The ***Heavy-Duty Omnibus Regulation*** reduces idling limits for heavy-duty diesel vehicles from 30 g/hr to 10 g/hr in MY 2024, and to 5 g/hr in MY 2027.

Fleet Rules

CARB's ***Cleaner In-Use Heavy-duty Truck Regulation (Truck and Bus Regulation)*** impacts approximately one million inter- and intra-state vehicles and requires privately and federally owned diesel fueled trucks and buses and privately and publicly owned school buses to fully upgrade to newer, cleaner engines by 2023. This regulation leverages the benefits provided by new truck emission standards by accelerating introduction of the cleanest trucks. The Truck and Bus Regulation was adopted in December 2008, and was amended in both December 2010 and December 2014. The regulation represents a multi-year effort to turn over the legacy fleet of engines and replace them with the cleanest technology available. While heavy-duty engine

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[66] U.S. EPA 2012 "California State Motor Vehicle and Nonroad Engine Pollution Control Standards; Truck Idling Requirements; Final Notice of Decision" Federal Register Volume 77, Number 32, pp. 9239-9250 http://www.gpo.gov/fdsys/pkg/FR-2012-02-16/pdf/2012-3690.pdf

technology has become significantly cleaner in the past few decades, the long useful lives of some heavy-duty engines means that older, higher-emitting trucks remain on the road for many years after newer generations of engine standards have gone into effect.

Starting in 2012, the Truck and Bus Regulation phased in requirements so that by 2014, nearly all vehicles operating in California will have PM emission controls, and by 2023 nearly all vehicles meet 2010 model year engine emissions levels. The regulation applies to nearly all diesel fueled trucks and buses with a GVWR greater than 14,000 pounds that are privately or federally owned, including on-road and off-road agricultural yard goats, cargo handling equipment, drayage trucks, solid waste collection vehicles, and school buses. Moreover, the regulation applies to any person, business, school district, or federal government agency that owns, operates, leases or rents affected vehicles. The regulation also establishes requirements for any in-State or out-of-State motor carrier, California-based broker, or any California resident who directs or dispatches vehicles subject to the regulation. Finally, California sellers of a vehicle subject to the regulation must disclose the regulation's potential applicability to buyers of the vehicles. In January 2017, U.S. EPA granted a waiver of preemption for the portions of the Truck and Bus Regulation for which a waiver was required.[67]

To move beyond combustion engines toward electrification of the heavy-duty fleet, CARB recently approved the ***Advanced Clean Fleets Regulation***, which will accelerate the market for zero-emission trucks, vans, and buses by requiring fleets that are well suited for electrification, to transition to ZEVs where feasible. With the adoption of the Advanced Clean Trucks Regulation, CARB Resolution 20-19 directed staff to return to the Board with a zero-emission fleet rule and sets the following targets for transitioning sectors to ZEVs:

- 100 percent zero-emission drayage, last mile delivery, and government fleets by 2035;
- 100 percent zero-emission refuse trucks and local buses by 2040;
- 100 percent zero-emission-capable vehicles in utility fleets by 2040; and
- 100 percent zero-emission everywhere else, where feasible, by 2045.

Achieving these and other milestones also contributes to meeting the goals in the Governor's Executive Order N-79-20. With the Advanced Clean Fleets Regulation, CARB anticipates developing a regulatory action that will accelerate ZEV adoption in the medium- and heavy-duty sectors by setting zero-emission requirements for fleets. The ***Advanced Clean Fleets Regulation*** accelerates ZEV adoption in the medium-to heavy-duty sectors and for light-duty package delivery trucks by setting zero-emission requirements for fleets. This regulation targets drayage trucks, public fleets, and other high priority fleets with 50 or more trucks or entities with trucks and $50 million in annual revenues. This effort is part of a comprehensive strategy to achieve a ZEV truck and bus fleet by 2045 everywhere feasible, and significantly earlier for certain well-suited

[67] U.S. EPA 2017 "Final Notice of Decision - On-Highway Heavy-Duty Vehicle and Engine Regulations for 2007 and Subsequent Model Years" Accessed April 30, 2017 at https://www.gpo.gov/fdsys/pkg/FR-2017-01-17/pdf/2017-00940.pdf Federal Register / Vol. 82, No. 10 / Tuesday, January 17, 2017 pp. 4867

market segments such as last mile delivery, drayage, and government fleets. The regulation will phase in ZEV requirements for different fleets, including components as follows:

- Beginning January 1, 2024, all additions to High Priority fleets (fleets with 50 or more trucks or entities with trucks and $50 million in annual revenues) and federal fleets must be ZEVs, and all combustion vehicles must be removed from the California fleet at the end of their useful life, or fleets may opt to phase-in ZEV requirement where a portion of the fleet must be zero-emission based on a pre-determined schedule.
- State and local government fleets including cities, counties, special districts, and other municipalities would be required to add only ZEVs to their fleets starting at 50 percent of new additions in 2024 and 100 percent starting in 2027 or fleets may opt to phase-in ZEV requirement where a portion of the fleet must be zero-emission based on a pre-determined schedule. Small public fleets or those that are based in designated low population counties would begin with 100 percent ZEV additions starting in 2027.
- Beginning January 1, 2024, any truck added to drayage service would need to be a ZEV. All drayage trucks entering seaports and intermodal railyards would be required to be zero-emission by 2035.
- 100 percent of medium- and heavy-duty vehicle sales in California would be zero-emissions starting in 2036.

Due to the recently-approved Advanced Clean Fleets Regulation and the Advanced Clean Truck Regulation, the number of medium- and heavy-duty ZEVs operating in California will be about 1.7 million by 2045.

In analyzing the feasibility of this regulation, CARB staff found that medium- and heavy-duty ZEVs that are commercially available today are already capable of meeting the daily needs of most local and regional trucking operations, and a variety of vocational uses. Fleet owners reported information about their vehicles and operations as part of the Large Entity Reporting program;[68] data collected in 2021 that shows that the vast majority of trucks drive 100 miles or fewer per day. Today's medium- and heavy-duty ZEVs have energy storage systems that can meet most of these daily operational requirements. As technology advances, zero-emission trucks will become suitable for more applications. Most major truck manufacturers have announced plans to introduce market ready zero-emission trucks in the near future.

Zero-emission truck availability (as of July 2022):

- 148 models in North America are available for order or pre-order. There are more than 70 different models of zero-emission vans, trucks and buses that already are commercially available from several manufacturers.
- 135 models are actively being produced and delivered to customers.

[68] Large Entity Reporting https://ww2.arb.ca.gov/our-work/programs/advanced-clean-trucks/large-entity-reporting

- At least 35 manufacturers are producing vehicle Class 2b through 8 ZEVs.

Another measure committed to in the 2022 State SIP Strategy, the ***Zero-Emission Trucks Measure,*** is also being developed, designed to accelerate the number of zero-emissions trucks beyond existing measures (including the Advanced Clean Fleets Regulation and Advanced Clean Truck Regulation): the previously adopted Advanced Clean Truck Regulation will result in almost 420,000 ZE trucks on the road by 2037, and the more recently adopted Advanced Clean Fleets Regulation would increase the number of ZE trucks by another 220,000 to a total of 640,000. However, in 2037, even after the implementation of the Advanced Clean Truck and Advanced Clean Fleets Regulations, about 480,000 heavy-duty combustion powered trucks will still be on the road. In this modified approach, staff would seek to upgrade these remaining heavy-duty combustion trucks to new or used ZE trucks rather than to trucks with cleaner combustion engines. For this measure, staff would implement regulatory strategies to achieve the goal of transitioning the remainder of the heavy-duty combustion fleet to ZE trucks. This measure was originally proposed as a public measure suggestion based on the input from community-based organizations and members of the public during the development of the 2022 State SIP Strategy. CARB staff decided to develop this public measure suggestion into a SIP measure commitment, which will go beyond MSM requirements.

Drayage Trucks

Drayage trucks are subject to requirements under the ***Truck and Bus Regulation***, which requires 2010 Model Year or newer engines to continue entering ports and rail yards starting on January 1, 2023.

Under the ***Advanced Clean Fleets Regulation***, CARB is further strengthening emission controls for drayage fleets; all drayage trucks entering seaports and intermodal railyards would be required to be zero-emission by 2035. Advanced Clean Fleets Regulations controls drayage emissions through three main components:

- Zero-emission drayage truck requirements
  Drayage trucks will be required to start transitioning to zero-emission technology beginning in 2024, with full implementation by 2035
- Drayage Truck Registration Requirements
  All drayage trucks intending to begin or continue operations at a California seaport or intermodal railyard must be registered with CARB. Beginning in 2035, all trucks in the CARB Online System will be required to be zero-emission.
- Removing Combustion-Powered Drayage Trucks from Service
  Non-zero-emission (legacy) drayage trucks with a 2010 or newer model year engine may register in the CARB Online System on or before January 1, 2024. Beginning in 2024, all legacy drayage trucks must visit a seaport or intermodal railyard at least once each year to remain in the CARB Online System. Legacy drayage trucks 12 years old must begin reporting their mileage annually in 2025 and, can remain in the system until they reach their minimum useful life (either

800,000 miles or the engine is older than 18 years, whichever comes first). Beginning in 2025, legacy drayage trucks will be removed from the CARB Online System if they did not meet the annual visit requirement, OR if they have exceeded their minimum useful life requirements.

Solid Waste Collection Vehicles

For Solid Waste Collection Vehicles (SWCVs) operating in the South Coast, the South Coast AQMD requires under South Coast AQMD Rule 1193 that governmental agencies with 15 or more refuse collection vehicles use alternative fuel heavy-duty vehicles or engines that use compressed or liquefied natural ga, liquefied petroleum gas, methanol, electricity, fuel cells, or other advanced technologies that do not rely on diesel fuel. This rule began implementation in 2010, with requirements that new vehicles added to SWCV fleets (including purchases or leases) are rule-compliant vehicles. In 2020, the rule required that all vehicles used for refuse services are alternative-fueled or pilot ignition vehicles.[69] This program complements the suite of CARB regulations governing SWCVs.

CARB's ***Solid Waste Collection Vehicle Regulations*** were adopted in 2003 to reduce toxic diesel particulate matter (diesel PM) from approximately 12,000 diesel-fueled commercial and residential solid waste collection vehicle (SWCV) and recycling collection vehicles operated in California. The rule applies to all SWCVs of 14,000 pounds or more that run on diesel fuel, have engines in model years (MY) from 1960 through 2006, and collect waste for a fee. Additionally, SWCVs are subject to requirements under the ***Truck and Bus Regulation***, which requires 2010 Model Year or newer engines as of January 1, 2023.

The ***Advanced Clean Fleets Regulation***, approved by the CARB Board in April 2023, will accelerate ZEV adoption among solid waste collection vehicles. This regulation targets all state and local government fleets, and high priority fleets with 50 or more trucks or entities with trucks and $50 million in annual revenues. This effort is part of a comprehensive strategy to achieve a ZEV truck and bus fleet by 2045 everywhere feasible, and significantly earlier for certain well-suited market segments. The Advanced Clean Fleets Regulation would phase in ZEV requirements for different fleets, including State and local government fleets and those owned by or contracted with municipalities, including waste fleets. 100 percent of solid waste collection vehicle sales in California would be zero-emissions starting in 2036.

Public Agency and Utility Vehicles

California's ***Diesel Particulate Matter Control Measure for Municipality or Utility On-Road Heavy-Duty Diesel Fueled Vehicles*** (***Public Agency and Utility Regulation***) requires a municipality or utility that owns, leases or operates on-road diesel fueled vehicles with engine model year 1960 or newer and GVWR greater than 14,000 pounds to reduce PM2.5 emissions to 0.01 g/bhp-hr. This can be done by repowering, retrofitting, or retiring the vehicle. Implementation of the rule started in

[69] South Coast AQMD Rule Book, Rule 1193: Clean On-Road Residential and Commercial Refuse Collection Vehicles http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1193.pdf?sfvrsn=4

2007, with a compliance schedule based on the engine model year. Additionally, public agencies and utilities' fleets may be subject to requirements under the Truck and Bus Regulation.

The ***Advanced Clean Fleets Regulation***, approved by the CARB Board in April 2023, will accelerate ZEV adoption among public fleets. This regulation targets public fleets with 50 or more trucks or entities with trucks and $50 million in annual revenues. This effort is part of a comprehensive strategy to achieve a ZEV truck and bus fleet by 2045 everywhere feasible, and significantly earlier for certain well-suited market segments such as government fleets. The Advanced Clean Fleets Regulation will phase in ZEV requirements for different fleets, including requirements for State and local government fleets (including cities, counties, special districts, and other municipalities) to add only ZEVs to their fleets starting at 50 percent of new additions purchased in 2024 and 100 percent starting in 2027, or fleets may opt to phase-in ZEV requirement where a portion of the fleet must be zero-emission based on a pre-determined schedule. Small public fleets and those that are based in designated low population counties would begin with 100 percent ZEV additions starting in 2027.

Transit Agencies

Adopted in 2000, the ***Fleet Rule for Transit Agencies (Transit Fleet Rule)*** requires reductions in diesel PM and NOx emissions from urban buses and transit fleet vehicles and required future zero-emission bus purchases. Urban bus fleets were required to select either the diesel path or the alternative-fuel path. Transit agencies on the diesel path needed to demonstrate zero-emission buses, and to meet the zero-emission bus purchase requirements sooner, while agencies on the alternative-fuel path had to ensure that 85 percent of urban bus purchases were alternative fueled without a demonstration requirement. The Transit Fleet Rule was amended in 2004, and again in 2006. The 2006 amendments temporarily postponed the zero-emission bus purchase requirement (until 2011 and 2012, depending on the compliance path) and expanded the initial demonstration with a subsequent advanced technology demonstration phase. In 2009, CARB staff provided a technology update to the Board on the commercial readiness of zero-emission buses, and received Board direction to research and develop commercial readiness metrics to be used as criteria to initiate the zero-emission bus purchase requirement, and to conduct a technology assessment on the readiness of zero-emission bus technologies. U.S. EPA granted CARB a waiver of preemption for the Fleet Rule for Transit Agencies in 2013.[70] Additionally, transit fleets are subject to requirements under the Truck and Bus regulation.

In 2018, CARB adopted the ***Innovative Clean Transit (ICT) Regulation***, which requires all public transit agencies to gradually transition to a 100 percent zero-emission bus (ZEB) fleet. Beginning in 2029, 100 percent of new purchases by transit agencies must be ZEBs, with a goal for full transition by 2036. It applies to all transit agencies that own, operate, or lease buses with a gross vehicle weight rating (GVWR) greater than 14,000 lbs. It includes standard, articulated, over-the-road, double-decker, and cutaway

[70] U.S. EPA 2013, "California State Motor Vehicle Pollution Control Standards; Urban Buses; Request for Waiver of Preemption; Final Notice of Decision" Federal Register July 23, 2013 Volume 78, Number 141 pp. 44112-44117 https://www.gpo.gov/fdsys/pkg/FR-2013-07-23/pdf/2013-17700.pdf

buses. Under the ICT Regulation, requirements differ for large and small transit agencies. A transit agency is considered large if it operates at least 100 buses in annual maximum service in an urbanized area with a population of at least 200,000. However, if an agency operates in either the South Coast Air Basins or the San Joaquin Valley with more than 65 buses in annual maximum service, it is also considered a large transit agency. The ICT Regulation includes the following elements:

- A ZEB Rollout Plan required from each transit agency, approved by its Board, to show how it is planning to achieve a full transition to zero-emission technologies by 2040. Large transit agencies have to submit their Rollout Plan by July 1, 2020, and small transit agencies by July 1, 2023;
- ZEB purchases with various exemptions and compliance options to provide safeguards and flexibility to transit agencies;
- Low NO_x engine purchases, unless the transit buses are dispatched from NO_x Exempt areas;
- Use of renewable diesel or renewable natural gas for large transit agencies; and
- Reporting and record keeping requirements.

As shown in Table 15, ZEB purchase requirements begin in 2023 for large transit agencies and 2026 for small transit agencies, based on a percentage of new bus purchases each year that must be zero-emission. The ZEB purchase requirements for articulated, over-the-road, double-decker, or cutaway buses do not start until 2026 or later. These bus types remain exempt from the ZEB purchase requirements until they pass the Altoona testing.

Table 15: ZEB Purchase Schedule
(ZEB Percentage of Total New Bus Purchases)

Year	Large Transit	Small Transit
2023	25%	-
2024	25%	-
2025	25%	-
2026	50%	25%
2027	50%	25%
2028	50%	25%
2029	100%	100%

<u>Last Mile Delivery</u>

California's emission controls for last mile delivery vehicles (Class 3-7 heavy-duty delivery trucks used to deliver freight from warehouses and distribution centers to the final point of sale or use) are the most stringent in the country. ***Truck and Bus Regulation*** requires MY 2010 or equivalent engines by 2023.

Further increases in the stringency of last mile delivery fleets are anticipated under the ***Advanced Clean Fleets*** Regulation. Approved by CARB in April 2023, the Advanced Clean Fleets Regulation will accelerate ZEV adoption in the medium- and heavy-duty sectors by setting zero-emission requirements for fleets. This regulation high priority fleets with 50 or more trucks or entities with trucks and $50 million in annual revenues. This effort is part of a comprehensive strategy to achieve a ZEV truck and bus fleet by 2045 everywhere feasible, and significantly earlier for certain well-suited market segments. With this measure, staff anticipates bringing to the Board for consideration a regulation that would phase in ZEV requirements for different fleets, resulting in 100 percent of medium- and heavy-duty vehicle sales in California being zero-emissions starting in 2040.

Airport Shuttle Buses

The ***Zero-Emission Airport Shuttle Bus*** Regulation was adopted in 2019 and requires airport shuttle operators to transition to 100 percent zero-emission vehicle (ZEV) technologies. Airport shuttle operators must begin adding zero-emission shuttles to their fleets in 2027 and complete the transition to ZEVs by the end of 2035. The Regulation applies to airport shuttle operators who own, operate, or lease vehicles at any of the 13 California airports regulated under this rule (regulated airports), including Fresno Yosemite International Airport. Airport shuttle buses transport passengers between car parking lots, airport terminals, and airport car rental facilities. Airport shuttles that fall under the regulation include those with GVWR of 8,501 lbs or greater, which transport passengers to, from, or around a regulated airport, shuttles based or housed within 15 miles of a regulated airport that have round trip routes equal to or less than 30 miles, and shuttles with fixed destination routes that may include stops at locations such as rental car facilities, on-airport or off-airport parking, hotels, or other tourist destinations. (A fixed destination route is a predetermined route that transports passengers between the same locations, although the number of stops along the route may vary.)

Airport shuttle fleets must meet fleet ZEV requirements according to the compliance schedule in Table 16. After January 1, 2023, a fleet owner choosing to replace a ZEV in the existing fleet must replace it with another ZEV. Model year 2026 (and later) airport shuttles greater than 14,000 lbs (GVWR) must comply with the Zero-Emission Powertrain Certification Regulation. Reporting and record keeping requirements begin in 2022.

Table 16: Zero-Emission Airport Shuttle Regulation Requirements

Airport Shuttle Buses – Fleet ZEV Requirements	
Compliance Deadline	Percent of Fleet that Must be Zero-Emission
December 31, 2027	33%
December 31, 2031	66%
December 31, 2035	100%

School Buses

The ***Truck and Bus Regulation*** requires that all California school buses are equipped with diesel PM filters. Additionally, the ***School Bus Idling Airborne Toxic Control Measure*** (School Bus ATCM) limits bus and commercial motor vehicle idling near schools or at school bus destinations to only when necessary for safety or operational concerns. It has been in effect since July 16, 2003, and reduces emissions from more than 26,000 school buses that operate daily at or near schools. The program targets school buses, school pupil activity buses, youth buses, paratransit vehicles, transit buses, and heavy-duty commercial motor vehicles that operate at or near schools. In 2009, Senate Bill 124, Oropeza (SB 124) acknowledged and codified CARBs ATCM limiting school bus idling raising the minimum penalty for a violation of this rule from $100 to $300. The bill also clarifies local air district authority to enforce the State's school bus idling program. SB 124 became effective on January 1, 2010, and the existing regulation was revised to reflect this change.

While California's idling requirements for school buses are the most stringent in the nation, California does not currently have any proposed or current regulations that require electrification of the school bus fleet. New York State's enacted fiscal year 2022-2023 budget established a nation-leading commitment for all new school buses purchased to be zero emission by 2027 and all school buses in operation to be electric by 2035,[71] a mandate that was first introduced in New York Governor Kathy Hochul's 2022 State of the State Address.[72] Under the New York law, all school district purchases or leases of new vehicles for student transportation must be zero-emission by 2027. School districts can, upon request, be granted an extension for up to two years beyond the 2027 deadline, but all purchases and leases by school districts or transportation contractors will need to be electric by 2029. In 2035, when fully implemented, all school buses must be electric, including district-owned and leased vehicles.[73]

FUELS

In addition to new engine and in-use standards, cleaner burning fuels represent an important component in reducing emissions from on-road heavy-duty diesel trucks and buses. Cleaner fuel has an immediate impact in reducing emissions from the mobile source, and thus represent an important component in reducing NOx and diesel PM emissions from the on-road heavy-duty fleet. California's stringent air quality programs treat motor vehicles and their fuels holistically (as a system, rather than as separate components). As a result, CARB's fuels programs achieve significant reductions in criteria emissions from motor vehicles used in California.

CARB Diesel Fuel Regulations

The California diesel fuel program sets stringent standards for diesel fuel sold in California and ensures that in-use diesel engines continue to operate as cleanly as

[71] New York Senate Bill S8006C https://www.nysenate.gov/legislation/bills/2021/S8006
[72] 2022 New York State of the State Book https://info.aee.net/hubfs/2022StateoftheStateBookNY.pdf
[73] Rockefeller Institute of Government, November 2022 https://rockinst.org/blog/meeting-new-yorks-electric-school-bus-mandate-takeaways-from-the-2022-school-finance-symposium/

possible. CARB's Diesel Fuel Regulations have, over time, phased in more stringent requirements for fuel mixture specifications for aromatic hydrocarbons and sulfur (a precursor to formation of secondary PM), and have establish a lubricity standard which apply fuels used in on- and off-road applications in California. ***"CARB diesel" Specifications*** adopted in 1988 limited the allowable sulfur content of diesel fuel 500 parts per million by weight (ppmw), and the aromatic hydrocarbon content to 10 percent, and became effective in 1993.

In 2003, ***CARB's Ultra Low Sulfur Diesel (ULSD) Regulation*** increased the stringency of the sulfur content limits in to 15 ppm, which harmonized with the 1993 U.S. EPA regulation that also limited sulfur in on-road diesel fuels to the same level. Both the California and federal ULSD regulations began implementation in 2006. CARB's ULSD Regulation had an immediate impact in reducing emissions from the in-use on-road heavy-duty fleet, while also enabling the use of advanced emissions control technologies, including the use of catalyzed diesel particulate filters, NOx after-treatment, and other advanced after-treatment based emission control technologies that higher sulfur levels would have inhibit the performance of (at the time of CARB's ULSD rulemaking, the average sulfur content of California diesel was approximately 140 ppmw).

Beyond the current fuels control program, CARB committed in the 2016 State SIP Strategy to develop a ***Low Emission Diesel*** Measure that will require diesel fuel providers to steadily decrease criteria pollutant emissions from their diesel products. The use of low-emission diesel in on-road vehicles and off-road equipment will reduce tailpipe NOx and PM emissions, in addition to other criteria pollutants. Some studies carried out to date on hydrotreated vegetable oil have reported NOx emission reductions of 6 percent to 25 percent and PM emission reductions of 28 percent to 46 percent, depending on the types of fuels, drive cycles tested, and diesel engines used. This standard is anticipated to both increase consumption of low-emission diesel fuels, and to reduce emissions from conventional fuels. This measure is anticipated to provide NOx benefits predominately from legacy (pre-2010) on-road heavy-duty vehicles, off-road engines, stationary engines, portable engines, marine vessels and locomotives, as well as NOx and diesel PM benefits in potentially all model year off-road engines, stationary engines, portable engines, marine vessels and locomotives. Interstate vehicles, even those registered out-of-State but operating on CARB diesel blended with low-emission diesel, are also anticipated to provide emission reduction benefits.

Controlling Criteria Emissions from Renewable Fuels

The ***Low Carbon Fuel Standard (LCFS) and Alternative Diesel Fuel (ADF) Regulations,*** as amended in 2014, work together to reduce the carbon intensity of the California fuel supply. The regulations also limit criteria emissions from alternative fuels and/or alternative fuel mix blends (a mix of fuels made from renewable feedstocks, which are then blended with conventional gasoline or diesel).

STEP 2(B): OTHER STATES' AND NONATTAINMENT AREAS' ON-ROAD MEDIUM- AND HEAVY-DUTY CONTROL MEASURES

Error! Not a valid bookmark self-reference. summarizes the most stringent control measures currently in use in any state or nonattainment that have been identified and discussed for on-road heavy-duty vehicles. Each of the measures identified in this table are discussed in more detail in this section, below.

Table 17: Comparison of Stringency – Heavy-Duty Measures

CARB Control Programs Compared to Federal Standards and Control Programs in Other States and Nonattainment Areas

Type of Control Measure	Most Stringent Control Program Identified	Summary of Findings from Analysis	Other Jurisdiction(s) Analyzed
On-Road Heavy-Duty Vehicles			
New Engine Standards			
New Vehicle and Engine Standards: Zero-Emission Requirements	Advanced Clean Trucks (CARB)	The Advanced Clean Truck Regulation is part of a holistic approach to accelerate a large-scale transition of zero-emission medium-and heavy-duty vehicles from Class 2b to Class 8. The regulation has two components including a manufacturer sales requirement, and a reporting requirement: • Zero-emission truck sales: Manufacturers who certify Class 2b-8 chassis or complete vehicles with combustion engines would be required to sell zero-emission trucks as an increasing percentage of their annual California sales from 2024 to 2035. By 2035, zero-emission truck/chassis sales would need to be 55% of Class 2b – 3 truck sales, 75% of Class 4 – 8 straight truck sales, and 40% of truck tractor sales.	CARB is leading the nation on the development and penetration of on-road heavy-duty ZEVs through the Advanced Clean Trucks Regulation Reg teams – what other States have adopted / are in the process of adopting the ACT regulation? MA, NJ, NY, OR, VT, & WA have adopted … others? ME has begun rulemaking process, where do CO, CT, DC, HI, MD, NC, OR, PA, RI, VA, stand? The following states have adopted ACT: MA, NJ, NY, OR, VT, and WA. Some other states are considering adoption. NC has an executive order directing state officials to begin adopting the ACT rule.
New Vehicle and Engine Standards: Heavy-duty internal combustion engine emission standards (mandatory standards)	Mandatory Heavy-Duty vehicle and engine emission standards (CARB and U.S. EPA) Heavy-Duty Omnibus Regulation (CARB)	California's emissions standards for on-road heavy-duty vehicles are the most stringent in the nation. CARB's current emission standards for heavy-duty engines (NOx and PM) are set at the same level of stringency as Federal standards for MY 2010– 2023 engines. With the Heavy-Duty Omnibus regulation, CARB has further increased the stringency of controls for MY 2024 and subsequent engines by lowering California NOx and PM emission standards on existing regulatory cycles as well as a new NOx standard on a new low load certification cycle. The NOx standards would be cut to about 75 percent below current standards beginning in 2024 and 90 percent below current standards in 2027. The limits are for MY 2024 - 2026: • NOx: 0.050 g/bhp-hr	No other state has more stringent exhaust emission standards than California. Current CARB and U.S. EPA limit exhaust emissions to same levels (MY 2010 – 2023) • NOx: 0.20 g/bhp-hr • PM: 0.01 g/bhp-hr Five other States have also adopted the Omnibus regulation (MA, NY, OR, WA and VT). In MYs 2024-2026, California's standards will exceed the stringency of Federal standards, which are currently at 0.20 g/bhp-

Type of Control Measure	Most Stringent Control Program Identified	Summary of Findings from Analysis	Other Jurisdiction(s) Analyzed
On-Road Heavy-Duty Vehicles			
		• PM: 0.005 g/bhp-hr For MY 2027-2030: • NOx: 0.020 g/bhp-hr @ miles ≤ 435,000 0.035 g/bhp-hr @ 435,000 < miles ≤ 600,000 • PM: 0.005 g/bhp-hr For 2031 and Subsequent MYs: • NOx : 0.020 g/bhp-hr @ miles ≤ 435,000 0.040 g/bhp-hr @ 435,000 < miles ≤ 800,000 • PM: 0.005 /bhp-hr In December 2022, U.S. EPA finalized new emissions standards for federally-certified vehicles beginning in 2027, though these are less stringent than those included in CARB's Heavy-Duty Omnibus Regulation: For MY 2027 and later years, federal certification limits will be set to 0.035 g/hp-hr for NOx and 0.005 g/hp-hr for PM	hr for NOx and 0.01 g/bhp-hr for PM, and will strengthen to 0.050 g/bhp-hr for NOx and 0.005 g/bhp-hr for PM.
New Vehicle and Engine Standards: Optional heavy-duty internal combustion engine emission standards	Optional Heavy-Duty Low NOx Emission Standards (CARB) Omnibus Regulation (CARB)	CARB's optional standards accelerate the pace of innovation and development of cleaner engine technologies by certifying engines that go beyond the stringency of existing standards. Starting in 2015, engine manufacturers could choose to certify to three optional NOx emission standards of 0.1 g/bhp hr, 0.05 g/bhp-hr, and 0.02 g/bhp-hr (i.e., 50 percent, 75 percent, and 90 percent lower than the existing mandatory standard of 0.2 g/bhp-hr). Together with the mandatory standards that harmonize with federal emission requirements, this program makes California's suite of HD engine emission controls the most stringent in the nation. The Heavy-Duty Omnibus Regulation will lower the optional Low-NOx Emission Standards to 0.020 g/bhp-hr for MY 2024-26 and to 0.010 g/bhp-hr for MY 2027 and later.	California is the only state with optional exhaust emission standards for heavy-duty engines that exceed the stringency of U.S. EPA requirements.
New Vehicle and Engine Standards: Warranty Requirements and Useful Life	California Emission Control System Warranty Regulations and Maintenance Provisions (CARB) Omnibus Regulation (CARB)	For Model Years 2022 and later, U.S. EPA warranty provisions cover 100,000 miles, or 5 years / 3,000 hours, for Class 4 – 8 trucks; California's more stringent warranty provisions cover: • Class 8: 350,000 miles, or 5 years • Class 6 – 7: 150,000 miles, or 5 years • Class 4 – 5: 110,000 miles, or 5 years CARB Useful Life: **Model Year** | **Useful Life (miles)**	Currently, no other state has more stringent warranty requirements than California. California is the only state with the authority to initially adopt and enforce emission standards and test procedures for new motor vehicles and new motor vehicle engines that are more stringent than federal emission standards and test procedures. For MY 2022 – 2026, CARB's warranty requirements are more stringent than Federal standards, and California's useful life requirements align with federal requirements. Under the 2021 Omnibus Regulation, California warranty and useful life

<table>
<tr><th>Type of Control Measure</th><th>Most Stringent Control Program Identified</th><th>Summary of Findings from Analysis</th><th>Other Jurisdiction(s) Analyzed</th></tr>
<tr><th colspan="4">On-Road Heavy-Duty Vehicles</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><th></th><th>Class 4 – 5 Diesel</th><th>Class 6 – 7 Diesel</th><th>Class 8 Diesel</th><th>Heavy-Duty Otto</th></tr>
<tr><td>Current – 2026</td><td>110,000 miles 10 years</td><td>185,000 miles 10 years</td><td>435,000 miles 10 years 22,000 hours</td><td>110,000 miles 10 years</td></tr>
<tr><td>2027–2030</td><td>190,000 miles 12 years</td><td>270,000 miles 11 years</td><td>600,000 miles 11 years 30,000 hours</td><td>155,000 miles 12 years</td></tr>
<tr><td>2031 and subsequent model years</td><td>270,000 miles 15 years</td><td>350,000 miles 12 years</td><td>800,000 miles 12 years 40,000 hours</td><td>200,000 miles 15 years</td></tr>
</table>
For older MY trucks and engines, both U.S. EPA and CARB require that heavy-duty vehicles meet emission standards throughout their useful life periods of 5 years / 100,000 miles (GVWR > 14,000 lbs.)</td><td>requirements are at least as stringent as federal requirements for My 2027 – 2031+.</td></tr>
<tr><td>New Vehicle and Engine Standards: OBD Requirements</td><td>Heavy-Duty OBD (CARB)</td><td>CARB and federal OBD regulations for heavy-duty vehicles generally align for MY2013 and newer engines, although CARB’s program has been amended to be more stringent than U.S. EPA’s for certain vehicle types. California OBD requirements are overall at least as stringent as applicable federal requirements. California OBD fault detection requirements are at least as stringent if not more stringent than U.S. EPA requirements. However in 2022, U.S. EPA updated their OBD requirements applicable to 2027 and subsequent model years to delete some California requirements and add some emission control system data parameters to be provided on demand and in the driver display.</td><td>No other state has more stringent OBD requirements than California</td></tr>
</table>

<table>
<tr><th>Type of Control Measure</th><th>Most Stringent Control Program Identified</th><th>Summary of Findings from Analysis</th><th>Other Jurisdiction(s) Analyzed</th></tr>
<tr><td colspan="4">On-Road Heavy-Duty Vehicles</td></tr>
<tr><td colspan="4">In-Use Emission Controls</td></tr>
<tr><td>In-Use Emissions Controls:
I/M program (opacity limits)</td><td>Periodic Smoke Inspection Program (PSIP) (CARB)</td><td>California’s in-use emission controls including opacity limits are the most stringent in the nation. The 2018 Amendments to the Periodic Smoke Inspection Program (PSIP) require all California-based fleets of two or more heavy-duty diesel vehicles over 6,000 pounds GVWR with engines over four years old are required to perform annual smoke opacity tests (1998 and newer diesel vehicles between 6,000–14,000 pounds GVWR subject to biennial smog check are not subject to PSIP).

Allowable levels of Smoke Opacity are shown below:
<table>
<tr><td colspan="2">Engines Equipped with a Diesel Particulate Filter (DPF)</td></tr>
<tr><td colspan="2">5% Opacity Limit</td></tr>
<tr><td colspan="2">Pre-2007 Model Year (MY) Engines without a DPF</td></tr>
<tr><td>1997– 2006 MY Engines</td><td>20% Opacity Limit</td></tr>
<tr><td>1991–1996 MY Engines</td><td>30% Opacity Limit</td></tr>
<tr><td>Pre-1991 MY Engines</td><td>40% Opacity Limit</td></tr>
<tr><td colspan="2">Engines Equipped with a Level 2 Verified Diesel Emission Control Strategy (VDECS)</td></tr>
<tr><td colspan="2">20% Opacity Limit</td></tr>
<tr><td colspan="2">Two-Engine Cranes Driven by a non-DPF Off-Road Engine</td></tr>
<tr><td colspan="2">40% Opacity Limit</td></tr>
</table></td><td>New Jersey’s opacity limits range from 40% - 20%. California’s in-use emission controls, including opacity limits, are the most stringent in the nation.</td></tr>
<tr><td>In-Use Emissions Controls:
I/M program (Testing)</td><td>Heavy-Duty Vehicle Inspection Program (HDVIP) (CARB)

Periodic Smoke Inspection Program (PSIP) (CARB)

The Heavy-Duty Omnibus Regulation (CARB)

The Heavy-Duty Inspection and Maintenance Program (HD I/M) (CARB)</td><td>California’s in-use testing program (including the HD I/M, HDVIP and PSIP regulations) is the most stringent in the nation, with further increases in stringency going into effect in 2024.

The Heavy-Duty Omnibus Regulation revised the heavy-duty in-use testing program to make it more effective in ensuring compliance with the in-use emission standards over a broader range of vehicle operation, and to better represent heavy-duty vehicle operations in real world conditions. The Omnibus regulation established clearer criteria for engine family pass/fail determination, and requires on-board diagnostic (OBD) data during testing to verify the condition of the test vehicle and sensors. These amendments apply to 2024 and subsequent model year engines, and replace the current NTE-based methodology with a new three-bin moving average windows-based methodology.

Under the Heavy-Duty Inspection and Maintenance Program (HD I/M), heavy-duty vehicles registered in California will also be required to demonstrate annual compliance with HD I/M program requirements in order to register with the Department of Motor Vehicles. Beginning in January 2023, CARB is using roadside emissions monitoring devices (REMD) to screen for vehicles that may have high emissions. Vehicles flagged as potential high emitters may be required to undergo follow-up vehicle compliance testing to ensure they are operating with properly</td><td>Three other states also test OBD in heavy-duty vehicles (MA, NJ, and WI), but none aside from California are currently enforcing on OBD scans for vehicles >14,000 lb. GVWR. Additionally, they do not control emissions from out-of-state trucks, or include the potential use of telematics like CARB.</td></tr>
</table>

Type of Control Measure	Most Stringent Control Program Identified	Summary of Findings from Analysis	Other Jurisdiction(s) Analyzed
On-Road Heavy-Duty Vehicles			
		functioning emissions control systems. Upon full implementation of HD I/M periodic compliance testing, nearly all vehicles will be required to undergo twice per year testing with results submitted to CARB. Three years after the start of HD I/M periodic compliance testing, on board diagnostics (OBD) equipped vehicles will be required to undergo testing four times per year. On-road agricultural vehicles and California-registered motorhomes only will be required to undergo testing once per year.	
In-Use Emissions Controls: Idling requirements	Heavy-Duty Diesel Vehicle Idling Reduction Program (CARB) Heavy-Duty Omnibus Regulation (CARB)	California's idling requirements and comprehensive program for on-road heavy-duty vehicles limits idling time to five minutes, and requires that MY 2008 and newer engines are equipped to automatically shut down after five minutes of idling. While other jurisdictions have adopted similar idling time limits requirements – some with more stringent time limits than CARB – none surpassed the stringency of California's program in effect, because emission performance requirements for idle reduction technologies are unique to California's program. The Heavy-Duty Omnibus Regulation reduces idling limits for heavy-duty diesel vehicles from 30g/hr to 10g/hr in MY 2024 – 2026 engines, and to 5 g/hr in MY 2027+ engines.	Areas with more stringent time limits: • 2 minute restrictions, no exemptions: Philadelphia, PA • 2 minute restrictions, some exemptions: Salt Lake City and Salt Lake County, UT • 3 minute restrictions, some exemptions: CT, DC, City of Ketchum (ID), New York City (NY), the Village of Larchmont (NY), the Village of Mamaroneck (NY), the County of Westchester (NY), Park City (UT), and the City of Birmingham (VT) Areas with less stringent time limits: • 3 minute restrictions, some exemptions DE, Chicago (IL), NJ, Town of Mamaroneck (NY), and Rockland County (NY)
In-Use Emissions Controls: Fleet Rules	Truck and Bus Regulation (CARB) Advanced Clean Fleets Regulation (CARB) Future Measure: *Zero-Emission Trucks Measure (CARB)*	California's in-use emission controls for on-road heavy-duty vehicles are the most stringent in the nation. CARB's Truck and Bus regulation is the most comprehensive and stringent mandatory heavy-duty fleet turnover rule in the nation, affecting approximately one million inter- and intra-state on-road diesel vehicles. The regulation applies to nearly all privately or federally owned diesel-fueled trucks and buses > 14,000 lbs., GVWR, including on-road and off-road agricultural yard goats, cargo handling equipment, drayage trucks, solid waste collection vehicles, and school buses. Its phased-in requirements mandate diesel particulate filters in early years, eventually requiring vehicles to fully upgrade to newer, cleaner engines that meet MY 2010 engine equivalent emissions levels when fully implemented in 2023. Approved by CARB in April 2023, the Advanced Clean Fleets Regulation accelerates ZEV adoption in the medium-to heavy-duty sectors and for light-duty package delivery trucks by setting zero-emission requirements for fleets. This regulation targets drayage trucks, public fleets, and other high priority fleets with 50 or more trucks or entities with trucks and $50 million in annual revenues. This effort is part of a comprehensive strategy to achieve a ZEV truck and bus fleet by 2045 everywhere feasible, and significantly earlier for certain well-suited market segments such as last mile delivery, drayage, and government fleets. The	No other state requires diesel particulate filters (DPF) and MY 2010 + equivalent engines as a mandatory fleet rule affecting nearly the entire on-road diesel fleet No other state has zero-emission requirements for heavy-duty vehicle fleets

Type of Control Measure	Most Stringent Control Program Identified	Summary of Findings from Analysis	Other Jurisdiction(s) Analyzed
On-Road Heavy-Duty Vehicles			
		regulation will phase in ZEV requirements for different fleets, including components as follows: • Beginning January 1, 2024, all additions to High Priority and Federal fleets must be ZEVs, and all combustion vehicles must be removed from the California fleet at the end of their useful life, or fleets may opt to phase-in ZEV requirement where a portion of the fleet must be zero-emission based on a pre-determined schedule. • State and local government fleets including cities, counties, special districts, and other municipalities would be required to add only ZEVs to their fleets starting at 50 percent of new additions in 2024 and 100 percent starting in 2027 or fleets may opt to phase-in ZEV requirement where a portion of the fleet must be zero-emission based on a pre-determined schedule. Small public fleets or those that are based in designated low population counties would begin with 100 percent ZEV additions starting in 2027. • Beginning January 1, 2024, any truck added to drayage service would need to be a ZEV. All drayage trucks entering seaports and intermodal railyards would be required to be zero-emission by 2035; and • 100 percent of medium- and heavy-duty vehicle sales in California would be zero-emissions starting in 2036. Under the recently-approved regulation and the ACT regulation, the number of medium- and heavy-duty ZEVs operating in California will be about 1.7 million by 2045. The future Zero-Emission Trucks measure would accelerate the number of zero-emissions (ZE) trucks beyond existing measures (including the Advanced Clean Fleets regulation). This measure is anticipated to be implemented through one of two potential options: • Option A would use market signal tools, if given authority to implement differentiated registration fees, restrictions or fees for heavy-duty combustion trucks entering low/zero-emission zones, and/or indirect source rules to establish ZE zones by 2035. • Option B would likely be pursued if CARB is unable to implement the strategies and/or if new authorities outlined in Option A do not come to fruition. If so, CARB may need to implement an inflexible requirement for all fleets to phase-in ZEVs and to remove legacy trucks from service in California. *(Note: CARB has committed to pursue the Zero-Emission Trucks measure, but this measure has yet to be proposed to the Board for approval/adoption)*	

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Type of Control Measure	Most Stringent Control Program Identified	Summary of Findings from Analysis	Other Jurisdiction(s) Analyzed
On-Road Heavy-Duty Vehicles			
In-Use Emissions Controls: Fleet Rules (Drayage Trucks)	Truck and Bus Regulation (CARB) Advanced Clean Fleets Regulation (CARB)	California's in-use emission controls for drayage trucks are the most stringent in the nation. The Truck and Bus Regulation requires 2010 Model Year or newer engines at ports and rail yards starting in 2023. Approved by CARB in April 2023, the Advanced Clean Fleets (ACF) Regulation, CARB is further strengthening emission controls for drayage fleets; all drayage trucks entering seaports and intermodal railyards would be required to be zero-emission by 2035; ACF controls drayage emissions through three main components: • Zero-emission drayage truck requirements Drayage trucks will be required to start transitioning to zero-emission technology beginning in 2024, with full implementation by 2035 • Drayage Truck Registration Requirements All drayage trucks intending to begin or continue operations at a California seaport or intermodal railyard must be registered with CARB. Beginning in 2035, all trucks in the CARB Online System will be required to be zero-emission. • Removing Combustion-Powered Drayage Trucks from Service Non-zero-emission (legacy) drayage trucks with a 2010 or newer model year engine may register in the CARB Online System on or before January 1, 2024,. Beginning in 2024, all legacy drayage trucks must visit a seaport or intermodal railyard at least once each year to remain in the CARB Online System. Legacy drayage trucks 12 years old must begin reporting their mileage annually in 2025 and, can remain in the system until they reach their minimum useful life (either 800,000 miles or the engine is older than 18 years, whichever comes first). Beginning in 2025, legacy drayage trucks will be removed from the CARB Online System if they did not meet the annual visit requirement, OR if they have exceeded their minimum useful life requirements.	No other jurisdiction mandates more stringent fleet requirements for drayage trucks.
In-Use Emissions Controls: Fleet Rules (Solid Waste Collection Vehicles)	Solid Waste Collection Vehicle Regulations (CARB) Truck and Bus Regulation (CARB) Advanced Clean Fleets Regulation (CARB)	California's in-use emissions controls for solid waste collection vehicles (SWCVs) are the most stringent in the nation. Compared to New York City's program, CARB's Solid Waste Collection Vehicles regulation limits PM emissions at approximately the same level of stringency. However, SWCV's with 2007-2009 engines were also subject to more stringent 2010 engine requirements under Truck and Bus, however, the overall level of emission controls are more stringent in California than any other jurisdiction. Approved by CARB in April 2023, the Advanced Clean Fleets Regulation accelerates ZEV adoption among solid waste collection vehicles. This regulation targets all state and local government fleets and high priority fleets with 50 or	New York City (NY) requires that at least 90 percent of the ~8,300 qualifying privately and publicly-owned SWCVs meet the U.S. EPA's 2007 diesel standard for PM. Comparatively, CARB controls ~12,000 SWCVs (MYs 1960 through 2006) at approximately the same level of PM control for all trucks (i.e. equivalent to the 2007 MY standard of 0.01 g/bhp-hr).

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Type of Control Measure	Most Stringent Control Program Identified	Summary of Findings from Analysis	Other Jurisdiction(s) Analyzed
On-Road Heavy-Duty Vehicles			
		more trucks or entities with trucks and $50 million in annual revenues. This effort is part of a comprehensive strategy to achieve a ZEV truck and bus fleet by 2045 everywhere feasible, and significantly earlier for certain well-suited market segments. The regulation will phase in ZEV requirements for different fleets, including State and local government fleets and those owned by or contracted with municipalities, including waste fleets. 100 percent of solid waste collection vehicle sales in California would be zero-emissions starting in 2036.	
In-Use Emissions Controls: Fleet Rules (Public fleets)	Public Agency and Utility Regulation (CARB) Truck and Bus Regulation (CARB) Advanced Clean Fleets Regulation (CARB)	California's in-use emissions controls for public fleets are the most stringent in the nation. CARB's Public Agency and Utility Regulation requires similar stringency in PM emissions limits as the Boston, MA program; because some utility fleets are also subject to more stringent requirements under Truck and Bus, the overall level of emission controls are more stringent in CA than any other jurisdiction. Approved by CARB in April 2023, the Advanced Clean Fleets Regulation accelerates ZEV adoption among public fleets. This regulation targets all public fleets in California. This effort is part of a comprehensive strategy to achieve a ZEV truck and bus fleet by 2045 everywhere feasible, and significantly earlier for certain well-suited market segments such as last mile delivery, drayage, and government fleets. The regulation will phase in ZEV requirements for different fleets. State and local government fleets – including cities, counties, special districts, and other municipalities – would be required to add only ZEVs to their fleets starting at 50 percent of new purchases in 2024 and 100 percent starting in 2027 or fleets may opt to phase-in ZEV requirement where a portion of the fleet must be zero-emission based on a pre-determined schedule. Small public fleets and those that are based in designated low population counties would begin with 100 percent ZEV additions starting in 2027.	The city of Boston (MA) requires by 2018 all pre-2007 diesel vehicles and equipment not previously retrofit to be controlled to achieve emission reductions of at least 85 percent (approximately equivalent to the 2007 PM standard of 0.01 g/bhp-hr). Comparatively, CARB limits are set equivalent to the 2007 MY standard of 0.01 g/bhp-hr for engine MY 1960 or newer, GVWR > 14,000 lbs.
In-Use Emissions Controls: Fleet Rules (Transit fleets)	Transit Fleet Rule (CARB) Innovative Clean Transit Regulation (CARB)	California's in-use emission controls for transit vehicles are the most stringent in the country. The Transit Fleet Rule requires emission reductions (PM and NOx) from urban buses and transit fleet vehicles, and required future zero-emission bus purchases. The Innovative Clean Transit (ICT) Regulation requires all public transit agencies to gradually transition to a 100 percent zero-emission bus (ZEB) fleet. Beginning in 2029, 100% of new purchases by transit agencies must be ZEBs, with a goal for full transition by 2036.	No other jurisdiction mandates more stringent fleet requirements for transit fleets.
In-Use Emissions Controls: Fleet Rules (Last mile delivery trucks)	Truck and Bus Regulation (CARB)	California's in-use emission controls for last mile delivery vehicles (Class 3-7 heavy-duty delivery trucks used to deliver freight from warehouses and distribution centers to the final point of sale or use) are the most stringent in the nation. Truck and Bus requires MY 2010 or equivalent engines for Class 4 – 8 engines by 2023.	No other jurisdiction mandates more stringent fleet requirements for last mile delivery trucks.

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Type of Control Measure	Most Stringent Control Program Identified	Summary of Findings from Analysis	Other Jurisdiction(s) Analyzed
On-Road Heavy-Duty Vehicles			
	Advanced Clean Fleets Regulation (CARB)	Approved by CARB in April 2023, the Advanced Clean Fleets Regulation accelerates ZEV adoption in the medium- to heavy-duty sectors and for light-duty package delivery trucks by setting zero-emission requirements for high priority fleets with 50 or more trucks or entities with trucks and $50 million in annual revenues. This effort is part of a comprehensive strategy to achieve a ZEV truck and bus fleet by 2045 everywhere feasible, and significantly earlier for certain well-suited market segments. The regulation will phase in ZEV requirements for different fleets, resulting in 100 percent of medium- and heavy-duty vehicle sales in California being zero-emissions starting in 2036.	
In-Use Emissions Controls: Fleet Rules (Airport shuttle buses)	Truck and Bus Regulation (CARB) Zero-Emission Airport Shuttle Bus Regulation (CARB)	California's in-use emission controls for airport shuttle buses (vehicles used to transport passengers between car parking lots, airport terminals, and airport car rental facilities) are the most stringent in the nation. The Truck and Bus Regulation requires MY 2010 or equivalent engines by 2023. The Zero-Emission Airport Shuttle Bus Regulation requires airport shuttle operators to transition to 100 percent zero-emission vehicle (ZEV) technologies. Airport shuttle operators must begin adding zero-emission shuttles to their fleets in 2027, and complete the transition to ZEVs by the end of 2035. The regulation applies to airport shuttle operators who own, operate, or lease vehicles at any of the 13 California airports regulated under this rule (regulated airports), including the Fresno Yosemite International Airport.	No other jurisdiction mandates more stringent fleet requirements for airport shuttle buses.
In-Use Emissions Controls: Fleet Rules (School Buses)	Truck and Bus Regulation (CARB) School Bus Idling Airborne Toxic Control Measure (CARB) Omnibus Regulation (CARB) School Bus Incentive Program (CARB)	California's in-use emission controls for school buses are among the most stringent in the nation. The Truck and Bus regulation requires that all school buses are equipped with PM filters. Since 2003, California has also limited bus and vehicle idling time near schools or at school bus destinations through the School Bus ATCM, reducing emissions from >26,000 school buses operating daily at or near schools. Under the Omnibus Regulation, idling limits for diesel heavy-duty vehicles will be reduced from 30 g/hr currently to 10 g/hr in MY 2024 and to 5 g/hr in MY 2027. CARB has also used incentive funds as a key component of the strategy to reduce emissions from the school bus fleet. Over the past two decades, CARB's School Bus Incentive Program has invested over $1.2 billion to date to clean up old, higher-polluting school buses, which has supported about 1,800 zero emission school buses. Under this program, California leads the nation in deployment of zero emission school buses; by comparison, 888 zero emission school buses have been awarded, ordered, or deployed across the U.S. outside of California.	Colorado (CO) controls emissions from school buses through a School Bus Retrofit Program funded by DERA Grants from U.S. EPA. This voluntary program began in 2009, and controls PM emissions through retrofits. CARB staff is unaware of any other jurisdictions that mandate retrofits. New York State requires all new school buses purchased to be zero emission by 2027, and all school buses in operation to be electric by 2035.

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Type of Control Measure	Most Stringent Control Program Identified	Summary of Findings from Analysis	Other Jurisdiction(s) Analyzed
On-Road Heavy-Duty Vehicles			
Fuels Programs			
Fuels Standards: Diesel Standards	CARB Diesel Fuel Regulations and Ultra Low Sulfur Diesel (CARB) Future Measure: *Low Emission Diesel measure (CARB)*	California's fuel standards for diesel are the most stringent in the nation. CARB Diesel Fuel Regulations include stringent requirements for fuel mixture specifications for aromatic hydrocarbons and sulfur, and have establish a lubricity standard and applies to sales of fuel used in on-road vehicles and off-road vehicles and locomotives in California. CARB's ULSD program reduces NOx and PM emissions significantly relative to U.S. EPA requirements, providing approximately 7 percent more NOx reductions and 25 percent more dPM reductions than federal diesel. CARB is anticipated to further increase the stringency of controls on criteria pollutant emissions diesel products. *(NOTE: CARB has committed to pursue the Low Emission Diesel measure, but it has not yet been proposed to the Board for approval/adoption.)*	No state requires cleaner burning diesel than California. The California diesel fuel regulations exceed federal requirements in stringency. CARB staff are aware of only one other state, Texas, who has a boutique diesel fuel program that is approved into the SIP. An independent analysis of The Texas Low Emission Diesel program (TxLED) showed that the TxLED fuel emissions performance does not provide as significant of emission reduction benefits as the California specifications.
Fuels Standards: Alternative Fuel Standards (Diesel substitutes)	Low Carbon Fuel Standard (CARB) Alternative Diesel Fuel Regulation (CARB)	California's fuel standards for diesel substitutes are the most stringent in the nation. The Low Carbon Fuel Standard and Alternative Diesel Fuel regulations work together to reduce the carbon intensity of the California fuel supply while requiring limits on criteria emissions from alternative fuels and/or alternative fuel mix blends.	No other state has set as stringent of criteria emission requirements on alternative fuels and alternative fuel blends than California. For low carbon fuel/clean fuel programs: • Oregon, and Washington have low carbon fuel standard programs, California participates in the Pacific Coast Collaborative with these states, and British Columbia. • Other states and countries that are considering a clean fuel regulation: NY, MI, MN, NM, VT, IL, MA.

NEW HEAVY-DUTY VEHICLE AND ENGINE STANDARDS

Heavy-duty engine emission standards

CARB's truck engine standards for on-road heavy-duty engines are consistent with the most stringent of any other area in the nation. CARB's current heavy-duty engine emission standards (MY 2010 - 2023) set exhaust emission standards for PM2.5 at 0.01 g/bhp-hr and NOx at 0.20 g/bhp-hr. This aligns with the applicable federal standards set by U.S. EPA, which are also set at the same levels of stringency.[74]

With the adoption and implementation of the Heavy-Duty Omnibus Regulation, CARB will further increase the stringency of these requirements to reduce NOx exhaust emissions standards to levels 90 percent lower than the current mandatory standard (for MY 2027 – 2030, mandatory emissions standards will be set to 0.020 g/bhp-hr at miles ≤ 435,000, and 0.035 g/bhp-hr at 435,000 - 600,000 miles). Massachusetts, New York, Oregon, Washington, and Vermont have also committed to adopt CARB's Omnibus Regulation. CARB's standards will exceed the stringency of Federal standards in MY 2024 – 2031.

In December 2022, U.S. EPA finalized new emissions standards for federally-certified vehicles beginning in 2027, though these are less stringent than those included in CARB's Heavy-Duty Omnibus Regulation: For MY 2027 and later years, federal certification limits will be set to 0.035 g/hp-hr for NOx and 0.005 g/hp-hr for PM.

In December 2022, U.S. EPA finalized their regulation, "Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards", which sets stronger NOx emission standards for MY 2027 and later heavy-duty vehicles and engines. For MY 2027 and later years, federal limits will be set to 0.05 g/bhp-hr for NOx and 0.005 g/bhp-hr for PM. Like the California standards, the new federal standards will also require lower NOX emissions over a much wider range of testing conditions both in the laboratory and when engines are operating on the road. Further, the regulation includes longer useful life periods, as well as significant increases in the emissions-related warranty periods.

As most Class 7 and 8 vehicles operating in California have been originally purchased outside of the State and are thus covered by U.S. EPA, rather than CARB standards, federal action is critical to achieving the needed emission reductions for the South Coast and other California nonattainment areas to meet U.S. EPA's air quality standards. However, U.S. EPA's recently finalized Clean Trucks Plan[75] is less stringent than the options previously suggested by U.S. EPA and CARB's Heavy-Duty Omnibus Regulation. Given the need for deep emissions reductions and the benefits of consistency in this area given the multiple jurisdictions in which trucks are purchased and used, CARB will advocate to align the federal CTP with CARB's Omnibus Regulations to the maximum degree possible.

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[74] U.S. EPA 2016 "Heavy-Duty Highway Compression-Ignition Engines and Urban Buses: Exhaust Emission Standards" https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100O9ZZ.pdf accessed May 1, 2018.

[75] U.S. EPA 2023 "Clean Trucks Plan" https://www.epa.gov/regulations-emissions-vehicles-and-engines/clean-trucks-plan accessed August 2, 2023.

U.S. EPA has also released two additional steps in their CTP, including a proposal for heavy-duty GHG standards for MY 2027 and later, under their "Phase 3" regulation, and multipollutant standards for light and medium-duty vehicles for MY 2027 and later. [76] U.S. EPA has issued final decisions in 2023 regarding several California waiver requests for California's heavy-duty vehicle and engine emission standards, including the 2018 Heavy-Duty Warranty Amendments, the Advanced Clean Truck (ACT) Regulation, the Zero-Emission Airport Shuttle Bus Regulation, and the Zero-Emission Powertrain Certification Regulation.[77] U.S. EPA has also signaled that they intend to issue a final decision on the waiver request for the Heavy-Duty Omnibus Regulation this year.[78] CARB will continue to call on U.S. EPA to move expeditiously in developing these requirements in recognition of the critical public health benefits they will provide.

Optional engine emission standards

To achieve further reductions and incentivize ongoing development of increasingly more efficient engine technologies, CARB has also provided since 2015 certification to optional emission standards at levels 50 percent, 75 percent, and 90 percent cleaner than currently mandated emission standards. This allows CARB and local air districts to preferentially incentivize and fund the purchase of cleaner trucks and engines than would have otherwise met the mandatory standard. CARB staff is unaware of any other state with a similar control program. With the Omnibus Regulation, the optional emission standards lower further, from current levels of 0.10 – 0.02 g/bhp-hr (through MY 2024), to 0.010 g/bhp-hr for MY 2027+.

Zero-Emission Trucks

CARB's Advanced Clean Truck Regulation has also been adopted by several states, including Massachusetts, New Jersey, New York, Oregon, Vermont, and Washington, while Maine has begun the rulemaking process to adopt.[79] Some other states are also considering adoption of the rule, while North Carolina has an executive order directing state officials to begin adopting the Advanced Clean Truck rule. Together with California, these states comprise approximately a quarter of the U.S. medium- and heavy-duty market. Additionally, sixteen states and the District of Columbia have signed a Memorandum of Understanding to spur the adoption of medium- and heavy-duty ZEVs.[80]

Useful Life and Warranty Requirements

CARB's useful life and warranty requirements for new on-road heavy-duty vehicles exceeds the stringency of any other in the nation for MY 2022 - 2026. Currently, no other state has more stringent warranty requirements than California. California is the

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[76] U.S. EPA, 2023. "Proposed Rule: Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles – Phase 3" https://www.epa.gov/regulations-emissions-vehicles-and-engines/proposed-rule-greenhouse-gas-emissions-standards-heavy

[77] U.S. EPA, 2023. "California Waiver Requests for Heavy-Duty Vehicle Emission Regulations" https://www.epa.gov/regulations-emissions-vehicles-and-engines/california-waiver-requests-heavy-duty-vehicle-emission

[78] U.S. EPA, 2022. "Heavy-Duty 2027 and Beyond: Clean Trucks Final Rulemaking" https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P101695R.pdf

[79] ICCT 2021 https://theicct.org/wp-content/uploads/2022/01/state-level-hdv-emissions-reg-FS-dec21.pdf

[80] Multi-State Medium- and Heavy-Duty Zero Emission Vehicle Memorandum of Understanding, 2020 https://ww2.arb.ca.gov/sites/default/files/2020-07/Multistate-Truck-ZEV-Governors-MOU-20200714.pdf signatories include CA, CO, CT, DC, HI, ME, MD, MA, NJ, NY, NC, OR, PA, RI, VT, and WA. Virginia also signed in December 2021 https://www.sierraclub.org/press-releases/2021/12/governor-northam-signs-virginia-multi-state-agreement-electrify-trucks-and

only state with the authority to initially adopt and enforce emission standards and test procedures for new motor vehicles and new motor vehicle engines that are more stringent than federal emission standards and test procedures. For MY 2022 – 2026, CARB's warranty requirements are more stringent than federal standards, and California's useful life requirements align with federal requirements. Under the Omnibus Regulation, California warranty and useful life requirements are at least as stringent as federal requirements for My 2027 – 2031 and later model years.

Lower In-Use Emission Performance Standards and Test Procedures

CARB's in-use emission performance standards and test procedures for new on-road heavy-duty engines and vehicles exceeds the stringency of any other state in the nation. California is the only state with emission performance standards and test procedures for new on-road heavy-duty engines and vehicles that exceed the stringency of U.S. EPA requirements.

OBD Requirements

CARB and federal OBD regulations for heavy-duty vehicles generally align for MY2013 and newer engines, although CARB's program has been amended to be more stringent than U.S. EPA's for certain vehicle types. California OBD requirements are overall at least as stringent as applicable federal requirements, and California OBD fault detection requirements are at least as stringent if not more stringent than U.S. EPA requirements. However, in 2022, U.S. EPA updated their OBD requirements applicable to 2027 and subsequent model years to delete some California requirements and add some emission control system data parameters to be provided on demand and in the driver display. No other state has more stringent OBD requirements than California.

IN-USE EMISSION CONTROLS FOR HEAVY-DUTY VEHICLES

In-Use Inspection Program

The Inspection / Maintenance (I/M) Program testing and in-use emission controls in the South Coast for on-road heavy-duty trucks and buses are consistent with the most stringent of any other I/M program in the nation.

Opacity Limits

New Jersey has opacity limits that range from 40 percent to 20 percent.[81] Under the ***2018 Amendments to the Periodic Smoke Inspection Program,*** California opacity limits are the most stringent in the nation, ranging from 40 percent to 5 percent.

I/M Testing

CARB's HDVIP program requires heavy-duty trucks and buses to be inspected for excessive smoke and tampering, and engine certification label compliance, including all applicable OBD requirements. Any heavy-duty vehicle traveling in California, including vehicles registered in other states and foreign countries, may be tested. Tests are performed by CARB inspection teams at border crossings, weigh stations, fleet facilities, and randomly selected roadside locations. Owners of trucks and buses found in

[81] For more information on the New Jersey Opacity Limits, please see http://www.nj.gov/dep/bmvim/bmvim_emisStds.htm

violation are subject to minimum penalties starting at $300 per violation. The PSIP program requires that diesel and bus fleet owners conduct annual smoke opacity inspections of their vehicles and repair those with excessive smoke emissions to ensure compliance. CARB randomly audits fleets, maintenance and inspection records and tests a representative sample of vehicles. All vehicles that do not pass the test must be repaired and retested. A fleet owner that neglects to perform the annual smoke opacity inspection on applicable vehicles is subject to a penalty of $500 per vehicle, per year.

Comparatively, three other states have efforts to include OBD testing on heavy-duty vehicles, which are summarized below:

- Massachusetts currently requires opacity testing for diesel engines over 14,000 lbs., GVWR, and OBD testing starting at 2007, with plans to develop a more stringent OBD testing program that will include OBD testing on vehicles 14,000 lbs., GVWR and above;
- New Jersey currently requires opacity testing for diesel engines over 18,000 lbs., GVWR, and has announced the award of a new program to include OBD testing on all diesels over 18,000 lbs., GVWR; and
- Wisconsin currently requires OBD testing for diesel engines up to 14,000 lbs., GVWR, which began in 2007. Wisconsin is considering an option to move toward testing OBD on 14,000 lbs., GVWR and above in the future.

While Massachusetts and New Jersey are developing similar I/M programs as California (all three states are collecting OBD test data for vehicles over 14,000 lbs., GVWR) no jurisdictions aside from California are currently enforcing on OBD scans for vehicles over 14,000 lb. GVWR. Furthermore, none include the potential use of telematics or are trying to also capture out-of-State trucks in the program as California's control program does. Thus, CARB's I/M testing controls program (including the HD I/M, HDVIP and PSIP regulations) are the most stringent in the nation, with further increases in stringency going into effect in 2024.

Idling Requirements

The idling requirements in the South Coast's plan are aligned with the most stringent in the nation. California has a 5-minute idling time restriction. In addition, it has emission performance requirements for alternative idle reduction technologies such as auxiliary power units (APU) and fuel-fired heaters. While other states have adopted similar HD idling requirements as California, none have surpassed the stringency of California requirements in effect, due to the unique exemptions provided California under the Act that enables CARB to set emissions performance requirements that exceed the stringency of those required by U.S. EPA. The following states, counties and cities have more stringent timing requirements for idling time restrictions. However, they do not set performance requirements for idle reduction technologies to reduce the intensity of emissions emitted over a given amount of time.

- The City of Philadelphia (PA) has the most stringent idling restriction of 2-minutes with no exemptions.

- Salt Lake City and Salt Lake County in Utah have also idling restrictions of 2 minutes with some exemptions but still more stringent than California idling restrictions.
- Connecticut, the District of Columbia, City of Ketchum (Idaho), New York City (NY), the Village of Larchmont (NY), the Village of Mamaroneck (NY), the County of Westchester (NY), Park City (Utah), and the City of Birmingham (Vermont) have idling time restriction of 3 minutes with some exemptions.
- Delaware, Chicago (Illinois), New Jersey, Town of Mamaroneck (NY), and Rockland County (NY) also have 3-minute idling restrictions, but their exemptions make their rules less stringent than California idling rule.

Only California has emission performance requirements for idle reduction technologies. Therefore, even if another jurisdiction has an idle time restriction shorter than California's 5-minute idling restriction, for sleeper cabs that use APUs as an alternative technology, California's regulation is more stringent because of the differences in APU emissions. Thus, all other state, county, or city idling rules are less stringent than California's idling restriction.

Heavy-Duty Fleet Rules

California's fleet rules for heavy-duty trucks and buses are the most stringent of any in the nation. The Truck and Bus Regulation requires that by 2014, nearly all vehicles operating in California will have PM emission controls, and by 2023 nearly all vehicles will meet 2010 model year engine emissions levels. The Regulation applies to nearly all diesel fueled trucks and buses with a gross vehicle weight rating greater than 14,000 pounds that are privately or federally owned, including on-road and off-road agricultural yard goats, and privately and publicly owned school buses. Moreover, the Regulation applies to any person, business, school district, or federal government agency that owns, operates, leases or rents affected vehicles. No other state requires diesel particulate filters and MY 2010 + equivalent engines as a mandatory fleet rule affecting nearly the entire on-road diesel fleet.

Approved by CARB in April 2023, the Advanced Clean Fleets Regulation is a nation-leading zero-emission fleet requirement. The Advanced Clean Fleets Regulation accelerates ZEV adoption in the medium-to heavy-duty sectors and for light-duty package delivery trucks by setting zero-emission requirements for fleets. This Regulation targets drayage trucks, public fleets, and other high priority fleets with 50 or more trucks or entities with trucks and $50 million in annual revenues. This effort is part of a comprehensive strategy to achieve a ZEV truck and bus fleet by 2045 everywhere feasible, and significantly earlier for certain well-suited market segments such as last mile delivery, drayage, and government fleets. No other state has zero-emission requirements for heavy-duty vehicle fleets.

Additionally, California has adopted and implemented fleet-specific rules that are consistent with the most stringent in the nation.

Drayage Trucks

California's in-use emissions controls for drayage trucks are the most stringent in the nation. The Truck and Bus Regulation requires 2010 Model Year or newer engines at ports and rail yards starting in 2023. Under the recently approved Advanced Clean Fleets Regulation, CARB is further strengthening emission controls for drayage fleets; all drayage trucks entering seaports and intermodal railyards would be required to be zero-emission by 2035. No other jurisdiction mandates more stringent fleet requirements for drayage trucks.

Solid Waste Collection Vehicles

California's in-use emissions controls for SWCVs are the most stringent in the nation. New York City (NY) is implementing a control measure that began in 2017 to modernize the city's fleet of diesel-powered solid waste vehicles of approximately 2,000 trucks used for picking up residential waste and recyclables with newer, less-polluting models. This program requires that at least 90 percent of the approximately 8,300 qualifying vehicles must meet the tougher emission control standards for diesel trucks that the U.S. EPA set in 2007.[82] Comparatively, California's Solid Waste Collection Vehicle Regulation was adopted in 2003 to reduce toxic diesel PM from approximately 12,000 diesel fueled commercial and residential SWCV and recycling collection vehicles operated in California. The rule applies to all SWCVs of 14,000 pounds or more that run on diesel fuel, have engines in MYs from 1960 through 2006, and collect waste for a fee.

Compared to New York City's program, CARB's Solid Waste Collection Vehicles Regulation limits PM emissions at approximately the same level of stringency. However, SWCVs with 2007-2009 engines were also subject to more stringent 2010 engine requirements under Truck and Bus (which requires diesel particulate filters and MY 2010 + equivalent engines), meaning that the overall level of emission controls are more stringent in California than any other jurisdiction. Additionally, the Advanced Clean Fleets Regulation accelerates ZEV adoption among solid waste collection vehicles. The Regulation will phase in ZEV requirements for different fleets, including waste fleets. Starting in 2036, 100 percent of solid waste collection vehicle sales in California would be zero-emissions. No other state has zero-emission requirements for SWCVs.

Public Fleet Rules

California's in-use emissions controls for public fleets are the most stringent in the nation. The city of Boston (MA) requires that, all pre-2007 City-owned or operated vehicles to have equipment that reduces diesel emissions by at least 20 percent by the end of 2015, and that all pre-2007 diesel vehicles and equipment not previously retrofit would be required to have retrofits achieving at least 85-percent—or best available—pollution reductions by the end of 2018. Public fleets in California are subject to the Truck and Bus Regulation, which requires diesel particulate filters and MY 2010+ equivalent engines. California's statewide Public Agency and Utility Regulation requires any municipality or utility that owns, leases, or operates on-road diesel fueled vehicles with engine model year 1960 or newer and GVWR greater than 14,000 pounds to

[82] https://www.nytimes.com/2016/08/19/opinion/how-garbage-trucks-can-drive-a-green-future.html

reduce PM2.5 emissions to 0.01 g/bhp-hr. This can be done by repowering, retrofitting, or retiring the vehicle. Implementation of the rule started in 2007, with a compliance schedule based on the engine model year. Comparatively, CARB's Public Agency and Utility Regulation requires similar stringency in PM emissions limits as the Boston, MA program; because some utility fleets are also subject to more stringent requirements under the Truck and Bus Regulation, the overall level of emission controls are more stringent in California than any other jurisdiction.

Additionally, the Advanced Clean Fleets Regulation will phase in ZEV requirements for public fleets in California. State and local government fleets – including cities, counties, special districts, and other municipalities – would be required to add only ZEVs to their fleets starting at 50 percent of new purchases in 2024 and 100 percent starting in 2027, or fleets may opt to phase-in ZEV requirement where a portion of the fleet must be zero-emission based on a pre-determined schedule. Small public fleets and those that are based in designated low population counties would begin with 100 percent ZEV additions starting in 2027.

<u>Transit Fleets</u>

California's in-use emission controls for transit vehicles are the most stringent in the country. CARB's Transit Fleet Rule requires emission reductions (PM and NOx) from urban buses and transit fleet vehicles and required future zero-emission bus purchases. Additionally, the Innovative Clean Transit Regulation requires all public transit agencies to gradually transition to a 100 percent ZEB fleet. Beginning in 2029, 100 percent of new purchases by transit agencies must be ZEBs, with a goal for full transition by 2036. No other jurisdiction mandates more stringent fleet requirements for transit fleets.

<u>Last Mile Delivery Trucks</u>

California's in-use emission controls for last mile delivery vehicles (Class 3-7 heavy-duty delivery trucks used to deliver freight from warehouses and distribution centers to the final point of sale or use) are the most stringent in the nation. Truck and Bus requires MY 2010 or equivalent engines by 2023. Additionally, the Advanced Clean Fleets Regulation accelerates ZEV adoption in the medium- to heavy-duty sectors and for light-duty package delivery trucks by setting zero-emission requirements for high priority fleets with 50 or more trucks or entities with trucks and $50 million in annual revenues. The regulation will phase in ZEV requirements for different fleets, resulting in 100 percent of medium- and heavy-duty vehicle sales in California being zero-emissions starting in 2036. No other jurisdiction mandates more stringent fleet requirements for last mile delivery trucks.

<u>Airport Shuttle Buses</u>

California's emission controls for airport shuttle buses (vehicles used to transport passengers between car parking lots, airport terminals, and airport car rental facilities) are the most stringent in the nation. The Truck and Bus Regulation requires MY 2010 or equivalent engines by 2023. Additionally, the Zero-Emission Airport Shuttle Bus Regulation requires airport shuttle operators to transition to 100 percent ZEV technologies. Airport shuttle operators must begin adding zero-emission shuttles to their fleets in 2027, and complete the transition to ZEVs by the end of 2035. The Regulation applies to airport shuttle operators who own, operate, or lease vehicles at any of the 13

California airports regulated under this rule (regulated airports), including the Fresno Yosemite International Airport. No other jurisdiction mandates more stringent fleet requirements for airport shuttle buses.

School Buses

Colorado controls emissions from school buses through a School Bus Retrofit Program funded by DERA Grants from U.S. EPA. This program began in 2009, and reduces emissions of diesel exhaust by retrofitting school buses with proven emissions-reduction technologies, including diesel-oxidation catalysts, engine preheaters and closed-crankcase filtration systems. Comparatively, California's Truck and Bus regulation requires that all privately and publicly owned school buses are equipped with diesel PM filters. California also limits bus and vehicle idling time near schools or at school bus destinations through the School Bus ATCM. It has been in effect since 2003 and reduces emissions from more than 26,000 school buses that operate daily at or near schools. The School Bus ATCM targets school buses, school pupil activity buses, youth buses, paratransit vehicles, transit buses, and heavy-duty commercial motor vehicles that operate at or near schools.

Additionally, CARB's School Bus Incentive Program has invested over $1.2 billion to date to clean up old, higher-polluting school buses. The California Legislature recently appropriated an additional $1.8 billion for zero-emission school buses and associated charging infrastructure over the next five years. Over the last twenty years, the total $1.2 billion statewide investment made, including $255 million invested in school bus cleanup over the past year alone, has supported about 1,800 zero-emission school buses. More than 560 of those buses are already on California roadways, with 327 in the State's most pollution-burdened communities.[83]

New York State's enacted fiscal year 2022-2023 budget established a requirement for all new school buses purchased to be zero emission by 2027.[84] Under the New York law, all school buses must be electric, including district-owned and leased vehicles upon full implementation in 2035.[85] New York is the only state the nation with an in zero-emission school bus requirements. California, however, leads the nation with its deployment of about 1,800 zero-emission school buses. By comparison, 888 zero-emission school buses have been awarded, ordered, or deployed across the U.S. outside of California, as of 2021.[86] While CARB incentive programs have turned over the most school buses to zero-emission engines of any state to date, California does not currently have any proposed or current regulations that require electrification of the school bus fleet.

CARB utilizes incentive programs rather than mandating turnover through regulatory actions due to the costs of zero-emission school buses, and particularly due to the impact those costs would have on public school districts. Public school districts often do not have the funding to replace their aging school bus fleet. Based on a comprehensive

[83] CARB, 2022 https://ww2.arb.ca.gov/news/new-report-shows-how-california-leading-nation-cleaning-school-buses
[84] New York Senate Bill S8006C https://www.nysenate.gov/legislation/bills/2021/S8006
[85] Rockefeller Institute of Government, November 2022 https://rockinst.org/blog/meeting-new-yorks-electric-school-bus-mandate-takeaways-from-the-2022-school-finance-symposium/
[86] CARB, 2022 https://ww2.arb.ca.gov/news/new-report-shows-how-california-leading-nation-cleaning-school-buses

assessment of funding for home-to-school transportation conducted by the Legislative Analyst's Office in 2014,[87] the primary responsibility for school transportation funding lies with public school districts through the State legislative process. Investing in California's school bus fleet is a collective effort amongst agencies on the local, state, and federal level. CARB and CEC have led the effort in dedicating funding and resources to turning over old, dirty school buses and investing in new technologies.[88] Together, CARB and CEC have made significant progress to make it easier for school districts to access zero-emission school bus and charging/fueling infrastructure incentives in a coordinated, streamlined manner. If CARB were to adopt a regulatory program that mandated zero-emission school buses, the ability to use incentive funds to help alleviate school districts of the burden of purchasing these new buses would be compromised, due to requirements in most of CARB's incentive funding programs that require that incentive dollars are spent on turning over vehicles and mobile equipment that exceed regulatory requirements.

FUELS

Diesel Fuel Regulations

U.S. EPA began regulating sulfur content in diesel in 1993. At that time, uncontrolled fuels (i.e. non-CARB diesel) contained approximately 5,000 parts per million (ppm) of sulfur. In 2006, U.S. EPA began to phase-in more stringent requirements under the federal Ultra-Low Sulfur Diesel (ULSD) regulations, which lowered the amount of sulfur in on-road diesel fuel to 15 ppm. The On-road (Highway) Diesel Fuel Standard was phased-in from 2006 to 2010, and since 2011 have required that all highway diesel fuel supplied to the market be ULSD, and that all highway diesel vehicles must use ULSD.

CARB's Ultra-Low Sulfur Diesel (ULSD) program limits sulfur content at the same levels as U.S. EPA's on-road ULSD program (i.e. at 15 ppm); however, due to other specifications that uniquely apply to CARB diesel, the California program reduces emissions significantly relative to federal diesel, providing about a 7 percent reduction in NOx and 25 percent in diesel PM.[89] Furthermore, CARB is anticipated to further increase the stringency of controls on criteria pollutant emissions diesel products under ***the Low Emission Diesel measure***. No other state or nonattainment area controls criteria emissions from renewable fuels more stringently than CARB.
Beyond the federal diesel requirements described above, the Act also allows states to adopt unique fuel programs to meet local air quality needs, which are referred to as Boutique Fuel Programs. As of January 19, 2017, U.S. EPA identified only one boutique fuel programs that had been approved in a SIP,[90] the Low Emission Diesel Program in Texas (TxLED). The fuel specifications for the TxLED are based on CARB diesel

[87] Legislative Analyst's Office, 2014. "Review of School Transportation in California" https://lao.ca.gov/reports/2014/education/school-transportation/school-transportation-022514.pdf
[88] CARB https://ww2.arb.ca.gov/sites/default/files/2022-10/fy2022_23_funding_plan_appendix_e.pdf
[89] Beyond sulfur limits at 15 ppm, CARB's program also requires the aromatic hydrocarbon content of the diesel fuel sold in the state not to exceed 10 percent by volume. Alternative diesel fuel formulations can be used to demonstrate equivalent compliance without actually meeting the aromatic limit.
[90] U.S. EPA, 2017 https://19january2017snapshot.epa.gov/gasoline-standards/state-fuels_.html

requirements,[91] and fuel formulations approved by CARB are also considered approved by the Texas Commission on Environmental Quality, and may be used to comply with the TxLED regulations.[92] Additionally, independent analysis of TxLED, CARB ULSD and federal ULSD shows that the TxLED fuel emissions performance does not provide as significant of emission reduction benefits as the California specifications,[93] although U.S. EPA credited the TxLED program with providing approximately a 5 percent NOx emission reduction benefit over federal ULSD fuels.[94] Furthermore, the stringency of Texas' testing requirements are based on the federal Complex Model, which is less stringent and nuanced than the California Predictive Model that is used to determine compliance with California fuel requirements.

Controlling Criteria Emissions from Renewable Fuels

The Low Carbon Fuel Standard (LCFS) and Alternative Diesel Fuel (ADF) regulations work together to limit criteria emissions from alternative fuels. Oregon and Washington State also have low carbon fuel standard programs modeled after the California regulation, California participates in the Pacific Coast Collaborative with these states, in addition to British Columbia. Seven other states are also considering a clean fuel regulation, including New York, Michigan, Minnesota, New Mexico, Vermont, Illinois, and Massachusetts.

While other states have adopted or are considering adopting similar programs to the California LCFS, no other state has set criteria emission requirements on alternative fuels. U.S. EPA's Renewable Fuel Standard (RFS II) does not specify criteria emission requirements for alternative fuels.

[91] Texas Administrative Code Title 30 Part I Chapter 114 Subchapter H, Division 2 Rule §114.312 http://texreg.sos.state.tx.us/public/readtac%24ext.TacPage?sl=R&app=9&p_dir=&p_rloc=&p_tloc=&p_ploc=&pg=1&p_tac=&ti=30&pt=1&ch=114&rl=312

[92] Texas Commission on Environmental Quality https://www.tceq.texas.gov/assets/public/implementation/air/sip/texled/List%20of%20TCEQ-Approved%20Alternative%20Diesel%20Formulations.pdf

[93] American Transportation Research Institute (ATRI) 2008 "Energy and Other Fuel Property Changes with On-Road Ultra-Low Sulfur Diesel Fuel" http://www.atri-online.org/research/results/environmentalfactors/2008ATRIDiesel.pdf

[94] U.S. EPA 2001, "Approval and Promulgation of Air Quality State Implementation Plans (SIP); Texas: Low Emission Diesel Fuel" https://www.federalregister.gov/documents/2001/11/14/01-27581/approval-and-promulgation-of-air-quality-state-implementation-plans-sip-texas-low-emission-diesel Federal Register Vol. 66, No. 220 pages 57196-57219

STEP 3(A): EVALUATION OF STRINGENCY: MEDIUM- AND HEAVY-DUTY CONTROL MEASURES

Step 3(a) calls for an evaluation of each of the potential control measures identified in Step 2, in order to evaluate their stringency and determine whether they meet all applicable requirements to satisfy the definitions of MSM as discussed in Section 1 and Section 2.

As shown in the Step 2(b): Other States' and Nonattainment Areas' on-road Medium- and Heavy-Duty Control Measures

Error! Not a valid bookmark self-reference. summarizes the most stringent control measures currently in use in any state or nonattainment that have been identified and discussed for on-road heavy-duty vehicles. Each of the measures identified in this table are discussed in more detail in this section, below.

Table *17* in Step 2(b), CARB's programs are the most stringent in the nation. This comparison between CARB's control measures and the measures currently in place at the federal level and/or within other states and jurisdictions illustrates the stringency of the current CARB on-road heavy-duty control program, which meets the stringency requirements of MSM.

Furthermore, CARB staff have conducted an analysis of the timing of the new measures included in the 2022 State SIP Strategy, which go beyond the stringency of the current control program as it is now being implemented and thus beyond MSM. Many of these measures are still in their development phases and are not yet being implemented; the development timeline, however, is critical to allowing industry and technological advancements to progress sufficiently such that the newly emerging technologies called for in these regulatory actions (most of which are technology-inducing regulations) have sufficient time to attain market readiness. Table 18, below, discusses the timeframe considerations for each of the applicable medium- and heavy-duty control measures, and indicates why a more expedited timeframe is neither technologically nor economically feasible. For these reasons, the measures meet the MSM requirement of being phased in as "expeditiously as practicable" and go beyond MSM requirements in terms of stringency.

Table 18: Medium- and Heavy-Duty Control Measures – Stringency and Timeline for Implementation

Measures	Implementation Begins	12 µg/m³ Annual PM2.5 Standard (2012)
New Heavy-Duty Vehicle Standards		
Mandatory Emission Standards (Internal Combustion Engines)		
Heavy-Duty Emission Standards for New Vehicles and Engines (Mandatory)	ongoing	MSM
Heavy-Duty Omnibus Regulation (Mandatory Emission Standards)	2024	MSM
CARB's mandatory emission standards for heavy-duty vehicles and engines harmonize with federal standards for NOx and PM emission requirements though MY 2023. For MY 2024 and later, the Omnibus regulation established new low NOx and lower PM Standards that, when implemented, will be the lowest in the nation. Adopted in 2021, the omnibus regulation is a technology-forcing regulation; further stringency is infeasible. The Omnibus regulation also lengthened the useful life and emissions warranty provisions for heavy-duty diesel engines. Heavy-Duty emission standards for new vehicles and engines require years of lead time to be developed, certified, manufactured, and implemented; a more accelerated timeline is infeasible.		
Optional Emission Standards (Internal Combustion Engines)		
Optional Low-NOx Emission Standards for Heavy-Duty Engines	ongoing	MSM
Heavy-Duty Omnibus Regulation (Optional Emission Standards)	2024	MSM
CARB's optional Low-NOx emission standards are the most stringent in the nation, and are technology-forcing regulations that have driven the development and market readiness of the cleanest heavy-duty engines. The Omnibus regulation, when implemented, will further lower CARB's optional low-NOx emission standards to an even lower level; further increases in stringency are not feasible. Vehicle emission standards, including optional standards, are dependent on technological development, and require years of lead time to be developed, certified, manufactured, and implemented; a more accelerated timeline is infeasible.		
Zero-Emission Truck Standards – Sales and Manufacturer Requirements		
Advanced Clean Trucks	2024	MSM
Adopted in 2020, the Advanced Clean Trucks (ACT) regulation established manufacturer zero-emission truck sales requirements for Class 2b – Class 8 trucks beginning in 2024, as well as company and fleet reporting requirements. The ACT regulation has the most stringent zero-emission truck requirements in the nation. As a technology-forcing regulation, ACT will accelerate the development and deployment of Zero-Emission Heavy-Duty trucks and engines; further increases in stringency are not feasible. Manufacturer sales requirements need years of lead time to be implemented; it would be infeasible to implement on a more accelerated timeframe.		
Warranty, Useful Life, and On-Board Diagnostics (OBD) Requirements		
California Emission Control System Warranty and Maintenance Provisions	ongoing	MSM
Amendments to Useful Life & Warranty Provisions (as part of Omnibus)	2027	MSM
For MY 2022 - 2026 engines, California's Emission Control System Warranty and Maintenance Provisions are the most stringent in the nation. Adopted in 2021, the Omnibus Regulation further amended the warranty and useful life provisions for heavy-duty engines for MY 2027 and later years. To help ensure emission controls are well maintained and repaired when needed, and to help ensure more durable emission control systems, Omnibus extends the criteria pollutant emissions warranty and useful life period requirements for heavy-duty vehicles and engines. For My 2027 – 2031 and later years, California warranty and useful life requirements are at least as stringent as the federal requirements. As technology-forcing regulations, California's warranty and maintenance provisions are the most stringent in the nation; further increases in stringency are not feasible. Likewise, an accelerated timeline is not feasible; the requisite technological innovations and developments needed to meet California's level of stringency require years of lead time for implementation, as manufacturers must have sufficient time to develop, test, certify, and manufacture these needed advanced technologies.		
Heavy-Duty On-Board Diagnostics (HD OBD) and OBD II	ongoing	MSM
Amendments to Useful Life & Warranty Provisions (as part of Omnibus)	2024	MSM
The Heavy-Duty OBD regulation required that all MY 2013 and later engines offered for sale in California come equipped with OBD systems. CARB and federal OBD regulations for heavy-duty vehicles generally align for MY2013 – current engines, although CARB's program has been amended to be more stringent than U.S. EPA's for certain vehicle types. With the 2021 adoption of the Omnibus regulation, California's threshold for OBD requirements will become more stringent, concurrent with the phase-in of more stringent emission requirements. Omnibus also requires		

Measures	Implementation Begins	12 µg/m^3 Annual PM2.5 Standard (2012)
updates to address cold start emissions and diesel PM monitoring. Many of the regulatory changes are phased-in, as full implementation is not anticipated to be technologically feasible until 2027. As the most stringent requirements in the nation, for these technology-forcing regulations, further increases in stringency are not feasible. Furthermore, because OBD requirements need significant lead time to be developed, adopted, and implemented, they require sufficient lead time for manufacturers to develop, test, and manufacture the needed hardware and/or software changes, and to verify via testing; an accelerated timeline for implementation is therefore not feasible.		
In-Use Emission Control Measures		
Inspection and Maintenance Provisions		
HD Diesel Vehicle Inspection Program (HDVIP)	ongoing	MSM
Periodic Smoke Inspection Program (PSIP)	ongoing	MSM
HD Inspection and Maintenance Program (HD I/M)	ongoing	MSM
Heavy-Duty In-Use Testing Program (HDIUT) (Part of Omnibus Regulation)	2024	MSM
California's in-use testing program (including the HD I/M, HDVIP and PSIP regulations) is the most stringent in the nation, with further increases in stringency going into effect in 2024 (HDIUT). • Amended in 2018, HDVIP requires heavy duty vehicles to be inspected for smoke opacity, tampering, and engine certification label compliance. PSIP identifies malfunctioning PM emission control components and requires their repair. The 2018 amendments to HDVIP and PSIP lowered the smoke opacity limits and required engines over four years old to be inspected annually. • Adopted in 2021, HD I/M is a comprehensive heavy-duty vehicle inspection and maintenance regulation requiring periodic vehicle emissions testing and reporting on nearly all heavy-duty vehicles operating in California. Combining periodic vehicle testing with other emissions monitoring and expanded enforcement strategies, the HD I/M regulation ensures that vehicles' emissions control systems are properly functioning when traveling on California's roadways, and that polluting, poorly maintained heavy-duty vehicles operating in California are quickly identified and repaired. As of 2023, CARB is using roadside emissions monitoring devices (REMD) to screen for vehicles that may have high emissions. • To ensure that in-use heavy-duty vehicles continue to operate at their cleanest possible level, the 2020 Omnibus regulation amended the Heavy-Duty In-Use Testing (HDIUT) Program by revising procedures to better represent heavy-duty vehicle operations in real world conditions, establishing clearer criteria for engine family pass/fail determination, and requiring on-board diagnostic (OBD) data during testing to verify the condition of the test vehicle and sensors. California's HD inspection and maintenance requirements are the most stringent in the nation; further increases in stringency are not feasible. Further increases in stringency under the Omnibus Regulation take effect next year and are phased-in in subsequent years to allow regulated parties and manufacturers sufficient lead time to comply with the regulation's stringency; a more accelerated timeline is infeasible.		
Diesel Idling Requirements		
HD Idling Reduction Program	ongoing	MSM
Reduced Idling Limits (as part of Omnibus)	2024	MSM
School Bus Idling ATCM	ongoing	MSM
The HD Idling Reduction Program requires that drivers of diesel-fueled commercial motor vehicles (GVWR < 10,000 lbs), including buses and sleeper berth equipped trucks, not idle the vehicle's primary diesel engine longer than five minutes at any location. The regulation also consists of new engine and in-use truck requirements and emission performance requirements for technologies used as alternatives to idling the truck's main engine. Under the new engine requirements, 2008 and newer model year heavy-duty diesel engines need to be equipped with a non-programmable engine shutdown system that automatically shuts down the engine after five minutes of idling. The Omnibus regulation further reduces diesel idling limits from 30 g/hr to 10 g/hr in MY 2024, and to 5 g/hr in MY 2027+ engines. In addition to the idling limits required under the HD Idling Reduction program and the Reduced Idling Limits as part of the Omnibus Regulation, the School Bus Idling Airborne Toxic Control Measure (School Bus ATCM) further limits bus and commercial motor vehicle idling near schools or at school bus destinations to only when necessary for safety or operational concerns. California's idling requirements are the most stringent in the nation; further increases in stringency are not feasible. Reduced idling limits from the Omnibus Regulation take effect next year (2024+) and are phased-in in subsequent years to allow regulated parties and manufacturers sufficient lead time to comply with the regulation's stringency; a more accelerated timeline is infeasible.		
Fleet Rules - General		
Truck and Bus	ongoing	MSM

CARB Control Program MSM Analysis
for the SCAQMD 2024 12 µg/m³ annual PM2.5 Plan

Measures	Implementation Begins	12 µg/m³ Annual PM2.5 Standard (2012)
Advanced Clean Fleets (ACF) Regulation (2022 State SIP Strategy measure, adopted April 2023)	2024	MSM
Zero-Emission Trucks Measure (2022 State SIP Strategy measure with commitment)	2030	Beyond MSM

California's heavy-duty fleet rules are the most stringent in the nation, and have continually relied on the newest developments in advanced clean technologies that are spurred by CARB's new engine and vehicle standards. For the timeline of analysis for this document, there have been / will be three generations of fleet rules, which transition California's heavy-duty fleet from low-emission internal combustion engines to increasingly stringent requirements for zero-emission technologies:

- Adopted in 2010, the Truck and Bus regulation requires heavy-duty diesel vehicles that operate in California to reduce exhaust emissions. By 2023, nearly all trucks and buses will be required to have 2010 or newer model year engines to reduce PM and NOx.
- Building on the successful emission reductions from Truck and Bus, the Advanced Clean Fleets (ACF) regulation would transition CARB's fleet rules toward establishing zero-emission purchasing requirements for medium- and heavy-duty vehicle fleets (including state and local agencies, and drayage fleets, high priority, and federal fleets), beginning in 2024. ACF would also require 100% zero-emission new vehicle sales starting 2040. Under the recently-adopted ACF regulation, together with the ACT regulation, the number of medium- and heavy-duty ZEVs operating in California will be about 1.2 7 million by 2045.
- The future Zero-Emission Trucks Measure would build on the rollout of ZE trucks through the Advanced Clean Trucks and Advanced Clean Fleets regulations by going beyond ACF requirements and further increasing the number of ZEVs, with the goal of achieving a full ZEV fleet by 2045 everywhere feasible. It would seek to expand the ZEV market in a manner that is economically feasible for more than 100,000 fleets where some cannot afford to purchase new trucks and will not be able to operate without access to retail ZEV infrastructure, especially for long-haul and inter-state vehicles.

Fleet requirements need years of lead time to be implemented for reasons of technological and economic feasibility. As purchasing requirements and fleet turnover cannot happen immediately, it would be infeasible to accelerate the implementation schedule for new purchasing requirements. California's currently committed to heavy-duty fleet requirements are technology-forcing and are the most stringent in the nation, as they will eventually exclusively require zero-emission trucks and engines; further increases in stringency are not feasible.

Fleet Rules - Drayage Trucks

Truck and Bus	ongoing	MSM
Advanced Clean Fleets (ACF) Regulation (2022 State SIP Strategy measure, adopted April 2023)	2024	MSM

Drayage trucks are subject to requirements under the Truck and Bus Regulation, which requires MY 2010 or newer engines on drayage trucks entering ports and rail yards, beginning in on January 1, 2023. Under the Advanced Clean Fleets (ACF) Regulation, CARB will further strengthen emission controls for drayage fleets with zero-emission drayage truck requirements. Drayage trucks will be required to start transitioning to zero-emission technology beginning in 2024, with full implementation by 2035. Fleet requirements need years of lead time to be implemented for reasons of technological and economic feasibility. As purchasing requirements and fleet turnover cannot happen immediately, it would be infeasible to accelerate the implementation schedule for new purchasing requirements. California's fleet requirements for drayage trucks are technology-forcing and are the most stringent in the nation, as they will require zero-emission trucks and engines; further increases in stringency are not feasible.

Fleet Rules - Solid Waste Collection Vehicles (SWCVs)

Solid Waste Collection Vehicle Regulation	ongoing	MSM
Truck and Bus	ongoing	MSM
Advanced Clean Fleets (ACF) Regulation (2022 State SIP Strategy measure, adopted April 2023)	2024	MSM

Adopted in 2003, the Solid Waste Collection Vehicle Regulations reduce diesel PM from SWCVs by requiring engines equivalent to the 2007 MY standard of 0.01 g/bhp-hr. SWCVs are also subject to requirements under the Truck and Bus Regulation, which requires MY 2010 or newer engines as of January 1, 2023. The ACF regulation will accelerate ZEV adoption among SWCVs, with a goal of 100 percent ZE vehicle sales in California starting in 2036. Fleet requirements need years of lead time to be implemented for reasons of technological and economic feasibility. As purchasing requirements and fleet turnover cannot happen immediately, it would be infeasible to accelerate the implementation schedule for new purchasing requirements. California's fleet requirements for SWCVs are technology-forcing and are the most stringent in the nation, as they will require zero-emission trucks and engines; further increases in stringency are not feasible.

CARB Control Program MSM Analysis
for the SCAQMD 2024 12 µg/m³ annual PM2.5 Plan

Measures	Implementation Begins	12 µg/m³ Annual PM2.5 Standard (2012)
Fleet Rules - Public Agencies and Utilities		
Public Agency and Utility Regulation	ongoing	MSM
Truck and Bus	ongoing	MSM
Advanced Clean Fleets (ACF) Regulation (2022 State SIP Strategy measure, adopted April 2023)	2024	MSM
The Public Agency and Utility Regulation requires PM emission limits comparable to the 2007 MY standard of 0.01 g/bhp-hr for engine MY 1960 or newer. Some public and utility fleets are also subject to requirements of Truck and Bus, and must have MY 2010 or newer engines as of January 1, 2023. The ADF regulation accelerates ZEV adoption among all state and local government and utility fleets, starting with a 50% purchase requirement in 2024, with increasingly stringent requirements phased-in over subsequent years. Fleet requirements need years of lead time to be implemented for reasons of technological and economic feasibility. As purchasing requirements and fleet turnover cannot happen immediately, it would be infeasible to accelerate the implementation schedule for new purchasing requirements. California's fleet requirements for public and utility fleets are technology-forcing and are the most stringent in the nation, as they will require zero-emission trucks and engines; further increases in stringency are not feasible.		
Fleet Rules - Transit Agencies		
Fleet Rule for Transit Agencies	ongoing	MSM
Innovative Clean Transit	2023	MSM
The Transit Fleet Rule requires PM and NOx emission reductions from urban buses and transit fleet vehicles, and required future zero-emission bus purchases. Adopted in 2018, the Innovative Clean Transit (ICT) Regulation requires all public transit agencies to gradually transition to a 100 percent zero-emission bus (ZEB) fleet. Beginning in 2029, 100% of new purchases by transit agencies must be ZEBs, with a goal for full transition by 2040. Fleet requirements need years of lead time to be implemented for reasons of technological and economic feasibility. As purchasing requirements and fleet turnover cannot happen immediately, it would be infeasible to accelerate the implementation schedule for new purchasing requirements. California's fleet requirements for transit agencies are technology-forcing and are the most stringent in the nation, as they will require zero-emission trucks and engines; further increases in stringency are not feasible.		
Fleet Rules - Airport Shuttle Buses		
Truck and Bus	ongoing	MSM
Zero-Emission Airport Shuttle Buses	2027	MSM
The Truck and Bus Regulation requires airport shuttle buses to use MY 2010 or equivalent engines by 2023. The Zero-Emission Airport Shuttle Bus Regulation requires airport shuttle operators to transition to 100 percent zero-emission vehicle (ZEV) technologies. Airport shuttle operators must begin adding zero-emission shuttles to their fleets in 2027, and complete the transition to ZEVs by the end of 2035. Fleet requirements need years of lead time to be implemented for reasons of technological and economic feasibility. As purchasing requirements and fleet turnover cannot happen immediately, it would be infeasible to accelerate the implementation schedule for new purchasing requirements. California's fleet requirements for airport shuttle buses are technology-forcing and are the most stringent in the nation, as they will require zero-emission trucks and engines; further increases in stringency are not feasible.		
School Buses – In-Use Control Programs		
Truck and Bus	ongoing	MSM
School Bus Idling ATCM	ongoing	MSM
Heavy-Duty Omnibus Regulation	2024	MSM
School Bus Incentive Program	ongoing	MSM
The Truck and Bus regulation applies to school buses > 14,000 lbs., GVWR, and requires the use of diesel particulate filters. The School Bus Idling Airborne Toxic Control Measure (School Bus ATCM) further limits bus and commercial motor vehicle idling near schools or at school bus destinations to only when necessary for safety or operational concerns. Under the Omnibus Regulation, idling limits for diesel heavy-duty vehicles will be reduced from 30 g/hr currently to 10 g/hr in MY 2024 and to 5 g/hr in MY 2027. CARB also uses incentive funds as a key component of the strategy to reduce emissions from the school bus fleet. Over the past two decades, CARB's School Bus Incentive Program has invested over $1.2 billion to date to clean up old, higher-polluting school buses, which has supported about 1,800 zero emission school buses. California's requirements for in-use control programs for school buses are among the most stringent in the nation; it would be infeasible to accelerate the implementation schedule, or require further increases in stringency.		

CARB Control Program MSM Analysis
for the SCAQMD 2024 12 µg/m³ annual PM2.5 Plan

Measures	Implementation Begins	12 µg/m³ Annual PM2.5 Standard (2012)
Fuels Control Measures		
Conventional Diesel Fuel Standards		
CARB Ultra Low Sulfur Diesel (ULSD)	ongoing	MSM
Low-Emission Diesel Requirement (2016 State SIP Strategy measure, not yet adopted)	TBD	Beyond MSM
CARB's Ultra Low Sulfur Diesel (ULSD) regulation was last amended 2003 to establish more stringent standards for diesel fuel, lowering the sulfur limit to 15 ppmw. Relative to federal diesel requirements, CARB ULSD reduces NOx and PM emissions significantly. The Low Emission Diesel measure will require diesel fuel providers to steadily decrease criteria pollutant emissions from their fuels, which will reduce NOx and PM tailpipe emissions. CARB fuel regulations reduce emissions from even those vehicles registered out of state and therefore not subject to CARB's other mobile source control measures. CARB's diesel standards and requirements are the most stringent in the nation, and some of the most stringent in the world; it is not feasible to require further stringency of fuel specifications.		
Alternative Fuel Standards		
Low Carbon Fuel Standard (LCFS)	ongoing	MSM
Alternative Diesel Fuel (ADF) Regulation	ongoing	MSM
The LCFS and ADF regulations work together to reduce the carbon intensity of the California fuel supply. The regulations also limit criteria emissions from alternative fuels and/or alternative fuel mix blends. The regulations were amended in 2018 to extend the carbon intensity target of 20 percent to 2030. No other state or federal requirements have set as stringent of criteria emission requirements on alternative fuels and alternative fuel blends than California. The LCFS and ADF are technology-forcing regulations, and are the most stringent in the nation; further stringency would not be feasible. As it takes fuel producers years to develop, certify, and manufacture new alternative fuel types to meet the increasingly stringent requirements of the LCFS and ADF, an accelerated implementation timeframe would not be feasible.		

STEP 3(B): EVALUATION OF FEASIBILITY: MEDIUM- AND HEAVY-DUTY CONTROL MEASURES

Step 3(b) calls for an assessment of the feasibility of implementing any measure that is not included in the proposed South Coast SIP, but which is identified as a potential control measure in Step 2. During the public process for the 2022 State SIP Strategy, CARB staff received public measure suggestions for additional potential heavy-duty measures, as described below. Staff developed the Zero-Emission Trucks measure in response to these public measure suggestions.

- On-Road Heavy-Duty Vehicle Useful Life Regulation
  This suggestion would involve CARB developing a regulation, potentially paired with new incentives or legislative measures, to require on-road heavy-duty vehicles that have reached the end of their useful life as defined in Senate Bill 1,[95] as the earlier of 800,000 vehicles miles traveled or 18 years from the engine model year to retire, replace, retrofit, or repower the on-road heavy-duty vehicle or engine, and upgrade to zero-emission trucks.

  CARB staff has investigated the feasibility and potential benefits of this suggested measure and have included it as one potential option in the ***Zero-Emission Trucks measure*** in the 2022 State SIP Strategy.

- Additional Incentive Programs: Zero-Emission Trucks
  Additional incentive programs are needed to send clear signals to the market and support new scrap and replace regulatory programs, specifically to help ensure that smaller trucking companies have more consistent access to zero-emission truck incentives. This measure would involve CARB working to develop incentive programs which should include consideration of policies other jurisdictions have employed such as supporting local zero-emission zones and/or differentiated registration fees so that dirtier trucks pay more and zero-emission trucks have a consistent source of incentive funding.

  CARB staff has investigated the feasibility and potential benefits of this suggested measure, and have included it as one potential element of the ***Zero-Emission Trucks measure*** in the 2022 State SIP Strategy.

- Indirect Source Rule
  This measure could involve CARB writing a Suggested Control Measure which acts as a model rule to assist the air districts in the rule development process. An indirect source can be any facility, building, structure, or installation, or combination thereof, which attracts or generates mobile source activity that results in emissions – these include warehouses, railyards, ports, airports, and mobile sources attracted to those warehouses, railyards, ports, and airports. Only a few air districts in California have indirect source rules to limit emissions of this nature on a facility basis.

[95] Beall, Chapter 5, Statutes of 2017 https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180SB1

> CARB staff have investigated the feasibility and potential benefits of this suggested measure, and have included an Indirect Source Regulation as one potential element of the Zero-Emission Trucks measure in the 2022 State SIP Strategy. In addition, CARB staff will explore opportunities to expand existing State law to provide partnership opportunities for CARB and air districts to work together to develop, adopt, and implement indirect source rules.

CARB staff do not recommend eliminating any of the potential medium- and heavy-duty control measures identified on the basis of technical or economic infeasibility.

Off-Road Sources

Off-road mobile sources include a wide variety of engines ranging from locomotives, ships, and aircraft, to equipment used in the agricultural, construction, mining, and freight / goods movement industries. This category is composed of off-road compression ignition (diesel) engines and equipment, small spark ignition off-road engines and equipment less than 25 hp (including lawn and garden equipment, and small industrial equipment), off-road large spark ignition (gasoline and liquefied petroleum gas) engines and equipment 25 hp and greater (including industrial equipment, forklifts, and portable generators), airport ground support equipment, and cargo handling equipment used at railyards, warehouses, and the Ports of LA and Long Beach. Similar to the on-road sectors, California has a comprehensive program for reducing emissions from off-road equipment that goes well beyond current requirements in place elsewhere in the nation.

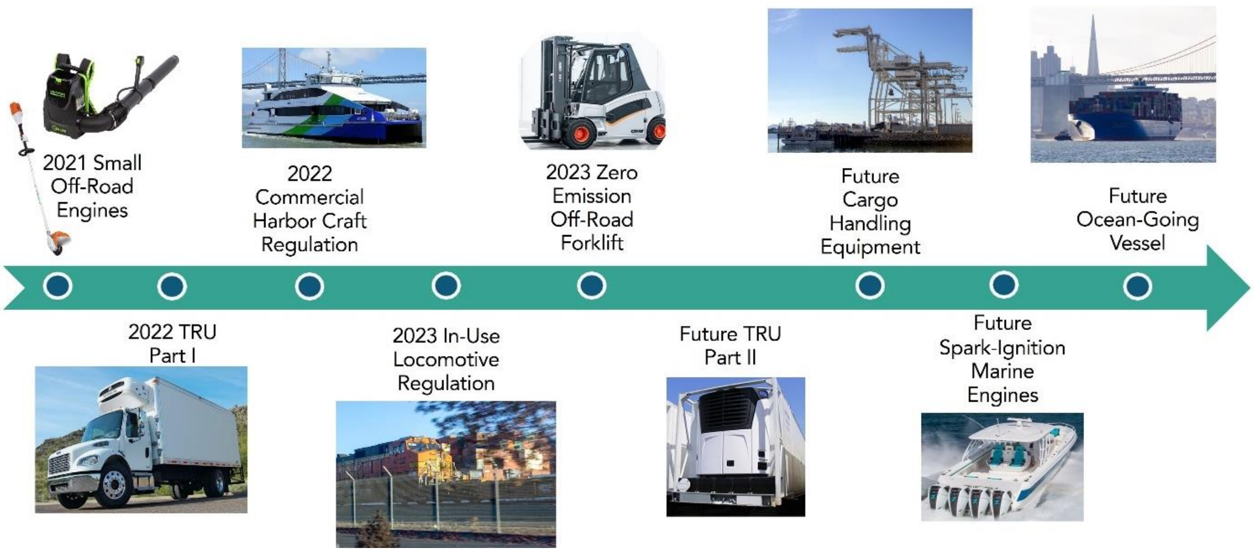
While emission standards for locomotives are set by U.S. EPA, CARB has accelerated reductions from these sources through efforts that have focused on cleaner fuel requirements, and increasing use of cleaner locomotives. CARB staff and the Class I railroads have also been implementing a memorandum of understanding to accelerate the introduction of cleaner locomotives since 2005. The recently adopted In-Use Locomotive Regulation accelerates the adoption of advanced, cleaner technologies for locomotive operations, including zero-emission technologies.

Similarly, emission standards for Ocean-Going Vessels (OGVs) are largely regulated on an international level by the International Maritime Organization (IMO), whose primary focus is reducing NOx and GHG emissions from OGVs. IMO marine engine standards for OGVs regulate NOx emissions only, with no PM standards in place. Increased emissions are occurring from all modes of OGV operations (in transit, maneuvering, anchoring, and at berth) because of increased import/export activity and seaport congestion (which may be associated with a variety of factors, including the global pandemic, increased purchasing by consumers, periodic labor disputes, tariff changes, etc.). The majority of emissions from OGVs occur while vessels are in transit and operating their large slow-speed marine engines, which are typically powered by heavy fuel oil (or “bunker fuel”).96 CARB’s Vessel Clean Fuel Regulation requires OGVs to use 0.1 percent sulfur distillate grade fuels (marine diesel oil/marine gas oil) for all OGVs sailing within 10 nautical miles of the California coast to help reduce emissions from OGVs. CARB’s At Berth Regulation requires regulated vessels to connect to shore power or use an alternative emissions control technology to reduce emissions while docked at berth at regulated California seaports.

STEP 2(A): CALIFORNIA’S OFF-ROAD CONTROL MEASURES

Emission reductions from ongoing implementation of the current off-road control program are projected to reduce emissions of NOx by over 47 percent between today and 2030, emissions of direct PM by over 44 percent between today and 2030, and emissions of ammonia by approximately 15 percent between today and 2030. Achieving reductions in the off-road sectors remains a greater challenge than in the on-road sector due to the diverse nature of these sources, regulatory authority that rests outside of CARB in many cases, and the length of time sources remain in the fleet.

Figure 5: Off-Road Control Measures



The major regulatory and programmatic control measures that provide these emissions reductions are described below.

NEW VEHICLE, EQUIPMENT, AND ENGINE STANDARDS

Internal Combustion Off-Road Equipment (General)

To control emissions from off-road equipment, CARB adopted in 2004 a fourth tier of increasingly stringent PM and NOx standards based on the use of advanced aftertreatment emission controls. U.S. EPA also adopted the Tier 4 standards in 2004. California's current standards are equal in stringency to current federal standards. These ***"Tier 4" standards*** apply to new off-road compression-ignition engines, and were phased-in across product lines from 2008 through 2015 and reduced exhaust emission levels by up to 95 percent compared to previous control strategies. New engine standard requirements vary according to the power rating of engines. **Error! Reference source not found.** shows the schedule for phasing in tiered requirements for new off-road engines with a power rating between 175 and 300 hp. Beginning in 2014, new Tier 4 construction equipment must emit about 96 percent less NOx and PM than new Tier 1 equipment sold in the year 2000.

Table 19: Phase-in of Off-Road Engine Standards

Model year	Level of Control	Applicable Emission Standard for New Off-road Engines 175<hp<300 g/bhp-hr	
		NOx	PM
1996-2002	Tier 1	6.9	0.4
2003-2005	Tier 2	4.9*	0.15
2006-2010	Tier 3	3.0*	0.15
2011-2013	Tier 4 interim	1.5	0.015
2014+	Tier 4 final	0.3	0.015
Under development	Tier 5 Standards	TBD	TBD

*Reflects combined limit for non-methane hydrocarbons and NOx

Moving beyond the stringency of emission controls required in the current control program, in the 2022 State SIP Strategy, CARB committed to ***Tier 5 Off-Road New Compression-Ignition Engine Standards***, which would go beyond MSM and establish more stringent standards and test procedures for new, off-road compression-ignition (CI) engines to reduce NOx, PM, and carbon (CO2) emissions (referred to as Tier 5) for all off-road engine power categories, including those that do not currently utilize exhaust aftertreatment such as diesel particulate filters (DPF) and selective catalytic reduction (SCR). CI engines are used in a wide range of off-road equipment including tractors, excavators, bulldozers, graders, and backhoes. As of model year 2020, more than half of all new off-road CI engine families continue to be certified to California's most stringent (Tier 4 final) emission standards without the need for DPFs. This means that most new off-road CI engines are not reducing toxic diesel PM to the greatest extent feasible using the best available technology. The proposed new Tier 5 standards and test procedures would be more stringent than required by current U.S. EPA and European Stage V nonroad regulations and would require the use of best available technologies for both PM and NOx. Lower NOx standards – up to 90 percent below the current Tier 4 final emission standard levels – coupled with lower PM standards, would force engine manufacturers to incorporate DPFs, which many currently do not have. DPFs would also ensure greater reductions in ultrafine PM, which may pose a health concern separate from PM emissions as a whole.

CARB has also engaged in a number of feasibility studies and technological demonstrations of the requisite technologies for this measure:

- CARB funded a research effort demonstrating the feasibility of advanced aftertreatment on 79 small off-road CI engines, which was completed by the Center for Environmental Research and Technology (CE-CERT) in 2019. Small off-road CI engines (less than 56-kilowatt [kW] or 75 hp) are not currently required to comply with advanced NOx aftertreatment-based standards, and a subset of these engines that are less than 19 kW (25 hp) are not required to comply with advanced PM aftertreatment--based standards. Small off-road CI engines account for between 20 to 40 percent of the off-road diesel PM and NOx emissions inventories in California.[96]

[96] "Evaluation of the feasibility, cost-effectiveness, and necessity of equipping small off-road diesel engines with advanced PM and/or NOx aftertreatment" – CARB Contract No. 14-300, March 2019, https://ww2.arb.ca.gov/sites/default/files/2020-10/14-300.pdf

- A recent research effort performed for CARB by CE-CERT concluded that current reporting and recordkeeping requirements are insufficient for determining the number of engines and equipment sold in California with less-stringent emission levels under both the federal Average, Banking, and Trading program and the federal Transition Program for Equipment Manufacturers.[97] Hence, it would be helpful to revise and improve the reporting and recordkeeping requirements.
- Recent CARB funded demonstrations of ultra-low NOx on-road engines conducted at the Southwest Research Institute (SWRI) show that much lower NOx standards are feasible for on-road engines. Because off-road diesel engines are similar in technology to on-road heavy-duty diesel engines, this work suggests that lower NOx standards are likely feasible for off-road engines as well. Additionally, CARB is currently funding an off-road demonstration project with SWRI to support determining the feasibility of more stringent off-road standards for NOx, PM, and CO2.
- Recent CARB test data, consistent with test data presented by reputable diesel publications, indicate that up to 40 percent of a typical off-road CI engine's in-use operation occur at idle,[98] and that the frequency of in-use low-load- operation[99] is insufficient to keep exhaust emission aftertreatment temperature above 250 degrees Celsius, that enables efficient SCR operation to control NOx emissions. Establishing new idle emission reduction strategies and a low-load test cycle are also being investigated as part of this Tier 5 measure.

Under this measure, CARB would develop and propose standards and test procedures for new off-road CI engines including the following: aftertreatment-based PM standards for engines less than 19 kW (25 hp), aftertreatment-based NOx standards for engines greater than or equal to 19 kW (25 hp) and less than 56 kW (75 hp), and more stringent PM and NOx standards for engines greater than or equal to 56 kW (75 hp) and first time CO2 tailpipe standards targeting a 5 to 8.6 percent reduction. Other possible elements include enhancing in-use compliance, proposing more representative useful life periods, idle requirements and developing a low load test cycle. It is expected that Tier 5 requirements would rely heavily on technologies manufacturers are developing to meet the recently approved low-NOx standards and enhanced in-use requirements for on-road- heavy-duty engines.

Zero-Emission Off-Road Equipment (General)

CARB anticipates increasing the stringency of Off-Road engine requirements through a rule requiring Zero-Emission manufacturer requirement. With the ***Off-Road Zero-Emission Targeted Manufacturer Rule*** measure, a commitment in the 2022 State SIP Strategy, CARB would accelerate the development and production of zero-emission off-road equipment and powertrains into more sectors (including wheel

[97] "Evaluation of the Impacts of Emissions Averaging and Flexibility Programs for all Tier 4 Final Off-road Diesel Engines," CARB Contract No. 14-301, February 2018, https://ww2.arb.ca.gov/sites/default/files/classic//research/apr/past/14-301.pdf?_ga=2.127732621.1682659074.1620315165-1165705998.1587147934
[98] https://www.constructionequipment.com/home/blog/10727772/thinking-through-fuel-burn-rates
[99] Measurement of PM and Gaseous Emissions from Cargo Handling Equipment (CHE) during Real-World Operation – David Quiros, 29th CRC Real World Emissions Workshop, March 2019

loaders, excavators, and bulldozers) as technology advancements occur due to existing CARB zero-emission regulations and regulations in the forklifts, cargo handling equipment, off-road fleets, and small off-road engines sectors. For this measure, CARB would propose to develop a regulatory measure that would require manufacturers of off-road equipment and/or engines to produce for sale zero-emission equipment and/or powertrains as a percentage of their annual statewide sales volume to ensure these globally emerging zero-emissions products and related innovations come to California.

REDUCING IN-USE EMISSIONS

Fleet Rules: Off-Road Equipment (General)

Large diesel off-road equipment typically remains in use for long periods of time. As with heavy-duty trucks, this long life means that newer, lower-emitting engines would be introduced into fleets relatively slowly. To address this, ***the Cleaner In-Use Off-Road Equipment Regulation (Off-Road Regulation)*** was adopted in 2007, and amended in 2009 and 2010. The regulation covers all self-propelled off-road diesel vehicles 25 horsepower or greater used in California and most two-engine vehicles (except on--road two-engine sweepers). The Off-Road Regulation requires off-road fleets to reduce their emission by retiring, replacing, or repowering older engines. This Regulation expanded the penetration of existing clean technology to ensure that the engines and vehicles used today are as clean as possible. U.S. EPA approved this regulation in 2013. The types of off-road equipment controlled by this regulation are used in construction, manufacturing, the rental industry, road maintenance, airport ground support, and landscaping. In December 2011, the Off-Road Regulation was modified to include on-road trucks with two diesel engines.

The Off-Road Regulation is an extensive program designed to accelerate the penetration of the cleanest equipment into California's fleets. This regulation significantly reduces emissions of diesel PM and NOx from the over 150,000 in-use off-road diesel vehicles that operate in California by requiring their owners to modernize their fleets and install exhaust retrofits. The regulation requires that fleets meet an increasingly stringent set of fleet average targets, culminating in 2023 for large and medium fleets (large fleets represent about 54 percent of vehicle ownership) and in 2028 for small fleets. The most stringent fleet average target generally corresponds to roughly a 2012 model year, or a Tier 3 average standard. In 2015, the program reduced emissions from 10,447 vehicles used in 838 fleets by requiring owners to modernize their fleets by replacing older engines or vehicles with newer, cleaner models, retiring older vehicles or using them less often, or by applying retrofit exhaust controls. The Off-Road Regulation imposes idling limits on off-road diesel vehicles, requires a written idling policy, and requires a disclosure when selling vehicles. The Regulation also requires that all vehicles be reported to CARB and labeled, restricts the addition of older vehicles into fleets, and requires fleets to reduce their emissions by retiring, replacing, or repowering older engines, or installing verified exhaust retrofits. The requirements and compliance dates of the Off-Road Regulation vary by fleet size.

With the ***2022 Amendments to the In-Use Off-Road Diesel-Fueled Fleets Regulation***, CARB further reduced emissions from the in-use off-road diesel equipment sector by increasing the stringency of the regulation's requirements. These amendments create additional requirements to the currently regulated fleets by targeting the oldest and dirtiest equipment that is allowed to operate indefinitely under the current regulation's structure. The amendments will require fleets to phase-out use of the oldest and highest polluting off-road diesel vehicles in California and prohibit the addition of high-emitting vehicles to a fleet. The amendments phase-in starting in 2024 through the end of 2036, and include changes to enhance enforceability and encourage the adoption of zero-emission technologies. The In-Use Off Road Diesel Fleets Regulation also requires the use of R99 or R100 renewable diesel in off-road diesel vehicles starting in January 2024 for all fleets.

CARB anticipates further emission reductions from the off-road equipment fleets through the ***Clean Off-Road Fleet Recognition Program measure***. This measure would create a non-monetary incentive to encourage off-road fleets to go above and beyond existing regulatory fleet rule compliance and adopt advanced technology equipment with a strong emphasis on zero-emission technology. This measure would provide a standardized methodology for contracting entities, policymakers, state and local government, and other interested parties to establish guidelines for contracting criteria or require participation in the program to achieve their individual policy goals. For this voluntary program, CARB would establish a framework that would encourage fleets to incorporate advanced technology and ZEVs into their fleets, prior to or above and beyond regulatory mandates. The program would provide standardized criteria or a rating system for fleet participation at various levels to reflect the penetration of advanced technology and ZEVs into a fleet. Levels could be scaled over time as zero-emission equipment becomes more readily available. CARB anticipates the next several years of technology advancements and demonstrations to drive the stringency of the rating system. Participation in the program would be voluntary for fleets; however, designed in a manner that provides them motivation to go beyond business as usual. The program would offer value for fleets to participate by providing them access to jobs/contracts, public awareness, and marketing opportunities.

Beyond the general fleet rules controlling emissions from off-road equipment, CARB has also developed and implemented control measures that target specific to categories of sources within the off-road sector, which are described below.

SOURCE-SPECIFIC RULES

Given the diversity of types of engines, vehicles, and equipment used in the off-road sector, CARB's control strategy includes multiple requirements that are specific to categories of sources within the off-road sector. This includes:

Agricultural Equipment

Emission Standards for Agricultural Equipment

In 2004, U.S. EPA and California adopted equivalent standards that require additional reductions from off-road engines, including engines used in mobile agricultural equipment. These ***Tier 4 Engine Standards*** continue to achieve substantial reductions in PM2.5 and NOx as new farm equipment is introduced into the fleet.

In-Use Controls: Agricultural Equipment

New engines used in agricultural equipment, primarily tractors, must meet the same standards as other off-road engines ensuring that new equipment becomes progressively cleaner. Just as in other off-road applications, diesel agricultural equipment can remain in use for long periods of time. This long life means that equipment with new, lower emitting engines are introduced into the fleet at a relatively slower pace than what is needed to meet air quality standards. CARB's ***Funding Agricultural Replacement Measures for Emission Reductions (FARMER) Program*** provides funding through local air districts for agricultural harvesting equipment, heavy-duty trucks, agricultural pump engines, tractors, and other equipment used in agricultural operations. Local air districts receive funds based on a formula and award them to farmers and agricultural businesses for individual projects.

Airport Ground Support Equipment (GSE)

Emission Standards for Airport GSE

Engines used in newly manufactured GSE operating on gasoline, LPG, and CNG are required to meet California's new engine emission standards for LSI. The ***LSI engine standard*** for engines greater than 1.0 liter (typical for GSE) is 0.6 g/bhp-hr of hydrocarbons (HC) and NOx. Engines meeting this standard are 70 percent cleaner than LSI engines produced as recent as 2009. Diesel engines in newly manufactured GSE must meet the Tier 4 emission standards applicable to off-road compression-ignition engines under the ***In-Use Off Road Diesel-Fueled Fleets Regulation***. These standards vary by horsepower and are more than 90 percent cleaner than the emissions levels of engines produced twenty years ago.

CARB is also anticipated to further increase the stringency of emission controls with the Zero-Emission Airport Ground Support Equipment measure, which will act as a catalyst to further adoption of zero-emission equipment in the off-road sector, facilitate the transfer of technology to suitable heavier duty-cycle applications, and expand use of zero-emission infrastructure.

In-Use Controls: Airport GSE

In addition to adopting regulations limiting emissions from new engines used in GSE, California has adopted regulations to reduce emissions from existing, in-use GSE. In 2007, California adopted the ***In-Use Off-Road Diesel-Fueled Fleets Regulation,*** which requires fleets operating in-use diesel equipment to meet an annual fleet average emissions target that decreases over time. For example, for equipment over 175 and under 750 HP, the final 2023 NOx fleet average target is 1.5 g/bhp hr, which is equivalent to the interim Tier 4 NOx standard for newly produced engines. Fleets that do not meet the required annual fleet average must meet the BACT requirements that require turnover, repower or retrofit of a specific percent of a fleet's total HP. These requirements are currently being phased in. Additionally, fleets operating LSI GSE must meet the ***In-Use LSI Engine Fleet Requirements***. Adopted in 2006, the LSI fleet rule requires GSE fleets to maintain an average emission level of no more than 2.5 g/bhp hr HC+NOx, starting January 1, 2013. Non-mobile GSE such as portable air-start units, ground power units and air conditioners may be subject to the ***Portable Diesel-Engines Air Toxic Control Measure*** (ATCM). The ATCM reduces PM emissions by requiring engine replacement in a schedule based on a fleet's weighted PM emission average.

CARB is also anticipated to further increase the stringency of emission controls with the ***Zero-Emission Airport Ground Support Equipment measure***, a measure committed to in the 2016 State SIP Strategy, which will act as a catalyst to further adoption of zero-emission equipment in the off-road sector, facilitate the transfer of technology to suitable heavier duty-cycle applications, and expand use of zero-emission infrastructure.

Cargo Handling Equipment (CHE)

Emission Standards for Airport CHE

California's ***Cargo Handling Equipment Regulation*** set performance standards for engines in newly acquired, as well as in-use, mobile CHE at ports or intermodal rail yards in California. Mobile CHE is used to transfer goods or perform maintenance and repair activities and includes equipment such as yard trucks (hostlers), top handlers, side handlers, reach stackers, forklifts, rubber-tired gantry cranes, dozers, excavators, loaders, and railcar movers used in maintenance operations at ports and intermodal rail yards. CARB's CHE Regulation was originally adopted in 2005 to establish BACT requirements for new and in-use cargo handling equipment that operate at California's ports and intermodal rail yards, and was amended in 2011 to include opacity monitoring requirements. CARB obtained authorization for the 2005 version of the regulation in 2012. Under the CHE Regulation, all newly purchased yard truck and non-yard truck equipment brought onto a port or intermodal rail yard must have either a Tier 4 Final off-road engine or an on-road engine meeting the 2010 or newer on-road emission standards. CHE Regulations set performance standards for engines in newly acquired, as well as in-use, mobile CHE at ports or intermodal rail yards in California.

CARB staff anticipates increasing the stringency of emission standards for CHE beyond MSM with the ***Amendments to CHE Regulation***. In March 2018, CARB staff presented to the Board a plan to begin development of a regulation to transition CHE to zero-emission technologies, and to minimize emissions and community health impacts from cargo handling equipment. The CHE amendments would set in-use requirements for diesel cargo handling equipment at ports and rail yards, including but not limited to yard trucks (hostlers), rubber-tired gantry cranes, container handlers, and forklifts. The regulatory amendments would propose to start transitioning CHE to zero-emission with an implementation schedule for new equipment and facility infrastructure requirements, with effective dates beginning in 2030~~26~~. Staff would assess the availability and performance of zero-emission technology as an alternative to all combustion-powered cargo equipment and evaluate additional solutions that may include efficiency improvements. Based on the current state of zero-emission CHE technological developments, the transition to zero-emission would most likely be achieved largely through the electrification of CHE. In this potential action, all mobile equipment at ports and rail yards, including but not limited to diesel, gasoline, natural gas, and propane-fueled equipment, would be subject to new requirements. Staff anticipates that ~~all~~ yard trucks and forklifts would transition to ~~be~~ zero-emission ~~by 2030~~earliest, followed by rubber-tired gantry cranes ~~would be zero-emission by 2032~~, and 90 percent of other CHE will be zero-emission by 2036. These assumptions are supported by the fact that currently some electric rubber tire gantry cranes, electric forklifts, and electric yard tractors are already commercially available. Other technologies are in early production or demonstration phases. CARB staff would also consider opportunities to prioritize the earliest implementation in or adjacent to the communities most impacted by air pollution. Board consideration for adoption of these amendments is anticipated in 2024.

In-Use Controls: CHE

As described earlier, the ***Cargo Handling Equipment Regulation*** (adopted in 2005, amended in 2011) includes performance standards for in-use, mobile CHE at ports or intermodal rail yards in California. CARB's CHE Regulation was originally adopted in 2005 to establish BACT requirements for new and in-use cargo handling equipment that operate at California's ports and intermodal rail yards, and was amended in 2011 to include opacity monitoring requirements. CARB obtained authorization for the 2005 version of the regulation in 2012. Under the CHE Regulation, all legacy in-use non-yard truck engines that are still in service (Tier 0 – Tier 3) must have a Verified Diesel Emission Control Strategy (VDECS) installed.

CARB anticipates increasing the stringency of in-use requirements beyond MSM with the CHE measure committed to in the 2022 State SIP Strategy. CARB's proposed ***Amendments to the Cargo Handling Equipment Regulation*** would set in-use requirements for diesel cargo handling equipment at ports and rail yards, including but not limited to yard trucks (hostlers), rubber-tired gantry cranes, container handlers, and forklifts. Staff would assess the availability and performance of zero-emission technology as an alternative to all combustion-powered cargo equipment and evaluate additional solutions that may include efficiency improvements. The regulatory amendments would propose an implementation schedule for new equipment and facility infrastructure requirements, with effective dates beginning in 2030~~26~~.

Commercial Harbor Craft (CHC)

Emission Standards and in-use controls for CHC

The ***Commercial Harbor Craft Regulation*** reduces diesel PM and NOx emissions from a number of types of CHC operating in California. CARB's 2008 and 2011 CHC

Regulations required NOx and diesel PM emission controls on crew and supply boats, ferries, excursion vessels, towboats, push boats, tug boats, barges, and dredges.

CARB adopted the ***Amended CHC Regulation in 2022***, establishing expanded and more stringent in-use requirements to cover more vessel categories, including all tank barges, pilot vessels, research vessels, workboats, commercial passenger fishing, and commercial fishing vessels. The amendments also mandate accelerated deployment of zero-emission and advanced technologies in vessel categories where technological feasibility has been demonstrated. Starting in 2023 and phasing in through 2031, most CHC (except for commercial fishing vessels and categories listed below) are required to meet the cleanest possible standard (Tier 3 or 4) and retrofit with DPF based on a compliance schedule. The current regulated CHC categories are ferries, excursion, crew and supply, tug/tow boats, barges, and dredges. The amendments impose in-use requirements on the rest of vessel categories except for commercial fishing vessels, including workboats, pilot vessels, commercial passenger fishing, and all barges over 400 feet in length or otherwise meeting the definition of an ocean-going vessel. The amendments also remove the current exemption for engines less than 50 horsepower. Starting in 2025, all new excursion vessels are required to be plug-in hybrid vessels that are capable of deriving 30 percent or more of combined propulsion and auxiliary power from a zero-emission tailpipe emission source. Starting in 2026, all new and in-use short run ferries are required to be zero-emission; and starting in 2030 and 2032, all commercial fishing vessels need to meet a Tier 2 standard at minimum. The 2022 Amendments to the Commercial Harbor Craft (CHC) Regulation also require the use of at least 99 percent Renewable Diesel ("R100" or "R99"). The use of renewable diesel in CHC will achieve additional emission reductions to the already reduced emissions from Tier 3 or Tier 4 engines plus diesel particulate filters (DPF). Renewable diesel has been required to be used by all CHC operating in the State as of January 1, 2023.

Forklifts

Emission Standards for Forklifts

Forklifts operate in many different industry sectors but are most prevalent in manufacturing and at locations such as warehouses, distribution centers, and ports. Diesel-fueled forklifts were first subject to engine standards and durability requirements in 1996. The most recent ***Tier 4 Final emission standards*** were phased in starting in 2013. Tier 4 emission standards are based on the use of advanced after-treatment technologies such as diesel particulate filters and selective catalytic reduction. Forklifts powered by LSI engines (gasoline and natural gas) have been subject to new engine standards that include both criteria pollutant and durability requirements since 2001, with the cleanest requirements phased-in starting in 2010.

CARB staff anticipates further increases to the stringency of emission controls with the ***Zero-Emission Off-Road Forklift Regulation Phase I measure***, a commitment from the 2016 State SIP Strategy, which would go beyond MSM and accelerate the deployment of zero-emission forklift technologies. The regulatory amendments would propose requirements that prohibit the new purchases of LSI forklifts, with an implementation schedule beginning in 2026. Forklifts are also subject to further controls under the ***Off-Road Zero-Emission Targeted Manufacturer Rule measure***, which CARB committed to in the 2022 State SIP Strategy. This measure would accelerate the deployment of zero-emission forklifts through a measure requiring manufacturers to produce zero-emission equipment and/or powertrains as a percentage of their sales volume.

In-Use Controls: Forklifts

Forklift fleets are subject to both the ***LSI Fleet Regulation*** (if powered by gasoline or propane), and the ***Off-Road Diesel Fleet Regulation*** (if powered by diesel) are required to retire, repower, or replace higher-emitting equipment in order to maintain fleet average standards. The ***Off-Road Diesel Regulation*** was adopted by the Board in 2007 with implementation beginning in 2010. It is applicable to all diesel-fueled, self-propelled off-road equipment with at least 25 HP. Forklifts are included in the fleet average along with other equipment. Additionally, the ***LSI fleet Regulation*** (which was originally adopted with requirements beginning in 2009) requires fleets with four or more LSI forklifts to meet fleet average emission standards. While the LSI fleet Regulation applies to forklifts, tow tractors, sweeper/scrubbers, and airport ground support equipment, it maintains a separate fleet average requirement specifically for forklifts.

With the recent adoption of the ***2022 Amendments to the In-Use Off-Road Diesel-Fueled Fleets Regulation,*** forklifts are also subject to begin transitioning to zero-emission technologies. Beginning in 2024, requirements begin to transition fleets from the oldest and highest-emitting off-road engines in operation in California by phasing out Tier 0 – Tier 2 equipment. Also beginning in 2024, the regulation includes requirements to restrict the addition of new vehicles and/or engines with Tier 3 and 4i engines, which is an expansion of the provisions of the current regulation, which restrict the vehicle-engine tiers that can be added to a fleet. The regulation also includes elements that require contracting entities to obtain and retain a fleet's valid Certificate of Reported Compliance prior to awarding a contract or hiring a fleet, mandate the use of R99 or R100 Renewable Diesel for all fleets, with some limited exceptions; provide voluntary compliance flexibility options for fleets that adopt zero-emission technology; and include additional requirements to increase enforceability, provide clarity, and provide additional flexibility for permanent low-use vehicles.

CARB is anticipated to further increase the stringency of in-use emission controls for forklifts beyond MSM with the ***Zero-Emission Off-Road Forklift Regulation Phase I measure,*** a measure committed to in the 2016 State SIP Strategy, which would be designed to accelerate the deployment of zero-emission forklift technologies. The regulatory amendments would propose requirements for fleets to retire existing LSI forklifts that are 13 years and older, and would propose an implementation schedule beginning in 2026. Under the ***Amendments to the Cargo Handling Equipment Regulation measure***, which CARB committed to in the 2022 State SIP Strategy, forklifts operating at ports and intermodal rail yards would also be subject to begin transitioning to zero-emission technologies. Staff anticipates that all forklifts operating at ports and intermodal rail yards would be zero-emission ~~by 2030~~in the coming years, which is supported by the fact that currently some electric forklifts are already commercially available, with other technologies are in early production or demonstration phases.

Marine Engines

Emission Standards for Marine Engines

U.S. EPA first promulgated exhaust emission standards to reduce emissions of HC and NOx from new outboard and personal watercraft engines in 1996, which were to begin in 2006. In 1998, CARB adopted the ***Exhaust Emission Regulations for Spark-Ignition Marine Engines***, which accelerated the federal standard's 2006 implementation date to 2001 in California, and also set more stringent California standards for outboard and personal watercraft engines that took effect in 2004 and 2008. In 2001, CARB amended the ***Spark-Ignition (SI) Marine Regulations*** to include HC+NOx emission standards for new sterndrive and inboard marine engines. These standards adopted Tier I and ***Tier II emission standards for inboard and stern-drive marine engines***. In 2007, U.S. EPA harmonized with CARB's accelerated implementation schedule and more stringent exhaust standards for outboard and personal watercraft engines, and also granted California authorization to enforce CARB's regulations for Outboard Engines and Personal Watercraft engines and Tier I of the California inboard and stern-drive marine engine emissions standards. In 2011, U.S. EPA granted California authorization to enforce CARB's Tier II exhaust emission standards for spark ignited inboard and stern-drive marine engines. The Tier II Emission Standards for Inboard and Stern-Drive Marine Engines (2001) controls emissions at the same level of stringency as national regulations. While CARB has the same exhaust emission standards as the federal standard, the California standard applies to engines sooner, starting in 2008 rather than 2010 under the federal requirement.

In February 2015, CARB Board approved more stringent ***Evaporative Emission Control Standards*** than those set forth by the U.S. EPA's 2008 rule for gasoline-fueled spark-ignition marine watercraft configured with engines greater than 30 kilowatts. The Evaporative Emission Control Standards (2015) exceeds the stringency of applicable national regulations set by U.S. EPA in 2008 for gasoline-fueled spark-ignition marine watercraft >30 kilowatts.

CARB anticipates proposing further increases in stringency for Spark-Ignition Marine Engine Standards. The ***Spark-Ignition Marine Engine Standards measure*** from the 2022 State SIP Strategy would go beyond MSM and reduce emissions from new spark-ignition (SI) marine engines by adopting more stringent exhaust standards for outboard and personal watercraft, which currently do not use catalyst control technologies. Staff estimates that stricter standards could reduce combined HC or ROG and NOx emissions by approximately 70 percent below the current HC+NOx standard (≈16.5 grams per kilowatt-hour (g/kW-hr)) for engines greater than or equal to 40 kilowatts (kW) in power, and by approximately 40 percent for engines less than 40 kW in power. CARB staff is also evaluating whether some outboard and personal watercraft vessels could be propelled by zero-emission technologies in certain applications. For example, zero-emission powertrains have the potential to gradually replace most outboard engines less than 19 kW, as well as many new personal watercraft engines.

Off-Highway Recreational Vehicles (OHRV)

Emission Standards for OHRV

Off-road recreation vehicles, also known as off-highway recreational vehicles (OHRV), primarily include off-highway motorcycles, all-terrain vehicles (ATVs), and utility-terrain vehicles, off-road sport and utility vehicles, sand cars, and golf carts. In 1994, CARB adopted its first OHRV regulation, which established ***exhaust emission standards for OHRVs***. At that time, there were no equivalent federal standards regulating exhaust emissions from the vehicles and engines covered by California's OHRV regulations (U.S. EPA first set exhaust emission limits for OHRVs in 2002). U.S. EPA granted authorization for CARB's 1994 OHRV regulations in 1996. CARB subsequently amended the regulations to increase the stringency of controls and expand the categories of OHRVs controlled under the program; first in 1999, subsequently in 2003, and again in 2006. All three OHRV Engine Emission Standard amendments were granted authorization concurrently by U.S. EPA in 2014.[100]

The 2006 amendments to CARB's OHRV program also set ***evaporative emission standards***, establishing a fuel tank permeation limit of 1.5 grams per square meter per day (g/m^2/day) of total organic gas (TOG) for a 3-day diurnal period, and a fuel hose permeation limit of 15 g/m^2/day. At the time, these limits were identical to the national limits set by U.S. EPA. In July 2013, CARB adopted more stringent evaporative emission control standards for OHRVs that established a new test procedure and reduced evaporative emission limits to 1.0 g/m^2/day. Authorization was granted by U.S. EPA in 2017.[101]

In 2019 the Board approved more stringent exhaust regulations for OHRVs, which set more stringent exhaust emission control standards for ATVs, off-road sport vehicles, and off-road utility vehicles for MY 2022 – 2027, and more stringent evaporative regulations for OHRVs, which harmonize with U.S. EPA evaporative emissions standards for OHMC for MY 2020 – 2026. The 2019 Amendments also included provisions to accelerate the development of zero-emission OHRVs, and set more stringent California-specific emissions standards for all new OHRV beginning with MY 2027 for evaporative emission standards, and with MY 2028 for exhaust emission standards.

In-Use Controls: OHRV

In 1994, CARB set exhaust standards for all OHRV that were to go into effect starting in 1998. The exhaust standards were technology forcing, and additional time was needed for manufacturers to produce a full range of compliant vehicles. Dealers expressed

[100] U.S. EPA, 2014. "California State Nonroad Engine Pollution Control Standards; Off-Highway Recreational Vehicles and Engines; Notice of Decision" https://www.gpo.gov/fdsys/pkg/FR-2014-02-04/pdf/2014-02297.pdf Federal Register, Vol. 79, No. 23

[101] U.S. EPA, 2017. "California State Nonroad Engine Pollution Control Standards; Evaporative Emission Standards and Test Procedures for Off-Highway Recreational Vehicles (OHRVs); Notice of Decision" https://www.gpo.gov/fdsys/pkg/FR-2017-01-19/pdf/2017-01259.pdf Federal Register, Vol. 82, No. 12

concern that certified models would not be available and that California OHRV dealerships would go out of business. In 1998, CARB met with affected stakeholders and developed a temporary compromise that allowed for the certification of vehicles that do not meet emissions standards. CARB adopted this compromise into regulation in 1999, which have become known as the ***Red Sticker Program***. It allows for certification and sale of OHRV that have no emissions control systems.

In order to reduce excess emissions, the 1999 Amendments established a new compliance category beginning with the 2003 model year, and designates OHRVs as either “green sticker” or “red sticker”, depending on whether the engine meets or exceeds the applicable emission standard. Non-emission compliant OHRVs are identified with a red registration sticker issued from the Department of Motor Vehicles (DMV), while emission compliant OHRVs are identified with a green sticker. Red sticker OHRVs are subject to in-use restrictions that do not apply to green sticker OHRVs; namely, the red sticker limits operation at certain off-highway recreational vehicle parks located in ozone nonattainment areas during the summer months (i.e. peak ozone season).

The red sticker program was envisioned as a temporary measure to provide market stability while manufacturers developed a full range of OHRV that complied with California’s emissions standards. This temporary measure has now been in effect for more than twenty years, and the majority of off-highway motorcycles sold in California are red sticker vehicles with no emissions controls. The 2019 Amendments to the OHRV program instituted actions to begin sunsetting the Red Sticker Program, including:

- Ending red sticker certification of new OHRV with no emissions controls beginning in model year 2022;
- Establishing transitional standards from 2020 through 2026; and
- Lifting the seasonal riding restrictions on existing red sticker vehicles starting on January 1, 2025.

Currently, this program is being phased-out to allow for more stringent emission control measures. In the meantime, however, the red-sticker program continues to control emissions from the in-use OHRV fleet.

Small Off-Road Equipment (SORE)

Emission Standards for SORE

Small Off-Road Engines (SORE) are spark-ignited engines rated at or below 19 kilowatts. This category includes handheld and non-handheld lawn and garden and industrial equipment such as string trimmers, leaf blowers, walk-behind lawn mowers, generators, and lawn tractors. They are used in applications such as lawn and garden, industrial, construction and mining, logging, airport ground support, commercial utility, and farm equipment, golf carts, and specialty vehicles. Staff estimates that there are approximately 16.5 million pieces of SORE equipment in California, the majority of which are spark-ignition (SI) engines used in residential and commercial lawn and garden applications, together with other utility and small industrial applications.

CARB first adopted ***SORE Exhaust Emission Standards and Test Procedures*** in 1990, with amendments in 1998 that increased the stringency and extended the types of engines and equipment applicable to the standard. In September 2003, CARB adopted more stringent exhaust emission standards***,*** and set the first ***Evaporative Emission Standards*** for SORE. Prior to the adoption of these standards, evaporative emissions were uncontrolled. U.S. EPA granted full authorization for this suite of regulations in 2006, and these more stringent standards were phased-in for model years 2006 through 2013.[102]

In 2010, CARB set ***Standards for Zero-Emission SORE Equipment***.[103] In 2011, CARB again amended the regulation, modifying CARB's existing test procedures and aligned California procedures to be consistent with U.S. EPA's amendments to the federal certification and exhaust emission testing requirements (see Title 40 CFR Parts 1054 and 1065.11). The 2011 Amendments also set ***Exhaust Emission Certification Test Fuel Amendments*** for using ethanol blends of up to 10 percent (E10) in Off-Road SI SORE Engines, if it is certified by U.S. EPA. U.S. EPA approved the full suite of 2011 Amendments in 2015.[104] In 2016, CARB amended its ***evaporative emission standards*** for the entire category of SORE to increase stringency.[105]

In 2021, CARB adopted amendments to the Small Off-Road Engine Regulations ***(2021 Amendments to the SORE Regulation)***. These amendments set SORE emission standards to zero in two phases:

- First, SORE emission standards are lowered to zero for model year (MY) 2024 and all subsequent model years by setting exhaust emission standards to zero (0.00 grams per kilowatt-hour or g·kWh-1). Evaporative emission standards are also set to zero (0.00 grams per test or g·test-1). The evaporative emission standards include "hot soak" emissions (representing emissions that occur when placing a hot engine in storage after use on a hot summer day) to better evaluate emissions from real-world use of SORE equipment. These emission standards of zero apply for engines used in all equipment types produced for sale or lease for operation in California, except pressure washers with engine displacement greater than or equal to 225 cubic centimeters and generators. Generator emission standards are more stringent than the existing emission standards starting in MY 2024, but would not be zero; and
- The second phase would be implemented starting in MY 2028, when the phase-in for zero-emission pressure washers and generators would begin.

In analyzing the feasibility of this regulation, CARB staff found that zero-emission equipment (ZEE) are available for most small off-road equipment categories, including

[102] U.S. EPA, 2006. "California State Non-road Engine and Vehicle Pollution Control Standards; Decision of the Administrator" https://www.gpo.gov/fdsys/pkg/FR-2006-12-15/pdf/E6-21378.pdf Federal Register / Vol. 71, No. 241
[103] CARB 2010. "Final Regulations Order" accessed June 2018 https://www.arb.ca.gov/regact/2008/sore2008/soreresubfro.pdf?_ga=2.218709145.1039751104.1528225837-29497060.1519676686
[104] U.S. EPA 2015. "California State Non-road Engine Pollution Control Standards; Small Off-Road Engines Regulations; Notice of Decision
[105] CARB 2016. "Final Regulations Order" accessed June 2018 https://www.arb.ca.gov/regact/2016/sore2016/finalreg.pdf?_ga=2.102358145.1039751104.1528225837-29497060.1519676686

lawn and garden equipment and utility equipment, for both residential and professional use. The level of performance, number of brands, and number of equipment options have increased greatly and continue to do so today. At present, there are at least 35 brands of zero-emission lawn mowers available, with several brands directed at professional users. While adoption rates for ZEE among professional landscapers are lower than for residential users, there is substantial evidence that all new small off-road equipment can be zero-emission. Using ZEE is technologically feasible and can offer significant cost-savings to professional users. There are at least 12 brands of zero-emission lawn and garden equipment designed for professional users available for sale.

Transport Refrigeration Units (TRU)

Emission Standards for TRU

TRUs are refrigeration systems powered by an internal combustion engine (inside the unit housing), designed to control the environment of temperature sensitive products that are transported in refrigerated trucks, trailers, railcars, and shipping containers. TRUs operate in large numbers at distribution centers, food manufacturing facilities, packing houses, truck stops, and intermodal facilities, and are used to haul perishable products including food, beverages, pharmaceuticals, flowers, medical products, industrial chemicals, and explosives. TRUs may be capable of both cooling and heating. They deliver perishable goods to retail outlets, such as grocery stores, restaurants, cafeterias, convenience stores, etc. Although TRU engines are relatively small (ranging from 9 to 36 hp) significant numbers of these engines congregate at distribution centers, truck stops, and other facilities, exacerbating air quality challenges and resulting in potential for health risks to those that live and work nearby. The growth rate of TRUs is tied to population, since food is the main product type that is hauled.

In 2022, CARB adopted amendments to the ***Airborne Toxic Control Measure (ATCM) for In-Use Diesel-Fueled TRUs and TRU Generator Sets (TRU ATCM)***, which include requirements that MY 2023 and newer trailer TRU, DSC TRU, railcar TRU, and TRU generator set engines shall meet a PM emission standard of 0.02 grams per brake horsepower-hour or lower (aligns with the U.S. EPA Tier 4 final off-road PM emission standard for 25-50 horsepower engines).

In the 2022 State SIP Strategy, CARB committed to developing a subsequent ***Transport Refrigeration Unit Regulation Part 2*** measure, which would go beyond MSM and require zero-emission trailer TRUs, domestic shipping container TRUs, railcar TRUs, and TRU generator sets for future Board consideration. The new requirements would achieve additional emission and health risk reductions, increase the use of zero-emission technology in the off-road sector, and meet the directive of Governor Newsom's Executive Order N-79-20, which set a goal for 100 percent zero-emission off-road vehicles and equipment in the State by 2035 where feasible. For this measure, CARB would propose the Part 2 rulemaking to require trailer TRUs, domestic shipping container TRUs, railcar TRUs, and TRU generator sets to use zero-emission technology. CARB is currently assessing zero-emission technologies for trailer TRUs and the remaining TRU categories.

In-Use Controls: TRU

CARB adopted the ***Airborne Toxic Control Measure*** (***ATCM) for In-Use Diesel-Fueled TRUs and TRU Generator Sets (TRU ATCM)*** in 2004 (and amended it in 2010 and 2011) to reduce diesel PM emissions and resulting health risk from diesel-powered TRUs. The TRU regulations establish in-use performance standards for diesel-fueled TRUs and TRU generator sets which operate in California, and facilities where TRUs operate. The regulation is designed to reduce the diesel PM emissions from in-use TRU and TRU generator set engines that operate in California, using a phased-in implementation approach over about 12 years by requiring engines to meet in-use emission standards by the end of the seventh year after manufacture. Implementation of the TRU ATCM began in 2009, and applies to in-use diesel-fueled TRUs and TRU generator sets that operate in California, whether they are registered in or outside the State. U.S. EPA issued an authorization for the TRU regulation in 2009.[106] CARB subsequently amended the TRU ATCM in 2010 and again in 2011 to provide owners of TRU engines with certain flexibilities to facilitate compliance, clarify recordkeeping requirements, and establish requirements for businesses that arrange, hire, contract, or dispatch the transport of goods in TRU-equipped trucks, trailers, or containers. U.S. EPA authorized the 2010 Amendments in 2013 and the 2011 Amendments in 2017, respectively.[107, 108]

On February 24, 2022, CARB adopted ***Amendments to the TRU ATCM (2022 Amendments)*** to achieve additional emission and health risk reductions from diesel-powered TRUs and increase the use of zero-emission (ZE) technology in the off-road sector. Key elements of the 2022 Amendments include:

- **Zero-emission truck TRU requirement –** Beginning December 31, 2023, TRU owners shall turnover at least 15 percent of their truck TRU fleet (defined as truck TRUs operating in California) to ZE technology each year (for seven years). All truck TRUs operating in California shall be ZE by December 31, 2029.
- **Applicable facility requirements –** Beginning December 31, 2023, owners of refrigerated warehouses or distribution centers with a building size of 20,000 square feet or greater, grocery stores with a building size of 15,000 square feet or greater, seaport facilities, and intermodal railyards (applicable facilities) shall register the facility with CARB, pay fees every three years, and report all TRUs that operate at their facility to CARB quarterly, or alternatively attest that only compliant TRUs operate at their facility.
- **Expanded TRU reporting –** Beginning December 31, 2023, TRU owners shall report all TRUs (including out-of-state based) that operate in California to CARB.

[106] U.S. EPA, 2009. “California State Nonroad Engine and Vehicle Pollution Control Standards; Authorization of Transport Refrigeration Unit Engine Standards; Notice of Decision” Federal Register Volume 74, Number 11, pp. 3030-3033

[107] U.S. EPA, 2013. “California State Nonroad Engine Pollution Control Standards; Within-the-Scope Determination for Amendments to California’s ‘‘Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units (TRU) and TRU Generator Sets and Facilities Where TRUs Operate’’; Notice of Decision” https://www.gpo.gov/fdsys/pkg/FR-2013-06-28/pdf/2013-15437.pdf Federal Register Vol. 78, No. 125

[108] U.S. EPA, 2017. “California State Nonroad Engine Pollution Control Standards; In-Use Diesel-Fueled Transport Refrigeration Units (TRUs) and TRU Generator Sets and Facilities Where TRUs Operate; Notice of Decision” https://www.gpo.gov/fdsys/pkg/FR-2017-01-19/pdf/2017-01225.pdf Federal Register Vol. 82, No. 12

- **TRU operating fees and compliance labels –** Beginning December 31, 2023, TRU owners shall pay TRU operating fees and affix CARB compliance labels to their TRU every three years, for each TRU operated in California. Collected fees will be used to cover CARB's reasonable costs associated with the certification, audit, and compliance of TRUs.
- **Zero-emission truck TRU assurances –** Manufacturers of zero-emission truck TRUs shall be required to provide a comprehensive warranty for zero-emission truck TRUs and have an authorized service-and-repair facility located in California to perform warranty repairs.

In the 2022 State SIP Strategy, CARB committed to developing a subsequent ***Transport Refrigeration Unit Regulation Part 2***, which would go beyond MSM and require zero-emission trailer TRUs, domestic shipping container TRUs, railcar TRUs, and TRU generator sets for future Board consideration. The new requirements would achieve additional emission and health risk reductions, increase the use of zero-emission technology in the off-road sector, and meet the directive of Governor Newsom's Executive Order N-79-20, which set a goal for 100 percent zero-emission off-road vehicles and equipment in the State by 2035 where feasible. For this measure, CARB would propose the Part 2 rulemaking to require trailer TRUs, domestic shipping container TRUs, railcar TRUs, and TRU generator sets to use zero-emission technology. CARB is currently assessing zero-emission technologies for trailer TRUs and the remaining TRU categories.

PRIMARILY FEDERALLY AND INTERNATIONALLY REGULATED SOURCES

Locomotives

Emission Standards for Locomotives

Under the Act, U.S. EPA has the sole authority to establish emissions standards for new locomotives.[109] Locomotives are self-propelled vehicles used to push or pull trains, including both freight and passenger operations. Union Pacific Railroad (UP) and BNSF Railway (BSNF) are the two Class I, or major, freight railroads operating in California. There are also seven intrastate passenger commuter operators and up to 26 freight shortline railroads currently operating in California. UP and BNSF, however, generate the vast majority (90 percent) of locomotive emissions within the State, with most attributable to interstate line haul locomotives. UP and BNSF operate three major categories of freight locomotives, both nationally and in California. The first category is interstate line haul locomotives, which are primarily ~4,400 horsepower (HP). The second category is made up of medium-horsepower (MHP) locomotives, as defined by CARB as typically between 2,301 and 3,999 HP. MHP locomotives are typically older line haul locomotives that have been cascaded down from interstate service. And lastly, there are switch (yard) locomotives, specifically defined by U.S. EPA as between 1,006 and 2,300 HP. Locomotives operating at railyards and traveling throughout the nation are a significant source of emissions of diesel PM (which CARB has identified as a toxic air contaminant), NOx, and GHGs. These emissions often occur in or near densely

[109] 42 United States Code (U.S.C.) §7547, (a)(5)

populated areas and neighborhoods, exposing residents to unhealthy levels of toxic diesel PM, plus regional ozone and secondary PM2.5.

U.S. EPA has previously promulgated two sets of national locomotive emission regulations (1998 and 2008). In 1998, U.S. EPA approved national regulations that primarily emphasized NOx reductions through Tier 0, 1, and 2 emission standards. Tier 2 NOx emission standards reduced older uncontrolled locomotive NOx emissions by up to 60 percent, from 13.2 to 5.5 g/bhp-hr.

In 2008, U.S. EPA approved a second set of national locomotive regulations. Older locomotives, upon remanufacture, are required to meet more stringent PM emission standards, which are about 50 percent cleaner than Tier 0-2 PM emission standards. U.S. EPA refers to the PM locomotive remanufacture emission standards as Tier 0+, Tier 1+, and Tier 2+. The new Tier 3 PM emission standard (0.1 g/bhp-hr), for model years 2012-2014, is the same as the Tier 2+ remanufacture PM emission standard. The 2008 regulations also included new ***Tier 4 locomotive NOx and PM emission standards*** (2015 and later model years). U.S. EPA Tier 4 NOx and PM emission standards further reduced emissions by approximately 90 percent from uncontrolled levels.

Beyond the currently adopted levels of controls, CARB staff petitioned U.S. EPA in 2017[110] to promulgate by 2020 both Tier 5 national emission standards for newly manufactured locomotives, and more stringent national requirements for remanufactured locomotives, as committed to in the 2016 State SIP Strategy's ***More Stringent National Locomotive Emission Standards*** measure. This would reduce emissions of criteria and toxic pollutants, fuel consumption, and GHG emissions. CARB staff estimates that U.S. EPA could require manufacturers to implement the new locomotive emission regulations by as early as 2023 for remanufactures and 2025 for newly manufactured locomotives. As documented in the Final Technology Assessment for Freight Locomotives,[111] CARB staff believes the most technologically feasible advanced technology for near-term deployment is the installation of a compact aftertreatment system (e.g., combination of selective catalytic reduction (SCR) and diesel oxidation catalyst (DOC)) onto new and remanufactured diesel-electric freight interstate line haul locomotives. Newly manufactured locomotives can also be augmented with on-board batteries to provide an additional 10-25 percent reduction in diesel fuel consumption and GHG emissions to achieve the Tier 5 emission levels. On board batteries could also provide zero emission track mile capabilities in and around railyards to further reduce diesel PM and the associated health risks.

A new federal standard could also facilitate development and deployment of zero-emission track mile locomotives and zero-emission locomotives by building incentives for those technologies into the regulatory structure. The compact SCR and DOC aftertreatment system could also be retrofitted to existing Tier 4 locomotives to be able to achieve a Tier 4+ emissions standard, when Tier 4 locomotives are scheduled

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[110] https://ww2.arb.ca.gov/resources/documents/us-epa-responds-carbs-petition-strengthen-locomotive-emission-standards
[111] Final Technology Assessment for Freight Locomotives available at: https://www.arb.ca.gov/msprog/tech/report.htm

for remanufacture (every 7 to 10 years). Based on the typical remanufacture schedule, all Tier 4 locomotives could potentially be retrofitted with aftertreatment between 2025 and 2037. Existing locomotives originally manufactured to meet Tier 2 or Tier 3 standards could also be upgraded with the same compact aftertreatment system upon remanufacture to achieve emissions equal to Tier 4 levels.

In-Use Controls: Locomotives

CARB has worked closely with the major railroads in California, together with other stakeholders, to develop innovative measures to reduce in-use emissions from locomotives, a major source of NOx and PM emissions in the South Coast, but a source category over which CARB has limited regulatory authority.

While emission standards for locomotives are set by U.S. EPA, CARB has accelerated reductions from these sources through efforts that have focused on cleaner fuel requirements, and increasing use of cleaner locomotives. CARB staff and the Class I railroads have also been implementing through the ***2005 Statewide Rail Yard Agreement for California Rail Yards,*** a Memorandum of Understanding (MOU) to accelerate the introduction of cleaner locomotives since 2010.[112] This agreement obligated the railroads to increase the use of idle control devices, lowered locomotive idle times to 15 minutes, and opened a collaboration to produce Health Risk Assessments on 18 major railyards in the State, which was completed in 2015.

CARB will also increase the stringency of controls on locomotive operations with the recently adopted ***In-Use Locomotive Regulation***, which the Board adopted in April 2023. This regulation will accelerate the adoption of advanced, cleaner technologies for locomotive operations, including zero-emission technologies, and includes:

- Starting in 2024: Spending Account
  Locomotive operators will be required to fund their own trust account based on the emissions created by their locomotive operations in California. The dirtier the locomotive, the more funds must be set aside. Spending Account funds would be used in the following manner:
  - Until 2030: to purchase, lease, or rent Tier 4 or cleaner locomotives, or for the remanufacture or repower to Tier 4 or cleaner locomotive(s).
  - At any time: to purchase, lease, or rent ZE locomotive(s), ZE capable locomotive(s), ZE rail equipment, or to repower to ZE locomotive(s) or ZE capable locomotive(s).
  - At any time: for ZE infrastructure associated with ZE locomotive(s), ZE capable locomotive(s), ZE rail equipment.
  - At any time: to pilot or demonstrate ZE locomotives or ZE rail equipment technologies.

[112] CARB 2005 "ARB/Railroad Statewide Agreement: Particulate Emissions Reduction Program at California Rail Yards" https://ww2.arb.ca.gov/sites/default/files/2020-06/2005%20MOU%20Remediated%2003102020.pdf

- Starting in 2030: In-Use Operational Requirements
  Only locomotives less than 23 years old will be able to be used in California. Switchers, industrial and passenger locomotives with original engine build dates of 2030 or newer would be required to operate in a ZE configuration in California. Freight line haul locomotives with original engine build dates of 2035 and newer will be required to operate in a ZE configuration in California.
- Starting in 2024: Idling Limit
  All locomotives with automatic shutoff devices (AESS) will not be permitted to idle longer than 30 minutes, unless for an exempt reason. Exemptions closely align with those described by U.S. EPA, and would be granted for reasons like maintaining air brake pressure to perform maintenance.
- Starting in 2024: Registration and Reporting
  Locomotives operating in the State will be required to register with CARB. Reporting includes and annual administrative payment. Locomotive activity, emission levels and idling data will be required to be reported annually.

Additionally, the ***1998 Locomotive NOx Fleet Average Emissions Agreement in the South Coast Air Basin (1998 MOU)***, signed by CARB, Union Pacific Railroad and BNSF Railway, accelerated the introduction of cleaner locomotives into the South Coast. Under the MOU, UP and BNSF agreed to operate locomotive fleets that meet an average Tier 2 NOx emission standard, beginning in 2010 and running through 2030.

Local air districts may also pursue indirect source rules for freight facilities that could result in reductions from this category. CARB staff is considering an indirect source rule suggested control measure to assist air districts.

Ocean-Going Vessels

Ocean-going vessels (OGVs) are large commercial vessel designed to transport cargo or passengers between ports. Ocean-going vessels are generally greater than 400 feet, weigh more than 10,000 gross tons, and have per-cylinder engine displacement of greater than 30 liter/cylinder, and can be a U.S. or foreign owned vessel. Due to the international nature of shipping, most ocean-going vessels are owned by foreign companies, but are still subject to California ocean-going vessel regulations when within 24 nautical miles (nm) of the California coastline (Regulated California Waters or regulatory boundary or zone) or at-berth in California ports. The main categories of ocean-going vessels that operate in and visit California include: container, refrigerated cargo ("reefer"), cruise (or "passenger"), auto carrier, roll on-roll off ("ro-ro"), tanker, bulk, and general cargo vessels.

Emission Standards for Ocean-Going Vessels

OGVs and emissions standards are largely regulated on an international level by the International Maritime Organization (IMO), which specifies new engine NOx standards and sets fuel sulfur limits; neither U.S. EPA nor CARB have the authority to set emission standards for OGVs.

The IMO's primary focus is reducing NOx and GHG emissions from OGVs. IMO marine engine standards for OGVs regulate NOx emissions only, with no PM standards in place. Tier I and II engine standards exist for any vessel with a keel-laid date beginning on January 1, 2000, and January 1, 2011, respectively. Stricter Tier III IMO marine engines, which achieve a significant reduction in NOx emissions (around an 80 percent reduction from Tier II) are currently required for any OGV with a keel-laid date of January 1, 2016, or later. However, due to the long lifespan of OGVs and the fact that OGVs with keel laid dates after January 1, 2016, are only required to have Tier III engines when sailing within Emission Control Areas (ECA), turnover to Tier III engines is slow and not expected for most vessel categories until 2030+.[113]

In-Use Controls: Ocean-Going Vessels

While California does not have the authority to regulate emission standards for OGVs, California does have the authority to set in-use requirements for marine vessels, including foreign-flagged vessels, when they are in RCW and visit our ports, to the extent such regulation is not preempted by federal law.

In 2008, CARB adopted the ***Ocean-Going Vessel Fuel Regulation***, "Fuel Sulfur and Other Operational Requirements for Ocean-Going Vessels within California Waters and 24 Nautical Miles of the California Baseline," which is designed to reduce PM, NOx, and sulfur oxide emissions from ocean-going vessels. The OGV Clean Fuel Regulation requires operators to use less polluting marine distillate fuels instead of heavy fuel oil in their diesel engines and auxiliary boilers while operating within Regulated California Waters. The fuel requirements require the use of either marine gas oil (MGO) or marine diesel oil (MDO) with a maximum sulfur limit of 1.5 percent, and the MDO has a maximum sulfur limit of 0.1 percent.

In 2007, CARB adopted the ***Ocean-Going Vessels At-Berth Regulation (At-Berth Regulation)***, with compliance deadlines that began in 2014. The At Berth Regulation reduces emissions from container ships, passenger ships, and refrigerated-cargo ships docked at six California ports: Los Angeles, Long Beach, Oakland, San Diego, San Francisco, and Hueneme. At berth, auxiliary engines are used by vessels to run power for lighting, ventilation, pumps, communication, heating, and other onboard equipment while a vessel is docked. The At-Berth Regulation requires that vessels turn off their auxiliary diesel engines and plug in to shore-based grid electrical power, or utilize alternative technologies to achieve comparable emission reductions. Under the 2007 regulation, compliance requirements for vessels include visit requirements and emission or power reduction requirements, both which were phased in over time. More specifically, the regulation set an 80 percent reduction requirement, meaning a fleet must reduce its auxiliary engine power by 80 percent from the fleet's baseline power generation during the vessel's stay on 80 percent of the fleet's annual vessel visits. Under the 2007 Regulation, container, reefer, and cruise vessel fleets that make 25 visits or more per calendar year to a regulated port, and cruise vessels that make 5 or

[113] California Air Resources Board. Staff Report: Initial Statement of Reasons. October 15, 2019. https://ww2.arb.ca.gov/sites/default/files/classic/regact/2019/ogvatberth2019/isor.pdf

more visits per year to a regulated port, were subject to the requirements. Smaller vessel fleets (i.e., fleets that are comprised of container and reefer vessels that make fewer than 25 visits or cruise with fewer than 5 visits) and vessels that do not often frequent California ports were exempt from the 2007 Regulation.

CARB amended the At-Berth Regulation in 2020 to introduce emission control requirements to additional ports and terminals, including marine terminals that operate independently from a port or port authority, and to cover vessels exempted from the 2007 Regulation. This fulfilled a commitment in the 2016 State SIP Strategy to amend the 2007 At-Berth Regulation. The 2020 Amendments achieve additional emissions reductions of NOx, diesel particulate matter, PM2.5, ROG, and GHG emissions. Under the 2020 Amendments, the At-Berth Regulation was expanded to:

- require vessels to control at-berth emissions at additional ports and terminals;
- cover roll-on/roll-off and tankers;
- add compliance requirements for small fleets;
- Include previously exempted auxiliary engines that operate on liquefied natural gas (LNG) or other alternative fuels;
- Require tankers operating boiler steam powered pumps (for off-loading cargoes like crude oil) to control their boiler emissions;
- Require all regulated vessel visits to use a CARB approved emissions control strategy to reduce auxiliary engine emissions and boiler emissions on every visit to a regulated terminal; and
- Require all vessels visiting California, regardless of port and terminal applicability, to maintain opacity standards at berth and at anchor.

The 2020 Amendments also streamlined the regulatory structure while adding reporting and compliance requirements.

Reduced vessel speeds also provide emission reduction benefits, and programs are operated by local air districts along the California coast to incentivize lower speeds. CARB staff received comments during the public process for the 2022 State SIP Strategy about including a statewide vessel speed reduction program. In the 2022 State SIP Strategy, the CARB measure for ***'Future Measures for Ocean-Going Vessel Emission Reductions'*** considers options available under CARB authority to go beyond MSM and achieve further emissions reductions of NOx, PM, and GHG emissions from OGVs through the use of operational changes and new technologies currently in development, including advances in exhaust capture and control, mobile shore power connections, cleaner fuels (such as LNG, hydrogen, methanol, ammonia, etc.), alternative power sources (including batteries and fuel cells), as well as potential vessel side technologies (such as water-in-fuel emulsion). In pursuing regulatory measures, CARB would work with U.S. EPA, California air districts, seaports, and industry stakeholders in a collaborative effort to determine which measure would provide the most effective emissions reductions, as well as CARB's ability to implement each potential measure. Advocacy at the federal and international levels are necessary to achieve additional emissions reductions from OGVs given the international nature of sea trade. Incentives or regulatory measures may be pursued to achieve emissions reductions from using cleaner engines or cleaner fuels, reducing emissions while anchored within RCW, sailing at slower speeds while in RCW, and requiring bulk/general cargo vessels to reduce emissions at berth.

Aircraft

In-Use Controls: Aircraft

NOx emissions from aircraft are projected to grow significantly. In California, aircraft are projected to make up 9.5 percent of mobile source NOx emissions in 2035, increasing from 5.4 percent in 2020.[114] According to CARB's emissions inventory, five different aircraft categories contribute significantly to NOx emissions: civilian piston aircraft, agricultural crop-dusting aircraft, military jet aircraft, commercial jet aircraft, and civilian jet aircraft. Commercial jet aircraft contribute about 90 percent of NOx emissions from all aircraft in California, whereas military jet aircraft and civilian jet aircraft each contribute about 4.5 percent of NOx. Together, civilian piston aircraft and agricultural crop-dusting aircraft produce less than 1 percent of NOx emissions.

The International Civil Aviation Organization (ICAO) is the United Nations body that sets and adopts civil aviation standards and practices for its 193 national government members. The Committee on Aviation Environmental Protection (CAEP) is a technical committee of ICAO. CAEP assists ICAO with formulating new policies and adopting new standards and recommended practices. The most recent standards adopted by ICAO are:[115]

- CAEP/8: latest NOx standard adopted in 2011;
- CAEP/10: first CO2 standard adopted in 2017; and
- CAEP/11: first non-volatile PM mass and number standard adopted in 2019.

U.S. EPA is required to set emission standards for any air pollutant emitted by aircraft that may reasonably be anticipated to endanger public health or welfare.[116] U.S. EPA is not bound by ICAO standards and can adopt standards that are stricter than those set by ICAO. U.S. EPA has historically adopted ICAO standards and has most recently adopted a GHG emission standard and has proposed a PM emission standard for aircraft that are both equivalent to the ICAO standards.

The Federal Aviation Administration's (FAA) Continuous Low Energy, Emissions, and NOISE (CLEEN) Program is a cost-sharing program aimed at accelerating the development and commercialization of new certifiable aircraft technologies and sustainable aviation fuels. The program has been successful in developing technologies relating to composite airframe technologies, advanced wing technologies, advanced fan

[114] CARB 2022 State SIP Strategy https://ww2.arb.ca.gov/sites/default/files/2022-08/2022_State_SIP_Strategy.pdf
[115] Committee on Aviation Environmental Protection (CAEP) (icao.int) https://www.icao.int/ENVIRONMENTAL-PROTECTION/Pages/CAEP.aspx
[116] Clean Air Act sec. 231, 42 U.S.C. § 7571.

systems, and many other technologies.[117] There are certified aircraft engines available that achieve NOx emissions below the CAEP/8 standard and PM emissions below the latest CAEP/11 standard. Engine manufacturers are also currently developing engines that achieve significant reductions beyond the current standards. These new technology advances enable reductions in both NOx and PM emissions and provide a pathway for achieving effective ways to reduce harmful emissions.

Included in the 2022 State SIP Strategy was the ***Future Measures for Aviation Emission Reductions***, which committed CARB to strongly advocating for stricter emission regulations from U.S. EPA, while also exploring other opportunities under State authority to set reporting and/or operational requirements that can contribute to emissions reductions from aircraft. The Future Measures for Aviation Emissions Reductions measure was committed to in the 2022 State SIP Strategy. It would go beyond MSM and reduce emissions from airport and aircraft related activities, including main aircraft engines, auxiliary power units (APU), and airport ground transportation. As a part of this measure, CARB would explore requiring all larger airports to perform a comprehensive and standardized emission inventory. An accurate emission inventory that reflects all on-ground and near-ground emissions would establish a baseline and enable verifiable and quantifiable future emissions reductions. CARB would continue to assess technology development for the aviation sector. The purpose is to help inform and support CARB planning, regulatory, and voluntary incentive efforts. Concurrently, CARB would support, track, and explore current, in-development, and future emission reduction technology advancements. CARB would further evaluate federal, State, and local authority in setting operational efficiency practices to achieve emissions reductions. Operational practices include landing, takeoff, taxi, and running the APU, and contribute to on-ground and near-ground emissions. CARB would similarly work with U.S. EPA, air districts, airports, and industry stakeholders in a collaborative effort to develop regulations, voluntary measures, and incentive programs.

FUELS

In addition to new engines and in-use standards, cleaner burning fuels represent an important component in reducing emissions from the off-road mobile fleet. Cleaner fuel has an immediate impact in reducing emissions from the mobile source, and thus represent an important component in reducing NOx and PM emissions from off-road engines. California's stringent air quality programs treat mobile sources and their fuels holistically (as a system, rather than as separate components). As a result, CARB's fuels programs achieve significant reductions in criteria emissions from vehicles and mobile engines used in California.

CARB Diesel Fuel Regulations

The California diesel fuel program sets stringent standards for diesel fuel sold in California and produces cost-effective emission reductions from diesel-powered

[117] FAA, CLEEN Phase I and II Projects, Feb. 27, 2020, available at https://www.faa.gov/about/office_org/headquarters_offices/apl/eee/technology_saf_operations/cleen

vehicles. More stringent fuel requirements further ensure that diesel engines are operating as cleanly as possible. ***CARB Diesel Fuel Regulations*** have, over time, phased in more stringent requirements for fuel mixture specifications for aromatic hydrocarbons and sulfur, and have establish a lubricity standard. The program applies to sales of fuel used in on-road vehicles and off-road vehicles and locomotives in California. ***"CARB diesel" Specifications*** adopted in 1988 limited the allowable sulfur content of diesel fuel 500 parts per million by weight (ppmw), and the aromatic hydrocarbon content to 10 percent, and became effective in 1993.

U.S. EPA began regulating sulfur content in diesel in 1993. At that time, uncontrolled fuels (i.e. non-CARB diesel) contained approximately 5,000 parts per million (ppm) of sulfur. In 2006, U.S. EPA began to phase-in more stringent requirements under the federal Ultra-Low Sulfur Diesel (ULSD) regulations, which lowered the amount of sulfur in on-road diesel fuel to 15 ppm. U.S. EPA's Nonroad Diesel Fuel Standards were phased in from 2007 to 2014, and require that all off-road engines, including those used in locomotives and off-road equipment, use ULSD fuel (with some exemptions for older locomotives and marine engines). The Nonroad Standards also require that diesel fuel sold into the market for off-road use must be ULSD. It is important to note that while U.S. EPA defines ULSD as ≤ 15 ppm for on-road applications, the definition of off-road ULSD is significantly less stringent, defined as ≤ 500 ppm standard.

In 2003, ***CARB's Ultra Low Sulfur Diesel (ULSD) Regulation*** increased the stringency of the sulfur content limits in to 15 ppm, which began implementation in 2006. CARB's ULSD Regulation had an immediate impact in reducing emissions from the in-use fleet, while also enabling the use of advanced emissions control technologies, including the use of catalyzed diesel particulate filters, NOx after-treatment, and other advanced after-treatment based emission control technologies that higher sulfur levels would have inhibit the performance of (at the time of CARB's ULSD rulemaking, the average sulfur content of California diesel was approximately 140 ppmw). The original applicability of the regulations was to vehicular diesel fuel; however, the applicability of the regulations has been extended by the adoption of ATCMs to non-vehicular diesel fuel, such as fuel for stationary engines, locomotives, and marine harbor craft.

Beyond the current fuels control program, CARB committed to develop a ***Low Emission Diesel*** Measure in the 2016 State SIP Strategy that will require diesel fuel providers to steadily decrease criteria pollutant emissions from their diesel products. The use of low-emission diesel in on-road vehicles and off-road equipment will reduce tailpipe NOx and PM emissions, in addition to other criteria pollutants. Some studies carried out to date on hydrotreated vegetable oil have reported NOx emission reductions of 6 percent to 25 percent and PM emission reductions of 28 percent to 46 percent, depending on the types of fuels, drive cycles tested, and diesel engines used. This standard is anticipated to both increase consumption of low-emission diesel fuels, and to reduce emissions from conventional fuels. This measure is anticipated to provide NOx benefits predominately from legacy (pre-2010) on-road heavy-duty vehicles, off-road engines, stationary engines, portable engines, marine vessels and locomotives, as well as NOx and diesel PM benefits in potentially all model year off-road engines, stationary engines, portable engines, marine vessels and locomotives. Interstate vehicles, even those registered out-of-State but operating on CARB diesel blended with low-emission diesel, are also anticipated to provide emission reduction benefits.

Controlling Criteria Emissions from Renewable Fuels

The ***Low Carbon Fuel Standard (LCFS) and Alternative Diesel Fuel (ADF) Regulations*** work together to reduce the carbon intensity of the California fuel supply. The regulations also limit criteria emissions from alternative fuels and/or alternative fuel mix blends (a mix of fuels made from renewable feedstocks, which are then blended with conventional gasoline or diesel). The regulations were amended in 2018 to extend the carbon intensity target of 20 percent to 2030. Due to regulatory constraints, the LCFS and ADF do not apply to fossil jet fuel, aviation gasoline, fuels used in interstate locomotives, or fuels used for the propulsion of ocean-going vessels – regulatory control over these fuels lies at the national and international level.

STEP 2(B): OTHER STATES' AND NONATTAINMENT AREAS' OFF-ROAD CONTROL MEASURES

Error! Reference source not found. summarizes the most stringent control measures currently in use in any state or n onattainment that have been identified and discussed for off-road equipment. Each of the measures identified in this table are discussed in more detail in this section, below.

Table 20: Comparison of Stringency – Off-Road Measures

CARB Control Programs Compared to Federal Standards and Control Programs in Other States and Nonattainment Areas

Type of Control Measure	Most Stringent Control Program Identified	Summary of Findings from Analysis	Other Jurisdiction(s) Analyzed
Off-Road Mobile Sources			
New Engine Standards			
New Engine Standards: Off-Road Diesel Engine Emission Standards (general)	Tier 4 Off-Road Engine Standards (CARB and U.S. EPA) Future Measure: *Tier 5 Off-Road Vehicles and Equipment measure (CARB)*	California's emission standards for off-road diesel engines are consistent with those of U.S. EPA and the most stringent in the nation. CARB's current emission standards for new off-road engines with a power rating between 175 and 300 hp are set at the same level of stringency as federal standards, and requires Tier 4 emission standards (which use advanced after treatment technologies such as diesel particulate filters and selective catalytic reduction). This regulation is applicable to all diesel-fueled, self-propelled off-road equipment with at least 25 HP. With the Tier 5 Off-Road Vehicles and Equipment Measure, CARB has committed to develop and propose standards and test procedures for new off-road CI engines More stringent PM and NOx standards for engines greater than or equal to 56 kW (75 hp), including the following: • Aftertreatment-based PM standards for engines less than 19 kW (25 hp), • Aftertreatment-based NOx standards for engines greater than or equal to 19 kW (25 hp) and less than 56 kW (75 hp), and • First-time CO2 tailpipe standards targeting a 5 to 8.6 percent reduction. • Other possible elements include enhancing in-use compliance, proposing more representative useful life periods, idle requirements and developing a low load test cycle. It is expected that Tier 5 requirements would rely heavily on technologies manufacturers are developing to meet the recently approved low-NOx standards and enhanced in-use requirements for on-road- heavy-duty engines. *(Note: CARB has committed to pursue the Tier 5 Off-Road Vehicles and Equipment measure, but this measure has not yet been proposed to the Board for approval/adoption)*	No other state has more stringent exhaust emission standards for off-road equipment than California. Currently CARB and U.S. EPA limit exhaust emissions to same "Tier 4" levels: • NOx: 0.3 g/bhp-hr • PM: 0.015 g/bhp-hr
New Engine Standards: Off-Road Zero-Emission Engine Standards (general)	Future Measure: *Off-Road Zero-Emission Targeted Manufacturer Rule measure (CARB)*	The Off-Road Zero-Emission Targeted Manufacturer Rule would accelerate the development and production of zero-emission off-road equipment and powertrains into more sectors (including wheel loaders, excavators, and bulldozers) as technology advancements occur due to existing CARB zero-emission regulations and regulations in the forklifts, cargo handling equipment, off-road fleets, and small off-road engines sectors. For this measure, CARB would propose to develop a regulatory measure that would require manufacturers of off-road equipment and/or engines to produce for sale zero-emission equipment and/or powertrains as a percentage of their annual statewide sales volume to ensure these globally emerging zero-emissions products and related innovations come to California.	No other state requires zero-emission off-road engine standards.

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Type of Control Measure	Most Stringent Control Program Identified	Summary of Findings from Analysis	Other Jurisdiction(s) Analyzed
Off-Road Mobile Sources			
		(Note: CARB has committed to pursue the Off-Road Zero-Emission Targeted Manufacturer Rule measure, but this measure has not yet been proposed to the Board for approval/adoption)	
In-Use Emission Controls			
In-Use Emissions Controls: Fleet Rules (Off-Road Equipment – General)	In-Use Off-Road Diesel-Fueled Fleets Regulation (Off-Road Regulation) (CARB) Future Measure: *Clean Off-Road Fleet Recognition Program (CARB)*	California's in-use emission controls for off-road equipment are the most stringent in the nation. CARB's off-road regulation controls diesel PM and NOx emissions from >150,000 in-use off-road engines by requiring their owners to retire, replace, or repower older engines, and/or installing verified exhaust retrofit control technologies. Additionally, all vehicles are reported and labeled, and older, dirtier vehicles are restricted from entering fleets. With the 2022 Amendments to the In-Use Off-Road Diesel-Fueled Fleets Regulation, CARB further reduced emissions from the in-use off-road diesel equipment sector by increasing the stringency of the regulation's requirements. These amendments create additional requirements to the currently regulated fleets by targeting the oldest and dirtiest equipment that is allowed to operate indefinitely under the current regulation's structure. The amendments will require fleets to phase-out use of the oldest and highest polluting off-road diesel vehicles in California; prohibit the addition of high-emitting vehicles to a fleet; and require the use of R99 or R100 renewable diesel in off-road diesel vehicles. The amendments phase-in starting in 2024 through the end of 2036 and include changes to enhance enforceability and encourage the adoption of zero-emission technologies. CARB anticipates further emission reductions from the off-road equipment fleets through the Clean Off-Road Fleet Recognition Program measure, which would create a non-monetary incentive to encourage off-road fleets to go above and beyond existing regulatory fleet rule compliance and adopt advanced technology equipment with a strong emphasis on zero-emission technology. This measure would provide a standardized methodology for contracting entities, policymakers, state and local government, and other interested parties to establish guidelines for contracting criteria or require participation in the program to achieve their individual policy goals. *(Note: CARB has committed to develop the Clean Off-Road Fleet Recognition Program measure, but this measure has not yet been proposed to the Board for approval/adoption)*	While Chicago (IL) and New York City (NY) have in-use fleet controls for construction equipment, no other state or nonattainment area controls in-use off-road equipment fleets more stringently than CARB.
Source-Specific Rules			
New Engine Standards: Agricultural equipment	Tier 4 Off-Road Engine Standards (CARB and U.S. EPA)	U.S. EPA and California adopted equivalent Tier 4 standards in 2004 that require additional emission reductions from off-road engines, including those used in mobile agricultural equipment.	No state has more stringent requirements for new emission performance standards for agricultural equipment engines than California.
In-Use Emissions Controls: Agricultural Equipment	Funding Agricultural Replacement Measures for Emission Reductions (FARMER) Program (CARB)	California's in-use emission control program for agricultural equipment is among the most stringent in the nation. CARB's Funding Agricultural Replacement Measures for Emission Reductions (FARMER) Program provides funding through local air districts for agricultural harvesting equipment, heavy-duty trucks, agricultural pump engines, tractors, and other equipment used in agricultural operations. Local air districts receive funds based on a formula and award them to farmers and agricultural businesses for individual projects.	CARB's agricultural equipment fleet controls are among the most stringent in the nation.

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Type of Control Measure	Most Stringent Control Program Identified	Summary of Findings from Analysis	Other Jurisdiction(s) Analyzed
Off-Road Mobile Sources			
New Engine Standards: Airport Ground Support Equipment (GSE)	Large Spark Ignition (LSI) Fleet Regulation (CARB) Tier 4 Off-Road Engine Standards (CARB and U.S. EPA) Future measure: *Zero-Emission Airport Ground Support Equipment measure (CARB)*	California's emission controls for Airport Ground Support Equipment (GSE) are the most stringent in the nation. NOx limits for the LSI Engine Standard for engines > 1.0 liter (the typical engine size for GSE) is 0.6 g/bhp-hr. Engines meeting this standard are 70 percent cleaner than LSI engines produced as recent as 2009. Additionally, diesel engines in newly manufactured GSE must meet the Tier 4 emission standards applicable to off-road compression ignition engines. CARB is anticipated to further increase the stringency of emission controls with the Zero-Emission Airport Ground Support Equipment measure, which will act as a catalyst to further adoption of zero-emission equipment in the off-road sector, facilitate the transfer of technology to suitable heavier duty-cycle applications, and expand use of zero-emission infrastructure. *(NOTE: CARB has committed to pursue the Zero-Emission Airport Ground Support Equipment measure, but it has not yet been proposed to the Board for approval/adoption.)*	No other state has more stringent exhaust emission standards for airport ground support equipment than California.
In-Use Emissions Controls: Fleet Rules (Airport Ground Support Equipment)	In-Use Off Road Diesel-Fueled Fleets Regulation (CARB) Large Spark-Ignition (LSI) Engine Fleet Requirements Regulation (CARB) Portable Diesel-Engines Air Toxic Control Measure (CARB) Future Measure: *Zero-Emission Airport Ground Support Equipment measure (CARB)*	California's in-use emission controls for airport ground support equipment (GSE) are the most stringent in the nation. The In-Use Off-Road Diesel-Fueled Fleets Regulation requires GSE fleets operating in-use diesel equipment to meet an annual fleet average emissions target that decreases over time. For example, for equipment over 175 and under 750 HP, the final 2023 NOx fleet average target is 1.5 g/bhp hr, which is equivalent to the interim Tier 4 NOx standard for newly produced engines. Fleets that do not meet the required annual fleet average must meet the BACT requirements that require turnover, repower or retrofit of a specific percent of a fleet's total HP. These requirements are currently being phased in. Airport GSE fleets operating LSI GSE must meet the in-use LSI engine fleet requirements. Adopted in 2006, the LSI Engine Fleet Requirements Regulation requires GSE fleets to maintain an average emission level of no more than 2.5 g/bhp hr HC+NOx, starting January 1, 2013. Non-mobile GSE such as portable air-start units, ground power units and air conditioners may be subject to the Portable Diesel-Engines Air Toxic Control Measure (ATCM). CARB is anticipated to further increase the stringency of emission controls with the Zero-Emission Airport Ground Support Equipment measure. *(NOTE: CARB has committed to develop the Zero-Emission Airport Ground Support Equipment measure, but it has not yet been proposed to the Board for approval/adoption.)*	No other state or nonattainment area controls airport GSE more stringently than CARB.
New Engine Standards: Cargo Handling Equipment (CHE)	Cargo Handling Equipment Regulation (CARB) Future Measure: *Cargo Handling Equipment*	California's emission controls for Cargo Handling Equipment (CHE) are the most stringent in the nation. CARB's Cargo Handling Equipment regulation sets performance standards for newly acquired engines, as well as in-use mobile CHE at ports or intermodal rail yards. CARB is anticipated to further increase the stringency of the CHE Regulation by transitioning CHE to zero-emission beginning in 2026. Based on the current state of zero-emission CHE technological developments, the transition to zero-emission would most likely be achieved largely through the electrification of CHE.	No other state has more stringent exhaust emission standards for cargo handling equipment than California.

Type of Control Measure	Most Stringent Control Program Identified	Summary of Findings from Analysis	Other Jurisdiction(s) Analyzed
		Off-Road Mobile Sources	
	Amendments measure (CARB)	Staff anticipates that all yard trucks and forklifts would be zero-emission by 2030, rubber-tired gantry cranes would be zero-emission by 2032, and 90 percent of other CHE will be zero-emission by 2036. *(Note: CARB has committed to pursue the Cargo Handling Equipment Amendments measure, but this measure has not yet been proposed to the Board for approval/adoption)*	
In-Use Emissions Controls: Fleet Rules (Cargo Handling Equipment)	Cargo Handling Equipment Regulation (CARB) Future measure: *Amendments to the Cargo Handling Equipment measure (CARB)*	California's in-use emission controls for cargo handling equipment (CHE) are the most stringent in the nation. The Cargo Handling Equipment regulation was adopted in 2005 to establish BACT requirements for in-use and newly purchased CHE, and amended in 2011 to include opacity monitoring requirements. The CHE regulation includes performance standards for in-use, mobile CHE at ports or intermodal rail yards in California, and requires that all newly purchased yard truck and non-yard truck equipment brought onto a port or intermodal rail yard must have either a Tier 4 Final off road engine or an on-road engine meeting the 2010 or newer on-road emission standards, and that all legacy in-use non-yard truck engines that are still in service (Tier 0 – Tier 3) must have a Verified Diesel Emission Control Strategy (VDECS) installed. CARB is anticipated to further increase the stringency with the Amendments to the Cargo Handling Equipment Regulation would set in-use requirements for diesel cargo handling equipment at ports and rail yards, including but not limited to: yard trucks (hostlers), rubber-tired gantry cranes, container handlers, and forklifts. Staff would assess the availability and performance of zero-emission technology as an alternative to all combustion-powered cargo equipment. The regulatory amendments would propose an implementation schedule for new equipment with effective dates beginning in 2026. *(Note: CARB has committed to pursue the Amendments to the Cargo Handling Equipment measure, but this measure has not yet been proposed to the Board for approval/adoption)*	No other state or nonattainment area has more stringent in-use fleet requirements for CHE than California.
New Engine Standards: Commercial Harbor Craft (CHC)	Commercial Harbor Craft Regulation (CARB)	California's emission controls for commercial harbor craft (CHC) are the most stringent in the nation. CARB's 2008 and 2011 CHC Regulations reduced NOx and diesel PM emissions from crew and supply boats, ferries, excursion vessels, towboats, push boats, tug boats, barges and dredges. CARB amended the CHC regulation in 2022, establishing expanded and more stringent in-use requirements to cover more vessel categories, including all tank barges, pilot vessels, research vessels, workboats, commercial passenger fishing, and commercial fishing vessels. The amendments also mandate accelerated deployment of zero-emission and advanced technologies in vessel categories where technological feasibility has been demonstrated.	No other state has more stringent exhaust emission standards for commercial harbor craft than California.
In-Use Emissions Controls: Fleet Rules (Commercial Harbor Craft)	Commercial Harbor Craft Regulation (CARB)	California's in-use emission controls for commercial harbor craft (CHC) are the most stringent in the nation. The Commercial Harbor Craft regulation (adopted in 2008 and amended in 2010) included in-use limits that required diesel PM and NOx emission controls on ferries, excursion vessels, and tugboats, towboats, and push boats. The 2011 amendments extended the types of CHC for which in-use engine requirements apply to include crew and supply, barges and dredges. CARB amended the CHC regulation in 2022, establishing expanded and more stringent in-use requirements to cover more vessel categories including all tank barges, pilot vessels, research vessels, workboats, commercial passenger fishing, and commercial fishing vessels. The amendments also mandate accelerated deployment of zero-emission and advanced technologies in vessel categories where technology feasibility has been demonstrated.	No other state or nonattainment area controls in-use CHC emissions more stringently than CARB.

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Type of Control Measure	Most Stringent Control Program Identified	Summary of Findings from Analysis	Other Jurisdiction(s) Analyzed
Off-Road Mobile Sources			
New Engine Standards: Forklifts	Tier 4 Off-Road Engine Standards (CARB and U.S. EPA) Future Measures: *Zero-Emission Off-Road Forklift Regulation Phase 1 measure (CARB)* *Off-Road Zero-Emission Targeted Manufacturer Rule measure (CARB)*	California's emission controls for forklifts are the most stringent in the nation. Forklifts powered by LSI engines (gasoline and natural gas) are subject to new engine standards that include both criteria pollutant and durability requirements since 2001, with the cleanest requirements phased-in starting in 2010. Diesel Forklifts > 25 HP are subject to Tier 4 Final emission standards (based on the use of advanced after-treatment technologies such as diesel particulate filters and selective catalytic reduction) starting in 2013. CARB is anticipated to further increase the stringency of emission controls with the Zero-Emission Off-Road Forklift Regulation Phase I measure, which would be designed to accelerate the deployment of zero-emission forklift technologies. The regulatory amendments would propose requirements that prohibit the new purchases of LSI forklifts, with an implementation schedule beginning in 2026. *(NOTE: CARB has committed to pursue the Zero-Emission Off-Road Forklift Regulation Phase 1 measure, but it has not yet been proposed to the Board for approval/adoption.)* CARB is anticipated to further increase the stringency of in-use emission controls for forklifts through the Off-Road Zero-Emission Targeted Manufacturer Rule measure. *(NOTE: CARB has committed to pursue the Off-Road Zero-Emission Targeted Manufacturer Rule measure, but it has not yet been proposed to the Board for approval/adoption.)*	No state has more stringent requirements for new emission performance standards for forklifts engines than California.
In-Use Emissions Controls: Fleet Rules (Forklifts)	Off-road Diesel Regulation (CARB) LSI Fleet Regulation (CARB) 2022 Amendments to the In-Use Off-Road Diesel Fueled Fleets Regulation (CARB) Future Measure: *Zero-Emission Off-Road Forklift Regulation Phase 1 (CARB)* Future Measure: *Amendments to the Cargo Handling Equipment measure (CARB)*	California's in-use emission controls for forklifts are the most stringent in the nation. Forklift fleets subject to both the LSI fleet regulation (if powered by gasoline or propane), and the off-road diesel fleet regulation (if powered by diesel) are required to retire, repower, or replace higher-emitting equipment in order to maintain fleet average standards. Diesel Forklifts > 25 HP are subject to fleet average emission requirements under the Off-Road Diesel Regulation starting in 2010. Under the 2022 Amendments to the In-Use Off-Road Diesel Fueled Fleets Regulation, forklifts are also subject to requirements begin to transition fleets from the oldest and highest-emitting off-road engines in operation in California by phasing out Tier 0 – Tier 2 equipment beginning in 2024. Also beginning in 2024, the regulation includes requirements to restrict the addition of new vehicles and/or engines with Tier 3 and 4i engines. CARB is anticipated to further increase the stringency of in-use emission controls with the Zero-Emission Off-Road Forklift Regulation Phase I measure, which would be designed to accelerate the deployment of zero-emission forklift technologies. The regulatory amendments would propose requirements for fleets to retire existing LSI forklifts that are 13 years and older, and would propose an implementation schedule beginning in 2026. *(NOTE: CARB has committed to develop the Zero-Emission Off-Road Forklift Regulation Phase 1 measure, but it has not yet been proposed to the Board for approval/adoption.)* CARB is also anticipated to further reduce the emissions from forklifts operating at ports and intermodal rail yards through the Amendments to the Cargo Handling Equipment Regulation measure. Under the CHE measure, forklifts would begin transitioning to zero-emission technologies. Staff anticipates that all forklifts operating at ports and intermodal rail yards would be zero-emission by 2030. *(NOTE: CARB committed to pursue the Amendments to the Cargo Handling Equipment measure, but this measure has yet to be proposed to the Board for approval/adoption.)*	No other state or nonattainment area has more stringent fleet requirements for in-use forklifts than CARB.

CARB Control Program MSM Analysis
for the SCAQMD 2024 12 µg/m³ annual PM2.5 Plan

Type of Control Measure	Most Stringent Control Program Identified	Summary of Findings from Analysis	Other Jurisdiction(s) Analyzed
Off-Road Mobile Sources			
New Engine Standards: Marine Engines	Exhaust Emission Regulations for Spark-Ignition Marine Engines (CARB) Tier II Emission Standards for Inboard and Stern-Drive Marine Engines (CARB) Evaporative Emission Control Standards (CARB) Future Measure: *Spark-Ignition Marine Engine Standards measure (CARB)*	CARB's recreational boats and marine engine program exceeds the stringency of U.S. EPA's federal standards and are the most stringent in the nation: • The Exhaust Emission Regulations for Spark-Ignition Marine Engines (1998) controls emissions at the same level of stringency as national regulations; • The Tier II Emission Standards for Inboard and Stern-Drive Marine Engines (2001) controls emissions at the same level of stringency as national regulations; and • The Evaporative Emission Control Standards (2015) exceeds the stringency of applicable national regulations set by U.S. EPA in 2008 for gasoline-fueled spark-ignition marine watercraft >30 kilowatts. The Spark-Ignition Marine Engine Standards measure would reduce emissions from new spark-ignition (SI) marine engines by adopting more stringent exhaust standards for outboard and personal watercraft, which currently do not use catalyst control technologies. Staff estimates that stricter standards could reduce combined HC or ROG and NOx emissions by approximately 70 percent below the current HC+NOx standard (≈16.5 grams per kilowatt-hour (g/kW-hr)) for engines greater than or equal to 40 kilowatts (kW) in power, and by approximately 40 percent for engines less than 40 kW in power. CARB staff is also evaluating whether some outboard and personal watercraft vessels could be propelled by zero-emission technologies in certain applications. For example, zero-emission powertrains have the potential to gradually replace most outboard engines less than 19 kW, as well as many new personal watercraft engines. *(Note: CARB has committed to pursue the Spark-Ignition Marine Engine Standards measure, but this measure has not yet been proposed to the Board for approval/adoption)*	No other state has the authority to set exhaust emission and/or evaporative emission standards that exceed the stringency of U.S. EPA's national standards.
New Engine Standards: Off-Highway Recreational Vehicles (OHRVs)	Exhaust Emission Standards for OHRVs (CARB) Evaporative Emission Standards for OHRVs (CARB)	California's emission controls for Off-Highway Recreational Vehicles (OHRVs) are the most stringent in the nation. CARB's exhaust emission standards control emissions from off-highway motorcycles, all-terrain vehicles, and utility terrain vehicles at more stringent levels than applicable national standards set by U.S. EPA for MY 2022 – 2027+. CARB evaporative emission standards harmonize with federal limits for MY 2020 – 2026. California's evaporative emission standards will exceed the stringency of federal requirements for MY 2027+.	No other state has the authority to set exhaust emission and/or evaporative emission standards that exceed the stringency of U.S. EPA's national standards.
In-Use Emissions Controls: Fleet Rules (Off-Highway Recreational Vehicles)	OHRV "Red Sticker" program (CARB)	California's in-use emission controls for Off-Highway Recreational Vehicles (OHRVs) are the most stringent in the nation. CARB's "Red Sticker" program requires in-use OHRVs that do not meet the applicable exhaust emission standards display a red registration sticker that limits operation at certain off highway recreational vehicle parks located in nonattainment areas during peak ozone season.	No other state or nonattainment area controls in-use emissions from OHRV more stringently than CARB.
New Engine Standards: Small Off-Road Engines (SORE)	Exhaust and Evaporative Standards for Small Off-Road Engines (CARB)	California's emission controls for small off-road engines (SORE) are the most stringent in the nation. CARB's current SORE program (through MY 2023) aligns the exhaust and evaporative standards for SORE with federal standards, and sets requirements for Zero-Emission SORE equipment. CARB further increased the stringency of emission controls with the 2021 Amendments to the SORE Regulations, which will accelerate the deployment of zero-emission technologies, set tighter exhaust and evaporative emission standards (MY 2024+), and enhance enforcement of current emission standards for SORE. Beginning in MY 2024, exhaust and evaporative emission standards were lowered to zero, except	No other state has the authority to set exhaust emission and/or evaporative emission standards that exceed the stringency of U.S. EPA's national standards.

Type of Control Measure	Most Stringent Control Program Identified	Summary of Findings from Analysis	Other Jurisdiction(s) Analyzed
Off-Road Mobile Sources			
		for pressure washers with engine displacement greater than or equal to 225 cubic centimeters and generators (phase-in for ZE pressure washers and generators begins in MY 2028 and 2024, respectively). For MY 2024 and subsequent years, CARB's emission control requirements for SORE will exceed federal requirements.	
New Engine Standards: Transport Refrigeration Units (TRU)	Airborne Toxic Control Measure for In-Use Diesel-Fueled TRUs and TRU Generator Sets (TRU ATCM) (CARB) Future Measure: *Transport Refrigeration Units (TRU) Regulation Part 2 measure (CARB)*	California's emission controls for Transport Refrigeration Units (TRU) are the most stringent in the nation. CARB adopted the Airborne Toxic Control Measure (ATCM) for In-Use Diesel-Fueled TRUs and TRU Generator Sets, and Facilities Where TRUs Operate (TRU ATCM) in 2004 and amended it in 2010 and 2011 to reduce diesel particulate matter (PM) emissions and resulting health risk from diesel-powered TRUs used to control the environment of temperature-sensitive products. In 2022, CARB further amended the TRU ATCM (2022 Amendments), which included requirements that MY 2023 and newer trailer TRU, DSC TRU, railcar TRU, and TRU generator set engines shall meet a PM emission standard of 0.02 grams per brake horsepower-hour or lower (aligns with the United States Environmental Protection Agency Tier 4 final off-road PM emission standard for 25-50 horsepower engines). CARB is anticipated to further increase the stringency of in-use emission controls on TRUs via the Transport Refrigeration Units Regulation Part 2 measure, which would be designed to require zero-emission trailer TRUs, domestic shipping container TRUs, railcar TRUs, and TRU generator sets. *(Note: CARB has committed to pursue the Transport Refrigeration Unit Regulation Part 2 measure, but this measure has not yet been proposed to the Board for approval/adoption)*	No other state or nonattainment area requires as stringent of emission standards for TRUs
In-Use Emission Controls (Fleet Standard): Transport Refrigeration Units (TRU)	Air Toxic Control Measure for Transport Refrigeration Units and TRU Generator Sets (CARB) Future measure: *Transport Refrigeration Units (TRU) Regulation Part 2 measure (CARB)*	California's in-use emission controls for Transport Refrigeration Units (TRUs) are the most stringent in the nation. CARB adopted the Airborne Toxic Control Measure (ATCM) for In-Use Diesel-Fueled TRUs and TRU Generator Sets, and Facilities Where TRUs Operate (TRU ATCM) in 2004 and amended it in 2010 and 2011 to reduce diesel particulate matter (PM) emissions and resulting health risk from diesel-powered TRUs used to control the environment of temperature-sensitive products. In 2022, CARB further amended the TRU ATCM (2022 Amendments), which included Zero-emission truck TRU fleet requirements. Beginning December 31, 2023, TRU owners shall turnover at least 15 percent of their truck TRU fleet (defined as truck TRUs operating in California) to ZE technology each year (for seven years). All truck TRUs operating in California shall be ZE by December 31, 2029. CARB is anticipated to further increase the stringency of in-use emission controls on TRUs via the TRU Regulation Part 2 measure, which would be designed to require zero-emission trailer TRUs, domestic shipping container TRUs, railcar TRUs, and TRU generator sets. *(Note: CARB has committed to pursue the Transport Refrigeration Unit Regulation Part 2 measure, but this measure has not yet been proposed to the Board for approval/adoption)*	No other state or nonattainment area controls in-use emissions from TRUs more stringently than CARB.
Primarily Federally and Internationally Regulated Sources			
New Engine Standards: Locomotives	Tier 4 NOx and PM Locomotive emission standards (U.S. EPA) CARB has petitioned U.S. EPA to further increase stringency.	U.S. EPA has the sole authority to establish emissions standards for locomotives. CARB petitioned U.S. EPA in 2017 to increase stringency by developing Tier 5 national emission standards for newly manufactured locomotives, and more stringent national requirements for remanufactured locomotives (by ~2020) *(NOTE: CARB has petitioned U.S. EPA for more stringent locomotive standards given the needs in California's nonattainment areas, but approval/adoption of this MSM rests exclusively with U.S. EPA and is thus beyond the purview of CA.)*	No state has emission standards for locomotives that differ from U.S. EPA's.

<table>
<tr><th>Type of Control Measure</th><th>Most Stringent Control Program Identified</th><th>Summary of Findings from Analysis</th><th>Other Jurisdiction(s) Analyzed</th></tr>
<tr><td colspan="4">Off-Road Mobile Sources</td></tr>
<tr><td></td><td>(2016 State SIP Strategy's More Stringent National Locomotive Emission Standards measure)</td><td></td><td></td></tr>
<tr><td>In-Use Emission Controls (Locomotives):

In-Use Locomotive Regulation</td><td>1998 Locomotive NOx Fleet Average Emissions Agreement in the South Coast Air Basin

Statewide Rail Yard Agreement for California Rail Yards (Locomotive Memorandum of Understanding) (CARB)

In-Use Locomotive Regulation (CARB)</td><td>California's in-use emission reduction measures for locomotives are the most stringent in the nation.

The 1998 Locomotive NOx Fleet Average Emissions Agreement in the South Coast Air Basin (1998 MOU), signed by CARB, Union Pacific Railroad and BNSF Railway, accelerated the introduction of cleaner locomotives into the South Coast Air Basin. Under the MOU, UP and BNSF agreed to operate locomotive fleets that meet an average Tier 2 NOx emission standard, beginning in 2010 and running through 2030.

The 2005 Statewide Rail Yard Agreement for California Rail Yards, a Memorandum of Understanding (MOU) with the Class I Railroads to increase the use of idle control devices, lowered locomotive idle times to 15 minutes, and opened a collaboration to produce Health Risk Assessments on 18 major railyards in the State, which was completed in 2015.

Adopted in April 2023, the In-Use Locomotive Regulation accelerates the adoption of advanced, cleaner technologies for locomotive operations, including zero-emission technologies. The regulatory elements include:
Starting in 2024: Spending Account
Locomotive operators would be required to fund their own trust account based on the emissions created by their locomotive operations in California. The dirtier the locomotive, the more funds must be set aside. Spending Account funds would be used to fund turnover to cleaner locomotives, rail equipment, and/or related infrastructure.
Starting in 2030: In-Use Operational Requirements
Only locomotives less than 23 years old would be able to be used in California. Switchers industrial and passenger locomotives with original engine build dates of 2030 or newer would be required to operate in a ZE configuration in California. Freight line haul locomotives with original engine build dates of 2035 and newer would be required to operate in a ZE configuration in California.
Starting in 2024: Idling Limit
All locomotives with automatic shutoff devices (AESS) would not be permitted to idle longer than 30 minutes, unless for an exempt reason. Exemptions closely align with those described by U.S. EPA, and would be granted for reasons like maintaining air brake pressure or to perform maintenance.
Starting in 2024: Registration and Reporting
Locomotives operating in the State would be required to register with CARB. Reporting includes and annual administrative payment. Locomotive activity, emission levels and idling data would be required to be reported annually.
Local air districts may also pursue indirect source rules for freight facilities that could result in reductions from this category.</td><td>No other state has a regulation to accelerate the adoption of advanced, cleaner locomotive operations technologies, including zero-emission.</td></tr>
<tr><td>New Engine Standards:

Ocean-Going Vessels</td><td>Tier III emission standards (IMO)

Future Measure:</td><td>The International Maritime Organization (IMO) has the sole authority to establish emissions standards for ocean-going vessels. The IMO regulates NOx emissions from OGVs, but does not limit PM exhaust emissions.</td><td>No state has emission standards for ocean-going vessels that differ from the IMO's standards.</td></tr>
</table>

Type of Control Measure	Most Stringent Control Program Identified	Summary of Findings from Analysis	Other Jurisdiction(s) Analyzed
Off-Road Mobile Sources			
	Future Measures for Ocean-Going Vessel Emission Reductions measure (CARB)	In the 2022 State SIP Strategy, CARB also committed to a future measure to further reduce in-use emissions from OGVs with the Future Measures for Ocean-Going Vessel Emission Reductions measure. Due to the IMO's authority on setting emission standards, for this measure, CARB would strongly advocate for stricter emission regulations and highlight the need to reduce pollution to protect public health *(Note: CARB has committed to pursue the Future Measures for Ocean-Going Vessel Emission Reductions measure, but this measure has not yet been proposed to the Board for approval/adoption)*	
In-Use Emission Controls: Ocean-Going Vessels	Ocean-Going Vessel Fuel Regulation (CARB) At-Berth Regulation (CARB) Future Measure: *Future Measures for Ocean-Going Vessel Emission Reductions measure (CARB)*	California's in-use emission reduction measures for ocean-going vessels are the most stringent in the nation. CARB's 2008 Ocean Going Vessel (OGV) Fuel Regulation reduces PM, NOx, and SOx emissions from OGVs by requiring operators of OGVs to use less polluting marine distillate fuels instead of heavy fuel oil in their diesel engines and auxiliary boilers while operating within approximately 24 nautical miles (nm) of the California coastline (otherwise known as Regulated California Waters, or RCW). Under Annex VI, the IMO sets fuel sulfur limits. The fuel sulfur limit in the North American Emission Control Areas (ECAs) is 0.1 percent sulfur within 200 nm, the same percent sulfur (as CARB's Ocean-Going Vessel OGV Fuel Regulation. However, there are some differences between the regulations. The California regulation specifies the use of cleaner "distillate" grades of fuel, rather than just a sulfur limit, and the federal ECA provides exemptions for many vessels that are not exempted by CARB's OGV Fuel Regulation (E.g. scrubbers, ultra-low sulfur fuel oil). California is the only state that further regulates the sulfur content and type of fuels that can be used in OGVs, above what the IMO requires. CARB's OGV At-Berth Regulation (At-Berth Regulation), which was amended in 2020, reduces emissions from vessels docked at California ports by requiring that vessels turn off their auxiliary diesel engines and plug in to shore-based grid electrical power, or utilize alternative technologies to achieve comparable emission reductions. Although California is the only state in the United States that has a regulation requiring vessels to control emissions at berth, other states around the country have installed and are using shore power to control OGV emissions at berth. Seattle, New York, and New Jersey provide shore side power for cruise vessels. In addition, the Port of Tacoma has provided shore power to container ships since 2010 and is adding shore power to be ready for use by the end of 2023. The Port of Miami has plans to install five shore power systems for cruise ships by the end of the year, which when finished, will be the largest shore power system in the world. In the 2022 State SIP Strategy, CARB also committed to a future measure to further reduce in-use emissions from OGVs with the Future Measures for Ocean-Going Vessel Emission Reductions measure. Under this measure, CARB will consider available control options through the use of operational changes and new technologies currently in development, including advances in exhaust capture and control, mobile shore power connections, cleaner fuels (such as LNG, hydrogen, methanol, ammonia, etc.), alternative power sources (including batteries and fuel cells), as well as potential vessel side technologies (such as water-in-fuel emulsion). Incentives or regulatory measures may be pursued to achieve emissions reductions from using cleaner engines or cleaner fuels, reducing emissions while anchored within RCW, sailing at slower speeds while in RCW (Vessel Speed Reduction, aka VSR), and requiring bulk/general cargo vessels to reduce emissions at berth.	California is the only state that further regulates the sulfur content and type of fuels that can be used in OGVs, above what the IMO requires. California is the only state in the United States that has a regulation requiring vessels to control emissions at-berth. There are no other states outside of California that regulate shipping emissions

CARB Control Program MSM Analysis
for the SCAQMD 2024 12 µg/m^3 annual PM2.5 Plan

Type of Control Measure	Most Stringent Control Program Identified	Summary of Findings from Analysis	Other Jurisdiction(s) Analyzed
Off-Road Mobile Sources			
		Certain areas and ports within California currently use incentive programs to support OGV emissions reductions through VSR and other mechanisms, The Port of Long Beach has employed a Green Ship Incentive Program since 2012 which is a voluntary program that incentivizes cleaner vessel visits, with incentives ranging from $600 to $6,000 depending on the vessel's Environmental Ship Index (ESI) score. The Port of Los Angeles also participates in the ESI Program, and provides incentives for Tier III vessels to come into port (incentive grant of $5,000 per call), and offers a Technology Advancement Program grant ($750 per call) for OGVs that demonstrate an emission reduction technology that reduces diesel particulate matter and NOx emissions. While there are no other states outside of California that regulate shipping emissions, other ports in the United States also incentivize ships to use cleaner technology and practices that reduce emissions beyond the regulatory requirements set by the IMO. The Ports of New York and New Jersey's Clean Vessel Incentive Program offers financial incentives to encourage OGVs to voluntarily enhance their engines, fuel, and technology. The program employs a scoring system that rewards VSR and the vessel's Environmental Ship Index (ESI) score, with additional points given to vessels meeting clean engine standards. *(Note: CARB has committed to pursue the Future Measures for Ocean-Going Vessel Emission Reductions measure, but this measure has not yet been proposed to the Board for approval/adoption)*	
In-Use Emission Controls (Aircraft): Future Measures for Aviation Emission Reductions	Future Measure: *Future Measures for Aviation Emission Reductions (CARB)*	Future Measures for Aviation Emissions Reductions would reduce emissions from airport and aircraft related activities, including main aircraft engines, auxiliary power units (APU), and airport ground transportation. Due to U.S. EPA's authority on setting emission standards, for this measure, CARB would strongly advocate for stricter emission regulations and highlight the need to reduce pollution to protect public health. CARB would also explore requiring all larger airports to perform a comprehensive and standardized emission inventory. An accurate emission inventory that reflects all on-ground and near-ground emissions would establish a baseline and enable verifiable and quantifiable future emissions reductions. CARB would continue to assess technology development for the aviation sector. The purpose is to help inform and support CARB planning, regulatory, and voluntary incentive efforts. Concurrently, CARB would support, track, and explore current, in-development, and future emission reduction technology advancements. CARB would evaluate federal, State, and local authority in setting operational efficiency practices to achieve emissions reductions. Operational practices include landing, takeoff, taxi, and running the APU, and contribute to on-ground and near-ground emissions. CARB would similarly work with U.S. EPA, air districts, airports, and industry stakeholders in a collaborative effort to develop regulations, voluntary measures and incentive programs. *(Note: CARB has committed to pursue the Future Measures for Aviation Emission Reductions, but this measure has not yet been proposed to the Board for approval/adoption)*	No state has emission standards for aircraft that differ from U.S. EPA's and FAA's.
Fuels			
Fuels Standards: Diesel Standards	CARB Diesel Fuel Regulations and Ultra Low Sulfur Diesel (CARB) Future measure:	California's fuel standards for diesel are the most stringent in the nation. CARB Diesel Fuel Regulations include stringent requirements for fuel mixture specifications for aromatic hydrocarbons and sulfur, and have establish a lubricity standard and applies to sales of fuel used in on-road vehicles and off-road vehicles and locomotives in California. CARB's ULSD program reduces NOx and PM emissions significantly relative to U.S. EPA requirements, providing approximately 7 percent more NOx reductions and 25 percent more PM reductions than federal diesel.	No state requires cleaner burning diesel than California. The California diesel fuel regulations exceed federal requirements in stringency.

CARB Control Program MSM Analysis
for the SCAQMD 2024 12 µg/m^3 annual PM2.5 Plan

Type of Control Measure	**Most Stringent Control Program Identified**	**Summary of Findings from Analysis**	**Other Jurisdiction(s) Analyzed**
Off-Road Mobile Sources			
	Low Emission Diesel measure (CARB)	CARB is anticipated to further increase the stringency of controls on criteria pollutant emissions diesel products. *(NOTE: CARB has committed to pursue the Low Emission Diesel measure, but it has not yet been proposed to the Board for approval/adoption.)*	CARB staff are aware of only one other state, Texas, who has a boutique diesel fuel program that is approved into the SIP. An independent analysis of The Texas Low Emission Diesel program (TxLED) showed that the TxLED fuel emissions performance does not provide as significant of emission reduction benefits as the California specifications.
Fuels Standards: Alternative Fuel Standards (Diesel substitutes)	Low Carbon Fuel Standard (LCFS) (CARB) Alternative Diesel Fuel Regulation (ADF) (CARB)	California's fuel standards for diesel substitutes are the most stringent in the nation. The LCFS and ADF regulations work together to reduce the carbon intensity of the California fuel supply while requiring limits on criteria emissions from alternative fuels and/or alternative fuel mix blends. The LCFS regulation supports alternative fuels used in several off-road applications. However, the program does not apply to fossil jet fuel, aviation gasoline, fuels used in interstate locomotives or fuels used for propulsion of ocean-going vessels.	No other state has set criteria emission requirements on alternative fuels and alternative fuel blends. The Federal Renewable Fuel Standard (RFS II) does not specify criteria requirements for alternative fuels. Other states with low carbon fuel and/or clean fuel programs: • Oregon, Washington, and British Columbia have low carbon fuel standard programs, California participates in the Pacific Coast Collaborative with these states/provinces. • Other states that are considering a clean fuel regulation include: NY, MI, MN, NM, VT, IL, MA.

EMISSION STANDARDS FOR NEW ENGINES AND EQUIPMENT

Off-Road Equipment (General)

CARB ***Tier 4 Off-Road Equipment Standards are*** nearly identical to those finalized by U.S. EPA in its Clean Air Nonroad Diesel Rule. These regulations require engine manufacturers to meet aftertreatment-based exhaust standards for PM and NOx starting in 2011 that are over 90 percent lower than the previous engine generation's emission levels. CARB's new engine standards for off-road equipment is thus aligned with most stringent control program of any in the nation.

Due to constraints in the Act, California is the only state that can set new engine standards (including control measures such as emission standards, sales mandates, warranty provisions, and OBD requirements) that are more stringent than U.S. EPA's national standards. Other states can adopt California programs for which U.S. EPA has provided California with authorizations. While the Act allows other states to adopt CARB's regulations for off-road engine or off-road vehicles (provided that such standards are identical to the CARB standards for which an authorization has been obtained), other states have not yet adopted off-road engine emission standards equivalent to the California off-road regulation, although there are some states currently considering doing so.

CARB has also committed to increase the stringency of off-road equipment emission standards with the ***Tier 5 Off-Road Vehicles and Equipment measure*** and the ***Off-Road Zero-Emission Targeted Manufacturer Rule measure****.* Under the Tier 5 Off-Road Vehicles and Equipment measure, CARB would develop and propose standards and test procedures for new off-road CI engines More stringent PM and NOx standards for engines greater than or equal to 56 kW (75 hp). The Off-Road Zero-Emission Targeted Manufacturer Rule would accelerate the development and production of zero-emission off-road equipment and powertrains into more sectors.

IN-USE EMISSION CONTROLS FOR OFF-ROAD ENGINES AND EQUIPMENT

Fleet Rules: Off-Road Equipment (General)

In aggregate, CARB's fleet requirements for off-road equipment are the most stringent in the nation. CARB's ***Cleaner In-Use Off-Road Equipment Regulation (Off-Road Regulation)*** controls diesel PM and NOx emissions from >150,000 in-use offroad engines by requiring their owners to retire, replace, or repower older engines, and/or installing verified exhaust retrofit control technologies to BACT-equivalent engines. Additionally, all vehicles are reported and labeled, and older, dirtier vehicles are restricted from entering fleets.

CARB's Off-Road Regulation controls emissions from aerial lifts, aircraft tugs, backhoes, baggage tugs, belt loaders, cargo loaders, crawler tractors (such as bulldozers), excavators, forklifts, graders, loaders, mowers, rollers, rough terrain forklifts, rubber tired loaders, scrapers, skid steer loaders, snow blowers, tractors, trenchers, as well as several types of on-road vehicles, such as two-engine vehicles, and workover rigs. Furthermore, CARB has also committed to further emission reductions from the off-road equipment fleets through the ***Clean Off-Road Fleet Recognition Program*** measure, which would create a non-monetary incentive to encourage off-road fleets to go above and beyond existing regulatory fleet rule compliance and adopt advanced technology equipment with a strong emphasis on zero-emission technology.

Some nonattainment areas have fleet requirements that also require BACT-equivalent levels of controls for some off-road equipment (i.e. construction equipment), which are described below.

- New York City's Local Law 77 requires use of ultra-low sulfur diesel fuel and BACT for reducing emissions from non-road equipment above 37 kW used on city construction projects.
- Chicago (IL) Clean Diesel Construction Ordinance bans high-polluting diesel equipment from City construction sites. While the California program requires fleets to turnover to Tier 4 or equivalent control levels, the Chicago ordinance only requires fleets to turnover to Tier 2 or equivalent control levels (on-road vehicles MY 1998 and earlier and pre-US Environmental Protection Agency Tier 1 equipment will be banned under the Chicago ordinance.)

No other state or nonattainment area controls in-use off-road equipment fleets more stringently than CARB. Neither of the New York or Chicago programs cover the full suite of off-road equipment engine types and applications that are regulated under CARB's program. Additionally, they do not have as stringent of labeling and reporting requirements as CARB. Finally, the use of ULSD in off-road equipment in New York provides significantly less emission reductions than the use of ULSD inside of California (as is required – see fuels section for more information), as federal USLD specifications allow significantly less stringent caps on sulfur and aromatic hydrocarbon content in fuels than CARB diesel specifications.

OFF-ROAD ENGINES AND EQUIPMENT: SOURCE-SPECIFIC RULES

Beyond the regulations that apply to the majority of the off-road category, CARB also controls sub-categories of off-road equipment through source-specific emission standards and fleet requirements, as described below.

Agricultural Equipment

Emission Standards for Agricultural Equipment

CARB's new engine standards for off-road agricultural equipment (ag equipment) is consistent with the most stringent of any in the nation. In 2004, U.S. EPA and California adopted equivalent ***Tier 4 Off-Road Engine Emission Standards***, which includes requirements for agricultural equipment engines. Beyond the Off-Road Regulation, CARB also controls sub-categories of off-road equipment through specific fleet requirements, as described below.

In-Use Controls: Agricultural Equipment

CARB's agricultural equipment fleet controls are among the most stringent in the nation. The Funding Agricultural Replacement Measures for Emission Reductions (FARMER) Program provides funding through local air districts for agricultural harvesting equipment, heavy-duty trucks, agricultural pump engines, tractors, and other equipment used in agricultural operations. Local air districts receive funds based on a formula and award them to farmers and agricultural businesses for individual projects. Funding is supported in part by California Climate Investments, a statewide program that puts billions of Cap-and-Trade dollars to work. In April 2022, CARB expanded the project categories within the FARMER Program to include zero-emission agricultural equipment. As of September 2022, $685 million has been allocated, with $347.6 million implemented across 8,057 projects. The emission reductions benefits associated with these projects include 22,400 tons of NO_x reductions, and 1,350 tons of PM 2.5 reductions, Statewide.

Airport Ground Support Equipment (GSE)

Emission Standards for Airport GSE

CARB's new engine standards for airport GSE is the most stringent in the nation. New airport GSE is subject to emission standards under CARB's ***Large Spark Ignition (LSI) Fleet Regulation*** (natural gas and gasoline engines), and under CARB's ***Tier 4 Off-Road Engine Standards*** (diesel engines). NOx limits for the LSI Engine Standard for engines > 1.0 liter (the typical engine size for GSE) is 0.6 g/bhp-hr. Engines meeting this standard are 70 percent cleaner than LSI engines produced as recent as 2009. Additionally, diesel engines in newly manufactured GSE must meet the Tier 4 emission standards applicable to off-road compression ignition engines. Non-mobile GSE such as portable air-start units, ground power units and air conditioners may be subject to the ***Portable Diesel-Engines Air Toxic Control Measure (ATCM)***. The ATCM reduces PM emissions by requiring engine replacement in a schedule based on a fleet's weighted PM emission average. No other state has more stringent exhaust emission standards for airport GSE than CARB. Furthermore, CARB is anticipated to further increase the stringency of emission controls beyond MSM under the ***Zero-Emission Airport Ground Support Equipment measure*** committed to in the 2016 State SIP Strategy.

In-Use Controls: Airport GSE

CARB's new engine standards for airport GSE is the most stringent in the nation. New airport GSE is subject to emission standards under CARB's ***Large Spark Ignition (LSI) Fleet Regulation*** (natural gas and gasoline engines), and under CARB's ***Tier 4 Off-Road Engine Standards*** (diesel engines). NOx limits for the LSI Engine Standard for engines > 1.0 liter (the typical engine size for GSE) is 0.6 g/bhp-hr. Engines meeting this standard are 70 percent cleaner than LSI engines produced as recent as 2009. Additionally, diesel engines in newly manufactured GSE must meet the Tier 4 emission standards applicable to off-road compression ignition engines. Non-mobile GSE such as portable air-start units, ground power units and air conditioners may be subject to the ***Portable Diesel-Engines Air Toxic Control Measure (ATCM)***. The ATCM reduces

PM emissions by requiring engine replacement in a schedule based on a fleet's weighted PM emission average. No other state has more stringent exhaust emission standards for airport GSE than CARB. Furthermore, CARB is anticipated to further increase the stringency of emission controls beyond MSM under the ***Zero-Emission Airport Ground Support Equipment measure*** committed to in the 2016 State SIP Strategy.

CARB's airport GSE fleet requirements are the most stringent in the nation. CARB's ***In-Use Off-Road Diesel-Fueled Fleets Regulation*** requires fleets operating in-use diesel equipment to meet an annual fleet average emissions target that decreases over time to become equivalent to the interim Tier 4 NOx standard for newly produced engines. Airport GSE fleets operating Large Spark-Ignition (LSI) GSE must meet the in-use LSI engine fleet requirements. Adopted in 2006, ***the LSI Engine Fleet Requirements Regulation*** requires GSE fleets to maintain an average emission level of no more than 2.5 g/bhp hr HC+NOx, starting January 1, 2013. Non-mobile GSE such as portable air-start units, ground power units and air conditioners may be subject to the ***Portable Diesel-Engines Air Toxic Control Measure (ATCM)***. The ATCM reduces PM emissions by requiring engine replacement in a schedule based on a fleet's weighted PM emission average. CARB is anticipated to further increase the stringency of emission controls beyond MSM with ***the Zero-Emission Airport Ground Support Equipment measure***. No other state or nonattainment area controls airport GSE more stringently than CARB.

Cargo Handling Equipment (CHE)

Emission Standards for CHE

CARB's ***Cargo Handling Regulation*** established engine performance standards for new CHE used to transfer goods or perform maintenance and repair activities and includes equipment such as yard trucks (hostlers), rubber-tired gantry cranes, top handlers, side handlers, forklifts, and loaders at ports and intermodal rail yards. CARB CHE emission standards are the most stringent of any in the nation, with further increases in stringency anticipated through the ***Cargo Handling Equipment Amendments measure*** committed to in the 2022 State SIP Strategy, which will go beyond MSM and transition CHE to zero-emission equipment. CARB obtained U.S. EPA authorization in 2012. No other state or nonattainment area has more stringent exhaust emission standards for CHE than California.

In-Use Controls: CHE

CARB's ***Cargo Handling Equipment Regulation*** includes in-use limits that require diesel PM and NOx emission controls for mobile CHE at ports or intermodal rail yards. The CHE Regulation requires that all newly purchased yard truck and non-yard truck equipment brought onto a port or intermodal rail yard must have either a Tier 4 Final off road engine or an on-road engine meeting the 2010 or newer on-road emission standards, and that all legacy in-use non-yard truck engines that are still in service (Tier 0 – Tier 3) must have a Verified Diesel Emission Control Strategy (VDECS) installed. CARB is anticipated to further increase the stringency with ***the Amendments***

to the Cargo Handling Equipment Regulation, which would go beyond MSM and set in-use requirements for diesel cargo handling equipment at ports and rail yards. No other state or nonattainment area has more stringent in-use fleet requirements for CHE than California.

Commercial Harbor Craft (CHC)

Emission Standards for CHC

CARB's new engine standards for CHC is the most stringent of any in the nation. The ***Commercial Harbor Craft Regulation*** controls NOx and PM emissions from crew and supply boats, ferries / excursion vessels, towboats, push boats, tugboats, barges, and dredges. CARB amended the CHC regulation in 2022, establishing expanded and more stringent in-use requirements to cover more vessel categories, and to accelerate the deployment of zero-emission and advanced technologies in vessel categories where technological feasibility has been demonstrated. No other state has more stringent exhaust emission standards for commercial harbor craft than California.

In-Use Controls: CHC

CARB's ***Commercial Harbor Craft Regulation*** (adopted in 2007) includes in-use limits that require diesel PM and NOx emission controls, which was amended in 2010 and 2022 to extend the types of CHC for which in-use engine requirements apply. The regulation includes in-use limits that required diesel PM and NOx emission controls on ferries, excursion vessels, tugboats, towboats, push boats, crew and supply boats, barges, dredges, tank barges, pilot vessels, research vessels, workboats, commercial passenger fishing, and commercial fishing vessels. The 2022 amendments also mandate accelerated deployment of zero-emission and advanced technologies in vessel categories where technology feasibility has been demonstrated. No other state or nonattainment area controls in-use CHC emissions more stringently than CARB.

Forklifts

Emission Standards for Forklifts

CARB's new engine standards for forklifts are the most stringent of any in the nation. Forklifts powered by LSI engines (gasoline and natural gas) are subject to new engine standards that include both criteria pollutant and durability requirements since 2001 with the cleanest requirements phased-in starting in 2010. Diesel Forklifts > 25 HP are subject to fleet average emission requirements under the Off-Road Diesel Regulation starting in 2010 and ***Tier 4 Off-Road Engine Standards*** (based on the use of advanced after-treatment technologies such as diesel particulate filters and selective catalytic reduction) starting in 2013. Furthermore, the stringency of these requirements is anticipated to increase under ***the Zero-Emission Off-Road Forklift Regulation Phase 1 measure*** committed to in the 2016 State SIP Strategy and the ***Off-Road Zero-Emission Targeted Manufacturer Rule measure***, committed to in the 2022 State SIP Strategy. Both of these measures would increase the deployment of zero-emission forklifts. No other state has more stringent forklift emission standards than CARB.

In-Use Controls: Forklifts

California forklifts are subject to either the ***LSI Fleet Regulation*** (if powered by gasoline or propane), and the ***Off-Road Diesel Fleet Regulation*** (if powered by diesel). Under both regulations, forklift fleets are required to retire, repower, or replace higher-emitting equipment in order to maintain fleet average standards. Under the 2022 Amendments to the ***In-Use Off-Road Diesel Fueled Fleets Regulation***, forklifts are also subject to requirements begin to transition fleets from the oldest and highest-emitting off-road engines in operation in California by phasing out Tier 0 – Tier 2 equipment beginning in 2024. Also beginning in 2024, the regulation includes requirements to restrict the addition of new vehicles and/or engines with Tier 3 and 4i engines. CARB is anticipated to further increase the stringency of emission controls the emissions for from forklifts operating at ports and intermodal rail yards beyond MSM through the ***Zero-Emission Cargo Handling Equipment Regulation*** measure, which begin transitioning to zero-emission technologies. Staff anticipates that all forklifts operating at ports and intermodal rail yards would be zero-emission by 2030. No other state or nonattainment area has more stringent fleet requirements for in-use forklifts than CARB.

Marine Engines

Emission Standards for Marine Engines

CARB's new engine standards for recreational boats are the most stringent of any in the nation, and exceed the stringency of U.S. EPA federal standards:

- The ***Exhaust Emission Regulations for Spark-Ignition Marine Engines*** (1998) controls emissions at the same level of stringency as national regulations;
- The ***Tier II Emission Standards for Inboard and Stern Drive Marine Engines*** (2001) controls emissions at the same level of stringency as national regulations; and
- The ***Evaporative Emission Control Standards*** (2015) exceeds the stringency of applicable national regulations set by U.S. EPA in 2008 for gasoline-fueled spark-ignition marine watercraft >30 kilowatts.

Furthermore, CARB is anticipated to increase the stringency of marine engine controls beyond MSM with the ***Spark-Ignition Marine Engine Standards measure,*** which would reduce emissions from new spark-ignition marine engines by adopting more stringent exhaust standards for outboard and personal watercraft, which currently do not use catalyst control technologies. No other state has the authority to set exhaust emission and/or evaporative emission standards that exceed the stringency of U.S. EPA's national standards.

Off-Highway Recreational Vehicles (OHRV)

Emission Standards for OHRV

CARB's new engine standards for OHRV are the most stringent of any in the nation. CARB's program sets ***Exhaust Emissions Standards and Evaporative Emission Standards for OHRVs,*** together with amendments to the testing procedures to ensure the most stringent level of emission reductions are achieved. CARB's exhaust emission standards control emissions from off-highway motorcycles, all-terrain vehicles, and utility-terrain vehicles at more stringent levels than applicable national standards set by U.S. EPA for MY 2022 – 2027+. CARB evaporative emission standards harmonize with federal limits for MY 2020 – 2026. California's evaporative emission standards will exceed the stringency of federal requirements for MY 2027 and subsequent years. U.S. EPA has issued authorization for CARB's OHRV regulations. No other state or nonattainment area controls emissions from new OHRV more stringently than CARB.

In-Use Controls: OHRV

CARB's In-Use controls for OHRV under the ***"Red Sticker" program*** controls in-use emissions from OHRV more stringently than any other state or nonattainment area in the nation. Under this program, engines that do not meet the applicable emission standard for new engines are subject to in-use restrictions that limits operation at certain off-highway recreational vehicle parks located in ozone nonattainment areas during the summer peak ozone season. CARB is currently in the process of phasing out the Red Sticker program in favor of more stringent emission controls, and has ended Red Sticker certification of new OHRVs with no emission controls beginning in Model Year 2022. The seasonal riding restrictions on existing red sticker vehicles, however, continues through December 2024, providing for ongoing in-use emission controls for the legacy vehicle fleet. No other state or nonattainment area controls in-use emissions from OHRV more stringently than CARB.

Small Off-Road Engines (SORE)

Emission Standards for SORE

California's emission controls for SORE are the most stringent in the nation. CARB's current SORE program (through MY 2023) aligns the exhaust and evaporative standards for SORE with federal standards. CARB further increased the stringency of emission controls with the 2021 Amendments to the SORE Regulations, which will accelerate the deployment of zero-emission technologies, set tighter exhaust and evaporative emission standards, and enhance enforcement of current emission standards for SORE. Beginning in MY 2024, exhaust and evaporative emission standards were lowered to zero, except for pressure washers with engine displacement greater than or equal to 225 cubic centimeters, and generators (phase-in for ZE pressure washers and generators begins in MY 2028 and 2024, respectively). For MY 2024 and subsequent years, CARB's emission control requirements for SORE will exceed federal requirements. No other state has the authority to set exhaust emission and/or evaporative emission standards that exceed the stringency of U.S. EPA's national standards.

Transport Refrigeration Units (TRU)

Emission Standards for TRU

California's emission controls for Transport Refrigeration Units (TRU) are the most stringent in the nation. CARB adopted the ***Airborne Toxic Control Measure (ATCM) for In-Use Diesel-Fueled TRUs and TRU Generator Sets, and Facilities Where TRUs Operate (TRU ATCM)*** in 2004 and amended it in 2010 and 2011 to reduce diesel particulate matter (PM) emissions and resulting health risk from diesel-powered TRUs used to control the environment of temperature-sensitive products. In 2022, CARB further amended the TRU ATCM (2022 Amendments), which included requirements that MY 2023 and newer trailer TRU, DSC TRU, railcar TRU, and TRU generator set engines shall meet a PM emission standard of 0.02 grams per brake horsepower-hour or lower (aligns with the United States Environmental Protection Agency Tier 4 final off-road PM emission standard for 25-50 horsepower engines). Furthermore, CARB is anticipated to further increase the stringency of in-use emission controls on TRUs beyond MSM via the ***Transport Refrigeration Units Regulation Part 2 measure***, which would be designed to require zero-emission trailer TRUs, domestic shipping container TRUs, railcar TRUs, and TRU generator sets. No other state or nonattainment area requires as stringent of emission standards for TRUs.

In-Use Controls: TRU

CARB's ATCM for TRUs and TRU Generator Sets (***ATCM for In-Use Diesel-Fueled TRUs***) requires engines to meet in-use diesel PM emission standards by the end of the seventh year after manufacture, and applies to TRUs that operate in California, regardless of whether they are registered in or outside of the State. CARB's program is the most stringent of its type in the nation. Furthermore, CARB is anticipated to further increase the stringency of emission controls beyond MSM under the ***TRU Regulation Part 2 measure*** committed to in the 2022 State SIP Strategy, which is anticipated to increase NOx and PM emission reductions by reducing the amount of time TRUs operate while stationary. No other state or nonattainment area controls in-use emissions from TRUs more stringently than CARB.

Primarily Federally and Internationally Controlled Sources

Emission Standards for Locomotives

U.S. EPA sets nationwide emission standards for locomotives, the most recent of which is the Tier 4 NOx and PM Locomotive Emission Standards. No state, including California, has the authority to regulate emission standards for locomotives. Thus, CARB's locomotive controls are equivalent to the controls used in all other nonattainment areas in the nation. Nonetheless, further increases in stringency of locomotive emission controls are needed for California nonattainment areas, including the South Coast, to attain federal ambient air quality standards. For this reason, CARB has petitioned U.S. EPA to set more stringent emission controls for locomotives.

In-Use Emission Controls for Locomotives

While emission standards for locomotives are set by U.S. EPA, CARB has accelerated reductions from this source through efforts that have focused on increasing the use of cleaner locomotives. The ***2005 Statewide Rail Yard Agreement for California Rail Yards,*** a MOU obligated the railroads to increase the use of idle control devices, lowered locomotive idle times to 15 minutes, and opened a collaboration to produce Health Risk Assessments on 18 major railyards in the State which was completed in 2015. CARB also recently adopted more stringent in-use locomotive emission controls with the ***In-Use Locomotive Regulation***, which accelerates the adoption of advanced, cleaner technologies for locomotive operations, including zero-emission technologies. No other state or nonattainment area has an agreement with Class I railroads to accelerate the introduction of cleaner locomotive engines, or has achieved similarly significant levels of emission reductions from in-use locomotives than CARB.

Emission Standards for Ocean-Going Vessels

The IMO, under Annex VI ("Regulations for the Prevention of Air Pollution from Ships"), specifies new engine NOx standards. Tier 2 IMO NOx standards have applied to new vessels since 2011, and Tier 3 NOx standards apply within NOx Emission Control Areas (ECAs) such as the North American ECA since 2016. However, the Tier 3 NOx limits are relatively high compared to the standards that apply to landside diesel engines. Annex VI regulations also do not limit PM exhaust emissions from new engines.

Neither CARB nor U.S. EPA have the regulatory authority to set emission limits for OGVs; thus no state, including California, has the authority to regulate emission standards for OGVs at levels different from those set by the IMO. Therefore, CARB's OGV emission standard controls are equivalent to the controls used in all other nonattainment areas in the nation. Nonetheless, further increases in stringency of OGV emission controls are needed for California nonattainment areas, especially the South Coast, to attain federal ambient air quality standards. For this reason, CARB, together with U.S. EPA, the Coast Guard, and international partners, continues to urge the IMO to adopt more stringent emission standards for new OGVs and efficiency requirements for existing vessels.

In-Use Emission Controls for Ocean-Going Vessels

CARB's ***Ocean-Going Vessel Fuel Regulation***, "Fuel Sulfur and Other Operational Requirements for Ocean-Going Vessels within California Waters and 24 Nautical Miles of the California Baseline," (2008) reduces PM, NOx, and sulfur oxide emissions from ocean-going vessels by requiring operators of OGVs to use less polluting marine distillate fuels instead of heavy fuel oil in their diesel engines and auxiliary boilers while operating within approximately 24 nautical miles (nm) of the California coastline. CARB's fuel requirements require the use of either marine gas oil (MGO) with a maximum sulfur limit of 1.5 percent, or marine diesel oil (MDO) with a maximum sulfur limit of 0.1%. Under Annex VI, the IMO sets fuel sulfur limits. The fuel sulfur limit in the North American Emission Control Areas (ECAs) is 0.1 percent sulfur, the same as CARB's Ocean-Going Vessel Fuel Regulation. However, there are some differences between the regulations. The California regulation specifies the use of cleaner "distillate" grades of fuel, rather than just a sulfur limit, and the federal ECA provides exemptions for many vessels that are not exempted by CARB's OGV Fuel Regulation.

In 2007, CARB adopted the ***Ocean-Going Vessels At Berth Regulation (At-Berth Regulation)***, which was amended in 2020. The At-Berth Regulation reduces emissions from vessels docked at California ports. At berth, auxiliary engines are used by vessels to run power for lighting, ventilation, pumps, communication, heating, and other onboard equipment while a vessel is docked. The At-Berth Regulation requires that vessels turn off their auxiliary diesel engines and plug in to shore-based grid electrical power, or utilize alternative technologies to achieve comparable emission reductions.

Although California is the only state in the United States that has a regulation requiring vessels to control emissions at berth, other states around the country have installed and are using shore power to control OGV emissions at berth. Seattle, New York, and New Jersey provide shore side power for cruise vessels.[118] In addition, the Port of Tacoma has provided shore power to container ships since 2010 and is adding shore power to be ready for use by the end of 2023. The Port of Miami has plans to install five shore power systems for cruise ships by the end of the year, which when finished, will be the largest shore power system in the world.[119]

CARB measure from the 2022 State SIP Strategy, ***Future Measures for Ocean-Going Vessel Emission Reductions***, considers available options to go beyond MSM and achieve further emissions reductions, including developing a statewide vessel speed reduction program, and/or through the use of operational changes and new technologies currently in development, including advances in exhaust capture and control, mobile shore power connections, cleaner fuels (such as LNG, hydrogen, methanol, ammonia, etc.), alternative power sources (including batteries and fuel cells), as well as potential vessel side technologies (such as water-in-fuel emulsion). The Port of Long Beach has employed a Green Ship Incentive Program since 2012 which is a voluntary program that incentivizes cleaner vessel visits, with incentives ranging from \$600 to \$6,000 depending on the vessel's ESI score.[120] The Port of Los Angeles also participates in the ESI Program, and provides incentives for Tier III vessels to come into port (incentive grant of \$5,000 per call), and offers a Technology Advancement Program grant (\$750 per call) for OGVs that demonstrate an emission reduction technology that reduces diesel particulate matter and NOx emissions.[121]

While there are no other states outside of California that regulate shipping emissions, other ports in the United States incentivize ships to use cleaner technology and practices that reduce emissions beyond the regulatory requirements set by the IMO. The Ports of New York and New Jersey's Clean Vessel Incentive Program offers financial incentives to encourage OGVs to voluntarily enhance their engines, fuel, and technology. The program employs a scoring system that rewards VSR and the vessel's Environmental Ship Index (ESI) score, with additional points given to vessels meeting clean engine standards.[122]

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[118] Shore Power Technology Assessment at U.S. Ports, 2022 Update, U.S. EPA, December 2022, https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1016C86.pdf

[119] MarineLog, PortMiami to deploy world's largest shore power system, February 16, 2023, https://www.marinelog.com/passenger/cruiseships/portmiami-to-deploy-worlds-largest-shore-power-system/#:~:text=The%20PowerCon%20system%20will%20provide,to%20bring%20shore%20power%20to

[120] Port of Long Beach, Port of Long Beach Increases Green Ship Incentive, May 26, 2021, https://polb.com/port-info/news-and-press/port-of-long-beach-increases-green-ship-incentive-05-26-2021/,

[121] The Port of Los Angeles, Port of Los Angeles Voluntary Environmental Ship Index Program, https://www.portoflosangeles.org/environment/air-quality/environmental-ship-index

[122] Port of New York and New Jersey, Clean Vessel Incentive Program, https://www.panynj.gov/port/en/our-port/sustainability/clean-vessel-incentive-program.html

In-Use Emission Controls for Aircraft

No state has emission standards for aircraft that differ from U.S. EPA's and FAA's. To control emissions from airport and aircraft related activities, including main aircraft engines, auxiliary power units (APU), and airport ground transportation, CARB has committed to the ***Future Measures for Aviation Emissions Reductions.*** Due to U.S. EPA's authority on setting emission standards, for this measure, CARB has identified opportunities for EPA to adopt cleaner emission standards for aircraft. Toward that end, CARB would strongly advocate U.S. EPA for stricter emission regulations and highlight the need to reduce pollution to protect public health.

FUELS

CARB Diesel Fuel Regulations

U.S. EPA began regulating sulfur content in diesel in 1993. At that time, uncontrolled fuels (i.e. non-CARB diesel) contained approximately 5,000 ppm of sulfur. In 2006, U.S. EPA began to phase-in more stringent requirements under the federal ULSD regulations, which lowered the amount of sulfur allowed in federal diesel fuels. U.S. EPA's Nonroad Diesel Fuel Standards were phased in from 2007 to 2014, and require that all off-road engines, including those used in locomotives and off-road equipment, use ULSD fuel (with some exemptions for older locomotives and marine engines). The Nonroad Standards also require that diesel fuel sold into the market for off-road use must be ULSD. It is important to note that while U.S. EPA defines ULSD as ≤ 15 ppm for on-road applications, the definition of off-road ULSD is significantly less stringent, defined as ≤ 500 ppm standard.

For the off-road fleet, CARB's current ULSD regulation is significantly more stringent than the applicable current federal ULSD standards (Phase III):

- Whereas the federal ULSD program differs in requirements for on- and off-road fuels, CARB's ultra-low sulfur diesel program sets the same requirements for fuels burned in on- and off-road applications. CARB limits sulfur content at 15 ppm rather than the federal limit of 500 ppm for off-road ULSD. Compared with CARB ULSD standards, federal off-road ULSD allows 33 times the sulfur content.
- CARB's ULSD significantly reduces emissions relative to federal on-road ULSD, which is much cleaner than federal off-road ULSD. Both federal on-road ULSD and CARB ULSD limit sulfur content (a precursor to secondary atmospheric formation of PM2.5) to 15 ppm, yet CARB's fuel emits ~25 percent less PM. Given that federal off-road ULSD sulfur content is capped at levels 3,000 percent higher than CARB's ULSD, the California program is significantly more stringent in terms of its ability to control emissions of sulfur oxide emissions.
- In addition, CARB controls hydrocarbons and aromatics, unlike U.S. EPA requirements.
- Furthermore, CARB is anticipated to further increase the stringency of controls on criteria pollutant emissions diesel products under the Low Emission Diesel measure committed to in the State SIP Strategy.

As was discussed in the on-road diesel fuel section, only one other state has a boutique fuel program with requirements that differ from federal specifications, the Low Emission Diesel Program in Texas (TxLED). An independent analysis of TxLED, CARB ULSD and federal ULSD shows that the TxLED fuel emissions performance does not provide as significant of emission reduction benefits as the California specifications.[123] Furthermore, the stringency of Texas' testing requirements are based on the federal Complex Model, which is less stringent and nuanced than the California Predictive Model that is used to determine compliance with California fuel requirements. CARB diesel specifications are more stringent than federal and other states' programs. CARB's ULSD program reduces NOx and PM emissions significantly relative to U.S. EPA requirements, providing approximately 7 percent more NOx reductions and 25 percent more diesel PM reductions than federal diesel. Furthermore, CARB is anticipated to further increase the stringency of controls on criteria pollutant emissions diesel products under ***the Low Emission Diesel measure***. No other state or nonattainment area controls criteria emissions from off-road diesel fuels more stringently than CARB.

Controlling Criteria Emissions from Renewable Fuels

The ***Low Carbon Fuel Standard (LCFS) and Alternative Diesel Fuel (ADF) regulations*** work together to reduce the carbon intensity of the California fuel supply while requiring limits on criteria emissions from alternative fuels and/or alternative fuel mix blends. While other states have adopted or are considering adopting similar programs to the California LCFS, no other state has set criteria emission requirements on alternative fuels and alternative fuel blends. The Federal Renewable Fuel Standard (RFS II), which is the most equivalent program type at the federal level, increases the renewable content of the fuel mix nationally (as the LCFS does in California), however it does not specify criteria requirements for alternative fuels. No other state or nonattainment area controls criteria emissions from renewable fuels more stringently than CARB.

[123] American Transportation Research Institute (ATRI) 2008 "Energy and Other Fuel Property Changes with On-Road Ultra-Low Sulfur Diesel Fuel" http://www.atri-online.org/research/results/environmentalfactors/2008ATRIDiesel.pdf

STEP 3(A): EVALUATION OF STRINGENCY: OFF-ROAD CONTROL MEASURES

Step 3(a) calls for an evaluation of each of the potential MSM control measures identified in Step 2, in order to evaluate their stringency and determine whether they meet all applicable requirements to satisfy the definitions of MSM as discussed in Section 1 and Section 2.

As shown in the **Error! Reference source not found.** in Step 2(b), CARB's programs a re the most stringent in the nation. This comparison between CARB's control measures and the measures currently in place at the Federal level and/or within other States and jurisdictions illustrates the stringency of the current CARB off-road control program, which meets the stringency requirements of MSM.

Furthermore, CARB staff have conducted an analysis of the timing of the new measures included in the 2022 State SIP Strategy, which go beyond the stringency of the current control program as it is now being implemented. Many of these measures are still in their development phases and are not yet being implemented and thus beyond MSM; the development timeline, however, is critical to allowing industry and technological advancements to progress sufficiently such that the newly emerging technologies called for in these regulatory actions (most of which are technology-inducing regulations) have sufficient time to attain market readiness. **Error! Reference source not found.** s ummarizes the timeframe considerations for each of the applicable off-road control measures, and indicates why a more expedited timeframe is neither technologically nor economically feasible. For these reasons, the measures meet the MSM requirement of being phased in as "expeditiously as practicable" and go beyond MSM requirements in terms of stringency.

Table 21: Off-Road Control Measures – Stringency and Timeline for Implementation

Measures	Implementation Begins	12 ug/m3 Annual (2012)
Off-Road Control Standards (General)		
Off-Road New Vehicle, Equipment and Engine Standards (General)		
Tier 4 Off-Road Engine Emission Standards	ongoing	MSM
Tier 5 Off-Road Vehicles and Equipment (2022 State SIP Strategy measure with commitment)	2029	Beyond MSM
California's emission standards for off-road diesel engines are consistent with those of U.S. EPA and the most stringent in the nation, with NOx limits at 0.3 g/bhp-hr, and PM limits at 0.015 g/bhp-hr. With the Tier 5 Off-Road Vehicles and Equipment Measure, CARB has committed to develop and propose standards and test procedures for new off-road CI engines More stringent PM and NOx standards for engines greater than or equal to 56 kW (75 hp). It is expected that Tier 5 requirements would rely heavily on technologies manufacturers are developing to meet the recently approved low-NOx standards and enhanced in-use requirements for on-road- heavy-duty engines. With the commitment to adopt Tier 5 emission standards, California's control program for new off-road engines will be further lowered to a nation-leading level; these levels will be technology-forcing, and will take years of lead time to enable manufacturers sufficient time to develop, test, certify, and manufacture the necessary low-emission engines and components. Further increases in stringency are not feasible. New off-road emission standards for new vehicles and engines are dependent on technological developments, and require years of lead time to be developed, certified, manufactured, and implemented; a more accelerated timeline is infeasible.		
Zero-Emission Off-Road New Equipment and Engine Standards (General)		
Off-Road Zero-Emission Targeted Manufacturer Rule (2022 State SIP Strategy measure with commitment)	2031	Beyond MSM
The Off-Road Zero-Emission Targeted Manufacturer Rule would accelerate the development and production of zero-emission off-road equipment and powertrains into more sectors (including wheel loaders, excavators, and bulldozers) as technology advancements occur due to existing CARB zero-emission regulations and regulations in the forklifts, cargo handling equipment, off-road fleets, and small off-road engines sectors. As a technology-forcing regulation, the Off-Road Zero-Emission Targeted Manufacturer Rule will accelerate the development and deployment of Zero-Emission off-road engines and powertrains; further increases in stringency are not feasible. Manufacturer sales requirements need years of lead time to be implemented; it would be infeasible to implement on a more accelerated timeframe.		
In-Use Control Measures – Off-Road Fleets (General)		
In-Use Off-Road Diesel-Fueled Fleets Regulation (Off-Road Regulation)	ongoing	MSM
2022 Amendments to the In-Use Off-Road Diesel-Fueled Fleets Regulation (2022 State SIP Strategy measure, adopted November 2022)	2024	MSM
Clean Off-Road Fleet Recognition Program (2022 State SIP Strategy measure with commitment)	2027	Beyond MSM
California's in-use emission controls for off-road equipment are the most stringent in the nation. CARB's off-road regulation controls diesel PM and NOx emissions from >150,000 in-use off road engines by requiring their owners to retire, replace, or repower older engines, and/or installing verified exhaust retrofit control technologies. Additionally, all vehicles are reported and labeled, and older, dirtier vehicles are restricted from entering fleets. The 2022 Amendments to the Off-Road Regulation create additional requirements to the currently regulated fleets by targeting the oldest and dirtiest equipment that is allowed to operate indefinitely under the current regulation's structure. The amendments will require fleets to phase-out use of the oldest and highest polluting off-road diesel vehicles in California, starting in 2024, and include changes to enhance enforceability and encourage the adoption of zero-emission technologies. CARB anticipates further emission reductions from the off-road equipment fleets through the Clean Off-Road Fleet Recognition Program measure, which would create a non-monetary incentive to encourage off-road fleets to go above and beyond existing regulatory fleet rule compliance and adopt advanced technology equipment with a strong emphasis on zero-emission technology. Fleet requirements need years of lead time to be implemented for reasons of technological and economic feasibility. As purchasing requirements and fleet turnover cannot happen immediately, it would be infeasible to accelerate the implementation schedule for new purchasing requirements. California's currently committed to off-road fleet requirements are technology-forcing and are the most stringent in the nation, requiring the lowest-emitting internal combustion engine and equipment technology, with zero-emission elements; further increases in stringency are not feasible.		

CARB Control Program MSM Analysis
for the SCAQMD 2024 12 µg/m^3 annual PM2.5 Plan

Measures	Implementation Begins	12 ug/m3 Annual (2012)
Off-Road Control Measures - Source Category Specific		
Agricultural Equipment		
Tier 4 Off-Road Engine Emission Standards	ongoing	MSM
U.S. EPA and California adopted equivalent Tier 4 standards in 2004 that require additional emission reductions from off-road engines, including those used in mobile agricultural equipment. No State has more stringent requirements for new emission performance standards for agricultural equipment engines than California. Further increases in stringency, or an accelerated timeline for implementation are not feasible.		
Funding Agricultural Replacement Measures for Emission Reductions (FARMER) Program	ongoing	MSM
California's in-use emission control program for agricultural equipment is among the most stringent in the nation. The Funding Agricultural Replacement Measures for Emission Reductions (FARMER) Program provides funding through local air districts for agricultural harvesting equipment, heavy-duty trucks, agricultural pump engines, tractors, and other equipment used in agricultural operations. Local air districts receive funds based on a formula and award them to farmers and agricultural businesses for individual projects. Funding is supported in part by California Climate Investments, a statewide program that puts billions of Cap-and-Trade dollars to work. In April 2022, CARB expanded the project categories within the FARMER Program to include zero-emission agricultural equipment. As of September 2022, \$685 million has been allocated, with \$347.6 million implemented across 8,057 projects. The emission reductions benefits associated with these projects include 22,400 tons of NO_x reductions, and 1,350 tons of PM 2.5 reductions, Statewide. California's agricultural equipment fleet rules are among the most stringent in the nation; further increases in stringency are not feasible. Fleet turnover programs need years of lead time to be implemented for reasons of technological and economic feasibility; because fleet turnover cannot happen immediately, it would be infeasible to accelerate the implementation schedule for new purchasing requirements.		
Airport Ground Support Equipment (GSE)		
Tier 4 Off-Road Engine Emission Standards	ongoing	MSM
LSI Engine Fleet Requirements Regulation	ongoing	MSM
In-Use Off-Road Diesel-Fueled Fleets Regulation (Off-Road Regulation)	ongoing	MSM
Portable Diesel-Engine ATCM	ongoing	MSM
Zero-Emission Airport Ground Support Equipment (GSE) (2016 State SIP Strategy measure, not yet adopted)	TBD	Beyond MSM
California's emission controls for Airport Ground Support Equipment (GSE) are the most stringent in the nation: • Diesel engines in newly manufactured GSE must meet the Tier 4 Emission Standards applicable to off-road compression ignition engines; • NOx limits for the LSI Engine Standard for engines > 1.0 liter (the typical engine size for GSE) is 0.6 g/bhp-hr. Engines meeting this standard are 70 percent cleaner than LSI engines produced as recently as 2009; • Airport GSE fleets operating LSI GSE must meet the In-Use LSI Engine Fleet Requirements. Adopted in 2006, the LSI fleet rule requires GSE fleets to maintain an average emission level of no more than 2.5 g/bhp hr HC+NOx; • The In-Use Off-Road Diesel-Fueled Fleets Regulation requires GSE fleets operating in-use diesel equipment to meet an annual fleet average emissions target that decreases over time, which are currently being phased in; • Non mobile GSE such as portable air-start units, ground power units and air conditioners may be subject to the Portable Diesel-Engines ATCM; • CARB is anticipated to further increase the stringency of emission controls with the Zero-Emission Airport Ground Support Equipment measure, which will act as a catalyst to further adoption of zero-emission equipment. The stringency of California's control program for Airport GSE leads the nation, and will be further lowered with the Zero-Emission Airport GSE measure; these levels will be technology-forcing, and will take years of lead time to enable manufacturers sufficient time to develop, test, certify, and manufacture the necessary low-emission engines and components. Further increases in stringency are not feasible. New emission standards and fleet requirements for GSE are dependent on technological developments, and require years of lead time to be developed, certified, manufactured, and implemented; a more accelerated timeline is infeasible.		
Cargo Handling Equipment (CHE)		
Cargo Handling Equipment (CHE) Regulation	ongoing	MSM

Measures	Implementation Begins	12 ug/m3 Annual (2012)
Amendments to CHE Regulation (2022 State SIP Strategy measure with commitment)	2026	Beyond MSM
California's emission controls for Cargo Handling Equipment (CHE) are the most stringent in the nation. CARB's Cargo Handling Equipment regulation sets performance standards for newly acquired engines, as well as in-use mobile CHE at ports or intermodal rail yards. The CHE regulation also includes performance standards for in-use, mobile CHE at ports or intermodal rail yards in California. CARB is anticipated to further increase the stringency of the CHE Regulation by transitioning CHE to zero-emission beginning in 2026. As committed to in the 2022 State SIP Strategy, CARB's amendments to the Cargo Handling Equipment Regulation would set in-use requirements for diesel cargo handling equipment at ports and rail yards, including but not limited to: yard trucks (hostlers), rubber-tired gantry cranes, container handlers, and forklifts. CARB's control measures are the most stringent in the nation, and the requirements committed will be technology-forcing and the most stringent feasible, including zero-emission requirement; further increases in stringency are not feasible. New standards for CHE are dependent on technological developments, and require years of lead time to be developed, certified, manufactured, and implemented; a more accelerated timeline is infeasible.		
Commercial Harbor Craft (CHC)		
Commercial Harbor Craft (CHC) Regulation	ongoing	MSM
2022 Amendments to CHC Regulation 2022 State SIP Strategy measure, adopted May 2022)	ongoing	MSM
California's emission controls for commercial harbor craft (CHC) are the most stringent in the nation. As amended in 2011, CARB's CHC Regulations reduce NOx and diesel PM emissions from crew and supply boats, ferries, excursion vessels, towboats, push boats, tugboats, barges, and dredges, and included in-use limits that required diesel PM and NOx emission controls. CARB amended the CHC regulation in 2022, establishing expanded and more stringent in-use requirements to cover more vessel categories including all tank barges, pilot vessels, research vessels, workboats, commercial passenger fishing, and commercial fishing vessels. The amendments also mandate accelerated deployment of zero-emission and advanced technologies in vessel categories where technology feasibility has been demonstrated. CARB's CHC control measures are technology forcing and the most stringent in the nation; further increases in stringency are infeasible. The requisite technology developments need years of lead time for development, certification, and implementation; it is not technologically feasible to accelerate the implementation timeline.		
Forklifts		
Tier 4 Off-Road Engine Emission Standards	ongoing	MSM
In-Use LSI Engine Fleet Requirements	ongoing	MSM
In-Use Off-Road Diesel-Fueled Fleets Regulation (Off-Road Regulation)	ongoing	MSM
Zero-Emission Off-Road Forklift Regulation Phase 1 (2016 State SIP Strategy measure with commitment)	2026	Beyond MSM
Amendments to the CHE Regulation (2022 State SIP Strategy measure with commitment)	2026	Beyond MSM
Off-Road Zero-Emission Targeted Manufacturer Rule (2022 State SIP Strategy measure with commitment)	2031	Beyond MSM

California's emission controls for forklifts are the most stringent in the nation. Forklifts powered by LSI engines (gasoline and natural gas) are subject to new engine standards that include both criteria pollutant and durability requirements. Diesel Forklifts > 25 HP are subject to Tier 4 Final emission standards (based on the use of advanced after-treatment technologies such as diesel particulate filters and selective catalytic reduction). Under the 2022 Amendments to the In-Use Off-Road Diesel Fueled Fleets Regulation, forklifts are also subject to requirements begin to transition fleets from the oldest and highest-emitting off-road engines in operation in California by phasing out Tier 0 – Tier 2 equipment beginning in 2024. Also beginning in 2024, the regulation includes requirements to restrict the addition of new vehicles and/or engines with Tier 3 and 4i engines. CARB is anticipated to further increase the stringency of emission controls:

- The Zero-Emission Off-Road Forklift Regulation Phase I measure would be designed to accelerate the deployment of zero-emission forklift technologies, with an implementation schedule beginning in 2026;
- For forklifts operating at ports and intermodal rail yards, the Amendments to the Cargo Handling Equipment Regulation measure that CARB committed to in the 2022 State SIP Strategy measure would also require transitioning to zero-emission technologies. Staff anticipates that all forklifts operating at ports and intermodal rail yards would be zero-emission by 2030;
- The Off-Road Zero-Emission Targeted Manufacturer Rule measure would further increase the stringency of emission controls for forklifts, transitioning more fully to zero-emission powertrains.

The stringency of California's forklift control program leads the nation, and will be further lowered with the Zero-Emission Off-Road Forklift Regulation Phase 1, the Amendments to CHE Regulation, and the Off-Road Zero-Emission Targeted Manufacturer Rule measures; the levels committed to with these measures will be technology-forcing, and will take years of lead time to

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Measures	Implementation Begins	12 ug/m3 Annual (2012)
enable manufacturers sufficient time to develop, test, certify, and manufacture the necessary low-emission engines and components. Further increases in stringency are not feasible. New emission standards and fleet requirements for forklifts are dependent on technological developments, and require years of lead time to be developed, certified, manufactured, and implemented; a more accelerated timeline is infeasible		
Marine Engines		
Exhaust Emission Regulation for Spark-Ignition Marine Engines	ongoing	MSM
Tier II Emission Standards for Inboard and Stern-Drive Marine Engines	ongoing	MSM
Marine Engine Evaporative Emission Control Standards	ongoing	MSM
Amendments to Spark-Ignition Marine Engine Standards (2022 State SIP Strategy measure with commitment)	2031	Beyond MSM
CARB's recreational boats and marine engine program exceeds the stringency of U.S. EPA's federal standards and are the most stringent in the nation: • The Exhaust Emission Regulations for Spark-Ignition Marine Engines (1998) controls emissions at the same level of stringency as national regulations; • The Tier II Emission Standards for Inboard and Stern Drive Marine Engines (2001) controls emissions at the same level of stringency as national regulations; and • The Evaporative Emission Control Standards (2015) exceeds the stringency of applicable federal regulations set by U.S. EPA in 2008 for gasoline-fueled SI marine watercraft >30 kilowatts. The Spark-Ignition Marine Engine Standards measure would reduce emissions from new spark-ignition (SI) marine engines by adopting more stringent exhaust standards for outboard and personal watercraft, which currently do not use catalyst control technologies. Staff estimates that stricter standards could reduce combined HC or ROG and NOx emissions by approximately 70 percent below the current HC+NOx standard. CARB staff is also evaluating whether some outboard and personal watercraft vessels could be propelled by zero-emission technologies in certain applications. California's control program for marine engines is currently the most stringent in the nation, and will be further lowered with the Spark-Ignition Marine Engine Standards measure; these levels will be technology-forcing, and will take years of lead time to enable manufacturers sufficient time to develop, test, certify, and manufacture the necessary low-emission engines and components. Further increases in stringency are not feasible. New marine engine emission standards are dependent on technological developments, and require years of lead time to be developed, certified, manufactured, and implemented; a more accelerated timeline is infeasible.		
Off-Highway Recreational Vehicles (OHRV)		
Exhaust and Evaporative Emission Standards for OHRVs	ongoing	MSM
California's emission controls for Off-Highway Recreational Vehicles (OHRVs) are the most stringent in the nation. CARB's exhaust emission standards and evaporative emission standards control emissions from motorcycles, all-terrain vehicles, and utility-terrain vehicles at more stringent levels than applicable national standards set by U.S. EPA for MY 2022 – 2027+. CARB evaporative emission standards harmonize with federal limits for MY 2020 – 2026, and will exceed the stringency of federal requirements for MY 2027+. CARB's "Red Sticker" program requires in-use OHRVs that do not meet the applicable exhaust emission standards display a red registration sticker that limits operation at certain off highway recreational vehicle parks located in nonattainment areas during peak ozone season. CARB's OHRV program is the most stringent in the nation; further increases in stringency or an accelerated implementation timeframe are not feasible.		
Small Off-Road Engines		
SORE Exhaust Emission Standards and Test Procedures	ongoing	MSM
Evaporative Emission Standards for SORE	ongoing	MSM
2021 Amendments to the Small Off-Road Engines (SORE) Regulation	2024	MSM
California's emission controls for small off-road engines (SORE) are the most stringent in the nation. CARB's current SORE program (through MY 2023) aligns the exhaust and evaporative standards for SORE with federal standards, and sets requirements for Zero-Emission SORE equipment. CARB further increased the stringency of emission controls with the 2021 Amendments to the SORE Regulations, which will accelerate the deployment of zero-emission technologies, set tighter exhaust and evaporative emission standards (MY 2024+), and enhance enforcement of current emission standards for SORE. Beginning in MY 2024, exhaust and evaporative emission standards were lowered to zero, except for pressure washers with engine displacement greater than or equal to 225 cubic centimeters and generators (phase-in for ZE pressure washers and generators begins in MY 2028 and 2024, respectively). As a technology-forcing regulation, the SORE Regulation will accelerate the development and deployment of zero-emission SORE; further increases in stringency are not feasible. New exhaust and evaporative emission standards need years of lead time to be implemented; it would be infeasible to implement on a more accelerated timeframe.		
Transport Refrigeration Units (TRUs)		
ATCM for In-Use Diesel-Fueled Transport Refrigeration Units (TRUs) and TRU Generator Sets	ongoing	MSM

Measures	Implementation Begins	12 ug/m3 Annual (2012)
Transport Refrigeration Unit Regulation Part 2 (2022 State SIP Strategy measure with commitment)	2028	Beyond MSM
California's emission controls for Transport Refrigeration Units (TRU) are the most stringent in the nation. Amended in 2022, the TRU ATCM requires that MY 2023 and newer trailer TRU, DSC TRU, railcar TRU, and TRU generator set engines meet a PM emission standard of 0.02 grams per brake horsepower-hour or lower (aligns with the United States Environmental Protection Agency Tier 4 final off-road PM emission standard for 25-50 horsepower engines). Beginning December 31, 2023, TRU owners shall turnover at least 15 percent of their truck TRU fleet (defined as truck TRUs operating in California) to ZE technology each year (for seven years). All truck TRUs operating in California shall be ZE by December 31, 2029. CARB has committed to increasing the stringency of TRU controls with the TRU Regulation Phase 2, which would establish zero-emission options for non-truck TRUs. These levels will be technology-forcing, and will take years of lead time to enable manufacturers sufficient time to develop, test, certify, and manufacture the necessary low-emission engines and components. Further increases in stringency are not feasible. New emission standards and zero-emission requirements for TRUs are dependent on technological developments, and require years of lead time to be developed, certified, manufactured, and implemented; a more accelerated timeline is infeasible.		
In-Use Emission Control Measures for Primarily Federally and Internationally Regulated Sources		
In-Use Railroad Control Measures		
Statewide Rail Yard Agreement for California Rail Yards (Railroad MOU)	ongoing	MSM
In-Use Locomotive Regulation (2022 State SIP Strategy measure, adopted April 2023)	2024	MSM
U.S. EPA has the sole authority to establish emissions standards for locomotives. California's in-use emission reduction measures for locomotives are the most stringent in the nation. The 2005, Statewide Rail Yard Agreement for California Rail Yards, a Memorandum of Understanding (MOU) with the Class I Railroads to increase the use of idle control devices, lowered locomotive idle times to 15 minutes, and opened a collaboration to produce Health Risk Assessments on 18 major railyards in the state was completed in 2015. Adopted in April 2023, the In-Use Locomotive Regulation accelerates the adoption of advanced, cleaner technologies for locomotive operations, including zero-emission technologies. The regulatory elements include: • Starting in 2024: Spending Account Locomotive operators would be required to fund their own trust account based on the emissions created by their locomotive operations in California. The dirtier the locomotive, the more funds must be set aside. Spending Account funds would be used to fund turnover to cleaner locomotives, rail equipment, and/or related infrastructure. • Starting in 2024: Idling Limit All locomotives with automatic shutoff devices (AESS) would not be permitted to idle longer than 30 minutes, unless for an exempt reason. Exemptions closely align with those described by U.S. EPA., and would be granted for reasons like maintaining air brake pressure or to perform maintenance. • Starting in 2030: In-Use Operational Requirements Only locomotives less than 23 years old would be able to be used in California. Switchers, industrial, and passenger locomotives with original engine build dates of 2030 or newer would be required to operate in a ZE configuration in California. Freight line haul locomotives with original engine build dates of 2035 and newer would be required to operate in a ZE configuration in California. CARB's in-use emission controls for locomotives are the most stringent in the country, and with the In-Use Locomotive Regulation, which includes zero-emission elements, stringency will be increased further; these requirements are technology-forcing and additional increases in stringency are not feasible. Fleet requirements need years of lead time to be implemented; it would be infeasible to accelerate the implementation timeframe.		
In-Use Ocean-Going Vessel Control Measures		
Ocean-Going Vessel Fuel Regulation	ongoing	MSM
Ocean-Going Vessels At-Berth Regulation (At-Berth Regulation)	ongoing	MSM
Future Measures for Ocean-Going Vessel Emissions Reductions (2022 State SIP Strategy measure, not yet adopted)	2027+	Beyond MSM

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Measures	Implementation Begins	12 ug/m3 Annual (2012)
The International Maritime Organization (IMO) has the sole authority to establish emissions standards for ocean-going vessels. California's in-use emission reduction measures for OGVs are the most stringent in the nation. The 2008 Ocean Going Vessel Fuel Regulation reduces PM, NOx, and SOx emissions from ocean-going vessels by requiring operators of OGVs to use less polluting marine distillate fuels instead of heavy fuel oil in their diesel engines and auxiliary boilers while operating within approximately 24 nautical miles (nm) of the California coastline. The At-Berth Regulation, which was amended in 2020, reduces emissions from vessels docked at California ports by requiring that vessels turn off their auxiliary diesel engines and plug in to shore-based grid electrical power, or utilize alternative technologies to achieve comparable emission reductions. With the Future Measures for Ocean-Going Vessel Emissions Reductions measure, which may include developing a statewide vessel speed reduction program, and/or through the use of operational changes and new technologies currently in development, including advances in exhaust capture and control, mobile shore power connections, cleaner fuels (such as LNG, hydrogen, methanol, ammonia, etc.), alternative power sources (including batteries and fuel cells), as well as potential vessel side technologies (such as water-in-fuel emulsion), stringency will be increased further; these requirements are technology-forcing and additional increases in stringency are not feasible. Fleet requirements need years of lead time to be implemented; it would be infeasible to accelerate the implementation timeframe.		
In-Use Aviation Control Measures		
Future Measures for Aviation Emission Reductions (2022 State SIP Strategy measure with commitment)	2029	Beyond MSM
The authority to establish emissions standards for aircraft lies at the federal level; no state has emission standards for aircraft that differ from those set by U.S. EPA and the FAA. CARB's Future Measures for Aviation Emissions Reductions would reduce in-use emissions from airport and aircraft related activities, including main aircraft engines, auxiliary power units (APU), and airport ground transportation. These emission control strategies would be nation-leading in terms of stringency; further increases in stringency are not feasible. These strategies are also dependent on technological and operational developments, and require sufficient lead time for regulated parties to comply; an accelerated implementation timeline would not be feasible.		
Fuels Control Measures		
Conventional Diesel Fuel Standards		
CARB Ultra Low Sulfur Diesel (ULSD)	ongoing	MSM
Low-Emission Diesel Requirement (2016 State SIP Strategy measure, not yet adopted)	TBD	Beyond MSM
CARB's Ultra Low Sulfur Diesel regulation was last amended 2003 to establish more stringent standards for diesel fuel, lowering the sulfur limit to 15 ppmw. The California Diesel Fuel Regulations apply to essentially all diesel fuel supplied, sold, or offered for sale in California. The original applicability of the regulations was to vehicular diesel fuel; however, the applicability of the regulations has been extended by the adoption of ATCMs to non-vehicular diesel fuel, such as fuel for stationary engines, locomotives, and marine harbor craft. The Low Emission Diesel measure would require diesel fuel providers to steadily decrease criteria pollutant emissions from their fuels, which will reduce NOx and PM tailpipe emissions. CARB fuel regulations reduce emissions from even those vehicles registered out of state and therefore not subject to CARB's other mobile source control measures. CARB's diesel standards and requirements are the most stringent in the nation, and some of the most stringent in the world; it is not feasible to require further stringency of fuel specifications.		
Alternative Fuel Standards		
Low Carbon Fuel Standard (LCFS)	ongoing	MSM
Alternative Diesel Fuel (ADF)	ongoing	MSM
California's fuel standards for diesel substitutes are the most stringent in the nation. The LCFS and ADF regulations work together to reduce the carbon intensity of the California fuel supply while requiring limits on criteria emissions from alternative fuels and/or alternative fuel mix blends (due to regulatory constraints, the LCFS and ADF do not apply to aviation gasoline, nor fuels used in interstate locomotives and ocean-going vessels – regulatory control over these fuels lies at the national and international level). The regulations were amended in 2018 to extend the carbon intensity target of 20 percent to 2030. No other state or federal requirements have set as stringent of criteria emission requirements on alternative fuels and alternative fuel blends than California. The LCFS and ADF are technology-forcing regulations, and are the most stringent in the nation; further stringency would not be feasible. As it takes fuel producers years to develop, certify, and manufacture new alternative fuel types to meet the increasingly stringent requirements of the LCFS and ADF, an accelerated implementation timeframe would not be feasible.		

STEP 3(B): EVALUATION OF FEASIBILITY: OFF-ROAD CONTROL MEASURES

Step 3(b) calls for an assessment of the feasibility of implementing any measure that is not included in the proposed South Coast SIP, but which is identified as a potential MSM control measure in Step 2. During the public process for the 2022 State SIP Strategy, CARB staff received a public measure suggestion for an additional potential control measure, as described below:

- Indirect Source Rule
  This measure could involve CARB writing a Suggested Control Measure which acts as a model rule to assist the air districts in the rule development process. An indirect source can be any facility, building, structure, or installation, or combination thereof, which attracts or generates mobile source activity that results in emissions – these include warehouses, railyards, ports, airports, and mobile sources attracted to those warehouses, railyards, ports, and airports. Only a few air districts in California have indirect source rules to limit emissions of this nature on a facility basis.

  CARB staff has been investigating the feasibility and potential benefits of this suggested measure, and is continuing to explore this suggested measure and how it can meet the Clean Air Act requirements for SIP measure approvability. CARB staff has also been exploring its feasibility, given the current limitations of State law and the nature of how emission control authority is designated amongst CARB and local air districts. (How do we want to phrase this limit to our statutory authority?) Nonetheless, CARB staff have included an Indirect Source Rule as one potential element of the ***Zero-Emission Trucks measure*** committed to in the 2022 State SIP Strategy. In addition, CARB staff will explore opportunities to expand existing State law to provide partnership opportunities for CARB and air districts to work together to develop, adopt, and implement indirect source rules.

CARB staff continue to investigate the feasibility of this public measure suggestion, as well as whether it would meet the U.S. EPA's approvability criteria for SIP measures, and legal questions around statutory authority as designated to CARB and the air districts. While CARB staff have included an Indirect Source Rule as one potential element of the Zero-Emission Trucks measure, due to feasibility and approvability issues, this suggestion has not yet been formally organized into a SIP control measure.

Commercial and Residential Building Appliances

STEP 2(A): CALIFORNIA'S COMMERCIAL AND RESIDENTIAL BUILDING APPLIANCES CONTROL MEASURE

In the 2022 State SIP Strategy, CARB committed to achieving emissions reductions for combustion sources used in buildings through the ***Zero Emission Standard for Space and Water Heaters measure***. The primary goal of this measure is to reduce emissions from new residential and commercial space and water heaters sold in California. CARB would set a zero-emission standard for space and water heaters to go into effect in 2030. This measure would be the first time CARB would be regulating these sources of emissions which are also subject to various other requirements at the State and local levels. As such, CARB would design any such standard in collaboration with energy and building code regulators, and with air districts, to ensure it was consistent with all state and local efforts.

The South Coast AQMD controls NOx emissions from residential space and water heaters through two rules: Rule 1121 – Control of Oxides of Nitrogen (NOx) from Residential Type, Natural Gas-Fired Water Heaters; and Rule 1111 – Reduction of NOx Emissions from Natural-Gas Fired, Fan-Type Central Furnaces, which regulates residential space heating sources.

Rule 1111 reduces NOx emissions from residential and commercial gas-fired fan-type space heating furnaces with a rated heat input capacity of less than 175,000 BTU per hour or, for combination heating and cooling units, a cooling rate of less than 65,000 BTU per hour. The rule applies to manufacturers, distributors, and installers of such furnaces. The rule was originally adopted in 1978, and has been subsequently amended, including a 2009 amendment that lowered the NOx emissions from 40 to 14 nanograms per Joule (ng/J), and a 2014 amendment that provided an alternate compliance option that allows the manufacturer to pay a per-unit mitigation fee, in lieu of meeting the new lower NOx emission limit, for up to 36 months past the applicable compliance date.[124]

Rule 1121, which was last amended in 2004, applies to manufacturers, distributors, retailers, and installers of natural gas-fired water heaters, with heat input rates less than 75,000 Btu per hour. The most stringent limits in SCAQMD Rule 1121 went into effect for all applicable units less than 75,000 Btu/hr between 2006 and 2008, and require a 10 ng/J standard for gas-powered water heaters.[125]

The South Coast AQMD controls NOx emissions from commercial and industrial space and water heaters through three rules:

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[124] SCAQMD 2021 *Preliminary Draft Staff Report Proposed Amended Rule 1111 – Reduction of NOx Emissions from Natural Gas-Fired, Fan-Type Central Furnaces* https://www.aqmd.gov/docs/default-source/rule-book/Proposed-Rules/1111/par-1111_preliminary-draft-staff-report_june-18-2021.pdf?sfvrsn=6#:~:text=Rule%201111%20reduces%20emissions%20of,than%2065%2C000%20BTU%20per%20hour.

[125] SCAQMD 2004 RULE 1121 Control of NOx from Residential Type, Natural Gas-Fired water Heaters http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1121.pdf

- Rule 1146: Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters applies to existing boilers, steam generators, and process heaters with maximum rated heat input capacities greater than or equal to 5 million British thermal units per hour (MMBtu/hr);
- Rule 1146.1: Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters applies to boilers, steam generators, and process heaters with maximum rated heat input capacities greater than 2 MMBtu/hr and less than 5 MMBtu/hr;
- Rule 1146.2: Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers and Process Heaters establishes NOx emission limits for large water heaters, boilers and process heaters less than or equal to 2 MMBtu/hr.

Rules 1146, 1146.1 and 1146.2 update NOx emission limits for boilers, heaters, and steam generators applicable to these rules. The revised NOx emission limits represent BARCT and apply to former RECLAIM and non-RECLAIM facilities. Table *22* summarizes the applicability and existing NOx emission limits in Rules 1146, 1146.1 and 1146.2.[126]

Table 22: Applicability and NOx Limits for Rules 1146, 1146.1, and 1146.2

Rule	Applicability	Size	Summary of NOx Emission Limits
1146	Boilers, steam generators, and process heaters	≥ 5 MMBtu/hr	• 5 ppm for units burning natural gas ≥ 75 MMBtu/hr • 9 ppm for units burning gaseous fuels 5 to 75 MMBtu/hr • 30 ppm for thermal fluid heaters burning gaseous fuels • 40 ppm for nongaseous fuels • 12 ppm for atmospheric units • 15 ppm for units burning digester gas • 25 ppm for units burning landfill gas
1146.1	Boilers, steam generators, and process heaters	> 2 and < 5	• 9 ppm for units burning natural gas • 30 ppm for thermal fluid heaters burning gaseous fuels • 12 ppm for atmospheric units • 15 ppm for units burning digester gas • 25 ppm for units burning landfill gas
1146.2	Natural gas-fired water heaters, boilers, and process heaters	≤ 2 MMBtu/hr	• Manufacturer limit of 20 ppm • End-user limit of 30 ppm

[126] SCAQMD 2018, "PARs 1146, 1146.1 and 1146.2, and PR 1100 Final Staff Report" http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2018/2018-dec7-028.pdf?sfvrsn=6

During the adoption of the 2016 AQMP, the South Coast AQMD Board directed staff to transition the NOx RECLAIM program to a command-and-control regulatory structure requiring Best Available Retrofit Control Technology (BARCT) as soon as practicable. In December 2018, the South Coast AQMD Board adopted source-specific rules establishing BARCT emission limits, which are needed for equipment at former RECLAIM facilities as they transition to a command-and-control regulatory program. The 2018 Amendments to Rules 1146, 1146.1 and 1146.2 updated NOx emission limits for boilers, heaters, and steam generators. The revised NOx emission limits represent BARCT and apply to former RECLAIM and non-RECLAIM facilities. Facilities with Rule 1146/1146.1 units had until January 1, 2022 to retrofit all existing units, and until January 1, 2023 to replace any existing units. Rule 1146.2 units (between 400,000 to 2 million British thermal units per hour) are required to comply with the 30 ppm limit by December 31, 2023.

Additionally, in their *2022 Air Quality Management Plan*, the South Coast AQMD has committed to develop zero-emission standards for commercial and residential space and water heaters in installations in both new and existing residences, in addition to incentive-based strategies.[127]

As previously mentioned, CARB committed in the 2022 State SIP Strategy to achieving additional emissions reductions for combustion sources used in buildings through the ***Zero Emission Standard for Space and Water Heaters measure***. This would be the first Statewide measure of its kind, as no other state has enacted such a requirement. Through meaningful engagement with communities and the process outlined below, CARB would adopt a statewide zero-emission standard which would have criteria pollutant benefits as a key result along with GHG reductions. Beginning in 2030, 100 percent of sales of new space heaters and water heaters would need to comply with the emission standard. CARB would design any such standard in collaboration with energy and building code regulators, and with air districts, to ensure it was consistent with all State and local efforts, and would work carefully with communities to consider any housing cost or affordability impacts, recognizing that reducing emissions from space and water heaters can generate health benefits and cost-savings with properly designed standards.

CARB understands that this measure needs to be part of a suite of equity-promoting and complementary building decarbonization policies deeply informed by public process that include scaling back natural gas infrastructure, expanding construction of zero-emission buildings, and building a sustainable market by increasing affordability and accessibility through expanding incentive programs, ensuring utility rates are supportive of electrification, developing the workforce, and increasing consumer education. Although this measure is the only component appropriate for including in the SIP, before setting an emission standard, CARB will work in collaboration with other agencies, industry, environmental stakeholders, and community representatives to

[127] SCAQMD. *2022 Air Quality Management Plan*. December 2, 2022. Retrieved from: http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2022-air-quality-management-plan/final-2022-aqmp/final-2022-aqmp.pdf?sfvrsn=10

ensure that the measure is developed and implemented in an equitable manner to benefit low-income and disadvantaged communities. As such, community engagement will be a critical aspect of the entire process. Furthermore, as this proposal is developed, this measure may be expanded to include other end-uses.

For this measure, CARB would develop and propose zero-emission standards for space and water heaters sold in California using its regulatory authority for GHGs (which includes consideration of related criteria pollutant reduction benefits). CARB would collaborate with the U.S. Department of Energy and the California Energy Commission which are responsible for establishing appliance standards focused on maximizing energy efficiency at the federal and state level. CARB would consult with the California Building Standards Commission, Housing and Community Development and the California Energy Commission which have authority to develop building standards for new construction, additions, and alterations of residential and commercial buildings to ensure this measure is complementary. At the regional level, CARB would work with air districts in the development of a statewide zero-emission standard and to support further tightening district rules to drive increased adoption of zero-emission technologies. Finally, CARB would engage with community-based organizations and other key stakeholders to incorporate equitable considerations for low-income and environmental justice communities where feasible. This proposed measure is a key component of a broader portfolio of strategies to advance equitable building decarbonization in California. This measure would not mandate retrofits in existing buildings, but some buildings would require retrofits to be able to use the new technology that this measure would require. Beginning in 2030, 100 percent of new space and water heaters (for either new construction or replacement of burned-out equipment in existing buildings) sold in California would need to meet the zero-emission standard.

This measure has the potential to significantly accelerate the transition away from pollution associated with combustion in these sources, while creating economic opportunities for building retrofits. CARB staff has been analyzing the feasibility and potential benefits of this measure and expect that this regulation would rely heavily on currently-available heat pump technologies, which are now being sold to electrify new and existing homes. CARB staff have included in the Zero Emission Standard for Space and Water Heaters measure the potential to expand beyond space and water heaters to include additional end-uses as suggested via a public measure suggestion.

In addition to the proposed standard for space and water heaters, California has in place programs to ensure weatherization and energy efficiency of new buildings. The State of California’s Building Energy Efficiency Standards for Residential and Nonresidential Buildings (California Energy Code, Title 24, Part 6) are in effect Statewide and affect both new builds and alterations of existing buildings. The Building Energy Efficiency Standards were last updated in 2022 (effective as of January 1, 2023); the 2022 updates set in place new standards to encourage building decarbonization, emphasizing in particular on heat pumps for space heating and water heating, and extended the benefits of photovoltaic and battery storage systems and other demand flexible technology to work in combinations with heat pumps.

California also has a number of funding programs, including the California Department of Community Services and Development's (CSD) Low-Income Weatherization Program to provides low-income households with solar photovoltaic systems and energy efficiency upgrades at no cost to residents, including specific components to support low-income farmworkers and multi-family properties. The California CSD also provides additional resources and administers certain federal weatherization programs including the U.S. Department of Energy's Weatherization Assistance Program, and the U.S. Department of Health and Human Services' Low-Income Home Energy Assistance Program; California CSD works with local energy services providers throughout the state installing weatherization and energy efficiency measures for low-income homeowners and renters to facilitate these programs. Further, the California Public Utilities Commission has an Energy Savings Assistance Program which provides no-cost weatherization services to consumers who meet the income limits under the California Alternate Rates for Energy program.

STEP 2(B): OTHER STATES' AND NONATTAINMENT AREAS' COMMERCIAL AND RESIDENTIAL BUILDING APPLIANCES CONTROL MEASURES

Table 23 summarizes the most stringent control measures currently in use in any state that have been identified and discussed for commercial and residential building appliances.

Table 23: Comparison of Stringency – Commercial and Residential Building Appliances

CARB Control Program Compared to Federal Standards and Control Programs in Other States

Type of Control Measure	Most Stringent Control Program Identified	Summary of Findings from Analysis	Other Jurisdiction(s) Analyzed
Commercial and Residential Building Appliances			
Space and Water Heaters			
Emission standard (new sales): Zero-Emission Standard for Space and Water Heaters	Future measure: Zero-emission Standard for Space and Water Heaters (CARB)	CARB's Zero-Emission Standard for Space and Water Heaters measure is the most stringent standard of its type at the state level. This measure would reduce emissions from new residential and commercial space and water heaters sold in California. CARB would set an emission standard for space and water heaters to go into effect in 2030. CARB would adopt a statewide zero-emission standard which would have criteria pollutant benefits as a key result along with GHG reductions. Beginning in 2030, 100 percent of sales of new space heaters and water heaters would need to comply with the emission standard. *(Note: CARB has committed to pursue the Zero-Emission Standard for Space and Water Heaters measure, but this measure has not yet been proposed to the Board for approval/adoption)*	No other state has emission standards that require space and water heaters sales to be exclusively zero-emission by 2030. Maryland passed the Climate Solutions Now Act, establishing Building Energy Performance Standards for buildings 35,000 square feet and larger to achieve a 20 percent reduction in net direct greenhouse gas (GHG) emissions by 2030 and net-zero emissions by 2040. The regulation also requires holistic retrofits of low-income households, including weatherization and heat pump installations.[128] New York supports statewide building decarbonization in new construction and existing buildings through a combination of building codes and appliance efficiency standards, among other strategies.[129]

[128] Maryland Department of Environment. "Building Energy Performance Standards: Summary of Authorizing Law for the Development of Regulations." Accessed on April 13, 2023 at: https://mde.maryland.gov/programs/air/ClimateChange/Pages/BEPS.aspx.

[129] New York State Energy Research and Development Authority. 2022. "New York's Carbon Neutral Buildings Roadmap." Available at: https://www.nyserda.ny.gov/All-Programs/Carbon-Neutral-Buildings.

While there may be certain local jurisdictions with requirements for zero-emission space and water heaters that establish earlier implementation dates, CARB has analyzed other State-level requirements and must evaluate feasibility for implementation on a statewide level. As shown in Table 23 summarizes the most stringent control measures currently in use in any state that have been identified and discussed for commercial and residential building appliances.

Table *23*24 above, CARB's Zero-Emission Standard for Space and Water Heaters measure is the most stringent State-level requirement of its type within the U.S and thus goes beyond MSM requirements.

STEP 3(A): EVALUATION OF STRINGENCY: COMMERCIAL AND RESIDENTIAL BUILDING APPLIANCES CONTROL MEASURES

CARB has committed to bringing to the Board by 2025 a measure for zero-emission commercial and residential building appliances, which would propose to require, beginning in 2030, that 100 percent of new space and water heaters sold in California meet the zero-emission standard. No other state is engaged in more stringent efforts to require zero-emission space and water heaters.

Furthermore, CARB staff have conducted an analysis of the timing of the new space and water heater measure included in the 2022 State SIP Strategy. This measure is still in its development phase and is not yet being implemented; the development timeline, however, is critical to allow industry sufficient time to implement the requisite changes in their business models to transition to exclusively selling the required zero-emission technologies called for in this proposed regulatory action, and for manufacturers to scale up production to levels sufficient to meet the demand stimulated by a statewide requirement: A more expedited timeframe would be neither technologically nor economically feasible.

The public process to undertake a rulemaking of this scope would be at least two years. Additionally, manufacturers need time to ramp up production of zero-emission technologies to meet the expected demand. For example, despite the fact that appliance saturation studies in California show residential electric use for space heating has quadrupled over the last 10 years, manufacturing and deployment would need to continue to accelerate to meet the demand under a new zero-emission space and water heater standard.[130] Further, CARB would need to design any such standard in collaboration with energy regulators (U.S. Department of Energy and California Energy Commission), and building code regulators (California Building Standards Commission, California Department of Housing and Community Development, and California Energy Commission), and with air districts, ensure it was consistent with all State and local efforts, and would work carefully with communities to consider any housing cost or affordability impacts, recognizing that reducing emissions from space and water heaters can generate health benefits and cost-savings with properly designed standards.

CARB understands that this measure needs to be part of a suite of equity-promoting and complementary building decarbonization policies deeply informed by public process that include scaling back natural gas infrastructure, expanding construction of zero-emission buildings, and building a sustainable market by increasing affordability and accessibility through expanding incentive programs, ensuring utility rates are supportive of electrification, developing the workforce, and increasing consumer education. As part of the public process for equity promoting building decarbonization, CARB is reviewing and considering reports like Building Energy, Energy and Power (BEEP) Coalition's

[130] Opinion Dynamics, *California Heat Pump Residential Market Characterization and Baseline Study*, Figure 18. May 17, 2022. Retrieved from: https://www.calmac.org/publications/OD-CPUC-Heat-Pump-Market-Study-Report-5-17-2022.pdf

Community Priorities for Equitable Building Decarbonization Equitable.[131] Community engagement will be a critical aspect of the entire public process. CARB needs to engage with community-based organizations and other key stakeholders to incorporate equitable considerations for low-income and environmental justice communities where feasible.

For these reasons, the Zero Emission Standard for Space and Water Heaters measure meets the MSM requirement of being phased in as "expeditiously as practicable" and goes beyond MSM requirements in terms of stringency.

[131] Building Energy, Equity and Power Coalition, *Community Priorities for Equitable Building Decarbonization.* March 1, 2022. Retrieved from: https://ww2.arb.ca.gov/sites/default/files/2022-03/BEEP%20Letter%20and%20Report_Equitable%20Decarb%20March%202022.pdf

Table 24: Commercial and Residential Building Appliances Control Measures – Stringency and Timeline for Implementation

Measures	Implementation Begins	12 ug/m3 Annual (2012)
State SIP Strategy Residential and Commercial Building Appliance Measures (with Commitment)		
Zero Emission Standard for Space and Water Heaters measure	2030	Beyond MSM
With the Zero-Emission Standard for Space and Water Heaters measure, CARB would set a statewide zero-emission standard for space and water heaters. Beginning in 2030, 100 percent of the sales of new space heaters and water heaters would need to comply with the emission standard. This standard would be the most stringent of any state in the U.S., and would exceed the stringency of Federal requirements; further increases in stringency are not feasible. New zero-emission standards take years of lead time to ensure manufacturers have sufficient time to implement the necessary changes in their business models and to scale up production to a sufficient level to meet the demand produced by a Statewide standard; a more accelerated timeline is not feasible		

STEP 3(B): EVALUATION OF FEASIBILITY: COMMERCIAL AND RESIDENTIAL BUILDING APPLIANCES CONTROL MEASURES

Step 3(b) calls for an assessment of the feasibility of implementing any measure that is not included in the proposed South Coast SIP, but which is identified as a potential MSM control measure in Step 2. Staff developed the Zero-Emission Standard for Space and Water Heaters measure in response to a public measure suggestion received during the public process for the 2022 State SIP Strategy, which is described below:

- Additional Building Emission Standards
  CARB could propose additional emissions standards for combustion sources used in buildings by working with air districts to set such standards and, with building and energy code agencies on standards for new construction, or by taking other actions (including potentially incentive programs) to accelerate the removal of fossil fuels from the building stock in both new and existing buildings.

  CARB staff has been investigating the feasibility and potential benefits of this suggested measure and have included in the 2022 State SIP Strategy the Zero-Emission Standard for Space and Water Heaters measure, which also includes the potential to include other end-uses.

CARB staff do not recommend eliminating any of the potential commercial and residential building appliance control measures identified on the basis of technical or economic infeasibility.

Summary of Steps 2 and 3

STEP 2: POTENTIAL MOBILE SOURCE CONTROL MEASURES IDENTIFIED

The purpose of Step 2 is to identify all potential MSM control measures for the emission sources identified Step 1. Per U.S. EPA guidance, staff began to identify the list of all potential MSM control measures by starting with California's control program (Step 2(a)), which includes:

- Control measures adopted in the SIP for the South Coast (i.e. the current control program); and
- Additional control measures committed to in the 2022 State SIP Strategy.

In Step 2(b), staff expanded the scope of focus beyond California's controls to identify any additional potential MSM control measures that are in use in other nonattainment areas and states, and which exceed the stringency of California's controls identified in Step 2(a). The analysis undertaken for Step 2(b) found that, while there are some measures in other jurisdictions that have emission controls which are individually more stringent than an individual CARB control program, the comprehensive stringency of similar control measures committed to in the 2022 State SIP Strategy meets and/or exceeds the stringency of the controls in use in other jurisdictions. Thus, Step 2(b) did not identify any additional potential MSM control measures in use in other jurisdictions that are more stringent than the California control measures previously identified in Step 2(a).

To meet statutory requirements for the MSM plans, staff also reviewed all previous South Coast PM2.5 SIPs in Step 2(c), and found no CARB mobile source control measures that were proposed in previous Moderate or Serious attainment plan control strategies for the area that were not subsequently adopted and/or implemented.

As there are no applicable control measures previously rejected as infeasible for the South Coast's MSM demonstration process, Step 2(c) did not identify any additional potential MSM control measures beyond the control measures identified in Steps 2(a) and 2(b).

STEP 3: ANALYSIS OF STRINGENCY AND FEASIBILITY

The analysis of stringency and feasibility for each possible MSM control measure identified in Step 2 has shown that California's control program is at least consistent with the most stringent of any nonattainment area or state in the nation, with the majority of California control measures exceeding the stringency of controls in use in the rest of the nation.

The control measures included in the proposed 2024 12 μg/m3 annual PM2.5 Plan represent the full suite of emission control approaches that aligns with the most stringent levels of control feasible, given the current status of technology and its potential in the near future. Furthermore, CARB staff has not received any public comments to date indicating that more stringent control technologies than those included in the proposed South Coast SIP would be commercially available and/or technologically and economically feasible to implement in the timeframe required for the area's PM2.5 SIPs. ~~The~~ CARB current control measures analyzed in this document therefore meet the requirements of Most Stringent Measures (MSM), and ~~.~~all 2022 State SIP Strategy measure commitments go beyond MSM requirements.

Section V. Step 4: Adoption of Control Measures

The final step required by the Act's step-wise process is to adopt and implement feasible control measures identified in Step 3 to satisfy MSM requirements.

The CARB control program for the proposed South Coast 2024 12 µg/m3 annual PM2.5 Plan includes all of the measures identified as MSM in Step 3. The control measures included in this analysis have been shown to meet or go beyond the MSM requirements. The control measures described in this chapter are in varying stages of the adoption and implementation process at CARB:

- Most of the measures identified as MSM have already been adopted by the Board, submitted into the SIP, and are currently being implemented as part of CARB's current control program.
- Additional control measures which go beyond MSM have been committed to in the 2022 State SIP Strategy, which the Board adopted in September 2022, yet many of these control measures themselves have not yet been adopted by the Board. The Board's adoption of the 2022 State SIP Strategy created a commitment to adopt measures according to a defined schedule, and a commitment to achieve specified emission reductions in the South Coast.

Board adoption of the proposed South Coast 2024 12 µg/m3 annual PM2.5 Plan – including the control measures described in the 2022 State SIP Strategy – will satisfy the requirements of Step 4.

Section VI. Conclusion: Findings of MSM Analysis

California's long history of comprehensive and innovative emissions control has resulted in the strongest mobile source control program in the nation. U.S. EPA has acknowledged the strength of these programs in their approval of CARB's regulations and through the waiver and authorization process. In addition, U.S. EPA has provided past determinations that CARB's mobile source control programs meet Best Available Control Measure (BACM) requirements, which are more stringent than RACM, as part of their 2019 approval of the South Coast's 24-hour PM2.5 Plan[132]:

> "Overall, we believe that the program developed and administered by CARB and SCAG provide for the implementation of BACM for PM2.5 and PM2.5 precursors in the South Coast nonattainment area."

Additionally, in their 2020 proposed approval of the San Joaquin Valley's PM2.5 Serious Area 2018 Plan,[133] U.S. EPA further found that CARB's mobile source control program met the more stringent level of MSM. In their 2020 proposal for that plan, U.S. EPA found that,

> "CARB's programs constitute the most stringent emission control programs currently available for the mobile source and fuels categories, taking into account economic and technological feasibility."[134]

Since then, CARB has continued to enhance and accelerate reductions from our mobile source control programs through the implementation of more stringent engine emissions standards, in-use requirements, incentive funding, and other policies and initiatives as described in the preceding sections. These efforts not only ensure that all source sectors continue to achieve maximum emission reductions through implementation of the cleanest current technologies, but also promote the ongoing development of more advanced zero and near-zero technologies. As a result, California's current mobile source control programs reflect the most stringent and feasible level of emissions control in the nation and fully meet the requirements for MSM.

Additionally, this analysis shows that CARB's control measures committed to in the 2022 State SIP Strategy for mobile sources and commercial and residential building appliances ~~also meets~~go beyond the requirements of MSM.

As the requirements for MSM are inclusive of the requirements for BACM – and indeed, are more stringent than BACM requirements – this analysis shows that CARB's control

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[132] 83 FR 5923 https://www.federalregister.gov/documents/2018/02/12/2018-02677/air-quality-state-implementation-plans-approvals-and-promulgations-california-south-coast-moderate

[133] 85 FR 44192 https://www.federalregister.gov/documents/2020/07/22/2020-14471/clean-air-plans-2006-fine-particulate-matter-nonattainment-area-requirements-san-joaquin-valley While elements of this plan were later disapproved and remanded due to a 9th Circuit Court of Appeals decision, the Court's findings nonetheless upheld EPA's approval of mobile source control measure finding of MSM.

[134] 85 FR 17382 https://www.federalregister.gov/documents/2020/03/27/2020-05914/clean-air-plans-2006-fine-particulate-matter-nonattainment-area-requirements-san-joaquin-valley

measures for mobile sources and for commercial and residential building appliances also meet the requirements of BACM, in addition to MSM.

In conclusion, CARB followed the procedures outlined by U.S. EPA for determining MSM, and have found that California's control programs for mobile sources and commercial and residential building appliances satisfy and, in certain cases, go beyond the applicable requirements for the PM2.5 standard in this analysis.

South Coast Air Basin Attainment Plan for the 2012 Annual PM2.5 Standard

Appendix III

ATTACHMENT C: QUANTITATIVE ANALYSIS FOR WOOD BURNING CURTAILMENT THRESHOLD

Emission Reduction Analysis for Rule 445 in Comparison to San Joaquin Valley Rule 4901

Summary

Rule 445 on Wood-Burning Devices establishes mandatory burning curtailment across the entire South Coast Air Basin (Basin) when daily PM2.5 concentration in any source receptor area (SRA) is projected to exceed 29 µg/m^3. Residences located 3,000 or more feet above mean sea level and low-income households are exempt from this curtailment. The emission reductions associated with this Basin-wide approach are compared to the potential emission reductions that would be achieved if San Joaquin Valley Air Pollution Control District's (SJVAPCD) Rule 4901 were to be applied to the Basin.

Rule 4901 Structure and Its Application to the South Coast Air Basin

SJVAPCD Rule 4901 establishes a tier system for emission curtailment that is based on whether devices are U.S. EPA certified (See Table III-C-1). Rule 4901 includes a registration procedure where household can register certified devices, which provides data on the penetration of certified devices within the San Joaquin Valley. In contrast, the Basin does not have implemented any registration system, and as a result, there is no reliable information on the percentage of households that use certified devices. And most of wood burning devices exist in the Basin are fireplaces used for ambience, not for heating or cooking. For simplicity and conservative approach, this analysis assumed that all wood burning devices are uncertified and subject to the most stringent thresholds: 20 µg/m^3 in non-hotspot areas, and 12 µg/m^3 for hotspot areas.

TABLE III-C-1
SAN JOAQUIN VALLEY'S RULE 4901 TIER STRUCTURE FOR EMISSIONS CURTAILMENT

	Certified Devices		Uncertified Devices & Fireplaces	
	Non-Hotspot	Hotspot	Non-Hotspot	Hotspot
Level 1	N/A	N/A	20 µg/m^3	12 µg/m^3
Level 2	65 µg/m^3	35 µg/m^3	20 µg/m^3	12 µg/m^3

Identifying Hotspots in the South Coast Air Basin

The quantitative analysis presented in this section utilizes General Forecasting Areas (GFA)~~SRAs~~ as the geographical unit to delineate hotspots and non-hotspots. There are 35 SRAs in the basin that are grouped in 13 GFAs based on the similar topographical and demographical features that are distinctive from other

SRAs.[1] South Coast AQMD issues air quality forecasts each day and reports current air quality conditions for each SRA. This information is disseminated to the public, website, and newspapers, television and radio stations. SJVAPCD Rule 4901 establishes hotspots and non-hotspots across nine forecast areas. Each county is considered a single forecast area, with the exception of Tulare County, which is divided into two separate areas. Total population of the SJVAPCD jurisdiction is 4.2 million, which leads to an average of 0.47 million people per forecast area. ~~The air quality forecast for the Basin is partitioned into 35 SRAs. Air quality forecast including PM2.5 is issued every day, tailored to individual SRA.~~ In contrast, ~~The~~ the average populations of an SRA and a GFA are~~is~~ approximately 0.49 and 1.32 million, respectively, both exceeding the population density of each forecast area in the San Joaquin Valley. According to the latest demographic data from SCAG's regional transportation plan, the Basin accommodates approximately 17.3 million residents. In addition, Rule 445 used to implement residential wood burning curtailment program by SRA until May 2020 when it was amended to incorporate contingency measure components to comply with PM2.5 and ozone SIP requirements. While SRA is a smaller area than a county, transport and dispersion are embedded in the South Coast AQMD's daily forecast system. The air quality forecast reflects emissions, meteorological conditions, topography, photochemistry, and transport, given that these pieces of information are reflected in the measurements and photochemical models of which results are input to the daily forecast system. Therefore, SRA is an equivalent unit to the county of SJV, this analysis uses GFA unit to define hotspots per U.S. EPA's comment. A hotspot is defined as a~~n~~ GFA~~SRA~~ where the design value projected for the 2030 baseline exceeds 12 µg/m³. This is consistent with the approach adopted by SJVAPCD, which defined hotspots as the forecast areas that exceed the annual PM2.5 standard after "incorporating an exhaustive list of aggressive potential measures in (San Joaquin) Valley wide."[2] The 2030 baseline design values employed in this analysis align with those utilized in the modeling results presented in Chapter 5. Spatial interpolation methods, identical to those applied in the unmonitored area analysis, were employed to assign design values for GFA~~SRA~~s lacking valid measurement-based data. The unmonitored area analysis utilizes inverse distance weighting with model gradient adjustment. The resulting ~~SRAs~~ GFAs classified as hotspots are illustrated in Figure III-C-1.

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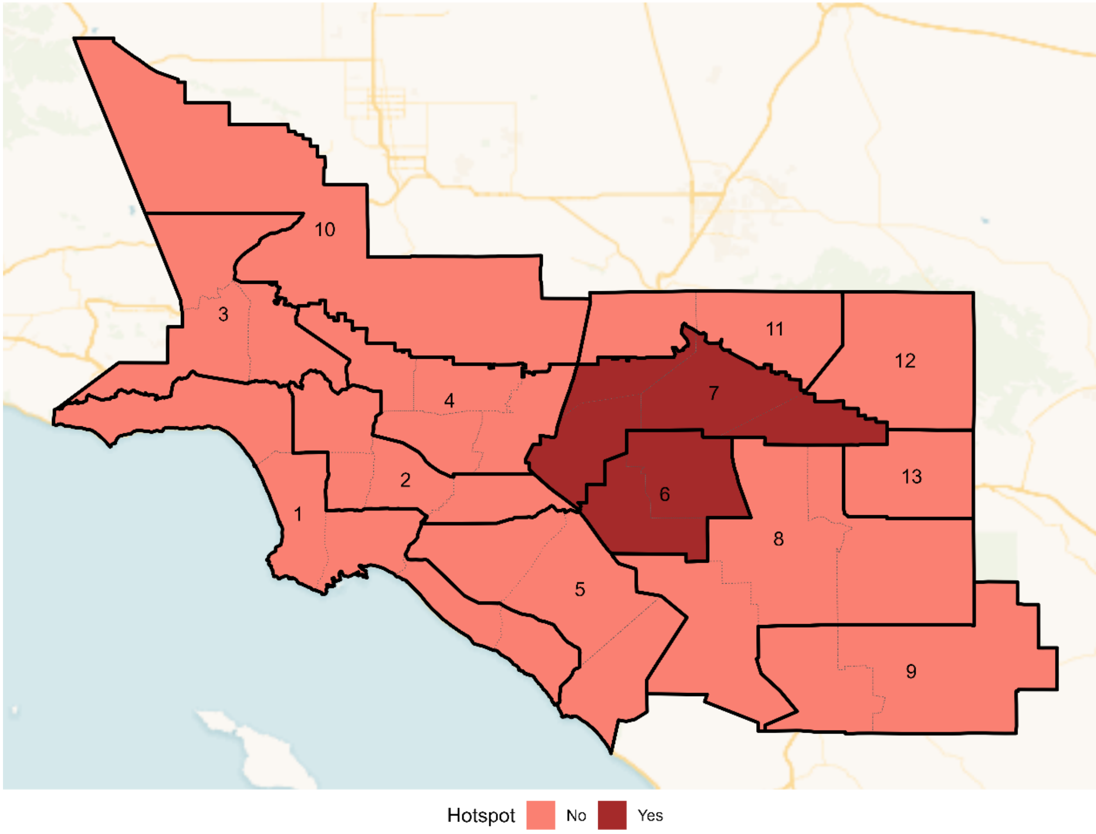
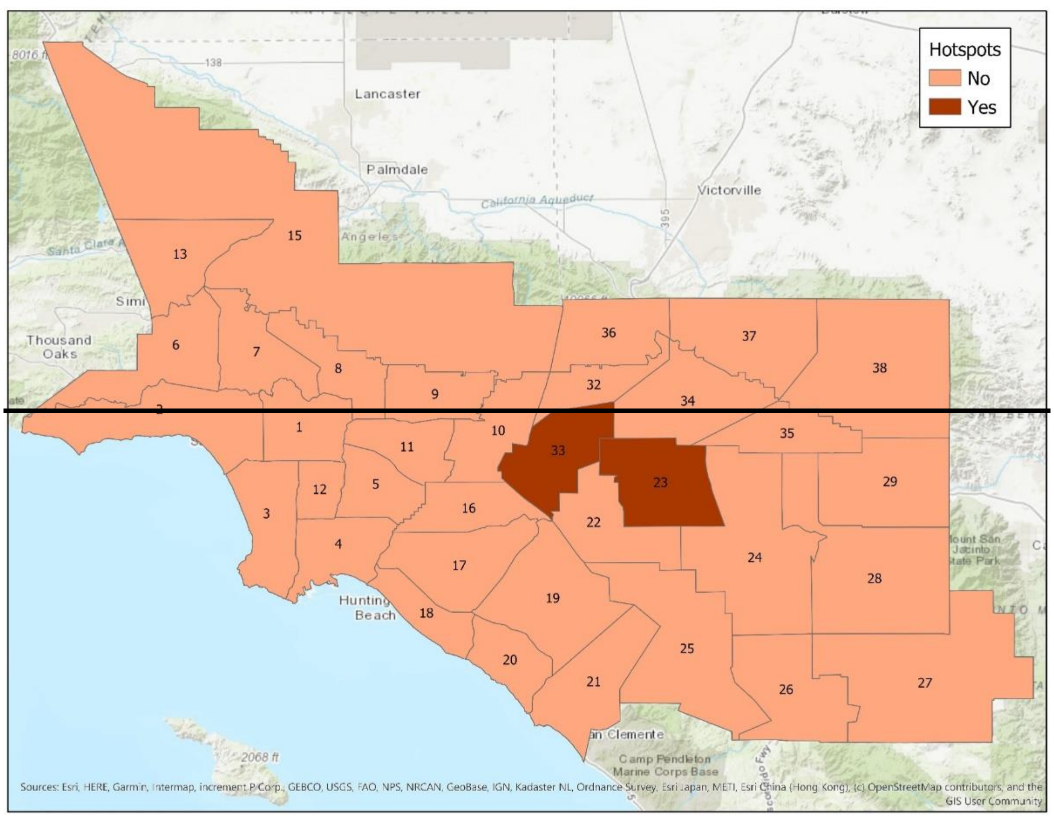
[1] South Coast AQMD General Forecast Areas and Source Receptor Areas http://www.aqmd.gov/docs/default-source/default-document-library/map-of-monitoring-areas.pdf

[2] Adoption of proposed amendments to San Joaquin Valley Air Pollution Control District's Rule 4901, June 2019. https://www.valleyair.org/Board_meetings/GB/agenda_minutes/Agenda/2019/June/final/13.pdf


10
3
11
12
4
7
2
6
13
1
8
5
9
Hotspot
No
Yes


Hotspots
No
Yes
Lancaster
Palmdale
Victorville
Thousand Oaks
Simi
Hunting Beach
San Clemente
Camp Pendleton Marine Corps Base
15
13
6
7
8
9
36
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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

FIGURE III-C-1
HOTSPOT AND NON-HOTSPOT ~~SOURCE RECEPTOR AREAS~~GENERAL FORECAST AREAS (~~SRAS~~GFAS).

Quantification of Emission Reductions

Emission reductions due to curtailment are quantified using the following procedure:

1) Determine the monthly emissions:

Emissions by GFA~~SRA~~ are determined by spatially allocating county-wide emissions from residential wood combustion with the spatial surrogate factors employed in air quality modeling. The spatial allocation factors are available at 1 km grid spacing. The emissions were allocated to each month based on levoglucosan measurements. These monthly allocation factors were utilized in the October 2020 amendment of the Rule 445,[3] the current version of the rule. The total emissions subject to Rule 445 are shown by area in Table III-C-2. The emissions are estimated with no curtailment in place. For the basin-wide emissions, the total excludes emissions above 3,000 feet to account for the exemption included in Rule 445. In contrast, emissions by GFA~~SRA~~ include all emissions without any exemption related to altitude because such exemption is not included in SJVAPCD Rule 4901.

TABLE III-C-2
EMISSIONS FROM RESIDENTIAL WOOD COMBUSTION BY AREA WITHOUT ANY CURTAILMENT

	Emissions (tons/month)			
GFA~~SRA~~	**January**	**February**	**November**	**December**
Basin total*	330.8	214.0	350.2	583.7
1~~1~~	66.8~~14.9~~	43.3~~9.6~~	70.6~~15.8~~	117.8~~26.3~~
2~~2~~	45.5~~15.4~~	29.4~~10.0~~	48.1~~16.3~~	80.2~~27.2~~
3~~3~~	35.2~~20.4~~	22.8~~13.2~~	37.3~~21.6~~	62.1~~36.0~~
4~~4~~	38.3~~14.7~~	24.9~~9.5~~	40.6~~15.5~~	67.7~~25.9~~
5~~5~~	29.7~~13.6~~	19.3~~8.8~~	31.4~~14.4~~	52.4~~24.0~~
6~~6~~	22.6~~15.6~~	14.7~~10.1~~	24.0~~16.5~~	40.0~~27.5~~
7~~7~~	50.8~~15.2~~	32.9~~9.8~~	53.8~~16.1~~	89.5~~26.8~~
8~~8~~	24.6~~6.6~~	15.8~~4.3~~	25.9~~7.0~~	43.2~~11.6~~
9~~9~~	11.9~~11.5~~	7.7~~7.5~~	12.6~~12.2~~	20.9~~20.4~~
10~~10~~	7.7~~9.4~~	5.0~~6.1~~	8.1~~9.9~~	13.5~~16.6~~
11~~11~~	4.0~~10.8~~	2.6~~7.0~~	4.2~~11.5~~	7.1~~19.1~~
12~~12~~	4.3~~7.6~~	2.8~~4.9~~	4.6~~8.0~~	7.6~~13.4~~

[3] Staff report for the amendment to Rule 445, approved in October 2020. Available at: https://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2020/2020-oct27-001.pdf

13~~13~~	2.8~~4.4~~	1.8~~2.9~~	3.0~~4.7~~	5.0~~7.8~~
~~15~~	~~7.7~~	~~5.0~~	~~8.1~~	~~13.5~~
~~16~~	~~9.4~~	~~6.1~~	~~9.9~~	~~16.5~~
~~17~~	~~19.1~~	~~12.4~~	~~20.2~~	~~33.7~~
~~18~~	~~12.0~~	~~7.8~~	~~12.7~~	~~21.2~~
~~19~~	~~7.7~~	~~5.0~~	~~8.1~~	~~13.5~~
~~20~~	~~4.3~~	~~2.8~~	~~4.5~~	~~7.5~~
~~21~~	~~2.9~~	~~1.9~~	~~3.1~~	~~5.2~~
~~22~~	~~10.0~~	~~6.5~~	~~10.6~~	~~17.7~~
~~23~~	~~12.6~~	~~8.2~~	~~13.4~~	~~22.3~~
~~24~~	~~12.9~~	~~8.3~~	~~13.6~~	~~22.7~~
~~25~~	~~5.8~~	~~3.7~~	~~6.1~~	~~10.2~~
~~26~~	~~11.6~~	~~7.5~~	~~12.3~~	~~20.5~~
~~27~~	~~0.3~~	~~0.2~~	~~0.3~~	~~0.4~~
~~28~~	~~5.9~~	~~3.8~~	~~6.2~~	~~10.3~~
~~29~~	~~2.8~~	~~1.8~~	~~3.0~~	~~5.0~~
~~32~~	~~11.4~~	~~7.4~~	~~12.1~~	~~20.1~~
~~33~~	~~13.8~~	~~8.9~~	~~14.6~~	~~24.3~~
~~34~~	~~19.5~~	~~12.6~~	~~20.6~~	~~34.3~~
~~35~~	~~6.1~~	~~4.0~~	~~6.5~~	~~10.8~~
~~36~~	~~0.1~~	~~0.1~~	~~0.1~~	~~0.2~~
~~37~~	~~3.9~~	~~2.5~~	~~4.1~~	~~6.9~~
~~38~~	~~4.3~~	~~2.8~~	~~4.6~~	~~7.6~~

* Basin total excludes emissions located above 3,000 feet.

2) Determine the number of ("no-burn") days exceeding varying thresholds:

Air quality data recorded in the period from 2019 through 2023 is processed using a retrospective archive of PM2.5 values from South Coast AQMD's AQI mapping system. This system is run in real-time to report hourly values of PM2.5, PM10, O3, NO2, CO, and AQI on the South Coast AQMD website (www.aqmd.gov) and on the South Coast AQMD mobile app (www.aqmd.gov/mobileapp). This peer-reviewed algorithm[4] blends data from regulatory monitors, low-cost sensors, and chemical transport model simulations of ozone and PM2.5 from the National Air Quality Forecast Capability. This map has been operational since November 2020, but staff conducted a reanalysis to recreate the gridded hourly values from 2019 through 20203. The hourly values were then aggregated into daily values for each 5 km by 5 km grid cell. The highest daily PM2.5 value of all the grid cells in each GFA~~SRA~~ was determined for everyday between 2019 to 2023. The number of days exceeding the thresholds of 12 $\mu g/m^3$ and 20 $\mu g/m^3$ in each GFA~~SRA~~ is

[4] Schulte N., Li X., Ghosh J. K., Fine P. M., Epstein S. A., 2020. Responsive high-resolution air quality index mapping using model, regulatory monitor, and sensor data in real-time. Environmental Research Letters, 15, 1040a7. DOI: 10.1088/1748-9326/abb62b

provided in Table III-C-3. In comparison, the number of days exceeding a specific threshold anywhere in the basin – 12 µg/m^3, 20 µg/m^3, and varying from 25 µg/m^3 to 30 µg/m^3 – is presented in Table III-C-4. Hotspot areas in Mira Loma (GFA ~~SRA 23~~6) and Ontario CA-60 Near-Road (~~SRA~~ GFA ~~33~~7) exhibit high number of days exceeding thresholds. In contrast, many non-hotspot ~~SRAs~~GFAs, e.g., ~~SRAs 26-29~~GFAs ~~and 37-38~~8-13, exhibit a low number of curtailment days. Because the basin, as a whole, includes all the areas that may exceed a certain threshold, the basin-wide numbers are always higher than the exceeding days of any given GFA~~SRA~~.

TABLE III-C-3
NUMBER OF CURTAILMENT DAYS THAT WOULD BE CALLED UNDER TWO THRESHOLDS:
12 µg/m³ AND 20 µg/m³

	Threshold = 12 µg/m³					Threshold = 20 µg/m³			
GFA~~SRA~~	Jan	Feb	Nov	Dec		Jan	Feb	Nov	Dec
1	19~~15~~	14~~10~~	21~~18~~	21~~15~~		8~~4~~	3~~2~~	10~~8~~	10~~5~~
2	21~~11~~	14~~7~~	23~~15~~	23~~12~~		10~~3~~	3~~2~~	12~~6~~	12~~3~~
3	16~~18~~	12~~11~~	19~~19~~	20~~20~~		4~~8~~	2~~3~~	8~~10~~	6~~7~~
4	13~~19~~	9~~14~~	14~~21~~	15~~21~~		6~~8~~	3~~2~~	7~~9~~	5~~10~~
5	17~~20~~	10~~13~~	17~~21~~	19~~22~~		7~~9~~	3~~3~~	8~~10~~	7~~10~~
6	20~~8~~	15~~6~~	19~~15~~	21~~16~~		11~~2~~	6~~0~~	13~~4~~	11~~4~~
7	20~~16~~	14~~12~~	18~~19~~	21~~20~~		10~~4~~	6~~2~~	12~~8~~	11~~6~~
8	7~~12~~	6~~7~~	11~~13~~	8~~13~~		2~~2~~	1~~2~~	3~~5~~	2~~4~~
9	4~~11~~	2~~7~~	6~~12~~	6~~13~~		0~~4~~	0~~2~~	1~~6~~	1~~4~~
10	5~~11~~	5~~9~~	12~~12~~	9~~13~~		2~~5~~	1~~3~~	4~~7~~	2~~4~~
11	3~~13~~	4~~9~~	9~~14~~	9~~15~~		1~~6~~	1~~2~~	2~~7~~	1~~5~~
12	4~~21~~	3~~14~~	4~~23~~	6~~23~~		0~~10~~	0~~3~~	0~~12~~	1~~12~~
13	4~~3~~	5~~2~~	7~~9~~	6~~6~~		1~~0~~	1~~0~~	1~~3~~	1~~1~~
~~15~~	~~5~~	~~5~~	~~12~~	~~9~~		~~2~~	~~1~~	~~4~~	~~2~~
~~16~~	~~15~~	~~10~~	~~16~~	~~18~~		~~7~~	~~3~~	~~8~~	~~7~~
~~17~~	~~17~~	~~10~~	~~17~~	~~19~~		~~7~~	~~3~~	~~8~~	~~7~~
~~18~~	~~15~~	~~6~~	~~14~~	~~15~~		~~4~~	~~1~~	~~4~~	~~5~~
~~19~~	~~13~~	~~8~~	~~14~~	~~12~~		~~5~~	~~2~~	~~6~~	~~5~~
~~20~~	~~7~~	~~3~~	~~9~~	~~8~~		~~3~~	~~1~~	~~2~~	~~4~~
~~21~~	~~7~~	~~5~~	~~11~~	~~10~~		~~3~~	~~2~~	~~3~~	~~4~~
~~22~~	~~20~~	~~15~~	~~18~~	~~20~~		~~11~~	~~6~~	~~12~~	~~11~~
~~23~~	~~20~~	~~15~~	~~19~~	~~21~~		~~10~~	~~6~~	~~13~~	~~11~~
~~24~~	~~7~~	~~6~~	~~11~~	~~8~~		~~1~~	~~1~~	~~3~~	~~2~~
~~25~~	~~6~~	~~5~~	~~10~~	~~8~~		~~2~~	~~1~~	~~3~~	~~2~~
~~26~~	~~4~~	~~2~~	~~6~~	~~6~~		~~0~~	~~0~~	~~1~~	~~1~~
~~27~~	~~2~~	~~2~~	~~3~~	~~1~~		~~0~~	~~0~~	~~0~~	~~1~~
~~28~~	~~5~~	~~6~~	~~8~~	~~7~~		~~1~~	~~1~~	~~2~~	~~2~~
~~29~~	~~4~~	~~5~~	~~7~~	~~6~~		~~1~~	~~1~~	~~1~~	~~1~~
~~32~~	~~8~~	~~7~~	~~13~~	~~12~~		~~4~~	~~2~~	~~6~~	~~3~~
~~33~~	~~20~~	~~14~~	~~18~~	~~21~~		~~10~~	~~6~~	~~12~~	~~11~~
~~34~~	~~10~~	~~8~~	~~16~~	~~16~~		~~3~~	~~2~~	~~8~~	~~7~~
~~35~~	~~3~~	~~3~~	~~10~~	~~8~~		~~0~~	~~1~~	~~2~~	~~2~~
~~36~~	~~3~~	~~3~~	~~9~~	~~7~~		~~1~~	~~1~~	~~2~~	~~1~~
~~37~~	~~3~~	~~4~~	~~8~~	~~9~~		~~0~~	~~0~~	~~0~~	~~1~~
~~38~~	~~4~~	~~3~~	~~4~~	~~6~~		~~0~~	~~0~~	~~0~~	~~1~~

TABLE C-4
NUMBER OF CURTAILMENT DAYS IN THE BASIN THAT WOULD BE CALLED UNDER VARYING BASIN-WIDE THRESHOLDS

Threshold (µg/m³)	January	February	November	December
12	26~~26~~	20~~20~~	27~~27~~	27~~27~~
20	15~~15~~	9~~9~~	16~~16~~	16~~16~~
21	14	9	14	14
22	13	8	14	14
23	12	7	13	13
24	10	6	12	12
25	10~~10~~	5~~5~~	11~~11~~	10~~10~~
26	9~~9~~	4~~4~~	10~~10~~	10~~10~~
27	8~~8~~	4~~4~~	10~~10~~	9~~9~~
28	7~~7~~	3~~3~~	9~~9~~	9~~9~~
29	7~~7~~	3~~3~~	8~~8~~	8~~8~~
30	6~~6~~	2~~2~~	8~~8~~	7~~7~~

3) Determine the curtailed emissions under SJVAPCD's Rule 4901 scenario in the South Coast Air Basin:

Emissions avoided by the curtailment are calculated by multiplying the number of days exceeding curtailment threshold by the emissions specified per month and geographical area. The curtailment thresholds are 12 µg/m³ for hotspot ~~SRAs~~ GFAs and 20 µg/m³ for non-hotspots ~~SRAs~~GFAs. Emissions avoided for the period of November through February are shown in Table III-C-5. The total emission reductions resulting from this hotspot/non-hotspot scenario add up to 458~~301~~ tons per year. These reductions include areas above 3,000 feet, because SJVAPCD Rule 4901 does not include an exemption for high-altitude areas.

TABLE III-C-5
EMISSIONS REDUCTIONS BY GFA~~SRA~~ DUE TO CURTAILMENT USING 12 μg/m³ FOR HOTSPOT AND 20 μg/m³ FOR NON-HOTSPOT

~~SRA~~GFA	Hotspot	Curtailed Emissions (tons/year)
1~~1~~	No~~No~~	83~~11~~
2~~2~~	No~~No~~	68~~8~~
3~~3~~	No~~No~~	28~~22~~
4~~4~~	No~~No~~	30~~17~~
5~~5~~	No~~No~~	29~~17~~
6~~6~~	Yes~~No~~	65~~7~~
7~~7~~	Yes~~No~~	142~~12~~
8~~8~~	No~~No~~	8~~3~~
9~~9~~	No~~No~~	1~~7~~
10~~10~~	No~~No~~	3~~7~~
11~~11~~	No~~No~~	1~~8~~
12~~12~~	No~~No~~	0~~11~~
13~~13~~	No~~No~~	0~~1~~
~~15~~	~~No~~	45~~83~~
~~16~~	~~No~~	83~~9~~
~~17~~	~~No~~	68~~19~~
~~18~~	~~No~~	28~~7~~
~~19~~	~~No~~	30~~5~~
~~20~~	~~No~~	29~~2~~
~~21~~	~~No~~	65~~1~~
~~22~~	~~No~~	142~~15~~
~~23~~	~~Yes~~	8~~36~~
~~24~~	~~No~~	1~~4~~
~~25~~	~~No~~	3~~2~~
~~26~~	~~No~~	1~~1~~
~~27~~	~~No~~	0~~0~~
~~28~~	~~No~~	0~~1~~
~~29~~	~~No~~	45~~80~~
~~32~~	~~No~~	8~~36~~
~~33~~	~~Yes~~	68~~39~~
~~34~~	~~No~~	28~~16~~
~~35~~	~~No~~	30~~1~~
~~36~~	~~No~~	29~~0~~
~~37~~	~~No~~	65~~0~~
~~38~~	~~No~~	142~~0~~
Total		**458~~301~~**

4) Compare emission reductions based on Rule 4901 approach to a Basin-wide curtailment approach:

The amount of emissions avoided due to Basin-wide curtailment was calculated by multiplying the number of exceeding days by the Basin-total emissions subject to Rule 445. Table III-C-6 presents the resulting curtailed emissions under various thresholds from 25 to 29 µg/m^3, ~~.~~ excluding emissions from areas above 3,000 ft altitude. The current Basin-wide curtailment threshold of 29 µg/m^3 ~~already~~ achieves ~~higher~~ lower emission reductions compared to SJVAPCD Rule 4901. To achieve the same emissions reductions as in the SJVAPCD rule, the Basin-wide curtailment threshold would have to be lowered to 25 µg/m^3. ~~.~~

~~In addition, per U.S. EPA's recommendation, additional analysis was conducted to include the areas above 3,000 ft altitude. Since the high-altitude area accounts for less than 4 percent of the total wood burning emissions, even if the area is excluded, the curtailment threshold equivalent to the hotspot-based analysis would be still 29 µg/m^3.~~

TABLE III-C-6
EMISSION REDUCTIONS (IN TONS PER YEAR) UNDER VARIOUS BASIN-WIDE CURTAILMENT THRESHOLDS

	Threshold (µg/m^3)								
	21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**
Basin-wide Emission Reductions (tons/year)	645	627	578	519	462	432	402	372	342

South Coast AQMD

APPENDIX IV-A

South Coast AQMD's Stationary and Mobile Source Measures

Table of Contents

Introduction

This Appendix describes the South Coast Air Quality Management District (South Coast AQMD) staff's proposed stationary and mobile source control measures to be included in the PM2.5 Plan. Control measures presented in this appendix are designed to achieve the 2012 Annual PM2.5 National Ambient Air Quality Standard (NAAQS) by 2030. The proposed control measures are further divided into stationary source NOx, NH3, and PM2.5 measures and mobile source measures. The measures are based on a variety of control strategies and incentive programs that are at or near commercial availability and/or are deemed technologically feasible in the next few years. South Coast AQMD will prioritize distribution of incentive funding in Environmental Justice (EJ) areas and seek opportunities to expand funding to benefit the most disadvantaged communities.

Control Measures

A control measure is a set of specific technologies and methods identified for potential implementation to reduce emissions to attain an air quality standard. South Coast AQMD's proposed stationary source measures are designed to assist with attainment of the 2012 Annual PM2.5 standard primarily through reductions of NOx, NH3, and direct PM2.5 emissions. Co-benefits from greenhouse gas (GHG) emissions reduction policies and other measures are included as well. The NOx, NH3, and direct PM2.5 stationary measures are identified by the three-letter prefix BCM. Measures pursuing co-benefits from Energy and Climate Change Programs are identified by the three-letter prefix ECC.

In the PM2.5 Plan, South Coast AQMD is proposing a total of 38 control measures. Out of the 38 proposed control measures, 23 target reductions from stationary sources. South Coast AQMD's control measures focus on stationary sources as that is the area where South Coast AQMD has the strongest regulatory authority. The majority of these measures are anticipated to be developed in the next several years and implemented prior to 2030. Table IV-A-1 provides a list of South Coast AQMD proposed PM2.5 measures for stationary sources along with anticipated emission reductions in 2030.

TABLE IV-A-1
SOUTH COAST AQMD PROPOSED STATIONARY SOURCE MEASURES

Number	Title [Pollutant]	Emission Reductions (2030) (tons per day)
South Coast AQMD Stationary Source NOx Measures:		
BCM-01	Emission Reductions from Replacement with Zero Emission or Low NOx Appliances – Residential Water Heating [PM2.5, NOx]	TBD
BCM-02	Emission Reductions from Replacement with Zero Emission or Low NOx Appliances – Residential Space Heating [PM2.5, NOx]	TBD
BCM-03	Emission Reductions from Residential Cooking Devices [PM2.5, NOx]	TBD
BCM-04	Emission Reductions from Replacement with Zero Emission or Low NOx Appliances – Residential Other Combustion Sources [PM2.5, NOx]	TBD
BCM-05	Emission Reductions from Emergency Standby Engines [PM2.5, NOx]	0.04 [PM2.5] 0.36 [NOx]
BCM-06	Emission Reductions from Diesel Electricity Generating Facilities [NOx]	0.16
BCM-07	Emission Reductions from Incinerators [NOx]	0.81
	Total Quantified PM2.5 and NOx Reductions	**0.04 [PM2.5]** **1.33 [NOx]**
South Coast AQMD Co-Benefits from Energy and Climate Change Programs Measures:		
ECC-01	Co-benefits from Existing and Future Greenhouse Gas Programs, Policies, and Incentives [All Pollutants]	TBD
ECC-02	Co-benefits from Existing and Future Residential and Commercial Building Energy Efficiency Measures [All Pollutants]	TBD
ECC-03	Additional Enhancements in Reducing Existing Residential Building Energy Use [All Pollutants]	TBD
South Coast AQMD NH3 Measures:		
BCM-08	Emission Reductions from Livestock Waste at Confined Animal Facilities [NH3]	0.27
BCM-09	Ammonia Emission Reductions from NOx Controls [NH3]	TBD

Number	Title [Pollutant]	Emission Reductions (2030) (tons per day)
BCM-10	Emission Reductions from Direct Land Application of Chipped and Ground Uncomposted Greenwaste [NH3]	0.08
BCM-11	Emission Reductions from Organic Waste Composting [NH3]	TBD
	Total Quantified NH3 Reductions	**0.35**
South Coast AQMD Direct PM2.5 Measures:		
BCM-12	Further Emission Reductions from Commercial Cooking [PM2.5]	TBD
BCM-13	Emission Reductions from Cooling Towers [PM2.5]	TBD
BCM-14	Further Emission Reductions from Paved Road Dust Sources [PM2.5]	TBD
BCM-15	Emission Reductions from Abrasive Blasting Operations [PM2.5]	TBD
BCM-16	Emission Reductions from Stone Grinding, Cutting and Polishing Operations [PM2.5]	TBD
BCM-17	Emission Reductions from Prescribed Burning for Wildfire Prevention [PM2.5]	TBD
BCM-18	Further Emission Reductions from Wood-Burning Fireplaces and Wood Stoves [PM2.5]	0.33~~TBD~~
BCM-19	Emission Reductions from Unpaved Road Dust Sources [PM2.5]	TBD
	Total Quantified Direct PM2.5 Reductions	**0.33~~TBD~~**
South Coast AQMD Other Measures:		
BCM-20	Application of All Feasible Measures [All Pollutants]	TBD

Note: TBD are reductions to be determined once the measure is further evaluated, the technical assessment is complete, and inventories and cost-effective control approaches are identified, and are not relied upon for attainment demonstration purposes.

South Coast AQMD proposes a total of 15 mobile source measures which are categorized into five groups – emission growth management, facility-based mobile sources, on-road and off-road, incentives, and other (see Table IV-A-2). Two emission growth management measures (EGM-01 to EGM-02) are proposed to identify actions to help mitigate and potentially provide emission reductions due to new development and redevelopment projects, and clean construction. Four facility-based mobile source measures (FBMSMs) (MOB-01 to MOB-04) seek to identify actions that will result in additional emission reductions at commercial marine ports, rail yards, warehouse distribution centers, and commercial airports. FBMSMs for marine ports and rail yards are currently undergoing a process to develop Indirect Source Rules and/or other voluntary based measures. Six on-road and off-road mobile source measures (MOB-05 to MOB-10) focus on on-road light/medium/heavy-duty vehicles, international shipping vessels, passenger locomotives and small off-road engines. Additionally, two incentive-based measures (MOB-11 and MOB-12) will use established protocols such as Carl Moyer Program guidelines and report to the Governing Board periodically. MOB-12, Pacific Rim Initiative for Maritime Emission Reductions seeks NOx emission reductions from partnership with local, State, federal and international entities. One other measure (MOB-13) focuses on fleet vehicle mitigation options and the development of a work plan to support and accelerate the deployment of zero emission infrastructure needed for the widespread adoption of zero emission vehicles and equipment.

TABLE IV-A-2
SOUTH COAST AQMD PROPOSED MOBILE SOURCE MEASURES

Number	Title [Pollutant]	Emission Reductions (2030) (tons per day)
South Coast AQMD Emission Growth Management Measures:		
EGM-01	Emission Reductions from New Development and Redevelopment [All Pollutants]	TBD
EGM-02	Emission Reductions from Clean Construction Policy [All Pollutants]	TBD
South Coast AQMD Facility-Based Measures:		
MOB-01	Emission Reductions at Commercial Marine Ports [PM2.5, NOx]	TBD
MOB-02	Emission Reductions at New and Existing Rail Yards [PM2.5, NOx]	TBD
MOB-03	Emission Reductions at Warehouse Distribution Centers [PM2.5, NOx]	TBD
MOB-04	Emission Reductions at Commercial Airports [PM2.5, NOx]	TBD
South Coast AQMD On-Road and Off-Road Measures:		
MOB-05	Accelerated Retirement of Light-Duty and Medium-Duty Vehicles [PM2.5, NOx]	TBD
MOB-06	Accelerated Retirement of On-Road Heavy-Duty Vehicles [NOx]	TBD
MOB-07	On-Road Mobile Source Emission Reduction Credit Generation Program [NOx]	TBD
MOB-08	Small Off-Road Engine Exchange Program [PM2.5, NOx]	TBD

Number	Title [Pollutant]	Emission Reductions (2030) (tons per day)
MOB-09	Further Emission Reductions from Passenger Locomotives [PM2.5, NOx]	TBD
MOB-10	Off-Road Mobile Source Emission Reduction Credit Generation Program [PM2.5, NOx]	TBD
South Coast AQMD Incentive-Based Measures:		
MOB-11	Emission Reductions from Incentive Programs [PM2.5, NOx]	TBD
MOB-12	Pacific Rim Initiative for Maritime Emission Reductions [PM2.5, NOx]	TBD
South Coast AQMD Other Mobile Source Measures:		
MOB-13	Rule 2202 – On-Road Motor Vehicle Mitigation Options [PM2.5, NOx]	TBD

Rule Effectiveness

The U.S. Environmental Protection Agency (U.S. EPA) has adjustment factors by industry type, but an adjustment is not necessary when emissions can be calculated by means of a direct determination. In most cases, South Coast AQMD calculates emission reductions by means of direct determination. As described below under Rule Compliance and Test Methods, the compliance demonstration for each proposed control measure, where the South Coast AQMD accounted for emission reductions, identifies the compliance mechanisms such as recordkeeping, inspection and maintenance activities, etc., and test methods such as South Coast AQMD, California Air Resources Board (CARB), and U.S. EPA approved test methods. South Coast AQMD's ongoing source testing and on-site inspection programs also strengthen the status of compliance verification. In addition, South Coast AQMD conducts workshops, and compliance education programs to inform facility operators of rule requirements and assist them in performing recordkeeping and self-inspections. These compliance tools are designed to ensure that rule compliance would be achieved on a continued basis. As a result, the majority of control measures proposed in this appendix with quantifiable emission reductions are based on a rule effectiveness of 100 percent. With respect to implementation of existing rules, emissions reported through South Coast AQMD's Annual Emission Reporting (AER) program are based on actual emissions, substantiated by source testing or other processing data. Any upset conditions or emissions under variance are also included in the AER.

Format of Control Measures

Included in each control measure description is the title, a summary table, a description of the source category (including background and regulatory history), the proposed method of control, estimated emission reductions, rule compliance, test methods, cost-effectiveness, and references. The information that can be found under each of these subheadings is described below.

Control Measure Number

Each control measure is identified by a control measure number such as "CM # BCM-01" located at the upper right-hand corner of every page. "CM #" signifies "control measure number" and is immediately followed by a three-letter designation, such as "BCM," which represents the abbreviation for a source category or specific programs. For example, "BCM" is an abbreviation for "Best Control Measures." The following provides a description of the abbreviations for each of the measures.

- BCM Best Control Measures
- ECC Energy and Climate Change Sources
- EGM Emission Growth Management Sources
- MOB Mobile Sources

Title

The title contains the control measure name and the major pollutant(s) controlled by the measure.

Summary Table

Each measure contains a table that summarizes the measure and is designed to identify the key components of the control measure. The table contains a brief explanation of the source category, control method, baseline emissions, emission reductions, control costs, and implementing agency.

Some measures in the summary table are listed as “TBD” (to be determined) for emission inventory, emission reductions and/or cost control. The “TBD” measures require further technical and feasibility evaluations to determine the emission reduction potential and thus, the attainment demonstration is not dependent on these measures. However, they are included in the PM2.5 Plan as part of a comprehensive plan with all feasible measures. These measures will require further development after the approval of the Plan, but could be proposed for rule or program development at a later date. Emission reductions achieved and quantified by these measures can be applied toward contingency requirements, make up for any shortfalls in reductions from other quantified measures, be credited towards rate-of-progress reporting, and/or be incorporated into future SIP revisions.

Description of Source Category

This section provides an overall description of the source category and the intent of the control measure. The source category is presented in two sections, background and regulatory history. The background has basic information about the source category such as the number of sources in the South Coast Air Basin (Basin), description of emission sources, and pollutants.

The regulatory history contains information regarding existing regulatory control of the source category such as applicable South Coast AQMD rules or regulations and whether the source category was identified in prior air quality plans.

Proposed Method of Control

The purpose of this section is to identify potential control options an emission source can use to achieve emission reductions. If an expected performance level for a control option is provided, it is intended for informational purposes only and should not be interpreted as the targeted overall control efficiency for the proposed control measure. To the extent feasible, the overall control efficiency for a control measure should take into account achievable controls in the field by various subcategories within the control measure. A more detailed type of this analysis is typically conducted during rulemaking, not in the planning stage. It has been South Coast AQMD's long standing policy not to exclude any control technology and to intentionally identify as many control options as possible to spur further technology development.

In addition to the proposed control methods discussed in each control measure, affected sources may have the option of partially satisfying the emission reduction requirements of each control measure with incentive programs that will become available in the future from the implementation of control measure. Examples of incentive programs currently available and future enhancements to those incentive programs would be described in this section.

Emission Reductions

The emission reductions are estimated based on the baseline inventories prepared for the PM2.5 Plan and are provided in the Control Measure Summary Table. The emissions section of the control measure summary table includes the 2018 base year inventory and the 2030 future year inventory. The 2030 inventory projections reflect implementation of existing adopted rules.

The emission reductions listed in the control measure summary table represent the current best estimates, which are subject to change during rule development. As demonstrated in previous rulemakings, South Coast AQMD is always seeking maximum emission reductions when proven technically feasible and cost-effective. For emission accounting purposes, a weighted average control efficiency is calculated based on the targeted controls. The concept of a weighted average acknowledges the fact that a control measure or rule may consist of several subcategories, and the emission reduction potential for each subcategory is a function of proposed emission limitation and the associated emission inventory. Therefore, the use of control efficiency to estimate emission reductions does not represent a commitment by South Coast AQMD to require emission reductions uniformly across source categories. In addition, due to the current structure of emission inventory reporting system, a control measure may partially affect an inventory source category (e.g., certain size of equipment or certain level of material usage). In this case, an impact factor is incorporated into the calculation of a control efficiency to account for the fraction of inventory affected. During the rule development, the most current inventory will be used. However, for tracking rate-of-progress for the SIP emission reduction commitment, the approved PM2.5 Plan inventory will be used. More specifically, emission reductions that are permanent and achieved due to mandatory or voluntary, but enforceable, actions will be credited towards SIP obligations.

Rule Compliance and Test Methods

This section addresses requirements in the 1990 Clean Air Act by which the U.S. EPA has indicated that it is necessary to have a discussion of rule compliance with each control measure. This section discusses the recordkeeping and monitoring requirements envisioned for the control measure. In general, South Coast AQMD would continue to verify rule compliance through site inspections, recordkeeping, and submittal of compliance plans (when applicable).

In addition to requiring recordkeeping and monitoring requirements, the U.S. EPA has stated that "An enforceable regulation must also contain test procedures in order to determine whether sources are in compliance." This section identifies appropriate approved South Coast AQMD, CARB, and U.S. EPA source test methods.

Cost Effectiveness

Staff relied on control measure cost-effectiveness analyses presented in the 2016 and 2022 AQMPs. Cost-effectiveness approaches include Discounted Cash Flow (DCF), Levelized Cash Flow (LCF), and Modified LCF (MLCF). The approaches differ in how compliance costs are calculated: DCF converts all costs to the present value while LCF annualizes all costs over the equipment life. The conversions are done irrespective of how the compliance costs are actually financed by each affected facility. The difference in cost conversion between DCF and LCF means that the dollar costs of compliance alternatives are expressed at different time periods; therefore, the cost-effectiveness results, albeit both in dollar per ton, are not directly comparable to each other. MLCF is an approach that uses the traditional LCF method, but modifies it to only include costs incurred between 2023-2037, which aligns with the planning horizon in the 2022 AQMP.

The cost-effectiveness values contained herein represent the best available information at this time. As additional information regarding technology, affected facilities, and existing processes becomes available, the cost-effectiveness will be revised and analyzed during rulemaking.

Implementing Agency

This section identifies the agency(ies) responsible for implementing the control measure. Also included in this section is a description of any legal or jurisdictional issues that may affect the control measure's implementation.

References

This section identifies directly cited references, or those references used for general background information.

BCM-01: EMISSION REDUCTIONS FROM REPLACEMENT WITH ZERO EMISSION OR LOW NOx APPLIANCES – RESIDENTIAL WATER HEATING

[PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	RESIDENTIAL WATER HEATING	
CONTROL METHODS:	REGULATORY APPROACH: ZERO EMISSION AND LOW NOX LIMIT, AND INCENTIVE APPROACH: ZERO EMISSION TECHNOLOGY	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
PM2.5 INVENTORY	0.59	0.56
PM2.5 REDUCTION	-	TBD
PM2.5 REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
NOX INVENTORY	1.89	1.80
NOX REDUCTION	-	TBD
NOX REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

Background

Control measure BCM-01 seeks further NOx emission reductions from residential building water heating sources that are subject to Rule 1121 - Control of Oxides of Nitrogen (NOx) from Residential Type, Natural Gas-Fired Water Heaters.

BCM-01 sources were previously included under the 2016 AQMP control measure CMB-02 for NOx emission reductions from residential and commercial appliances, with a control strategy focused on a combination of long-term regulation and short-term incentives to replace existing water heaters with new zero emission or low NOx emission units. BCM-01 is derived from 2022 AQMP control measure R-CMB-01.

Regulatory History

Rule 1121 - Control of Nitrogen Oxides from Residential Type, Natural-Gas-Fired Water Heaters, applies to manufacturers, distributors, retailers, and installers of natural gas-fired water heaters, with heat input rates less than 75,000 Btu per hour. This type of water heater is typically a tank type for residential water heating. Rule 1121, last amended in 2004, requires the implementation of 10 ng/J NOx emission limit, which currently remains one of most stringent NOx standards for this appliance in the nation.

Rule 1121 was originally adopted in 1978, establishing a 40 ng/J NOx emission limit for residential water heaters. This rule was amended in 1999 to lower the emission limit by two steps, from 40 ng/J to 20 ng/J on July 1, 2002 (interim limit) and then 10 ng/J on January 1, 2005 (final limit). The rule was amended in 2004 to extend the compliance date for the final rule limit. With that amendment, the final emission limit of 10 ng/J became applicable on January 1, 2006, for conventional water heater of 50-gallon capacity or less, on January 1, 2007 for conventional water heater greater than 50 gallon capacity, and on January 1, 2008 for direct-vent, power-vent, and power direct-vent water heaters. Manufacturers paid a mitigation fee during the interim period prior to the final compliance date.

Proposed Method of Control

Control measure BCM-01 seeks NOx emission reductions from residential building water heating sources by: (1) requiring zero emission water heating units through a regulatory approach for both new and existing residences; and (2) allowing low NOx technologies as a transitional alternative in lieu of installing and operating zero emission water heaters, when installing a zero emission unit is determined to be infeasible (e.g., colder climate zones, or architecture design obstacles). A mitigation fee will be considered where appropriate. The mitigation fee collected would be utilized as incentives to accelerate the adoption of zero emission units.

A primary zero emission residential water heating technology is the all-electric heat pump water heater. Most homeowners who have heat pumps use them to heat and cool their homes. But a heat pump also can be used to heat water, either as stand-alone water heating system, or as a combination water heating and space conditioning system. Because they remove heat from the air, any type of air-source heat pump system works more efficiently in a warm climate. Manufacturers' heat pump water heater development involves expanding the number of available models, further improving unit energy efficiency, enhancing heat pump performance for colder weather, and developing a heat pump water heater that can operate from a (residential standard) 120-volt plug-in. The low power 120-volt design can plug into existing wall outlets without requiring expensive panel upgrades and/or home rewiring that can be required for traditional heat pumps that require 240-volts, providing a more cost-effective solution for retrofit applications.

The primary lower NOx water heating technologies include fuel cell water heaters and gas heat pump water heaters. Residential fuel cells used for the generation of electricity and hot water have been available commercially in Europe since 2009. This technology is yet to be utilized in the United States market. A residential fuel cell with a hot water storage tank is a suitable technology to provide hot water usage for a small number of residents. South Coast AQMD also has funded a natural gas heat pump water heater demonstration by Stone Mountain Technologies. A natural gas heat pump water heater is another lower NOx emission technology that uses a natural gas fired engine instead of electricity, to drive the heat pump compressor. Control measure BCM-01 also proposes to incentivize zero emission technologies adoption with a focus on electric panel upgrades needed for older homes especially for homes in disadvantaged communities. The collected mitigation fees would fund the incentives. Staff plans to allocate a significant percentage of funding to residents in disadvantaged communities and offer higher rebate amounts to those residents. Furthermore, staff will conduct outreach to disadvantaged communities including public meetings to gain feedback on the incentive program development and processes. The incentive approach would not only promote more participation in building electrification but also provide an opportunity to address any potential inequities on cost burden by allocating a portion of funding to overburdened communities. During rule development, staff will consider technical feasibility, identify industry-specific affordability issues, cost-effectiveness and incremental cost-effectiveness, and may consider alternative compliance mechanisms.

Incentives Implementation

Integrity Elements

Emission reductions that are projected to be achieved from the voluntary incentive measures must be demonstrated to be quantifiable, surplus, enforceable, and permanent. This demonstration must include project type(s); project life; applicable incentive program guideline(s), by title, year, chapter(s); and analysis of applicable incentive program guideline(s) for consistency with integrity elements. The following describes the definitions and provides examples of the key elements of such a demonstration:

- <u>Quantifiable</u>: Emission reductions are quantitatively measurable supported by existing and acceptable technical data. The quantification should use well-established, publicly available, and approved emission factors and accepted calculation methodology. There must be procedures to evaluate and verify over time the level of emission reductions actually achieved.

Potential emission reductions associated with various equipment types are discussed in the Proposed Method of Control section. The following table provides an overview of the sources, emission reductions, and proposed incentives for targeted sources.

- Surplus: Emission reductions must be above and beyond any South Coast AQMD, state, or federal regulation. Emission reductions used to meet air quality attainment requirements are surplus as long as they are not otherwise relied on in the State Implementation Plan (SIP), SIP-related requirement, other State air quality programs adopted but not in the SIP, a consent decree, or federal rules that focus on reducing criteria pollutants or their precursors. In the event that SIP emission reductions are relied on to meet air quality-related program requirements, they are no longer surplus. In addition, the emission reductions are available only for the remaining useful life of the equipment being replaced (e.g., if the equipment being replaced had a remaining useful life of five years, the additional emission reductions from the new equipment are available for SIP or conformity purposes under this guidance for only five years).

- Enforceable: The South Coast AQMD will be responsible for assuring that the emission reductions credited in the SIP will occur. Emission reductions and other required actions are enforceable if:

  - They are independently verifiable;
  - Program violations are defined;
  - Those liable for emission reductions can be identified;
  - The South Coast AQMD and the U.S. EPA maintain the ability to apply penalties and secure appropriate corrective action where applicable;
  - The general public have access to all the emissions-related information obtained from the source;
  - The general public can file suits against sources for violations (with the exception of those owned and operated by Tribes); and
  - They are practically enforceable in accordance with other U.S. EPA guidance on practicable enforceability.

  Actual emission reductions, for example, can be assured through the replacement equipment registration, recordkeeping and reporting, and inspections (initial inspection after installation and subsequent on a regular basis thereafter, if needed) throughout the term. Specific enforcement mechanisms will be addressed in the guidelines for the individual incentive measures.

- Permanent: The emission reductions need to be permanent throughout the term for which the credit is generated. The emission reductions are permanent if these reductions are ensured to occur over the duration of the SIP program, and for as long as they are relied on in the SIP.

  For example, those awarded incentives would need to ensure the projects are properly implemented and the reductions are occurring and will continue to occur. Thus, recipients of the incentive awards would agree to contract provisions, such as recordkeeping and reporting to track reductions and agreements that newly installed equipment would not be removed without concurrence with the South Coast AQMD (i.e., permanent placement) and the proof that the replaced equipment would be destructed or at least not be operated any more in the Basin (e.g., pictures, certification). Detailed procedures to ensure permanent reductions will be described in the guidelines for the individual incentive measures.

Guidelines

Each SIP needs to have detailed and comprehensive guidelines that are approved by the South Coast AQMD Governing Board. The guidelines will be the protocol to implement the program, to ensure SIP applicability, and to maintain SIP approvability:

- ☑ SIP should demonstrate compliance with the four key elements of the SIP: quantifiable emissions plus incentive costs, surplus reductions, enforceable compliance, and permanent reductions.
- ☑ A working group should be established to solicit public input and feedback during SIP guideline development.
- ☑ Process and procedures to apply for incentives should be clearly explained in the guideline.
- ☑ It needs to clearly describe how incentives would be awarded (e.g., priority to high emitters and/or age of equipment, tiered process, first come first serve, or EJ area priority).
- ☑ It should have conditions of some form for agreement (e.g., contracts) including tracking and ensuring permanent reductions. The following forms should be prepared:
  - ☑ Application Forms (samples are required).
  - ☑ Contracts with Conditions (samples are required).
  - ☑ Product Example.
- ☑ Tracking mechanism is required to ensure overall effectiveness of program and procedures to correct emission projections, such as reductions by the committed target date and submittal to the U.S. EPA annually. Tracking checklist should include:
  - ☑ Project Title.
  - ☑ Product.
  - ☑ Annual Emission Reductions (e.g., from 2030 to 2050, incremented by one year).
  - ☑ Life of project (e.g., 10 years).
  - ☑ Installation dates (e.g., fixed year 2030 or multiple installation years 2017 and 2018).
- ☑ Possible recordkeeping, reporting, and monitoring requirements need to be addressed.
- ☑ Individual outreach efforts (e.g., social media, email blasts) to promote the program, make aware of deadlines to apply, and provide timing locations of workshops.

- ☑ Program guidelines should be approved by the South Coast AQMD Governing Board and published online.

Emission Reductions

To be determined.

Rule Compliance and Test Methods

South Coast AQMD Method 100.1

Cost Effectiveness

To be determined.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from these stationary sources.

References

South Coast Air Quality Management District. (2004). Rule 1121 – Control of Nitrogen Oxides from Residential Type, Natural Gas-Fired Water Heaters (Amended September 3, 2004).

South Coast Air Quality Management District. (2004). Final Staff Report: Proposed Amended Rule 1121 – Control of Nitrogen Oxides from Residential Type, Natural Gas-Fired Water Heaters. South Coast Air Quality Management District. August 2004.

South Coast Air Quality Management District. (2017). Final 2016 Air Quality Management Plan. South Coast Air Quality Management District. March 2017.

Department of Energy. Heat Pump Water Heater. https://www.energy.gov/energysaver/water-heating/heat-pump-water-heaters

Energy-Solution. California TECH Initiative. https://energy-solution.com/tech/

Advanced Water Heating Initiative. 120-Volt Heat Pump Water Heater Technology Validation and Commercialization. https://www.advancedwaterheatinginitiative.org/120v-field-study

Southern California Gas Company. Residential Natural Gas-fueled Heat Pump Water Heaters – Technology Advancements & Demonstration. https://www.socalgas.com/sustainability/research-and-development

Southern California Gas Company. (2018). Proposal in response to South Coast AQMD Air Pollution Control Projects that Reduce/Mitigate Emissions/Toxic Exposure P2018-06: Residential Fuel Cell Demonstration with Integrated PV and Storage. April 10, 2018.

California Air Resources Board, Proposed 2022 State SIP Strategy Appendix A: Economic Analysis, September 2022. https://ww2.arb.ca.gov/sites/default/files/2022-09/2022_State_SIP_Strategy_App_A.pdf

California Energy Commission. (2021). Building Energy Efficiency Measure Proposal to the California Energy Code, Title 24, Part 6 Building Energy Efficiency Standards Residential Electric Baseline – Residential HVAC and Residential Water Heating. May 2021.

Application of Southern California Edison Company for Approval of its Building Electrification Programs. December 2021. https://docs.cpuc.ca.gov/SearchRes.aspx?docformat=ALL&docid=432773552

BCM-02: EMISSION REDUCTIONS FROM REPLACEMENT WITH ZERO EMISSION OR LOW NOx APPLIANCES – RESIDENTIAL SPACE HEATING

[PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	RESIDENTIAL SPACE HEATING	
CONTROL METHODS:	REGULATORY APPROACH: ZERO EMISSION AND LOW NOX LIMIT, AND INCENTIVE APPROACH: ZERO EMISSION TECHNOLOGY	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
PM2.5 INVENTORY	0.90	0.88
PM2.5 REDUCTION	-	TBD
PM2.5 REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
NOX INVENTORY	11.66	7.64
NOX REDUCTION	-	TBD
NOX REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

Background

Control measure BCM-02 seeks nitrogen oxides (NOx) emission reductions from residential space heating sources regulated by Rule 1111 - Reduction of NOx Emissions from Natural-Gas-Fired, Fan-Type Central Furnaces.

BCM-02 sources were previously included under the 2016 AQMP control measure CMB-02 for NOx emission reductions from residential and commercial appliances, with a control strategy focused on implementing 14 ng/J Rule 1111 NOx limit and the associated Clean Air Furnace Rebate Program. BCM-02 is derived from 2022 AQMP control measure R-CMB-02.

Regulatory History

Rule 1111 reduces emissions of NOx from gas-fired fan-type space heating furnaces with a rated heat input capacity of less than 175,000 Btu per hour or, for combination heating and cooling units, a cooling rate of less than 65,000 Btu per hour. The rule applies to manufacturers, distributors, and installers of such furnaces. The applicable furnaces are mainly utilized in residential buildings.

Rule 1111 was adopted by the South Coast AQMD Governing Board in December 1978 establishing a 40 ng/J NOx emission limit. The rule was amended in 2009 lowering the NOx emission limit from 40 to 14 ng/J with a future compliance date. Rule 1111 categorizes furnaces into condensing, non-condensing, weatherized furnaces, and mobile home furnaces. Depending on the furnace type, the compliance date has been postponed by the mitigation fee alternate compliance option or temporary exemption.

Implementation of 14 ng/J NOx limit for condensing and non-condensing furnaces (about 85 percent of market coverage) for installations in new buildings or replacements in existing buildings started on October 1, 2019, except for high-altitude furnaces.[28] Implementation of 14 ng/J NOx limit for weatherized furnaces (about 10 percent of market coverage) commenced on October 1, 2021. The most recent Rule 1111 amendment in September 2021 delayed the implementation for mobile home furnaces (about 4 percent of market coverage) to October 1, 2023 and provided special consideration for high-altitude furnaces. That is, condensing or non-condensing furnaces with 40 ng/J NOx are allowed to be installed in high-altitude areas until March 31, 2022, when 14 ng/J NOx limit becomes effective. Rule 1111 also provides an exemption for downflow and large-sized (≥100,000 Btu/hour) condensing or non-condensing furnaces, replacing existing furnaces in the high-altitude areas. This niche exemption would result in a negligible amount of emission reductions forgone.

In conjunction with the Rule 1111 implementation, the Clean Air Furnace Rebate Program was launched in June 2018 with a fund of $3,000,000 to incentivize early deployment of compliant furnaces, which was

[28] Condensing or non-condensing furnaces installed at elevations greater than or equal to 4,200 feet above sea level

subsequently exhausted. So, in September 2020 this program was approved to be updated with an additional fund of $3,500,000 and expanded to incentivize all-electric heat pumps to replace central ducted Rule 1111 non-compliant furnaces. Relevant to the 2016 AQMP CMB-02 implementation, a request for proposal was issued in January 2018 and twenty-six proposals for emission reduction and technology demonstration projects were approved to be funded by the Governing Board in January 2019. Among those proposals, one burner technology development project was for residential and commercial furnaces targeting NOx emissions to be certified ranging from 7 to 8 ng/J. Although the Covid-19 pandemic caused a delay, those projects were completed in 2023. Current rulemaking is focused on zero emission standards in order to achieve air quality objectives.

Proposed Method of Control

Control measure BCM-02 seeks NOx emission reductions from residential building space heating sources by: (1) requiring zero emission space heating units through a regulatory approach for both new and existing residences; and (2) allowing low NOx technologies as a transitional alternative in lieu of installing and operating zero emission space heating units, when installing a zero emission unit is determined to be infeasible (e.g., colder climate zones, or architecture design obstacles). A mitigation fee will be considered where appropriate. The mitigation fee collected would be utilized as incentives to accelerate the adoption of zero emission units.

With regards to zero emission technologies, all-electric heat pumps offer an energy-efficient and zero emission alternative to natural gas furnaces. There are three types of heat pumps: (1) air-to-air, (2) water source, and (3) geothermal. The heat pump choice depends on whether the unit transfers heat between the building and outside air, water, or ground. The most common type is the air source heat pump. According to the United States Department of Energy, today's heat pump systems can reduce household electricity use for heating by approximately 50 percent compared to electric resistance heating such as furnaces and baseboard heaters. High-efficiency heat pumps also dehumidify better than standard central air conditioners, resulting in less energy usage and more cooling comfort during the summer months. For homes without ducts, air source heat pumps are also available in a ductless version, referred as a split system. Heat pumps have been used for many years in nearly all areas of the United States. However, when utilized in warmer climate zones such as in the South Coast Air Basin (Basin), heat pumps are even more energy-efficient and cost-effective.

A new type of heat pump for residential systems is the absorption heat pump, also called a natural gas heat pump, which is considered a low NOx emission technology. Instead of using electricity to fuel the operation, a natural gas heat pump has a natural gas fired engine to drive the heat pump compressor.

Current Rule 1111 compliant furnaces are certified at achieving 14 ng/J NOx level, however, many of these furnace models were tested below 10 ng/J for NOx emissions. Staff reviewed the source test results for 24 base models that were certified in 2021 at 14 ng/J NOx emissions. Fifteen models tested below 10 ng/J NOx level, and six of them were at or below 7 ng/J NOx level. Furthermore, lower NOx emission rates are expected by new burner development projects as demonstrated by burner development projects currently funded by South Coast AQMD. For example, Lantec Products has completed the burner design, operational testing, and certification of residential condensing and non-condensing furnaces emitting no more than 7 ng/J NOx, and will seek to commercialize in the near future. Low NOx space heating technologies would provide an alternative or off-ramp for situations when zero emission requirement is deemed not as feasible/efficient. The examples could include buildings in a cooler climate zone, or structures with special design or function.

In addition to a regulatory approach, incentives for the purchase and installation of zero emission technology (e.g., electric heat pump) or electric panel upgrade would be considered under this control measure not only for additional emission reductions, but also to encourage further development of future zero emission space heating technology for existing residential buildings. With the additional Rule 1111 mitigation fees that have been collected and utilization of the existing Clean Air Furnace Rebate Program, future Rule 1111 incentives could be readily implemented. During rule development, staff will consider technical feasibility, identify industry-specific affordability issues, cost-effectiveness and incremental cost-effectiveness, and may consider alternative compliance mechanisms. Incentives for residents to adopt zero-emission appliances would not only promote more participation in building electrification, but also provide an opportunity to address some of the inequities by allocating a significant percentage of funding to residents in disadvantaged communities and offering higher rebate amounts to those residents. Staff plans to conduct outreach to disadvantaged communities including public meetings to gain feedback on program development and processes.

Incentives Implementation

Integrity Elements

Emission reductions that are projected to be achieved from the voluntary incentive measures must be demonstrated to be quantifiable, surplus, enforceable, and permanent. This demonstration must include project type(s); project life; applicable incentive program guideline(s), by title, year, chapter(s); and analysis of applicable incentive program guideline(s) for consistency with integrity elements. The following describes the definitions and provides examples of the key elements of such a demonstration:

- Quantifiable: Emission reductions are quantitatively measurable supported by existing and acceptable technical data. The quantification should use well-established, publicly available, and approved emission factors and accepted calculation methodology. There must be procedures to evaluate and verify over time the level of emission reductions actually achieved.

  Potential emission reductions associated with various equipment types are discussed in the Proposed Method of Control section. The following table provides an overview of the sources, emission reductions, and proposed incentives for targeted sources.

- Surplus: Emission reductions must be above and beyond any South Coast AQMD, state, or federal regulation. Emission reductions used to meet air quality attainment requirements are surplus as long as they are not otherwise relied on in the State Implementation Plan (SIP), SIP-related requirement, other State air quality programs adopted but not in the SIP, a consent decree, or federal rules that focus on reducing criteria pollutants or their precursors. In the event that SIP emission reductions are relied on to meet air quality-related program requirements, they are no longer surplus. In addition, the emission reductions are available only for the remaining useful life of the equipment being replaced (e.g., if the equipment being replaced had a remaining useful life of five years, the additional emission reductions from the new equipment are available for SIP or conformity purposes under this guidance for only five years).

- Enforceable: The South Coast AQMD will be responsible for assuring that the emission reductions credited in the SIP will occur. Emission reductions and other required actions are enforceable if:

    - They are independently verifiable;
    - Program violations are defined;
    - Those liable for emission reductions can be identified;
    - The South Coast AQMD and the U.S. EPA maintain the ability to apply penalties and secure appropriate corrective action where applicable;
    - The general public have access to all the emissions-related information obtained from the source;
    - The general public can file suits against sources for violations (with the exception of those owned and operated by Tribes); and
    - They are practically enforceable in accordance with other U.S. EPA guidance on practicable enforceability.

  Actual emission reductions, for example, can be assured through the replacement equipment registration, recordkeeping and reporting, and inspections (initial inspection after installation and subsequent on a regular basis thereafter, if needed) throughout the term. Specific enforcement mechanisms will be addressed in the guidelines for the individual incentive measures.

- Permanent: The emission reductions need to be permanent throughout the term for which the credit is generated. The emission reductions are permanent if these reductions are ensured to occur over the duration of the SIP program, and for as long as they are relied on in the SIP.

  For example, those awarded incentives would need to ensure the projects are properly implemented and the reductions are occurring and will continue to occur. Thus, recipients of the incentive awards would agree to contract provisions, such as recordkeeping and reporting to track reductions and agreements that newly installed equipment would not be removed without concurrence with the South Coast AQMD (i.e., permanent placement) and the proof that the replaced equipment would be destructed or at least not be operated any more in the Basin (e.g., pictures, certification). Detailed procedures to ensure permanent reductions will be described in the guidelines for the individual incentive measures.

Guidelines

Each SIP needs to have detailed and comprehensive guidelines that are approved by the South Coast AQMD Governing Board. The guidelines will be the protocol to implement the program, to ensure SIP applicability, and to maintain SIP approvability:

- ☑ SIP should demonstrate compliance with the four key elements of the SIP: quantifiable emissions plus incentive costs, surplus reductions, enforceable compliance, and permanent reductions.
- ☑ A working group should be established to solicit public input and feedback during SIP guideline development.
- ☑ Process and procedures to apply for incentives should be clearly explained in the guideline.
- ☑ It needs to clearly describe how incentives would be awarded (e.g., priority to high emitters and/or age of equipment, tiered process, first come first serve, or EJ area priority).
- ☑ It should have conditions of some form for agreement (e.g., contracts) including tracking and ensuring permanent reductions. The following forms should be prepared:
    - ☑ Application Forms (samples are required).
    - ☑ Contracts with Conditions (samples are required).
    - ☑ Product Example.
- ☑ Tracking mechanism is required to ensure overall effectiveness of program and procedures to correct emission projections, such as reductions by the committed target date (e.g., 2031, 2037) and submittal to the U.S. EPA annually. Tracking checklist should include:
    - ☑ Project Title.
    - ☑ Product.
    - ☑ Annual Emission Reductions (e.g., from 2030 to 2050, incremented by one year).
    - ☑ Life of project (e.g., 10 years).
    - ☑ Installation dates (e.g., fixed year 2030 or multiple installation years 2017 and 2018).
- ☑ Possible recordkeeping, reporting, and monitoring requirements need to be addressed.
- ☑ Individual outreach efforts (e.g., social media, email blasts) to promote the program, make aware of deadlines to apply, and provide timing locations of workshops.
- ☑ Program guidelines should be approved by the South Coast AQMD Governing Board and published online.

Emission Reductions

To be determined.

Rule Compliance and Test Methods

South Coast AQMD Method 100.1

Cost Effectiveness

To be determined.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from these stationary sources.

References

South Coast Air Quality Management District. (2021). Rule 1111 – Reduction of NOx Emissions from Natural-Gas-Fired, Fan-Type Central Furnaces (Amended October 3, 2021).

South Coast Air Quality Management District. (2017). Final 2016 Air Quality Management Plan. South Coast Air Quality Management District. March 2017.

South Coast Air Quality Management District. (2021). Staff Report: Proposed Amended Rule 1111 – NOx Emissions from Natural-Gas-Fired, Fan-Type Central Furnaces. South Coast Air Quality Management District. September 2021.

South Coast Air Quality Management District. (2018). Board meeting agenda No.3: Issue RFP for Emission Reduction Projects Using Incentive Funding from SOUTH COAST AQMD Special Revenue Funds, Allocate Funds, and Execute Contract. January 5, 2018.

South Coast Air Quality Management District. Clean Air Furnace Rebate Program: https://www.cleanairfurnacerebate.com/

U.S. Department of Energy. Heat Pump Systems. https://www.energy.gov/energysaver/heat-pump-systems

California Energy Commission. Workshops, Notices, and Documents for 2022 Building Energy efficiency Standards. https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/2022-building-energy-efficiency-0

California Energy Commission. (2021). Staff presentation at the Lead Commissioner Hearing, 2022 energy code update rulemaking. May 24, 2021.

E3 study on Residential Building Electrification in California. April 2019. Available at: https://www.ethree.com/wpcontent/uploads/2019/04/E3_Residential_Building_Electrification_in_California_April_2019.pdf

LANTEC Products. (2018). Proposal in response to South Coast AQMD Air Pollution Control Projects that Reduce/Mitigate Emissions/Toxic Exposure P2018-06: Next Generation Ultra Low NOx Forced Air Furnace. April 11, 2018.

Energy-Solution. California TECH Initiative. https://energy-solution.com/tech/

Application of Southern California Edison Company for Approval of its Building Electrification Programs. December 2021. Available at: https://docs.cpuc.ca.gov/SearchRes.aspx?docformat=ALL&docid=43277355

BCM-03: EMISSION REDUCTIONS FROM RESIDENTIAL COOKING DEVICES

[PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	RESIDENTIAL COOKING DEVICES	
CONTROL METHODS:	Low NOx Burners, Induction Cooktops and Electric Cooking Devices	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
PM2.5 INVENTORY	0.10	0.10
PM2.5 REDUCTION	-	TBD
PM2.5 REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
NOX INVENTORY	1.28	1.23
NOX REDUCTION	-	TBD
NOX REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

Control Measure BCM-03 seeks to achieve NOx reductions from residential cooking devices including stoves, ovens, griddles, broilers, and others in new and existing residential buildings. Natural gas and electricity are the two main types of energy sources used in this source category. Conventional gas cooking appliances typically use atmospheric burners that mix primary air with fuel gas to create a combustible mixture.[29] Gas cooking devices emit criteria pollutants such as NOx, particulate matter, and CO through incomplete combustion and oxidation processes. Electric cooking devices and induction cooktops that utilize electricity rather than gas do not generate NOx emissions on site. Induction cooktops are also highly energy efficient as they heat cookware directly, resulting in minimal heat loss. Replacing existing gas burners with zero emission and low NOx emission appliances such as electric cooking devices, induction cooktops, and low NOx gas burners can reduce emissions from residential cooking devices. Some emission sources in BCM-03 were previously included in the 2016 AQMP as control measure CMB-04, which addresses NOx emission reductions from restaurant burners and residential cooking. The proposed method of control for CMB-04 in the 2016 AQMP was a combination of regulatory approaches, incentives and/or efficiency standards. BCM-03 is derived from 2022 AQMP control measure R-CMB-03.

Background

There are over 5.3 million occupied housing units in the South Coast Air Basin (Basin). Almost 75 percent of these households use gas appliances for cooking, while the remaining households use electric cooking devices, induction cooktop, and other fuels.[30] The transition from conventional gas burners to electric cooking devices, induction cooktops, or low NOx gas burners would improve both indoor and outdoor ambient air quality.

As part of the 2022 State Strategy for the State Implementation Plan (2022 State SIP Strategy), the California Air Resources Board (CARB) has proposed statewide emissions standards for combustion-based appliances in residential and commercial buildings to accelerate the transition from fossil fuels. CARB proposed to adopt a statewide zero Greenhouse Gas (GHG) emissions standard for space and water heaters, which would have co-benefits of reducing criteria pollutants. Beginning in 2030, 100 percent of sales of new space and water heaters would need to meet zero emission standards. This requirement applies to both new construction and replacement of burned-out equipment in existing buildings. As part of the public measure suggestions, the 2022 State SIP Strategy includes the possibility of additional emissions standards for combustion-based appliances used in buildings such as stoves, work with air districts to set further such standards, work with building and energy code agencies to ready more buildings for zero emission appliances, or take other actions (including potentially incentive programs) to accelerate the removal of fossil fuels from the building stock in both new and existing buildings. Such measures can accelerate the transition away from pollution associated with combustion in these sources while creating economic opportunities for building retrofits.[31]

Regulatory History

NOx emissions from residential cooking devices are not currently regulated by South Coast AQMD. In the last few years, the State of California has established aggressive goals to reduce GHG emissions across various sectors. State climate actions can help reduce combustion-related emissions from residential

[29] Primary air - air supplied and mixed with fuel prior to ignition that controls the amount of fuel to be burned
[30] 2019 California Residential Appliance Saturation Study
[31] CARB 2022 State Strategy for the State Implementation Plan

cooking appliances. Senate Bill (SB) 100 signed in 2018 increased California's Renewables Portfolio Standard (RPS) to 60 percent renewable energy sources by 2030. California Governor's Executive Order (EO) B-55-18 established the goal of carbon neutrality and 100 percent carbon-free energy sources by 2045. The increase in renewable generation in the state will reduce NOx emissions from electricity generating facilities.[32] Furthermore, Assembly Bill (AB) 3232 requires the California Energy Commission (CEC) in consultation with the California Public Utilities Commission (CPUC) and CARB, to develop plans and projections to reduce greenhouse gas emissions from California's residential and commercial buildings to 40 percent below 1990 levels by 2030. Once materialized, AB 3232 is an opportunity to bring further NOx emission reductions from residential and commercial buildings.

Proposed Method of Control

This proposed control measure seeks NOx reductions from residential cooking devices by replacing conventional gas-fired cooking appliances with zero emission and low NOx emission devices such as electric cooking devices, induction cooktops, and low NOx burner technologies.

In the South Coast Air Basin, residential cooking accounts for about 11 percent of total residential combustion emissions in 2018. Electric and induction cooking devices offer the most reductions opportunities with no emissions on site and have been commercially available for years. Electric cooking devices include a coil or infrared heating element that generates heat by electric current and are often inexpensive due to their simple design. High efficiency induction cooktops do not have an open flame and transfer heat directly through magnetic cookware which minimizes heat loss to ambient air. Consequently, this reduces cooking times and NOx emissions and adds extra safety in food preparation. Low NOx gas burners can also provide NOx reductions compared to conventional burners. Organizations such as the Lawrence Berkeley National Laboratory (LBL) have developed a low NOx Ring Burner that can be used for residential and commercial gas cooking devices, as well as other appliances such as water heaters and furnaces. The low NOx Ring Burner can achieve NOx levels of less than 20 ppm, which is about 80 percent lower than the emissions from conventional gas burners.[33] Reductions are achieved by a ring burner design that burns a leaner premixed fuel/air mixture capable of more complete combustion and lower NOx emissions. Additional research and development with an Original Equipment Manufacturer (OEM) are needed for the LBL Ring Burner to meet the American National Standards Institute (ANSI) cooktop standards for commercialization.

NOx reductions could be achieved through a combination of regulatory and incentive approaches. Proposed method of control consists of two steps: step one is a technology assessment including testing of various cooking devices to establish emissions rates. Once emissions rates are defined, step two supports future rule development and incentive programs. The first applies to manufacturers, distributors, and installers establishing emission limits and the latter intends to encourage use of zero emission and low NOx emission technologies. The rule working group will include a diverse group of

[32] 2021 SB 100 Joint Agency Report

[33] Research and Development of Natural Draft Ultra-Low Emissions Burners for Gas Appliances

stakeholders representing manufacturers, distributors, and installers. As for the incentive approach, South Coast AQMD will consider funding various projects/programs to facilitate the deployment of zero emission and low NOx emission appliances, including, but not limited to technology development, public outreach to promote consumers' choice for clean technology, incentive funding for the purchase and installation of clean technology appliances. Partnerships with utilities will be pursued to implement incentive programs that maximize reductions in a cost-effective manner. Implementation of this control measure will be a combination of regulatory and incentive approaches. During rule development, staff will consider technical feasibility, identify industry-specific affordability issues, cost-effectiveness and incremental cost-effectiveness, and may consider alternative compliance mechanisms. Incentives for residents to adopt zero_-emission appliances would not only promote more participation in building electrification, but also provide an opportunity to address some of the inequities by allocating a significant percentage of funding to residents in disadvantaged communities and offering higher rebate amounts to those residents. Staff plans to conduct outreach to disadvantaged communities including public meetings to gain feedback on program development and processes.

Emission Reductions

To be determined.

Rule Compliance and Test Methods

South Coast AQMD Method 100.1

Cost Effectiveness

To be determined.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from these stationary and area sources.

References

California Energy Commission, 2019 California Residential Appliance Saturation Study, August 2021. https://www.energy.ca.gov/data-reports/surveys/2019-residential-appliance-saturation-study

California Air Resources Board, 2022 State Strategy for the State Implementation Plan, January 2022. https://ww2.arb.ca.gov/resources/documents/2022-state-strategy-state-implementation-plan-2022-state-sip-strategy

California Energy Commission, 2021 SB 100 Joint Agency Report, September 2021. https://www.energy.ca.gov/publications/2021/2021-sb-100-joint-agency-report-achieving-100-percent-clean-electricity

Lawrence Berkeley National Laboratory, Research and Development of Natural Draft Ultra-Low Emissions Burners for Gas Appliances, September 2016. https://www.osti.gov/biblio/1377849

California Statewide Reach Codes Program. https://localenergycodes.com/

Energy and Environmental Economics, Inc., Residential Building Electrification in California, April 2019. https://www.ethree.com/wp-content/uploads/2019/04/E3_Residential_Building_Electrification_in_California_April_2019.pdf

California Energy Commission, Final 2021 Integrated Energy Policy Report Volume I: Building Decarbonization, February 2022. https://efiling.energy.ca.gov/GetDocument.aspx?tn=241361

Frontier Energy, Residential Cooktop Performance and Energy Comparison Study, July 2019. https://frontierenergy.com/wp-content/uploads/Residential-Cooktop-Performance-and-Energy-Comparison-Study_Induction-Range-Report-July-2019-Frontier-Energy.pdf

Navigant Consulting, Inc., Impacts of Residential Electrification, August 2018. https://efiling.energy.ca.gov/GetDocument.aspx?tn=224761

California Public Utilities Commission, Utility Costs and Affordability of the Grid of the Future, May 2021. https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/office-of-governmental-affairs-division/reports/2021/senate-bill-695-report-2021-and-en-banc-whitepaper_final_04302021.pdf

U.S. Energy Information Administration, 2020 Utility Bundled Sales to Ultimate Customers- Residential. https://www.eia.gov/electricity/sales_revenue_price/pdf/table6.pdf

Solar Energy Industries Association. https://www.seia.org/states-map

UCLA Fielding School of Public Heath, Effects of Residential Gas Appliances on Indoor and Outdoor Air

Quality and Public Health in California, April 2020. https://coeh.ph.ucla.edu/effects-of-residential-gas-appliances-on-indoor-and-outdoor-air-quality-and-public-health-in-california/

California Energy Commission, Building Energy Efficiency Standards - Title 24. https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards

South Coast Air Quality Management District, 2016 Air Quality Management Plan, September 2011.http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2016-air-quality-management-plan/final-2016-aqmp/final2016aqmp.pdf?sfvrsn=15

BCM-04: EMISSION REDUCTIONS FROM REPLACEMENT WITH ZERO EMISSION OR LOW NOx APPLIANCES – RESIDENTIAL OTHER COMBUSTION SOURCES

[PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	RESIDENTIAL - OTHERS	
CONTROL METHODS:	REGULATORY APPROACH: ZERO EMISSION AND LOW NOX LIMIT, AND INCENTIVE APPROACH: ZERO EMISSION TECHNOLOGY	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
PM2.5 INVENTORY	0.22	0.23
PM2.5 REDUCTION	-	TBD
PM2.5 REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
NOX INVENTORY	3.53	3.74
NOX REDUCTION	-	TBD
NOX REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

Background

Control measure BCM-04, as residential-others, seeks NOx emission reductions from residential combustion sources using natural gas and Liquefied petroleum gas (LPG) that are not water heating (See BCM-01), space heating (See BCM-02) and cooking equipment (See BCM-03). BCM-04 sources are miscellaneous, but primarily comprised of swimming pool heaters, laundry dryers, and barbecue grills. Further study is needed to identify other equipment that would be subject to this control measure. Such a study should be included in future rulemaking efforts.

Pool heaters are regulated under Rule 1146.2. Natural gas pool heaters normally have a capacity ranging from 75,000 to 450,000 Btu per hour. The 2012 AQMP estimated that there were about 200,000 residential pool heaters in the South Coast Air Basin (Basin).

According to the U.S. Department of Energy, laundry dryers with drum sizes less than 4.4 cubic feet are deemed as “compact sized” and dryers with drum sizes equal to or large than 4.4 cubic feet are classified as “standard sized.” Residential laundry dryer drum volumes may be compact sized but for gas models typical drum volumes are between 5.6 and 7.4 cubic feet with heat input ratings between 20,000 and 25,000 Btu/hour.

The laundry market is composed of both gas and electric devices. Gas laundry dryers can be fueled by either natural gas or LPG gas. Most electric dryers operate on 240-volt to heat the equipment’s coils. This is about twice the voltage used to operate the standard household devices. Some compact or portable electric dryers may operate on 110-volts. Gas and electric dryers typically have about the same equipment life. According to H&R Block (usnews.com), a gas dryer’s expected lifespan is about 13 years, compared to an electric dryer’s expected lifespan of 14 years.

According to a 2009 report by the Environmental Council of the States (ECOS), in 2008 U.S. consumers purchased nearly 7 million clothes dryers, of which 5.62 million were electric and 1.35 million were natural gas. That would mean 32,400 annual consumer purchase of natural gas residential laundry dryers in the South Coast Air Basin. This estimation is based on a 12 percent nationwide purchase being in California (California Energy Commission, 2013), and 20 percent California purchase being within the Basin.

For barbecue grills, according to www.statista.com, a 2013 study by Hearth, Patio & Barbecue Association found that 61 percent of users opted for gas grills and 10 percent of users owned electric rigs. In 2018, gas barbecue grill sales in the United States amounted to about 1.32 billion U.S. dollars. According to www.theatlantic.com, Hearth, Patio & Barbecue Association believes that the electric-grill market is expected to continue to grow at an average rate of 7 percent a year.

BCM-04 sources were previously included as a part of control measure CMB-02 in 2016 AQMP for NOx emission reductions from residential and commercial appliances, with a control strategy focused on regulating those currently unregulated commercial furnaces used for space heating and incentivizing zero emission and low NOx emission technology appliances. BCM-04 is derived from 2022 AQMP control measure R-CMB-04.

Regulatory History

Pool heaters are regulated under Rule 1146.2 - Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers and Process Heaters. The provisions of this rule are applicable to manufacturers, distributors, retailers, installers, and operators of new units with a rating at or less than 2,000,000 BTU per hour, excluding units regulated by Rule 1121. The provisions of this rule are also applicable to operators of existing units that are rated greater than 400,000 BTU per hour up to and including 2,000,000 BTU per hour. Rule 1146.2 does not regulate residential gas-fired tank type water heaters less than 75,000 BTU/hour heat input which are regulated under South Coast AQMD Rule 1121. Rule 1146.2 units are typically used for industrial and commercial water heating. Pool heaters are also regulated under Rule 1146.2. Natural gas pool heaters normally have a capacity ranging from 75,000 to 450,000 BTU per hour.

Rule 1146.2 was originally adopted in 1998 and was amended in 2006 to impose a lower NOx emission limit. The current Rule 1146.2 limit for NOx emissions is 14 ng/J (20 ppm), except for Type 1 units rated equal and greater than 400,000 BTU per hour installed prior to January 1, 2012 to which the NOx limit is 55 ppm, and for Type 2 units rated between 400,000 and 2,000,000 BTU per hour installed prior to January 1, 2010 to which the NOx limit is 30 ppm.

According to the 2018 amendment, Rule 1146.2 required a technology assessment that was due to the South Coast AQMD Governing Board by January 2022. This technology assessment was to determine if the current NOx emission limit should apply to both RECLAIM and non-RECLAIM units, or if a BARCT assessment should be undertaken as part of the rulemaking process to seek a lower NOx emission limit. Under the BARCT assessment, the technology to achieve a lower NOx limit will need to be feasible, available, and cost-effective. This lower NOx emission limit would apply to both RECLAIM and non-RECLAIM units. A technology assessment was completed by January 1, 2022, determining that the NOx emission limits should be lowered in order to satisfy BARCT requirements. Staff evaluated water heaters and boilers rated less than or equal to 2,000,000 Btu/hr in both non-RECLAIM and RECLAIM facilities and reviewed certification test reports submitted in recent years to understand the actual emission levels of certified models and the potential for achieving NOx emission reductions. Prior to the current rulemaking, staff reviewed 137 source tests conducted since 2017 for units required to be certified at 20 ppm for NOx emissions and found that 39 units (28 percent of units) had NOx concentrations less than 12 ppm and 21 units (15 percent of units) had NOx concentrations less than 10 ppm. As part of the 2021 technology assessment, staff also met with stakeholders seeking their input and conducted a working group meeting on December 16, 2021. Staff recommended a future rule amendment and BARCT assessment to evaluate the potential for further NOx emission reductions. Proposed Amended Rule 1146.2 is currently undergoing rule development for zero-NOx-emissions.

Residential laundry dryers and gas grills are not regulated by any South Coast AQMD rule for NOx emissions.

Proposed Method of Control

Control measure BCM-04 seeks NOx emission reductions from residential-other combustion sources by: (1) requiring zero emission technologies through a regulatory approach for some emission sources in both new and existing residences; and (2) allowing low NOx technologies as an alternative for the rest of emission sources. A mitigation fee may be required for certain lower NOx technology applications which will be evaluated during the future rulemaking process. The mitigation fee collected would be utilized as incentives to accelerate the adoption of zero emission units.

Although the currently available electric laundry dryers (electric resistance heating models) are considered zero NOx emission units, heat pump laundry dryers with a much higher energy efficiency would be the preferred zero emission technology for incentives.

Heat pump laundry dryer technology has been in existence for years as an alternative to electric resistance heating models. However, the market presence of this technology remains insignificant in the United States as the low number of this technology is probably due to the higher cost of this technology. Heat pump dryers may also have longer drying times than resistance heating models. This is due to a smaller heat pump that is typically used for cost and efficiency considerations.

Heat pump dryers with an integrated heat recovery exhaust condenser would increase the dryer's efficiency. This efficiency increase is a result of exhaust heat being captured and reused. As noted in the 2013 Department of Energy's study, under a demonstration project funded by the U.S. Department of Energy, a modified heat pump clothes dryer delivered 40-50 percent energy savings with 35 degrees Fahrenheit lower fabric temperatures and similar drying times for regular loads.

ENERGY STAR certified heat pump dryer models are available for the brands Asko, Beko, Blomberg, LG, Miele, Samsung, and Whirlpool.

The emerging zero emission technology for heating pools is the swimming pool heat pump. Heat pumps used for heating pools transfer heat from the outdoors into the water. Heat pump pool heaters work efficiently as long as the outside temperature remains above the 45–50 degrees Fahrenheit range. The warm climate of the South Coast Air Basin favors the application of pool heat pumps. As a pool heat pump works slower than a gas heater on heating the pool, it is better suited when a consistent pool temperature for a long period of time is desired. The most economical way to run this type of heater is to let the unit run automatically to keep "topping up" the heat.

Natural gas pool heaters are subject to Rule 1146.2 and it is certification requirement for NOx emissions. Staff reviewed source test results for Rule 1146.2 certification conducted since 2017. There are tests for six heater models identified by the vendors as pool heaters. As all six models were certified to meet the 55 ppm NOx limit, four of them showed emissions at 10 to 20 ppm. A low NOx limit may be feasible with the current technology.

With regards to gas grills, the electric-grill market is expected to continue to grow at an average rate of 7 percent a year. A regulatory approach would accelerate the turnover of some gas gills to zero emission grills. In addition to zero emission units, emission reductions could be achieved by lower emission technologies. As burner adjustment for cooking equipment as proposed by control measure BCM-03 would lower the NOx emissions by 70 percent, this technology could be potentially applied to gas grills as well. Further evaluation during future rulemaking will be conducted.

In addition to a regulatory approach, incentives for the purchase and installation of zero emission technology or electric panel upgrade would be considered under this control measure not only for additional emission reductions, but also to encourage further development of future zero emission space heating technology for existing residential buildings. Collected mitigation fee and future allocated funding would be utilized for the incentives. More local agencies are now proposing incentives for retrofitting gas appliances, including sources for this control measure. For example, the City of Santa Monica is offering a $300-400 rebate for replacing a gas dryer with an electric heat pump clothes dryer, incentives to electric panel upgrade, and rebates to other zero emission appliances. During rule development, staff will consider technical feasibility, identify industry-specific affordability issues, cost-effectiveness and incremental cost-effectiveness, and may consider alternative compliance mechanisms.

Incentives Implementation

Integrity Elements

Emission reductions that are projected to be achieved from the voluntary incentive measures must be demonstrated to be quantifiable, surplus, enforceable, and permanent. This demonstration must include project type(s); project life; applicable incentive program guideline(s), by title, year, chapter(s); and analysis of applicable incentive program guideline(s) for consistency with integrity elements. The following describes the definitions and provides examples of the key elements of such a demonstration:

- Quantifiable: Emission reductions are quantitatively measurable supported by existing and acceptable technical data. The quantification should use well-established, publicly available, and approved emission factors and accepted calculation methodology. There must be procedures to evaluate and verify over time the level of emission reductions actually achieved.

  Potential emission reductions associated with various equipment types are discussed in the Proposed Method of Control section. The following table provides an overview of the sources, emission reductions, and proposed incentives for targeted sources.

- Surplus: Emission reductions must be above and beyond any South Coast AQMD, state, or federal regulation. Emission reductions used to meet air quality attainment requirements are surplus as long as they are not otherwise relied on in the State Implementation Plan (SIP), SIP-related requirement, other State air quality programs adopted but not in the SIP, a consent decree, or federal rules that focus on reducing criteria pollutants or their precursors. In the event that SIP emission reductions are relied on to meet air quality-related program requirements, they are no longer surplus. In addition, the emission reductions are available only for the remaining useful life of the equipment being replaced (e.g., if the equipment being replaced had a remaining useful life of five years, the additional emission reductions from the new equipment are available for SIP or conformity purposes under this guidance for only five years).

- Enforceable: The South Coast AQMD will be responsible for assuring that the emission reductions credited in the SIP will occur. Emission reductions and other required actions are enforceable if:

    - They are independently verifiable;
    - Program violations are defined;
    - Those liable for emission reductions can be identified;
    - The South Coast AQMD and the U.S. EPA maintain the ability to apply penalties and secure appropriate corrective action where applicable;
    - The general public have access to all the emissions-related information obtained from the source;
    - The general public can file suits against sources for violations (with the exception of those owned and operated by Tribes); and
    - They are practically enforceable in accordance with other U.S. EPA guidance on practicable enforceability.

  Actual emission reductions, for example, can be assured through the replacement equipment registration, recordkeeping and reporting, and inspections (initial inspection after installation and subsequent on a regular basis thereafter, if needed) throughout the term. Specific enforcement mechanisms will be addressed in the guidelines for the individual incentive measures.

- Permanent: The emission reductions need to be permanent throughout the term for which the credit is generated. The emission reductions are permanent if these reductions are ensured to occur over the duration of the SIP program, and for as long as they are relied on in the SIP.

  For example, those awarded incentives would need to ensure the projects are properly implemented and the reductions are occurring and will continue to occur. Thus, recipients of the incentive awards would agree to contract provisions, such as recordkeeping and reporting to track reductions and agreements that newly installed equipment would not be removed without concurrence with the South Coast AQMD (i.e., permanent placement) and the proof that the replaced equipment would be destructed or at least not be operated any more in the Basin (e.g., pictures, certification). Detailed procedures to ensure permanent reductions will be described in the guidelines for the individual incentive measures.

Guidelines

Each SIP needs to have detailed and comprehensive guidelines that are approved by the South Coast AQMD Governing Board. The guidelines will be the protocol to implement the program, to ensure SIP applicability, and to maintain SIP approvability:

☑ SIP should demonstrate compliance with the four key elements of the SIP: quantifiable emissions plus incentive costs, surplus reductions, enforceable compliance, and permanent reductions.

- ☑ A working group should be established to solicit public input and feedback during SIP guideline development.
- ☑ Process and procedures to apply for incentives should be clearly explained in the guideline.
- ☑ It needs to clearly describe how incentives would be awarded (e.g., priority to high emitters and/or age of equipment, tiered process, first come first serve, or EJ area priority).
- ☑ It should have conditions of some form for agreement (e.g., contracts) including tracking and ensuring permanent reductions. The following forms should be prepared:
  - ☑ Application Forms (samples are required).
  - ☑ Contracts with Conditions (samples are required).
  - ☑ Product Example.
- ☑ Tracking mechanism is required to ensure overall effectiveness of program and procedures to correct emission projections, such as reductions by the committed target date (e.g., 2031, 2037) and submittal to the U.S. EPA annually. Tracking checklist should include:
  - ☑ Project Title.
  - ☑ Product.
  - ☑ Annual Emission Reductions (e.g., from 2030 to 2050, incremented by one year).
  - ☑ Life of project (e.g., 10 years).
  - ☑ Installation dates (e.g., fixed year 2030 or multiple installation years 2017 and 2018).
- ☑ Possible recordkeeping, reporting, and monitoring requirements need to be addressed.
- ☑ Individual outreach efforts (e.g., social media, email blasts) to promote the program, make aware of deadlines to apply, and provide timing locations of workshops.
- ☑ Program guidelines should be approved by the South Coast AQMD Governing Board and published online.

Emission Reductions

To be determined.

Rule Compliance and Test Methods

South Coast AQMD Method 100.1

Cost Effectiveness

To be determined.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from these stationary sources.

References

Paul Bendt, Chris Calwell, and Laura Moorefield. (2009). Residential clothes dryers: An investigation of energy efficiency test procedures and savings opportunities, December 6, 2009.

California Energy Commission. (2013). Codes and Standards Enhancement (CASE) Initiative for FY 2013: Title 20 Standards Development Analysis of Standards Proposal for Commercial Clothes Dryers. July 30, 2013.

ENERGY STAR. Heat pump dryer. https://www.energystar.gov/products/heat_pump_dryer

Home Depot. Gas and electric dryers. https://www.homedepot.com/b/Appliances/N-5yc1vZbv1w?cm_sp=d-flyout-Appliances

U.S. News. Gas vs. Electric Dryers. August 5, 2021. https://www.usnews.com/360-reviews/dryers/gas-vs-electric

Department of Energy. Heat pump swimming pool heaters. https://www.energy.gov/energysaver/heat-pump-swimming-pool-heaters

Statista. Share of grill ownership in the United States in 2020 by type of grill. https://www.statista.com/statistics/271755/us-grill-ownership-by-type-of-grill/

The Atlantic. The greenest way to grill. https://www.theatlantic.com/science/archive/2021/07/grilling-emissions-environment/619394/

BCM-05: EMISSION REDUCTIONS FROM EMERGENCY STANDBY ENGINES

[PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	EMERGENCY STANDBY ENGINES	
CONTROL METHODS:	REGULATIONS	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	0.15	0.14
POLLUTANT REDUCTION	-	0.04
POLLUTANT REMAINING	-	0.10
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	4.15	3.97
POLLUTANT REDUCTION	-	0.36
POLLUTANT REMAINING	-	3.61
CONTROL COST:	MODIFIED LCF METHOD: $1,027,200/TON OF NOX REDUCED^	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

^Cost-effectiveness only considers NOx reductions. Including PM2.5 reductions would further reduce the ratio.

Description of Source Category

Internal combustion engines (ICEs) are commonly used for emergency backup for electric power generation. South Coast AQMD rules require permits for stationary ICEs rated over 50 brake horsepower (bhp). Based on South Coast AQMD's permitting database, there are over 12,000 permitted emergency standby ICEs at a wide range of facilities such as commercial buildings, hospitals, convalescent facility medical support systems, cell towers, police facilities, schools, etc. Approximately 90 percent of these ICEs are diesel-fueled, and an estimated 88 percent of these diesel emergency ICEs do not meet Tier 4 Final emission standards, and thus emit higher emissions.

Background

Emergency standby ICEs typically operate only when backup power is needed and for testing and maintenance purposes. In general, they have long lifespans, meaning that older, more polluting ICEs are kept in service when cleaner technologies are available. Under Rule 1110.2 – Emissions from Gaseous- and Liquid-Fueled Engines and Rule 1470 – Requirements for Stationary Diesel-Fueled Internal Combustion and Other Compression Ignition Engines, emergency standby ICEs are exempt from emission limits provided permit conditions are established that limit use to 200 hours or less per year. Emissions from emergency standby ICEs are notable due to the large numbers of this equipment in the South Coast AQMD, as well as the advanced age of the equipment.

A control measure to reduce NOx and VOC emissions from emergency standby ICEs was included in the 2022 AQMP (L-CMB-04: Emissions Reductions from Emergency Standby Engines). The control measure sought to maximize NOx emission reductions by installing alternatives to ICEs where and when technically feasible and cost-effective. As described in the 2022 AQMP, alternatives to emergency standby ICEs are emerging technologies and may not be suitable for all applications. Accordingly, a feasibility assessment was identified as a first step to identify industries or specific applications (e.g., facilities with low standby power needs) that can move towards zero emission and low NOx technologies for emergency backup power. Emissions reductions for the 2022 AQMP control measure were therefore assigned to the year 2037. The purpose of this PM2.5 plan is to identify emissions reductions that can be achieved by 2030.

The PM2.5 Plan includes an emissions inventory for 2018 and 2030. The emissions inventory for L-CMB-04 (Emergency Standby Engines) in this control measure is based on emissions from point and area source ICEs.

Renewable Diesel Fuel

Renewable diesel is a synthetic diesel fuel produced from non-petroleum resources and meets CARB diesel specifications, as well as the ASTM International[34] D975 standard specification for diesel fuel. It is not interchangeable with biodiesel. Both are derived from similar feedstock, but undergo different processing methods and have different chemical properties, physical properties and environmental attributes. Biodiesel can reduce PM emissions, but can increase NOx emissions in some ICEs, and is used as a blend stock rather than as a replacement for CARB diesel fuel. Renewable diesel is currently widely available and is a drop-in replacement for CARB diesel fuel; it can be used in ICEs immediately, without the need to modify equipment or operations. The storage life of renewable diesel has also been found to be comparable with conventional diesel fuel. CARB-led evaluations of renewable diesel have found that using it in place of CARB diesel reduces PM emissions by approximately 30 percent, and NOx emissions by approximately 10 percent in ICEs without Tier 4 Final controls. In 2022, CARB amended Commercial

[34] ASTM International, formerly American Society for Testing and Materials, develops and publishes voluntary consensus technical standards for a wide range of materials, products, systems, and services (www.astm.org).

Harbor Craft (CHC) and In-Use Off-Road Diesel-Fueled Fleet (ORD) regulations to require the use of 99 or 100 percent renewable diesel fuel for mobile (non-Tier 4 Final) diesel-fueled ICEs by January 1, 2024.

A potential roadblock to the widespread use of renewable diesel in emergency standby ICEs is the cost differential compared to CARB diesel. The cost of renewable diesel to mobile source end-users is comparable with that of CARB diesel fuel due to credits and incentives provided by State and federal programs. There are no comparable programs for using renewable diesel in stationary sources.

Regulatory History

South Coast AQMD includes several regulations regarding ICEs, including:

- Rule 1110.2 – Emissions from Gaseous- and Liquid-Fueled Engines;
- Rule 1470 – Requirements for Stationary Diesel-Fueled Internal Combustion and Other Compression Ignition Engines; and
- Rule 1472 – Requirements for Facilities with Multiple Stationary Emergency Standby Diesel-Fueled Internal Combustion Engines.

Newly permitted emergency standby ICEs must be demonstrated to meet Best Available Control Technology (BACT) emission requirements. ICEs rated 50 to 750 bhp must meet Tier 3 emission standards, and ICEs rated over 750 bhp must meet Tier 2. Rule 1110.2 and Rule 1470 exempt emergency ICEs from meeting the rule's NOx, VOC, and CO emission limits provided that the engine has a permit condition limiting the engine to 200 operating hours or less per year. Nearly all, if not all, emergency standby ICEs are limited to 200 hours or less per year of operation. Additionally, Rule 1470 restricts operation of diesel emergency standby ICEs for maintenance and testing purposes to 50 hours a year or less and requires the use of CARB diesel fuel for all diesel-fueled ICEs rated over 50 brake horse power (bhp). These exempted emergency ICEs are also exempt from emissions testing, monitoring, reporting, and recordkeeping requirements of Rule 1110.2.

Proposed Method of Control

Most emergency standby ICEs within South Coast AQMD's jurisdiction are diesel-fueled, and most of those do not meet Tier 4 Final emission standards. Requiring the use of renewable diesel for all emergency standby ICEs that are not equipped with Tier 4 Final controls is a potential regulatory approach to achieve PM2.5 and NOx emission reductions in the near term. Renewable diesel is a readily available drop-in alternative to CARB diesel, and would result in immediate emissions reductions. South Coast AQMD can work with other relevant agencies to explore the use of credits and other incentives to ensure that the cost of renewable diesel to non-mobile source ICE end-users is also comparable to that of CARB diesel.

Other longer-term controls for this source category were proposed in the L-CMB-04 control measure in the 2022 AQMP. The potential regulatory approach outlined in L-CMB-04 involved removing the oldest

ICEs in the South Coast AQMD from operation where and when technically feasible and cost-effective. The approach would target the oldest diesel ICEs in operation for replacement, starting with pre-Tier 0 (pre-1988 model year) engines and then focusing on Tier 0 (1988+ model year) and Tier 1 (1996+ model year) engines. If facilities are not able to install alternatives to ICEs and sought to install new ICEs, the units would be required to be the lowest emitting diesel ICEs available or natural gas ICEs. Staff anticipates that this potential regulatory approach would begin implementation post-2030.

Emission Reductions

For a non-Tier 4 Final diesel ICE, replacing CARB diesel with renewable diesel would reduce PM and NOx emissions by approximately 30 percent and 10 percent, respectively. By applying these reductions to the emissions from all permitted non-Tier 4 Final diesel emergency standby ICEs, the estimated overall PM emissions reductions to this source category would be 27 percent, and the estimated overall NOx emissions reductions would be nine percent. These estimates would be refined as part of future rulemaking activities.

Rule Compliance and Test Methods

Compliance with the provisions of this control measure would require the use of only renewable diesel in non-Tier 4 Final diesel emergency standby ICEs. CARB recently amended its CHC and ORD regulations to require the use of renewable diesel by January 1, 2024.

Cost Effectiveness

Costs of implementing BCM-05 are based on the analysis for L-CMB-04 in the 2022 AQMP. Alternative emergency standby power technologies are emerging and are more expensive than diesel engines. Another challenge is that many of these technologies are also currently not designed to be used solely for emergency standby power and are not like-for-like replacements of emergency standby ICEs. As technologies mature and newer technologies emerge, staff anticipates that their costs will become more competitive in future years. Based on the best available information, the cost effectiveness, determined using the Discounted Cash Flow (DCF) method is estimated to be $592,000 per ton of NOx reduced; the cost effectiveness, determined using the Modified Levelized Cash Flow (MLCF) method is estimated to be $1,027,200 per ton of NOx reduced. A refined cost-effectiveness analysis for the proposed methods of control will be developed during rule development.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from stationary engines rated over 50 bhp.

References

Approximate Diesel Fuel Consumption Chart. Generator Source. Retrieved 2023, June 12. https://www.generatorsource.com/Diesel_Fuel_Consumption.aspx.

California Environmental Protection Agency. *Multimedia Evaluation of Renewable Diesel*. May, 2015. https://ww2.arb.ca.gov/sites/default/files/2018-08/Renewable_Diesel_Multimedia_Evaluation_5-21-15.pdf.

California Air Resources Board. *Low Carbon Fuel Standard*. Retrieved 2023, July 14. https://ww2.arb.ca.gov/sites/default/files/2020-09/basics-notes.pdf.

California Air Resources Board. *Public Hearing to Consider Proposed Amendments to the In-Use Off-Road Diesel-Fueled Fleets Regulation – Staff Report: Initial Statement of Reasons.* September, 2022. https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/off-roaddiesel/isor.pdf.

California Air Resources Board. Technical Support Document and Assessment of Marine Emission Control Strategies, Zero-Emission, and Advanced Technologies for Commercial Harbor Craft – Proposed Amendments to the Commercial Harbor Craft Regulation. September, 2021. https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2021/chc2021/appe.pdf

Joint Statement issued by CARB and the State Water Resources Control Board (2013, July 31). https://ww2.arb.ca.gov/sites/default/files/2018-08/Renewable_Diesel_Joint_Statement_7-31-13.pdf.

Silvas, M. et al. Neste. Video conference. (2023, June 14).

BCM-06: EMISSION REDUCTIONS FROM DIESEL ELECTRICITY GENERATING FACILITIES [NOX]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	ELECTRIC GENERATING UNITS AT ELECTRIC GENERATING FACILITIES	
CONTROL METHODS:	LOW NOX AND ZERO EMISSION TECHNOLOGIES	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	0.43	0.34
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	1.55	2.06
POLLUTANT REDUCTION	-	0.16
POLLUTANT REMAINING	-	1.90
CONTROL COST:	DCF METHOD: $1,512,300/TON OF NOX REDUCED MODIFIED LCF METHOD: $2,420,000/TON OF NOX REDUCED	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD/LOCAL OR REGIONAL AGENCIES	

Description of Source Category

There are six diesel permitted electric generating units in the South Coast Air Basin (Basin). Electric generating units at electricity generating facilities are regulated by Rule 1135 – Emissions of Oxides of Nitrogen from Electricity Generating Facilities (Rule 1135). Electricity generating facilities are investor-owned electric utilities, publicly owned electric utilities, or facilities with a combined electrical power generation capacity of 50 Megawatts or more for distribution in the state or local electrical grid system. Rule 1135 was amended in 2018 to require BARCT level emission limits as directed by the 2016 Final AQMP Resolution to transition equipment in the RECLAIM program to a command-and-control regulatory structure. This control measure seeks PM emission reductions from diesel electric generating units by using renewable diesel and low NOx and zero emission technologies.

Background

When RECLAIM was adopted in 1993, electricity generating facilities were initially included in NOx RECLAIM and could opt-in to SOx RECLAIM. In June 2000, RECLAIM program participants experienced a sharp and sudden increase in NOx RECLAIM trading credit (RTC) prices for both the 1999 and 2000 compliance years. Based on the 2000 RECLAIM Annual Report, electricity generating facilities reported approximately 4,400 tons per year over their initial allocation. This was primarily due to an increased demand for power generation and delayed installation of controls by electricity generating facilities. The electric power generating industry purchased a large quantity of RTCs, which depleted the available RTCs. This situation was compounded because few RECLAIM facilities added control equipment. As a result, in May 2001, the Board adopted Rule 2009 – Compliance Plan for Power Producing Facilities (Rule 2009). Rule 2009 required installation of BARCT through compliance plans at electricity generating facilities. However, the six diesel engines used for power generation on Santa Catalina Island were excluded from Rule 2009 and remain in operation today.

Regulatory History

Rule 1135 was adopted in 1989 and applied to electric power generating steam boiler systems, repowered units, and alternative electricity generating sources. A NOx system-wide average emission limit and a daily NOx emissions cap was established for each utility system. Additionally, Rule 1135 required Emission Control Plans and continuous emissions monitoring systems (CEMS).

Rule 1135 was amended in December 1990 to resolve implementation and enforceability issues raised by CARB. This amendment included accelerated retrofit dates for emission controls, unit-by-unit emission limits, modified compliance plan and monitoring requirements, computerized telemetering, and an amended definition of alternative resources. Rule 1135 was amended again July 1991 to address additional staff recommendations regarding system-wide emission rates, daily emission caps, annual emission caps, oil burning, and cogeneration, along with outstanding issues related to modeling and BARCT analysis. U.S. EPA approved Rule 1135 into the State Implementation Plan (SIP) on August 11, 1998.

In 2018, Rule 1135 was amended to establish BARCT NOx limits which are needed to transition electricity generating facilities in the NOx RECLAIM program to a command-and-control regulatory structure and to implement Control Measure CMB-05 of the 2016 AQMP. The 2018 amendment expanded Rule 1135 applicability to all electric generating units at RECLAIM NOx, former RECLAIM NOx, and non-RECLAIM NOx electricity generating facilities. The amendment updated emission limits to reflect current BARCT levels.

Rule 1135 was last amended in January 2022 to revise the emission requirements for diesel internal combustion engines located on Santa Catalina Island. Rule 1135 incorporates a compliance path for Catalina Island electric generating units to meet a NOx emission cap of 13 tons per year starting January 1, 2026, to be achieved using zero or low NOx emission technology with possibly diesel engine replacements in the interim. Staff is in the process of conducting an updated BARCT assessment to evaluate current and emerging low NOx and zero emission technologies.

Proposed Method of Control

This control measure seeks NOx emission reductions from diesel electric generating units regulated by Rule 1135 and will focus on assessing renewable diesel, low NOx and zero emission technologies for power generation. This measure proposes to implement low NOx and zero emission technologies through a regulatory approach at electricity generating facilities and to require the use of renewable diesel for any remaining diesel engines used for backup power. This approach needs to consider electrical or alternative fuel infrastructure required to operate these equipment and future electrical grid stability when transitioning to zero emission electric generating units.

Emission Reductions

Emissions reductions for this control measure are estimated to be approximately 0.16 tons per day of NOx by 2030. The target of this approach is to replace existing diesel internal combustion engines with lower-emitting technologies and utilize renewable diesel for fueling the remaining diesel engines used for backup power. Direct PM2.5 emission reductions are to be determined.

Rule Compliance and Test Methods

Compliance with the provisions of this control measure would be based on monitoring, recordkeeping, and reporting requirements that have been established in Rule 1135. Compliance would be verified through inspections and other recordkeeping and reporting requirements.

Cost Effectiveness

The overall average cost-effectiveness for this control measure is $1,512,300 per ton of NOx reduced.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from stationary sources.

References

South Coast AQMD, 2018. Final Staff Report on Proposed Amendments to Rule 1135, November 2, 2018.
South Coast AQMD, 2022. Final Staff Report on Proposed Amendments to Rule 1135 and Proposed Rule 429.2, January 7, 2022.
California Air Resources Board, 2021. Renewable Diesel Fuel Effect on Exhaust Emissions from a Tier 3 GE ES44C4 Locomotive.

BCM-07: EMISSION REDUCTIONS FROM INCINERATORS [NOX]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	INCINERATORS AND OTHER COMBUSTION EQUIPMENT	
CONTROL METHODS:	LOW NOx AND ZERO EMISSION TECHNOLOGIES	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	0.04	0.05
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOx]:	2018	2030
POLLUTANT INVENTORY	1.11	1.13
POLLUTANT REDUCTION	-	0.81
POLLUTANT REMAINING	-	0.32
CONTROL COST:	DCF METHOD: $900/TON OF NOx REDUCED MODIFIED LCF METHOD: $1,500/TON OF NOx REDUCED	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD/LOCAL OR REGIONAL AGENCIES	

Description of Source Category

Control measure BCM-07 seeks emission reductions of NOx by replacement or retrofits with low NOx emission technologies on incinerators and other combustion equipment associated with incinerators and better control of ammonia injection used currently to control NOx. Incinerators are used to burn waste material at high temperatures until reduced to ash.

Background

South Coast AQMD has adopted a series of rules to promote clean, lower emission technologies, while encouraging economic growth and providing compliance flexibility. For existing sources, replacing older higher-emitting equipment with zero emitting equipment can apply to a single source or an entire facility. The manufacturing and deployment of zero emission and low NOx emission technologies will help reduce PM emissions in the region, accelerate removal of higher-emitting equipment that can otherwise last for many decades, and advance economic development and job opportunities in the region.

Regulatory History

Incinerators are regulated by Rule 404 – Particulate Matter - Concentration last amended in 1986.

Proposed Method of Control

Secondary PM2.5 are formed from chemical reactions of NOx and ammonia. Feed-forward systems control ammonia injection into NOx catalytic control systems. Closed loop control systems using sensors to provide feedback can more accurately reflect operating conditions reducing ammonia slip and excess NOx. Burner technologies such as low NOx burner systems (LNB) or ultra-low NOx burner systems (ULNB) are combustion control technologies utilized to lower NOx emissions. A variety of factors impact the NOx emissions with LNB or ULNB, such as burner orientation and arrangement, firebox size, heater type (force or natural draft), and fuel type. Dependent on the burner configuration and operation, additional combustion controls are used to reduce NOx emissions, such as fuel and air premix, staged fuel, staged air, and flue gas recirculation. During rule development, staff will consider technical feasibility, identify industry-specific affordability issues, cost-effectiveness and incremental cost-effectiveness, and may consider alternative compliance mechanisms.

Emission Reductions

NOx emissions are estimated to be reduced by 0.81 tons per day by 2030. The target of this approach is to reduce ammonia emissions by utilizing a closed loop feed-forward control system and to reduce NOx emissions with improved burner technologies. Direct PM2.5 emissions are to be determined.

Rule Compliance and Test Methods

Source test methods vary depending on the type of source and quality of emissions (e.g., criteria pollutant and toxic emissions). Source test methods may include, but are not limited to South Coast AQMD Methods 5.1, 25.1 25.3, 100.1, 207.1 or other South Coast AQMD-approved test methods.

Cost Effectiveness

The overall average cost-effectiveness for this control measure is $900 per ton of NOx reduced.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from stationary sources.

References

South Coast AQMD, 1986. Rule 404 – Particulate Matter - Concentration.

Jaaskelainen, H. and Majewski, W, 2018. Urea Dosing Control
https://dieselnet.com/tech/cat_scr_diesel_control.php

ECC-01: CO-BENEFITS FROM EXISTING AND FUTURE GREENHOUSE GAS PROGRAMS, POLICIES, AND INCENTIVES [ALL POLLUTANTS]

CONTROL MEASURE SUMMARY

SOURCE CATEGORY:	GHG PROGRAMS, POLICIES AND INCENTIVES	
CONTROL METHODS:	REDUCTIONS FROM PROGRAMS THAT REDUCE GHGS ALSO REDUCE CRITERIA POLLUTANTS	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE:	2018	2030
POLLUTANT INVENTORY	TBD	TBD
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	VARIOUS AGENCIES	

Description of Source Category

Sources of greenhouse gases (GHG) are typically also emission sources of criteria pollutants. Federal, State, and local mandates and programs to reduce GHG emissions provide co-benefits of criteria pollutant reductions. This control measure seeks to capture the co-benefits from existing and future GHG programs, policies, and incentives.

Background

The State of California has a successful history of fighting climate change and reducing GHG emissions. Significant efforts are currently being undertaken and planned to further reduce GHGs under the State's 2030, 2045, and 2050 targets. To help achieve GHG reductions, many different regulations, market mechanisms, and incentive programs are being implemented in California. As these GHG reduction efforts are undertaken across all sectors, the co-benefit reductions of criteria pollutants will be accounted for under this control measure.

Regulatory History

The State of California adopted the Global Warming Solutions Act of 2006 (AB 32) to develop regulations and programs that reduce California's GHG emissions 20 percent below 1990 levels by 2020, along with authorizing a cap and trade program. Under the cap and trade program, an emissions limit is placed on the largest stationary sources of GHGs, fuel providers, and imports of electricity. The emissions cap on these sources is lowered over time and entities under the cap may choose to reduce their emissions or purchase allowances from the market to cover their emissions. Under AB 32, CARB must develop a Scoping Plan every five years that describes the approach to meeting the State's GHG reduction targets. Since the adoption of AB 32 several regulations and programs have been implemented along with executive orders to reduce GHG levels in California 80 percent below 1990 levels by 2050 and a midterm target of 40 percent by 2030. California has also successfully reduced GHG emissions from the electricity generating facilities. Prior to the adoption of AB 32, California established a 20 percent renewable portfolio standard (RPS) mandate for investor-owned utilities in 2010. The RPS mandate was then expanded in 2011 to include municipal owned utilities along with establishing a new mandate of 33 percent by 2020. The three large investor-owned utilities and the majority of municipal owned utilities either met or surpassed the 2020 annual RPS target of 33 percent in 2020.[35] In 2015, as part of SB 350, the RPS mandate was expanded to be 50 percent by 2030 along with increasing efficiency of existing buildings (see ECC-02 for more details on energy efficiency measures).

In the last few years, California Legislature passed a suite of bills that seek to continue to reduce greenhouse gas emissions from various sectors including electricity generation as well as residential and commercial buildings. In 2018, California passed SB 100 (California Renewables Portfolio Standard Program: Emissions of Greenhouse Gases), which sets new standards to California's renewable portfolio by requiring the State to use 50 percent renewable electricity by 2026, 60 percent renewable electricity by 2030, and 100 percent carbon-free electricity by 2045. In addition, two new laws directed towards the State's building sector, AB 3232 (Zero-emissions Buildings and Sources of Heat Energy) and SB 1477 (Low-emissions Buildings and Sources of Heat Energy), were signed in 2018. AB 3232 requires the California Energy Commission (CEC) to assess, by January 1, 2021, the potential for reducing GHG emissions from California's residential and commercial buildings to 40 percent below 1990 levels by 2030. The assessment[36] identified key options and policies for increasing heating efficiency while reducing carbon emissions from the State's commercial and residential buildings. SB 1477 helps promote and implement clean heating technology in the State by providing $50 million per year through 2023 to encourage market-based development and adoption of low-emission, clean heating technologies for buildings. As part of the implementation of SB 1477, the CPUC created the Technology and Equipment for Clean Heating (TECH) Program and the Building Initiative for Low Emissions Development (BUILD) Program. The two programs are designed to provide incentives to reduce carbon emissions in buildings. In 2018, Governor

[35] https://www.cpuc.ca.gov/-/media/cpuc-website/industries-and-topics/documents/energy/rps/cpuc-2021-rps-annual-report-to-legislature.pdf.
[36] https://www.energy.ca.gov/data-reports/reports/building-decarbonization-assessment.

Brown also signed Executive Order B-55-18, committing California to total, economy-wide carbon neutrality by 2045.

At the federal level, the U.S. EPA is establishing regulations to limit the emissions of GHGs from stationary and transportation sources. Recently, federal targets have been established to achieve a 50-52 percent reduction from 2005 levels in economy-wide GHGs by 2030, create a carbon pollution-free power sector by 2035, and net zero emissions economy-wide by 2050.

Proposed Method of Control

GHG reductions being implemented through federal, State, and local programs are being implemented across multiple energy sectors and are generally mandated by law. The GHG emission reductions are being implemented through several mechanisms such as market programs, renewable energy targets, incentive and rebate programs, and promoting implementation and development of new technologies.

Within California, market mechanisms such as the cap and trade program provide GHG emissions monitoring, emissions caps, and emissions trading for required entities. Revenues generated from the cap and trade program are mandated to be further invested in GHG reductions. Other programs such as the Renewable Portfolio Standards require the procurement of renewable power onto the electrical grid. While many regulations are already in place, more regulations will likely be implemented at the State and federal levels along with new mechanisms for GHG emission reductions. Overall, California sets ambitious goals to promote clean technologies and reduce GHG emissions across all sectors. These State climate policies will result in NOx and PM2.5 reduction co-benefits in the mid to long term time frame.

Under this control measure, the criteria pollutant co-benefits associated with GHG reductions will be quantified and accounted for towards attainment of federal ozone standards. Existing and future incentives, programs, and partnerships will be evaluated for reduction of emissions of both GHGs and criteria pollutants. South Coast AQMD will also work closely with other agencies and stakeholders to focus GHG reduction programs within the South Coast Basin to maximize emission reductions across all pollutants. During rule development, staff will consider technical feasibility, identify industry-specific affordability issues, cost-effectiveness and incremental cost-effectiveness, and may consider alternative compliance mechanisms.

Emission Reductions

To be determined.

Rule Compliance and Test Methods

Performance of GHG reductions and criteria pollutant co-benefits will be measured through the relevant agencies' enforcement of GHG requirements as well as the South Coast AQMD and State agencies emission inventories along with reductions achieved through specific programs.

Cost Effectiveness

Because this control measure relies on other programs, no additional costs other than relatively minor administrative costs are anticipated as a direct result of this control measure.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from stationary sources and will work with other regulatory agencies, businesses, and other stakeholders in implementation and program enhancements for the both the transportation and stationary sectors.

References

California's 2030 Climate Commitment: Double Energy Savings in Existing Buildings & Develop Cleaner Heating Fuels by 2030: http://www.arb.ca.gov/html/fact_sheets/2030_energyefficiency.pdf

U.S. EPA, "Roadmap for Incorporating Energy Efficiency/Renewable Energy Policies into State and Tribal Implementation Plans," 2012.

SB350 Clean Energy and Pollution Reduction Act of 2015: http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB350

California's Existing Buildings Energy Efficiency Action Plan: http://www.energy.ca.gov/ab758/

2015 Integrated Energy Policy Report (CEC-100-2015-001-CMD): http://www.energy.ca.gov/2015_energypolicy/

2015-2025 California Energy Demand Updated Forecast (CEC-200-2014-009-CMF): http://www.energy.ca.gov/2014publications/CEC-200-2014-009/CEC-200-2014-009-CMF.pdf

ECC-02: CO-BENEFITS FROM EXISTING AND FUTURE RESIDENTIAL AND COMMERCIAL BUILDING ENERGY EFFICIENCY MEASURES [ALL POLLUTANTS]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	EXISTING RESIDENTIAL AND COMMERCIAL POWER AND FUEL USE	
CONTROL METHODS:	REDUCED ENERGY USE	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	19.30	19.95
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	27.43	23.02
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	VARIOUS AGENCIES	

Description of Source Category

Energy consumption in existing residential and commercial buildings results in direct and indirect emissions of criteria pollutants, toxics, and greenhouse gases. Direct emissions result from combustion of fuels such as natural gas, propane, and wood. Indirect emissions are a result of energy use requiring electricity production from power sources, many of which burn fossil fuels. Improvements in residential weatherization and other efficiency measures provide emission reductions through reduced energy use for heating, cooling, lighting, cooking, and other needs.

Background

In 1978, California adopted the California Code of Regulations building energy standards. The building energy standards adopted within Title 24 have been routinely made stronger since that time. The strengthening of Title 24 standards along with new building materials and more efficient appliances has resulted in newly constructed residences and commercial buildings being more efficient than previous constructions.

In addition to the Title 24 building energy standards, there are multiple programs that provide incentives, rebates, and loans for efficiency projects on residential and commercial structures. These assistance programs are largely administered through servicing utilities for the property and are voluntary. Despite the availability of multiple assistance programs and the many benefits from undertaking energy savings measures, there remain many barriers to overcome. One of the challenges is increasing energy efficiency within rental and leased properties where tenants are often responsible for utility costs. Within the South Coast Air Basin (Basin) it is estimated that 48 percent of the residential properties are occupied by tenants. In EJ communities in the South Coast Air Basin, 59 percent of residential properties are occupied by tenants. Other barriers to undertaking these projects are identifying the most worthwhile and cost-effective projects, finding suited contractors, and capital to fund the projects.

In California and the Basin there is significant potential to achieve large energy reductions from retrofitting existing buildings. Within the Basin, about 60 percent of the residential structures were constructed before 1979 when the California Title 24 building energy standard was first implemented. Additionally, energy efficiency measures provide cumulative benefits when implemented. Increased deployment and accelerating the rate of implementation of existing programs provides benefits in reduced energy costs, energy infrastructure needs, and emissions of greenhouse gases, toxics, and criteria pollutants. To further realize these benefits the State of California passed the Clean Energy Pollution Reduction Act of 2015 (SB 350) that sets a path to double the energy efficiency savings for electricity and natural gas use by retail customers and increase renewable energy sources from 33 to 50 percent by 2030. The bill establishes a legal mandate by requiring the State Energy Resources Conservation and Development Commission (California Energy Commission or CEC) to establish annual targets for statewide energy efficiency savings and demand reduction that will achieve a cumulative doubling of statewide energy efficiency savings in electricity and natural gas end uses of retail customers by January 1, 2030. The bill would require the Public Utilities Commission to establish efficiency targets for electrical and gas corporations consistent with this goal. The bill would also require local publicly owned electric utilities to establish annual targets for energy efficiency savings and demand reduction consistent with this goal.

Regulatory History

The U.S. EPA has recognized the importance of efficiency and renewable energy efforts in reducing emissions. In July 2012, the U.S. EPA released the Roadmap for Incorporating Energy Efficiency/Renewable

Energy Policies into State and Tribal Implementation Plans. Under the guidance of this document, the emissions benefits not yet accounted for within the baseline inventory from efficiency measures set into action can be accounted for within State Implementation Plans as control measures. Emission reductions from efficiency efforts of SB 350 are reflected in the 2020 California Gas Report[10] and the baseline inventory for the PM2.5 Plan. Meanwhile, significant efforts are currently being undertaken and planned to further reduce GHGs under the State's 2030, 2045, and 2050 targets. In the last few years, California Legislature passed a suite of bills that seek to reduce greenhouse gas emissions from various sectors including electricity generation as well as residential and commercial buildings. In 2018, California passed SB 100 (California Renewables Portfolio Standard Program: Emissions of Greenhouse Gases), which sets new standards to California's renewable portfolio by requiring the State to use 50 percent renewable electricity by 2026, 60 percent renewable electricity by 2030, and 100 percent carbon-free electricity by 2045. In addition, two new laws directed towards the State's building sector, AB 3232 (Zero-emissions Buildings and Sources of Heat Energy) and SB 1477 (Low-emissions Buildings and Sources of Heat Energy), were signed in 2018. AB 3232 requires the California Energy Commission (CEC) to assess, by January 1, 2021, the potential for reducing GHG emissions from California's residential and commercial buildings to 40 percent below 1990 levels by 2030.[11] The assessment identified key options and policies for increasing heating efficiency while reducing carbon emissions from the State's commercial and residential buildings. SB 1477 helps promote and implement clean heating technology in the State by providing $50 million per year through 2023 to encourage market-based development and adoption of low-emission, clean heating technologies for buildings. In 2018, Governor Brown also signed Executive Order B-55-18, committing California to total, economy-wide carbon neutrality by 2045.

Overall, California sets ambitious goals to promote clean technologies and decrease energy use in California's existing and new building stock. Reducing, managing, and changing the way energy is used in the commercial and residential sectors can provide additional emission reductions, reduce energy costs, and provide multiple environmental benefits. These State climate policies will result in NOx and PM2.5 reduction co-benefits in the mid to long term time frame.

Proposed Method of Control

South Coast AQMD has worked with the local utilities and contractors to implement weatherization programs within the Environmental Justice Communities of Coachella Valley, Boyle Heights, San Bernardino and San Fernando Valley areas. South Coast AQMD staff will work with agencies, utilities, and other stakeholders to further implement weatherization and other measures that provide energy savings along with emission reductions within the Basin.

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[10] 2020 California Gas Report. https://www.socalgas.com/sites/default/files/2020-10/2020_California_Gas_Report_Joint_Utility_Biennial_Comprehensive_Filing.pdf

[11] California Building Decarbonization Assessment- Final Commission Report. https://efiling.energy.ca.gov/GetDocument.aspx?tn=239311&DocumentContentId=72767

Co-benefits from other existing and future residential and commercial building energy efficiency measures, such as Title 24 building energy standards, and incentive programs such as the Building Initiative for Low-Emissions Development (BUILD) Program will be monitored, and the energy savings and criteria pollutant emission benefits will be quantified. During rule development, staff will consider technical feasibility, identify industry-specific affordability issues, cost-effectiveness and incremental cost-effectiveness, and may consider alternative compliance mechanisms.

Emission Reductions

Weatherization and other efficiency measures are typically permanent measures that provide cumulative benefits. The existing energy efficiency programs are having impacts on emission reductions, such as implementation of SB 350, are generally taken into account within the baseline emissions inventory. Any future federal, State or local programs that significantly enhances the State's renewable energy and efficiency targets will result in co-benefits of NOx and PM2.5 reductions. The emission benefits from other existing and future energy efficiency measures would result in less fuel use such as natural gas usage. South Coast AQMD will continue to evaluate opportunities for additional feasible NOx and PM2.5 reductions in existing and new residential and commercial buildings through regulatory or incentive-based programs, and an evaluation of the benefits of these existing and emerging energy programs not reflected in the baseline inventory will be evaluated and quantified.

Rule Compliance and Test Methods

Not applicable.

Cost Effectiveness

No additional costs are anticipated beyond those that would otherwise be allocated to reduce GHG emissions through State programs. This measure seeks merely to quantify criteria pollutant reductions from these GHG programs. Furthermore, weatherization and efficiency measures, when appropriately applied, can realize short payback periods from reduced energy costs (two–seven years).

Implementing Agency

South Coast AQMD has the authority to regulate emissions from stationary sources and will work with other regulatory agencies to help implement this control measure.

References

California's 2030 Climate Commitment: Double Energy Savings in Existing Buildings & Develop Cleaner Heating Fuels by 2030: http://www.arb.ca.gov/html/fact_sheets/2030_energyefficiency.pdf

U.S. EPA, "Roadmap for Incorporating Energy Efficiency/Renewable Energy Policies into State and Tribal Implementation Plans," 2012.

SB350 Clean Energy and Pollution Reduction Act of 2015:
http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB350

California's Existing Buildings Energy Efficiency Action Plan: http://www.energy.ca.gov/ab758/

SB100: California Renewables Portfolio Standard Program: Emissions of Greenhouse Gases (2018):
https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180SB100

AB3232: Zero-Emissions Buildings and Sources of Heat Energy (2018):
https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB3232

2020 California Gas Report: https://www.socalgas.com/sites/default/files/2020-10/2020_California_Gas_Report_Joint_Utility_Biennial_Comprehensive_Filing.pdf

2021 Integrated Energy Policy Report (CEC-100-2020-001-V3-CMD): https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2021-integrated-energy-policy-report

2021-2035 California Energy Demand Updated Forecast:
https://efiling.energy.ca.gov/GetDocument.aspx?tn=241239

ECC-03: ADDITIONAL ENHANCEMENTS IN REDUCING EXISTING RESIDENTIAL BUILDING ENERGY USE

[ALL POLLUTANTS]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	EXISTING RESIDENTIAL POWER AND FUEL USE	
CONTROL METHODS:	REDUCED ENERGY USE BEYOND EXISTING REGULATIONS	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	1.81	1.76
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOx]:	2018	2030
POLLUTANT INVENTORY	18.36	14.42
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	VARIOUS AGENCIES	

Description of Source Category

Energy consumption in residential and commercial buildings results in direct and indirect emissions of criteria pollutants, toxics, and greenhouse gases. Direct emissions result from combustion of fuels such as natural gas, propane, and wood. Indirect emissions are a result of electricity generation with fossil fuel. Efficiency improvements within the residential sector provide emission reductions along with reducing energy costs and help alleviate the need for additional energy infrastructure. Efforts in the residential sector under this control measure include weatherization, the use of energy efficient appliances and addition of solar thermal and solar photovoltaic systems. Co-benefit reductions from existing and future energy efficiency programs are accounted for in control measure ECC-02 (Co-benefits from Existing and Future Residential and Commercial Building Energy Efficiency Measures).

ECC-03 seeks to maximize emission reductions by implementing advanced highly efficient zero emission appliance technologies and efficiency measures when cost-effective and feasible, including weatherization along with renewable energy sources and low emission technologies, such as renewable gas, in all other applications. This measure is designed to reduce end use energy consumption and provide emission reductions within existing residences. Implementation will be coordinated with utilities and other agencies to leverage and enhance existing programs and maximize energy savings and emission reductions.

Background

Improved appliance efficiencies, declining renewable energy prices, weatherization, and other demand-side energy measures have been shown to reduce the need for new energy infrastructure. The building energy standards adopted in California's Title 24, along with Title 20 appliance efficiency standards, have routinely become more efficient. In California, the strengthening of these building energy and appliance codes has resulted in newly constructed residences and buildings being more efficient than previous construction. Within the Basin, there is extremely high potential to reduce end use residential and commercial energy usage. Over 60 percent of the residential structures in Southern California were built before 1979, when the California Title 24 building energy standard was first implemented.

There are multiple programs that provide incentives, rebates, and loans for efficiency projects on residential and commercial structures that can assist in going beyond current regulations and enhance existing programs. One such opportunity could be targeting increased energy efficiency within rental and leased properties (approximately 48 percent in the region) where tenants are often responsible for utility costs. In California and the Basin, there is significant potential to achieve large energy reductions from retrofitting existing buildings. Additionally, energy efficiency measures provide cumulative long-term benefits once implemented. Accelerating implementation of these measures provides additional benefits in reduced energy costs, energy infrastructure needs, and reductions of emissions of greenhouse gases, toxics, and criteria pollutants.

Combustion appliances within residences account for the majority of direct emissions within the residential sector. Appliances are considered durable goods and most appliances last one or two decades before needing replacement. South Coast AQMD has several regulations including Rules 1121, 1146.2, and 1111, which establish limits on NOx emissions from combustion sources such as water heaters, pool heaters, and furnaces. Other residential combustion sources include cook stoves, and fireplaces. While South Coast AQMD regulations established NOx emission thresholds, there are zero and low NOx appliances that can provide further emission reductions and energy efficiency co-benefits beyond most existing and replacement appliances. This is especially true when appliances are coupled with renewable resources such as solar photovoltaic and/or solar thermal systems. Payback periods from these actions with small incentives can be as short as 2 to 3 years depending on the cost of the equipment, available incentives, efficiency gains, and energy prices.

Many appliances such as water heaters are now available with energy factors (EF) greater than 0.8 for natural gas pilotless storage and EF levels over 2.4 for heat pump storage systems. While these highly efficient water heaters have higher upfront costs, savings from efficiency gains often make them attractive options. These longer-term benefits from higher efficiency appliances are often not apparent to consumers who generally look at upfront purchase prices. Therefore, the voluntary incentive program will encourage the purchase of these higher efficiency appliances in the Basin. High efficiency pool heaters, furnaces, and cook stoves are also available.

Declining costs in renewable energy and solar thermal heating sources can be coupled with existing appliances and/or be implemented with new appliances along with weatherization efforts. In the residential sector, solar thermal heating can help offset heating energy needs from water heaters, pool heaters, and, in some instances, clothes dryers. Solar thermal energy sources can range from rooftop heating systems to pool covers.

Traditionally, adding solar photovoltaics was done after load reductions occurred through weatherization and appliance upgrades. However, rapidly declining costs in solar photovoltaics provides an inexpensive technology to add electrical generation that can be coupled with highly efficient appliances, such as heat pump furnaces and water heaters, which help reduce electricity costs. A household's potential for improving appliance efficiency and weatherization could be coupled with the evaluation of solar opportunities when contractors review residences for solar panel additions. Sizing of the solar panel installations could then be adjusted for efficiency gains or increased electrical loads resulting from appliance replacements. A similar approach can be taken with solar thermal hot water heaters.

The increased appliance efficiencies and emission reductions within this measure will be surplus to current South Coast AQMD regulations and existing efficiency programs. This measure will be implemented in collaboration with State agencies and local utilities to develop incentive efforts. Additionally, other technologies and market programs, such as energy storage and smart grid measures like grid connected electric water heaters are expected to become less costly and incentivized more widely by utilities. The use of appliances as grid resources will be evaluated and considered during the development and implementation phases of this measure. Other residential combustion appliances, such as fireplaces, furnaces, space heaters, and outdoor heaters will also be evaluated for energy efficiency and eligibility for potential incentives.

All regulations, actions, and incentive programs directed at residential appliances will consider both energy efficiency and emission reductions. Zero emission and high efficiency applications will be prioritized to the extent they are feasible and cost-effective at the time of implementation. Lastly, South Coast AQMD will collaborate with utilities, agencies, and other organizations to attract funding and distribute them in coordination with similar existing programs.

Regulatory History

The U.S. EPA provided guidance to acknowledge emission benefits from energy efficiency measures and renewable energy mandates. While such measures are reflected in the baseline emissions, such as reduced natural gas consumption due to the requirement of energy efficiency, not all of them may be reflected in the baseline emissions due to challenges in quantifying such reductions. In such cases, those reductions will be quantified to the extent feasible and reflected as a benefit from this control measure. Emission reductions from efficiency efforts beyond current requirements and the use of smart grid technology will primarily be achieved through ambitious incentives and outreach.

Proposed Method of Control

South Coast AQMD has worked with local utilities and contractors to implement weatherization programs within the Environmental Justice Communities of Coachella Valley, Boyle Heights, San Bernardino and San Fernando Valley areas, helping to lower the implementation barrier of weatherization and smart grid efforts within Environmental Justice Communities.

South Coast AQMD staff will work with agencies, utilities, and other stakeholders to further implement weatherization and other measures that provide energy savings focusing on emission reductions within the Basin. South Coast AQMD staff will also assist in developing new tools or improving current tools that help effectively implement efficiency measures along with quantifying energy savings, emissions benefits along with educating consumers about short payback periods and cost savings opportunities.

Implementation of smart grid technology and other energy efficiency weatherization programs for residential buildings can be incentivized through voluntary public participation. To obtain credit in the SIP with emission reductions resulting from implementation, the integrity elements must be satisfied that are described in detail in the “Incentives Implementation” section. During rule development, staff will consider technical feasibility, identify industry-specific affordability issues, cost-effectiveness and incremental cost-effectiveness, and may consider alternative compliance mechanisms.

Emission Reductions

Weatherization, high efficiency appliances, renewable energy and smart grid measures are typically long-term measures that provide cumulative benefits. Existing energy efficiency programs with impacts on emission reductions are generally incorporated into the baseline emissions inventory. Emission benefits expected from actions going beyond SB 350 and Title 24 building energy standards are not yet within the future year emissions inventory. Accelerated focused deployment, additional programs, and additional incentives within the Basin can achieve NOx and PM2.5 emission reductions beyond existing efficiency programs and regulations. The reduction in NOx and PM2.5 emissions would largely be the result of less natural gas and electricity usage, and the magnitude of these benefits will be evaluated and quantified.

Rule Compliance and Test Methods

Not applicable.

Cost Effectiveness

The cost-effectiveness of this control measure varies based on many factors including the type of appliance to be replaced, infrastructure of the existing building, and the potential change in utility cost. ECC-03 pursues to maximize emission reductions by implementing advanced highly efficient zero emission appliance technologies and efficiency measures such as enhanced weatherization when cost-effective and feasible. Electric heat pump space and water heaters are found to be the most cost-effective high efficiency appliances, along with incorporating pool heaters and covers under current market and technology conditions. Adding solar thermal or solar photovoltaic systems can reduce energy costs, making these technologies more affordable in the long-term.

On the other hand, incentives such as rebates could lower the upfront cost. Incremental cost may be partially offset by local utility companies and State agencies who have proposed incentives for heat pumps (e.g., California TECH Initiative) or panel upgrades. Income-qualified homeowners in disadvantaged communities can be qualified for a free solar panel system to offset incremental utility costs. Incentivizing the purchase of a pool cover is the most cost-effective option at the lower end of the incentive cost range while weatherizing an entire existing home or installing a solar thermal pool heating system is at the higher end of the incentive cost range. The cost for heat pumps might be lowered when the market achieves greater penetration. Technology advancement in residential appliances may also lower the cost of equipment.

Overall, cost-effectiveness for this control measure varies depending on the type of appliance to be replaced, existing infrastructure, the potential change in utility cost, and the availability of incentives from other programs. As a result, the cost-effectiveness will be determined as incentive programs and projects are developed.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from stationary sources and will work with other regulatory agencies, utilities, industry groups, and stakeholders to help develop and implement incentives under this control measure.

References

California's 2030 Climate Commitment: Double Energy Savings in Existing Buildings & Develop Cleaner Heating Fuels by 2030: http://www.arb.ca.gov/html/fact_sheets/2030_energyefficiency.pdf

U.S. EPA, Roadmap for Incorporating Energy Efficiency/Renewable Energy Policies into State and Tribal Implementation Plans, July 2012. https://www.epa.gov/sites/default/files/2016-05/documents/eeremanual_0.pdf

SB350 Clean Energy and Pollution Reduction Act of 2015: http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB350

California's Existing Buildings Energy Efficiency Action Plan: http://www.energy.ca.gov/ab758/

Opportunities for Energy and Economic Savings by Replacing Electric Resistance Heat with Higher Efficiency Heat Pumps, American Council for an Energy-Efficient Economy, Report #A1603, May 2016.

Gas Swimming Pool Heaters, Department of Energy: energy.gov/energysaver/gas-swimming-pool-heaters

SB100: California Renewables Portfolio Standard Program: Emissions of Greenhouse Gases (2018): https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180SB100

AB3232: Zero-Emissions Buildings and Sources of Heat Energy (2018):https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB3232

2020 California Gas Report: https://www.socalgas.com/sites/default/files/2020-10/2020_California_Gas_Report_Joint_Utility_Biennial_Comprehensive_Filing.pdf

2021 Integrated Energy Policy Report (CEC-100-2020-001-V3-CMD): https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2021-integrated-energy-policy-report

2021-2035 California Energy Demand Updated Forecast: https://efiling.energy.ca.gov/GetDocument.aspx?tn=241239

California Energy Commission, Building Energy Efficiency Standards - Title 24. https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards

Energy-Solution, California TECH Initiative. https://energy-solution.com/tech/

Navigant Consulting, Inc., Impacts of Residential Electrification, August 2018. https://efiling.energy.ca.gov/GetDocument.aspx?tn=224761

Energy and Environmental Economics, Inc., Residential Building Electrification in California, April 2019. https://www.ethree.com/wp-content/uploads/2019/04/E3_Residential_Building_Electrification_in_California_April_2019.pdf

GRID Alternatives, Disadvantaged Communities - Single-family Solar Homes (DAC-SASH) Program. https://www.gridsolar.org/sceresidentialpage/

BCM-08: EMISSION REDUCTIONS FROM LIVESTOCK WASTE AT CONFINED ANIMAL FACILITIES

[NH3]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	LIVESTOCK WASTE AT LARGE CONFINED ANIMAL FACILITIES	
CONTROL METHODS:	MANURE MANAGEMENT STRATEGIES	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [NH3]:	2018	2030
POLLUTANT INVENTORY	8.17	6.13
POLLUTANT REDUCTION	-	0.27
POLLUTANT REMAINING	-	5.86
CONTROL COST:	DCF METHOD: $21,000/ton	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD/LOCAL OR REGIONAL AGENCIES	

Description of Source Category

The purpose of this control measure is to reduce ammonia emissions from livestock waste at large Confined Animal Facilities (CAFs). The first component seeks to lower the applicability thresholds in South Coast AQMD Rule 223 – Emission Reduction Permits for Large Confined Animal Facilities to align with the more stringent thresholds in San Joaquin Valley Air Pollution Control District (SJVAPCD) Rule 4570 – Confined Animal Facilities. This is the portion of the control measure that has been identified to satisfy Most Stringent Measures (MSM) requirements. Independent of MSM, this control measure also seeks to explore the feasibility of introducing more stringent manure management requirements to reduce ammonia emissions at CAFs.

Background

In 2018, there were approximately 126,000 dairy cattle, 1.6 million layer poultry, and 1,000 swine in the South Coast Air Basin (Basin). Although California is the largest dairy-producing state,[12] the livestock

[12] CARB 2022 Scoping Plan for Achieving Carbon Neutrality. https://ww2.arb.ca.gov/sites/default/files/2022-12/2022-sp_1.pdf

industry in the Basin is not growing. Livestock waste emits significant amounts of ammonia that contribute to PM2.5 via atmospheric reactions with NOx to form ammonium nitrate. Emission reductions from the dairy and livestock sector have mainly been driven by the growing adoption of manure management strategies and a decreasing animal population.

Given the larger presence of dairies and CAFs in the San Joaquin Valley, South Coast AQMD consulted U.S. EPA's recent actions on SJVAPCD's PM2.5 SIP to develop control strategies that apply to this source category. U.S. EPA published a proposed rule on December 29, 2021 to approve SJVAPCD's 2018 Serious Area Plan for the 2012 annual PM2.5 NAAQS.[13] However, based on adverse public comments, U.S. EPA reversed course and proposed disapproval of several plan requirements on October 5, 2022.[14] A central issue in U.S. EPA's proposed disapproval relates to SJVAPCD's BACM analysis for Rule 4570. U.S. EPA referenced several research studies and guidance documents for ammonia reductions from CAFs that were not consulted as part of the process to develop potential control measures. Based on these references, South Coast AQMD's BACM/MSM analysis identified two measures with the potential to further reduce emissions from CAFs in the South Coast Air Basin: incorporation of solid cattle manure within 24 hours and acidifying amendments for poultry litter.

South Coast AQMD's BACM analysis also determined that SJVAPCD Rule 4570 has more stringent applicability thresholds than South Coast AQMD Rule 223 (1,000 milk cows in South Coast AQMD vs. 500 milk cows in SJVAPCD, and 650,000 birds in South Coast AQMD vs. 400,000 birds in SJVAPCD). This control measure therefore seeks to lower CAF applicability thresholds in Rule 223 to match those in SJVAPCD Rule 4570.

Regulatory History

Rule 1127 – Emission Reductions from Livestock Waste was adopted in August 2004 to address best management practices specifically for dairies, with requirements regarding manure removal, handling, and composting. Rule 1127 applies to dairy farms and related operations such as heifer and calf farms and the manure produced on them. It also applies to manure processing operations, such as composting operations and anaerobic digesters.

California Senate Bill 700 – Agriculture & Air Quality Summary and Implementation (SB 700), enacted into law on January 1, 2004, eliminated the exemption from the permit system of local air pollution control districts for agricultural operations in the farming of crops or raising of fowl or animals. The bill amended air pollution control requirements in the California Health & Safety Code to include requirements for agricultural sources of air pollution. SB 700 required California Air Resources Board (CARB) to develop a definition for the source category of large CAFs by July 1, 2005, to be used by the local air pollution control and air quality management districts to mitigate emissions from large CAFs.

[13] 86 FR 74310

[14] 87 FR 60494

Rule 223 – Emission Reduction Permits for Large Confined Animal Facilities was adopted in August 2006 to satisfy SB 700 and California Health & Safety Code requirements for nonattainment areas. Rule 223 requires a permit to operate for all large CAFs, defined as facilities with (1): 1,000 or more milking cows; or 3,500 or more beef cattle; or 7,500 or more calves, heifers, or other cattle; or (2): 650,000 or more laying hens; or (3): 3,000 or more swine. Pertaining to manure management, the dairy provisions in Rule 223 require that owners/operators implement at least six of 12 corral measures, two of seven solid manure or separated solids handling measures, one of eight liquid manure handling measures, and two of four land application measures. Poultry large CAF operators must implement at least one of seven solid manure or separated solids handling measures, and one of eight liquid manure handling measures.

In addition to ammonia, California's dairy and livestock industries account for roughly half of the State's total methane emissions from two primary sources, manure management and enteric fermentation. In 2016, the Legislature passed SB 1383 (Lara, Chapter 395, Statutes of 2016), which sets a 2030 methane emissions reductions goal of 40 percent below 2013 levels by 2030 for the dairy and livestock sector. To reach this target, CARB implemented a Short-Lived Climate Pollutant Reduction Strategy that could result in co-benefits of ammonia reductions. In 2022, CARB released an analysis on the progress the sector has made in achieving the 2030 target, as required by SB 1383.[15] This analysis shows that the dairy and livestock sector is projected to achieve just over half of the annual methane emission reductions necessary to achieve the 2030 target through modifications to manure management systems, primarily using anaerobic digesters, and additional reductions through decreases in animal populations.

Proposed Method of Control

South Coast AQMD's BACM analysis identified three measures with the potential to reduce ammonia emissions from large CAFs beyond Rule 223: lowering Rule 223 applicability thresholds, incorporation of solid manure within 24 hours, and acidifying amendments for poultry litter.

To align with the more stringent thresholds in SJVAPCD Rule 4570, South Coast AQMD proposes to lower the Rule 223 applicability thresholds from 1,000 to 500 milk cows and from 650,000 to 400,000 birds. As the lower applicability thresholds are required in SJVAPCD, staff determined that they can feasibly be implemented in the Basin and, accordingly, identified this requirement as being needed satisfy MSM.

There are other proposed controls that will be further evaluated during rulemaking. Rule 1127 currently requires the disposal of dairy manure to either a manure processing operation (e.g., anaerobic digestion or composting facilities) or to agricultural lands approved for the spreading of manure. Soil incorporation of the manure on agricultural lands reduces NH3 emissions by decreasing the exposed surface area of manure. For CAFs requiring a permit, Rule 223 includes land incorporation of all manure within 72 hours of removal as a Class One Mitigation Measure. It is technologically feasible to reduce the window from 72 hours to 24 hours while allowing exceptions (e.g., for extreme weather). Low-disturbance incorporation

[15] CARB Analysis of Progress toward Achieving the 2030 Dairy and Livestock Sector Methane Emissions Target, March 2022. https://ww2.arb.ca.gov/sites/default/files/2022-03/final-dairy-livestock-SB1383-analysis.pdf

such as vertical tillage reduces ammonia emissions by 34 percent when manure is incorporated within 72 hours and by 50 percent when manure is incorporated within 24 hours. High-disturbance land incorporation, which requires chisel plowing followed by secondary tillage with a disk harrow or field cultivator, reduces ammonia emissions by 50 percent when manure is incorporated within 72 hours and by 75 percent when manure is incorporated within 24 hours. All ammonia control efficiencies for soil incorporation are estimated based on information from the Chesapeake Bay Program Watershed Model report.[16] Based on this report, high-disturbance tillage is expected to achieve the greatest reductions.

Ammonia is a weak base and reducing the pH of litter binds ammonia and reduces its volatilization. Aluminum sulfate, also known as alum, is a common compound used to treat poultry litter to reduce ammonia emissions and bind phosphorous to prevent runoff. The typical recommended application rate for aluminum sulfate is within the range of 0.1 to 0.2 lb of aluminum sulfate per broiler placed.[17] The lower bound of the aluminum sulfate application rate decreases the ammonia control efficiency by about 50% compared to application of 0.2 lb of aluminum sulfate per broiler placed.[18, 19] Larger birds will require correspondingly larger application rates to achieve the same control of ammonia.[20]

Emission Reductions

As shown in Table BCM-08-A, the total inventory for this source category is 6.13 tpd of NH3 in 2030, yet dairy cattle are responsible for over 80 percent of those emissions. Lowering Rule 223 applicability thresholds results in an estimated 5 percent NH3 emission reduction. Thus, the estimated reduction from lowering the thresholds in Rule 223 for dairy cattle and poultry layers is 0.27 tpd. Emission reductions for other proposed control measures including more stringent manure management practices will be estimated during the rulemaking process.

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[16] Chesapeake Bay Phase 6.0 Manure Incorporation and Injection Expert Review Panel: Dell, C., Allen, A., Dostie, D., Meinen, R., Maguire, R (December 2016) Manure Incorporation and Injection Practices for Use in Phase 6.0 of the Chesapeake Bay Program Watershed Model. Prepared for Chesapeake Bay Program, Annapolis, MD 21403. CBP/TRS-309-16. EPA Contract No. EP-C-12-055. https://d18lev1ok5leia.cloudfront.net/chesapeakebay/documents/Phase_6_FINAL_MII_Final_Report.pdf

[17] See Moore, P. Treating Poultry Litter with Aluminum Sulfate. USDA ARS. Developed by Livestock GRACEnet. https://www.ars.usda.gov/ARSUserFiles/np212/LivestockGRACEnet/AlumPoultryLitter.pdf

[18] Moore, P., Watkins, S. Treating Poultry Litter with Alum. University of Arkansas (U of A) Division of Agriculture Cooperative Extension Service. https://www.uaex.uada.edu/publications/PDF/FSA-8003.pdf

[19] Moore, P., Miles, D., Burns, R. (March 2019). Reducing Ammonia Emissions from Poultry Litter with Alum. Livestock and Poultry Environmental Learning Community (LPELC). https://lpelc.org/reducing-ammonia-emissions-from-poultry-litter-with-alum/

[20] Anderson, K.; Moore, P.A., Jr.; Martin, J.; Ashworth, A.J. (2020) Effect of a New Manure Amendment on Ammonia Emissions from Poultry Litter. *Atmosphere*, *11*, 257. https://doi.org/10.3390/atmos11030257

TABLE BCM-08-A
2030 BASELINE EMISSIONS FROM LIVESTOCK WASTE

Facility type	NH3 Emissions (tpd)
Dairy Cattle	5.08
Range Cattle	0.13
Poultry - Layers	0.28
Swine	0.02
Sheep	0.08
Horses	0.51
Goats and Others	0.05
Total	**6.13**

Rule Compliance and Test Methods

Compliance with Rule 223 requirements is determined through South Coast AQMD's permitting program.

Cost Effectiveness

Staff identified approximately 36 dairy farms and no poultry farms that would be impacted by lowering the applicability thresholds for large CAFs under Rule 223 from 1,000 to 500 milk cows and 600,000 to 400,000 birds, respectively.. Rule 223 requires the affected dairy farms to submit and implement an emission mitigation plan based on different classes of mitigation measures to minimize ammonia emissions. Costs will vary per facility depending on the measures implemented from the mitigation menu. For this control measure, cost effectiveness was determined using the anticipated incremental costs that would be incurred by the 36 impacted dairy farms for the additional cost of disposing manure through composting compared to disposing manure by land application, and the cost of more frequent corral cleaning (4 instead of 2 times per year per farm). Costs are based on data from the 2016 AQMP control measure BCM-04: Emission Reductions from Manure Management Strategies and inflated to 2022 dollars. Staff is not aware of additional costs beyond those estimated in 2016 AQMP control measure BCM-04: Emission Reductions from Manure Management Strategies. Therefore, the 2022 cost-effectiveness was adjusted from the 2016 cost-effectiveness using the ratio of Marshall & Swift Indices for both years, which is calculated to be 1.4. Cost-effectiveness is estimated at $21,000 per ton of NH3 reduced. Cost-effectiveness for this control measure will be refined further during rulemaking.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from these stationary and area sources.

References

CARB 2022 Scoping Plan for Achieving Carbon Neutrality. https://ww2.arb.ca.gov/sites/default/files/2022-12/2022-sp_1.pdf

Clean Air Plans; 2012 Fine Particulate Matter Serious Nonattainment Area Requirements; San Joaquin Valley, California. 40 CFR 52, Federal Register, Volume 86, No. 247, pg. 74310. December 29, 2021. https://www.govinfo.gov/content/pkg/FR-2021-12-29/pdf/2021-27796.pdf

Clean Air Plans; 2012 Fine Particulate Matter Serious Nonattainment Area Requirements; San Joaquin Valley, California. 40 CFR Part 52, Federal Register, Volume 87, No. 192, pg. 60494. October 5th, 2022. https://www.govinfo.gov/content/pkg/FR-2022-10-05/pdf/2022-21492.pdf

CARB Analysis of Progress toward Achieving the 2030 Dairy and Livestock Sector Methane Emissions Target, March 2022. https://ww2.arb.ca.gov/sites/default/files/2022-03/final-dairy-livestock-SB1383-analysis.pdf

Chesapeake Bay Phase 6.0 Manure Incorporation and Injection Expert Review Panel: Dell, C., Allen, A., Dostie, D., Meinen, R., Maguire, R (December 2016) Manure Incorporation and Injection Practices for Use in Phase 6.0 of the Chesapeake Bay Program Watershed Model. Prepared for Chesapeake Bay Program, Annapolis, MD 21403. CBP/TRS-309-16. EPA Contract No. EP-C-12-055. https://d18lev1ok5leia.cloudfront.net/chesapeakebay/documents/Phase_6_FINAL_MII_Final_Report.pdf

See Moore, P. Treating Poultry Litter with Aluminum Sulfate. USDA ARS. Developed by Livestock GRACEnet. https://www.ars.usda.gov/ARSUserFiles/np212/LivestockGRACEnet/AlumPoultryLitter.pdf

Moore, P., Watkins, S. Treating Poultry Litter with Alum. University of Arkansas (U of A) Division of Agriculture Cooperative Extension Service. https://www.uaex.uada.edu/publications/PDF/FSA-8003.pdf

Moore, P., Miles, D., Burns, R. (March 2019). Reducing Ammonia Emissions from Poultry Litter with Alum. Livestock and Poultry Environmental Learning Community (LPELC). https://lpelc.org/reducing-ammonia-emissions-from-poultry-litter-with-alum/

Anderson, K.; Moore, P.A., Jr.; Martin, J.; Ashworth, A.J. (2020) Effect of a New Manure Amendment on Ammonia Emissions from Poultry Litter. *Atmosphere*, *11*, 257. https://doi.org/10.3390/atmos11030257

Ammonia: Supplemental Information for EPA in Support of 15 µg/m^3 Annual PM2.5 Standard, CARB. March 2023.

BCM-09: AMMONIA EMISSION REDUCTIONS FROM NOX CONTROLS [NH3]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	NH3	
CONTROL METHODS:	IMPROVED SCR SYSTEMS	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [NH3]:	2018	2030
POLLUTANT INVENTORY	12.37	12.42
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	N/A	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

Background

This control measure seeks to reduce ammonia from NOx controls such as Selective Catalytic Reduction (SCR) and Selective Non-Catalytic Reduction (SNCR). These systems can reduce Nitrogen Oxide (NOx) emissions from combustion sources very effectively. However, the use of systems also results in potential emissions of ammonia that "slip" past the control equipment and into the atmosphere. Ammonia (NH3) is a precursor gas for secondary PM formation, and so minimizing ammonia slip is essential for optimizing emission reductions from these controls.

Regulatory History

There were several rules that regulate equipment that have SCR systems. These rules include:

1- **Rule 1134 – Emissions of Oxides of Nitrogen from Stationary Gas Turbines** (last amended February 4, 2022). This Rule applies to turbines with generating capacity greater than 0.3 MW except those located electric generating facilities, landfills, petroleum refineries, and publicly owned treatment works or fueled with landfill gas. There are 37 facilities with 72 turbines that are subject to Rule 1134.

2- **Rule 1135 – Emissions of Oxides of Nitrogen from Electricity Generating Facilities** (last amended January 7, 2022). This Rule regulates Boilers, internal combustion engines, and turbines located at investor-owned electric utilities, publicly owned electric utilities, and facilities with combined generation capacity of ≥ 50 MW. Rule 1135 applies to 133 combustion units at 32 facilities.

3- **Rule 1146 – Emission of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters** (last amended December 4, 2020). This Rule applies to boilers, steam generators, and process heaters of equal to or greater than 5 million Btu per hour rated heat input capacity used in all industrial, institutional, and commercial operations.

4- **Rule 1147 – NOx Reductions from Miscellaneous Sources** (last amended May 6, 2022). Rule 1147 applies to manufacturers, distributors, retailers, installers, owners, and operators of combustion equipment with NOx emissions that require a South Coast AQMD permit, and when other South Coast AQMD Regulation XI rules are not applicable to the Unit. Equipment that falls under specialized exemption language of an applicable South Coast AQMD Regulation XI rules is not being regulated under Rule 1147. This rule affects approximately 5,300 units located at approximately 3,000 facilities.

5- Rule 1109.1 – Emission of Oxides of Nitrogen from Petroleum Refineries and Related Operations (adopted November 5, 2021). This Rule establishes NOx and CO concentration limits for combustion equipment at petroleum refineries and facilities with operations related to petroleum refineries. Rule 1109.1 regulated five major petroleum refineries, three small refineries, and four facilities with related operations with nearly 300 pieces of combustion equipment distributed among all facilities.

For all Rules, there is no ammonia emission limit as that is regulated under Regulation XIII and the limit is set on a case-by-case basis. Under Regulation XIII, the ammonia emissions must meet current Best Available Control Technology (BACT) limit of 5 ppm.

Proposed Method of Control

Post-combustion equipment for emission control technology systems includes SCRs. This technology reduces emissions of NOx. This method to reduce NOx emissions converts the NOx to Nitrogen and water by the reaction of NOx and NH3. The reaction between these two compounds is not perfect and there is an excess of un-reacted NH3 that goes into the atmosphere. This excess ammonia is known as ammonia slip. The units will be upgrading their SCR systems by tuning/optimizing to achieve the NOx limits specified in each rule and as a result, the ammonia slip from the upgraded SCR systems will be reduced with improved Ammonia Injection Grid (AIG) from the new /retrofitted systems. The upgraded and improved AIG improves the contact with the flue gas thus resulting in lower excess ammonia slip.

Emission Reductions

To be determined.

Rule Compliance and Test Methods

The rule compliance and their respective compliance schedules for NOx emissions along test methods are specified in each rule. Ammonia emissions are tested by source test method 207.1 – Determination of Ammonia Emissions from Stationary Sources.

Cost Effectiveness

The cost-effectiveness for each rule is based on NOx control utilizing SCR technology to achieve the proposed NOx limits.

Implementing Agency

South Coast AQMD

References

South Coast AQMD 2016 AQMP; final2016aqmp.pdf (aqmd.gov)

South Coast AQMD 2022 AQMP Appendix VI; appendix-vi.pdf (aqmd.gov)

South Coast AQMD Rule 1134; Rule 1134

South Coast AQMD Rule 1134, Staff Report; Staff Report

South Coast AQMD Rule 1135; Rule 1135

South Coast AQMD Rule 1135, Staff Report; Staff Report

South Coast AQMD Rule 1146; Rule 1146

South Coast AQMD Rule 1146, Staff Report; Staff Report

South Coast AQMD Rule 1147; Rule 1147

South Coast AQMD Rule 1147, Staff Report; Staff Report

South Coast AQMD Rule 1109.1; Rule 1109.1

South Coast AQMD Rule 1109.1 Staff Report; Staff Report

BCM-10: EMISSION REDUCTIONS FROM DIRECT LAND APPLICATION OF CHIPPED AND GROUND UNCOMPOSTED GREENWASTE [NH3]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	GREENWASTE COMPOSTING EMISSION REDUCTIONS	
CONTROL METHODS:	COMPOSTING OF CHIPPED AND GROUND GREENWASTE	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [NH3]:	2018	2030
POLLUTANT INVENTORY	0.67	0.67
POLLUTANT REDUCTION	-	0.08
POLLUTANT REMAINING	-	0.59
CONTROL COST:	DCF METHOD: $91,200/TON	
INCENTIVE COST:	N/A	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

This proposed control measure would seek reductions in ammonia (NH3) emissions from direct land application (DLA) of chipped and ground uncomposted greenwaste to agricultural land, to public land for erosion control or roadway management, and to consumers' properties for gardening or landscaping purposes (e.g., mulching). The control approach involves minimum composting requirements for chipped and ground greenwaste prior to DLA.

Background

Based on data reported to California's Department of Resources Recycling and Recovery (CalRecycle), California's 39.3 million residents and 1.7 million businesses generated an estimated 76.7 million tons of municipal solid waste in 2021, of which 36.9 million tons were recycled. The remaining 39.8 million tons were disposed. Disposed material contained approximately 28 percent (11.3 million tons) compostable organic materials, including 11 percent food, 6 percent landscape waste, and 16 percent wood waste. Recent legislation passed in California has aimed to reduce landfill disposal of organic materials. For example, Senate Bill (SB) 1383 (Short-Lived Climate Pollutants; Lara, Chapter 395, Statues of 2016) targets a 50 percent reduction of statewide organic waste disposal from 2014 levels by 2020, and a 75 percent reduction by 2025. SB 1383 also establishes an additional target that at least 20 percent of currently disposed edible food is recovered for human consumption by 2025. SB 1383 organic waste mandates are implemented by local jurisdictions with oversight from CalRecycle. CalRecycle conducted a formal rulemaking process through collaboration with other stakeholders that resulted in regulations for organic waste management programs. Under SB 1383 regulations, organic waste includes a broad range of waste categories such as food, green material, landscape and pruning waste, organic textiles and carpets, lumber, wood, paper products, printing and writing paper, manure, biosolids, digestate, and sludges that will be diverted from landfills and taken to the appropriate organic waste recovery facilities. Under SB 1383 regulations, all residents and businesses in California have been required to separate food and other organic materials from the rest of their garbage since January 1, 2022. Local governments are required to take enforcement against noncompliance starting January 1, 2024.

DLA and composting are the two primary alternatives to disposal of greenwaste in landfills. Farmers who have fallow land lacking in organic matter may find DLA of uncomposted greenwaste, which includes surface placement and incorporation of greenwaste into soil, to be beneficial because this method offers gradual release of organic matter and shields the exposed soil from the damaging effects of sunlight, wind, and rain. Additionally, it serves as a solution for areas where composting facilities are not sufficient to handle municipally collected greenwaste. DLA is also economically advantageous for landowners, as it is significantly cheaper than purchasing finished compost, and often requires only the expenses for delivery and spreading. Such applications may produce greenhouse gases (GHGs) and other air pollutants such as VOCs and NH3 and have the potential to spread pathogens. With the implementation of SB 1383, DLA of greenwaste may become an increasingly common practice in California. There are limited studies, however, on the air quality impact of chipped and ground uncomposted greenwaste. According to Burger et al., uncomposted greenwaste incorporated into soil released lower GHG and VOC emissions than surface application of the greenwaste. The study also found that the VOC emissions contained greater amounts of monoterpenes, which are potent organic aerosol precursors, compared to composted greenwaste.

Organic mulch, which is a plant by-product such as bark, wood chips, or a recycled material such as chipped construction waste, is often applied as loose material to slopes and flat areas. Mulching is common following roadside plantings or highway improvement projects. Several types of organic mulch can be used including tree bark, wood chips, tree trimmings, etc. (see Caltrans' 2018 Standard Specification section 20-5.04 Wood Mulch). In general, these types of wood mulch should contain minimal leaves and must be cleaned and decontaminated from pathogens or pests prior to DLA. Wood mulch is high in carbon and low in nitrogen (carbon to nitrogen ratio = 600:1). Furthermore, it decays slowly and takes much longer to decompose compared to well-balanced greenwaste. For these reasons, emissions of NH3 from uncomposted wood mulch are anticipated to be low.

Regulatory History

South Coast AQMD Rule 1133 – Composting and Related Operations – General Administrative Requirements, established administrative requirements for greenwaste disposal facilities such as composting facilities, chipping and grinding facilities, and material recovery facilities (MRF). The facilities are required to register with South Coast AQMD and submit annual updates of their material handling and processing activities, including throughput of incoming materials (e.g., food, green, wood), type of operations (e.g., chipping and grinding, composting, aerated static piles), and tonnage of products as a result of operations.

South Coast AQMD Rule 1133.1 – Chipping and Grinding Activities, establishes requirements for holding green materials received on-site before and after chipping and grinding.

South Coast AQMD Rule 1133.3 – Greenwaste Composting Operations, establishes requirements of composting greenwaste and/or greenwaste with foodwaste. To control VOC and NH3 emissions from composting operations, either best management practices (BMPs) or an add-on control is required based upon facility-wide annual throughput of foodwaste received. For a facility receiving up to 5,000 tons per year of foodwaste, the required BMPs are covering each composting pile with a layer of at least 6 inches of finished compost or compost overs for the first 15 days of the active phase of composting and watering the pile as needed. These BMPs have a control efficiency of 40 percent for VOCs and 20 percent for NH3. Add-on controls, such as aerated static piles and in-vessel composting, are required for facilities processing greater than 5,000 tons of foodwaste per year and those that process active composting piles containing greater than 10 percent foodwaste. The required control efficiency of an add-on control device is 80 percent for VOCs and NH3.

California Code of Regulations, Title 14, Section 17868.3 requires a pathogen reduction period of 15 days for a windrow composting process. The pathogen reduction period aligns with the active phase BMP requirements in Rule 1133.3. For aerated static piles or in-vessel composting, which are subject to the 80 percent VOCs and NH3 add-on control efficiency requirement under Rule 1133.3, a minimum of three days is required to reduce pathogens.

Proposed Method of Control

Chipped and ground greenwaste used as ground cover may have increased emissions of GHGs, NH3, and VOCs and contain pathogens if it does not first undergo composting. Therefore, this measure proposes to require composting of chipped and ground greenwaste, in accordance with the BMP requirements of Rule 1133.3, prior to DLA.

Based on Card and Schmidt's analysis, cumulative NH3 emissions during the active phase of composting account for over 70 percent of total composting NH3 emissions. Further analysis showed that up to 85 percent of NH3 emissions occur in the first 15 days out of the 22-day active phase composting period. Rule 1133.3 already has requirements to control emissions during this period. Therefore, emission reductions can be achieved by having chipped and ground greenwaste undergo at least 15 days of active phase composting prior to DLA.

Emission Reductions

Twenty-three greenwaste processing facilities in the South Coast Air Basin are potentially subject to this control measure. Among the 23 facilities, five facilities are greenwaste composting facilities that produce finished compost on-site and the remaining 18 facilities are greenwaste chipping and grinding facilities that do not produce finished compost on-site.

The 2030 baseline inventory is 0.67 tpd of NH3 for chipped and ground greenwaste that may be used for direct land application. About 70 percent of the emissions are associated with active-phase composting, while the remaining 30 percent are from the curing phase. The estimated emission reductions are 0.08 tpd of NH3 based on 20 percent control efficiency during the first 15 days of active phase composting of chipped and ground greenwaste produced at chipping and grinding and/or composting facilities.

Several assumptions were made in the quantification of emission reductions including the uncontrolled NH3 emission factor, 20 percent NH3 emission control efficiency, the chipping and grinding activity data, and the percentage of NH3 emissions during the first 15 days of active phase composting. NH3 emission reductions were quantified using the same assumptions used in the 2016 AQMP, except that chipping and grinding activity data has been updated. The activity data is the tonnage of annual throughput that these facilities reported to the South Coast AQMD for the year 2018, which is required by the Rule 1133 Registration/Annual Update requirements. If the 2018 throughput data was not readily available for the facility, the most recent throughput available between 2014 and 2019 was used as a substitute.

Staff previously estimated NH3 emissions from greenwaste composting stockpiles at an emission rate of 0.017 lbs/wet ton-day. However, emission rates from surface-applied chipped and ground, fresh greenwaste have not been investigated and thus warrant further research to refine the emissions inventory and estimated reductions.

Rule Compliance and Test Methods

A South Coast AQMD regulation or other enforceable instrument will be considered to ensure emission reductions. The most effective regulatory tool will be selected. Implementation of this control measure would not conflict with efforts under SB 1383. South Coast AQMD staff will work with CalRecycle, CARB, and Caltrans to develop appropriate test methods to quantify emissions.

Cost Effectiveness

Cost-effectiveness for this control measure is estimated based on the analysis of cost-effectiveness of 2016 AQMP control measure BCM-10. The 2016 AQMP estimated compliance costs by assuming that 18 chipping and grinding facilities would need to purchase cover material (either finished compost or compost overs) from local composting facilities. To reduce the cover material purchasing cost, which could be high depending on the size of mulch throughput, it is assumed that facilities would purchase it only for the first year and then would produce finished compost on-site in the following years. Therefore, material cost is considered as a one-time cost, annualized over 15 years of a facility's lifetime. In addition to the cover material cost, watering, covering, and recordkeeping costs are also included in the compliance costs calculation. Five composting facilities would also need to perform mulch composting to achieve pathogen reduction for the first 15 days using the proposed BMPs. However, since the cover material is readily available on-site, the purchasing of cover material is not needed. Moreover, recordkeeping costs were not considered as the composting facilities are already subject to the recordkeeping requirements in Rule 1133.3.

Staff is not aware of additional costs beyond those estimated in the 2016 AQMP. Therefore, the 2022 cost-effectiveness was adjusted from the 2016 cost-effectiveness using the ratio of Marshall & Swift Indices for both years, which is calculated to be 1.4. Cost-effectiveness is estimated at $91,200 per ton of NH3 reduced. Cost-effectiveness for this control measure will be refined further during rulemaking.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from stationary sources.

References

CalRecycle, 2021 Disposal Facility-based Waste Characterization Data Tables, November 2022

An Overview of SB 1383's Organic Waste Reduction Requirements. https://www2.calrecycle.ca.gov/Docs/Web/115800

CalRecycle, Third Assessment of California's Compost- and Mulch-Processing Infrastructure – Management Practices and Market Conditions, August 2010

California Department of Transportation, Roadway Management Toolbox: Organic Mulch. https://dot.ca.gov/programs/design/lap-roadside-management-toolbox/tool4r-lap-organic-mulch. Accessed on June 6, 2023

California Department of Transportation, Standard Specifications, 2018

Burger, M., X. Zhu and P.G. Green, 2015. Research to Evaluate Environmental Impacts of Direct Land Application of Uncomposted Green and Woody Wastes on Air and Water Quality, Contractor's Report to CalRecycle, March 30, 2015

Card, T.R. and C.E. Schmidt, 2006. Air emissions source test: Jepson Prairie Organics Compost Facility, Vacaville, CA. Report to NorCal Waste Systems, Inc.

Card, T.R. and C.E. Schmidt, 2009. Northern Recycling Zamora Compost Facility Air Emissions Source Test. Report to Yolo Solano AQMD

BCM-11: EMISSION REDUCTIONS FROM ORGANIC WASTE COMPOSTING [NH3]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	ORGANIC WASTE COMPOSTING	
CONTROL METHODS:	FOODWASTE CO-DIGESTION, INTEGRATION OF ANAEROBIC DIGESTION WITH COMPOSTING	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [NH3]:	2018	2030
POLLUTANT INVENTORY	0.63	0.96
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	N/A	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

This proposed control measure would seek emission reductions of NH3 from the processing of organic waste materials including foodwaste, greenwaste, and agricultural waste. Control approaches include foodwaste co-digestion and integration of anaerobic digestion (AD) with composting.

Background

AD is a process through which bacteria decompose organic material such as animal manure, wastewater biosolids, and foodwaste in the absence of oxygen to produce biogas. AD occurs in a sealed vessel known as a reactor, which is designed and constructed in a variety of shapes and sizes based on the site and feedstock conditions. Multiple organic materials can be combined in one digester. Co-digested materials include manure, foodwaste (pre- and post-consumer), crop residues, and fats, oils and grease (FOG) from restaurant grease traps, and many other sources. Co-digestion can increase biogas production from low-yielding (e.g., biosolids, manure) or difficult-to-digest (e.g., yard waste) organic waste. These reactors contain complex microbial communities that digest the waste and produce resultant biogas and other useful co-products (i.e., solid and liquid portions of the digestate). Biogas is composed of methane, which is the primary component of natural gas, at a relatively high percentage (50 to 75 percent), carbon dioxide (CO_2), hydrogen sulfide, water vapor, and trace amounts of other gases. Biogas can be purified by removing the low-value constituents to generate renewable natural gas which can be sold and injected into the natural gas distribution system, compressed and used as vehicle fuel, or processed further to generate alternative transportation fuel, energy products, or other advanced biochemicals and bioproducts. Digestate is the residual material left after the digestion process and is composed of liquid and solid portions. Both portions are separated and handled independently, and can be used in many beneficial applications, such as animal bedding (solids), nutrient-rich fertilizer (liquids and solids), a foundation material for bioproducts, organic-rich compost (solids), or as soil amendments (solids).[21]

Based on data reported to California's Department of Resources Recycling and Recovery (CalRecycle), California's 39.3 million residents and 1.7 million businesses generated an estimated 76.7 million tons of municipal solid waste in 2021, of which 36.9 million tons were recycled. The remaining 39.8 million tons were disposed. Disposed material contained approximately 28 percent (11.3 million tons) compostable organic materials, including 11 percent foodwaste, 6 percent landscape waste, and 16 percent wood waste. Foodwaste can be composted or utilized to generate renewable energy; landscape waste including grass clippings and tree trimmings can be composted; and wood waste such as lumber can be transformed into mulch, used in a biofilter, or burned in a biomass plant to generate renewable energy.[22]

Recent legislation passed in California has aimed to reduce landfill disposal of organic materials. For example, Senate Bill (SB) 1383 (Short-Lived Climate Pollutants; Lara, Chapter 395, Statues of 2016) targets a 50 percent reduction of statewide organic waste disposal from 2014 levels by 2020, and a 75 percent reduction by 2025. SB 1383 also establishes an additional target that at least 20 percent of currently disposed edible food is recovered for human consumption by 2025. SB 1383 organic waste mandates are implemented by local jurisdictions with oversight from CalRecycle. CalRecycle conducted a formal rulemaking process through collaboration with other stakeholders that resulted in regulations for organic waste management programs. Under SB 1383 regulations, organic waste includes a broad range of waste categories such as food, green material, landscape and pruning waste, organic textiles and carpets, lumber, wood, paper products, printing and writing paper, manure, biosolids, digestate, and sludges that will be diverted from landfills and taken to the appropriate organic waste recovery facilities. All residents and businesses in California have been required to separate food and other organic materials from their garbage since January 1, 2022. Local governments are required to take enforcement against noncompliance starting January 1, 2024.

Foodwaste has a high moisture content and decomposes quickly, resulting in greenhouse gases, VOC and NH3 emissions in landfills. Foodwaste is second only to manure for NH3 emissions in the organic waste composting category.[23,24] The potential use of foodwaste as an energy source has long been studied

[21] https://www.epa.gov/agstar/how-does-anaerobic-digestion-work

[22] https://calrecycle.ca.gov/climate/organics/

[23] Nordahl, S.L., C.V. Preble, T.W. Kirchstetter, and C.D. Scown, 2023. Greenhouse gas and air pollutant emissions from composting. Environ. Sci. Technol. 57, 2235–2247

[24] Prado, G., R. Moral, E. Aguilera, 2015. A.D. Prado, Gaseous emissions from management of solid waste: a systematic review, Global Change Biology, 21, 1313–1327

because foodwaste has three times the methane (CH_4) production potential of biosolids,[25] and anaerobic co-digestion of foodwaste and sewage sludge can boost biogas generation.[26,27]

According to CalRecycle's Draft Environmental Impact Report, 46 new or expanded compost facilities and 24 new or expanded anaerobic digester facilities would be required in the South Coast Air Basin by 2030 to process the diverted waste.[28] While overall Short-Lived Climate Pollutant emissions are expected to decline, emissions from processing of organic waste via composting and anaerobic digestion are expected to grow.

Regulatory History

South Coast AQMD Rule 1133 – Composting and Related Operations-General Administrative Requirements, established administrative requirements for green waste disposal facilities such as composting facilities, chipping and grinding facilities, and material recovery facilities (MRF). The facilities are mainly required to register with the South Coast AQMD and submit annual updates with their material processing activities including receiving materials throughput and outgoing products tonnage.

South Coast AQMD Rule 1133.2 – Emission Reductions from Co-Composting Operations, requires controls of VOC and NH3 emissions from new and existing co-composting operations. Co-composting facilities which began operations after January 10, 2003 are required to conduct all active co-composting in an enclosure, to conduct all curing using a negative aeration system, and to vent the exhaust from the enclosure and the aeration system to an emission control system that has a control efficiency of 80 percent or greater for VOC and NH3 emissions. Facilities that existed prior to January 10, 2003 are required to develop a compliance plan that demonstrates an overall emission reduction of 70 percent for VOC and NH3 emissions.

South Coast AQMD Rule 1133.3 – Emission Reductions from Greenwaste Composting Operations, establishes requirements of composting greenwaste and/or greenwaste with foodwaste. To control VOC and NH3 emissions from composting operations, either best management practices (BMPs) or add-on controls are required based upon facility-wide annual throughput of foodwaste received. For a facility receiving up to 5,000 tons per year of foodwaste, the required BMPs are covering each composting pile with a layer of at least 6 inches of finished compost or compost overs and watering the pile as needed for the first 15 days of the active phase composting. These BMPs have a control efficiency of 40 percent for VOCs and 20 percent for NH3. Add-on controls are required for a facility receiving greater than 5,000 tons

[25] U.S. Environmental Protection Agency, 2014. The benefits of anaerobic digestion of food waste at wastewater treatment facilities, USEPA Region 9. https://www.epa.gov/sites/production/files/documents/Why-Anaerobic-Digestion.pdf

[26] Deena, S.R., A.S. Vickram, S. Manikandan, R. Subbaiya, N. Karmegam, B. Ravindran, S.W. Chang, M.K. Awasthi, 2022. Enhanced biogas production from food waste and activated sludge using advanced techniques – A review, Bioresource Technology, 355, 127234

[27] Kuo, J., J. Dow, 2017. Biogas production from anaerobic digestion of food waste and relevant air quality implications, J. Air & Waste Manag. Assoc. 67, 1000–1011

[28] CalRecycle, 2019. Draft Environmental Impact Report, SB 1383 Regulations Short-Lived Climate Pollutants: Organic Waste Methane Emission Reduction, Table 2-3. https://www2.calrecycle.ca.gov/Docs/Web/119973

of foodwaste per year and those that process active composting piles for a minimum of 22 days, containing greater than 10 percent foodwaste. The required control efficiency of an add-on control device is 80 percent for VOCs and NH3. While emission controls can be achieved either by BMPs or add-on controls depending on the throughput level of foodwaste, both active and curing phases of composting are required to produce the finished compost.

Proposed Method of Control

South Coast AQMD's Rules 1133.2 (Co-Composting) and 1133.3 (Greenwaste Composting) currently do not regulate the co-digestion of foodwaste with sewage sludge or the incorporation of foodwaste digestate into greenwaste composting. The digestate produced by foodwaste co-digestion contains treated sewage sludge (referred to as biosolids) and the solid residue from the digested foodwaste. Because biosolid composting is governed by Rule 1133.2, the digestate produced by foodwaste co-digestion would also be governed by Rule 1133.2. Emissions of NH3 can be reduced by using an emission control system specified by Rule 1133.2. If foodwaste is the only feedstock input to AD, the resulting digestate could be included into greenwaste composting and NH3 emissions reduction is governed by Rule 1133.3.

This control measure proposes to expand the applicability of Rules 1133.2 and 1133.3 to regulate the co-digestion of foodwaste with biosolids and the integration of foodwaste digestate with greenwaste composting for further emission reductions.

Foodwaste Co-Digestion

Emerging technologies are available for co-digestion of foodwaste. For example, Waste Management (WM) has a proprietary Centralized Organic Recycling equipment (CORe®)[29] that recycles commercial and institutional pre- and post-consumer organic waste materials (food scraps) into an Engineered BioSlurry (EBS®). This organic slurry is co-digested in anaerobic digesters with wastewater treatment plant (WWTP) biosolids (e.g., sewage sludge) to boost biogas output. According to laboratory bench tests, EBS® significantly increased biogas production. With 10 percent EBS® volume addition to anaerobic digesters, renewable biogas production in the bench reactors increased by 112 percent.[30]

Co-digestion is a process in which energy-rich organic waste materials (e.g., FOG and/or food scraps) are added to dairy or WWTP digesters with excess capacity. CORe® accepts clean source-separated organics (SSO), pre-consumer (clean) and post-consumer (contaminated) organic waste, and packaged food material on a case-by-case basis. Wood and yard waste is not acceptable. Figure BCM-11-A illustrates co-digestion performance metrics with the WM CORe® process.

[29] https://www.wm.com/us/en/inside-wm/sustainable-technology/organics-recycling
[30] https://www.biocycle.net/los-angeles-county-wrrf-embraces-codigestion/

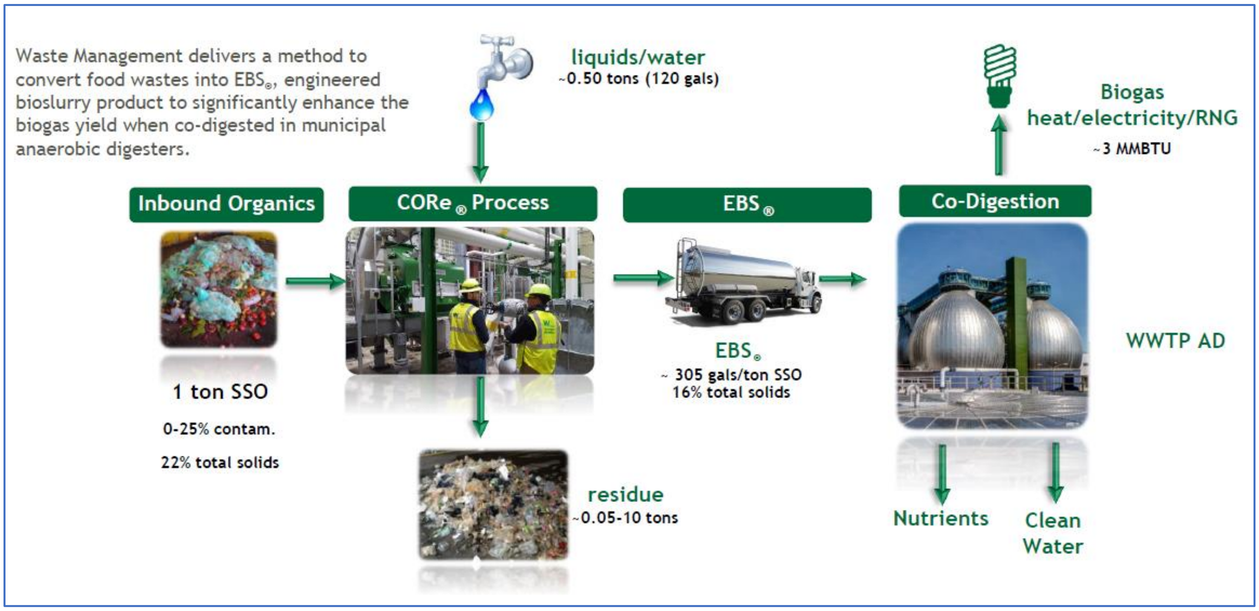

FIGURE BCM-11-A

WM CORE® AND CO-DIGESTION PERFORMANCE METRICS[31]

WM operates one CORe® facility in the South Coast Air Basin. SSO is transported to Orange County Transfer Station where the CORe® is located and loaded into the CORe® system's hopper and conveyed into a bioseparator, which separates organic material from inorganic waste. The separated organic waste is liquefied to create EBS® which is then transported via a tanker truck to the Los Angeles County Sanitation District (LACSD) Joint Water Pollution Control Plant in Carson, CA where the EBS® is added to the plant's anaerobic digestion system to increase the production of biogas. The biogas is collected and used to generate electricity and heat to serve the Plant's process needs to purify water. Leftover biosolids can be further composted.[32] Under Rule 1133.2, existing co-composting operations are required to have a 70 percent control efficiency whereas new co-composting operations must have an 80 percent control efficiency for NH3. The feasibility of the following control methods will be evaluated:

- Increasing the NH3 control efficiency of existing co-composting operations from 70 percent to 80 percent; and
- Increasing the NH3 control efficiency from 80 percent to 90 percent for new co-composting operations.

[31] https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/20230331-wm-core-codigestion-tech.pdf
[32] https://localsites.wm.com/a4480000006oO0bAAE/CORe+Flyer.pdf

Some studies also find that NH3 emissions can be reduced by optimizing the biofiltration or adding physical amendments to co-composting piles.[33,34] This will be further explored during rulemaking.

Integration of Anaerobic Digestion with Composting

With an integrated AD-composting system, digestate from AD becomes an input to the composting process, making less overall waste and a more useful product, as illustrated in Figure BCM-11-B.

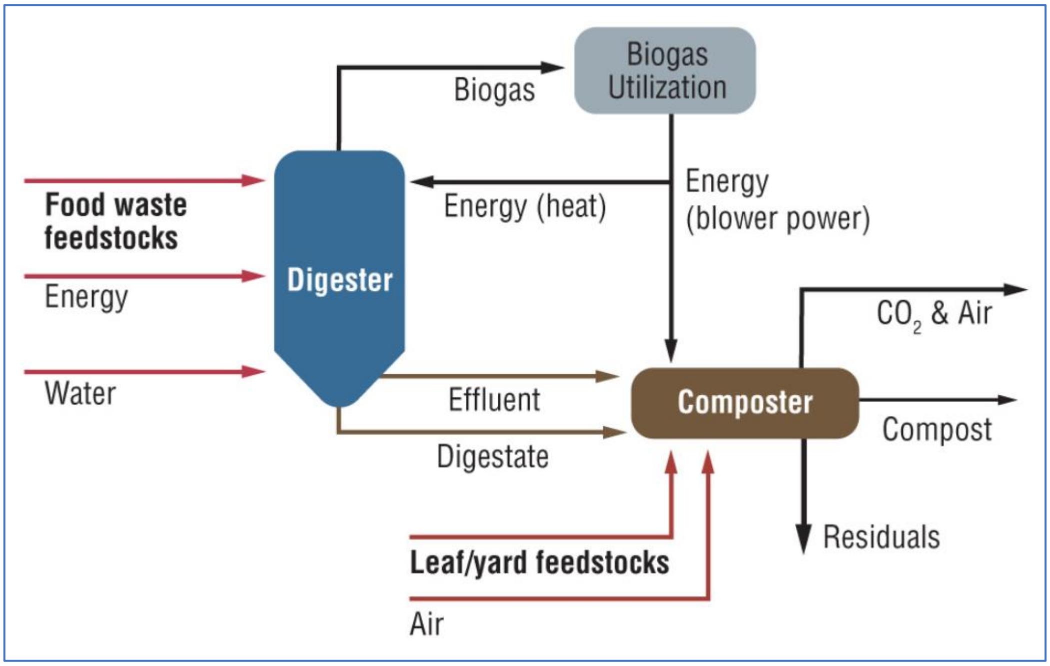

FIGURE BCM-11-B
INPUTS AND OUTPUTS FOR AN INTEGRATED AD AND COMPOSTING SYSTEM[35]

This integrated system works best where foodwaste (primarily SSO) is digested and greenwaste (primarily leaves and yard trimmings) is composted at the same facility. Digestate from AD becomes a feedstock for greenwaste composting. Composting of raw foodwaste, which typically takes 8 to 12 weeks, can be reduced to as little as 2 to 3 weeks for digestate because the material has been partially decomposed in

[33] Hwang, H.Y., S.H. Kim, J. Shim, S.J. Park, 2020. Composting process and gas emissions during food waste composting under the effect of different additives. Sustainability. 12(18), 7811
[34] Manu, M.K., C. Wang, D. Li, S. Varjani, J.W.C. Wong, 2022. Impact of zeolite amendment on composting of food waste digestate. Journal of Cleaner Production, 371(15), 133408
[35] https://www.biocycle.net/integrating-anaerobic-digestion-with-composting/

the digestion process. When foodwaste is anaerobically digested prior to composting, NH3 emissions can be up to 50 percent lower compared to composting the untreated foodwaste.[36]

Other synergistic effects of combining AD with composting include:

- Reduction and, in some cases, elimination of digester effluent treatment. Digester effluent can supply the water required for composting. Nutrients in the effluent can potentially increase compost value.
- Minimization of foodwaste processing odor as foodwaste receiving and digesting is completely enclosed.
- Direct onsite use of biogas energy. Biogas can supply electric power directly to the composting system (e.g., aeration and ventilation to biofiltration), avoiding grid electricity costs.
- Increases of the overall plant capacity with minimal footprint increase – one site, one permit, and one receiving building.
- During startup and shutdown periods of the AD system, foodwaste can be diverted to the composting system.

Emission Reductions

The 2030 baseline inventory is 0.96 tpd of NH3 for this source category. This source category has not been extensively investigated and thus warrants further research to refine the emissions inventory. As such, emission reductions will be determined during rulemaking.

Rule Compliance and Test Methods

A South Coast AQMD regulation or other enforceable instrument will be considered to ensure emission reductions. The most effective regulatory tool will be selected. Implementation of this control measure would not conflict with efforts under SB 1383. South Coast AQMD staff will work with CalRecycle and CARB to develop appropriate test methods to quantify emissions.

Cost Effectiveness

Cost-effectiveness will be determined during rulemaking.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from stationary sources.

[36] Nordahl, S.L., C.V. Preble, T.W. Kirchstetter, and C.D. Scown, 2023. Greenhouse gas and air pollutant emissions from composting. Environ. Sci. Technol. 57, 2235–2247

References

U.S. Environmental Protection Agency. How Does Anaerobic Digestion Work?
https://www.epa.gov/agstar/how-does-anaerobic-digestion-work

CalRecycle. Organic Materials Management and Climate Change.
https://calrecycle.ca.gov/climate/organics/

Nordahl, S.L., C.V. Preble, T.W. Kirchstetter, and C.D. Scown, 2023. Greenhouse gas and air pollutant emissions from composting. Environ. Sci. Technol. 57, 2235–2247

Prado, G., R. Moral, E. Aguilera, 2015. A.D. Prado, Gaseous emissions from management of solid waste: a systematic review, Global Change Biology, 21, 1313–1327

U.S. Environmental Protection Agency, 2014. The benefits of anaerobic digestion of food waste at wastewater treatment facilities, USEPA Region 9.
https://www.epa.gov/sites/production/files/documents/Why-Anaerobic-Digestion.pdf

Deena, S.R., A.S. Vickram, S. Manikandan, R. Subbaiya, N. Karmegam, B. Ravindran, S.W. Chang, M.K. Awasthi, 2022. Enhanced biogas production from food waste and activated sludge using advanced techniques – A review, Bioresource Technology, 355, 127234

Kuo, J., J. Dow, 2017. Biogas production from anaerobic digestion of food waste and relevant air quality implications, J. Air & Waste Manag. Assoc. 67, 1000–1011

CalRecycle, 2019. Draft Environmental Impact Report, SB 1383 Regulations Short-Lived Climate Pollutants: Organic Waste Methane Emission Reduction, Table 2-3.
https://www2.calrecycle.ca.gov/Docs/Web/119973
Waste Management, Organics Recycling. https://www.wm.com/us/en/inside-wm/sustainable-technology/organics-recycling

Coker, Craig, 2017. Los Angeles County WRRF Embraces Codigestion. BioCycle.
https://www.biocycle.net/los-angeles-county-wrrf-embraces-codigestion/
Waste Management, CORe.
https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/20230331-wm-core-codigestion-tech.pdf

Waste Management. WM CORe, Converting Southern California Food Waste to Clean, Renewable Energy. https://localsites.wm.com/a4480000006oO0bAAE/CORe+Flyer.pdf

Hwang, H.Y., S.H. Kim, J. Shim, S.J. Park, 2020. Composting process and gas emissions during food waste composting under the effect of different additives. Sustainability. 12(18), 7811

Manu, M.K., C. Wang, D. Li, S. Varjani, J.W.C. Wong, 2022. Impact of zeolite amendment on composting of food waste digestate. Journal of Cleaner Production, 371(15), 133408

Kraemer, T. and S. Gamble, 2014. Integrating Anaerobic Digestion with Composting. https://www.biocycle.net/integrating-anaerobic-digestion-with-composting/

Nordahl, S.L., C.V. Preble, T.W. Kirchstetter, and C.D. Scown, 2023. Greenhouse gas and air pollutant emissions from composting. Environ. Sci. Technol. 57, 2235–2247

BCM-12: FURTHER EMISSION REDUCTIONS FROM COMMERCIAL COOKING [PM2.5]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	CHARBROILERS	
CONTROL METHODS:	LOWER THRESHOLD FOR INTEGRATED CATALYTIC OXIDIZER REQUIREMENTS FOR CHAIN-DRIVEN CHARBROILERS	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	8.49	9.13
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD/LOCAL OR REGIONAL AGENCIES	

Description of Source Category

This proposed control measure would seek PM2.5 reductions from commercial charbroilers.

Background

Cooking activities are the largest source of directly emitted PM2.5 emissions in the Basin. The inventory estimates provided in the above summary table include emissions from charbroilers (chain-driven and under-fired), griddles, deep fat fryers, ovens, and other equipment. Under-fired charbroilers are responsible for the majority of emissions from this source category (2007, SCAQMD) due to the higher emission potential when compared with other cooking devices (e.g., 32.5 lbs PM per 1,000 lbs of meat cooked via under-fired charbroiler compared to 5 lbs PM per 1,000 lbs of meat cooked via a griddle). However, emissions from under-fired charbroilers are estimated based on 1999 survey report data and growth projection from it, indicating room for improvement. An under-fired charbroiler consists of three main components: a heating source, a high temperature radiant surface, and a slotted grill (grate). The grill holds the meat or other food while exposing it to the radiant heat. PM and VOC emissions occur when grease from the meat falls onto the high temperature radiant surface. Most under-fired charbroilers burn natural gas; however, solid fuels, such as charcoal or wood with or without the addition of ceramic stones, are sometimes used. Restaurant PM emissions are also classified as a black carbon source which recent studies identify as contributing to climate change both directly by absorbing sunlight and indirectly by disrupting cloud formation, precipitation patterns and water storage in snowpack.

Regulatory History

Efforts to reduce PM emissions from commercial cooking activities have been included in air quality plan control measures since the early 1990s. While the goal has been to develop a comprehensive rule applicable to all commercial cooking activities the only available, cost-effective PM control was initially limited to chain-driven charbroilers. In 1997, the South Coast AQMD Governing Board adopted Rule 1138 – Control of Emissions from Restaurant Operations, which requires chain-driven charbroilers to install a catalytic oxidizer (or equivalent) control device. These types of charbroilers were uniquely suited for the implementation of commercially available, low-cost catalyst oxidizers (flameless incineration) which operate with the necessary exhaust temperature of 700–800 °F. Rule 1138 applies to commercial cooking operations with chain-driven charbroilers cooking more than 875 pounds of meat per week and required control devices must be certified to achieve an 83 percent reduction in PM emissions.

Since adoption of Rule 1138, South Coast AQMD staff efforts to reduce emissions from commercial cooking operations have been focused on under-fired charbroilers and a series of reports were made to the South Coast AQMD Governing Board in 1999, 2001, and 2004 to present results of under-fired charbroiler control technology research. Affordable controls were not commercially available at that time for under-fired charbroilers.

In 2007, the Bay Area Air Quality Management District (BAAQMD) adopted Regulation 6, Rule 2 (Commercial Cooking) which included provisions for both chain-driven and under-fired charbroilers. The Bay Area regulation requires a catalytic oxidizer for chain-driven charbroilers with a throughput of at least 400 pounds of beef per week. Under-fired charbroilers with more than 10 square feet of cooking area are required to limit emissions to 1 pound of PM10 per 1,000 pounds of cooked beef (80 to 85 percent reduction in direct PM 10 emissions) under the Bay Area rule. Requirements for chain-driven charbroilers have been successfully implemented, however, there are no commercially available devices that meet the Bay Area AQMD emissions standards for under-fired charbroilers. Additionally, enforcement of this regulation is minimal.

As a result of the Bay Area regulation, a subsequent South Coast AQMD rule development effort to control PM emissions from under-fired charbroilers was initiated in 2008. A Working Group of approximately 35 members from affected industry, equipment manufacturers and researchers were formed to initially discuss current research and later to provide comment on draft rule language. Three working group meetings were held in 2008 and 2009 and a public workshop was held in August 2009.

Due to concerns over control device availability and initial equipment costs affecting small businesses, Proposed Rule 1138 amendments were postponed. Instead, South Coast AQMD initiated further research on under-fired charbroiler control technologies with the goal of identifying and testing lower cost devices.

In 2015 the New York City Department of Environmental Protection (DEP) initiated a program to reduce PM emissions from commercial charbroilers. The DEP program generally follows South Coast AQMD and other California air district requirements for chain-driven charbroiler restaurants (e.g., flameless catalytic oxidizers) but also establishes requirements for new restaurants with under-fired charbroilers. Specifically, the DEP regulation prohibits operation of a new under-fired commercial charbroiler cooking more than 875 pounds of meat per week unless an Electrostatic Precipitator (ESP) or other type of device achieving a 75 percent PM10 reduction (including condensable PM) is installed. Provisions for certification of emissions control devices and recordkeeping requirements are also established by the DEP program which is in effect as of September 1, 2016 (New York City, 2016). Currently, NYC DEP has an approved list of certified emission control devices with manufacturers, custom configurations, and model numbers. Configurations of multistage systems of Pollution Control Units (PCUs) commonly include filters with Maximum Efficiency Reporting Value (MERV) 15 ratings are paired with a HEPA filter or ESP (New York City, 2021). If commercial charbroiling restaurants would like to use an emission control device not listed, they are required to provide testing data to prove efficiency using EPA Method 5. Note the equivalent required PM2.5 control efficiency is about 50 percent, for new, non-solid fuel under-fired charbroilers. At this time, NYC DEP are not actively enforcing this code, so as a practical matter it is unclear whether the program is actually reducing emissions. However, NYC DEP are seeking to get approval for enforcement action on this ordinance in the near future.

AB 32 (California Global Warming Solutions Act of 2006) includes provisions to achieve and maintain Statewide GHG emission limits, however, recent legislation [Senate Bill 605 (SB 605), Lara, Chapter 523, Statutes of 2014] requires CARB to develop a plan to reduce what are referred to as short lived climate pollutants, including black carbon. In response to SB 605, CARB adopted the Short-Lived Climate Pollutant Reduction Strategy (SLCP Reduction Strategy) in March 2017 which acknowledges the benefits from control of smaller sources of PM, including commercial cooking.[37]

Control Technology Research

In October 2011, the South Coast AQMD Governing Board approved approximately $200,000 for control device testing and authorized the release of a Program Opportunity Notice (PON) to solicit proposals from control device manufacturers. Under the PON process, South Coast AQMD staff and an inter-agency working group consisting of representatives from U.S. EPA, SJVAPCD and Bay Area AQMD reviewed manufacturer proposals based on anticipated emission reductions and available cost data. Equipment showing promise would be subject to an initial screening test. Based on screening results, equipment could be tested using the full South Coast AQMD Test Protocol for Determining PM Emissions from Under-fired Charbroilers. All testing was initially funded by South Coast AQMD and conducted

[37] https://ww2.arb.ca.gov/sites/default/files/2020-07/final_SLCP_strategy.pdf

under an existing contract with the University of California at Riverside – Center for Environmental Research and Technology (CE-CERT). Subsequent additional funding was provided by U.S. EPA, and the Bay Area AQMD has funded a related charbroiler testing project at the CE-CERT facility.

To date, screening tests have been conducted on control device configurations provided by eight manufacturers. Protocol tests were then conducted on the most promising technologies and draft test results have been received on five control device configurations. Types of devices include commercially or near-commercially available technologies, including a multi-stage filter system, an Electrostatic Precipitator (ESP), and an in-hood baffle filter. Protocol tests were also conducted on prototype designs consisting of an inertial separator/aerosol mist device and a ceramic filter with microwave regeneration. Draft test results and preliminary device cost information is presented in Table BCM-12-A. The preliminary cost information is for control devices only and does not include installation or operation costs which can vary significantly based on the facility. Also, cost estimates for new facilities are not as expensive as for existing facilities that may require a complete system overhaul including fire suppression, ventilation, plumbing, ductwork, mounting, and electrical components which would be expected to increase cost estimates. Control equipment for new charbroiler installations at new sites can be designed with the controls integrated into the design of the overall site.

TABLE BCM-12-A
DRAFT CONTROL DEVICE TESTING RESULTS AND PRELIMINARY COST ESTIMATES

*Device Type	PM Control Efficiency	Preliminary Device Cost Estimates (CY$)
Electrostatic Precipitator (ESP)	86%	$84,000 (2023)
Multi-Stage Filter	80%	$41,000 (2023)
Ceramic Filter/Microwave Regeneration	63%	$20,000 (2016)
Centrifugal Separator/Aerosol Mist Nebulizer	58%	$27,000 (2016)
In-Hood Baffle Filter (new – retrofit)	25%	$225–$250/linear ft. of exhaust hood (2016)

* Note that only the ESP, Multi-Stage Filter, and In-Hood Baffle Filter control devices have been demonstrated in practice. Other devices are shown for informational purposes, but they have not either been certified/proven in practice to date. Pricing and efficiency may eventually be determined to be higher also.

In addition to the above technologies, South Coast AQMD staff is reviewing test results from a low cost device intended to reduce emissions by preventing the generation of smoke at the source instead of removing particulates from the exhaust stream with a traditional PM control device. South Coast AQMD staff are also reviewing other promising technologies intended to provide low to mid-range control efficiencies at lower costs. All of the CE-CERT test results and manufacturer supplied cost data, along with previous control device testing, are being compiled and will be presented in a technical and cost feasibility analysis intended to guide future regulation of PM emissions from under-fired charbroilers.

An additional action was approved by the South Coast AQMD Governing Board in 2011 to develop a companion $150,000 contract with CE-CERT to further characterize emissions from under-fired charbroilers. A report entitled "Characterization of the Physical, Chemical, and Biological Properties of PM Emissions, VOCs, and Carbonyl Groups from Commercial Cooking Operations" has been received by South Coast AQMD and the report confirms that under-fired charbroiler PM emissions are primarily less than one micron in size, are dominated by organic carbon and include compounds which are known toxics, mutagens, and carcinogens. As presented in Figure BCM-12-A, the CE-CERT Characterization report also documented that several of the control technologies could significantly reduce Polycyclic Aromatic Hydrocarbons (PAHs) compounds which have mutagenic and carcinogenic properties.

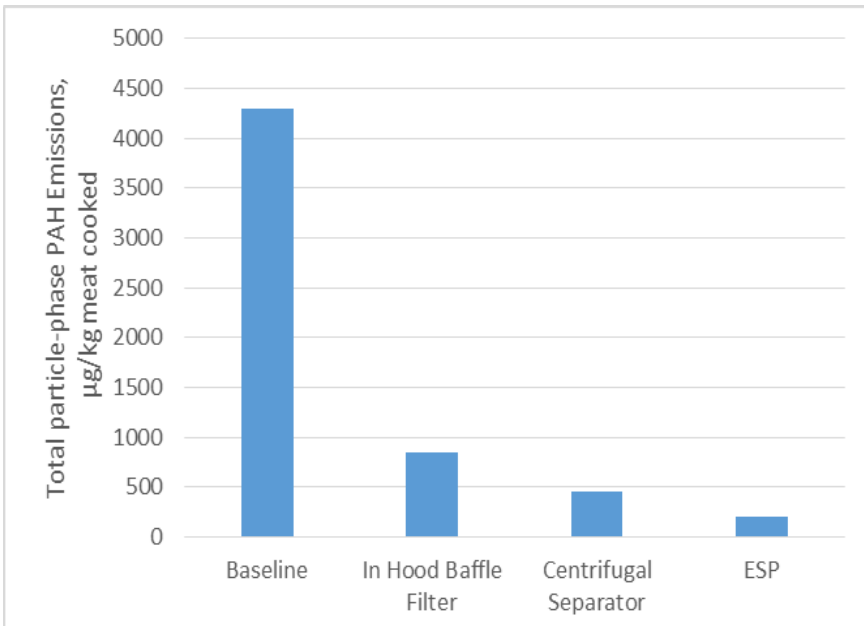

FIGURE BCM-12-A

PARTICLE-PHASE PAH EMISSIONS FOR BASELINE TEST AND THREE CONTROL TECHNOLOGIES

Findings to date show that while there is promising control technology the capital cost and required operating and maintenance costs remain prohibitively high. Also retrofitting controls on existing restaurants can be even more prohibitively expensive, and in some cases technologically infeasible. Based on discussions with restaurant operators, technology vendors, and other regulatory agencies, currently it can be extremely difficult and cost-prohibitive to add controls on existing restaurants. The installation may require structural, electrical, or water-line modifications that may not be feasible. This makes installation costs much higher for existing restaurants compared to new restaurants that can integrate emissions controls into the design. The existing structure may not have the necessary space or structural support for the control unit. Installing the control equipment may require the restaurant to temporarily shut down, resulting in loss of revenue. Furthermore, the existing restaurant may not have the authority to make changes to the building if the space is leased and the landlord is unwilling to accommodate. Local ordinances, such as building and safety and/or fire codes will have to be followed as well.

Installation cost of controls can be prohibitively expensive. For example, SJVAPCD research shows the cost of control units themselves are expensive, ranging from $30,000 to $80,000 for the most complicated unit configurations. In addition, installation costs range from $10,000 to $20,000 for new construction and $20,000 to $60,000 or higher, depending on the structural and electrical modifications required, for retrofits. It is possible that some high-volume restaurants may be able to support this cost, but restaurants with less income would be financially unable to install these units without incentive support.

Maintenance of controls can also be prohibitively expensive. Regular maintenance of control devices is critical to ensure control effectiveness. Depending on the control technology and type and volume of food cooked, filter change-out is required on a monthly or quarterly basis, with more in-depth filter replacement or unit cleaning required annually. Annual maintenance costs including both labor and materials starts around $6,000 and can exceed $100,000 for the highest volume restaurants with solid-fuel fired under-fired charbroilers. Additional costs include electricity, water, staff labor, or cleaning service company costs.

Maintenance requires specially trained staff that may not be accessible to all restaurants: Control device cleaning is a complex process, requiring specially trained staff. Training restaurant staff to perform this task may not be feasible, and service companies capable of performing the maintenance may not be readily available nearby. Any delays in required maintenance could cause significant economic impacts to restaurants.

Due to the potential lack of economic and technological feasibility of requiring these controls and uncertainties in emissions inventory, staff recommends first obtaining current data regarding charbroilers. This could be achieved in one of two ways. The first option would be to require additional registration information of under-fired charbroilers pursuant to Rule 222. The second option would be to conduct a survey independent of Rule 222, whether it be in the South Coast AQMD jurisdiction or through a state-wide effort. Regardless of the option chosen substantial detailed data should be collected regarding throughput, hours of operation, type of restaurant and a verify of additional metrics that will allow for an accurate representation of charbroiler characteristics in the South Coast Air Basin. This report will detail meat throughputs, hours of operation, and any installed control technology. A detailed data set with several metrics evaluated will allow for a discussion of how any proposed amendment of Rule 1138 should be structured. Ideas could be further explored through focus and working group meetings prior to formally proposing a draft rule amendment.

Regarding under-fired charbroilers, research into new emission control technologies is ongoing. Specifically, South Coast AQMD is continues to monitor the situation seeking control devices that have affordable up-front costs and are cost-effective. Partnerships with other air districts, businesses, and manufacturers will be important. Demonstration and incentive funding could be the path forward to assisting businesses with adopting currently available emission control technologies. Funding pilot studies to test efficacy and feasibility of emerging control technologies will be considered.

Proposed Method of Control

For chain-driven charbroilers, BAAQMD and SJVAPCD have adopted/amended their rules to lower the applicability threshold for emission control requirements. In 2009, SJVAPCD lowered their throughput quantity allowed for exemption from 875 pounds of meat cooked per week to 400 pounds of meat cooked per week to mirror BAAQMD's rule. South Coast AQMD currently has the applicability threshold set at 875 pounds of meat cooked per week and commits to consider reducing the threshold to 400 pounds per week. For BAAQMD and SJVAPCD, chain-driven charbroilers that require use of emission controls are required to use chain-driven charbroilers equipped with catalytic oxidizers certified by South Coast AQMD.

Emissions from under-fired charbroilers continue to be a significant contributor to the direct PM2.5 emission inventory. To date, a variety of control device technologies have been tested by CE-CERT and South Coast AQMD staff and the inter-agency working group has reviewed draft test results. Staff has also reviewed existing and proposed under-fired charbroiler control programs undertaken by the BAAQMD, the SJVAPCD, and the New York City DEP (NYC).

Based on testing conducted by CE-CERT and the demonstration projects in the San Joaquin Valley, control technology for under-fired charbroilers has continued to develop over the past few years. However, identification of affordable, commercially available PM control technologies, especially for retrofit projects at existing restaurants, remains elusive. Following identification of affordable commercially available control devices for existing restaurants, a tiered incentive and/or technology demonstration program could be developed that targets higher efficiency controls for under-fired charbroilers at large volume restaurants, with more affordable, lower efficiency controls at smaller restaurants. Small business incentive programs funded by mitigation fees or other sources could also be explored to help offset initial purchase and installation costs for existing restaurants.

South Coast AQMD will consider implementing a registration and reporting requirement for charbroilers in order to gather better inventory and emissions information for this source category since the current registration program under Rule 222 does not stratify the inventory of charbroilers. Using new survey/registration information, South Coast AQMD would better be able to pursue reductions in commercial charbroiler emissions.

South Coast AQMD's current emission and restaurant inventory is based on a 1999 survey report conducted by a third-party consultant. The emission inventory has been extrapolated using population growth factors for the 1999 through 2030 time period. Revising our current restaurant and charbroiler inventory is important to accurately determine what the actual emissions and inventory are and will enable us to perform calculations that reflect the current state of charbroiler inventory/emissions and set exemption thresholds.

Emission Reductions

Lowering the applicability threshold for chain-driven charbroilers from 875 pounds of meat per week to 400 pounds of meat per week would likely reduce PM2.5 emissions from this source category. However, without an accurate detailed charbroiler emission and restaurant inventory, we are unable to quantify the pollution reductions that might be achieved. A district-wide or state-wide effort to assess the restaurant and charbroiler inventory and throughputs would be helpful to determining throughput distributions, thresholds, and estimates of PM2.5 reductions.

Rule Compliance and Test Methods

Compliance determinations could be made through inspections aided by facility recordkeeping and equipment registrations or certifications.

The “Protocol – Determination of Particulate and Volatile Organic Compound Emissions from Restaurant Operations” is the test method currently being used for testing of charbroilers and potential control devices. The test methods are used by qualified labs to certify the emissions level of specific control systems but are not employed to test emissions at individual restaurants.

Similar to NYC DEP, South Coast AQMD could look into potentially implementing a certified under-fired charbroiler emission control list or adopt the list that NYC DEP has already produced.

Cost Effectiveness

To be determined.

Implementing Agency

South Coast AQMD has the authority to regulate PM emissions from restaurant operations. South Coast AQMD staff also participates in an ‘informal restaurant emissions’ working group with staff from other California air districts and U.S. EPA. During this process, participating agencies have shared staff resources and provided funding to conduct research projects.

References

Bay Area AQMD, 2007. Bay Area Air Quality Management District Staff Report, Regulation 6, Rule 2: Commercial Cooking Equipment; November 2007.

CARB, 2016. California Air Resources Board; Proposed Short-Lived Climate Pollutant Reduction Strategy; April 2016.

Federal Reserve Bank St. Louis, Federal Reserve Economic Data. Historical Population Data https://fred.stlouisfed.org/

New York City, 2016. Emissions Control Devices for Commercial Char Broilers, Department of Environmental Protection, 2016.
http://rules.cityofnewyork.us/content/emissions-control-devices-commercial-char-broilers

New York City, 2021. Certified Emission Control Devices for Commercial Under-Fired Charbroilers, 2021. https://www.nyc.gov/assets/dep/downloads/pdf/air/approved-under-fired-technology.pdf

Pacific Environmental Services, 1999. A Detailed Survey of Restaurant Operations in the South Coast Air Basin, Contract No. 98089; February 1999.

SCAQMD, 2006. Final – Methodology to Calculate Particulate Matter (PM) 2.5 and PM2.5 Significance Thresholds; October 2006.

SCAQMD, 2007. South Coast Air Quality Management District Final 2007 AQMP Appendix IV-A District's Stationary and Mobile Source Control Measures; June 2007.

SCAQMD, 2009. South Coast Air Quality Management District Preliminary Draft Staff Report, Proposed Amended Rule 1138 – Control of Emission from Restaurant Operations; August 2009.

SCAQMD, Test Protocol for Determining PM Emissions from Under-Fired Char-broilers, July 22 2009.

SCAQMD, 2011. South Coast Air Quality Management District Request to the Governing Board to Designate Funds and Issue Program Opportunity Notice for Testing Control Equipment for PM Reductions from Under-fired Char-broilers and Execute a Contract for Speciation and Toxicity Analysis of Emissions from Under-fired Char-broilers; October 7, 2011.

SCAQMD, 2012. South Coast Air Quality Management District Final 2012 AQMP, District's Stationary and Mobile Source Control Measures; February 2012.

SCAQMD, 2023. South Coast AQMD Certified Charbroilers with Integrated Catalysts, 2023. http://www.aqmd.gov/docs/default-source/permitting/product-certification/charbroilerscatalysts.pdf?sfvrsn=4

SJVAPCD, 2009. San Joaquin Valley Air Pollution Control District Final Draft Staff Report: Rule 4692 (Commercial Charbroiling); August 2009.

SJVAPCD, 2012. San Joaquin Valley Air Pollution Control District Final 2012 PM2.5 Plan, Appendix D, Stationary and Area Source Control Technology; December 2012.

SJVAPCD, 2015. San Joaquin Valley Air Pollution Control District Governing Board Agenda Item 7: Approve Next Steps for Addressing Emissions from Under-fired Char-broilers at Valley Restaurants; July 2015.

SJVAPCD, 2018. San Joaquin Valley Air Pollution Control District 2018 Plan for the 1997, 2006, and 2012 PM2.5 Standards; November 15, 2018.

SJVAPCD, 2023. Proposed San Joaquin Valley Contingency Measure State Implementation Plan Revision; April 18, 2023.

State of California Department of Finance, Projections, State Population Projections https://dof.ca.gov/forecasting/demographics/projections/

University of California Riverside, College of Engineering, Center for Environmental Research and Technology, Determination of Particulate Matter Removal Efficiency for Control Devices for Commercial Charbroiling Processes, Contract No. 10722; September 2017.

BCM-13: EMISSION REDUCTIONS FROM INDUSTRIAL COOLING TOWERS [PM2.5]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	INDUSTRIAL PROCESS COOLING TOWERS	
CONTROL METHODS:	DRIFT ELIMINATOR	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	0.76	0.78
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TO BE DETERMINED	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

This control measure seeks reductions of PM2.5 emissions from industrial process cooling towers with drift eliminator technologies.

Background

Industrial cooling towers are used to remove large amounts of heat absorbed in the circulating cooling water systems at power plants, petroleum refineries, petrochemical plants, natural gas processing plants, and a wide variety of industrial operations. They can be mainly classified into wet cooling towers and dry cooling towers.

Wet Cooling Towers

Wet cooling (direct or open circuit cooling tower) are enclosed structures containing a labyrinth-like packing or “fill” and are operated on the principle of latent and sensible cooling. The sensible cooling occurs as the air temperature increases by absorbing heat from the process water. The latent cooling occurs as some of the process water evaporates. As a result, hot water from the process stream is cooled as it descends through the fill while in direct contact with air that passes through it. The cooled water is collected in a cold water basin and is recycled to absorb more heat. The heated air leaving the fill is discharged to the atmosphere. Wet cooling towers can be further categorized as mechanical-draft and natural-draft cooling towers.

Mechanical-draft cooling towers use large fans to force or draw air through the cooling towers and are referred to as forced or induced-draft. Mechanical forced-draft cooling towers use mounted fans from the sides to force air into the towers. The more common induced-draft towers use mounted fans at the top to draw air in through the sides and expel it through the top of the towers. The induced draft towers discharge warm air at higher velocities, resulting in better dispersion of the expelled air, minimizing re-circulation of discharged air flow back into the air intake, thus maximizing cooling towers performance.

Natural-draft cooling towers generate airflow from natural driving pressure caused by the difference in density between the outside cool air and the inside hotter, humid air. The driving pressure is a function of the outside and inside air density and the height of the cooling tower. Natural-draft cooling towers require significant height (can be in excess of 500-feet in height) to generate the required airflow through the tower and is less aesthetically desirable.

Drift Issues Associated with Wet Cooling Towers

Since wet cooling towers provide direct interaction of the cooling water and the air passing through, some of the water may be entrained in the air stream and carried out of the cooling towers as drift droplets. Drift droplets contain the same minerals and chemicals as the circulating water, and can be converted to airborne emissions upon release. Drift droplets can also potentially carry bacteria such as Legionella, which, when inhaled, can pose significant health issues.

Large drift droplets that settle out of the exhaust air stream and deposit near the towers can cause damage to surrounding equipment and vegetation due to wetting, icing, and salt deposit. Other drift droplets evaporate before being deposited on the surrounding areas, discharging PM emissions as the drift droplets evaporate and form fine particulate matter by crystallization of dissolved solids. The rate of PM discharged to the atmosphere depends upon the following:

- The mass fraction of Total Dissolved Solids (TDS) in circulating water;
- Drift factor which is the percentage of water that leaves as drift droplets with respect to circulating water flow rate; and
- Circulating water flow rate through the tower.

The amount of solid mass in each drop is dependent on the TDS content and drift droplet size distribution. The estimated fraction of PM emissions as PM10 and PM2.5 therefore varies with TDS content. Cooling towers built in the 1970's and 1990's have drift rates of 0.01-0.002 percent, whereas cooling towers built more recently, in the 2000's, have a drift rate of 0.001 percent, due to drift eliminator advancements.

Drift Eliminators

Drift eliminators are incorporated into the design of cooling towers to limit the amount of drift droplets from the air stream before air exits the towers. Drift eliminators rely on the inertial impaction principle caused by sudden change in direction of the air stream passing through the eliminators. The momentum of the heavier water droplets causes them to separate from the air stream and impinge against the drift eliminators. The water droplets coalesce into a film that will fall back into the towers. Drift eliminators have various configurations and are made of various materials.

A recent study published in July 2023 by the California Energy Commission (CEC) measured drift emissions from two cooling towers, one that was constructed in 2004 with a specified drift eliminator efficiency of $5x10^{-4}$ percent, and the other constructed in 1957 with a specified drift eliminator efficiency of 0.2 percent. The study found that both cooling towers scrubbed nearly all coarse particulate matter, between 2.5 and 10 microns, from the incoming air, resulting in negative emissions from both towers. The study was unable to measure the PM2.5 scrubbing efficiency with certainty, but raised the possibility that cooling towers may have the same effect on these fine particles. The study also found that the drift eliminators of both cooling towers were more efficient than specified; the measured efficiency for the cooling towers were, roughly one order of magnitude lower for the tower built in 2004, and two orders of magnitude lower for the tower built in 1957.

More research may be required to verify the PM2.5 scrubbing efficiency of drift eliminators, as well as the overall efficiency of drift eliminators.

Dry Cooling Towers

Dry cooling towers are closed systems where circulating water does not interact with ambient air and heat rejection occurs through sensible heat transfer. Sensible heat transfer is achieved by passing the circulating water through finned tubes over which ambient air is passed. Sensible heat transfer limits the maximum attainable water outlet temperature to the local ambient dry bulb temperature.

Although dry cooling towers do not directly emit any pollutants to the atmosphere, they generate indirect emissions due to additional parasitic load losses and reduced heat transfer efficiency. Parasitic losses result from the additional fan load required to move more air in dry cooling towers. Reduced heat transfer efficiency and parasitic losses will require increased fuel consumption to attain an equivalent power output. In addition, according to the U.S. EPA, the installation cost of a dry cooling tower would be approximately 3.3 times that of an equivalent wet cooling tower.

Regulatory History

Cooling towers are largely exempt from permits per Rule 219 – Equipment Not Requiring a Written Permit Pursuant to Regulation II, which exempts towers that are not used to cool process water by evaporation and do not use chromium compounds to treat circulating water.

Rule 1404 – Hexavalent Chromium Emissions from Cooling Towers was amended in April 1990 and prohibits the use of hexavalent chromium-containing water treatment chemicals from being added to cooling tower circulating water.

Rule 222 – Filing Requirements for Specific Emission Sources Not Requiring a Written Permit Pursuant to Regulation II was amended in May 2017, establishing a registration program for industrial cooling towers. An industrial cooling tower is defined as a cooling tower located at a chemical plant, refinery or other industrial facility that is not used for comfort cooling. Under the registration program, facilities are required to submit information on water circulation rates and the average amount of total dissolved solids in the water for industrial cooling towers as a method of estimating PM emissions.

South Coast AQMD rules pertaining to PM mass rates and concentrations in discharged air could be applied to cooling towers (Rule 404 – Particulate Matter - Concentration and Rule 405 – Solid Particulate Matter - Weight). However, these rules are generally ineffective for the control of PM emissions from cooling towers due to characteristically lower emission rates or concentrations.

Proposed Method of Control

A potential control method outlined in the 2016 AQMP in BCM-02: Emission Reductions from Cooling Towers, proposed to phase in the use of drift eliminators with 0.001 percent drift rate for existing cooling towers where cost-effective. The proposed control method also discussed a potential BACT drift rate of 0.0005 percent for new construction. However, prior to developing a policy to implement controls, an emissions inventory and an equipment universe must be established. Information collected through the Rule 222 registration submittals may be used as a starting point to develop an equipment universe.

The recent CEC study also raised questions regarding the overall effect on emissions from cooling towers, with data showing that cooling towers may act as scrubbers for surrounding areas and emit negative emissions for coarse particles, and potentially have the same effect on PM2.5 emissions. The study also found that drift eliminators may vastly outperform their efficiency specifications. These findings should be examined prior to implementing controls.

Emission Reductions

To be determined.

Rule Compliance and Test Methods

To be determined.

Cost Effectiveness

The 2016 AQMP included a cost estimate of $1.37 million to retrofit a local refinery cooling tower with a high efficiency drift eliminator. The reduction in total PM, PM10, and PM2.5 was also previously estimated at approximately 173, 11, and 0.4 tons per year, respectively. Cost-effectiveness for BCM-02 in the 2016 AQMP was estimated at approximately $15,000 per ton of PM10, but was determined not cost-effective for reducing PM2.5 at over $400,000 per ton. Adjusting previous AQMP cost assumptions to 2022 costs would result in a higher cost-effectiveness estimate above $400,000 per ton. Additionally, it is possible that this control measure may be less cost-effective if the efficiencies of existing drift elimination installed at cooling towers are greater than specified, as outlined in the CEC study.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from stationary sources such as cooling towers.

References

South Coast Air Quality Management District. (2017). 2016 Air Quality Management Plan, Appendix IV-A Stationary and Mobile Source Control Measures. (Published March 2017).

United States Environmental Protection Agency. (2015). *Compilation of Air Pollutant Emission Factors (AP-42), Fifth Edition, Volume I: Stationary Point and Area Sources, Chapter 5.1 Petroleum Refining*. https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors.

Wexler, A., Wallis, C. D., Chuang, P., and Leandro, M. (2023). Assessing Particulate Emissions from Power Plant Cooling Towers. https://www.energy.ca.gov/publications/2023/assessing-particulate-emissions-power-plant-cooling-towers

BCM-14: FURTHER EMISSION REDUCTIONS FROM PAVED ROAD DUST SOURCES [PM2.5]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	PAVED ROAD DUST	
CONTROL METHODS:	ENHANCED STREET CLEANING	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	8.55	9.11
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TO BE DETERMINED	
INCENTIVE COST:	TO BE DETERMINED	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

Background

Fugitive dust emissions occur whenever vehicles travel over a paved surface such as a road or parking lot through the re-suspension of loose material. While fugitive dust emissions are primarily in the coarse size fraction (PM10-2.5), entrained paved road dust is a major direct PM2.5 source due to the large number of roadways and high traffic volumes in the region. Paved road dust emissions have been found to vary with what is termed the "silt loading" present on the road surface. According to U.S. EPA, silt loading is more specifically defined as the mass of silt-sized material (75 microns or less) per unit area of the travel surface. Sources affecting silt loading generally include: 1) pavement wear and decomposition; 2) vehicle-related deposition; 3) dust fall; 4) litter; 5) mud and soil carryout from unpaved areas; 6) erosion from adjacent areas; 7) spills; 8) biological debris; 9) ice control compounds; 10) recent precipitation history; and 11) recent road sweeping/cleaning history. Because of the importance of silt loadings to emissions, paved road dust control techniques attempt to either prevent material from being deposited on the surface (preventative controls) or remove material deposited on travel lanes (mitigative controls). U.S. EPA guidance encourages preventative over mitigative controls to reduce paved road dust PM emissions.

Regulatory History

In accordance with U.S. EPA guidance, South Coast AQMD has implemented a comprehensive program to reduce paved road dust emissions through both preventative and mitigative controls. Examples of preventative controls are included in numerous South Coast AQMD rules that require access improvements to reduce the amount of material tracked out from a facility onto surrounding paved public roads, including:

- Rule 403 – Fugitive Dust
- Rule 1156 – Further Reductions of Particulate Emissions from Cement Manufacturing Facilities
- Rule 1157 – PM10 Emission Reductions from Aggregate and Related Operations
- Rule 1158 – Storage, Handling, and Transport of Coke, Coal and Sulfur
- Rule 1460 – Control of Particulate Emissions from Metal Recycling and Shredding Operations
- Rule 1466 – Control of Particulate Emissions from Soils with Toxic Air Contaminants

Additionally, Rule 1186 – PM10 Emissions from Paved and Unpaved Roads, and Livestock Operations requires new or widened roads to be constructed with curbing or, as an alternative, paved shoulders. Most local governments implement mitigative controls through routine street sweeping conducted at frequencies of once or twice per week. Existing National Pollution Discharge Elimination System (NPDES) regulations also require local governments to establish street sweeping programs as part of a comprehensive effort to reduce debris from entering storm drains. South Coast AQMD has also established mitigative controls for paved road dust through requirements for local governments to procure only certified street sweeping equipment (Rule 1186) that operate on alternative fuels (Rule 1186.1 – Less Polluting Sweepers).

Proposed Method of Control

Existing South Coast AQMD regulations implement paved road dust controls based on U.S. EPA guidance. Since paved road dust emissions are a function of silt loadings, additional street cleaning could be a strategy to reduce PM2.5, however, studies that examine the effect of street sweeping on ambient PM levels are scarce. A recent study in Chiayi City, Taiwan concluded that street sweeping combined with street washing is effective at reducing ultrafine particle concentrations. Another study conducted in Krakow, Poland found that street sweeping followed by intensive street washing reduced road dust PM2.5 by 20-33 percent. However, since NPDES regulations prohibit street washing due to concerns over increasing the amount of debris entering storm drains, these studies are not applicable to southern California. The only studies identified as potentially applicable found that closed system regenerative air sweepers are more efficient, and less polluting compared to vacuum and mechanical brush sweepers.

Emission Reductions

Mandating increased street sweeping frequencies has unknown impacts on PM2.5 levels. Therefore, a pilot project along with a comprehensive atmospheric measurement campaign would be needed to assess the effectiveness of street sweeping as a method to reduce ambient PM2.5. New test protocols that evaluate the PM2.5 performance of sweepers, such as those in Toronto and Europe, may also be needed.

Rule Compliance and Test Methods

Compliance with this control measure can be monitored through recordkeeping and inspections.

Cost Effectiveness

Street sweeping costs vary greatly based on the number of miles and frequencies and whether the work is conducted with in-house or contracted resources. A survey of several large cities conducted in 2018 determined that the median annual cost of street sweeping was $52.31 per curb mile. A curb mile is one mile of city street from the face of the curb, extending out onto the street by the width of the sweeper. In the case of streets or other roadways without curbs, a curb mile is one mile down the center of the roadway by the width of the sweeper. Total curb miles swept are determined by the frequency of the street cleaning and the road surface in the jurisdiction. For example, if one curb line of a road is swept for 2 miles on both sides of the street on a weekly basis, a total of 16 curb miles are swept during a month. The cost of mandating increased street sweeping frequencies can be substantial considering that the City of Los Angeles is responsible for over 230,000 curb miles. A pilot project would provide further insight into the cost-effectiveness of this measure.

Implementing Agency

South Coast AQMD has the authority to adopt and enforce rules and regulations to reduce emissions from fugitive dust sources.

References

City of Fullerton, 2015. Contact with Ty Richter, Street Supervisor, City of Fullerton, September 2015.

City of Toronto, 2016. PM10 and PM2.5 Street Sweeper Efficiency Protocol. https://www.toronto.ca/wp-content/uploads/2018/02/94cd-CRCA_PM-Efficiency-Protocol-May2016.pdf

City of Lancaster, 2018. Requesting for Proposal for Street Sweeping Services, RFP No. 697-18. https://www.cityoflancasterca.org/Home/ShowDocument?id=39075

County Board of Supervisors, 2018. Comparative Street Cleaning Costs: San Francisco and 11 Other Cities. https://sfbos.org/sites/default/files/BLA_Report_Street_Cleaning_Cost_Survey_062518.pdf

ECORP Consulting, Inc., 2022. Strategic Street Sweeping Study prepared for Coachella Valley Association of Governments.

European Engineering Industries Association, 2023. Municipal Equipment, Sweepers. https://www.eu-nited.net/eunited+aisbl/municipal-equipment/sweepers-/index.html

Krylow, Malgorzata, et.al. Impact of Street Sweeping and Washing on the PM10 and PM2.5 Concentrations in Cracow (Poland) https://ros.edu.pl/index.php?view=article&id=740:043-ros-v21-r2019&catid=51&lang=pl

Lin, S.L., et.al, 2023. Do the Street Sweeping and Washing Work for Reducing the Near-ground Levels of Fine Particulate Matter and Related Pollutants? Aerosol Air Qual. Res. 23, 220338. https://doi.org/10.4209/aaqr.220338

Morgan, Christopher, 2007. Clean Roads to Air. American Public Works Association Reporter. https://www.tymco.com/wp-content/themes/va/pdf/Cleanroads-APWAReporter-092007.pdf

U.S. EPA, 1988. Control of Open Fugitive Dust Sources: Final Report. https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=91010T54.TXT

U.S. EPA, 1992. Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures https://nepis.epa.gov/Exe/ZyPDF.cgi/2000JCJE.PDF?Dockey=2000JCJE.PDF

U.S. EPA, 1996. U.S. Environmental Protection Agency, Compilation of Emission Factors (AP-42), Section 13.2.1, Paved Roads. c13s0201_jan1996.pdf (epa.gov)

BCM-15: EMISSION REDUCTIONS FROM ABRASIVE BLASTING OPERATIONS [PM2.5]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	PM2.5	
CONTROL METHODS:	AIR POLLUTION CONTROL (APC) EQUIPMENT	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	TBD	TBD
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

This control measure seeks to reduce PM2.5 emissions from abrasive blasting operations.

Background

Existing South Coast AQMD Rule 1140 (Abrasive Blasting) regulates opacity requirements for confined and unconfined abrasive blasting operations using various abrasives. The California Health and Safety Code prohibits local districts from requiring emission and performance standards more or less stringent than the State regulation. Rule 1140 (Amended 1985) has been developed for consistency with the California Code of Regulations Title 17, Subchapter 6 – Abrasive Blasting. Current permit conditions for abrasive blasting require venting to a PM air pollution control (APC) equipment when in full use.

Regulatory History

Rule 1140 is considerably similar to the California Code of Regulations, Title 17, Subchapter 6 — Abrasive Blasting provisions, which have been adopted by most California Air Districts. State law prohibits more stringent requirements. As such, the current Rule 1140 meets the BACT requirements.

Proposed Method of Control

Baghouses or dry filters are the most frequently used APC equipment. This control measure proposes voluntary applications of a portable blasting enclosure/booth with a dust collection system by providing incentives, primarily focusing on dry abrasive blasting operations conducted in open areas using portable blasting equipment with or without a written South Coast AQMD permit.

Emission Reductions

To be determined.

Rule Compliance and Test Methods

South Coast AQMD's Rule 1140 states that before blasting all abrasives used for dry unconfined blasting shall contain no more than 1% by weight material passing a No. 70 U.S. Standard sieve, and after blasting the abrasive shall not contain more than 1.8% by weight material five microns or smaller.

All abrasives used for dry unconfined blasting shall comply with the performance requirements of sections (c)(1)(A) and (c)(1)(B) in Rule 1140 when tested in accordance with "Method of Test for Abrasive Media Evaluation, Test Method No. Calif. 371-A", or other test method approved by the Executive Officer. In addition, Rule 1140 states that visible emission evaluation of abrasive blasting operations shall be conducted in accordance with the following provisions:

1. Emissions shall be read in opacities and recorded in percentages.
2. The light source should be behind the observer during daylight hours.
3. The light source should be behind the emission during hours of darkness.
4. The observer position should be at approximately right angles to wind direction and at a distance no less than twice the height of the source but not more than a quarter mile from the base of the source.
5. Emissions from unconfined abrasive blasting shall be read at the densest point in the plume, which point shall be at least 25 feet from the source.
6. Where the presence of uncombined water is the only reason for failure to comply with opacity limits, the opacity limits shall not apply. The burden of proof in establishing that opacity limits shall not apply shall be upon the operator.

7. Emissions from unconfined abrasive blasting employing multiple nozzles shall be evaluated as a single source unless it can be demonstrated by the operator that each nozzle, evaluated separately, meets the requirements of this rule.
8. Emissions from confined abrasive blasting shall be read at the densest point after the air contaminant leaves the enclosure.

Cost Effectiveness

To be determined.

Implementing Agency

South Coast AQMD.

References

2016 AQMP; final2016aqmp.pdf (aqmd.gov)

Rule 1140 - Abrasive Blasting; RULE 1140. ABRASIVE BLASTING (aqmd.gov)

California Code of Regulations Title 17, Subchapter 6; CCR: Title 17 Sections 92000 - 92530 Abrasive Blasting (ca.gov)

BCM-16: EMISSION REDUCTIONS FROM STONE GRINDING, CUTTING AND POLISHING OPERATIONS

[PM2.5]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	STONE FABRICATION OPERATIONS	
CONTROL METHODS:	WET DUST SUPPRESSION, PORTABLE HEPA FILTERS	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	TBD	TBD
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

Stone fabrication such as grinding, cutting, drilling, scarifying, polishing, carving, and etching generates significant amounts of dust emissions containing PM10, some PM2.5, and silica particles which are known to cause lung diseases or silicosis. Uncontrolled PM emissions from stonework can contribute to regional PM levels and cause high concentrations of PM locally, while also elevating the exposure of workers and neighborhood residents to toxic silica particles.

Background

Masonry or building materials such as concrete, stone, granite, tile, brick, and mortar can be processed for a variety of purposes at confined (e.g., stone shops) or unconfined (outdoor) worksites. Examples of these processes include, but are not limited to, grinding, milling, cutting, scarifying, drilling, carving, etching, and polishing operations for residential and commercial new construction and renovation. Many of those operations are performed by builders, landscapers and remodeling contractors, and may not be properly controlled for dust emissions. These operations are exempt from permitting requirements under South Coast AQMD Rule 219.

Regulatory History

South Coast AQMD Rule 219 does not require permits for machining equipment exclusively used for polishing, cutting, surface grinding, etc. However, South Coast AQMD Rule 403 – Fugitive Emissions, prohibits fugitive emissions from any onsite mechanical activities, including cutting, from exceeding a 20 percent opacity limit.

Proposed Method of Control

This control measure would seek to control PM including silica particles. Both dry and wet dust control options are available. Some of these methods of control are already regulated by the California Occupational Safety and Health Administration (Cal OSHA) as existing workplace standards.

- Wet Control Methods
    - Wet systems involve spraying water onto the rotating cutting disc to reduce dust emissions. Emissions are expected to be minimal, provided the waste material is disposed of properly. This method will produce a wet slurry associated with the wet dust suppression, in which case wet vacuuming, wet wiping, and wet sweeping can be implemented as housekeeping measures.
- Dry Control Methods
    - Local exhaust ventilation (LEV) would be suitable for hand-held power tools (e.g., cut-off saws and grinders). It uses guards and directors attached to the tools to act as a dust collecting hood. The guard or director is connected to an industrial vacuum cleaner which provides sufficient exhaust ventilation to capture the majority of dust emitted during the cutting or grinding operation. The vacuum cleaner is equipped with high efficiency particulate air (HEPA) filter to protect workers from silica dust.
    - Dry cutting emissions can be controlled at the point of operation using a portable dust collector, air scrubber and negative air machine to prevent dust from being released into the atmosphere. A combination of a variety of filter media can be customized to achieve appropriate controls, including HEPA filters.
- Incentives
    - Financial incentives can be made available to exchange existing dry/wet equipment with new equipment that includes integrated add-on controls.

Emission Reductions

HEPA filters are certified by manufacturers to be 99.97 percent efficient in removing particles 0.3 microns or larger once airborne dust is diverted to a collection system. However, the collection efficiency of these systems can vary widely. The PM emissions inventory and emission factors from these mechanical activities are currently not determined and will be examined during rule development.

Rule Compliance and Test Methods

Some work may be conducted at residential job sites, which presents enforcement challenges. A South Coast AQMD rule, other enforceable instrument, or use of equipment certification or incentives will be considered. The most efficient regulatory approaches will be selected considering cost-effectiveness.

Cost Effectiveness

To be determined during rule development.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from stationary sources.

References

Occupational Safety and Health Administration (OSHA), Worker Exposure to Silica during Countertop Manufacturing, Finishing and Installation, OSHA – HA-3768-2015. https://www.osha.gov/sites/default/files/publications/OSHA3768.pdf

California Code of Regulations, Title 8, Section 1530.1 – Control of Employee Exposures from Dust Generating Operations Conducted on Concrete or Masonry Materials

BCM-17: EMISSION REDUCTIONS FROM PRESCRIBED BURNING FOR WILDFIRE PREVENTION

[PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	N/A	
CONTROL METHODS:	INCENTIVE FUNDING	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
PM2.5 INVENTORY	0.27	0.27
PM2.5 REDUCTION	-	N/A
PM2.5 REMAINING	-	N/A
ANNUAL AVERAGE [NOx]:	2018	2030
NOx INVENTORY	0.01	0.01
NOx REDUCTION	-	N/A
NOx REMAINING	-	N/A
CONTROL COST:	$5,100 PER TON OF TSP PREVENTED; TBD FOR NOx	
INCENTIVE COST:	$318,240	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

This proposed control measure will seek particulate matter emission reductions and property defensible space enhancements from fuel reduction efforts via hand-thinning, mechanical thinning, and the use of chipping equipment (chipping) to mitigate excess fuels at properties located in the residential urban-wild-interface (UWI) areas of the San Bernardino National Forest (SBNF).

Background

Wildfires are a natural part of healthy Southern California forest ecosystems. Frequent and low- to moderate-intensity natural wildfires allow for fire-adapted species to reproduce, remove dying or dead flora, and increase forest resiliency through maintaining a natural biomass density.

Beginning in the early 20th century, fire suppression became the standard approach to managing fire. Fueled by fire suppression initiatives from the U.S. Forest Service as a result of the Theodore Roosevelt administration, changes to the social perception of forests, and economic pressure for optimizing timberlands not for forest health but for timber density, the natural cycle of fire-induced forest clearing and rejuvenation was disrupted. Several areas, including Southern California, have experienced severe wildfires as a result of overgrown fuel sources that have accumulated over the last several decades. Combined with increasing urbanization and increased climate change, flagrant wildfires are becoming more destructive and frequent, with 9 of 10 of the largest, most destructive, and most deadly fires in California's history occurring within the last decade.

Since the last third of the 20th century, policies against controlled burns were lifted on public and private lands and prescribed fire began to reemerge as a tool to combat human-caused forest compositional changes. However, progress has been slow and many acres remain to be fully treated. A 2019 study "We're Not Doing Enough Prescribed Fire in the Western United States to Mitigate Wildfire Risk," written by University of Idaho fire scientist Crystal Kolden, concluded that although California intentionally burned around 90,000 acres in 2018, however, the ideal burn rate is 5-10 times that amount.

While effective, prescribed burns have a complex administrative process in order to be approved, including burn and smoke management plans requiring regulatory approval. Prescribed burns also have social and safety implications as they are inherently a stronger and more complex approach to fuel reduction than thinning mechanisms. Hand-thinning and mechanical-thinning are fuel reduction methods that can be used in addition to or in-place of prescribed burning to achieve the objective of reduced fuel loads. These methods are often chosen in UWI areas due to proximity to structures and human life.

Thinning methods are also often paired with either prescribed pile burns or with chipping. Prescribed pile burns are similar to prescribed burns (often called "broadcast burns") but are localized to individual piles of loaded fuel from thinning efforts. Chipping involves no burning but changes the physical composition of the fuel.

Fuel composition encompasses four different categories. *Ground fuels* are the lowest elevation fuel that do not generally contribute to wildfire intensity or spread and consist of below-surface materials such as organic soils, duff, decomposing litter, roots, buried logs, and portions of stumps that lie below the surface. *Surface fuels* are on or near the ground floor that are often the most hazardous fuels, which is especially true in drier forests that have been affected by fire suppression and hyper-focused timber harvesting. Surface fuels consist of leaf and needle litter, dead branch material, downed logs, bark, tree cones, short shrubs, grasses, and other herbaceous materials. *Ladder fuels* are the next vertical fuel layer and are the second-most dangerous fuel as they allow for vertical extension of lower-intensity ground and surface fires into the canopy of larger trees. Ladder fuels consist of small trees, large shrubs, and the understory layer of trees. *Crown fuels* are the highest vertical fuel layer and include the canopy of large trees and play a smaller role in overall fire hazard potential.

Pairing thinning with chipping, also known as mastication, reduces flammable material and changes the physical composition from voluminous and flammable surface, ladder, and occasionally canopy fuels, into dense and less flammable chips. Thinning efforts primarily target ladder fuels to both reduce continuity between surface and crown fuels as well as promote native species propagation in areas where natural fires have been suppressed. Chips are a class of organic mulch and may be spread on the site where the fuel is collected, spread on private or government properties, or delivered to county facilities for processing. There is currently a shortage of data on mulch spread on the site of fuel collection on long-term ecological impact, with some studies showing an increase in non-native herbaceous and shrub flora and a short-term increase in surface fire hazard.

This mulch provides a multitude of benefits including reduced water consumption for adjacent flora, enhanced soil temperature insulation, reduced invasive weed propagation, improved erosion and dust control, mitigation of soil compaction, and aesthetic improvements. If gathered in sufficient enough quantities, chip material may also serve as an input to biomass processing facilities for energy production.

Homes and structures can catch fire through a variety of mechanisms, including embers which can float away from a main fire, radiant heat which can indirectly ignite materials from a sightline to a flame if in close enough proximity, and direct flame contact. Home hardening is the process of selecting materials, installation techniques, landscaping, and spacing considerations to increase the resiliency of homes or structures against these ignition mechanisms.

The California Department of Forestry and Fire Protection (CalFire) currently specifies 4 zones for defensible space for structures. *Zone 0* requirements, put into law in 2020 by Assembly Bill 3074, extend 0-5 feet from a structure and allows for no combustible material. *Zone 1* extends to 30 feet and requires removal of highly combustible materials such as dead vegetation. *Zone 2* extends to 100 feet and requires optimized spacing and vegetative care, such as no overgrown grass and appropriate spacing between plants, shrubs, and trees. CalFire also recommends removing all tree branches at least 6 feet from the ground and maintaining a vertical spacing under trees equal to 3 times the height of the tallest nearby shrub.

The practice of thinning and use of chips as ground cover can facilitate defensible space modifications by removing excess surface and ladder fuels and enhance the resiliency of underlying soil through increased water retention, complementing home hardening efforts.

The Mountain Rim Fire Safe Council (the "Council"), encompassing 110 square miles and much of the San Bernardino UWI, has successfully demonstrated the effectiveness of chipping initiatives and has successfully received CalFire and Southern California Edison funding in the past for thinning and chipping treatment.

Regulatory History

There are no South Coast AQMD funding initiatives specifically addressing fuel reduction efforts in communities in the San Bernardino National Forest. Rule 444 currently applies to open burning activities, which includes prescribed fire burning, but does not include a fuel reduction provision or mechanism for private landowners to conduct prescribed burning on residential properties. Rule 444 currently only allows for prescribed burning on public lands or lands open to the public, such as scout and Christian camps, when conducted by fire management agencies only.

Proposed Method of Control

The proposed method of control is to coordinate with other agencies to provide funding for chipping operations for the remaining untreated area in the Council's UWI. This would be similar to the CalFire and Southern California Edison grants the Council has received in the past. The Council has not been able to provide sufficient chipping operations to its constituency due to the overwhelming demand for the service that has already exhausted its most recent grant.

The Council has received a total of three grants for chipping operations, awarded in 2014, 2017, and 2018. Although the 2018 grant was intended to be a 4-year grant, the Council had a nearly 300 percent increase in enrollment in its constituency from the 2017 grant and the funds were exhausted 18 months early.

The Council has provided records detailing the volunteer match to the grant funds. With the chipping program in place, homeowners in the UWI are much more compliant and engaged with assisting with fuel load reduction by trimming and removing excess hazardous vegetation, such as dead trees and leaf litter, for chipping than without the program. Using the number of volunteer hours from these property owners for each grant and the California Volunteer Rate, the Council estimates a 440 percent volunteer match to grant funds.

The Council's 2017 and 2018 grants' funds were provided by the California Climate Investments Program, with a requirement to track the amount of fuel collected. The Council also tracked the 2014 amount of fuel collected. The total fuel collected was 1,682,215 cubic feet which is equivalent to approximately 20,187 green tons. The unit of measure, green tons, refers to the weight of material as it currently exists, moisture included, and bone-dry tons (BDT) refers to the dry-weight component of the green tonnage, without moisture.

As of 2021, the Council estimates that 25,000 properties still remain untreated, even after the three grants had been received and chipping was implemented.

Studies show that the combination of thinning and chipping costs approximately $500-$1,500 per acre treated. Over the course of the three grants, the Council has treated approximately 1,491 acres with grant funds of $284,242 and a volunteer match of $1,259,920, or a total of $1,544,162 expended for fuel reduction. Adjusting each grant's funds and each grant's corresponding volunteer match for inflation to

June 2023, the total is $1,895,756. This results in a cost-per-acre of $1,271. Based solely on grant funds, the cost-per-acre is $234/acre.

The 1,491 treated acres covered 2,281 properties, or an average of 0.65 acres per property. For the 25,000 remaining properties, a total of 16,250 acres remain to be treated assuming 0.65 acres per property. With the current grant-portion cost-per-acre of $234, this results in grant funds of $3,802,500. Given the extensive and ongoing nature of fuel reduction, it is advisable to stage the total number of treated acres over several years. This proposal recommends providing a portion of this total amount as funding for an initial pilot for one grant cycle to last 2 years. The increasing engagement of the chipping program in the subject area suggests that subsequent cycles have an increasing enrollment. The assumed number of participating properties is at least that of the highest enrollment in a previous year, which was 1,046 properties in 2020. Providing funding for 2 years results in a total of at least 2,092 properties or 1,360 acres. This results in pilot funding in the amount of $318,240. Upon conclusion of this pilot, a review shall be completed and a vote conducted on whether to continue providing funding for additional years based on treated area and overall success of the pilot grant.

While it is possible additional CalFire grants may be received by the Mountain Rim Fire Safe Council, funds from the South Coast AQMD would supplement, enhance, and broaden the positive impact of chipping activities and allow any future CalFire grant funds to be targeted to any number of additional fire-related initiatives: fire hazard abatement assistance; hazardous dead tree removal, document shredding, elimination of interior fuels, the publication of "Living with Wildfire in the Inland Empire", house numbering, leaf litter and pine needle collection, and fire prevention outreach and education.

Additional projects are conducted by the Council without any funding: Gold-Spotted Oak Borer Task Force (an invasive species), goats for fuel reduction; BioChar for woody debris disposal, pine needle collection and disposal (for use as biochar and/or use at ski resorts), home hardening compliance, demonstration of fire safe gardens/landscape sites (to showcase drought resistant, low water native species in various areas), and others such as a statewide chipping locator service currently in development. During rule development, staff will consider technical feasibility, identify industry-specific affordability issues, cost-effectiveness and incremental cost-effectiveness, and may consider alternative compliance mechanisms.

Emission Reductions

While there are no direct emission reductions associated with this proposal, it provides a preventative mechanism that may reduce emissions in the future. A flagrant, uncontrolled wildfire is undesirable, and can lead to destruction of properties as well as multiple tons of pollutants, including toxic pollutants, depending on the size of the wildfire and what is burning. Fortunately, there has not been a major fire in the San Bernardino UWI area since 2018 and thus the mitigated impact in terms of wildfire severity cannot be measured. However, it is reasonable to assume that, should a wildfire break out, that the 1,360 acres' worth of fuel, if not collected, would be burned, which is a likely scenario given the collected fuel is primarily ladder fuels. Additionally, structures that have not had thinning and chipping treatment are at an increased risk of burning and emitting toxic contaminants from interior fuel burning such as benzene, methylene chloride, vinyl chloride monomer, naphthalene, asbestos, and arsenic. These contaminants were released into the town of Paradise's drinking water supplies as it burned during the 2018 Camp Fire.

The average cubic feet of collected fuel per acre over the last 3 grants is 1,130 cubic feet per acre. Applied to the pilot grant's 1,360 acres, this equates to a total of 1,536,800 cubic feet of fuel proposed to be collected.

Several studies have reviewed the emissions profile of burned fuel. These emissions vary extremely widely depending on a number of factors including type of fuel (plant, shrub, or tree), species of fuel, humidity, available oxygen, temperature, wind, moisture content, and other factors.

One such source is a calculator developed by the University of Washington and used by the U.S. Forest Service which estimates emissions from pile burning based on fuel type, volume of fuel pile, packing density (large trees have higher packing density), bone-dry mass (removing moisture), and percentage of mass consumed. Using a total of 1,536,800 cubic feet of fuel collected (assumed to be a conifer composition with 90 percent combustion efficiency) and revising the calculator's packing density from 20 percent to 75 percent, the total emissions are 4.24 tons (PM), 3.00 tons (PM_{10}), 2.62 tons ($PM_{2.5}$), 60.72 tons (CO), 1,862 tons (CO_2), 4.91 tons (CH_4), and 3.32 tons (non-methane hydrocarbons). This source determines foregone emissions from preventing wildfire of the collected fuel only.

Another source is the U.S. EPA's AP-42, CH 13.1: "Wildfires and Prescribed Burning," which gives various emission factors for several different regions of the country. Although California is its own region (Region 5), due to the majority of California's forest being outside of Southern California and the region of the Council being closer in climate to that of the Southwestern region (Region 3), Region 3's emission factors were chosen. Region 3's emission factors are also lower than that of Region 5, providing a more conservative estimate of an emissions profile from burning. These emission factors are given in kg/Hectare units and are shown as 191 (PM), 1,570 (CO_2), 269 (CH_4), and 45 (NOx). Converting the pilot acreage of 1,360 acres to hectares yields 550.37 hectares. Converting kilograms (kg) to tons yields a conversion factor of 0.0011 tons/kg. This yields the following: 115.6 tons (PM), 950.49 tons (CO_2), 162.85 tons (CH_4), and 27.24 tons (NOx). This source determines foregone emissions from preventing wildfire of the total land area in the pilot grant. It is reasonable to assume that if a given land area is not treated, that more fuel than just that amount collected will burn as well. The collected fuel will contain excess ladder fuels, which if not collected, may lead to canopy fires and total combustion of a given land area.

Rule Compliance and Test Methods

Due to the nature of this control measure, no rules or test methods are proposed.

Cost Effectiveness

The pilot funding amounts to a grant of $318,240 to treat 1,360 acres for fuel reduction in the San Bernardino UWI. Should these materials be prevented from burning in a wildfire, the PM emissions prevented amount to 9.86 tons - 115.6 tons. Total Suspended Particles (TSP) will be used to aggregate all PM emissions and is defined as all particulates with a diameter less than or equal to 100 microns. A median of value of 62.73 tons TSP is selected, as the most probable scenario is that all of the excess surface and ladder fuels and a portion of canopy fuels would be combusted in a wildfire. Using this median value, the cost-effectiveness is $318,240/62.73 tons = $5,073 per ton of TSP prevented.

Implementing Agency

South Coast AQMD has the authority to provide grant funds to prevent emissions from excess fuel.

References

CalFire. (n.d.). *History*. Retrieved August 4, 2021, from https://www.fire.ca.gov/about-us/history/

CalFire. (n.d.). *Fuels Reduction Guide*. Retrieved August 4, 2021, from https://www.fire.ca.gov/media/4jqerfjh/fuels-reduction-guide-final-2021-interactive.pdf

CalFire. (n.d.). *Fire Probability for Carbon Accounting*. Retrieved August 4, 2021, from https://egis.fire.ca.gov/FireProbability/

CalFire. (n.d.). *Fire Hazard Severity Zones*. Retrieved August 4, 2021, from https://osfm.fire.ca.gov/divisions/community-wildfire-preparedness-and-mitigation/wildfire-prevention-engineering/fire-hazard-severity-zones/

CalFire. (n.d.). *Defensible Space*. Retrieved August 4, 2021, from https://www.fire.ca.gov/programs/communications/defensible-space-prc-4291/

California Fire Safe Council. (n.d.). *Annual Grant Reports*. Retrieved July 22, 2021, from https://cafiresafecouncil.org/grants-and-funding/grants-clearinghouse/annual-grant-reports/

Fire prevention: wildfire risk: defensible space: ember-resistant zones, Cal. Assemb. B. 3074, Chapter 259 (Cal. Stat. 2020).

Fitzgerald, S. (2013). *A Land Manager's Guide for Creating Fire-Resistant Forests* (M. Bennett, Ed.) [Review of *A Land Manager's Guide for Creating Fire-Resistant Forests*]. Oregon State University Extension Service. https://www.nwfirescience.org/sites/default/files/publications/A%20Land%20Managers%20Guide%20for%20Creating%20Fire-resistant%20Forests%20.pdf

Forest History Society. (n.d.). *U.S. Forest Service Fire Suppression*. Retrieved August 4, 2021, from https://foresthistory.org/research-explore/us-forest-service-history/policy-and-law/fire-u-s-forest-service/u-s-forest-service-fire-suppression/

Jakobs, J. (2020, September 15). *California Forests 80%-600% Denser Than 150 Years Ago, UC Researcher Says Biomass Is One of the Answers*. GV Wire. https://gvwire.com/2020/09/15/california-forests-80-600-denser-than-150-years-ago-uc-researcher-says-biomass-is-one-of-the-answers/

Kolden, C. A. (2019). We're Not Doing Enough Prescribed Fire in the Western United States to Mitigate Wildfire Risk. *Fire*, *2*(2), 30. doi:10.3390/fire2020030

Minnesota Department of Natural Resources. (n.d.). *The Benefits of Prescribed Burning on Private Lands*. Retrieved August 4, 2021, from https://files.dnr.state.mn.us/assistance/backyard/privatelandsprogram/benefits_prescribed_burning.pdf

Office of Air Quality Planning and Standards, Office of Air and Radiation (1995). AP-42 Fifth Edition: *Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources*. U.S. Environmental Protection Agency.

Rogstad, A., DeGomez, T., Hayes, C., Schalau, J., & Kelly, J. (n.d.). *Comparing the Ignitability of Mulch Materials for a Firewise Landscape* [Review of *Comparing the Ignitability of Mulch Materials for a Firewise Landscape*]. The University of Arizona Cooperative Extension. Retrieved August 4, 2021, from https://www.firesafemarin.org/wp-content/uploads/2017/04/Comparing_the_ignitability_of_mulch_materials_for_a_firewise_landscape_az1440-2014.pdf

Schrader-Patton, C. C., & Underwood, E. C. (2021). New Biomass Estimates for Chaparral-Dominated Southern California Landscapes. *Remote Sensing*, *13*(8), 1581. https://doi.org/10.3390/rs13081581

South Coast Air Quality Management District. (2013). Rule 444 – Open Burning (Amended July 12, 2013). http://www.aqmd.gov/docs/default-source/rule-book/rule-iv/rule-444.pdf

Wright, C. S. (2015). Piled fuels biomass and emissions calculator. Retrieved July 27, 2021, from https://www.fs.usda.gov/pnw/tools/piled-fuels-biomass-and-emissions-calculator-tool

BCM-18: FURTHER EMISSION REDUCTIONS FROM WOOD-BURNING FIREPLACES AND WOOD STOVES

[PM2.5]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	RESIDENTIAL WOOD COMBUSTION	
CONTROL METHODS:	REMOVE LOW-INCOME EXEMPTION ALLOWING WOOD-BURNING ON NO-BURN DAYS	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	4.94	4.82
POLLUTANT REDUCTION	-	0.33~~TBD~~
POLLUTANT REMAINING	-	4.49~~TBD~~
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD/LOCAL OR REGIONAL AGENCIES	

Description of Source Category

The purpose of this control measure is to seek additional PM2.5 emission reductions from residential wood burning activities.

Background

The types of devices used to burn wood in a typical residence are fireplaces and wood heaters (e.g., fireplace inserts and free-standing wood stoves). Since fireplaces are very inefficient heat sources and given the temperate climate in the Basin, they are used primarily for aesthetic purposes. Fireplace inserts and wood stoves are much more efficient and, in some residences, are used as the primary source of heating.

Emissions from residential wood burning devices are caused primarily by incomplete combustion and include PM, CO, NOx, SOx, and VOC. Particulate emissions, however, have been the focus of most air district control programs. Studies indicate that the vast majority of particulate emissions from residential wood combustion are in the fine (2.5 micrometers or less) fraction (PM2.5). Additionally, incomplete combustion of wood produces polycyclic organic matter (POM), a group of compounds classified as hazardous air pollutants under Title III of the federal Clean Air Act. Biomass burning is also a source of black carbon (soot) which recent studies suggest can influence climate by directly absorbing light, reducing the reflectivity of snow and ice through deposition and interacting with clouds. According to CARB, soot from residential wood combustion is forecast to be the largest individual anthropogenic (man-made) source of black carbon in 2030 if no new programs are implemented.

Regulatory History

Control measures for residential wood combustion were included in the 2007 and 2012 AQMPs and Rule 445 was adopted in 2008 and amended in 2013 to implement those control measures. In 2020, South Coast AQMD amended Rule 445 to extend the No-Burn Day requirement by mandating Basin-wide curtailment in all cases where any source receptor area exceeds a daily air quality forecast of 30 μg/m^3. Ozone and PM contingency measures were also added, including the establishment of new curtailment thresholds. Under the Rule 445 provisions, only gaseous-fueled hearth devices are allowed in new developments. For additions or modifications to existing developments, Rule 445 allows any gaseous-fueled device, but any wood-burning devices sold or installed must be U.S. EPA Phase II-certified or equivalent. Rule 445 prohibits the burning of any product not intended for use as a fuel (e.g., trash) in a wood burning device and requires commercial firewood facilities to only sell seasoned firewood (20 percent or less moisture content) from July through February. Rule 445 also established a mandatory wood burning curtailment program extending from November 1 through the end of February each winter season. During a wood burning curtailment period, the public is required to refrain from both indoor and outdoor solid fuel burning in specific areas when PM2.5 air quality is forecast to exceed 30 μg/m^3. These no burn provisions apply to the entire Basin whenever a PM2.5 level of greater than 30 μg/m^3 is forecast for any monitoring station that has recorded violations of the federal 24-hour PM2.5 standard in either of the previous two years. In 2021, this limit dropped to 29 μg/m^3, when the first contingency measure in the rule was triggered due to a failure to attain the PM2.5 24-hour standard by the due date. Lastly, Rule 445 requires commercial firewood or other wood-based fuel sellers to notify the public of the Check Before You Burn wood burning curtailment program through a labeling program.

AB 32 (California Global Warming Solutions Act of 2006) includes provisions to achieve and maintain Statewide GHG emission limits. Senate Bill (SB) 605 (Lara, Chapter 523, Statutes of 2014) requires CARB to develop a plan to reduce what are referred to as short-lived climate pollutants, including black carbon. In response to SB 605, CARB adopted the Short-Lived Climate Pollutant Reduction Strategy (SLCP Reduction Strategy)[65] in March 2017, which includes recommended control measures and emission reduction targets for residential wood combustion. Ultimately, the SLCP Reduction Strategy, along with

[65] https://ww2.arb.ca.gov/sites/default/files/2020-07/final_SLCP_strategy.pdf

other planning efforts, was incorporated into CARB's 2022 Scoping Plan Update[66] targeting to achieve carbon neutrality by 2045. Residential wood burning emissions, which account for 95 percent of residential black carbon emissions, are being reduced through Statewide programs like the Woodsmoke Reduction Program[67] established by SB 563 (Lara, Chapter 671, Statutes of 2017). The Woodsmoke Reduction Program offers financial incentives for homeowners to replace old, inefficient, and highly polluting wood stoves, wood inserts, or fireplaces with cleaner burning and more efficient home heating devices and is part of California Climate Investments,[68] a Statewide initiative that uses billions of dollars from the cap-and-trade program to improve public health and the environment, especially in disadvantaged communities, reduce greenhouse gas emissions, and boost the economy.

In 2019, the SJVAPCD amended Rule 4901 to introduce a two-tiered curtailment program which applies differently to hot-spot vs. non-hot-spot counties. In the "hot-spot" counties of Madera, Fresno, and Kern, the level one PM2.5 threshold is 12 μg/m^3 and the level two PM2.5 threshold is 35 μg/m^3. For the non-hot-spot counties in the San Joaquin Valley (San Joaquin, Stanislaus, Merced, Kings, and Tulare), the level one PM2.5 threshold is 20 μg/m^3 and the level two PM2.5 threshold is 65 μg/m^3. In 2023, the SJVAPCD amended Rule 4901 to add a contingency measure for applicable PM2.5 NAAQS (Section 2.5 – Section 5.7.3 Contingency Provision). If triggered, the contingency measure would align the non-hot-spot curtailment thresholds with the more stringent hot-spot thresholds.

Proposed Method of Control

Based on a review of other air districts' wood smoke control programs, the curtailment program in Rule 445 is as stringent as, if not more stringent than similar programs in other air districts. As presented in Appendix III, a quantitative analysis was conducted to compare the emission reductions achieved by Rule 445 to those that would be achieved if other air districts' programs were implemented in the Basin. The analysis demonstrated that the current Basin-wide curtailment threshold of 29 μg/m^3 provides equivalent to or greater stringency than other air districts curtailment programs~~ if the low-income exemption is removed~~. However, based on U.S. EPA Region 9's comment, ~~Therefore,~~ South Coast AQMD will ~~retain the current curtailment threshold. South Coast AQMD will also~~ consider lowering the curtailment threshold to 25 μg/m^3 and removing the low-income exemption, while retaining the sole-source of heat exemption to allow wood burning on no-burn days for ~~the~~ households with no other source of heating than wood burning. ~~South Coast AQMD may also consider lowering the curtailment threshold if future analyses demonstrate that this would be necessary to maintain the stringency of Rule 445.~~ South Coast AQMD will consider to remove the low-income exemption in Rule 445 as well.

Independent of MSM, this control measure also seeks to assess the feasibility of expanding access to incentives, especially for disadvantaged communities. Since 2008, South Coast AQMD has implemented programs which provide financial incentives to encourage the public to switch to cleaner hearth devices.

[66] https://ww2.arb.ca.gov/sites/default/files/2023-04/2022-sp.pdf
[67] https://ww2.arb.ca.gov/our-work/programs/residential-woodsmoke-reduction/woodsmoke-reduction-program
[68] https://ww2.arb.ca.gov/our-work/programs/california-climate-investments

The current program encourages households to upgrade wood-burning devices through South Coast AQMD incentives of up to $1,600 to offset purchase and installation costs. Although this program has been effective, additional reductions may be achieved through the use of higher incentives or expansion of the eligible geographic area. Experience has shown that education and outreach to targeted households is vital to ensure program participation.

Emission Reductions

~~To be determined during rulemaking.~~Refer to Attachment C of Appendix III for a quantification of reductions.

Rule Compliance and Test Methods

Compliance with this control measure is reliant on use of incentives and verification through complaint response. U.S. EPA is responsible for certifying wood burning devices under Title 40 Code of Federal Regulations, Part 60, Subpart AAA.

In general, compliance will be difficult to quantify as South Coast AQMD does not have the resources necessary to verify compliance with the curtailment program at the millions of residences with wood-burning devices.

Cost Effectiveness

The cost-effectiveness of this control measure has not been determined, however, increasing the number of curtailment days would result in few cost increases, if any, to the impacted community. Households that lack an alternative source of heat would continue to be able to burn on no-burn days so there would be no requirement to upgrade to a gas or electric furnace.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from residential wood combustion sources. South Coast AQMD will also seek partnerships with CARB, hearth product manufacturers and other air districts to secure funding to expand on current incentive programs that encourage the public to switch to lower emission fireplaces and woodstoves through financial incentives.

References

Bay Area AQMD, 2015. Bay Area Air Quality Management District, Air District Proposed Amendments to Regulation 6, Rule 3: Wood Burning Devices, August 17, 2015.

CARB, 2011. California Air Resources Board; Area Source Methodology, Section 7.1 Residential Wood Combustion; March 2011.

CARB, 2016. California Air Resources Board; Proposed Short-Lived Climate Pollutant Reduction Strategy; April 2016.

Naeher, 2007. Woodsmoke Health Effects: A Review, Journal of Inhalation Toxicology, 19:67-107, 2007

SJVAPCD, 2014. San Joaquin Valley Air Pollution Control District, Rule 4901 – Wood Burning Fireplaces and Wood Burning Heaters; Amended September 18, 2014.

SJVAPCD, 2023. San Joaquin Valley Air Pollution Control District, Rule 4901 – Wood Burning Fireplaces and Wood Burning Heaters: Amended May 18, 2023.

SCAQMD, 2013. South Coast Air Quality Management District; Draft Final Staff Report for Proposed Rule 445 – Wood Burning Devices; May 2013.

SCAQMD, 2020. South Coast Air Quality Management District; Final Staff Report for Proposed Amended Rule 445 – Wood Burning Devices; October 2020

SCAQMD, 2020. South Coast Air Quality Management District; Draft Final Staff Report for Proposed Amended Rule 445 – Wood Burning Devices; June 2020.

U.S. EPA, 1996a. U.S. Environmental Protection Agency AP-42, Section 1.9, Residential Fireplaces; October 1996.

U.S. EPA, 1996b. U.S. Environmental Protection Agency AP-42, Section 1.10, Residential Wood Stoves; October 1996.

U.S. EPA, 2016. U.S. Environmental Protection Agency, Black Carbon Background Publication https://www3.epa.gov/blackcarbon/basic.html#where and Effects of Black Carbon Publication.

BCM-19: EMISSION REDUCTIONS FROM UNPAVED ROAD DUST SOURCES [PM2.5]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	UNPAVED ROADS AND LOTS	
CONTROL METHODS:	DEVELOP AN INVENTORY TO ASSESS THE SUITABILITY FOR PAVING	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	1.67	1.67
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD/LOCAL OR REGIONAL AGENCIES	

Description of Source Category

This measure seeks to evaluate the potential to reduce PM2.5 emissions from well-traveled unpaved lots, roads, shoulders and other surfaces by applying paving materials.

Background

Fugitive dust emissions occur whenever vehicles travel over a surface such as a paved or unpaved road or parking lot through the re-suspension of loose material. While fugitive dust emissions are primarily in the coarse size fraction 10 to 2.5 microns, entrained road dust is a major direct PM2.5 source. Road dust emissions vary according to the "silt loading" present on the road surface. According to U.S. EPA, silt loading is more specifically defined as the mass of silt-sized material (75 microns or less) per unit area of the travel surface. Unpaved roads entrain more fugitive PM per Vehicle Miles Traveled (VMT). Sources affecting silt loading generally include: 1) road composition; 2) vehicle-related deposition; 3) dust fall; 4) litter; 5) mud and soil; 6) erosion from adjacent areas; 7) spills; 8) biological debris; 9) ice control compounds; 10) recent or current precipitation; and 11) the vehicle types using the road. Because of the importance of silt loadings and road composition to emissions, paving an unpaved road is a substantial contributor to reducing fugitive road dust emissions. U.S. EPA guidance encourages preventative over mitigative controls to reduce paved road dust PM emissions.

Paving of unpaved surfaces is a common strategy used in construction projects and other community improvement initiatives to reduce dust and airborne particulate matter emissions, including PM2.5. Other air districts have implemented unpaved road dust control measures that include paving as one method of controlling particulate matter emissions. Some have established traffic thresholds that would trigger the paving requirements set therein, and methodologies for PM emissions quantification.

Regulatory History

In accordance with U.S. EPA guidance, South Coast AQMD has implemented a comprehensive program to reduce paved road dust emissions through both preventative and mitigative controls. Examples of preventative controls are included in South Coast AQMD rules that require access improvements to reduce the amount of material tracked out from a facility onto surrounding paved public roads, including:

- Rule 403 – Fugitive Dust
- Rule 1156 – Further Reductions of Particulate Emissions from Cement Manufacturing Facilities
- Rule 1157 – PM10 Emission Reductions from Aggregate and Related Operations
- Rule 1158 – Storage, Handling, and Transport of Coke, Coal and Sulfur
- Rule 1460 – Control of Particulate Emissions from Metal Recycling and Shredding Operations
- Rule 1466 – Control of Particulate Emissions from Soils with Toxic Air Contaminants

Additionally, Rule 1186 – PM10 Emissions from Paved and Unpaved Roads, and Livestock Operations requires new or widened roads to be constructed with curbing or, as an alternative, paved shoulders. Most local governments implement mitigative controls through routine street sweeping conducted at frequencies of once or twice per week. Existing National Pollution Discharge Elimination System (NPDES) regulations also require local governments to establish street sweeping programs as part of a comprehensive effort to reduce debris from entering storm drains. South Coast AQMD has also established mitigative controls for paved road dust through requirements for local governments to procure only certified street sweeping equipment (Rule 1186) that operate on alternative fuels (Rule 1186.1 – Less Polluting Sweepers).

South Coast AQMD's rules do not prohibit the construction of new unpaved roads in urban areas. However, the South Coast AQMD has recently developed a Paving Project Plan for the Eastern Coachella Valley as part of the AB 617 Community Air Protection Program (CAPP), which has been approved by CARB. This plan was developed in response to community concerns related to particulate matter emissions from unpaved surfaces in the community of Eastern Coachella Valley. This paving plan includes an emissions reduction quantification methodology based on VMT.[1] The quantification methodology has been approved by CARB and is being applied to this Control Measure for paving of unpaved surfaces in the SCAB.

SJVAPCD has also adopted two unpaved road regulations, Rules 8061 and 8071, that offer a template for how other air districts can manage this source of PM emissions.[2]

Proposed Method of Control

The purpose of this control measure is to develop an inventory of unpaved roads and parking lots within urban areas in the Basin and assess the suitability for paving. In total, there are approximately 1,900 miles of unpaved roads in the Basin. However, not all of these roads are well-traveled or highly used and therefore the suitability for paving must be determined on a case-by-case basis. Factors that will be considered include vehicle miles travelled, proximity to AB 617 communities, and whether the road exists in natural or protected lands (e.g., local and regional parks, National Forests, etc.). In addition, this control measure will further evaluate the effects of paving on climate-related drought conditions and heatwaves frequently experienced in the Basin. Paving surfaces that would otherwise allow for underground aquifers to replenish during rainstorms must be considered when assessing suitability for paving. Paving unpaved surfaces, especially in urban areas, also creates heat island effects resulting in higher temperatures than outlying areas. In densely urbanized areas, paved roads absorb and re-emit the sun's heat more than natural landscapes becoming "islands" of higher temperatures relative to outlying areas. The costs of less permeable areas for surface drainage and heat island effects will be evaluated.

Emission Reductions

To be determined during rulemaking.

Rule Compliance and Test Methods

To be determined during rulemaking.

Cost Effectiveness

The cost projections of paving unpaved areas vary due to materials used for paving, be it asphalt, concrete, or some combination, and the need for striping, curbing, and other improvements. The Fugitive Dust Handbook published by the Western Regional Air Partnership estimate the costs of paving one mile of unpaved road at $44,100/mile-year with an estimated useful life of 25 years; a similar cost estimate for paving unpaved lots $0.23/square foot-year for a useful life of 25 years, though these costs have likely increased since publication.[3] CARB's Unpaved Road Dust, Non-Farm Roads Methodology estimated the total unpaved city and county land for the SCAB at 167.3 miles, though 'high-traffic' and adjacency to 617 communities were not limiting factors in these estimates.[4] Using these figures, a high cost estimate for paving the total unpaved city and county land in the SCAB would be approximately $184 million, though again these are total miles not 'high-traffic' miles, so the total unpaved lot area that would be considered by this measure would be significantly smaller. This methodology estimates that the tons of PM/year reductions of paving the total road miles at 553.3 tons/year, or 1.52 tpd for an estimated cost effectiveness figure of $13,334/ton. If only 10% of the road miles is paved, this could result in a reduction of 55 tons/year of PM. While most unpaved roads are in public jurisdictions, many unpaved lots are private and there is not currently an inventory of those spaces, and estimating cost effectiveness for those areas is not possible at this point. In addition, the costs of less permeable areas for surface drainage and heat island effects are unknown at this time.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from stationary sources such as unpaved roads.

References

South Coast AQMD Final Paving Project Plan ECV, September 2022. http://www.aqmd.gov/docs/default-source/ab-617-ab-134/steering-committees/eastern-coachella-valley/final-ecv-paving-project-plan.pdf?sfvrsn=8

San Joaquin Valley Air Pollution Control District Rule 8061 – Paved and Unpaved Roads, August 2004. https://www.valleyair.org/rules/currntrules/r8061.pdf

San Joaquin Valley Air Pollution Control District Rule 8071 – Unpaved Vehicle and Equipment Traffic Areas, September 2004. https://www.valleyair.org/rules/currntrules/r8071.pdf

Western Regional Air Partnership Fugitive Dust Handbook, 2006. https://www.wrapair.org/forums/dejf/fdh/content/FDHandbook_Rev_06.pdf

California Air Resources Board Miscellaneous Process Methodology 7.10, Unpaved Road Dust, Non-Farm Roads, 2012. https://ww3.arb.ca.gov/ei/areasrc/fullpdf/full7-10_2012.pdf

South Coast AQMD Final CAPP Paving Project Plan, September 2022 http://www.aqmd.gov/docs/default-source/ab-617-ab-134/steering-committees/eastern-coachella-valley/final-ecv-paving-project-plan.pdf?sfvrsn=8

Lin, S.L., et.al, 2023. Do the Street Sweeping and Washing Work for Reducing the Near-ground Levels of Fine Particulate Matter and Related Pollutants? Aerosol Air Qual. Res. 23, 220338. https://doi.org/10.4209/aaqr.220338

Morgan, Christopher, 2007. Clean Roads to Air. American Public Works Association Reporter. https://www.tymco.com/wp-content/themes/va/pdf/Cleanroads-APWAReporter-092007.pdf

U.S. EPA, 1988. Control of Open Fugitive Dust Sources: Final Report. https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=91010T54.TXT

U.S. EPA, 1992. Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures https://nepis.epa.gov/Exe/ZyPDF.cgi/2000JCJE.PDF?Dockey=2000JCJE.PDF

U.S. EPA, 1996. U.S. Environmental Protection Agency, Compilation of Emission Factors (AP-42), Section 13.2.1, Paved Roads. c13s0201_jan1996.pdf (epa.gov)

BCM-20: APPLICATION OF ALL FEASIBLE MEASURES [ALL POLLUTANTS]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	ALL SOURCE CATEGORIES	
CONTROL METHODS:	ALL AVAILABLE CONTROL METHODS	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	TBD	TBD
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	TBD	TBD
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD*	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

* Emission reductions and cost-effectiveness will be determined after a source category and feasible controls are identified.

Description of Source Category

This control measure seeks to explore all feasible measures that achieve criteria pollutant reductions. Existing rules and regulations reflect current best available retrofit control technology (BARCT). However, BARCT continually evolves as new technology becomes available that is feasible and cost-effective. South Coast AQMD staff would continue to review actions taken by other air districts for applicability in our region. Through this proposed control measure, South Coast AQMD would commit to consider the adoption and implementation of the new retrofit control technology standards, as well as new controls or limits on existing operations.

Background

This control measure serves as a placeholder for any future control measures that may become feasible, prior to subsequent State Implementation Plan (SIP) revisions, through technology advances and/or cost decreases. South Coast AQMD staff continually monitors evolving control technologies, price changes, and the actions of other air quality agencies to determine the feasibility of implementing additional controls to achieve emission reductions.

Regulatory History

The California Clean Air Act (CCAA) requires that “extreme” ozone nonattainment areas include all feasible measures.[69] Although this is a PM2.5 plan, feasible measures which achieve NOx reductions for ozone attainment will also assist with PM2.5 attainment. Feasible measures also encompass measures that target direct PM2.5 and ammonia reductions.

The term “feasible” is defined in the California Code of Regulations, section 15364, as a measure “capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors.” CARB guidance states that this definition, found in the CEQA Guidelines, applies to the requirements under air pollution laws. The required use of BARCT for existing stationary sources is one of the specified feasible measures. H&SC §40440 (b)(1) requires South Coast AQMD to adopt rules requiring best available retrofit control technology for existing sources. H&SC §40406 specifically defines BARCT as “an emission limitation that is based on the maximum degree of reduction achievable taking into account environmental, energy, and economic impacts by each class or category of source.”

Proposed Method of Control

South Coast AQMD staff will continue to review new emission limits or controls introduced through federal, State or local regulations to determine if South Coast AQMD regulations remain equivalent or more stringent than rules in other regions. If not, a rulemaking process will be initiated to perform a BARCT analysis with potential rule amendments if deemed feasible. In addition, South Coast AQMD will consider adopting and implementing new retrofit technology control standards, based on research and development and other information, that are feasible and cost-effective. During rule development, staff will consider technical feasibility, identify industry-specific affordability issues, cost-effectiveness and incremental cost-effectiveness, and may consider alternative compliance mechanisms.

[69] California Health and Safety Code (H&SC) § 40920.5

Emission Reductions

Further emission reductions would be sought from the adoption of new rules or amendment of existing rules and regulations to reflect new BARCT standards that may become available in the future prior to subsequent SIP revisions.

Rule Compliance and Test Methods

Compliance with this measure would be based on monitoring, recordkeeping, and reporting requirements that have been established in existing source specific rules and regulations. In addition, compliance would be verified through inspections and recordkeeping and reporting requirements.

Cost Effectiveness

Cost-effectiveness for this control measure cannot be determined because the future set of “all feasible” measures are not known. South Coast AQMD will continue to analyze the potential cost impact associated with implementing this control measure, conduct research on new control technologies, and provide cost-effectiveness information during any future rule making processes.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from stationary sources.

References

California Health and Safety Code Sections 40913, 40914, 40920.5, 40406, and 40440 (b)(1)

California Code of Regulations, Section 153

EGM-01: EMISSION GROWTH MANAGEMENT FROM NEW DEVELOPMENT AND REDEVELOPMENT

[ALL POLLUTANTS]

	CONTROL MEASURE SUMMARY	
SOURCE CATEGORY:	NEW DEVELOPMENT AND REDEVELOPMENT PROJECTS	
CONTROL METHODS:	TO BE DEVELOPED THROUGH A PUBLIC PROCESS	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE:	2018	2030
POLLUTANT INVENTORY	TBD	TBD
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD/LOCAL OR REGIONAL AGENCIES	

Description of Source Category

The purpose of this control measure is to identify emission reduction opportunities and to mitigate and, where appropriate, reduce emissions from new development or redevelopment projects such as residential, commercial, and industrial projects that are otherwise not included in other Facility Based Mobile Source Measures (FBMSMs) identified in the PM2.5 Plan. These projects are considered indirect sources. An indirect source is any facility, building, structure, or installation, or combination thereof, which generates or attracts mobile source activity. Through a public process with the Working Group, the measure is designed to identify control measures and a path forward to reducing emissions related to indirect sources required to meet and balance the needs of the South Coast Air Basin (Basin) in demonstrating attainment of the federal standards with evolving land use development patterns, growing economy, and the needs of the Basin's increasing populations for clean air, public health, infrastructure, and jobs.

Background

The South Coast Air Basin population is projected to increase 7.9 percent by 2030, resulting in new residential, commercial, and industrial development activities, according to the Southern California

Association of Governments (SCAG). The majority of that growth will occur as infill to existing urbanized areas. By 2045, SCAG's 2020 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) expects 51 percent of housing and 60 percent of jobs to be located in areas served by high quality transit. They are increased from the projected 46 percent of housing and 55 percent of jobs for 2040 in SCAG's 2016 RTP/SCS. As a result of the changing distribution and density of development, SCAG reports an increase in vehicle miles traveled (VMT) in the Basin between 2018 and 2030: daily VMT is projected to increase by 1.8 percent, from 388 million miles to 395 million miles.

A variety of existing and future programs, such as California's 2016, 2019, and the recently adopted 2022 Building Energy Efficiency Standards (i.e., Title 24) will contribute to emission reductions when compared to existing development activities. New development and redevelopment projects will also be constructed in compliance with Title 24 green building requirements that greatly reduce construction and operational emissions compared with existing development. However, additional numbers and length of passenger vehicles and trucks trips, landscape maintenance equipment, and construction emissions from new developments and redevelopments will contribute to regional and localized air pollution. EGM-01 aims PM2.5 co-benefit emission reductions primarily from project construction activities by increasing the deployment of zero and low NOx emission technologies for on-road and off-road mobile sources.

In recent years project developers and local jurisdictions have actively explored and implemented innovative policies that reduce emissions. One recent example includes the Net Zero Newhall Ranch development project located in the Santa Clarita Valley of Los Angeles County. The project is committed to reducing or mitigating the project's greenhouse gas emissions to zero. While net-zero greenhouse gas emission projects do not necessarily target Nitrogen Oxides (NOx) emission reductions they may provide quantifiable co-benefits of NOx and other criteria pollutant emissions. Another example includes Clean Construction policies used by Los Angeles County Metropolitan Transportation Authority (LA Metro), Los Angeles World Airport (LAX), and the Port of Los Angeles. These policies generally provide a step-down approach, where project developers must use Tier 4 final equipment, but are allowed to use lower tiered equipment if certain criteria are met (such as an inability to identify any manufacturers of a particular type of Tier 4 final equipment). While these policies reduce emissions for these specific projects, it is unclear if these are State Implementation Plan (SIP) creditable due to the complexity of demonstrating the U.S. EPA's integrity elements for SIP credit, which require the emission reductions to be surplus, permanent, enforceable and quantifiable. Finally, as part of the environmental review process under California Environmental Quality Act (CEQA) and/or National Environmental Policy Act (NEPA), some projects have chosen to contribute money to an air quality mitigation fund that would be used to incentivize the purchase and use of cleaner equipment to offset emissions.

A number of air districts in California have already adopted and are implementing indirect source rules, policies, and/or collection of mitigation fees to address emissions from new development and redevelopment projects. Common approaches include an emissions threshold test to determine the applicability of the rule, and mitigation fees, and/or demonstrations that feasible direct, on-site mitigation measures have been implemented. These examples by other air districts are provided for informational purposes only, and do not necessarily reflect a model of what an applicable rule that may be developed by South Coast AQMD would entail. Given the uniqueness and severity of the air quality in the Basin in comparison to other regions in California and the United States, unique considerations will be given in developing enforceable mechanisms in order to meet federal air emissions standards.

In December 2005, the San Joaquin Valley Air Pollution Control District (SJVAPCD) adopted Rule 9510 – Indirect Source Review, which was approved by the U.S. EPA in May 2011. In December 2017, SJVAPCD amended Rule 9510. The purpose of the rule is to reduce emissions of NOx and PM10 from the construction of a development project that seeks to gain a final discretionary approval from a public agency (upon full build-out) with design features, on-site measures, and off-site measures. The rule also applies to transportation or transit development projects whose construction exhaust emissions will equal or exceed 2 tons per year of NOx or 2 tons per year of PM10. The rule requires applicants of new development projects to provide documents necessary to perform an emissions generation analysis. SJVAPCD calculates a required emission reduction amount based on total emissions and identifies credits for specific on-site emission reduction measures included in the project. Required reductions not achieved by voluntary on-site measures would be achieved off-site through a mitigation fee. Off-site reductions are subject to criteria including, but not limited to, being quantifiable and surplus. Such offsite reductions are analyzed annually to ensure their effectiveness.

Regulatory History

California Health and Safety Code (H&SC) Section 40716 states that “a district may adopt and implement regulations to reduce or mitigate emissions from indirect and areawide sources of air pollution”. As an example, a 1993 California Attorney General opinion states that “a district’s regulations may require the developer of an indirect source to submit the plans to the district for review and comment prior to the issuance of a permit for construction by a city or county. A district may also require the owner of an indirect source to adopt reasonable post-construction measures to mitigate particular indirect effects of the facility’s operation [as a stationary source]. Such regulations could be enforced through an action for civil penalties…”. (Cal. Attorney General Opinion 92-519.) While other types of indirect source measures could be developed, the same attorney general’s opinion concluded that a district may not impose a permitting system upon indirect sources per se, given the primacy of local land use control. H&SC Section 40716 also states that “nothing in the section constitutes an infringement on the existing authority of counties and cities to plan or control land use, and nothing in the section provides or transfers new authority over such land use to a district” when an air district adopts and implement regulations to reduce or mitigate emissions from indirect and areawide sources of air pollution or encourage or require the use of measures that reduce the number or length of vehicle trips.

EGM-01 was first adopted as part of the mobile source control measure strategies within the 2016 AQMP. After the adoption, South Coast AQMD staff convened an EGM-01 working group consisting of affected stakeholders from local governments, the building industry, developers, realtors, other business representatives, environmental/community organizations, and other stakeholders and held four Working Group meetings from May 2017 to January 2018 to explore a framework and identify opportunities, innovative approaches, strategies, and actions to mitigate and potentially reduce emissions from new development or redevelopment projects. In March 2018, an initial concept for EGM-01 was developed and consisted of the pursuit of voluntary emission reduction strategies in addition to the development of an indirect source rule focused on reducing construction emissions from projects over a certain size or activity threshold using several compliance options. Potential options that staff proposed and presented to the South Coast AQMD's Governing Board included a new voluntary fleet certification program coupled with a facility/project requirement to utilize at least some certified clean fleets, a mitigation fee option, crediting options for activities like installation of charging/fueling infrastructure, or other emission reduction measures. In May 2018, the South Coast AQMD's Governing Board considered staff's proposal and directed staff to continue to work with the Working Group to develop rule concepts, timelines, and cost-benefits estimates.

Based on Governing Board direction, staff held three additional Working Group Meetings for the development of EGM-01 and surveyed the Working Group on investigative approaches to identify emission reduction costs. The Working Group identified that the fundamental step in proceeding with emission reduction strategies for New Development and Redevelopment Projects would require a cost-benefit analysis to investigate the costs of construction and assess the impacts of emission reduction strategies on these projects individually and at a larger scale regionally, specifically as it related to affordable housing projects. A Request for Proposal (RFP) to study the feasibility of emission reductions from construction and cost of emission reduction strategies on new development and redevelopment projects was drafted by staff with input from the Working Group. The RFP sought to profile the universe of off-road construction equipment available in the Basin and identify the incremental cost to upgrade existing off-road construction equipment to Tier 4 standards. The RFP was released for a 60-day period from September 2019 to November 2019. No proposals were received, and no contract was awarded.

Proposed Method of Control

South Coast AQMD is not required to adopt an indirect source rule simply because another air district found it feasible. However, a demonstration of infeasibility may be required in light of the actions taken by other air districts if South Coast AQMD does not pursue a regulatory approach in developing an indirect source rule for this facility sector.

South Coast AQMD staff will solicit public input including, but are not limited to, types of projects affected, including affordable housing projects; effects on real-estate prices and jobs; economic growth forecast and impacts; the latest Title 24 green building standards; and regionwide policy shifts toward infill development and active transportation with implications for trip generation, as documented in SCAG's 2020 RTP/SCS pursuant to SB 375. Promising emission reduction strategies are being pursued or implemented by new development or redevelopment projects under CEQA and/or NEPA. Through a public process, South Coast AQMD staff will continue to explore potential actions to encourage net-zero developments, use of zero emission technologies in developing new or redeveloping projects, and installation of charging and fueling infrastructure and develop concepts and innovative approaches that could include, but are not limited to, voluntary CEQA air quality mitigation programs. South Coast AQMD will continue collaborating with local utilities, local governments, SCAG, and the state Energy and Public

Utility Commissions and leverage their policies, programs, and resources to encourage acceleration of clean construction equipment and more rapid growth of alternative fuel and/or electric vehicle charging infrastructure in South Coast AQMD's jurisdiction. During rule development, staff will consider technical feasibility, identify industry-specific affordability issues, cost-effectiveness and incremental cost-effectiveness, and may consider alternative compliance mechanisms.

Emission Reductions

The amount of emission reductions that can be achieved from this measure will be determined dependent on the type and number of new development and redevelopment projects affected by the measure and the method of control to be implemented to reduce emissions for all pollutants. The reliance merely on VMT as an applicable metric will be avoided to the maximum extent possible due to the advances in fleet change and emission control technologies discussed earlier.

Rule Compliance and Test Methods

Compliance will be verified via South Coast AQMD outreach and field inspection. Approved emission quantification protocols by federal, State or local agencies will be used to track and report emission reductions for SIP purposes. If a protocol does not exist for a specific project, a protocol will be developed for the South Coast AQMD Governing Board's consideration for adoption.

Cost Effectiveness

South Coast AQMD will continue to work through a public process to identify methods for evaluating cost-effectiveness for the measure based on the control methods to be implemented by new development and redevelopment projects that will be subject to the measure.

Implementing Agency

Implementing agencies would include counties, cities, or other local or regional agencies that implement new development or redevelopment projects. South Coast AQMD may also be an implementing agency but may not "infringe upon the existing authority of counties and cities to plan or control land use" (California H&SC Section 40716).

References

Southern California Association of Governments. (2020). 2020 RTP/SCS. https://scag.ca.gov/sites/main/files/file-attachments/0903fconnectsocal-plan_0.pdf?1606001176

California Energy Commission. (2021). The 2022 Building Energy Efficiency Standards. https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/2022building-energy-efficiency

Proposed Rule to Implement the Fine Particle National Ambient Air Quality Standards. 40 CFR Parts 51 and 52, Federal Register, Volume 70, No. 210, page 65984

November 1, 2005. San Joaquin Valley Air Pollution Control South Coast AQMD. (2017). Rule 9510 Indirect Sour Review (ISR). https://www.valleyair.org/rules/currntrules/r9510-a.pdf

San Joaquin Valley Air Pollution Control South Coast AQMD. (2015). PM2.5 Plan for the 1997 PM2.5 Federal Standard. http://www.valleyair.org/Air_Quality_Plans/PM25Plans2015.htm

United States Environmental Protection Agency. Menu of Control Measures. http://www3.epa.gov/ttn/naaqs/pdfs/MenuOfControlMeasures.pdf

Jones, D., Wu, R., Barros, C. and Peterson, J. (2013). Research Findings on the Use of Rubberized Warm-Mix Asphalt in California. http://ra-foundation.org/wp-content/uploads/2013/02/040-PAP_060.pdf

South Coast Air Quality Management District. (2010). Rule 1110.2 – Emission Reductions from Gaseous and Liquid Fueled Engines (Amended July 9, 2010)

EGM-02: EMISSION REDUCTIONS FROM CLEAN CONSTRUCTION POLICY [ALL POLLUTANTS]

	CONTROL MEASURE SUMMARY	
SOURCE CATEGORY:	CONSTRUCTION EQUIPMENT/VEHICLES AND ACTIVITIES	
CONTROL METHODS:	TO BE DEVELOPED	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE:	2018	2030
POLLUTANT INVENTORY	TBD	TBD
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	N/A	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD/LOCAL OR REGIONAL AGENCIES	

Description of Source Category

The purpose of this control measure is to identify potential approaches to mitigate and control emissions from construction activities in the South Coast Air Basin (Basin). This measure is to develop a Clean Construction Policy (CCP) with a set of recommended control measures and approaches that can be utilized for reference and voluntary implementation by local municipalities and public agencies.

Background

Indirect sources such as construction projects involve and attract mobile sources, both on- and off-road, that emit significant amounts of harmful air pollutants that can adversely affect air quality and public health. To mitigate and reduce emissions from these indirect sources, EGM-01: Emission Reductions from New Development and Redevelopment Projects, was first adopted as a control measure in the 2007 Air Quality Management Plan (AQMP) and subsequently included in the 2016 AQMP. EGM-01 is designed to reduce emissions related to new residential, commercial, industrial, and institutional development and redevelopment projects. While EGM-01 will be based on mandated measures and approaches, such as an indirect source rule, to address air emissions from the new development and redevelopment projects, the CCP to be developed under EGM-02 will be offered as a voluntary measure for municipalities and other public agencies to adopt fully or partially in their respective programs. If the CCP is adopted and widely applied by the large majority of municipalities and public agencies to mitigate and reduce emissions from construction activities in the Basin, EGM-02 will be implemented in lieu of EGM-01 where applicable and feasible.

The California Health and Safety Code (H&SC) Section 40716 states that "a District may adopt and implement regulations to reduce or mitigate emissions from indirect and areawide sources of air pollution." The objective of the voluntary Clean Construction Policy is to encourage the implementation of the cleanest technology and equipment available as well as best management practices for construction activities, especially those located in or near environmental justice communities.

Regulatory History

To mitigate and reduce emissions from construction activities, a number of municipalities and agencies in California have adopted clean (or green) construction policies for their own projects and/or public projects within their jurisdiction. In April 2007, the City and County of San Francisco adopted an Ordinance requiring public projects to reduce emissions at construction sites starting in 2009. In March 2015, the Ordinance was expanded to require construction sites to further reduce emissions in areas with high background levels of air pollutants. The Ordinance requires contractors of publicly funded construction projects (greater than 20 days in length) to significantly reduce emissions by implementing: (a) the use of cleaner diesel-fueled engines, (b) alternative sources of power (if available) instead of portable diesel engines, (c) the preparation of a Construction Emissions Minimization Plan, which includes best management practices, and (d) construction activities monitoring and reporting. In July 2011, the Lost Angeles County Metropolitan Transportation Authority (Metro) adopted a Green Construction Policy (GCP) to reduce harmful diesel exhaust emissions from on-road vehicles, off-road equipment, and portable generators used for construction projects on their properties and at their rights-of-way. The GCP requires that off-road construction equipment must meet the Tier 4 engine standards, on-road vehicles to meet 2010 standards, and portable generators be BACT-compliant. In addition, the GCP requires the use of renewable diesel and 5-minute idling limit. It also requires contractors to consider, where feasible, emissions-reducing technology such as hybrid drives and specific fuel economy standards. To ensure compliance, Metro conducts periodic inspections of sites and construction equipment and also provides assistance to help contractors to meet the requirements. Other authorities such as the Port of Los Angeles (POLA) and the Los Angeles World Airports (LAWA) have implemented similar policies and guidelines to reduce emissions related to construction activities. In 2008, the POLA Board of Harbor Commissioners adopted the Los Angeles Harbor Department Sustainable Construction Guidelines, and on August 4, 2017, LAWA published a Sustainable Design & Construction Requirements for new construction and major renovation projects owned by LAWA or its tenants.

Together, these policies require cleanest-tier diesel engines available, hybrid and electric off-road equipment (where feasible), and best management practices.

Proposed Method of Control

This measure seeks to mitigate and reduce emissions generated by construction activities in the Basin through the voluntary adoption and use of a CCP. The goal of the CCP would be to reduce emissions by certain percentages compared to the statewide average for development projects. Although the CCP will be developed in collaboration with local municipalities and agencies, construction industry, and other affected stakeholders, a set of draft guidelines for the proposed CCP is provided below with recommended control measures and best management practices based on clean construction policies and ordinances that are already adopted and currently implemented in California.

The proposed approach to the CCP guidelines would consist of a hierarchy that prioritizes direct, on-site emission reductions. These emission reductions should first come from zero emission off-road construction equipment and on-road haul and material delivery trucks. If zero emission off-road and on-road equipment is not available or feasible for implementation, then the next cleanest, commercially available off-road and on-road equipment should be utilized during construction activities.

The alternative to direct, on-site emission reductions would be to achieve regional emission reductions off-site and outside of the area of the project. This may be accomplished through the use of credits from non-new source review programs, although this approach would be the least favorable and should be utilized as a last resort option to achieve emission reductions from construction activities.

Examples of potential voluntary measures that could be utilized to reduce emissions from construction activities are discussed below.

All off-road construction equipment used during construction activities should be zero emission to the extent possible. If it is not feasible to have all off-road construction equipment units be zero emission, then a step-down approach should be utilized to ensure that the majority of off-road construction equipment will be zero emission. Any diesel-powered off-road construction equipment greater than 50 horsepower should meet the U.S. EPA Tier 4 Final off-road emission standards, if possible. Additionally, any emissions control device used by contractor(s) should achieve emission reductions that are generally equivalent to what could be achieved by a Level 3 diesel emissions control strategy for a similarly sized engine as defined by CARB regulations. Although these are just examples of voluntary measures, the responsible entity should identify specific measures in applicable bid documents, purchase orders, and contracts.

A copy of each unit's certified tier specification, BACT documentation, and CARB or South Coast AQMD operating permit shall be provided at the time of mobilization of each applicable unit of equipment. All construction equipment must be tuned and maintained in compliance with the manufacturer's recommended maintenance schedule and specifications that optimize emissions without nullifying engine warranties. All maintenance records for each equipment and their construction contractor(s) should be made available for inspection and remain on-site for a period of at least two years from completion of construction.

All on-road construction equipment (e.g., haul and material delivery trucks), especially those greater than 14,000 lbs Gross Vehicle Weight Rating, should be zero emission to the extent possible. If it is not feasible to have all on-road construction equipment be zero emission, then a step-down approach should be utilized to ensure that the majority of on-road construction equipment will be zero emission. Any diesel-powered on-road construction equipment is encouraged to have engines that meet the 2010 U.S. EPA engine standards, or 0.2 g/bhp-hr NOx and 0.01 g/bhp-hr PM.

Cleaner off- and on-road construction equipment will become increasingly more feasible and commercially available as technology advances. If using zero emission technologies is not feasible at the start of construction activities, it could become feasible in a reasonable period of time for projects with extended or long-term construction schedules. These projects are encouraged to develop a process with performance standards to require and/or accelerate the deployment of the lowest emission technologies and the utilization of zero emission or low NOx emission off- and on-road construction equipment. Examples of these voluntary standards may include:

- Developing a minimum amount of zero emission or low NOx off- and on-road construction equipment that must be used each year during construction to ensure adequate progress. Include this requirement in construction management plans and business development agreement(s).
- Establishing a contractor(s) selection policy that prefers contractor(s) who can supply and use zero emission or low NOx off- and on-road construction. Include this policy in the Request for Proposal, procurement documents, and purchase order(s) for selecting contractor(s), tenant(s), or operator(s).
- Establishing a policy to select and use vendors that use zero emission or low NOx on-road construction equipment. Include this policy in the vendor contracts and business agreements.
- Establishing a purchasing policy to purchase and receive materials from vendors that use zero emission or low NOx on-road construction equipment to deliver materials. Include this policy in the procurement documents and purchase orders with vendors.
- Developing a project-specific process and criteria for periodically assessing progress in implementing the use of zero emission and low NOx off- and on-road construction equipment during the duration of construction activities.
- Best management practices such as scheduling truck trips to avoid sensitive land use (e.g., homes and schools), limiting engine idling time, maintaining an equipment inventory, and reducing construction duration by 10 percent for projects located in environmental justice communities, and design considerations including appropriate points for staging areas, and maintaining a buffer zone between truck traffic and sensitive receptors.

Emission Reductions

Emission reductions are not estimated at this time. The amount of emission reductions that can be achieved from this measure will be based on the number and type of participating construction projects and the method of control to be implemented to reduce Nitrogen Oxides (NOx) and fine Particulate Matter (PM2.5) emissions by each of those projects.

Cost Effectiveness

To Be Determined.

Implementing Agency

South Coast AQMD, Local Municipalities and Agencies.

References

2022 AQMP Control Measures Workshop - South Coast AQMD's Mobile Source Measures and CARB's State SIP Strategy Measures. 2021. https://scaqmd.zoom.us/j/93576923378

California Air Resources Board. 2021. Construction & Earthmoving Equipment. https://ww2.arb.ca.gov/our-work/topics/construction-earthmoving-equipment

Guide to Off-Road Vehicle & Equipment Regulations. California Air Resources Board. https://ww2.arb.ca.gov/sites/default/files/offroadzone/pdfs/offroad_booklet.pdf

Los Angeles International Airport. 2017. Sustainable Design & Construction Requirements. https://www.lawa.org/-/media/lawa-web/tenants411/file/sustainable-design-constructionrequirements.ashx

Low Carbon Fuel Standard. California Air Resources Board. https://ww2.arb.ca.gov/sites/default/files/2020-09/basics-notes.pdf

Los Angeles County Metropolitan Transportation Authority (LACMTA). 2011. LACMTA Green Construction Policy. http://boardarchives.metro.net/Items/2011/06_June/20110615EMACItem10.pdf

On-Road Heavy-Duty and Off-Road Compression Ignition Certification Programs: Useful Life Compliance and Durability Demonstration. California Air Resources Board. https://ww2.arb.ca.gov/road-heavy-dutyand-road-compression-ignition-certification-programsuseful-life-compliance-and

San Francisco Department of the Environment. 2015. San Francisco Clean Construction Ordinance – Implementation Guide for San Francisco Public Projects. https://www.sfdph.org/dph/files/EHSdocs/AirQuality/San_Francisco_Clean_Construction_Ordinance_2015.pdf

Truck and Bus Regulation Compliance Requirement Overview. California Air Resources Board. June 18, 2019. https://ww3.arb.ca.gov/msprog/onrdiesel/documents/fsregsum.pdf

U.S. EPA 2007/1010 Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements. http://www.meca.org/regulation/us-epa-20072010-heavyduty-engine-and-vehiclestandards-and-highway-diesel-fuel-sulfur-control-requirements

MOB-01: EMISSION REDUCTIONS AT COMMERCIAL MARINE PORTS [PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	PORTS AND PORT-RELATED SOURCES (OCEAN-GOING VESSELS, ON-ROAD HEAVY-DUTY TRUCKS, LOCOMOTIVES, COMMERCIAL HARBOR CRAFT, AND CARGO HANDLING EQUIPMENT, AND STATIONARY PORT EQUIPMENT)	
CONTROL METHODS:	INDIRECT SOURCE RULES, MARKET INCENTIVES, VOLUNTARY PROGRAMS	
EMISSIONS (TONS/DAY)*:		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	0.71	TBD
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	36.99	TBD
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD, PORTS OF LOS ANGELES AND LONG BEACH	

Description of Source Category

The goal of this measure is to assist in achieving the committed emission reductions described in the State SIP (State Implementation Plan) Strategy related to on-road heavy-duty vehicles, off-road equipment, and federal and international sources that operate in and out of the Ports of Los Angeles and Long Beach (San Pedro Bay Ports or Ports). This measure is also a continuation of control measure MOB-01 from the 2016 and 2022 Air Quality Management Plans (AQMPs). It is not expected that this measure will achieve the full emission reductions associated with the committed measures from the State SIP Strategy. Instead, this measure seeks to reduce emissions from port-related sources through a rule, as well as incentive funding and/or other voluntary programs. To the extent that these actions are sustained over a long-term basis and the emission reduction levels are maintained, the emission reductions may be credited as surplus reductions (as defined by the U.S. Environmental Protection Agency, U.S. EPA) into the SIP. Affected sources could include some or all port-related sources (on-road heavy-duty trucks, cargo handling equipment, harbor craft, marine vessels, locomotives, and stationary equipment), to the extent that cost-effective and feasible strategies are available.

Background

Emissions and Progress

The Ports of Los Angeles (POLA) and Long Beach (POLB) are the largest in the nation in terms of container throughput, and the mobile sources travelling to and from the ports collectively make up the single largest fixed source of air pollution in Southern California. Emissions from port-related sources were reduced significantly between 2006 and 2012 through efforts by the Ports and a wide range of stakeholders. In large part, these emission reductions resulted from programs developed and implemented by the Ports in collaboration with port tenants, marine carriers, trucking interests and railroads. Regulatory agencies, including the U.S. EPA, California Air Resources Board (CARB), and South Coast AQMD, participated in these earlier collaborative efforts, and some measures adopted by the Ports have led the way for adoption of analogous regulatory requirements that are now applicable Statewide as well as at the Ports. These earlier port measures included the first version of the Clean Trucks Program and actions to deploy shore-power and low emission cargo handling equipment. The Ports have also established incentive programs, which have not subsequently been adopted as regulations. These include incentives for routing of vessels meeting the International Maritime Organization (IMO) Tier II and III Nitrogen Oxides (NOx) standards, and vessel speed reduction. In addition, the Ports are, in collaboration with the regulatory agencies, implementing a Technology Advancement Program to develop and deploy clean technologies of the future.

Recently, the Ports implemented an update to the Clean Trucks Program. The centerpiece of this new program is a charge to cargo owners of $10 per twenty-foot equivalent unit (TEU) of loaded cargo that is trucked to or from the Ports. Zero emission trucks are exempt from the $10/TEU rate. At POLB, low NOx trucks (those meeting CARB's 0.02 g/hp-hr standard) purchased before November 8, 2021 are exempt from the $10/TEU rate through the end of 2034, while low NOx trucks entered into the drayage registry before the end of 2022, or purchased before July 31, 2022 and registered within a month after receipt are exempt through the end of 2031. At POLA, the low NOx truck exemption only applies to low NOx trucks entered into the drayage registry by the end of 2022, and only lasts through the end of 2027. The fee rate collection started in April 2022, with the funding disbursement anticipated in the following year. This program is anticipated to annually raise up to $90 million, and funding will go primarily towards deploying zero emission trucks and funding zero emission infrastructure, with POLB having provided some early funding for low NOx trucks using the anticipated fee revenue. Through September 2023, the Ports have collected $116.1 million in revenue from the Clean Trucks Program fee, and are disbursing these funds mainly as plus-ups to increase the level of incentive per truck provided through CARB's Hybrid and Zero Emission Truck and Bus Voucher Incentive Project (HVIP) for zero emission drayage truck purchases.

The supply chain has been disrupted in recent years with the COVID-19 pandemic, and the Ports experienced significant congestion beginning from late 2020. At its peak, there were more than 100 container vessels in queue waiting for a berth, and emissions may have increased by more than 25 tons of NOx and 0.5 tons of PM2.5 per day. A new voluntary program[43] was subsequently established by the Pacific Merchant Shipping Association, the Pacific Maritime Association, and the Marine Exchange to keep container vessels from anchoring within 150 miles from shore, resulting in lower emissions from vessels closer to shore.

Port-related sources such as marine vessels, locomotives, trucks, harbor craft and cargo handling equipment, continue to be among the largest sources of NOx in the region, thus contributing to PM2.5 emissions not only as primary but also secondary sources. Given the large magnitude of emissions from port-related sources, the substantial efforts described above play a critical part in the ability of the Basin to attain the national ozone and PM2.5 ambient air standards by federal deadlines. This measure provides assurance that emissions from the South Coast Air Basin (Basin)'s largest magnet of mobile sources will continue to support attainment of the federal 8-hour ozone and the 24-hour and annual PM2.5 standards. In addition, reductions in PM2.5 emissions will also reduce cancer risks from diesel particulate matter.

Clean Air Action Plan (CAAP)

The emission control efforts described above largely began in 2006 when the Ports of Los Angeles and Long Beach, with the participation and cooperation of staff of the South Coast AQMD, CARB, and the U.S. EPA, adopted the San Pedro Bay Ports CAAP. The CAAP was amended in 2010 and 2017, updating many of the goals and implementation strategies to reduce air emissions and health risks associated with port operations while allowing port development to continue. In addition to addressing health risks and greenhouse gas emissions from port-related sources, the CAAP sought the reduction of criteria pollutant emissions to the levels that assure port-related sources decrease their "fair share" of regional emissions to enable the Basin to attain State and federal ambient air quality standards. The CAAP includes proposed strategies on port-related sources that are implemented through new leases or port-wide tariffs, Memoranda of Understanding (MOU), voluntary action, grants or incentive programs.

In addition to the CAAP, the Ports have completed annual inventories of port-related sources since 2005. These inventories have been completed in conjunction with a technical working group composed of the South Coast AQMD, CARB, and the U.S. EPA. Based on the latest inventories, emissions from port-related sources are continuing to decrease from 2005 emission levels, albeit at slower levels in recent years compared to earlier years.[44] Although the ports met their 59 percent NOx reduction goal from the 2010 CAAP by 2020, this goal did not include emission reductions needed from the "black box" described in the

[43] Pacific Maritime Management Services (PacMMS). Online at: https://mxsocal.org/

[44] The congestion at the ports during 2021 showed an increase in emissions from previous years by 40% for NOx and 48% for PM2.5

2007 AQMP—which also contained defined (non-"black box") measures that served as the basis for the 2010 CAAP emission reduction goals. In addition, the 2017 CAAP did not update the NOx emission reduction goal. In 2021, the ports did not maintain the 59 percent NOx reduction goal due to the significant increase in ocean-going vessel emissions during the recent Ports' congestion period. Additional NOx emission reductions are still needed to attain federal air quality standards. As an example, the Ports' implementation of their 2017 CAAP is expected to result in about 2 to 3 tons per day of NOx reductions by 2031, yet their 'fair share' as described in the 2022 AQMP is about 16 to 17 tons per day.[45]

While many of the emission reduction targets in the CAAP result from implementation of federal and State regulations (either adopted prior to or after the CAAP), some are contingent upon the Ports taking and maintaining actions which are not required by air quality regulations. These actions include the Expanded Vessel Speed Reduction Incentive Program, lower-emission switch locomotives, and incentives for lower emission marine vessels.

Regulatory History

Port emission sources are regulated at the international, federal, and local level. There is also anticipated regulation that the IMO is proposing that would affect Port sources. The key regulations affecting Port sources are listed below.

The CAAP sets out the emission control programs and plans that will help mitigate air quality impacts from port-related sources. The CAAP relies on a combination of regulatory requirements and voluntary control strategies that go beyond the U.S. EPA or CARB requirements, or are implemented earlier than the requirements of applicable regulatory rules. The regulations that the CAAP relies on include international, federal and State requirements controlling port-related sources such as marine vessels, harbor craft, cargo handling equipment, locomotives, and trucks. Key regulatory and other actions taken to date are as follows:

International Maritime Organization (IMO) Emissions and Fuel Standards

The IMO's International Convention for the Prevention of Pollution from Ships (MARPOL) Annex VI, which came into force in May 2005, set new international NOx emission limits on marine engines with >130 kW power output installed on new vessels retroactive to the year 2000. In October 2008, the IMO adopted an amendment which placed a limit on marine fuel sulfur content of 0.1 percent by 2015 for specific areas known as Emission Control Areas (ECA). The North American and U.S. Caribbean Sea ECA extends 200 nautical miles from the U.S. Coast. The Basin off-coast waters are included in the ECA and ships calling at the Ports have to meet this new fuel standard or use SOx scrubber as an alternative compliance method. In addition, the 2008 IMO amendment required new ships with their keel laid after January 1, 2016 that enter the North American and U.S. Caribbean Sea ECA to meet Tier III NOx emission limits which are 80

[45] Determined by the percent reductions deemed necessary in the 2022 AQMP for each mobile source related to port operations, with the percent reductions applied to projected port-specific emissions based on the Ports' emissions inventory figures

percent lower than the Tier I emission limits and 75 percent lower than the Tier II emission limits. However, only about 3.5 percent of vessels calling at the Ports met these standards in 2021. For Tier III vessels that use selective catalytic reduction (SCR) engine retrofit systems for NOx control, any un-reacted ammonia emissions, or ammonia slip, from urea injection into the exhaust gas can potentially contribute to secondary formation of PM.

IMO GHG Strategy

In October 2018 IMO adopted an initial strategy to reduce GHG emissions from the global ship fleet. Compared to the 2008 level, the strategy set a reduction target of 40 percent by 2030 for carbon intensity and a reduction target of at least 50 percent by 2050 for total annual GHG emissions from international shipping. This strategy was further revised in 2023, including an amended 2050 target of net-zero GHG emissions, and new IMO standards are expected to be developed to implement the 2023 strategy. This level of GHG reductions will require the use of low or zero carbon fuels, with the latest target set at 5-10 percent of all energy used by international shipping by 2030; however, the effect on NOx and PM from this fuel switch may vary widely depending on which fuels are used and what controls are added to ship engines. Several programs have been adopted in recent years as short-term measures to attain the decarbonization targets, including the energy efficiency design index (EEDI) for newbuilt ships, the efficiency existing ship index (EEXI) for in-service ships, and the carbon intensity indicator (CII). Collectively, by reducing fuel consumption, these measures may indirectly lower NOx and PM emissions albeit to a limited extent.

U.S. EPA Marine Vessel Regulations

In 2010, the U.S. EPA adopted standards that apply to Category 3 (C3) engines (>30 liters per cylinder displacement) installed on U.S. vessels and to marine diesel fuels produced and distributed in the United States. That rule added two new tiers of engine standards for C3 engines consistent with the IMO standards described above. It also includes a regulatory program to implement IMO MARPOL Annex VI in the United States, including engine and fuel sulfur limits, and extends the ECA engine and fuel requirements to U.S. internal waters (i.e., rivers, lakes, etc.). The Department of State is the head of the U.S. delegation to the IMO; however, the U.S. EPA is also a participating member of the delegation. In that capacity the U.S. EPA has provided input to the fuel sulfur and NOx emission standards adopted by IMO and also works within international organizations to establish global engine and fuel standards. The U.S. delegation to the IMO is generally led by the State Department, with Coast Guard, the U.S. EPA, and other relevant agencies provide any necessary support and technical advice.

CARB Marine Fuel Rule

Beginning in 2009, CARB began implementing the State’s fuel sulfur regulation, applicable to both domestic and foreign flagged vessels, in waters out to 24 nm of the California baseline (i.e., Regulated California Waters or RCW). The rule initially limited sulfur content in marine gas oil (MGO) to 1.5 percent sulfur by weight and in marine diesel fuel (MDO) to 0.5 percent sulfur by weight. Beginning on January 1, 2012, all OGVs when operating in the RCW must switch to either type of distillate grade fuel with at maximum 0.1 percent sulfur content in weight, and unlike the IMO sulfur oxides (SOx) ECA requirements, the use of SOx scrubber is not permitted as an alternative compliance method.

CARB At-Berth Regulation

In 2020 CARB amended its At-Berth regulation that requires ships to reduce emissions while they are docked at a berth. This emission reduction is achieved either by plugging a ship into the land-based electrical grid (shore power), or by capturing emissions and sending them to control equipment. The amended regulation requires all container, reefer, and cruise vessel visits to reduce emissions at berth by 2023, and roro (roll-on, roll-off) and tanker vessels by 2025.

CARB Commercial Harbor Craft Regulation

In 2022 CARB amended its Commercial Harbor Craft regulation that requires vessel owners and operators to reduce emissions from harbor craft operations. The amended regulation establishes expanded and more stringent emission requirements for vessel engines starting in 2023 and requires deployment of zero emission and advanced technology (ZEAT) for certain vessel categories starting in 2025. The amended regulation also makes facility owners and operators jointly responsible for installation and maintenance of shore power and ZEAT support infrastructure.

CARB Cargo Handling Equipment Regulation

On December 8, 2005, CARB approved the Regulation for Mobile Cargo-Handling Equipment (CHE) at Ports and Intermodal Rail Yards (Title 13, CCR, Section 2479), which is designed to use Best Available Control Technology (BACT) to reduce diesel PM and NOx emissions from mobile cargo-handling equipment at ports and intermodal rail yards. The regulation became effective December 31, 2006. Since January 1, 2007, the regulation imposes emission performance standards on new and in-use terminal equipment that vary by equipment type. The CHE regulation was amended in 2011 to provide added compliance flexibility.

U.S. EPA Emission Standards for New Locomotives

To reduce locomotive emissions, the U.S. EPA in 2008 established a series of increasingly stricter emission standards for new locomotives, including remanufactured locomotive engines. The emission standards are implemented by “Tier” with Tier 0 as the least stringent and Tier 4 being the most stringent. For Tiers 0, 1, and 2, the remanufacture standards are more stringent than the new manufacture standards for those engines for some pollutants. Additionally, in 2023, the U.S. EPA removed from its rule certain provisions which previously preempted the State control of non-new locomotives for a period of 133 percent of the useful life of a new locomotive or engine.

CARB In-Use Locomotive Regulation

In April 2023, CARB adopted the In-Use Locomotive Regulation that will achieve emission reductions from locomotives operating throughout the state, including at the Ports. The final regulation includes a requirement for railroads to establish a spending account in 2026 and to pay into the account on an annual basis depending on the tier of locomotive used in the state. Lower tiers would pay more into the account than higher tiers. Funds from this account could be used to purchase Tier 4 and cleaner locomotives through 2030, and zero emission locomotives thereafter, or for the development of zero emission locomotive technologies including the supporting infrastructure. The regulation also would prohibit locomotives older than 23 years from operating in the state starting in 2030, and require new locomotives to be zero emissions if they are built in or after 2030 for switch, industrial, and passenger, and 2035 for line haul. The regulation provides flexibility for achieving compliance, allowing for alternatives to meet milestone deadlines and granting extensions in cases such as technological limitations or emergency circumstances. Finally, the proposal adopts the U.S. EPA's existing idling limits into state law.

U.S. EPA Emission Standards for New Trucks

To reduce emissions from on-road, heavy-duty diesel trucks, the U.S. EPA established a series of cleaner emission standards for new engines, starting in 1988. Currently, all new heavy-duty trucks of 2010 or later model years (MY) have to meet the emission standards including 0.20 g/bhp-hr for NOx and 0.01 g/bhp-hr for PM.

On December 20, 2022, U.S. EPA adopted a regulation to reduce NOx emissions from heavy-duty vehicles effective March 27, 2023. The rule requires control equipment on trucks to last longer, and to control emissions better in low load duty cycles (such as drayage activity). Starting with MY 2027, the adopted regulation will lower the 2010 NOx emission standard by 82.5 percent. The adopted regulation also increases the useful life of regulated heavy-duty vehicles by at least 50 percent. However, for drayage trucks, this federal regulation is no more stringent than CARB's recently adopted Advanced Clean Fleets regulation for drayage trucks (see below).

U.S. EPA proposed the Heavy Duty Greenhouse Gas (HD GHG) Phase 3 regulation on April 12, 2023. This proposed update would provide new GHG standards for heavy-duty highway vehicles starting MY 2028 through MY 2032 and revise certain standards established under GHG Phase 2. This document proposes eliminating the last MY year of the HD GHG Phase 2 advanced technology incentive program for certain types of electric highway heavy-duty vehicles. U.S. EPA is proposing to add warranty requirements for batteries and other components of zero emission vehicles and to require customer-facing battery state-of-health monitors for plug-in hybrid and battery electric vehicles.

CARB Regulations for Drayage Trucks

In December 2007, CARB adopted regulation that applies to heavy-duty diesel trucks operating at California ports and intermodal rail yards. This regulation eventually required that all drayage trucks meet the 2007 on-road emission standards by 2014. From January 1, 2023, the Drayage Truck Regulation was sunset, and drayage trucks are now subject to the Truck and Bus Regulation and must have a MY 2010 or newer engine.

In April 2023, CARB adopted the Advanced Clean Fleets Regulation which will apply a phase-in approach for ZE vehicle implementation for drayage, high priority, federal, state and local agency fleets. For medium- and heavy-duty vehicles, the regulation imposes a manufacture sales mandate which states manufacturers are only allowed to sell ZE medium- and heavy-duty vehicles for purchase in California, starting with MY 2036 vehicles. Drayage trucks will be required to start transitioning to ZE technology beginning in 2024 with full 100 percent ZE implementation by 2035.

Additionally, CARB also adopted the Heavy-Duty Inspection and Maintenance regulation, which began implementation in January 2023 and ensures that emissions control systems on in-use heavy-duty vehicles driven in California, including drayage trucks, are operating as designed and are repaired in a timely manner if they malfunction.

MOUs

In 1998, CARB entered into an MOU with Class 1 railroads UP and BNSF which established a fleet average emissions limit for locomotives operating in the Basin. The intended effect of this MOU was to accelerate introduction of Tier 2 or cleaner locomotives (achieving an approximate 57 percent level of NOx control) in this region. In June 2005, CARB entered into a second MOU with the same two railroads that is intended to reduce health risks near rail yards and identify actions to achieve a projected 20 percent reduction in DPM emissions. Finally, several years ago, the ports, shipping interests, and regulatory agencies entered into a MOU seeking voluntary reductions in vessel speed to reduce NOx emissions.

Proposed Method of Control

This measure seeks to reduce emissions related to on-road heavy-duty vehicles, off-road equipment, harbor craft, locomotives, and ocean-going vessels that operate in and out of the San Pedro Bay Ports. This measure will include development of a rule that will be applicable to sources at the San Pedro Bay Ports, as well as pursuit of incentive funding or other voluntary measures that can also achieve and/or facilitate emission reductions. In February 2022, South Coast AQMD began the rule development process for Proposed Rule 2304 –Commercial Marine Ports – Container Terminals. Depending upon how the proposed rule is ultimately structured, it may also require some level of federal approval before it can be fully implemented. To the extent possible, the proposed rule will be structured so as to allow incentive funding to be used to deploy cleaner technologies. Emission reductions may also be achieved if new regulations are developed and implemented at the federal or international level.

The proposed rule for commercial marine ports will continue to be developed through a public process that includes a working group, meetings with individual stakeholders, facility tours, community forums, and reports to the South Coast AQMD Governing Board Mobile Source Committee. The proposed rule is anticipated to be brought to the Governing Board for its consideration in 2024. Incentive programs and/or other voluntary programs will use their own public process specific to each program. During rule development, staff will consider technical feasibility, identify industry-specific affordability issues, cost-effectiveness and incremental cost-effectiveness, and may consider alternative compliance mechanisms.

Emission Reductions

Potential emission reductions will be determined as the proposed rule is developed and as programs are implemented. Emission reductions from any proposed rule or other program applicable to marine ports might not be creditable into the SIP at time of adoption. If so, the emission reductions that do occur will ultimately be SIP-creditable at a later date (e.g., through retrospective analysis after rule implementation), or quantified through other measures (e.g., incentive programs) or inventory analysis, so long as they are quantifiable, permanent, surplus, enforceable, and real.

Rule Compliance and Test Methods

Compliance with this control measure will depend on the type of control strategy implemented. Compliance will be verified through actual emissions reported, and enforced through submittal and review of records, reports, and emission inventories. Enforcement provisions will be discussed as part of the public process to develop enforceable mechanisms to ensure that the emission reductions remain permanent. If other enforceable mechanisms are established outside of the South Coast AQMD public process, or the State or federal government implement regulatory actions, that achieve equivalent emission reductions, compliance will be enforced through the provisions of those actions.

Approved emission quantification protocols by federal, State or local agencies will be used to track and report emission reductions for SIP purposes.

Cost Effectiveness

The cost-effectiveness of this measure will be based on the strategies identified through the public process.

Implementing Agency

There are many potential implementing agencies for this measure. The proposed rule would be implemented by South Coast AQMD. Voluntary programs (e.g., vessel speed reduction) may be implemented by the Ports of Long Beach and Los Angeles. Incentive programs may be implemented either by the agency issuing the funding (e.g., California Energy Commission, Federal Maritime Administration, etc.) or co-implemented by the Ports of Long Beach and Los Angeles if they receive the funding. Regulations adopted at the federal or international level would be implemented by the applicable federal agency. For example, the Emission Control Area under the IMO’s MARPOL Annex VI is enforced by both the U.S. Coast Guard and the U.S. EPA.

References

CARB (2022). 2022 State Strategy for the State Implementation Plan, September 2022

IMO (2018). Adoption of the Initial IMO Strategy on Reduction of GHG Emissions from Ships and Existing IMO Activity Related to Reducing GHG Emissions in the Shipping Sector, April 2018

San Pedro Bay Ports (2010). San Pedro Bay Ports Clean Air Action Plan, 2010 Update, October 2010

San Pedro Bay Ports (2017). San Pedro Bay Ports Clean Air Action Plan, 2017 Update, November 2017

South Coast AQMD (2007). Air Quality Management Plan, Appendix IV-A, June 2007

South Coast AQMD (2012). Air Quality Management Plan, Appendix IV-A, December 2012

South Coast AQMD (2017). Air Quality Management Plan, Appendix IV-A, March 2017

South Coast AQMD (2022). Air Quality Management Plan, Appendix IV-A, December 2022

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MOB-02: EMISSION REDUCTIONS AT NEW AND EXISTING RAIL YARDS

[PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	NEW AND EXISTING RAIL YARDS	
CONTROL METHODS:	INDIRECT SOURCE RULE, MARKET INCENTIVES, VOLUNTARY PROGRAMS	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	0.37	TBD
POLLUTANT REDUCTION	TBD	TBD
POLLUTANT REMAINING	TBD	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	15.57	17.97
POLLUTANT REDUCTION	TBD	TBD
POLLUTANT REMAINING	TBD	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

There are nine major rail yards conducting intermodal operations within the jurisdiction of South Coast AQMD, with additional freight rail yards supporting the movement of goods and commodities and performing critical functions such as classification of rail cars, locomotive fueling, equipment repair and maintenance, and so on. There are a variety of mobile emission sources related to freight rail yard operations including interstate line-haul locomotives, regional and local switch locomotives, on-road heavy-duty drayage trucks, cargo-handling equipment (CHE), and transportation refrigeration units (TRUs). In addition, the South California Regional Rail Authority (SCRRA or Metrolink) and Amtrak provide commuter rail transportation within the South Coast Air Basin (Basin). SCRRA maintains their passenger locomotives at two locations in the Basin. This measure seeks to reduce NOx and particulate matter emissions related to the operation of rail yards. Through the public process, South Coast AQMD will assess and identify potential actions that could result in further emission reductions from rail yards located within the South Coast AQMD jurisdiction.

Background

Rail yard operations generate significant levels of nitrogen oxides (NOx) and particulate matter (PM) emissions that contribute to the region's challenges to attain federal National Air Ambient Air Quality Standard (NAAQS). Moreover, environmental justice communities are located adjacent to many of these existing rail yards. Due to high rail and vehicle traffic in the area, nearby communities are subject to high levels of Nitrogen Dioxide (NO2) and diesel particulate emissions. During periods of routine locomotive maintenance, there have been concerns raised regarding excessive emissions from idling locomotives or during periods of routine locomotive maintenance. At the same time, due to projected economic and population growth, it is anticipated that locomotive activities will increase, and construction of new intermodal rail yards could potentially facilitate this projected growth, thereby resulting in further increased NOx and PM emissions.

Regulatory History

U.S. EPA Emission Standards for New Locomotives

To reduce locomotive emissions, the U.S. EPA in 2008 established a series of increasingly strict emission standards for new locomotives, including remanufactured locomotive engines. The emission standards are implemented by "Tier" with Tier 0 as the least stringent and Tier 4 being the most stringent. For Tiers 0, 1, and 2, the remanufacture standards are more stringent than the new manufacture standards for those engines for some pollutants. Additionally, in 2023, the U.S. EPA removed from its rule certain provisions which previously preempted the State control of non-new locomotives for a period of 133 percent of the useful life of a new locomotive or engine.

CARB Regulation for In-Use Locomotives

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On December 20, 2022, U.S. EPA adopted a regulation to reduce NOx emissions from heavy-duty vehicles effective March 27, 2023. The rule requires control equipment on trucks to last longer, and to control emissions better in low load duty cycles (such as drayage activity). Starting with MY 2027, the adopted regulation will lower the 2010 NOx emission standard by 82.5 percent. The adopted regulation also increases the useful life of regulated heavy-duty vehicles by at least 50 percent. However, for drayage trucks, this federal regulation is no more stringent than CARB's recently adopted Advanced Clean Fleets regulation for drayage trucks (see below).

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In April 2023, CARB adopted the Advanced Clean Fleets Regulation which will apply a phase-in approach for ZE vehicle implementation for drayage, high priority, federal, state and local agency fleets. For medium- and heavy-duty vehicles, the regulation imposes a manufacture sales mandate which states manufacturers are only allowed to sell ZE medium- and heavy-duty vehicles for purchase in California, starting with MY 2036 vehicles. Drayage trucks will be required to start transitioning to ZE technology beginning in 2024 with full 100 percent ZE implementation by 2035.

Additionally, CARB also adopted the Heavy-Duty Inspection and Maintenance regulation, which began implementation in January 2023 and ensures that emissions control systems on in-use heavy-duty vehicles driven in California, including drayage trucks, are operating as designed and are repaired in a timely manner if they malfunction.

CARB Cargo Handling Equipment Regulation

On December 8, 2005, CARB approved the Regulation for Mobile Cargo-Handling Equipment (CHE) at Ports and Intermodal Rail Yards (Title 13, CCR, Section 2479), which is designed to use Best Available Control Technology (BACT) to reduce diesel PM and NOx emissions from mobile cargo-handling equipment at ports and intermodal rail yards. The regulation became effective December 31, 2006. Since January 1, 2007, the regulation imposes emission performance standards on new and in-use terminal equipment that vary by equipment type. The CHE regulation was amended in 2011 to provide added compliance flexibility.

South Coast AQMD Regulation XXXV – Railroads and Railroad Operations

South Coast AQMD adopted Regulation XXXV – Railroads and Railroad Operations, which consists of three rules that address emissions from locomotives and rail yards. Rule 3501 – Recordkeeping for Locomotive Idling, requires recordkeeping of idling events in order to identify opportunities for reducing idling emissions and to assist in quantifying idling emissions. Rule 3502 – Minimization of Emissions from Locomotive Idling, requires railroads to minimize unnecessary locomotive idling. Rule 3503 – Emissions Inventory and Health Risk Assessment for Railyards, requires operators of railroads and rail yards to develop emissions inventories, prepare health risk assessments and notify the public of health risks. A federal District Court decision prevents these rules from being implemented until they become federally enforceable through inclusion in the SIP. Since the District rules have not become part of California's U.S. EPA-approved SIP at the time of the ruling, the court stated the Regulation XXXV rules do not have the force and effect of federal law and are found to be preempted by the Interstate Commerce Commission Termination Act of 1995.

MOUs

In 1998, the railroads and California Air Resources Board (CARB) entered into a Memorandum of Understanding (MOU) to accelerate the introduction of Tier 2 locomotives into the Basin. The MOU includes provisions for a fleet average in the Basin, equivalent to the U.S. EPA's Tier 2 locomotive standard by 2010. The MOU addressed NOx emissions from locomotives. Under the MOU, NOx levels from locomotives are reduced by 57 percent. However, little progress in emission reductions occurred in the most recent decade. As of 2020, only 5.9 percent of locomotive activities operated by Union Pacific (UP) within the South Coast Air Basin was with the cleanest Tier 4 locomotives, and the corresponding figure was 7.5 percent by Burlington Northern Santa Fe Corp (BNSF). In contrast, about 78 percent of locomotive activities operated by UP was with Tier 2 or older locomotives, and the corresponding figure was 66 percent by BNSF.

On June 30, 2005, UP and BNSF entered into a Statewide Rail Yard Agreement to Reduce Diesel PM at California Rail Yards with the CARB. The railroads committed to implementing certain actions from rail operations throughout the State. In addition, the railroads prepared equipment inventories and conducted dispersion modeling for diesel PM at a number of rail yards.

Proposed Method of Control

This measure seeks to reduce emissions related to on-road heavy-duty drayage trucks, off-road equipment including cargo handling equipment and transportation refrigeration units, and both line-haul and switch locomotives, that operate in and out of rail yards.

In May 2018, South Coast AQMD directed staff to pursue both regulatory and non-regulatory approaches to reduce rail yard related emissions. Following the initial rule development for existing rail yards, staff began in July 2021 to focus on developing a new indirect source rule (ISR) in response to the announcement of plans to construct two new intermodal rail yards: the Southern California International Gateway (SCIG) proposed by the Port of Los Angeles, and the Colton Intermodal Facility as a proposed component of California High Speed Rail (HSR) – Los Angeles to Anaheim section. While no further updates have been provided on SCIG to date, the Colton component was subsequently removed from consideration by the HSR Authority in mid-2023. Given this development, between August and November 2023, staff efforts were temporarily pivoted to explore a potential MOU to reduce emissions associated with all rail equipment owned/operated by Class I railroads that are deployed solely within the South Coast Air Basin. However, the parties were unable to reach a consensus, and the MOU effort was discontinued.

In the same year, CARB adopted its In-Use Locomotive regulation which is projected to accelerate the turnover to zero emission for locomotives deployed to California, starting in 2030 for switch locomotives (used for yard/localized jobs or passenger transportation) and 2035 for line-haul (used for both interstate goods movement and regional/local switching operations). Additionally, CARB also adopted the Advanced Clean Fleets regulation which mandates the transition of drayage truck fleet to zero emission by 2035.

This measure will include development of a proposed rule applicable to rail yard sources, as well as pursuit of incentive funding, technology demonstration, or other measures that can also achieve and/or facilitate emission reductions in addition to the proposed rule. The proposed rule will focus on localized realization of emission reduction benefits consistent with recently adopted statewide regulations affecting rail yard sources. The rule design will take into account differences in rail yard operations and equipment deployment patterns to ensure the proposed rule would act as a strengthening mechanism to assist with local implementation of state regulations. Depending upon how the proposed rule is ultimately structured, it may also require some level of federal approval before it can be fully implemented. To the extent possible, the proposed rule will be structured so as to allow incentive funding to be used to deploy cleaner technologies. Emission reductions may also be achieved if new regulations are developed and implemented at the federal level.

The proposed rule will continue to be developed through a public process that includes a working group, meetings with individual stakeholders, facility tours, community forums, and reports to the South Coast AQMD Governing Board Mobile Source Committee.

Emission Reductions

Potential emission reductions will be determined as programs are implemented. Emission reductions from any program applicable to rail yards might not be creditable into the SIP at time of adoption. If so, the emission reductions that do occur will ultimately be SIP-creditable at a later date (e.g., through retrospective analysis after rule implementation), or quantified through other measures (e.g., incentive programs) or inventory analysis, so long as they are quantifiable, permanent, surplus, enforceable, and real.

Rule Compliance and Test Methods

Compliance with this control measure will depend on the type of control strategy implemented. Compliance will be verified through actual emissions reported, and enforced through submittal and review of records, reports, and emission inventories. Enforcement provisions will be discussed as part of the public process to develop enforceable mechanisms to ensure that the emission reductions remain permanent. If other enforceable mechanisms are established outside of the South Coast AQMD public process, or the State or federal government implement regulatory actions, that achieve equivalent emission reductions, compliance will be enforced through the provisions of those actions.

Cost Effectiveness

The cost-effectiveness of this measure will be based on the strategies identified through the public process.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from indirect sources, including rail yards.

References

California Air Resources Board (1998). Memorandum of Mutual Understanding and Agreements: South Coast Locomotive Fleet Average Emissions Program. July 1998.

California Air Resources Board (2005). ARB/Railroad Statewide Agreement: Particulate Emissions Reduction Program at California Rail Yards. June 2005.

California Air Resources Board (2011). Regulation for Mobile Cargo Handling Equipment at Ports and Intermodal Rail Yards. September 2012.

California Air Resources Board (2022). Heavy-Duty Inspection and Maintenance Regulation, August 2022.

California Air Resources Board (2023). In-Use Locomotive Regulation, September 2023.

California Air Resources Board (2023). Advanced Clean Fleets Regulation, August 2023.

South Coast AQMD (2006). Regulation 35 – Railroads and Railroad Operations.

U.S. EPA (2008). Control of Emissions of Air Pollution from Locomotive Engines and Marine Compression-Ignition Engines Less Than 30 Liters per Cylinder; Republication, June 30, 2008 (73FR37096).

U.S. EPA (2022). Final Rule: Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards. December 2022.

U.S. EPA (2023). Proposed Rule: Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles – Phase 3, April 2023.

U.S. EPA (2023). Final Rule: Locomotives and Locomotive Engines; Preemption of State and Local Regulations, November 2023.

MOB-03: EMISSION REDUCTIONS AT WAREHOUSE DISTRIBUTION CENTERS [PM2.5, NOx]

CONTROL MEASURE SUMMARY[46]		
SOURCE CATEGORY:	MOBILE SOURCES (ON-ROAD VEHICLES, OFF-ROAD VEHICLES)	
CONTROL METHODS:	Warehouse Indirect Source Rule – Warehouse Actions and Investments to Reduce Emissions (WAIRE) Program	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	TBD	TBD
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	42	TBD
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	$12.6 MILLION – $979 MILLION (DEPENDENT ON THE MENU-BASED STRATEGY)	
INCENTIVE COST:	INCENTIVES ARE NOT DIRECTLY RELATED	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

Mobile Sources: (Includes Cargo Handling Equipment)

- On-Road Vehicles; and
- Off-Road Vehicles.

[46] http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2021/2021-May7-027.pdf?sfvrsn=10

Background

A large portion of the Nitrogen Oxides (NOx) emission inventory in the South Coast Air Basin (Basin) comes from the goods movement industry. More than half of the emissions from that sector result from heavy-duty diesel trucks. In addition, about 37% of the PM2.5 emissions in the Basin comes from mobile sources. Regulation of mobile sources is under the purview of the U.S. Environmental Protection Agency (U.S. EPA) and California Air Resources Board (CARB), but the South Coast Air Quality Management District (South Coast AQMD) has indirect source authority to be able to regulate the warehouses that attract diesel trucks and operate other mobile source vehicles (such as yard hostlers, forklifts, etc.). Warehouses are considered a point source of emissions in local disadvantaged communities.

There is a definite air quality need to reduce NOx and PM2.5 emissions from warehouse operations to achieve the following:

- Assist in meeting attainment goals;
- Assist related regulations in gaining emission reductions;
- Assist in the shortfall of incentive funds;
- Increase the use of zero emission vehicles;
- Assist in state actions on cleaner technology; and
- Reduce pollution burden in local communities.

Regulatory History

- Truck and Bus Regulation;
- Advanced Clean Trucks (ACT) Regulation;
- Low NOx Omnibus;
- Heavy-Duty Inspection and Maintenance Program; and
- Advanced Clean Fleet Regulation.

Proposed Method of Control

Rule 2305 requires annual compliance by applicable warehouse operators to implement emission reducing strategies based on the volume of truck traffic to each individual warehouse. Based on the volume of truck traffic, each warehouse operator would earn/acquire points through a variety of flexible options. The Warehouse Actions and Investments to Reduce Emissions (WAIRE) Program is a menu-based point system that would award WAIRE Points for completing items on a prescribed menu. Warehouse operators can propose a site-specific strategy evaluated similar to the actions/investments on the WAIRE Menu, and upon approval could earn the warehouse operator WAIRE Points. There is a mitigation fee option, where the funds paid to the mitigation fee program would fund incentives for cleaner technologies back in the communities of the warehouse operator that paid the mitigation fee. During rule development, staff considered technical feasibility, identified industry-specific affordability issues, cost-effectiveness and incremental cost-effectiveness, and considered alternative compliance mechanisms.

Emission Reductions

The WAIRE Program provides a suite of options for warehouse operators to comply. Rule 2305 requires warehouse operators to annually earn WAIRE Points by completing any combination of: 1) implementing actions from the WAIRE Menu, 2) developing and implementing an approved Custom WAIRE Plan, or 3) paying a mitigation fee. Revenues from the mitigation fees will be used to incentivize the installation of zero emission vehicle charging/fueling infrastructure or the turnover of existing diesel fleet vehicles with a low NOx or zero emissions truck. The staff report for Rule 2305 analyzed 19 different scenarios for compliance by warehouse operators to show the range of potential outcomes and emission reduction benefits from the rule.

Actions on the WAIRE Menu promote transportation electrification and fleet turnover with low NOx and zero emissions trucks. Most the actions result in NOx and PM2.5 reductions from cleaner trucks or offsetting reliance on electricity from local natural gas-fired power plants through solar panel installations or by reducing exposure at the local communities sited near warehouses. For the truck usage analysis of emission reductions, a retrospective analysis was conducted based on the surplus reductions observed in the EMFAC model.

TABLE MOB-03-A
ESTIMATED BASELINE TRUCK EMISSION (TONS PER DAY) ASSOCIATED WITH RULE 2305 WAREHOUSES REQUIRED TO EARN WAIRE POINTS

	2019		2023		2031	
	NOx	Diesel PM	NOx	Diesel PM	NOx	Diesel PM
EMFAC 2017 Baseline	41.67	0.67	20.19	0.14	20.18	0.14
Reductions from CARB ACT, Low NOx Omnibus and Heavy-Duty I/M Regulations	0	0	-0.005	< -0.01	-3.37	-0.03
Total	**41.67**	**0.67**	**20.19**	**0.14**	**16.81**	**0.12**

Rule Compliance and Test Methods

Rule 2305 has several reporting requirements to ascertain responsible entities, establish baseline operation numbers, and tracking annual progress. Warehouse operators that are required to earn WAIRE Points must submit an Annual WAIRE Report (AWR) which would then be reviewed and/or audited through both a desktop and field audit to determine compliance with reporting requirements and WAIRE Program requirements.[47]

Cost Effectiveness

The total costs of implementing Rule 2305 ranges from $12.6 million to $979 million depending on the WAIRE Menu actions/investments implemented by the warehouse operator, and in some scenarios results in an overall savings. Potential economic impacts have been thoroughly analyzed in the socioeconomic impact assessment for Rule 2305. These analyses concluded that the public health benefits of the rule are expected to outweigh the potential costs by a ratio of about 3:1, for most compliance scenarios that were analyzed. Further, the cost-effectiveness of Rule 2305 was found to be similar to the cost-effectiveness of several mobile source regulations adopted by CARB in recent years.

Implementing Agency

South Coast AQMD has the indirect source authority to implement Rule 2305 which complements the mobile source emission standards and regulations that U.S. EPA and CARB can enact.

References

South Coast AQMD May 7, 2021 Governing Board Package. http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2021/2021-May7-027.pdf?sfvrsn=10

[47] http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2021/2021-May7-027.pdf?sfvrsn=10.

MOB-04: EMISSION REDUCTIONS AT COMMERCIAL AIRPORTS [ALL POLLUTANTS]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	COMMERCIAL AIRPORTS	
CONTROL METHODS:	MOBILE SOURCE EMISSION REDUCTION EFFORTS INCLUDING DEPLOYMENT OF CLEANER TECHNOLOGIES, INCREASED EFFICIENCIES, OR FURTHER AIR QUALITY IMPROVEMENT PROJECT OPTION	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE:	2018	2030
POLLUTANT INVENTORY	TBD	TBD
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	N/A	
INCENTIVE COST:	N/A	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

There are five major commercial airports located in the South Coast Air Basin (Basin): Los Angeles International Airport (LAX), John Wayne Orange County Airport (SNA), Hollywood Burbank Airport (BUR), Ontario International Airport (ONT), and Long Beach Airport (LGB). Due to projected increases in airline passenger transportation and expansion of operations at commercial airports, emissions from airport operations may increase unless the increased emissions are mitigated. For this reason, the Facility-Based Mobile Source Measure (FBMSM) for Commercial Airports, which controls non-aircraft mobile sources at commercial airports, was adopted by the South Coast Air Quality Management District (South Coast AQMD) on December 6, 2019. The measure consists of Memoranda of Understanding (MOUs) between the South Coast AQMD and the aforementioned airports and the South Coast AQMD's enforceable commitment to achieve 0.52 and 0.37 ton per day NOx reductions in 2023 and 2031, respectively. Each airport developed their own Air Quality Improvement Plans/Measures during the development of the FBMSM for Commercial Airports and used them as the basis for the Memorandum of Understandings (MOUs). The FBMSM for Commercial Airports was intended to assist with the implementation of the

"Further Deployment of Clean Technologies" measures for mobile sources in the 2016 State SIP Strategy.[48] MOB-04 seeks to continue tracking implementation of the MOUs to assist with attainment of the 2012 annual PM2.5 National Ambient Air Quality Standard (NAAQS).

Background

There are a variety of emission sources related to commercial airport operations. In addition to aircraft, ground support equipment (GSE) such as baggage handling equipment, food service trucks, fuel trucks, and aircraft tugs contribute to airport emissions. Emissions associated with passenger transportation to and from the airport, delivery of goods and fuel for aircraft transport, and stationary equipment also contribute.

Historically, airport authorities have mitigated airport-related emissions and airport ground support equipment and on-road vehicles are regulated by California Air Resources Board (CARB). However, aircraft emissions are primarily regulated by the federal government or by the International Civil Aviation Organization (ICAO). ICAO establishes new aircraft engine emission standards internationally, while the U.S. Environmental Protection Agency (U.S. EPA) establishes aircraft emission standards nationally.

Regulatory History

Emission standards for Aircraft

In 1973, the U.S. EPA published emissions standards and test procedures to regulate gaseous emissions, smoke, and fuel venting from aircraft engines. In 1997, the standards were revised to be more consistent with those of the ICAO Committee of Aviation Environmental Protection (CAEP) for turbo engines used in commercial aircraft. These standards (CAEP/2) included new CO, HC, and NOx emissions standards of 118 grams per kilonewtons (g/kN), 19.6 g/kN, and 40 g/kN, respectively. In 2005, the standards were harmonized with ICAO CAEP/4 requirements which tightened the CAEP/2 NOx standards by 32 percent for newly-certified commercial aircraft engines.

On June 1, 2012, the U.S. EPA Administrator signed a final rule to revise the standards to be consistent with the current ICAO CAEP/6 and CAEP/8 requirements to further reduce NOx emissions. The first set of standards require that all new engines meet the ICAO CAEP/6 standards. The CAEP/6 standards represent approximately a 12 percent emission reduction from the ICAO Tier 4 levels. The second set of standards, Tier 8, took effect in 2014 and represent approximately a 15 percent reduction from Tier 6 levels.

South Coast AQMD's Fleet Rules

[48] 2016 State SIP Strategy. https://ww2.arb.ca.gov/resources/documents/2016-state-strategy-state-implementation-plan-federal-ozone-and-pm25-standards

South Coast AQMD's fleet rules apply to several vehicle categories operating at airports. Rule 1191, Clean On-Road Light- and Medium-Duty Public Fleet Vehicles, applies to all state and local government agencies located in the South Coast AQMD's jurisdiction, including state, regional, county, and city government departments and agencies, and any special districts such as water, air, sanitation, transit, and school districts, with 15 or more non-exempt light-duty vehicles. This regulation requires that these entities acquire low emission gasoline or alternative fuel vehicles when procuring new vehicles. Rule 1196, Clean On-Road Heavy-Duty Public Fleet Vehicles, is a similar regulation that applies to on-road heavy-duty vehicles with a gross vehicle weight of at least 14,000 pounds. It requires all applicable government agencies and special districts with fleets of 15 or more vehicles (including commercial airports), to acquire a gasoline, dual-fuel or alternative fueled engine or vehicle when purchasing or leasing a new vehicle. Airports and operators must also comply with Rule 1194, Commercial Airport Ground Access, which requires all public fleets and those under contract or exclusive franchise to a public entity providing passenger transportation services out of commercial airports to acquire low emission or alternative-fueled vehicles. This rule applies to passenger cars, light-duty trucks, and medium- and heavy-duty transit vehicle fleets of 15 or more vehicles. Passenger shuttle buses and taxi cabs under a contract or exclusive franchise serving airports must comply with this rule as well.

CARB GSE MOU

In 2002, CARB executed an MOU for GSE with commercial airlines and cargo operators in the Basin. GSE is utilized for various functions at airports such as refueling aircraft, transporting cargo and luggage, and providing maintenance. The 2002 MOU has the following objectives for airlines to meet; meeting a 2.65 g/bhp-hr hydrocarbon plus NOx emission rate performance target, converting at least 30 percent of the aggregate GSE fleet to electric, acquiring at least 45 percent of new GSE purchases be electric, and reducing diesel GSE emissions by installing particle filters. The date to achieve these objectives was December 31, 2010. However, the MOU was terminated in 2006 because CARB's statewide regulations addressed many aspects of the GSE MOU.

CARB In-Use Off-Road Diesel-Fueled Fleets Regulation

CARB requires emission reductions from existing off-road diesel-fueled vehicles through its statewide In-Use Off-Road Diesel-Fueled Fleets Regulation. The regulation applies to all off-road diesel vehicles with engines greater than 25 horsepower including diesel-powered GSE and other diesel off-road equipment and vehicles operated at airports. The regulation imposes limits on idling, restricts the addition of older vehicles to fleets, and requires fleet owners to retire, replace or repower older engines to achieve progressively lower fleet average emission rates, or comply with the Best Available Control Technology (BACT) requirements. This rule requires mandatory reporting of applicable equipment to CARB through the Diesel Off-road On-line Reporting System (DOORS).[49]

CARB On-Road Heavy-Duty Diesel Vehicles (In-Use) Regulation

[49] Available at https://ssl.arb.ca.gov/ssldoors/doors_reporting/doors_login.html

CARB's regulation requires emission controls and replacements for existing diesel trucks and buses through its statewide On-Road Heavy-Duty Diesel Vehicles (In-Use) Regulation, commonly referred to as the Truck and Bus Regulation. Heavy-duty vehicles with a gross vehicle weight greater than 14,000 pounds are required to be retrofitted with diesel particulate filters based on truck model years and according to specified schedules. In addition, replacement of older heavy-duty vehicles is mandated based on a tiered schedule that began in 2015. By 2023, nearly all trucks and buses will be required to have model year 2010 engines or newer.

CARB Heavy-Duty Omnibus Regulation

CARB's Heavy-Duty Omnibus Regulation represents a comprehensive update to the California emission standards and other emission-related requirements for heavy-duty engines and vehicles. This regulation requires vehicles with a gross vehicle weight greater than 10,000 pounds to achieve more stringent NOx emission standards beginning with model year 2024 engines. The regulation also modifies the test cycle used to determine compliance with the standards to better represent real-world emissions. Finally, the regulation ensures that emission controls are sufficiently durable to control emissions over the vehicle's useful life by lengthening the criteria pollutant emissions warranty beginning with model year 2027 engines.

CARB Advanced Clean Trucks

The purpose of CARB's Advanced Clean Trucks Regulation is to accelerate the widespread adoption of zero emission vehicles (ZEVs) in the medium- and heavy-duty truck sector and reduce the amount of harmful emissions generated from on-road mobile sources. This is accomplished through a zero emission sales requirement for manufacturers of vehicles with a gross vehicle weight greater than 8,500 pounds. The sales requirement takes effect in 2024 and reaches its most stringent level in 2030. The regulation also includes a reporting requirement for large entities regarding their use of trucks and buses.

CARB Heavy-Duty Inspection and Maintenance Regulation

CARB's Heavy-Duty Inspection and Maintenance regulation ensures that emissions control systems on heavy-duty vehicles driven in California are operating as designed and are repaired in a timely manner if they malfunction. Affected vehicles are required to undergo inspections every six months beginning in 2023. Depending on vehicle capability, owners are required to submit On-Board Diagnostic data or submit results from a smoke opacity test. The opacity test would also include a visual inspection of the emissions control system to ensure the components are installed according to the manufacturer's specifications. Finally, the regulation calls for expanding a roadside emissions monitoring network and increasing field inspections.

CARB Large Spark-Ignition (LSI) Engine Fleet Requirements Regulation

CARB's LSI regulation applies to off-road LSI engine forklifts, sweepers/scrubbers, industrial tow tractors, and airport ground support equipment operated within the State of California. Additionally, it applies only to vehicles with engines of at least 25 horsepower and 1.0 liter displacement that are part of fleets of four vehicles or more. The regulation requires that applicable fleets achieve specific fleet average emission levels (FAELs) for hydrocarbons and NOx. These standards became more stringent over time until reaching the lowest regulated FAEL in 2013. The regulation also mandates reporting of applicable equipment to CARB through DOORS.

CARB Zero Emission Airport Shuttle Regulation

CARB's Zero Emission Airport Shuttle Regulation, adopted by the CARB Governing Board in June 2019, promotes the use of zero emission ground transportation to and from airports in California. The regulation requires that at least 33 percent, 66 percent, and 100 percent of airport shuttle fleets be zero emission vehicles by December 31, 2027, 2031 and 2035, respectively. It also requires fleet owners to report fleet information annually starting in 2022 and to have zero emission certificates for 2026 and later model year vehicles.

Proposed Method of Control

The measure for Commercial Airports, which is based on the airports' implementation of MOU measures, seeks to reduce emissions from non-aircraft airport sources including ground support equipment (GSE), airport shuttle buses, and heavy-duty trucks. The MOU measures establish performance targets for 2023 and 2031 for these sources. All airport MOUs include a GSE measure, with three airports also including measures for shuttle buses and/or heavy-duty trucks. In addition to the MOU measures, each airport is implementing Air Quality Improvement Plans/Measures (AQIPs/AQIM), which will lead to further reductions. The AQIPs/AQIM cover sources including construction, light-duty fleets, and passenger transportation.

The South Coast AQMD will continue working with the airports to facilitate implementation of the MOU measures to meet the targets in 2023 and 2031. The airports are required to submit progress reports on implementing their respective MOU measures by June 1st every year. The first annual progress report was submitted to the U.S. EPA on November 2, 2021. The progress was discussed at the Airport MOU Working Group, which is comprised of stakeholders from, but not limited to, the airline industry, airport authorities, local governments, and community representatives. Working group meetings will be continued to monitor the airports' progress through 2032. South Coast AQMD will encourage airports to accelerate implementation of the MOU measures ahead of 2031 so that emission reductions in 2030 can be quantified.

Emission Reductions

The measure for Commercial Airports contains an enforceable commitment to achieve 0.52 and 0.37 ton per day NOx reductions in 2023 and 2031, respectively. While there are no committed reductions in 2030 beyond the 2023 commitment, it is expected that continued implementation of the MOUs will result in further reductions. Staff will seek to quantify emission reductions in 2030.

Rule Compliance

Compliance with the MOUs will be verified in accordance with the process identified in the MOUs. The MOUs require that each airport submit detailed progress reports, emissions inventories, and calculations by June 1st each year followed by the South Coast AQMD's report to the U.S. EPA by November 1st.

Test Methods

Approved emission quantification protocols by federal, state, or local agencies will be used to track and report emission reductions for SIP purposes.

Cost Effectiveness

The cost-effectiveness of the MOUs has not been determined.

Implementing Agency

South Coast AQMD is responsible for tracking progress associated with implementation of the MOUs.

References

South Coast Air Quality Management District. Facility Based Mobile Source Measure for Commercial Airports (Adopted December 6, 2019).

MOB-05: ACCELERATED RETIREMENT OF LIGHT-DUTY AND MEDIUM-DUTY VEHICLES [PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	GASOLINE- AND DIESEL-POWERED LIGHT- AND MEDIUM-DUTY VEHICLES UP TO 8,500 LBS GROSS VEHICLE WEIGHT	
CONTROL METHODS:	INCENTIVE PROGRAM FOR VOLUNTARY EARLY RETIREMENT OF OLDER LIGHT- AND MEDIUM-DUTY VEHICLES	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	2.87	2.47
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	75.62	24.37
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	UP TO $9,500 PER VEHICLE RETIRED. THE MAXIMUM FUNIDING LIMIT WILL SOON BE INCREASED UP TO $12,000 PER VEHICLE. ADDITIONAL FUNDING UP TO $2,000 FOR ELECTRIC VEHICLE CHARGING EQUIPMENT	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

The purpose of this control measure is to implement a strategy to accelerate retirement of older gasoline- and diesel-powered vehicles with up to 8,500 lbs. gross vehicle weight rating (GVWR). These vehicles include passenger cars, sports utility vehicles, vans, and light-duty pick-up trucks.

Background

Significant strides have been made in reducing emissions from motor vehicles through California Air Resources Board (CARB)'s mobile source regulations. As a result, a "new" vehicle today is approximately 99 percent less polluting compared to a vehicle manufactured a couple of decades ago. Incentives have also played a key role in accelerating the adoption of these cleaner vehicles by consumers. However, light-and medium-duty vehicles still account for over 15 percent of the NOx emissions from all sources in the South Coast Air Basin (Basin). Accelerated and wider use of advanced technologies such as battery electric, fuel cell, and plug-in hybrid electric vehicles that are capable of zero emission transportation is essential if clean air standards are to be achieved, especially for in-use vehicles.

Regulatory History

In January 2012, CARB adopted the Advanced Clean Cars (ACC) Program, including Low-Vehicle Emission (LEV) III criteria pollutant emission standards, LEV III GHG standards, and Zero Emission Vehicle (ZEV) regulation amendments to address model years 2015 through 2025. On August 25, 2022, CARB adopted the Advanced Clean Cars II (ACC II) standards as a continuation of the ACC Program to rapidly scale down emissions from light-duty passenger cars, pickup trucks and SUVs starting with the 2026 model year through 2035. The Zero Emission Vehicle Regulation was amended to increase the ZEV production requirements for manufacturers with all new passenger cars and light-duty trucks sold in California to be 100% ZEVs by 2035. The ACC II also includes increasingly stringent standards for conventionally fueled cars and trucks to ensure continued progress in the development of cleaner engines and fuel technologies for these vehicles.

On April 12, 2023, the United States Environmental Protection Agency (U.S. EPA) announced new, more ambitious standards to further reduce harmful air pollutant emissions from light- and medium-duty vehicles beginning with model year 2027. If adopted, these new proposed standards, which serve as a continuation of U.S. EPA's final standards for federal greenhouse gas emissions standards for passenger cars and light trucks for model years 2023 through 2026, would be phased in over model years 2027 through 2032. In addition to reducing vehicle emissions of greenhouse gases and criteria pollutants, the new proposed standards would leverage advances in clean car technology and provide greater benefits ranging from improving public health to saving drivers money through reduced fuel and maintenance costs.

On September 23, 2004, the California governor signed AB 923 (Firebaugh) which resulted in a significant increase in incentive funding for programs that achieve emission reductions from vehicular sources and off-road engines. The legislation identified and emphasized that in-use higher emitting vehicles are sources that need additional scrutiny and control in part because of their large contribution to the fleet's total emissions. To address this, the South Coast AQMD implemented, under the AB 923 program, the High Emitters Repair or Scrap (HEROS) pilot program to identify and retire high emitting on-road vehicles.

Subsequently, CARB adopted the Enhanced Fleet Modernization Program (EFMP) regulation in June 2009. The regulation implements the voluntary vehicle scrap and replacement voucher provisions of AB 118 (Nunez). The EFMP augments the State's existing voluntary accelerated vehicle retirement program, referred to as the Consumer Assistance Program (CAP) which is administered by the Bureau of Automotive Repair. The focus of the EFMP is to augment existing retirement programs and provide funding through vehicle replacement vouchers to retire the highest polluting vehicles in the areas with the greatest air quality problems.

In 2014, the State Legislature passed two bills (SB 459 – Pavley and AB 1365 – De Leon) that placed an emphasis on increasing the efficacy of the EFMP and encouraged opportunities for low and moderate-income residents to purchase cleaner, more fuel-efficient combustion vehicles and advanced technology vehicles such as all-battery electric and plug-in hybrid electric vehicles. CARB amended the EFMP regulation in 2014 to reflect these legislative directives. The amended EFMP provides up to $4,500 to eligible low- and moderate-income residents for the replacement of older vehicles with newer or new vehicles. Under separate actions, CARB allocated Clean Car 4 All (CC4A, formerly EFMP Plus-Up) funding under the California Climate Investments to augment the EFMP for eligible low- and moderate-income residents living in disadvantaged communities (DAC) for the purchase or lease of cleaner, more fuel-efficient combustion vehicles and advanced technology vehicles. Eligible residents may receive additional funding assistance from the CC4A. The South Coast AQMD has been implementing the EFMP and CC4A under the Replace Your Ride Program (RYR) since July 2015 with qualified applicants receiving up to $9,500 to replace their existing cars with newer, cleaner vehicles or other clean modes of transportation (e.g., transit passes or car-sharing). The maximum funding limit will soon be increased to $12,000 for residents in Disadvantaged Communities (DAC). A new option was introduced in July of 2022 for applicants that choose an E-bike in lieu of a clean replacement vehicle. E-bike applicants receive a flat $7,500 incentive regardless of DAC status of their residence. If the E-bike costs less than $7,500, the remainder will be credited to the applicant for expenditure on public transit or car-sharing. To date, the program has incentivized over 20 E-bikes.

Since its inception, the RYR has replaced almost 10,000 vehicles, having achieved approximately 29.5 tons per year (tpy), 1.6 tpy, and 6.0 tpy of NOx, PM2.5, and VOC emission reductions, respectively.

Proposed Method of Control

This action is to accelerate replacement of older light- and medium-duty vehicles with newer, cleaner vehicles or other clean mode of transportation, including transit passes, through the Replace Your Ride Program. Qualified applicants currently receive up to $9,500 as voucher per retired vehicle. The maximum voucher amount is expected to increase up to $12,000 which includes additional incentives for residents in a DAC zip code. For plug-in hybrid and battery electric vehicles, an additional incentive of up to $2,000 is also provided for the installation of electric vehicle charging equipment under this program.

Emission Reductions

Emission reductions are not estimated at this time as it will depend on the actual number of vehicles participating in the Replace Your Ride or other incentive programs.

Cost Effectiveness

Since the EFMP guidelines are developed based on funding appropriated by the State Legislature with the desire to provide sufficient funding for low- and moderate-income residents to access newer, cleaner, and more fuel-efficient combustion vehicles and advanced technology vehicles, no cost-effectiveness threshold has been established.

Implementing Agency

South Coast AQMD is the implementing agency under the guidelines set forth by CARB for the EFMP and CC4A. Funding would be provided by CARB with South Coast AQMD administering the replacement voucher provisions of the EFMP regulation.

References

South Coast AQMD (2023). Announcements – Residents Can Soon Receive Up to $12k for Upgrading to An Electric Vehicle. June 2023. http://www.aqmd.gov/docs/default-source/news-archive/2023/ryr-june2-2023.pdf

CARB (2015). AB118 Enhanced Fleet Modernization Program Regulation. April 2015. https://ww2.arb.ca.gov/sites/default/files/2021-03/finalregulationorder2014-S2.pdf

CARB (2021). EFMP Retire and Replace Program Statistics. June 2021. https://ww2.arb.ca.gov/sites/default/files/2021-09/EFMP%20Website%20Statistics%20Tables%20Cumulative%202021_Q2%2009-21-21.pdf

MOB-06: ACCELERATED RETIREMENT OF ON-ROAD HEAVY-DUTY VEHICLES [PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	ON-ROAD HEAVY-DUTY VEHICLES (GREATER THAN 8,500 LBS GVWR)	
CONTROL METHODS:	ACCELERATED REPLACEMENT OF EXISTING HEAVY-DUTY VEHICLES WITH ZERO OR LOW NOX EMISSION VEHICLES	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	2.57	1.15
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	103.15	23.24
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

The intent of this control measure is to seek additional emissions reductions from existing heavy-duty vehicles with gross vehicle weight rating (GVWR) greater than 8,500 lbs through an accelerated vehicle replacement program with zero or low NOx emission vehicles.

Background

Emissions from heavy-duty diesel mobile sources continue to represent a significant portion of the emissions inventory in the Basin, adversely affecting regional air quality and public health. The two primary pollutants resulting from diesel fuel combustion are particulate matter (PM) and Nitrogen Oxides (NOx). Diesel PM contains over 40 known cancer-causing substances and California identified diesel PM as a toxic air contaminant based on its potential to cause cancer in 1998. In August 2021, South Coast AQMD released a report titled, "MATES V Multiple Air Toxic Exposure Study." This report, the fifth in a series of such studies beginning in 1987, concluded that around 50 percent of the cancer risk associated with breathing ambient air can be attributed to diesel PM emissions. Diesel engines also emit significant quantities of NOx, which is a precursor to ozone and secondary particulate matter formation. Additional control of diesel engine emissions is essential for the attainment of ozone and PM ambient air quality standards, as well as mitigating its toxic air quality impact.

Regulatory History

The regulation of heavy-duty diesel emission sources is the primary responsibility of California Air Resources Board (CARB) and the U.S. Environmental Protection Agency (U.S. EPA). In California, vehicles with a GVWR above 8,500 lbs and up to 14,000 lbs are classified as light heavy-duty vehicles; vehicles with GVWR between 14,001 to 33,000 lbs are classified as medium heavy-duty vehicles; and vehicles over 33,000 lbs are classified as heavy heavy-duty vehicles. US and California regulations do not require that medium heavy-duty and heavy heavy-duty diesel vehicles be chassis certified, instead engine certifications are required. Light heavy-duty vehicles may be certified using the heavy-duty engine or light-duty chassis certification procedures, depending on the application.

Emissions standards for new diesel engines powering heavy-duty vehicles were first established for the 1974 model year and have gradually increased in stringency over time. Current standards in effect are established by CARB and the U.S. EPA for 2010 and subsequent model-years, which includes a 0.2 g/bhp-hr NOx emission standard (usually called "2010 engine" standard).

In August 2020, CARB approved the Low NOx Heavy-Duty Vehicle and Engine Omnibus Regulation that sets new standards for heavy-duty on-road engines, which requires a further 90 percent reduction of NOx emissions to be phased-in over 2024-2031. The regulation also introduces a number of other requirements such as a new Low Load Cycle (LLC) and extended emission durability periods. The mandatory low NOx standards apply to diesel and Otto cycle engines with a GVWR greater than 10,000 lbs. The Omnibus standards are implemented in two main stages: (1) MY 2024-2026 at 0.05 g/bhp·hr over the Federal Test Procedure (FTP) and the Ramped Modal Cycle (RMC), and 0.20 g/bhp·hr over the Low Load Cycle (LLC); (2) MY 2027 and later at 0.02 g/bhp·hr over the FTP and the RMC test cycles, and 0.05 g/bhp·hr over the LLC test cycle. CARB has recently proposed amendments to the Omnibus Regulation, which includes higher sales limits for legacy engines (0.2 g/bhp-hr NOx) from MY 2024 through MY 2026 to allow for smoother transition to the new standards by manufacturers. Public comments are due by September 18, 2023.

In December 2008, CARB adopted the Truck and Bus Regulation which applies to a significant number of heavy-duty vehicles with the gross vehicle weight rating of 14,001 lbs and greater. The Regulation requires replacement of existing vehicles with 2010 engine standard-compliant vehicles based on a compliance schedule which starts from January 1, 2015. By January 1, 2023, all trucks and buses must have 2010 standard compliant engines with a few exceptions.

In June 2020, CARB adopted the Advanced Clean Truck (ACT) Regulation that accelerates a large-scale transition of heavy-duty vehicles from Class 2b to Class 8 (above 8,500 lbs) to zero emission technology. The regulation has two components: a manufacturer sales requirement and a reporting requirement. Manufacturers who certify Class 2b-8 chassis or complete vehicles with combustion engines would be required to sell zero emission trucks as an increasing percentage of their annual California sales starting in 2024. By 2035, zero emission truck/chassis sales would need to be 55 percent of Class 2b–3 truck sales, 75 percent of class 4–8 straight truck sales, and 40 percent of truck tractor sales. Large employers including retailers, manufacturers, brokers and others are required to report information about shipments and shuttle services. Fleet owners, with 50 or more trucks, are also required to report about their existing fleet operations.

On December 9, 2021, CARB Board approved the proposal for the Heavy-Duty Inspection and Maintenance Regulation (HD I/M). This new regulation requires owners of non-gasoline heavy-duty vehicles with gross vehicle weight ratings over 14,000 pounds to periodically demonstrate that their vehicles' emission control systems are properly functioning in order to legally operate within the state. This regulation is designed to achieve criteria emission reductions by ensuring that malfunctioning emissions control systems are timely repaired. This regulation would replace CARB's existing heavy-duty vehicle inspection programs. To enhance CARB's ability to enforce the HD I/M Regulation, CARB will deploy roadside vehicle emission monitoring and an automated license plate recognition camera network throughout California to identify potentially non-complaint vehicles. All non-gasoline heavy-duty vehicles operating in California would be required to have a valid HD I/M compliance certificate to operate legally in the state, and the HD I/M program compliance would be tied to DMV vehicle registration for in-state vehicles. The HD I/M Regulation is expected to provide the largest benefits in regions with the most heavy-duty truck traffic. Thus, it would reduce adverse health impacts and improve air quality, especially in disadvantaged communities disproportionally impacted by truck emissions.

On April 28, 2023, CARB Board has approved the Advanced Clean Fleets (ACF) regulation, with the goal of achieving a full transition to zero emission truck and bus fleets by 2045 everywhere feasible in California and significantly earlier transition for certain market segments such as last mile delivery and drayage applications. The regulation applies to owner-operators and other fleets performing drayage operations, public agencies, federal governments, and high-priority fleets that own, operate or direct vehicles with a GVWR greater than 8,500 lbs. High priority fleets include any entity with $50 million or more in gross annual revenue, or any broker or fleet owners that in combination owns, operates, or dispatches 50 or more vehicles. High priority and federal fleets will be required to either purchase only zero emission vehicles (ZEVs) beginning in 2024 or elect to use the ZEV Milestones Option, which allows fleets to meet ZEV targets as a percentage of total fleet starting in 2025 with higher ZEV fleet percentages required in subsequent milestone dates. Public fleets will be required to purchase ZEVs when they make new purchases starting in 2024 (50 percent ZEVs starting 2024, and 100 percent ZEVs starting 2027) or may elect to meet ZEV targets using the ZEV Milestone Option. As for drayage trucks, starting January 1, 2024, only zero emission drayage trucks would be eligible to be added to the CARB drayage truck registry. By 2035, all drayage trucks would be required to be zero emission. The ACF also set requirements for all new heavy-duty vehicle sales to be ZEVs starting 2040.

At the federal level, On August 5, 2021, the U.S. EPA announced the Clean Trucks Plan to reduce greenhouse gas (GHG) and criteria pollutants emissions from heavy-duty trucks through a series of rulemakings over the next three years. The first rulemaking, which was finalized on December 20, 2022, applies to heavy-duty vehicles starting in model year 2027 with new certification standards for criteria pollutants, including 0.035 g/bhp-hr NOx over the Federal Test Procedure (FTP) and Supplemental Emissions Test (SET) cycles. This rule also requires lower NOx emissions over a much wider range of testing conditions both in the laboratory and during real world operations. In addition, the final rule also includes provisions for longer useful life and significantly increased warranty periods, which will ensure continued emissions control throughout the use of vehicles. On April 12, 2023, the U.S. EPA announced proposed Phase 3 greenhouse gas standards for heavy-duty vehicles from model years 2027 through 2032, building on the Phase 2 standards. The proposed rule is projected to achieve significant reductions not only in carbon emissions but also for criteria pollutants' emissions through the increased use of zero emission vehicles.

In 2000 and 2001, South Coast AQMD adopted a series of Clean Fleet Vehicle Rules which require public fleets and certain private fleets under contract or exclusive franchise to a public agency, to purchase alternative fuel powered vehicles at the time the fleet is expanding or replacing existing vehicles in its fleet. Rules 1186.1, 1192, 1193, 1194, 1195, and 1196 affect street sweepers, transit buses, waste collection vehicles, heavy-duty vehicles operating at commercial airports, school buses and heavy-duty vehicles operated by public entities, respectively. The Clean Fleet Vehicle Rules have been successfully implemented since their adoption with a significant number of alternative fuel vehicles now in service in a majority of public fleets and certain private fleets under exclusive franchise to a public entity such as refuse collection fleets and private school bus providers.

Proposed Method of Control

The objective of this control measure is to accelerate the retirement of old heavy-duty vehicles with low NOx or zero emission vehicles. One of the options being considered is a plus-up program to leverage existing incentive programs such as Carl Moyer and Prop 1B or other grant funding opportunities by providing supplemental funding to help truck owners and fleets with the purchase of cleaner engine vehicles, including zero emission trucks. This type of program would be especially helpful for individual operators and owners (IOOs) with limited financial resources to purchase or lease zero emission trucks which are still relatively costly compared to conventional vehicles.

Emission Reductions

Emission reductions are not estimated at this time and will depend on the actual number of vehicles participating in the incentive programs.

Cost Effectiveness

The cost-effectiveness of the proposed action is not estimated at this time. Cost-effectiveness limits in the Carl Moyer Guidelines might be referenced.

Implementing Agency

South Coast AQMD

References

South Coast AQMD (2021). MATES V Multiple Air Toxic Exposure Study. http://www.aqmd.gov/home/air-quality/air-quality-studies/health-studies/mates-v

DieselNet. Heavy-Duty Onroad Engines Emission Standards. https://dieselnet.com/standards/us/hd.php

CARB. On-Road Heavy-Duty Certification Program. https://ww2.arb.ca.gov/our-work/programs/road-heavy-duty-certification-program/about

CARB (2019). Truck and Bus Regulation Compliance Requirement Overview. https://ww2.arb.ca.gov/our-work/programs/truck-bus-regulation/truck-and-bus-regulation-fact-sheets

CARB (2020). Advanced Clean Trucks Fact Sheet. https://ww2.arb.ca.gov/resources/fact-sheets/advanced-clean-trucks-fact-sheet

CARB (2020). Low NOx Heavy-Duty Omnibus Regulation Fact Sheet. https://ww2.arb.ca.gov/sites/default/files/classic/msprog/hdlownox/files/HD_NOx_Omnibus_Fact_Sheet.pdf

CARB (2021). Facts about the Proposed Heavy-Duty Inspection and Maintenance Regulation. https://ww2.arb.ca.gov/sites/default/files/2021-10/HD%20IM%20FactSheet-final.pdf

CARB (2021). Advanced Clean Fleets Fact Sheet. https://ww2.arb.ca.gov/resources/fact-sheets/advanced-clean-fleets-fact-sheet

MOB-07: ON-ROAD MOBILE SOURCE EMISSION REDUCTION CREDIT GENERATION PROGRAM

[PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	ON-ROAD HEAVY-DUTY VEHICLES (14,001 LBS AND GREATER GVWR)	
CONTROL METHODS:	ACCELERATED DEPLOYMENT OF LOW NOX AND ZERO EMISSION VEHICLES	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	2.19	0.89
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	91.52	20.20
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

This measure seeks to develop mechanisms to incentivize the early deployment of zero and low NOx emission heavy-duty trucks through the generation of mobile source emission reduction credits (MSERCs) which could be used as an alternative means of compliance with South Coast AQMD regulations, where applicable. These MSERCs will be used only by entities affected by the PM2.5 Plan control measures MOB-01 through MOB-04, EGM-01, and EGM-03; and cannot be used to offset emissions from stationary sources.

Background

MSERC generation programs have been developed and implemented by South Coast AQMD to provide an incentive for the early deployment of cleaner, advanced technologies that are not otherwise required to comply with existing air regulations. Generation of such credits have been used as an alternative means of compliance with South Coast AQMD regulations that allow for such use. South Coast AQMD continues to work with affected stakeholders on the development and update of MSERC generation rules and the U.S. EPA to define an approach that can be approved into the SIP. This proposed measure provides a forum to advance such discussions with interested stakeholders and the U.S. EPA.

Regulatory History

In September 1995, South Coast AQMD adopted Rule 1612 – Credits for Clean On-Road Vehicles, which provides a quantification protocol for entities to generate MSERCs that could be used for compliance with other South Coast AQMD rules. Rule 1612 establishes a mechanism for the quantification of emission benefits from the implementation of projects that deploy on-road vehicles meeting the optional low NOx emission standards or are not otherwise required by a regulation or other enforceable mechanism. Mobile source emission reductions associated with said projects are converted to credits that could be used by the project proponent or sold to other entities to meet other South Coast AQMD rules as allowed by those regulations. MSERCs generated pursuant to Rule 1612 have been used to comply with Rule 2202 – On-Road Motor Vehicle Mitigation Options.

In March 2001, South Coast AQMD adopted Rule 1612.1 – Mobile Source Credit Generation Pilot Program, which sets forth credit generating mechanisms for mobile sources to generate MSERCs through the voluntary replacement of specific categories of diesel-fueled heavy-duty vehicles or yard hostlers with clean technologies. Although South Coast AQMD Rule 1612 permits the use of MSERCs for compliance with other South Coast AQMD regulations, the NOx MSERCs generated under this pilot program can only be used for compliance with South Coast AQMD's RECLAIM program. Rule 1612.1, which was approved by the U.S. EPA in 2002, provides local air quality benefits to community members who live in and around areas where participating vehicles operate. These benefits include reductions in NOx, diesel particulate matter (DPM), carbon monoxide (CO), and toxic air contaminant emissions associated with the use of heavy-duty diesel engines. The resolution adopted with the 2016 AQMP included a Governing Board's directive to transition the RECLAIM program to a command-and-control regulatory structure. As part of the transition, South Coast AQMD has been developing landing rules including Rule 1109.1 to control NOx emissions from petroleum refineries and related operations. With the RECLAIM Program scheduled for a phase out by as early as 2025 for NOx and 2026 for SOx, Rule 1612.1 may be amended to expand the use of MSERCs.

Proposed Method of Control

This measure seeks to amend Rule 1612.1 and/or 1612 to provide greater flexibility, such as expanding the eligibility of vehicle types and projects as well as providing more flexibility in the application and use of MSERCs, for accelerated deployment of zero and low NOx emission heavy-duty vehicles in the Basin and Coachella Valley. The focus of the amendment will be to encourage the deployment of commercially available zero and low NOx emission heavy-duty vehicles that do not receive or cannot receive public funding assistance. MSERCs must be real, surplus, quantifiable, permanent, and enforceable as defined by the U.S. EPA. As such, any project considered for generation of emission reduction credits must go beyond regulatory requirements such as the provisions of the Truck and Bus Regulation, Advanced Clean Fleets Regulation, mandatory engine exhaust emission standards, or other relevant regulations.

The discussions of potential enforceable mechanisms will be through a public process. South Coast AQMD staff will establish a working group, hold a series of working group meetings, along with public workshops. The purpose of the public process is to allow South Coast AQMD staff to work with a variety of stakeholders, potentially affected industries, other agencies, and environmental and community groups to solicit input and comments. Through the public process, there will be discussions on the types of voluntary actions that could lead to additional emission reductions. To the extent that such actions can be quantified and are determined to be surplus (i.e., the emission reduction benefits are not the result of a regulation), the emission reductions will be recognized into the SIP.

Emission Reductions

Emission reductions are not estimated at this time and will depend on the actual number and types of vehicles participating in the program.

Cost Effectiveness

To Be Determined during rulemaking.

Implementing Agency

South Coast AQMD.

References

California Legislative Information (2017). Assembly Bill 617 – Nonvehicular air pollution: criteria air pollutants and toxic air contaminants. https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180AB617

California Air Resource Board (2020). Advanced Clean Trucks Regulation. https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2019/act2019/fro2.pdf

South Coast Air Quality Management District (2019). South Coast AQMD Rule 1612 – Clean On-Road Vehicles (Amended March 1, 2019). http://www.aqmd.gov/docs/default-source/rule-book/reg-xvi/rule-1612.pdf?sfvrsn=11

South Coast Air Quality Management District (2001). South Coast AQMD Rule 1612.1 – Mobile Source Credit Generation Pilot Program (Adopted March 16, 2001). https://www.aqmd.gov/docs/default-source/rule-book/reg-xvi/rule-1612-1.pdf?sfvrsn=4

United States Environmental Protection Agency. Menu of Control Measures. EPA (2002). Revisions to the California State Implementation Plan, South Coast Air Quality Management District. https://www.epa.gov/sips-ca/epa-approved-south-coast-air-South Coast AQMD-regulations-california-sip

South Coast Air Quality Management District (2021). RECLAIM Transition. http://www.aqmd.gov/home/rules-compliance/reclaim-transition.

MOB-08: SMALL OFF-ROAD ENGINE EQUIPMENT EXCHANGE PROGRAM [PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	SMALL OFF-ROAD ENGINES (SORE) AND LARGER DIESEL-POWERED LAWN AND GARDEN EQUIPMENT	
CONTROL METHODS:	EXCHANGE EXISTING IN-USE SORE FOR ELECTRICAL EQUIPMENT, OR NEW LOW-EMITTING ENGINES	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	0.32	0.12
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	8.27	5.88
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

The purpose of this control measure is to promote the accelerated turn-over of in-use small off-road engines and other engines, such as those used in larger diesel-powered lawn and garden equipment, through expanded voluntary exchange programs.

Background

Small off-road engines (SORE) are spark-ignition engines rated at or below 25 horsepower (19 kilowatts) that are primarily used for lawn, garden, and other outdoor power equipment including trimmers, leaf blowers, lawn mowers, lawn tractors, as well as other commercial/industrial equipment. The SORE category does not include compression ignition engines or recreational vehicles. Although a small sector of the lawn and garden equipment operates on diesel such as riding lawn mowers, stump grinders, and other commercial turf equipment, most of the candidate equipment that are eligible for exchange programs under this measure are gasoline-powered.

Over half of the 15.4 million SORE population in California (61 percent) falls in the Residential Lawn and Garden equipment category, followed by Other Equipment types such as portable generators and pressure washers (20 percent), Federally Regulated Construction and Farming (11 percent), and Commercial Lawn and Garden equipment (8 percent). Although commercial lawn and garden equipment accounts for only 8 percent of the total SORE population, it is responsible for approximately 20 percent of smog-forming emissions from SORE during the summer in CA.

Since 2003, South Coast AQMD has sponsored a lawn mower exchange program for residential lawn mowers which is now known as the Electric Lawn Mower Rebate Program. The program is designed to incentivize residential users with a rebate of up to $250 for the purchase of a new electric lawn mower when they turn in their old gas-powered lawn mowers to an approved scrapper. Since its inception, this program has replaced approximately 59,000 high polluting gasoline-powered lawn mowers with electric lawn mowers.

In addition to the Electric Lawn Mower Rebate Program, South Coast AQMD has also sponsored a commercial leaf blower buyback program which provided $200 as an incentive to buy back an old two-stroke leaf blower. The payment was then applied toward the purchase of a new four-stroke gasoline-powered unit which are less polluting than the two-stroke units. Expanding the program to include other commercial lawn and garden equipment, South Coast AQMD launched the Commercial Electric Lawn and Garden Equipment Incentive and Exchange Program (Commercial L&G Equipment Program) in 2018, which aims to accelerate the replacement of old gasoline- or diesel-powered commercial lawn and garden equipment with zero emission, battery electric technology. This program provides a point-of-sale discount of up to 75 percent off the purchase price of a variety of new electric equipment including lawn mowers (ride-on, stand-on and walk-behind mowers), handheld trimmers, chainsaws, and pruners in addition to backpack and handheld leaf blowers. In exchange, participants are required to turn in their old commercial-grade equipment to an approved dismantler for scrapping. Eligible participants include commercial gardeners and landscapers, local governments, school districts and colleges, and non-profit organizations. Since its inception in 2018, the Commercial L&G Equipment Program has funded over 7,300 commercial lawn and garden equipment replacements with zero emission alternatives.

Regulatory History

In 1990, California Air Resources Board (CARB) became the first regulatory agency to adopt exhaust emissions standards for SORE engines. In 2003, CARB developed the first set of evaporative emissions standards for this category. As a result of the CARB regulations, SORE equipment today is 40-80 percent cleaner than they were when the program began.

On September 23, 2020, California adopted Executive Order N-79-20 to require the phasing out of gasoline-powered vehicles and equipment and transition to zero emission alternatives. Specifically, the order sets a goal to transition off-road vehicles and equipment operations to 100 percent zero emission by 2035, where feasible. As a strategy to meet this goal, the CARB Board approved amendments to the SORE Regulation on December 9, 2021, requiring most newly manufactured SORE equipment to be zero emissions starting in 2024. However, these new requirements do not apply to in-use sources, which presents a need for programs and/or regulations to reduce emissions from existing SORE engines.

Proposed Method of Control

In order to increase the penetration of new low-emission and zero emission equipment, this measure seeks to expand the existing exchange programs such as Electric Lawn Mower Rebate Program and Commercial Lawn and Garden Equipment Exchange Program by increasing the number of outreach and exchange events and available funding. In addition, South Coast AQMD has recently started a new battery rebate program for commercial lawn and garden equipment that were previously funded by the Commercial Lawn and Garden Exchange Program. The battery rebate program will fund up to 75 percent of the rechargeable battery cost with a maximum limit of three batteries per equipment. South Coast AQMD will continue to seek additional funding opportunities and resources to expand the scope and types of equipment and engines that can be funded by these programs.

Emission Reductions

Emissions reductions are not estimated as they will depend on the number and types of engines/equipment participating in the existing and future programs to be developed under this measure.

Cost Effectiveness

The cost-effectiveness will also depend on the types of engines and/or equipment participating in the exchange programs.

Implementing Agency

South Coast AQMD.

References

South Coast AQMD (2021). MATES V Multiple Air Toxic Exposure Study. http://www.aqmd.gov/home/air-quality/air-quality-studies/health-studies/mates-v

DieselNet. Heavy-Duty Onroad Engines Emission Standards. https://dieselnet.com/standards/us/hd.php

CARB. On-Road Heavy-Duty Certification Program. https://ww2.arb.ca.gov/our-work/programs/road-heavy-duty-certification-program/about

CARB (2019). Truck and Bus Regulation Compliance Requirement Overview. https://ww2.arb.ca.gov/our-work/programs/truck-bus-regulation/truck-and-bus-regulation-fact-sheets

CARB (2020). Advanced Clean Trucks Fact Sheet. https://ww2.arb.ca.gov/resources/fact-sheets/advanced-clean-trucks-fact-sheet

CARB (2020). Low NOx Heavy-Duty Omnibus Regulation Fact Sheet. https://ww2.arb.ca.gov/sites/default/files/classic/msprog/hdlownox/files/HD_NOx_Omnibus_Fact_Sheet.pdf

CARB (2021). Facts about the Proposed Heavy-Duty Inspection and Maintenance Regulation. https://ww2.arb.ca.gov/sites/default/files/2021-10/HD%20IM%20FactSheet-final.pdf

CARB (2021). Advanced Clean Fleets Fact Sheet. https://ww2.arb.ca.gov/resources/fact-sheets/advanced-clean-fleets-fact-sheet

MOB-09: FURTHER EMISSION REDUCTIONS FROM PASSENGER LOCOMOTIVES

[PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	LOCOMOTIVE ENGINES (PASSENGER)	
CONTROL METHODS:	ACCELERATED REPLACEMENT OF EXISTING LOCOMOTIVE ENGINES	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	0.02	0.01
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	0.96	0.81
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

Diesel-electric locomotives generate emission of diesel PM and other pollutants, which have been shown to be harmful to human health, causing illness, and premature death. The purpose of this control measure is to promote earlier and cleaner replacement or upgrade of existing passenger locomotives with Tier 4 or cleaner locomotives.

Background

Generally, diesel-electric locomotives have a large diesel engine (main traction engine) for generating electric power, which in turn drives electric traction motors in each axle to propel the locomotive. Typically, passenger locomotives have engines with about 3,800 horsepower and these locomotives remain in commercial service for 25 to 40 years.

California's locomotive emission inventory is consisted of four categories: line-haul, switcher, short line, and passenger; with passenger contributing approximately 6 percent of the total statewide locomotive Nitrogen Oxides (NOx) emissions (CARB 2016 Technology Assessment: Freight Locomotives). Generally powered by medium speed diesel engines, passenger locomotives are designed for lighter load and higher speed compared to other categories. Unlike other categories, passenger locomotives typically have a main propulsion engine and onboard hotel power (a generator of about 600 horsepower) that provides electricity via cable for lights, air conditioning, and other comfort-related features to the connected passenger railcars.

Two passenger railroads, Metrolink and Amtrak, operate rail lines in the South Coast Air Basin (Basin) as well as the surrounding counties. Metrolink operates 62 stations across the South Coast's four-county region as well as Ventura, moving approximately 12 million passengers annually over a 538 track-mile network. Amtrak operates approximately 70 intercity trains and 100 commuter trains per day in California. Its contract commuter services include the Metrolink commuter service, which serves a five-county area in the Los Angeles Basin, with seven lines, 55 stations, and approximately 40,000 weekday passengers.

Both Amtrak and Metrolink operate commuter rail services for the Southern California Regional Rail Authority. Southern California Regional Rail Authority adopted a locomotive replacement plan for Metrolink which includes the procurement of Tier 4 locomotive engines. Specifically, the plan directed the replacement of Metrolink's fleet of Tier 0 to Tier 2 locomotive engines with Tier 4 locomotives in a 5-year span. Since 2013, the South Coast AQMD's Governing Board has awarded a total of $110.8 million through the Carl Moyer Program over multiple funding cycles to fund the replacement of Metrolink's Tier 0 & Tier 2 locomotives with Tier 4 locomotives. Metrolink took delivery of its first Tier 4 locomotives in 2016 and has since replaced a total of 40 passenger locomotives with Tier 4 engines.

Regulatory History

Under the Clean Air Act, only the U.S. Environmental Protection Agency (U.S. EPA) has authority to establish emissions standards for new locomotives. By regulation, "new" locomotives include both newly manufactured as well as remanufactured or rebuilt locomotives. In 1998, and again in 2008, the U.S. EPA promulgated regulations for the control of emissions from locomotives. The regulations require locomotives to meet increasingly more stringent emission levels (Tier 0 thru Tier 4) when they are manufactured, and in some cases, additional emissions improvements when they are remanufactured at the end of their useful life.

For newly manufactured passenger locomotives, the cleanest emission standard (Tier 4) is required beginning in 2015 with emission levels that are over 90 percent cleaner than those from unregulated locomotive engines. For passenger locomotives manufactured before 2012 (i.e., meeting Tier 0, 1 or 2 emission standards), modest emissions improvements (referred to as "plus" standards) are required at the date of remanufacture which usually occurs seven to 10 years after the new locomotive is put into service. The U.S. EPA locomotive emission standards apply to 1973 and newer locomotives upon engine rebuild and new 2002 and later locomotives.

At the state level, on April 27, 2023, the California Air Resources Board (CARB) adopted the In-Use Locomotive Regulation to further reduce criteria pollutants, toxic air contaminants, and greenhouse gas emissions from diesel-powered locomotives. Notably, under the Regulation, beginning in 2024, locomotive operators will be required to fund their own trust account (Spending Account) based on the emissions created by their locomotive operations in California; the dirtier the locomotive, the more funds must be set aside. Funds from the Spending Account must be used to purchase the cleanest locomotives or upgrade existing locomotives to the cleanest tier. Additionally, only locomotives less than 23 years old will be able to operate in California starting in 2030, and all passenger locomotives with an original engine build date of 2030 or newer will be required to operate in a ZE configuration – i.e., qualify as either a ZE locomotive or ZE capable locomotive to operate in the state.

Proposed Method of Control

Through this measure, South Coast AQMD will continue to not only promote earlier replacement or upgrade of existing passenger trains with Tier 4 locomotives, but also support the development and adoption of zero or low NOx emission technologies. Amtrak's fleet that travels in the Basin is almost exclusively Tier 0 locomotives. Metrolink currently operates 15 Tier 2 locomotives as standby units when Tier 4 locomotives are down due to maintenance and repairs. South Coast AQMD will continue to work with both railroads to upgrade Tier 0 to Tier 2 locomotives with Tier 4 and cleaner engines. Tier 4 locomotives are 65 percent to 85 percent cleaner compared to Tier 2 and Tier 0, respectively, and have higher horsepower to pull more passenger cars per locomotive.

In addition, South Coast AQMD is continuing to work collaboratively with other stakeholders to explore the feasibility of zero and low NOx emission locomotive technologies such as battery electric or fuel cell engine-driven systems. For example, South Coast AQMD has been actively participating in the development and demonstration of zero emission battery-operated switcher locomotives in CARB-funded projects in the San Pedro Bay Ports since 2018.

There are other development and demonstration projects in the Basin. The San Bernardino County Transportation Authority is currently leading the way in the development of zero emission rail technology with a plan to debut the first of its kind battery and hydrogen-powered passenger train servicing San Bernardino and Redlands. Named ZEMU (zero emission multiple unit), the locomotive will be powered by a hybrid hydrogen fuel cell/battery technology to propel the train.

Emission Reductions

Emission reductions are not estimated for this control measure as it will depend on the actual type and number of locomotives participating in the program. For reference, the replacement of Metrolink's 40 Tier 0 and Tier 2 locomotives with Tier 4 locomotives has resulted in the reductions of 495 tons per year of NOx, 33.9 tons per year of Reactive Organic Gases (ROG), and 13.8 tons per year of particulate matter (PM).

Cost Effectiveness

According to the previous estimates by Metrolink staff, replacing Tier 0 passenger locomotives with Tier 4 locomotives would cost approximately $6.2 million per locomotive, and repowering Tier 2 locomotives would cost approximately $2.4 million each. These estimates would likely increase in future projects and the cost would be even greater for zero and low NOx emission locomotives. The exact cost-effectiveness will depend on the number and types of locomotives participating in the program.

Implementing Agency

South Coast AQMD.

References

California Air Resources Board. (2016). Technology Assessment: Freight Locomotives. https://ww2.arb.ca.gov/sites/default/files/2020-06/final_rail_tech_assessment_11282016%20-%20ADA%2020200117.pdf.

California Air Resources Board. (2017). The Carl Moyer Program Guidelines – 2017 Revisions. https://ww2.arb.ca.gov/sites/default/files/classic/msprog/moyer/guidelines/2017/2017_cmpgl.pdf.

Amtrak. (2019). Amtrak Fact Sheet Fiscal Year 2019. State of California. https://www.amtrak.com/content/dam/projects/dotcom/english/public/documents/corporate/nationalfactsheets/Amtrak-Company-Profile-FY2020-041921.pdf.

Amtrak. (2020). FY 2020 Company Profile. https://www.amtrak.com/content/dam/projects/dotcom/english/public/documents/corporate/nationalfactsheets/Amtrak-Company-Profile-FY2020-041921.pdf.

San Bernardino County Transportation Authority. (2021). Zero-Emission Rail Technology. https://www.gosbcta.com/wp-content/uploads/2019/09/ZEMU-technology-fact-sheet-021921.pdf.

Metrolink. (2021). Metrolink Central Maintenance Facility Community Update: Locomotive Fleet Modernization Study Update. https://d2kbkoa27fdvtw.cloudfront.net/metrolink/270f597291c927654419dba66f2a51e40.pdf.

Metrolink. (2021). Metrolink Central Maintenance Facility Update: Virtual Community Meeting Recap. https://metrolinktrains.com/globalassets/community/cmf/cmf-monthly-update-june-2021-1.pdf.

California Air Resources Board. (2023). CARB Fact Sheet: Passenger Locomotive Operators. https://ww2.arb.ca.gov/resources/fact-sheets/carb-fact-sheet-passenger-locomotive-operators.

MOB-10: OFF-ROAD MOBILE SOURCE EMISSION REDUCTION CREDIT GENERATION [PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	OFF-ROAD DIESEL-FUELED CONSTRUCTION, INDUSTRIAL EQUIPMENT, AIRPORT GROUND SUPPORT EQUIPMENT, AND DRILLING EQUIPMENT	
CONTROL METHODS:	ACCELERATED DEPLOYMENT OF TIER 4 EQUIPMENT AND LOW NOX AND ZERO EMISSION EQUIPMENT WHERE APPLICABLE	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	1.64	0.85
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	37.28	12.90
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

This measure seeks to develop mechanisms to incentivize the early deployment of Tier 4, zero, and low NOx off-road mobile combustion equipment, where applicable, through the generation of mobile source emission reduction credits (MSERCs). These MSERCs will be used only by entities affected by the PM2.5 Plan control measures MOB-01 through MOB-04, EGM-01, and EGM-03; and cannot be used to offset emissions from stationary sources. Furthermore, these MSERCs will be discounted to provide additional emission reductions to help meet air quality standards.

Background

Based on preliminary inventories, off-road equipment (construction, industrial, etc.) targeted in this measure would collectively account for approximately 8 percent of the total basin-wide NOx emissions in

2030. These off-road equipment categories are also a significant source of diesel Particulate Matter (PM) emissions which is a toxic air contaminant with over 40 known cancer-causing substances. Accelerated deployment of Tier 4 and cleaner technologies to reduce both NOx and diesel PM emissions from off-road equipment will be critical in achieving our air quality goals and also to protect public health.

Mobile source emission reduction credit generation programs developed by South Coast AQMD provide an incentive to deploy cleaner, advanced technologies that are not otherwise required to comply with existing regulations. Generation of such credits may be considered surplus and have been used to comply with other South Coast AQMD regulations. South Coast AQMD continues to work with affected stakeholders on the development of MSERC generation rules and the U.S. Environmental Protection Agency (U.S. EPA) to define an approach that can be approved into the SIP. This proposed measure provides a forum to continue such discussions with interested stakeholders and the U.S. EPA.

Regulatory History

In September 1995, South Coast AQMD adopted Rule 1620 – Credits for Clean Off-Road Mobile Equipment, which provides a protocol for entities to generate mobile source emission reduction credits that could be used for compliance with other South Coast AQMD rules. Rule 1620 established a mechanism for the quantification of emission benefits as a result of implementation of projects that deployed cleaner off-road mobile equipment meeting the cleanest NOx emission standards (currently Tier 4) or were not otherwise required by a regulation or other enforceable mechanism. Mobile source emission reductions associated with said projects are converted to credits that could be used by the project proponent or sold to other entities to meet other South Coast AQMD rules as allowed by those regulations.

In May 1996, South Coast AQMD adopted an emission reductions credit generation rule for lawn and garden equipment. Rule 1623 – Credits for Clean Lawn and Garden Equipment – focused on projects that replaced older gasoline powered lawn and garden equipment with new zero emission models. Similar to Rule 1620, emission reduction credits generated under Rule 1623 can be used for compliance with other South Coast AQMD rules if allowed by those rules.

Proposed Method of Control

This measure seeks to amend Rule 1620 to provide greater flexibility for entities to initiate projects to accelerate the deployment of zero and low NOx emission off-road mobile equipment in the South Coast Air Basin (Basin) and Coachella Valley. The focus of the amendment will be to encourage the deployment of commercially available zero and low NOx emission off-road mobile equipment that do not receive or cannot receive public funding assistance. Mobile source emission reduction credits must be real, surplus, quantifiable, permanent, and enforceable as defined by the U.S. EPA. As such, any project considered for generation of emission reduction credits must go beyond regulatory requirements.

For the purposes of this measure, a low NOx emission engine is one that is certified to be at least 90 percent cleaner than the current Tier 4 off-road emission standard (for the horsepower specification of the off-road engine), or meets the lowest optional NOx emission standard (for on-road heavy-duty engines if the on-road engine is used in an off-road application). If Tier 5 standard is adopted in the future, low NOx would be based 90 percent cleaner than the Tier 5 standard. Zero emission mobile equipment include, but are not limited to, commercially available battery-electric or fuel cell powered equipment.

The discussions of potential enforceable mechanisms will be through a public process. Through this process, South Coast AQMD staff will establish a working group, hold a series of working group meetings, along with public workshops. The purpose of the public process is to allow South Coast AQMD staff to work with a variety of stakeholders, potentially affected industries, other agencies, and environmental and community groups to solicit input and comments. It is envisioned that through the public process, there will be discussions on the types of voluntary actions that could lead to additional emission reductions. To the extent that such actions can be quantified and are determined to be surplus (i.e., the emission reduction benefits are not the result of a regulation), the emission reductions will be recognized into the SIP.

Emission Reductions

Emission reductions are not estimated at this time and will depend on the actual type and number of off-road vehicles/equipment participating in the program.

Cost Effectiveness

To be determined during rulemaking.

Implementing Agency

South Coast AQMD.

References

California Air Resources Board. (2021). Zero-Emission Off-Road Strategies. https://ww2.arb.ca.gov/sites/default/files/2020-11/ZEV_EO_Off-Road_Fact_Sheet_111820.pdf.

South Coast AQMD. (2019). Rule 1620 – Credits for Clean Off-Road Mobile Equipment (Amended March 1, 2019). http://www.aqmd.gov/docs/default-source/rule-book/reg-xvi/rule-1620.pdf.

South Coast AQMD. (2019). Rule 1623 – Credits for Clean Lawn and Garden Equipment (Amended March 1, 2019). http://www.aqmd.gov/docs/default-source/rule-book/reg-xvi/rule-1623.pdf

California Air Resources Board. (2023). Off-Road Diesel Regulation. https://ww2.arb.ca.gov/our-work/programs/truckstop-resources/road-zone/road-diesel-regulation.

MOB-11: EMISSION REDUCTIONS FROM INCENTIVE PROGRAMS [PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	ON-ROAD AND OFF-ROAD MOBILE SOURCE VEHICLES AND EQUIPMENT	
CONTROL METHODS:	IMPLEMENTATION OF INCENTIVE PROGRAMS	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	5.80	3.06
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	189.10	76.97
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

This control measure seeks to apply the administrative mechanism, as initially proposed in the 2016 Air Quality Management Plan (AQMP), to quantify and take credit for the emissions reductions achieved through the implementation of incentive programs administered by South Coast AQMD for State Implementation Plan (SIP) purposes. The incentive program-funded source category includes, but is not limited to, all on-road vehicles with a Gross Vehicle Weight Rating (GVWR) over 8,500 lbs (excluding motor homes), commercial harbor craft, locomotives, and off-road equipment from the sectors of port operations, rail operations, agricultural, industrial, construction, airport ground support, and oil drilling.

Background

South Coast AQMD has a long history of successful implementation of incentive programs that help fund the accelerated deployment of cleaner engines and aftertreatment technologies in on-road heavy-duty vehicles and off-road mobile equipment which results in early and surplus emissions reductions. Such accelerated deployment also provides a signal for technology providers, engine and automobile manufacturers, and academic researchers to develop and commercialize the cleanest combustion engines and further the efforts to commercialize zero emission technologies into a wider market. Some of the major incentive programs that are administered by South Coast AQMD are discussed below.

Carl Moyer Memorial Air Quality Standards Attainment Program

The Carl Moyer Memorial Air Quality Standards Attainment Program (Moyer Program) is a grant program that funds the incremental cost of cleaner-than-required engines, equipment, and other sources of air pollution. The Moyer Program was placed into State law in 1998 and the first set of Moyer Program Guidelines was adopted by California Air Resources Board (CARB) in 1999. The California Legislature has since periodically modified the Moyer Program to address evolving needs and to reflect advancing technologies as well as regulatory changes. For example, in 2004, Assembly Bill (AB) 923 and Senate Bill (SB) 1107 provided increased and continued funding while significantly expanding the Moyer Program to include light-duty vehicles and agricultural sources. Projects with Volatile Organic Compounds (VOCs) and Particulate Matter (PM) reductions were also included in 2004. This change allowed the Program to more comprehensively address air pollution challenges, including the air toxic risks from diesel engines. In 2013, AB 8 further extended funding from the AB 923 tire fees through 2023 and reauthorized the Moyer Program. Most recently, SB 513 has provided new opportunities for the Moyer Program to advance zero and low NOx emission technologies by substantially increasing cost-effectiveness limits and also including infrastructure projects for funding. It also allowed Moyer Program to leverage co-funding from other incentive programs without penalizing cost-effectiveness.

The Moyer Program helps to fund a variety of vehicles and equipment. Typical project types include replacement of old vehicles and equipment, engine repowers, and installation of retrofit devices. The Program also provides funding for installation of fueling/charging infrastructure for funded sources. Emission reduction technologies must be certified or verified by CARB and projects selected for funding must meet cost-effectiveness limits and achieve at least 15 percent reduction in NOx. In addition, projects reducing PM and/or VOC emissions are also eligible for funding provided they are cost-effective. For SIP purposes, emissions reductions funded through the Moyer Program must be permanent, surplus, quantifiable and enforceable.

The Moyer Program has been successful in reducing smog-forming and toxic emissions cost-effectively by providing incentives to obtain early or extra emissions reductions, especially from emission sources in minority and low-income communities and areas disproportionately impacted by air pollution. Since 1998, South Coast AQMD has awarded $570 million through the Moyer Program and has funded close to 8,700 vehicles and equipment with approximately 9,500 tons per year of accumulated NOx and 270 tons per year of accumulated PM reductions.

Proposition 1B: Goods Movement Emission Reduction Program

In 2006, California voters approved a bond measure called Proposition 1B. Proposition 1B authorized the Legislature to appropriate $1 billion in bond funding to the CARB to quickly reduce air pollution emissions and health risks from freight movement along California's priority trade corridors. The State Fiscal Year (FY) 2007-08 budget included implementing legislation, via SB 88, that created the Goods Movement Emission Reduction Program. AB 201 included a minor clarification. These bills are codified in the Health and Safety Code, sections 39625 et seq. SB 88 required CARB to adopt guidelines to ensure the Program achieve the statutory objectives.

The implementing statutes directed CARB to maximize the emission reduction benefits and achieve the earliest possible health risk reduction in communities heavily impacted by goods movement. This program supplements regulatory actions and other incentives to cut diesel emissions. By statute, the program can only fund emissions reductions "not otherwise required by law or regulation." Key pollutants targeted by the program include diesel PM and NOx that contribute to the formation of both PM2.5 and ozone. The projects funded under the program also provide co-benefits by reducing greenhouse gases and black carbon emissions that contribute to climate change.

Since 2009, South Coast AQMD has awarded $494 million through Proposition 1B and funded over 7,500 projects including heavy-duty vehicles and equipment in the sectors of shore power, locomotives, cargo handling, and transport refrigeration units (TRUs), with approximately 7,650 tons per year of accumulated NOx and 230 tons per year of accumulated PM reductions.

Lower-Emission School Bus Program

The Lower Emission School Bus Program is a grant program that provides funding for replacing old, high-emitting public school buses with new cleaner buses, and also for installing retrofit control devices on in-use diesel buses to reduce toxic PM emissions. The primary goal of the Lower Emission School Bus Program is to reduce school children's exposure to both cancer-causing and smog-forming pollution. The program does not impose any regulatory requirements on schools and their participation in the program is voluntary.

Since 2001, South Coast AQMD has awarded $372 million in total through the program and replaced/retrofitted over 5,300 school buses with approximately 890 tons per year of accumulated NOx and 65 tons per year of accumulated PM reductions achieved.

Community Air Protection Program

In 2017, Governor Brown signed AB 617 (C. Garcia, Chapter 136, Statutes of 2017) to develop a new "community-focused" strategy to reduce emissions of criteria pollutants and toxic air contaminants (TAC) in communities that are affected by a high cumulative exposure burden. AB 617 directed CARB, in conjunction with local air districts to establish the Community Air Protection Program (CAPP). AB 617 also calls for CARB and air districts to actively engage with members of heavily impacted communities, follow their guidance, and address local sources of concern. AB 617 includes a variety of strategies to address air quality issues in impacted communities, including community-level monitoring, uniform emission reporting across the State, stronger regulation of pollution sources, and incentives for both mobile and stationary sources.

To support the AB 617 effort, the California Legislature has appropriated incentive funding to support early actions to address localized air pollution in the most impacted communities. Budget bills passed in 2017, 2018, 2019 and 2020 have provided funds, “to support local air districts’ implementation of Chapter 136 of the Statutes of 2017” [AB 134 (2017), SB 856 (2018), AB 74 (2019), SB 74 (2020)]. The funding has enabled actions such as: establishing steering committees, developing and implementing emission reduction programs including staffing, outreach, strategies, and enforcement, as well as deploying air monitoring, reporting emissions, and implementing new requirements regarding best available retrofit control technologies.

The Legislature directed that air districts spend the funds appropriated in AB 134 on mobile source projects pursuant to the Carl Moyer Program and the Proposition 1B Program. The Legislature expanded the scope of the CAPP incentives appropriated in SB 856 to include additional project types. The project types called for in SB 856 include:

- Mobile source projects. Eligibility continues through either the Moyer Program or the Proposition 1B Program, with a focus on zero emission equipment;
- Zero emission charging infrastructure projects. Eligibility continues with a focus on medium- and heavy-duty vehicle infrastructure;
- Stationary source projects. New eligibility for the replacement of equipment at locations of stationary sources of air pollution not subject to the Cap-and-Trade Program, which will result in direct reductions of TACs or criteria air pollutants; and
- Community-identified projects. New eligibility for programs developed by an air district consistent with the actions identified in the applicable Community Emissions Reduction Program pursuant to AB 617, provided there is community input through a public process.

The CAPP program is now underway and South Coast AQMD staff are working in local communities to reduce air pollution in these most impacted communities. Since the inception of the program, the South Coast AQMD has awarded $219 million in total on mobile source projects through the Moyer Program and also allocated $48 million for stationary and/or community-identified projects.

Other incentive programs administered by the South Coast AQMD are discussed below.

Air Quality Improvement Program (AQIP) funds clean vehicle and equipment projects, research of biofuels production and air quality impacts of alternative fuels, and workforce training, etc. Each year, the Legislature appropriates funding to CARB for these incentives to reduce emissions and support advanced technology demonstrations and deployments.

On-Road Voucher Incentive Program (VIP) provides vouchers for truck replacements. The voucher amount ranges from $10,000 to $60,000 depending on factors such as miles traveled per year, weight class of the old vehicle, emission standards of the replacement vehicle, and whether the replacement vehicle is new or used. Funding also depends on the future compliance date to replace or retrofit the vehicle. The VIP program is funded with the Carl Moyer funds at local air district discretion. This program is limited to owners/operators with fleets of 10 or fewer vehicles that have been operating at least 75 percent (mileage-based) in California during the previous twenty-four (24) months.

Funding Agricultural Replacement Measures for Emission Reductions Program (FARMER) provides funding for agricultural harvesting equipment, heavy-duty trucks, agricultural pump engines, tractors, and other equipment used in agricultural operations. The FARMER Program is supported in part by California Climate Investments, a statewide program that puts billions of Cap-and-Trade dollars to work. This program prioritizes funding to disadvantaged communities.

Proposed Method of Control

The proposed measure is based on the implementation of incentive programs administered by South Coast AQMD. The measure proposes to take credit for the emissions reductions achieved through existing and future projects that are funded by these incentive programs for SIP purposes. Examples of projects include heavy-duty vehicle/equipment replacements, installation of retrofit units, and engine repowers. The emissions reductions are provided in two parts. The first part of the measure is to calculate the actual emissions reductions associated with existing projects that were funded by 2021 with the remaining project life through 2030. The second part of this measure is based on potential reductions that are projected from the implementation of future projects to be funded through these incentive programs. These reductions are estimated based on the projected level of funding for the programs and average emissions reductions achieved by past projects, discounted by control factors for future years. For on-road vehicle sectors (HD trucks and school buses), the Calculator for Spending Incentives (CSI), which is an internally developed model to identify at a screening level the most cost-effective projects, is used to calculate NOx and PM emission reductions.

Emission Reductions

To be determined.

~~Emissions reductions from existing projects with remaining project life and future projects are reflected in the control measure summary tables below. Emissions reductions in 2030 associated with existing projects that were funded as of 2021 are provided in Table MOB-11-A. Projected emissions reductions from the future projects in 2030 are listed in Table MOB-11-B.~~

~~TABLE MOB-11-A~~

~~NOX AND PM EMISSION REDUCTIONS IN 2030 ASSOCIATED WITH EXISTING PROJECTS~~

~~Project Sector~~	~~Project Type~~	~~Funding Source*~~	~~No. of Units~~	~~NOx (tons/day)~~	~~PM (tons/day)~~
~~Marine~~	~~Repower~~	~~CM~~	~~135~~	~~0.22~~	~~0.004~~
~~Locomotives~~	~~Replacement~~	~~CM~~	~~15~~	~~0.15~~	~~0.008~~
~~TOTAL~~			~~150~~	~~0.37~~	~~0.012~~

~~TABLE MOB-11-B~~

~~PROJECTED NOX AND PM EMISSION REDUCTIONS IN 2030 ASSOCIATED WITH FUTURE FUNDING~~

~~Project Sector~~	~~Project Type~~	~~Funding Source*~~	~~No. of Units~~	~~NOx (tons/day)~~	~~PM (tons/day)~~
~~On-Road HD Trucks~~	~~Replacement~~	~~CM, Prop1B, CAPP, VIP, AQIP~~	~~4,728~~	~~0.88~~	~~0.008~~
~~School Buses~~	~~Replacement~~	~~LESBP~~	~~855~~	~~0.25~~	~~0.003~~
~~Agriculture~~	~~Replacement~~	~~FARMER, CAPP~~	~~100~~	~~0.08~~	~~0.015~~
~~Construction~~	~~Repower~~	~~CM, CAPP, AQIP~~	~~676~~	~~1.92~~	~~0.065~~
~~Construction~~	~~Replacement~~	~~CM, CAPP, AQIP~~	~~362~~	~~0.99~~	~~0.025~~
~~Other Off-Road~~	~~Replacement~~	~~CAPP~~	~~426~~	~~0.78~~	~~0.016~~
~~Marine~~	~~Repower~~	~~CM, CAPP, AQIP~~	~~428~~	~~1.32~~	~~0.045~~
~~TRU~~	~~Replacement~~	~~CM, CAPP, AQIP~~	~~222~~	~~0.03~~	~~0.000~~
~~Locomotives~~	~~Replacement~~	~~CM, CAPP, AQIP~~	~~37~~	~~0.40~~	~~0.024~~
~~TOTAL~~			~~7,834~~	~~6.66~~	~~0.201~~

~~*CM: Carl Moyer Program; CAPP: Community Air Protection Program; VP: Voucher Incentive Program; AQIP: Air Quality Improvement Program; LESBP: Lower-Emission School Bus Program; FARMER: Funding Agricultural Replacement Measures for Emission Reductions Program~~

Cost Effectiveness

~~The cost-effectiveness will vary depending on the programs that are used to fund individual projects. Generally, the cost-effectiveness limits will be mainly based on the latest Carl Moyer Program Guidelines, which is currently set at $33,000 per weighted ton (NOx + ROG + 20 x PM) for conventional technology projects. The limit increases to $109,000 per weighted ton for optional advanced technology, and $300,000 per weighted ton for school buses. For on-road projects, higher limits could be applied at the discretion of air districts: up to $200,000 per weighted ton for on-road optional advanced technology (0.02 g/bhp-hr of NOx or cleaner), and up to $500,000 per weighted ton for on-road optional zero emission technology.~~ To be determined.

Implementing Agency

South Coast AQMD.

References

CARB. Carl Moyer Memorial Air Quality Standards Attainment Program. https://ww2.arb.ca.gov/our-work/programs/carl-moyer-memorial-air-quality-standards-attainment-program/about

CARB. (2017). Carl Moyer Program Guidelines, 2017 Revisions. April 2017. https://ww2.arb.ca.gov/sites/default/files/classic/msprog/moyer/guidelines/2017/2017_cmpgl.pdf

CARB. (2021). Proposed Amendments to the Carl Moyer Memorial Air Quality Standards Attainment Program 2017 Guidelines. November 2021. https://ww2.arb.ca.gov/resources/documents/proposed-updates-carl-moyer-memorial-air-quality-standards-attainment-program

CARB. Proposition 1B: Goods Movement Emission Reduction Program. https://ww2.arb.ca.gov/our-work/programs/proposition-1b-goods-movement-emission-reduction-program

CARB. (2015). Proposition 1B: Goods Movement Emission Reduction Program – Final 2015 Guidelines for Implementation. June 2015. https://ww2.arb.ca.gov/sites/default/files/2020-07/Final%20Prop.%201B%20June%202015%20Guidelines%20ADA%20Version%202020.pdf

CARB. (2020). Community Air Protection Incentives 2019 Guidelines. Revised October 14, 2020. https://ww2.arb.ca.gov/resources/documents/community-air-protection-incentives-guidelines

CARB. Community Air Protection Program. https://ww2.arb.ca.gov/capp/about

CARB. (2017). On-Road Voucher Incentive Program Fact Sheet. https://www.arb.ca.gov/msprog/moyer/voucher/vip_factsheet_onroad_7_13_17.pdf?_ga=2.144358834.643713679.1636434848-833871300.1622306158

CARB. Low Carbon Transportation Investments and Air Quality Improvement Program. https://ww2.arb.ca.gov/our-work/programs/low-carbon-transportation-investments-and-air-quality-improvement-program/about

CARB. Lower-Emission School Bus Program. https://ww2.arb.ca.gov/our-work/programs/lower-emission-school-bus-program/about

CARB. FARMER Program. https://ww2.arb.ca.gov/our-work/programs/farmer-program/about

South Coast AQMD. (2021). FARMER Program. https://www.aqmd.gov/docs/default-source/aqmd-forms/moyer/farmer_pps.pdf

MOB-12: PACIFIC RIM INITIATIVE FOR MARITIME EMISSION REDUCTIONS [PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	OCEAN-GOING VESSELS	
CONTROL METHODS:	COORDINATED PROGRAMS, E.G., PER-PORT-CALL INCENTIVES, AMONG PARTICIPATING PORT REGIONS ACROSS THE PACIFIC RIM TO ENCOURAGE DEPLOYMENT OF CLEANER SHIPS TO THE TRANSPACIFIC TRADE LANE	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	0.63	0.71
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	32.21	32.57
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD AND OTHER DOMESTIC AND INTERNATIONAL PARTNERING AUTHORITIES	

Description of Source Category

An ocean-going vessel (OGV) is a commercial, government, or military vessel, excluding articulated tug barges, meeting any of the following criteria: (1) a vessel greater than or equal to 400 feet in length overall; (2) a vessel greater than or equal to 10,000 gross tons under the convention measurement (international system); or (c) a vessel propelled by a marine compression ignition engine with a per-cylinder displacement of greater than or equal to 30 liters, i.e., Category 3 marine diesel engines. (See California Code of Regulations Section 93130.2.(b)(50).)

Background

The Port of Long Beach and the Port of Los Angeles (jointly referred to as "Ports") are co-located at the San Pedro Bay, within the South Coast Air Basin. They are the two largest commercial marine ports in North America in terms of cargo container throughput. When combined, the twin ports would rank among the ten largest container ports in the world. In recent years, OGVs of various types make between 3,700-4,000 port calls each year to the San Pedro Bay Ports Complex, with container ships accounting for slightly over half of these calls (1,900-2,200 annual calls), followed by tanker ships (500-700 annual calls). Correspondingly, based on the most recent emissions inventory reports published by the Ports for calendar year 2021 activities, container ships accounted for 64 percent of total OGV emissions that are directly related to port operations, with 21 percent for tankers, and 16 percent for the remaining vessels.

Shipping emissions have been a major concern for the residents in the port adjacent communities and the surrounding regions, particularly from vessel maneuvering, berthing, and anchoring in and around the harbor area. Additionally, when ships transit to and from the ports, much of the associated emissions occur along the coast and impact the air quality in downwind areas. Since 2014, California Air Resource Board (CARB)'s OGV At Berth Regulation has significantly reduced Nitrogen Oxides (NOx) and other pollutant emissions from auxiliary engines of container, passenger, and refrigerated cargo vessels. Further emission reductions are expected as the amended At Berth Regulation extends to more vessel types and further increases rule stringency. In the meantime, nearshore vessel speed reduction (VSR) programs have proven to be highly effective in reducing vessel fuel consumption, and correspondingly air pollutant emissions. In 2005, the Ports began incentivizing voluntary VSR by all OGVs down to 12 knots, initially within 20 nautical miles (nm) from Point Fermin and later expanded to 40 nm. In recent years, the Protecting Blue Whales and Blue Skies (BWBS) program also began incentivizing VSR by container ships and auto carriers down to 10 knots, which greatly supplements the annual voluntary VSR request issued jointly by the United States Coast Guard and the National Oceanic and Atmospheric Administration for large swaths of Southern California waters.[50]

According to the CARB's projections developed for the 2022 SIP, without additional control programs and regulations, transit emissions allocated to the South Coast Air Basin were expected to increase by more than 35 percent from 2018 to 2031, and most of the projected increase would come from the combustion of marine fuel in the vessel's main (propulsion) engine. Despite the success of abovementioned regulations and programs, NOx emissions from OGVs today and in the future are expected to make up about 40 percent of the entire air basin's carrying capacity for the 2015 ozone standard of 70 ppb. In addition to ozone, reducing NOx emissions from OGVs will also provide co-benefit of reducing secondary formation of PM2.5.

A major factor is the slow turnover of the OGV fleet to cleaner engine tiers, due to long OGV service life ranging from at least 20 years for vessels serving transoceanic routes to 40 years for vessels serving regional and other shorter routes. As a result, even though the International Maritime Organization

[50] See https://www.ourair.org/wp-content/uploads/2021-Attachment-A-VSR-Zone-Maps.pdf, which shows the BWBS program area in Southern California and is overlaid with the 40-nm radius of the Ports VSR program area.

(IMO)'s cleanest Tier III NOx engine standards are applicable to OGVs with keels laid in 2016 or later when operating in the North American Emission Control Area (ECA)—which encompasses the entire California OGV emissions inventory domain, only 3.5 percent of all port visits at the San Pedro Bay Complex were made by Tier III vessels in 2021. In the same year, 35 percent of port calls were made by Tier II vessels, indicating the majority (more than 60 percent) of port calls were made by Tier I or unregulated vessels. Compared to the older engine tiers, Tier III standards are on average 75 percent cleaner than Tier II and 80 percent cleaner than Tier I when measured by the average NOx emission rates weighted by engine certification load points.[51]

Among the 1,900-2,200 annual calls by container ships at the San Pedro Bay Ports, an estimated two-thirds to three-quarters of these port calls were made by vessels serving the transpacific trade lane. This is not surprising given that the Ports of Long Beach and Los Angeles are the largest U.S. gateway for imports originating from Asia, accounting for about 50 percent of containerized import value from East and Southeast Asia according to international trade data published by the U.S. Department of Commerce.[52] Figure MOB-12-A below plots the tier and age distributions of all vessels that were deployed to the transpacific routes between the Ports and at least one major Asian Pacific port between 2016 and 2019.[53] Consistent with the Ports' emissions inventory reports, it shows: 1) the majority of these vessels are subject to IMO Tier I emission limits or unregulated; 2) the unregulated vessels are slowly being replaced by Tier II vessels; and 3) many newly build ships were constructed on keels laid before 2016, thereby not subject to Tier III standards. In fact, the spikes in keels built (left panel of Figure MOB-12-1) are largely driven by the effective date of each IMO marine engine standard, whereas vessel ages (right panel of Figure MOB-12-1) show a smoother distribution reflecting a steadier trend of natural turnover coupled with market demand.

[51] NOx emissions vary by engine load, and the engine certification test cycles for OGV propulsion engine rely on a weighted average of NOx emission rates at various engine loads: 100 percent (weighting factor: 0.15), 75 percent (weighting factor: 0.15), 50 percent (weighting factor: 0.5), and 25 percent (weighting factor: 0.2). However, a typical container ship calling the San Pedro Bay Ports are estimated to operate at about 10 percent (off-cycle) propulsion engine load if slowing down to 10 knots. NOx emissions at such very low loads are expected to be much higher per unit of energy consumed (measured in g/kWh); meantime, due to less energy consumed when operating at slow speeds, it is generally expected that the increase in NOx emission rates would be more than offset by fuel/energy consumption.

[52] Data accessible at: https://usatrade.census.gov.

[53] Asian Pacific ports included in the analysis are Busan, Cai Mep-Vung Tau, Dalian-Yingkou, Fuzhou, Guangzhou (Nansha) , Haiphong, Hong Kong, Incheon, Kaohsiung, Keelung, Kobe-Osaka, Laem Chabang, Lianyungang, Nagoya-Yokkaichi, Naha, Ningbo-Zhoushan, Port Klang, Qingdao, Shanghai (including Yangshan), Shenzhen (including Chiwan, Dachan Bay, Mawan, Shekou and Yantian) , Shimizu, Singapore, Taipei, Tianjin, Tokyo-Yokohama-Kawasaki, Xiamen-Zhangzhou, and Yosu.

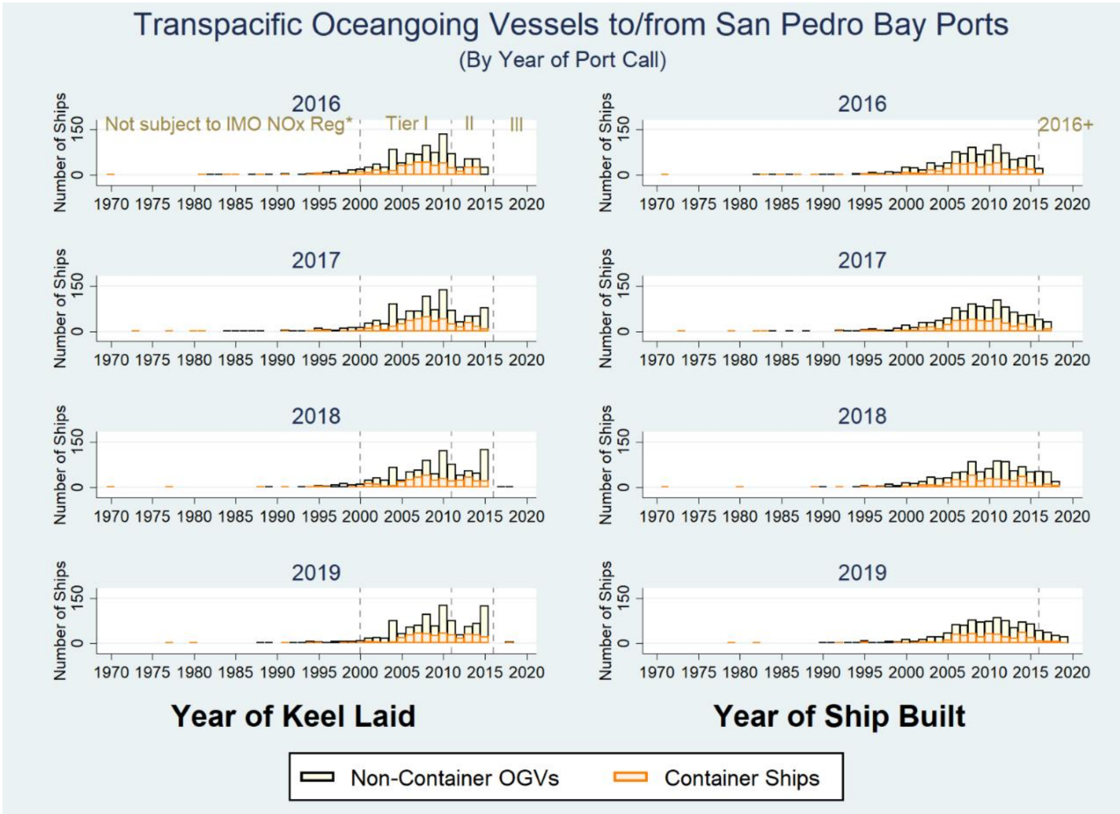

FIGURE MOB-12-A
TRANSPACIFIC OGVS CALLING SAN PEDRO BAY PORTS

In order to achieve emission reductions to attain health-protective federal and state air quality standards as expeditiously as possible, it is necessary to accelerate the deployment of newer vessels meeting IMO Tier III emission limits. But with the long service life of OGVs, a concurrent focus must be placed on retrofitting Tiers I and II OGVs to the extent practicable. However, given the lack of any in-use NOx emission requirements (which typically fall under federal/international authority) and the high project cost and complexity in retrofitting OGVs with the most common Tier III technologies including exhaust gas recirculation (EGR) and selective catalytic reduction (SCR),[54] the most feasible pathway would be to incentivize NOx retrofit with significantly more cost-effective technologies. One potential candidate would be water-in-fuel emulsion (WiF), which has more than a decade of research and development (R&D) history but has remained in the stage of technology demonstration due to the lack of regulation-driven market demand. While WiF cannot achieve Tier III standards, it may result in up to 40 percent NOx reductions for nearshore operations, or when main engine is operated at less than 50 percent loads. In

[54] Any un-reacted ammonia emissions, or ammonia slip, from urea injection into the exhaust gas as part of NOx control in SCR systems can contribute to secondary formation of PM, therefore potentially offsetting at least part of the PM benefits from NOx reductions. However, staff is not aware of publicly available emission testing results indicating whether, or to what extent, ammonia slip could be an issue for marine engine SCR systems

comparison, the effectiveness of Tier III technologies, especially SCR, are expected to exponentially decrease when engine loads become too low to maintain the required exhaust gas temperature for SCR to function properly. Additionally, there are exhaust filtration technologies being developed and tested for primary PM control of marine engine exhaust gas.

At the same time, any effort to reduce marine engine emissions at California ports could potentially benefit the port and coastal communities located on the other side of the Pacific as well. Based on staff's compilation of multiple reports and studies using data between 2013 and 2018, shipping accounted for significant shares of emissions in many major port cities in Asia. In Hong Kong and the entire country of Japan, where land-based sources have been subjected to increasingly stringent emissions and energy efficiency requirements, shipping accounted for 41-49 percent of primary PM2.5 emissions alone, not counting secondarily formed particulates, and 37 percent of their NOx emissions are also attributable to both domestic and international shipping. In Shanghai, Shenzhen, Qingdao, Tianjin, and Kaohsiung, shipping was also found to account for 9-24 percent of citywide NOx emissions. Similar to Southern California, shipping's share of NOx emissions is expected to increase further across our trading partners in East and Southeast Asia, due to limited scope and applicability of domestic programs and regulations in reducing OGV NOx emissions when compared to emission reduction efforts for land-based sources, particularly power plants and freight moving trucks.

Figure MOB-12-2 shows that container ships accounted for approximately three-quarters of all OGV port calls made in 2016-2019 across the San Pedro Bay Ports, the San Francisco Bay Ports, and all large-scale East and Southeast Asian ports. In contrast, this fleet of container ships made up just over one-third of all OGVs deployed to this trade lane during the same period. Furthermore, container ships constituted nearly all of the "transpacific frequent callers," defined for analytical purposes as those OGVs making a combination of 5 or more calls at the San Pedro Bay ports in a given year and also 5 or more calls in the same year at one or more ports on the other side of the Pacific Rim. On average, a frequent caller container ship made about 50 calls per year across the Pacific Rim ports. In contrast, a non-container OGV made only an average of 7 port calls per year in the same trade lane. In 2019, out of the approximately 120 frequently calling container ships deployed to the transpacific trade lane, more than half of them had visited major Asian ports including the ports of Busan, Shanghai, Ningbo-Zhoushan, Shenzhen, and Hong Kong, and more than a third of them had also called the ports of Tokyo Bay Ports (Keihin Port) and Kaohsiung. This port call pattern implies that many of the Pacific Rim port regions, including Southern California, share the common interest in investing in greener containerized goods movement.

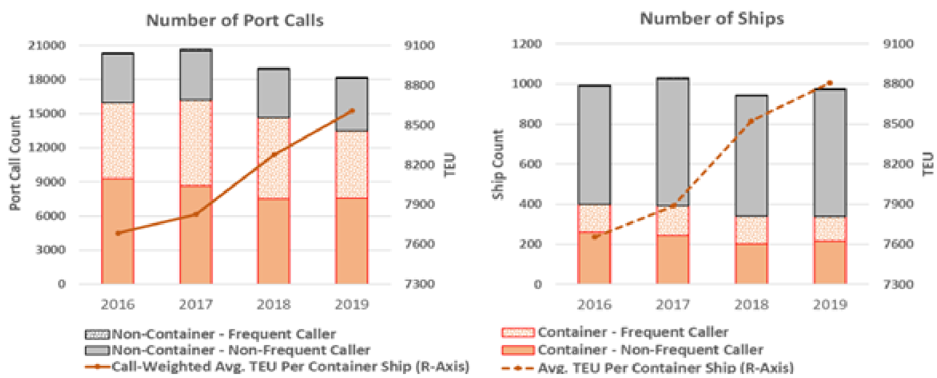

FIGURE MOB-12-2

PORT CALL PATTERN OF TRANSPACIFIC OGVS

With the common need and shared opportunity to reduce shipping emissions and to protect the health of port community residents across the Pacific, this control measure proposes to establish partnerships with other Pacific Rim ports and port regions in developing and implementing the Pacific Rim Initiative for Maritime Emission Reductions (PRIMER). PRIMER is envisioned as a multi-regional framework where all partnering regions can coordinate individual incentives and program requirements in order to maximize the effectiveness of all programs. There are several potential advantages of PRIMER:

Targeted approach. PRIMER partners will be encouraged to continue their existing or adopt new non-regulatory mechanisms to facilitate voluntary adoption of cleaner marine technologies by OGV owners and operators. The mechanism can be either monetary or non-monetary incentives that will be awarded based on each port visit, and the program participating requirements will be coordinated to the maximal extent feasible to ensure a participating OGV can take full advantage of the incentive offered by any PRIMER partner. Such per-port-call incentive will be most attractive to the OGVs frequently calling the partnering Pacific Rim ports, with minimal impact on the other OGVs whose owners/operators do not find a business case in undertaking the clean technology investment to qualify for the incentives.

Suitable for both new and in-service OGVs. Unlike the engine emission standards that are generally applicable to newbuilds only, the non-regulatory incentives can encourage retrofit investments among the in-service OGVs deployed to the transpacific shipping routes while also motivating the deployment of cleaner new OGVs to these routes.

Cost-effective for incentive providers. Investing in cleaner marine technology is no small feat, especially for the vessel-based emission abatement technologies. The required upfront capital investment tends to be very high while the payback period sought by the industry is short. The short payback period is further complicated by the industry's need to maintain enough flexibility in vessel deployment, which is the case for both liner and tramp services alike. By coordinating clean shipping incentives with other Pacific Rim ports on a targeted group of frequently calling OGVs, each PRIMER partner will be able to reduce the level of incentive needed by each individual port to effectively attract visits by cleaner OGVs, and the collective efforts will also shorten the payback period for the ship owner/operator who has made the technology investment.

Minimized free riding. Most emission abatement technologies, specifically for NOx reductions, are auxiliary devices that can be switched on and off. While this means that reporting requirements by participating OGV operators will be necessary for the PRIMER partnering port regions to verify emission reductions realized at each port visit, it also means that concerns of potential free riding by non-partnering ports will be possibly minimized if there is no incentive for those OGVs equipped with emission abatement technology to switch to lower-emitting operating mode.

Additionally, PRIMER can also serve as a platform for information exchange and experience sharing among partnering ports. In light of the IMO decarbonization targets and the corresponding global efforts to identify low- and zero-carbon solutions, NOx/PM abatement technologies are expected to remain highly relevant in the deep-sea-going sector. This is because, without significant technology breakthrough, internal combustion engines fueled by low-carbon biofuel blends or zero-carbon alternatives such as ammonia, hydrogen, and methanol, are commonly acknowledged as the most feasible propulsion technologies to achieve decarbonization goals among those ships serving the transoceanic routes. However, the combustion process will inevitably produce NOx and PM, so the installation of pretreatment (e.g., WiF and EGR) or aftertreatment (e.g., SCR, filtration) system may be still necessary pursuant to the IMO Tier III requirements for any dual- or multi-fuel vessels. Given that NOx/PM control will likely remain highly relevant in the future, incentivizing investments in optimizing NOx/PM abatement nearshore will not only help address the disproportionate air quality impacts on port regions from the in-service fleet, but also from the future low- and zero-carbon OGVs.

Finally, PRIMER can complement and work in conjunction with the Clydebank Declaration for Green Shipping Corridors, which is a multi-nation initiative announced at the 26th United Nations Climate Change Conference of the Parties (COP 26) at the end 2021. The Clydebank Declaration aims to promote zero-carbon emission maritime routes between 2 or more ports, with the goal of establishing at least 6 such routes/corridors by 2025. The U.S., being one of the signatories, is anticipated to either work towards decarbonizing one or more domestic shipping routes, or work with other current and prospective signatories in establishing international green shipping corridors. Given the outsized importance and cargo throughput of the San Pedro Ports among all U.S. ports, it would be of utmost priority for the U.S. to work with our Asian Pacific trade partners to explore such partnerships to achieve both climate and air quality objectives. As of July 2023, six Green Shipping Corridor have been announced between POLA and/or POLB with Asia Pacific port partners. While these agreements are focused on GHG reductions through alternative fuel bunkering and/or operational changes such as digitalization, PRIMER will focus on nearshore NOx reductions, with co-benefits for PM2.5 and potentially GHG.

Regulatory History

International Maritime Organization (IMO) Emissions and Fuel Standards

The IMO's International Convention for the Prevention of Pollution from Ships (MARPOL) Annex VI, which came into force in May 2005, set new international NOx emission limits in Regulation 13 on marine diesel engines installed on new vessels retroactive to the year 2000. The NOx limits are applicable to diesel engines of over 130 kW output power (other than those used solely for emergency purposes) irrespective of the tonnage of the ship where such engines are installed. In October 2008, the IMO adopted an amendment which places a global limit on marine fuel sulfur content of 0.1 percent by 2015 for specific areas known as Emission Control Areas (ECA). The North American and U.S. Caribbean Sea ECA extends 200 nautical miles from the U.S. coast. The Basin off-coast waters are included in the ECA and ships calling at the Ports have to meet this new fuel standard or use SOx scrubber as an alternative compliance method. In addition, the 2008 IMO amendment required new ships built after January 1, 2016 that enter the North American and U.S. Caribbean Sea ECA to meet Tier III NOx emission limits which are 80 percent lower than the Tier I emission limits and 75 percent lower than the Tier II limits.

IMO GHG Strategy

In October 2018, IMO adopted an initial strategy to reduce GHG emissions from the global ship fleet. Compared to the 2008 levels, the strategy set a reduction target of 40 percent by 2030 for carbon intensity and a reduction target of at least 50 percent by 2050 for total annual GHG emissions from international shipping. This strategy was further revised in 2023, including an amended 2050 target of net-zero GHG emissions, and new IMO standards are expected to be developed to implement the 2023 strategy. This level of GHG reductions will require the use of low or zero carbon fuels, with the latest target set at 5-10% of all energy used by international shipping by 2030; however, the effect on NOx and PM from this fuel switch may vary widely depending on which fuels are used and what controls are added to ship engines. Several programs have been adopted in recent years as short-term measures to attain the decarbonization targets, including the energy efficiency design index (EEDI) for newbuilt ships, the efficiency existing ship index (EEXI) for in-service ships, and the carbon intensity indicator (CII). Collectively, by reducing fuel consumption, these measures may indirectly lower NOx and PM emissions albeit to a limited extent.

U.S. EPA Marine Vessel Regulations

In 2010, the U.S. Environmental Protection Agency (U.S. EPA) adopted standards that apply to Category 3 (C3) engines (>30 liters per cylinder displacement) installed on U.S. vessels and to marine diesel fuels produced and distributed in the United States. That rule added two new tiers of engine standards for C3 engines consistent with the IMO standards described above. It also includes a regulatory program to implement IMO MARPOL Annex VI in the United States, including engine and fuel sulfur limits, and extends the ECA engine and fuel requirements to U.S. internal waters (i.e., rivers, lakes, etc.). U.S. is a member of IMO and provided input to the fuel sulfur and NOx emission standards adopted by IMO and works within international organizations to establish global engine and fuel standards. The U.S. delegation to the IMO is generally led by the State Department, with Coast Guard, the U.S. EPA, and other relevant agencies provide any necessary support and technical advice.

CARB Marine Fuel Rule

Beginning in 2009, CARB began implementing the State's fuel sulfur regulation, applicable to both domestic and foreign flagged vessels, in waters out to 24 nm of the California baseline (i.e., Regulated California Waters or RCW). The rule initially limited sulfur content in marine gas oil (MGO) to 1.5 percent sulfur by weight and in marine diesel fuel (MDO) to 0.5 percent sulfur by weight. Beginning in January 1, 2012, all OGVs when operating in the RCW must switch to either type of distillate grade fuel with at maximum 0.1 percent sulfur content in weight, and unlike the IMO sulfur oxides (SOx) ECA requirements, the use of SOx scrubber is not permitted as an alternative compliance method.

CARB OGV At Berth Regulation

Adopted in 2007, the original At Berth regulation was designed to reduce NOx and PM emissions from the operation of auxiliary engines on container vessels, passenger vessels, and refrigerated cargo vessels while these vessels are docked at berth at a California port. As such, starting from 2014, 50 percent of a regulated fleet's visits to the Ports were required to plug into shore power (also known as alternative maritime power (AMP) or cold ironing), or use other compliance options to achieve equivalent emission reductions. The percentage of fleet-based requirement would increase to 80 percent in 2020. In 2020, several amendments were adopted which, from 2023, would require rule compliance at each and every vessel visit by container vessels, passenger vessels, and refrigerated cargo vessels; from 2025, by roll-on and roll-off vessels, as well as tanker vessels visiting the ports of Los Angeles and Long Beach; and from 2027, all remaining tanker vessels.

MOUs

Several years ago, the ports, shipping interests, and regulatory agencies entered into a MOU seeking voluntary reductions in vessel speed to reduce NOx emissions.

Proposed Method of Control

This measure seeks to supplement the implementation of the 2022 State SIP (State Implementation Plan) Strategy "Federal Action: Cleaner Fuel and Vessel Requirements for Ocean-Going Vessels." It is not expected for this measure to achieve the full emission reductions associated with this specific SIP measure, but rather, this measure seeks to recognize OGV emission reductions that are the result of voluntary actions and may be considered surplus to the emission reduction commitments of the State SIP Strategy. Vessel owner/operator would register their vessels with verified emission reductions from the IMO Tier II emission limits and would be eligible for port-specific incentives for every port call made by a registered vessel at a port covered by program(s) administered by one of the PRIMER partners.

Emission Reductions

The amount of emission reductions that can be achieved from this control measure will be dependent on the type of OGVs and number of port calls affected by the measure and the actions or strategies identified through the public process. Any emission reductions that can be quantified and considered surplus to the region's overall emission reduction targets will be attributed towards the emission reduction commitment associated with the 2022 SIP Measure "Federal Action: Cleaner Fuel and Vessel Requirements for Ocean-Going Vessels" and could be recognized in the SIP as part of the Rate-of-Progress reporting or in future AQMP revisions as long as the reductions meet the U.S. EPA determination that such reductions are approvable as part of the SIP.

Rule Compliance and Test Methods

The proposed measure is an incentive program, and therefore, rule compliance is not applicable. However, program participation would require pre-registration by vessel owner/operator, and emission reductions will be verified through submittal and review of records, reports, and emission inventories. Approved emission quantification protocols by federal, State or local agencies will be used to track and report emission reductions for SIP purposes.

Cost Effectiveness

The cost-effectiveness of this measure will be based on cost of commercialized technologies, frequency of ports calls, the number of PRIMER partnering ports and the collective incentive amounts.

Implementing Agency

South Coast AQMD, along with other domestic and international partners, will collectively be the implementing agencies for port-specific incentive programs designed to encourage frequently calling OGVs to adopt cleaner and low NOx marine engine technologies.

References

California Air Resource Board. (2018). *CEPAM: 2016 SIP - Standard Emission Tool*. https://www.arb.ca.gov/app/emsinv/fcemssumcat/fcemssumcat2016.php

Chatani, S., Shimadera, H., Itahashi, S., Yamaji, K. (2020). Comprehensive analyses of source sensitivities and apportionments of PM2.5 and ozone over Japan via multiple numerical techniques. *Atmospheric Chemistry and Physics*, 20, 10311–10329. https://doi.org/10.5194/acp-20-10311-2020

Chen, D., Zhao, Y., Nelson, P., Li, Y., Wang, X., Zhou, Y., Lang, J., Guo X. (2016). Estimating ship emissions based on AIS data for port of Tianjin, China. *Atmospheric Environment*, 145, 10-18. http://dx.doi.org/10.1016/j.atmosenv.2016.08.086

Chen, D., Wang, X., Nelson, P., Li, Y., Zhao, N., Zhao, Y., Lang, J., Zhou, Y., Guo, X. (2017). Ship emission inventory and its impact on the PM2.5 air pollution in Qingdao Port, North China. *Atmospheric Environment*, 166, 351-361. http://dx.doi.org/10.1016/j.atmosenv.2017.07.021

Chen, D., Tian, X., Lang, J., Zhou, Y., Guo, X., Wang, W., Liu, B. (2019). The impact of ship emissions on PM2.5 and the deposition of ROG

and sulfur in Yangtze River Delta, China. *Science of the Total Environment*, 649, 1609-1619. https://doi.org/10.1016/j.scitotenv.2018.08.313

Eco-Mo Foundation. (2020). *Transport and Environment in Japan 2020*. http://www.ecomo.or.jp/english/pdf/tej2020.pdf

Feng, J., Zhang, Y., Li, S., Mao, J., Patton, A.P., Zhou, Y., Ma, W., Liu, C., Kan, H., Huang, C., An, J., Li, L., Shen, Y., Fu, Q., Wang, X., Liu, J., Wang, S., Ding, D., Cheng, J., Ge, W., Zhu, H., Walker, K. (2019). The influence of spatiality on shipping emissions, air quality and potential human exposure in the Yangtze River Delta/Shanghai, China. *Atmospheric Chemistry and Physics,* 19, 6167-6183. https://doi.org/10.5194/acp-19-6167-2019

Fu, Q. (2015). *Status and control strategies on shipping emission in Shanghai port*. Presentation at the 4th Pacific Ports Clean Air Collaborative Conference, October 27. Shanghai. http://www.ppcac.org/images/fupres2015.pdf

Journal of Commerce (JOC). (2020). *JOC Global Port Rankings: Asian ports grew fastest in 2019*. August 18. https://www.joc.com/port-news/joc-global-port-rankings-asian-ports-grew-fastest-2019_20200818.html

Liang, Y., et al. (2016). *Estimation of vessels air pollution emissions in Shenzhen port*. https://ste.cnki.net/kcms/detail/detail.aspx?filename=YNHK201602006&dbcode=CEIJ&dbname=CEITLKCJFDLAST2016&v=

Liu, H., Fu, M., Jin, X., Shang, Y., Shindell, D. (2016). Health and climate impacts of ocean-going vessels in East Asia. *Nature Climate Change*, 6, 1037-1041. https://doi.org/10.1038/nclimate3083

Hong Kong Environmental Protection Department. (2020). *Hong Kong Air Pollutant Emission Inventory*. https://www.epd.gov.hk/epd/english/environmentinhk/air/data/emission_inve.html

Ministry of Environment of Japan. (2019). *"平成30 年度PM2.5 インベントリ及び発生源 プロファイル策定委託業務" (2018 PM2.5 inventory and source profile formulation consignment work,* in Japanese).

Ng, S.K.W., Lin, C., Chan, J.W.M., Yip, A.C.K., Lau, A.K.H., Fung, J.C.H.. (2012). *Study on Marine Vessels Emission Inventory – Final Report submitted to the Environmental Protection Department of HKSAR*. https://www.epd.gov.hk/epd/sites/default/files/epd/english/environmentinhk/air/studyrpts/files/EPD_MVEIS_Final_Report_v7_approved_120528.pdf

Starcrest Consulting Group (Starcrest). (2017). *San Pedro Bay Ports Clean Air Action Plan 2017 – Bay Wide Ocean-Going Vessel International Maritime Organization Tier Forecast 2015-2050*. https://kentico.portoflosangeles.org/getmedia/a23bdf8e-7df2-42f5-873f-803c36be8a57/CAAP_Vessel_Tier_Forecasts_2015-2050-Final

Starcrest. (2021a). *Port of Los Angeles Inventory of Air Emissions – 2020*. https://kentico.portoflosangeles.org/getmedia/7cb78c76-3c7b-4b8f-8040-b662f4a992b1/2020_Air_Emissions_Inventory

Starcrest. (2021b). *Port of Long Beach Air Emissions Inventory – 2020*. https://polb.com/download/14/emissions-inventory/12958/2020-air-emissions-inventory.pdf

Shon, Z.-H. (2015). Emissions of Ozone Precursors from a Biogenic Source and Port-related Sources in the Largest Port City of Busan, Korea. *Asian Journal of Atmospheric Environment, 9*(1), 39-47. https://doi.org/10.5572/ajae.2015.9.1.039

Song, S.-K., Shon, Z.-H., Kim, Y.-K., Kang, Y.-H., Oh, I.-B., Jung, C.-H.. (2010). Influence of Ship Emissions on Ozone Concentrations around Coastal Areas during Summer Season. *Atmospheric Environment, 44*(5), 713-723. https://doi.org/10.1016/j.atmosenv.2009.11.010

South Coast Air Quality Management District. (2017). *Final 2016 Air Quality Management Plan*. https://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2016-air-quality-management-plan/final-2016-aqmp/final2016aqmp.pdf

Taiwan Environmental Protection Administration. (2017). *Taiwan Emission Data System*. https://air.epa.gov.tw/EnvTopics/AirQuality_6.aspx

Tian, J. (2019, January 21). 我国三大船舶排放控制区的大气污染物排放量下降明显 (Air Pollutants Have Substantially Reduced in China's Three Domestic Emission Control Areas, in Chinese). *Xinhua News Agency*. http://www.xinhuanet.com/politics/2019-01/21/c_1124018769.htm

United Kingdom Department of Transport. (2022). *COP 26: Clydebank Declaration for green shipping corridors*. https://www.gov.uk/government/publications/cop-26-clydebank-declaration-for-green-shipping-corridors/cop-26-clydebank-declaration-for-green-shipping-corridors

United Nations Conference on Trade and Development (UNCTAD). (2019). *Review of Maritime Transport 2019*. https://unctad.org/webflyer/review-maritime-transport-2019

UNCTAD. (2020). *Review of Maritime Transport 2020*. https://unctad.org/webflyer/review-maritime-transport-2020

United States Census Bureau. *USA Trade® Online*. https://usatrade.census.gov/

MOB-13: RULE 2202 – ON-ROAD MOTOR VEHICLE MITIGATION OPTIONS [PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	MOBILE SOURCES	
CONTROL METHODS:	STREAMLINE VARIOUS RIDESHARE STRATEGIES AND TELECOMMUTING OPTIONS	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	2.4	2.1
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	55.5	18.9
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD/LOCAL OR REGIONAL AGENCIES	

Description of Source Category

Rule 2202 has been designed to reduce emissions from motor vehicles used by employees for commute trips. Rule 2202 applies to larger employers in the region with more than 250 employees and requires that these employers mitigate emissions from employee commute trips into the worksite. Rule 2202 is designed to reduce emissions of Volatile Organic Compounds (VOCs), Oxides of Nitrogen (NOx), and Carbon Monoxide (CO), by an equal or greater amount to that achievable through a trip reduction program. Rule 2202 will also reduce PM2.5 emissions as a co-benefit. Rule 2202 provides employers with a menu of options to select from to implement a combination of emission reduction strategies to meet an emission reduction target (ERT) for their worksite. The types of vehicles included in Rule 2202 emission calculations are passenger vehicles and light-duty vehicles (LT1 and LT2).

Background

There are three main compliance options for Rule 2202:

Air Quality Investment Program (AQIP)

Employers may participate in the AQIP by submitting an air quality investment, to be placed in a restricted fund as set forth in Rule 311 - Air Quality Investment Program Fees. These funds are then used for air quality improvement projects that will achieve the emission reduction targets for a given compliance period. Some examples of projects that have been funded using AQIP funds are the replacement of older, high-polluting diesel-powered street sweepers with lower-emission compressed natural gas (CNG) sweepers, replacement or repower of older, high-polluting heavy-duty diesel engines with cleaner engine/vehicle technologies, various port-related clean air projects, and the replacement of gasoline-powered lawn and garden equipment with zero emissions, battery-electric powered equipment.

Emission Reduction Strategies (ERS)

Emission Reduction Credits (ERCs) may be used to meet an employer's emission reduction target. These credits are purchased by the regulated employer from a third-party credit vendor/broker. The credits are then transferred to South Coast AQMD and retired. ERCs that were approved for transfer into the program before June 6, 2014 and were issued in accordance with Regulation XIII may be used to meet an employer's emission reduction target. These ERCs have been primarily generated through facility shutdowns and equipment replacement projects. Mobile source emission reduction credits (MSERCs) issued in accordance with the provisions of Regulation XVI - Mobile Source Offset Programs may also be used. These credits have been primarily generated through old vehicle scrapping services.

Employee Commute Reduction Program (ECRP)

As an alternative to meeting an ERT, Rule 2202 also allows employers the option to implement an ECRP. The implementation of an ECRP is expected to lead to achievement and maintenance of the employer's designated Average Vehicle Ridership (AVR) target, determined by the worksite's AVR Performance Zone pursuant to Rule 2202(l)(3), through the reduction of work-related vehicle trips. As part of the ECRP, employers must choose 15 commute reduction strategies to implement at their worksite from a larger menu of strategies. These strategies can be developed and implemented to meet the individual needs of employers in achieving the designated AVR target.

Regulatory History

Rule 2202 was adopted in 1995 as a replacement to Rules 1501 – Work Trip Reduction Plans and 1501.1 - Alternatives to Work Trip Reduction Plans, to achieve an equal or greater amount of emission reductions.

In 1987, Regulation XV was adopted which required trip reduction plans for employers with 100 or more employees. Rule 1501 was amended in 1993 and Rule 1501.1 was adopted in 1995 to comply with federal and state requirements for "extreme" nonattainment areas. In 1995, Rule 2202 was adopted to respond to state legislation prohibiting mandatory trip reduction plans. Subsequently, Rule 2202 provided worksites of 100 or more employees a menu of emission reduction options to meet an emission reduction target for their worksite. The passage of SB 836 in 1996 directed South Coast AQMD to raise the employee threshold level from 100 to 250 employees, while SB 432 permanently exempted worksites with fewer than 250 employees from complying with the rule. Rule 2202 continues to allow affected employers the option of implementing a traditional trip reduction program to comply with the rule.

Proposed Method of Control

Telecommuting

Rule 2202 currently provides credit for telecommuting under the ECRP compliance option by including telecommuting as one of the optional direct strategies specified in the rule. As defined, telecommuting is characterized as working at home, off-site, or from a telecommuting center for a full workday that eliminates the trip into the worksite or reduces travel distance to the worksite by greater than 50 percent.

During the COVID-19 pandemic in 2020 and 2021, many Rule 2202 regulated employers incorporated telecommuting practices which have shown to be a very effective way of reducing emissions caused by employee commute trips into the worksite. Many employers have reported extremely high AVR scores, primarily due to the increased amount of telecommuting, over the 2020/2021 reporting period.

While Rule 2202 does currently provide credit for telecommuting, future rule amendments may include a larger focus on telecommuting strategies and provide additional incentives for regulated employers to adopt telecommuting policies. Based on reported information from regulated employers, telecommuting has shown to be an extremely effective measure for reducing emissions from employee-related commute trips. Other future rule amendments may include enhancements on current basic support and direct strategies, as well as streamlined compliance and reporting options. Options for inclusion of Rule 2202 for State Implementation Plan (SIP) creditability will also be explored.

Emission Reductions

The following emission reductions were achieved by Rule 2202 activities for year 2018:

TABLE MOB-13-A

RULE 2202 EMISSION REDUCTIONS FOR 2018

Program Type	VOC tons/day	NOx tons/day	CO tons/day
Employee Commute Reduction Program (including Offset)	0.47	0.35	3.97
Air Quality Investment Program	0.55	0.15	3.16
Emission Reduction Strategies	0.96	0.55	6.14
Total Achieved	1.98	1.05	13.27
Target	1.46	0.93	10.39

Rule Compliance and Test Methods

To be determined.

Cost Effectiveness

To be determined.

Implementing Agency

South Coast AQMD.

References

South Coast Air Quality Management District. (2014). Rule 2202 – On-Road Motor Vehicle Mitigation Options (Amended June 6, 2014). http://www.aqmd.gov/docs/default-source/rule-book/reg-xxii/rule-2202.pdf

South Coast Air Quality Management District. (2016). Employee Commute Reduction Program Guidelines. http://www.aqmd.gov/docs/default-source/rule-book/support-documents/rule-2202/rule-2202-employee-commute-reduction-program-guidelines-(ecrp).pdf

South Coast Air Quality Management District. (2014). Rule 2202 – On-Road Motor Vehicle Mitigation Options Implementation Guidelines. http://www.aqmd.gov/docs/default-source/rule-book/support-documents/rule-2202/rule-2202-implementation-guidelines.pdf

South Coast Air Quality Management District. (2019). Rule 2202 – On-Road Motor Vehicle Mitigation Options Emission Factor and Emission Reduction Target Methodology. http://www.aqmd.gov/docs/default-source/transportation/supplemental-documents/r2202_ef_methodology_emfac2017_2019.pdf

South Coast Air Quality Management District. (2005). Employee Commute Reduction Program AVR Survey Support Guide. http://www.aqmd.gov/docs/default-source/transportation/supplemental-documents/avr-survey-support-guide.pdf

South Coast Air Quality Management District. (2014). Board Letter to Amend Rule 2202 - On-Road Motor Vehicle Mitigation Options, Rule 2202 Implementation Guidelines, Rule 301 Permitting and Associated Fees, and Rule 311 Air Quality Investment Program Fees. http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2014/brdpkg-2014-jun6.pdf

South Coast AQMD

APPENDIX IV-B

SCAG's Regional Transportation Strategy and Control Measures

SCAG MISSION STATEMENT

Under the guidance of the Regional Council and in collaboration with our partners, our mission is to foster innovative regional solutions that improve the lives of Southern Californians through inclusive collaboration, visionary planning, regional advocacy, information sharing, and promoting best practices.

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Executive Summary

This Appendix IV-B (Appendix or Appendix IV-B throughout) describes the Southern California Association of Government's (SCAG) Regional Transportation Plan/Sustainable Communities Strategy and Transportation Control Measures (TCMs) to address the 2012 annual PM2.5 standards in the South Coast Air Basin as part of South Coast Air Quality Management District's (South Coast AQMD) Draft 2024 PM2.5 State Implementation Plan (SIP). This Appendix IV-B is based on SCAG's Final 2020–2045 Regional Transportation Plan/Sustainable Communities Strategy (2020 RTP/SCS, also known as Connect SoCal) and 2023 Federal Transportation Improvement Program (FTIP), as amended. The RTP/SCS and FTIP were developed in consultation with federal, state and local transportation and air quality planning agencies and other stakeholders. The four County Transportation Commissions (CTCs) in the South Coast Air Basin, namely Los Angeles County Metropolitan Transportation Authority, Riverside County Transportation Commission, Orange County Transportation Authority and the San Bernardino County Transportation Authority, were actively involved in the development of the regional transportation measures of this Appendix. While SCAG will soon adopt the 2024 RTP/SCS, this PM2.5 Plan is based on the 2020 RTP/SCS as it was the latest approved RTP/SCS at the time of plan development.

This Appendix consists of the following three Sections.

Section I. Introduction

As required by federal and state laws, SCAG is responsible for ensuring that the regional transportation plan, program, and project are supportive of the goals and objectives of applicable Air Quality Management Plans and State Implementation Plans (AQMPs/SIPs). SCAG is also required to develop demographic projections and regional transportation strategy and control measures for the South Coast AQMD's AQMP/SIP.

As the Metropolitan Planning Organization (MPO) for the six county region comprising SCAG's jurisdiction, SCAG is obligated to develop an RTP/SCS every four years. The RTP/SCS is a long-range regional transportation plan that provides for the development and integrated management and operation of transportation systems and facilities that will function as an intermodal transportation network for the SCAG region. The RTP/SCS also outlines certain land use growth strategies that provide for more integrated land use and transportation planning, and enhance transportation investments. The RTP/SCS is required by federal laws to demonstrate transportation conformity and also to achieve regional greenhouse gas (GHG) reduction targets set by the California Air Resources Board (CARB) pursuant to SB 375. Pursuant to the California Health and Safety Code, the RTP/SCS constitutes the Regional Transportation Plan/Sustainable Communities and Transportation Control Measures of the South Coast AQMD's AQMPs/SIPs.

In addition, SCAG develops the biennial FTIP. The FTIP is a list of multimodal capital improvement projects to be implemented over a six year period. The FTIP implements the programs and projects in the RTP/SCS.

Section II. Regional Transportation Plan/Sustainable Communities Strategy and Transportation Control Measures (TCMs)

The SCAG region faces many critical challenges including demographics, transportation system preservation, transportation funding, goods movement, housing, air quality, climate change, and public health. Under the guidance of the goals and objectives adopted by SCAG's Regional Council, SCAG's governing board, the Connect SoCal was developed to provide a blueprint to integrate land use and transportation strategies to help achieve a coordinated and balanced regional transportation system. Connect SoCal represents the culmination of more than three years of work involving dozens of public agencies, 197 local jurisdictions in the SCAG region, hundreds of local, county, regional and state officials, the business community, environmental groups, as well as various nonprofit organizations. Connect SoCal was adopted by SCAG's governing board, the Regional Council, on May 7, 2020 for transportation conformity purposes only and on September 3, 2020 for all purposes.

To realize a sustainable and connected region, Connect SoCal includes a Core Vision that centers on maintaining and better managing the transportation network for moving people and goods, while expanding mobility choices by locating housing, jobs and transit closer together and increasing investment in transit and complete streets; five Key Connections that augment the Core Vision to address trends and emerging challenges while closing the gap between what can be accomplished through intensification of core planning strategies alone and what must be done to meet increasingly aggressive greenhouse gas reduction goals; as well as action-oriented transportation strategies and Sustainable Communities Strategy.

Core Vision

- Sustainable Development
- System Preservation and Resilience
- Demand & System Management
- Transit Backbone
- Complete Streets
- Goods Movement

Key Connections

- Smart Cities and Job Centers

- Housing Supportive Infrastructure
- Go Zones
- Accelerated Electrification
- Shared Mobility and Mobility as a Service

Transportation Strategies

- Preserve and Optimize Our Current System
  - Congestion Management
  - Congestion Pricing
  - Transportation Demand Management (TDM)
  - Transportation System Management (TSM)
- Completing Our Transportation System
  - Transit
  - Passenger Rail
  - Active Transportation
  - Transportation Safety
  - Highway and Arterial Network
  - Regional Express Lane Network
  - Goods Movement
  - Aviation
  - Technological Innovations and Emerging Technology

Sustainable Communities Strategy

- Focus Growth Near Destinations & Mobility Options
- Promote Diverse Housing Choices

- Leverage Technology Innovations
- Support Implementation of Sustainability Policies
- Promote a Green Region

Transportation Control Measures (TCMs)

Connect SoCal includes, as a subset of transportation strategies, SIP-committed transportation programs and projects that reduce vehicle use or change traffic flow or congestion conditions for the purposes of reducing emissions from transportation sources and improving air quality, better known as Transportation Control Measures or "TCMs." In the South Coast Air Basin, TCMs include the following three main categories of transportation improvement projects and programs that have funding programmed for right-of-way and/or construction in the first two years of the 2023 FTIP:

1. Transit and non-motorized modes;
2. High Occupancy Vehicle (HOV) Lanes and their pricing alternatives; and
3. Information-based strategies (e.g., traffic signal synchronization).

Attachment A of Appendix IV-B is a list of transportation control measure projects that are from SCAG's 2023 FTIP and specifically identified and committed to in the 2024 PM2.5 SIP. Per the federal Clean Air Act (CAA), these committed TCMs are required to receive funding priority and be implemented in a timely manner. In the event that a committed TCM cannot be delivered or will be significantly delayed, there must be a substitution for the TCM. It is important to note that as the SCAG's FTIP is updated every two years, new committed TCMs are automatically added to the applicable SIP from the previous FTIP.

Plan Emissions Reduction Benefits

If the future vehicle fleet mix and emission factors are held constant as those in the Connect SoCal base year 2016, Connect SoCal is estimated to yield a reduction in NOx emissions by about ~~1.5~~ 2.0 tons per day (tpd) in 2025, ~~4~~5.1 tpd in 2035, and 6.9~~8~~ tpd in 2045 compared with their respective Baselines without Connect SoCal. However, if accounting for mandated future improvement in vehicle fleet mix and emission factors, the estimated NOx emission reduction from Connect SoCal is reduced by ~~60~~ 65 to ~~73~~ 94 percent, because the vehicles as a whole are becoming much cleaner and reduction of every vehicle mile traveled from Connect SoCal yields less reduction in NOx emissions.

Plan Investment

The total expenditure for the various strategies in Connect SoCal is forecasted to be $638.9 billion for the entire six-county SCAG region. Connect SoCal has identified the same amount of total revenues from both existing and several new funding sources that are reasonably expected to be available.

Cost-Benefit Analysis

Implementation of Connect SoCal will secure a safe, efficient, sustainable and prosperous future for the SCAG region. To demonstrate how effective Connect SoCal would be toward achieving our regional goals, SCAG conducted a Connect SoCal vs. Connect SoCal Baseline cost-benefit analysis utilizing the Cal-B/C Model to calculate regional network benefits – essentially comparing how the region would perform with and without implementation of the Connect SoCal.

Compared with the alternative without the Plan, Connect SoCal would result in significant benefits to our region, not only with respect to mobility and accessibility, but also in the areas of air quality, economic growth and job creation, sustainability and environmental justice. Altogether, the transportation investments in Connect SoCal will provide a return of two dollars for every dollar invested compared with the Baseline alternative.

Section III. TCM Best Available Control Measure (BACM) and Most Stringent Measure (MSM) Analysis

The South Coast Air Basin has been reclassified as a Serious nonattainment area under the 2012 PM2.5 NAAQS effective December 9, 2020. In addition, the South Coast AQMD's 2016 AQMP included a 2012 PM2.5 Serious Area SIP that demonstrated attainment by 2025. However, due to significant concerns raised by the United States Environmental Protection Agency (U.S. EPA) regarding the PM2.5 SIP in response to a lawsuit filed against U.S. EPA for failure to act on the SIP, the South Coast AQMD withdrew the SIP to prevent U.S. EPA disapproval and initiated the development of a new SIP. Further, the new SIP needs and will include a request to extend the attainment date to 2030 consistent with CAA Section 188(e) to allow more time for implementation. As a result, the South Coast Air Basin is required to implement BACMs and MSMs including TCMs for the control of direct PM2.5 and PM2.5 precursors from on-road mobile sources. This section serves as the TCM BACM and MSM component for the South Coast 2012 PM2.5 standard SIP.

Following the applicable U.S. EPA guidance and updating the previous TCM BACM analysis in the South Coast AQMD's 2016 AQMP that has received EPA approval, the TCM BACM and MSM analysis consists of a review of the on-going implementation of TCMs in the South Coast Air Basin, a review of TCM measures implemented in other Moderate and Serious PM2.5 nonattainment areas as well as Serious PM10 nonattainment areas throughout the country, and a review of TCMs not implemented in the SCAG region. The analysis demonstrates that the TCM projects being implemented in the South Coast Air Basin are both the best available and the most stringent TCMs.

Section I. Introduction

Federal and State Requirements

The transportation conformity requirements of the federal CAA establish a need to integrate air quality planning and regional transportation planning. This integration presents the challenge of balancing the real need for improved mobility and accessibility with the equally important goal of cleaner air. As the federally-designated MPO for the six-county Southern California region, SCAG is required by law to ensure that transportation activities "conform" to, and are supportive of, the goals of regional and state air quality plans to attain the National Ambient Air Quality Standards (NAAQS). In other words, transportation plans, programs, and projects are required to not create new violations, worsen the existing violations, or delay timely attainment of relevant NAAQS.

In addition, SCAG is a co-producer, with the South Coast AQMD and CARB, of the AQMP/SIP for the South Coast Air Basin. SCAG has the responsibility of providing the demographic projections and integrated regional land use, housing, employment, and transportation programs, measures, and strategies, as well as analyzing and providing travel activity data related to its planning responsibilities (California Health and Safety Code §40460).

Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS)

The SCAG Region is the largest metropolitan planning area in the United States, encompassing 38,000 square miles. The region is divided into 15 subregions and is one of the largest concentrations of population, employment, income, business, industry and finance in the world. The six-county SCAG Region is home to about 19 million people, nearly half of the population of the State of California.

Federal and State regulations require SCAG, as the MPO and Regional Transportation Planning Agency, to develop an RTP/SCS every four years in order for our region's transportation projects to qualify for federal and state funding and approval. The RTP/SCS is updated to reflect changes in trends, progress made on projects, and to adjust the growth forecast for population and employment changes. The long-range RTP/SCS integrates land use and transportation strategies that will achieve CARB greenhouse gas emissions reduction targets and provides a vision for transportation investments throughout the region. Using growth forecasts and economic trends that project out over a period of more than 20 years, the RTP/SCS considers the role of transportation in the broader context of land use, economic, environmental, and quality-of-life goals for the future, identifying regional transportation strategies and Sustainable Communities Strategy to address our mobility needs, air quality and climate change challenges.

The RTP/SCS is developed through a collaborative process, guided by SCAG's governing board, the Regional Council, and its Policy Committees and Sub-committees, the Transportation Working Group, numerous technical advisory committees/working groups/task force, CTCs, subregions, local governments, state and federal agencies, environmental and business communities, tribal governments, non-profit groups, as well as the general public.

Adopted by SCAG's Regional Council and approved by federal agencies, 2020 RTP/SCS or Connect SoCal is the currently conforming RTP/SCS for the SCAG region which includes the entire South Coast Air Basin.

The next 2024 RTP/SCS (Connect SoCal 2024) is currently under development. The Draft 2024 RTP/SCS was released for public review on November 2, 2023, and the Final 2024 RTP/SCS is scheduled to be adopted by SCAG's Regional Council in April 2024.

Federal Transportation Improvement Program (FTIP)

SCAG is also responsible for developing a biennial short-term (six year planning horizon) FTIP. SCAG develops the FTIP in partnership with the CTCs of Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura, and California Department of Transportation (Caltrans) Districts 7, 8, 11, and 12. The FTIP is a multimodal list of capital improvement projects to be implemented over a six-year period. The FTIP identifies specific funding sources and fund amounts for each project. It is prioritized to implement the region's overall strategy for providing mobility and improving both the efficiency and safety of the transportation system, while supporting efforts to attain federal and state air quality standards for the region by reducing transportation related air pollution. The FTIP must include all federally funded transportation projects in the region, as well as all regionally significant transportation projects for which approval from federal funding agencies is required, regardless of funding source. The FTIP is developed to incrementally implement the programs and projects in the RTP/SCS. TCMs that are committed to in the applicable SIP are derived from the first two years of the prevailing FTIP.

Adopted by SCAG's Regional Council and approved for federal agencies, 2023 FTIP is the currently conforming FTIP for the SCAG region which includes the entire South Coast Air Basin.

Section II. Regional Transportation Plan/Sustainable Communities Strategy and Transportation Control Measures (TCMs)

Introduction

Connect SoCal is a long-range regional plan that provides a blueprint to integrate land use and transportation strategies to help achieve greater mobility and sustainable growth. Transportation projects in the SCAG region must be included in Connect SoCal in order to receive federal funding and approval. Connect SoCal is comprised of an Introduction, six Chapters and 20 Technical Reports listed below:

- Chapter 0: Making Connections
- Chapter 1: About the Plan
- Chapter 2: SoCal Today
- Chapter 3: A Path to Greater Access, Mobility & Sustainability
- Chapter 4: Paying Our Way Forward
- Chapter 5: Measuring Our Progress
- Chapter 6 Looking Ahead
- Active Transportation Technical Report
- Aviation and Airport Ground Access Technical Report
- Congestion Management Technical Report
- Demographics and Growth Forecast Technical Report
- Economic and Job Creation Analysis Technical Report
- Emerging Technology Technical Report
- Environmental Justice Technical Report
- Goods Movement Technical Report
- Highways and Arterials Technical Report

- Natural and Farm Lands Technical Report
- Passenger Rail Technical Report
- Performance Measures Technical Report
- Project List Technical Report
- Public Health Technical Report
- Public Participation and Consultation Technical Report
- Sustainable Communities Strategy (SCS) Technical Report
- Transit Technical Report
- Transportation Conformity Analysis Technical Report
- Transportation Finance Technical Report
- Transportation Safety and Security Technical Report

Connect SoCal represents the culmination of more than three years of work involving dozens of public agencies, 197 local jurisdictions in the SCAG region, hundreds of local, county, regional and state officials, the business community, environmental groups, as well as various nonprofit organizations, and was founded on a broad-based public outreach effort. The implementation of a comprehensive and coordinated public participation effort undertaken by SCAG is documented in the Public Participation and Consultation Technical Report.[1]

Connect SoCal was adopted by the SCAG Regional Council on May 7, 2020, for transportation conformity purposes only and on September 3, 2020 for all purposes. Connect SoCal constitutes the transportation control strategy portion of the Final 2022 South Coast AQMP. A full list of the Connect SoCal projects can be found in the Project List Technical Report.[2]

Key Challenges in the Region

Our region is facing many formidable challenges related to affordable housing, natural and farmland conservation, transportation safety and security, public health, transportation system preservation and resilience, transportation access and mobility, funding the transportation system, and planning for

[1] https://scag.ca.gov/sites/main/files/file-attachments/0903fconnectsocal_public-participation-consultation.pdf?1606001825

[2] https://scag.ca.gov/sites/main/files/file-attachments/0903fconnectsocal_project-list_1.pdf?1606001744

disruption. For example, the region experiences significant travel delays (the time an average motorist spends stuck in traffic is 100 hours per year) and approximately 15 percent of the region's bridges are in poor condition. The SCAG region lost 21 percent of its farmland between 1984 (the year the farmland tracking began) and 2016. There are approximately 1,500 traffic fatalities annually. The annual cost of treating chronic disease (such as heart disease, strokes, chronic lower respiratory disease & diabetes) is $16.7 billion. Climate change adversely impacts traditionally underserved communities and 77 percent of residents in a flood hazard zones are minority.

Another regional challenge is the region's inability to meet federal air quality standards. Although air quality has improved significantly over the past decades, the SCAG region still experiences the worst air quality in the country. Almost the entire SCAG region fails to meet the health-based federal air quality standards for one or more transportation-related air pollutants. In addition to public health impacts from unhealthy air quality, the challenge of meeting health based federal air quality standards has serious implications for the RTP/SCS, the FTIP and transportation projects in the SCAG region.

A particularly pressing challenge is for the South Coast Region to meet the 2023 statutory deadline of attaining the 1997 ozone standard. Pursuant to the federal CAA, a Contingency Measure Plan was developed jointly by the South Coast AQMD and the CARB and subsequently submitted to the U.S. EPA. The Contingency Measure Plan[3] highlights the critical need for federal regulatory actions and/or funding to address emission sources under federal jurisdiction including aircraft, ships, trains and out-of-state trucks in order to meet the air quality standard. This is in addition to regulatory actions, programs and incentive funding South Coast AQMD and CARB have developed to achieve emission reductions.

If the U.S. EPA disapproves the Contingency Measure Plan, a federal sanctions clock will be triggered which will lead to federal highway sanctions if the underlying deficiency cannot be resolved within 24 months. Highway sanctions restrict federal funding to transportation projects that expand highway capacity, nonexempt project development activities and any other projects that do not explicitly meet exemption criteria. If imposed, highway sanctions have the potential to impact billions of dollars of federal funding and tens of billions of dollars of important transportation projects in the SCAG region.

Transportation, especially the goods movement sectors, contributes to the overwhelming majority of air pollutant emissions causing ozone pollution. A comprehensive and coordinated regional solution including aggressive regulations, advancements in clean technologies, innovative solutions, and integrated land use and transportation planning from all levels of government and all stakeholders will be required to achieve the needed emission reductions from the goods movement sectors.

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[3] South Coast AQMD, 2019, Contingency Measure Plan: Planning for Attainment of the 1997 80 ppb 8-Hour Ozone Standard in the South Coast Air Basin for the 1997 8-Hour Ozone NAAQS in the South Coast Air Basin, http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2016-air-quality-management-plan/1997-ozone-contingency-measure-plan/1997-8-hour-ozone-draft-contingency-measure-plan---120619.pdf?sfvrsn=10

Finally, the emission of air pollutants come from a wide range of sources and may be transported downwind. Therefore, a mitigation strategy should be in place to assist impacted communities, even if the emissions are not being locally produced.

Regional Goals and Guiding Principles

The development of projects, programs, and strategies are guided by the following goals and guiding principles that help carry out Connect SoCal's vision for improved economy, mobility, environment and healthy/complete communities. The plan explicitly lays out goals related to housing, transportation technologies, equity and resilience in order to adequately reflect the increasing importance of these topics in the region, and where possible the goals have been developed to link to potential performance measures and targets. The plan's guiding policies take these goals and focus them, creating a specific direction for plan investments.

Connect SoCal Goals

1. Encourage regional economic prosperity and global competitiveness
2. Improve mobility, accessibility, reliability, and travel safety for people and goods
3. Enhance the preservation, security, and resilience of the regional transportation system
4. Increase person and goods movement and travel choices within the transportation system
5. Reduce greenhouse gas emissions and improve air quality
6. Support healthy and equitable communities
7. Adapt to a changing climate and support an integrated regional development pattern and transportation network
8. Leverage new transportation technologies and data-driven solutions that result in more efficient travel
9. Encourage development of diverse housing types in areas that are supported by multiple transportation options
10. Promote conservation of natural and agricultural lands and restoration of habitats

Connect SoCal Guiding Principles

1. Base transportation investments on adopted regional performance indicators and MAP-21/FAST Act[4] regional targets
2. Place high priority for transportation funding in the region on projects and programs that improve mobility, accessibility, reliability and safety, and that preserve the existing transportation system
3. Assure that land use and growth strategies recognize local input, promote sustainable transportation options, and support equitable and adaptable communities
4. Encourage RTP/SCS investments and strategies that collectively result in reduced non-recurrent congestion and demand for single occupancy vehicle use, by leveraging new transportation technologies and expanding travel choices
5. Encourage transportation investments that will result in improved air quality and public health, and reduced greenhouse gas emissions
6. Monitor progress on all aspects of the Plan, including the timely implementation of projects, programs, and strategies
7. Regionally, transportation investments should reflect best-known science regarding climate change vulnerability, in order to design for long term resilience

Plan Strategies and Transportation Control Measures

To realize a more sustainable and connected region, Connect SoCal includes a Core Vision that centers on maintaining and better managing the transportation network for moving people and goods, while expanding mobility choices by locating housing, jobs and transit closer together and increasing investment in transit and complete streets; five Key Connections that augment the Core Vision to address trends and emerging challenges while closing the gap between what can be accomplished through intensification of core planning strategies alone and what must be done to meet increasingly aggressive greenhouse gas reduction goals; as well as action-oriented transportation strategies and Sustainable Communities Strategy.

[4] MAP-21 (The Moving Ahead for Progress in the 21st Century Act) was a two-year federal transportation authorization bill signed into law in 2012. Replacing MAP-21 in 2015, FAST Act (The Fixing America's Surface Transportation Act) authorizes $305 billion over fiscal years 2016 through 2020 for highway, highway and motor vehicle safety, public transportation, motor carrier safety, hazardous materials safety, rail, and research, technology, and statistics programs

Core Vision

Rooted in the 2008 and 2012 RTP/SCS plans, Connect SoCal's "Core Vision" centers on maintaining and better managing the transportation network we have for moving people and goods, while expanding mobility choices by locating housing, jobs and transit closer together and increasing investment in transit and complete streets. The Core Vision includes:

- **Sustainable Development**: Through our continuing efforts to better align transportation investments and land use decisions, we strive to improve mobility and reduce greenhouse gases by bringing housing, jobs and transit closer together.

- **System Preservation and Resilience**: "Fix it First" has been a guiding principle for prioritizing transportation funding in the RTP for the last decade. The cost of rebuilding roadways is eight times more than preventative maintenance. Preservation of the transportation system can extend the pavement life in a cost-effective manner and can also improve safety.

- **Demand & System Management**: Better managing the existing transportation system through demand management strategies and Intelligent Transportation Systems (ITS) yields significant mobility benefits in a cost-effective manner.

- **Transit Backbone**: Expanding the transit network and fostering development in transit-oriented communities is central to the region's plan for meeting mobility and sustainability goals while continuing to grow the regional economy.

- **Complete Streets**: Creating "complete streets" that are safe and inviting to all roadway users is critical to increasing mobility choices, reducing traffic fatalities and serious injuries and meeting greenhouse gas reduction targets.

- **Goods Movement**: The efficient movement of goods is critical to a strong economy and improves quality of life in the SCAG region by providing jobs and access to markets through trade. However, increased volumes of goods moving across the transportation system contribute to greater congestion, safety concerns and harmful emissions. It is critical to integrate land use decisions and technological advancements to minimize environmental and health impacts while fostering continued growth in trade and commerce.

Key Connections

Key Connections augment the Core Vision of the plan to address trends and emerging challenges while "closing the gap" between what can be accomplished through intensification of core planning strategies alone, and what must be done to meet increasingly aggressive greenhouse gas reduction goals. These Key Connections lie at the intersection of land use, transportation and innovation, aiming to coalesce policy discussions and advance promising strategies for leveraging new technologies and partnerships to accelerate progress on regional planning goals. The Key Connections include:

- **Smart Cities and Job Centers**: Smart Cities connect people, vehicles and infrastructure, allowing them to communicate in "real-time" through regional telecommunications networks. The Smart Cities and Job Centers strategy aims to catalyze investments across sectors to make "virtual access" a cost-effective and reliable option for all types of trips, expanding the air quality, congestion and VMT reduction benefits the region already realizes through teleworking. While Smart Cities strategies can be deployed universally, virtual access is particularly beneficial in rural communities where destinations are far apart. Connect SoCal specifically envisions intensified deployment in sub-regional job centers to encourage more growth of both jobs and housing in areas with already high employment density. The Smart Cities and Job Centers strategy enables this by using integrated information and communication technologies to improve the efficiency and performance of the transportation system. It incorporates transit demand management (TDM) measures that encourage carpooling and transit, and parking strategies that reduce the cost to build new employment facilities within job centers. Also, this strategy builds upon promising trends in "co-working"[5] to promote alternatives for long-distance commuters who prefer not to telecommute. Strengthening these locally significant employment centers allows the region to capitalize on the economic and mobility benefits of compact development, where housing and jobs are closer together.

- **Housing Supportive Infrastructure**: The extraordinary cost of producing housing is a significant barrier to growth throughout Southern California, but also specifically, to achieving the level of infill and transit-oriented development anticipated in Connect SoCal. The Regional Housing Supportive Infrastructure strategy will help make it quicker for local jurisdictions to produce critically-needed housing. The costs of building parking, and sewer/water infrastructure through Development Fees can range from 10 percent to nearly 25 percent of construction costs. By implementing tax-increment finance districts, jurisdictions can plan and implement housing supportive infrastructure. With the increase in use of ridesourcing, right-sizing parking strategies, enabled by technology, can reduce the overall cost of housing construction in Connect SoCal's Priority Growth Areas.

- **Go Zones**: Go Zones are geographic areas where a suite of mobility service options is provided together with incentives to reduce dependency on personal automobiles. This expanded mobility ecosystem can include increased transit, bike share, enhanced active transportation infrastructure and incentives—such as a fee on solo driving during peak traffic periods. Incentives would encourage the use of shared modes or shift less time sensitive trips to off-peak times. Revenues collected from the fee would be used to fund local transportation improvements and support sustainability goals by contributing to reductions in GHG emissions. Go Zones can be designed with policies and discounts that address equity concerns and promote mobility options for commuters of various income levels.

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[5] Co-working refers to the shared use of an office space by employees of several different firms as an alternative to a home office or traditional fixed workplace location

- **Accelerated Electrification**: The Accelerated Electrification strategy offers a holistic and coordinated approach to de-carbonizing or electrifying passenger vehicles, transit and goods movement vehicles. Through greater coordination and deeper collaboration, this strategy aims to go beyond benefits achieved through state mandates alone. In the light-duty sector, Connect SoCal plans for greater incentives to increase sales of electric vehicles and strategies to increase the availability of charging infrastructure. Electric vehicles (EVs) currently make up only seven percent of new car sales, but the growth is healthy: in 2013 EVs made up just 2.4 percent of all new car sales statewide. For transit, in 2018 the California Air Resources Board voted to mandate purchases of electric buses. We can facilitate that process by working with transit agencies to ensure adequate charging stations and electricity rates. In the goods movement sector, the goal is to achieve a zero-emissions system as soon as possible while fostering early adoption of near-zero-emissions technologies in the near-term.

- **Shared Mobility and Mobility as a Service**: The future of transportation, like so many aspects of living in our region, will be shaped by technology and the ability to customize our choices. The rise of shared mobility and mobility as a service will allow residents to choose how to travel, depending on the time, distance or goal of their trip. "Shared mobility" refers to a broad range of transportation options, such as rental e-scooters and e-bikes, ridesourcing services like Uber and Lyft that some transit operators are partnering to provide first/last mile services or replace low performing bus routes, and on-demand app-based transit connections provided by vans and shuttles. "Mobility as a service," or MaaS, allows travelers to research and compare different transportation options from one screen and plan their trip accordingly. MaaS will also allow the traveler to book and pay for different segments of a multimodal trip with one click. This will make it increasingly critical that dense urban areas manage their curb space smartly, in order to ensure safe access for low-speed modes, ridesourcing providers, parking and local deliveries.

Transportation Strategies

The transportation strategies described in Connect SoCal are divided into two broad categories: Preserving and optimizing the region's current and future system and capital improvements by mode for completing the region's transportation system. In all, Connect SoCal includes $638.9 billion in transportation system investments through 2045.

Preserve and Optimize Our Current System

A top priority for Connect SoCal is to maintain and preserve the transportation infrastructure through a "Fix it First" principle. Funding provided by Senate Bill 1 (SB 1) offers an opportunity to strategically reinvest in the transportation network to realize an improvement in the conditions of the existing system. Connect SoCal allocates approximately $68 billion over the plan period to ensure a well maintained and resilient system for generations to come. Connect SoCal also seeks to optimize the existing transportation system to meet increased demand levels through the use of innovative strategies that leverage the existing transportation infrastructure. Key preservation and optimization strategies are:

Congestion Management Process. The Congestion Management Process (CMP) aims to provide effective management of the regional transportation system through monitoring and maintenance, demand reduction, analysis of local land use decisions, operational management strategies and strategic capacity enhancements. The CMP requires that roadway projects that significantly increase the capacity for single-occupancy Vehicles (SOVs) be addressed through a CMP. The CMP should provide an appropriate analysis of reasonable, multimodal travel demand reduction and operational management strategies for the corridor. If alternative strategies are neither practical nor feasible, appropriate management strategies must be considered for roadway capacity improvement projects that would increase SOV capacity.

Congestion Pricing. SCAG's planning efforts have focused on integrating pricing strategies to optimize operation, improve travel time reliability and offer travelers greater choices. Connect SoCal has identified three promising congestion pricing strategies: 1) Develop a network of express lanes to accommodate growing inter-county travel; 2) Establish a mileage-based user fees to generate a funding source for aging infrastructure and construction of other travel options; and 3) Develop Cordon/Area Pricing which involves charging a variable or fixed fee to drive into or within a highly congested area.

Transportation Demand Management. Transportation Demand Management (TDM) is a set of strategies that aims to reduce the demand for roadway travel, particularly from single-occupancy Vehicles (SOVs). Connect SoCal allocates $7.3 billion through 2045 to implement TDM strategies throughout the region, including ridesharing and providing first/last mile services to and from transit, supporting telecommuting and alternative work schedules, as well as use of other modes such as transit, rail, bicycling, and walking, or other micro-mobility modes.

Transportation Systems Management. Transportation Systems Management (TSM) employs a series of techniques designed to maximize the capacity and efficiency of the existing transportation system. Examples of TSM strategies include Corridor System Management Plans (CSMPs) and system management initiatives (e.g., variable speed limits, signal synchronization, ramp metering, etc.), High Occupancy Toll (HOT) lanes, collision avoidance systems, universal transit fare cards and improved data collection.

Complete Our Transportation System

Strategies for improving and expanding the many modes of transportation that make up the regional network must be integrated closely with our strategies for how we use land. The success of transit, passenger rail, walking, bicycling and other forms of active transportation, our highways and arterials, the efficient movement of goods and our regional airport system all depend on a close relationship with how our region uses land and how we grow. This is particularly true when it comes to improving and building a transit system that can best serve people in communities throughout our region.

Transit. Since 1991, the region has spent more than $77 billion on transit (in 2016 dollars). This trend is expected to continue, as the combined costs for transit capital projects and operations and maintenance (O&M) total nearly half of the investments in Connect SoCal. Connect SoCal includes significant investment across all transit modes, with $66.8 billion toward transit capital projects, $53.3 billion toward passenger rail, $173.9 billion for transit O&M, and $22.6 billion for passenger rail O&M from 2020 through 2045.

Passenger Rail. Connect SoCal vision for passenger rail in the SCAG region consists of four main elements: grow ridership, provide more frequent and new services, improve connectivity, and secure funding for Metrolink (commuter rail), Amtrak (intercity rail), and California High-Speed Rail and Southern California to Las Vegas (interregional rail).

Transportation Safety. Connect SoCal prioritizes the safety and mobility of the region's residents, including drivers and passengers, transit riders, pedestrians, and bicyclists. SCAG's Safety strategies are largely grounded in the State's Strategic Highway Safety Plan that helps member agencies interested in pursuing safety initiatives and strategies at the local level. SCAG outlines detailed strategies and actions that local jurisdictions and county transportation commissions can undertake to enhance safety in our region in the transportation safety and security report.

Active Transportation. Connect SoCal is expected to increase the number of people making active transportation trips by more than two million, increasing the mode share from 7.8 percent in 2016 to 10.4 percent in 2045. In order to achieve these outcomes, planned future investments are nearly doubled from $12.9 billion in the 2016 RTP/SCS to $22.5 billion in Connect SoCal. The active transportation investments in Connect SoCal are allocated across a range of active transportation strategies that address planning, policy making and implementation for both short and regional trips. Additionally, they are designed to improve environmental justice outcomes and enhance the safety and comfort of people walking and bicycling.

Highway and Arterial Network. Connect SoCal includes capital improvements that will address the choke points and gaps in the system, to ensure the system is operating optimally and provides adequate and equitable access to opportunities. Connect SoCal emphasizes working with partner implementing agencies to prioritize projects that preserve and optimize the existing highway and arterial network. Projects include interchange improvements, auxiliary lanes, general purpose lanes, carpool lanes, toll lanes and Express/HOT lanes.

Regional Express Lane Network. The regional express lane network integrates congestion pricing to optimize existing capacity on freeways and offer users greater travel time reliability and choices. The regional express lane network included in Connect SoCal builds on the successful implementation of the I-10 and I-110 Express Lanes in Los Angeles County and the recent extension of the SR-91 Express Lanes between Orange and Riverside Counties. Additional efforts underway include planned express lanes on the I-105 in Los Angeles County, the I-15 in Riverside County, the I-15 and the I-10 in San Bernardino County and the I-405 in Orange County and Los Angeles County.

Goods Movement. SCAG has developed key strategies to realize a regional vison that maintains regional economic competitiveness, promotes job creation and retention, increased freight mobility and safety, and mitigating environmental impacts. The key strategies include:

- Infrastructure investments to improve freight mobility

- Last mile freight
- Workforce development
- Truck bottleneck relief strategies
- Goods movement warehouse distribution
- Goods movement environmental strategies

Specific details of these goods movement strategies can be found in the Goods Movement Technical Report.[6]

Aviation. Connect SoCal focuses on air passenger and cargo activity from the perspective of how the traffic coming and going from the airports affects the region's roads, highways, and transit systems, and how to improve ground transportation access to the airport. Strategies include working with airports and transportation agencies on airport ground access projects, effective analysis and planning, and facilitating ongoing communication and collaboration between airports, transportation agencies and government.

Technological Innovations and Emerging Technologies. Emerging technologies in transportation and mobility are primarily developed and advanced by the private sector but can be accelerated and promoted by government regulation and incentives, and it is important that public agencies monitor the development of such innovations. Emerging technology in transportation and mobility are themes threaded throughout Connect SoCal. SCAG has completed wide-ranging analysis of recent and emerging technologies principally associated with light-duty vehicles that could potentially impact travel behavior and location choices in the region over the next 25 years.

SCAG recognizes that many new technologies provide consumer solutions and have made inroads in public acceptance due to advancements in smartphones, mobile banking, navigational apps and social networking. Improvements in regional mobility will therefore be derived from how technology is used rather than from any individual technological development. Moreover, strategies to use the benefits of emerging technologies to advance Connect SoCal goals should be viewed through the lens of improving health, safety, equity and mobility outcomes.

Sustainable Communities Strategy

As part of the state's mandate to reduce per-capita GHG emissions from automobiles and light trucks, Connect SoCal presents strategies and tools that are consistent with local jurisdictions' land use policies and incorporate best practices for achieving the state-mandated reductions in GHG emissions at the regional level through reduced per-capita vehicle miles traveled (VMT). The following strategies are

[6] https://scag.ca.gov/sites/main/files/file-attachments/0903fconnectsocal_goods-movement.pdf?1606001690

intended to be supportive of implementing the regional Sustainable Communities Strategy (SCS). Several are directly tied to supporting related GHG reductions while others support the broader goals of Connect SoCal:

Focus New Growth Near Destinations and Mobility Options

- Emphasize land use patterns that facilitate multimodal access to work, educational and other destinations
- Focus on a regional jobs/housing balance to reduce commute times and distances and expand job opportunities near transit and along center-focused main streets
- Plan for growth near transit investments and support implementation of first/last mile strategies
- Promote the redevelopment of underperforming retail developments and other outmoded nonresidential uses
- Prioritize infill and redevelopment of underutilized land to accommodate new growth, increase amenities and connectivity in existing neighborhoods
- Encourage design and transportation options that reduce the reliance on and number of solo car trips (this could include mixed uses or locating and orienting close to existing destinations)
- Identify ways to "right size" parking requirements and promote alternative parking strategies (e.g. shared parking or smart parking)

Promote Diverse Housing Choices

- Preserve and rehabilitate affordable housing and prevent displacement
- Identify opportunities for new workforce and affordable housing development
- Create incentives and reduce regulatory barriers for building context-sensitive accessory dwelling units to increase housing supply
- Provide support to local jurisdictions to streamline and lessen barriers to housing development that supports reduction of greenhouse gas emissions

Leverage Technology Innovations

- Promote low emission technologies such as neighborhood electric vehicles, car sharing, bike sharing and scooters by providing supportive and safe infrastructure such as dedicated lanes, charging and parking/drop-off space

- Improve access to services through technology such as telework and telemedicine as well as commuter incentives such as a "mobility wallet", an app-based system for storing transit and other multi-modal payments

- Identify ways to incorporate "micro-power grids" in communities, for example solar energy, hydrogen fuel cell power storage and power generation

Support Implementation of Sustainability Policies

- Pursue funding opportunities to support local sustainable development implementation projects that reduce greenhouse gas emissions

- Support statewide legislation that reduces barriers to new construction and that incentivizes development near transit corridors and stations

- Support cities in the establishment of Enhanced Infrastructure Financing Districts (EIFDs), Community Revitalization and Investment Authorities (CRIAs), or other tax increment or value capture tools to finance sustainable infrastructure and development projects

- Work with local jurisdictions/communities to identify opportunities and assess barriers to implement sustainability strategies

- Enhance partnerships with other planning organizations to promote resources and best practices in the SCAG region

- Continue to support long range planning efforts by local jurisdictions

- Provide educational opportunities to local decisions makers and staff on new tools, best practices and policies related to implementing the Sustainable Communities Strategy

Promote a Green Region

- Support development of local climate adaptation and hazard mitigation plans, as well as project implementation that improves community resiliency to climate change and natural hazards

- Support local policies for renewable energy production, reduction of urban heat islands and carbon sequestration

- Integrate local food production into the regional landscape

- Promote more resource efficient development focused on conservation, recycling and reclamation

- Preserve, enhance and restore regional wildlife connectivity

- Reduce consumption of resource areas, including agricultural land
- Identify ways to improve access to public park space

Transportation Control Measures (TCMs)

Connect SoCal includes, as a subset of transportation strategies, SIP-committed transportation programs and projects that reduce vehicle use or change traffic flow or congestion conditions for the purposes of reducing emissions from transportation sources and improving air quality, better known as Transportation Control Measures or "TCMs." TCMs are either one of the types listed in CAA section 108, or any other measures for the purpose of reducing emissions or concentrations of air pollutants from transportation sources by reducing vehicle use or changing traffic flow or congestion conditions. Pursuant to U.S. EPA's Transportation Conformity Regulations, vehicle technology-based, fuel-based, and maintenance-based measures which control the emissions from vehicles under fixed traffic conditions are not TCMs. In the South Coast Air Basin, TCMs include the following three main categories of transportation improvement projects and programs that have funding programmed for right-of-way and/or construction in the first two years of the 2023 FTIP:

1. Transit and non-motorized modes;
2. High Occupancy Vehicle (HOV) Lanes their pricing alternatives; and
3. Information-based Transportation Strategies.

Connect SoCal includes TCM type projects throughout the entire planning horizon (i.e., 2045) and are all part of the regional transportation strategy for the 2024 PM2.5 SIP. Those TCM type projects which have funding programmed for right of way or construction in the first two years of the prevailing FTIP are considered "committed" for air quality planning purposes in the applicable SIP. Per U.S. EPA's Transportation Conformity Regulations, these committed TCMs are required to receive funding priority and be implemented in a timely manner. In the event that a committed TCM cannot be delivered or will be significantly delayed, the TCM must be substituted for. It is important to note that as the SCAG's FTIP is updated every two years, new committed TCMs are automatically added to the applicable SIP from the previous FTIP. As a result of the TCM "rollover process," thousands of committed TCM projects have been implemented over the last two decades. The "rollover" of TCMs updates the AQMPs/SIPs to include new projects in addition to ongoing projects from previous FTIPs. As the FTIP gets adopted every two years, new TCMs emerge and completed TCMs get removed.

Plan Emissions Reduction Benefits

Based on the travel activity projections generated from SCAG's Regional Travel Demand Model, an estimate of emissions associated with on-road mobile sources can be generated using CARB's Emission Factor Model (EMFAC). Through this process, future emissions from on-road mobile sources can be compared for the regional transportation system assuming implementation of the Connect SoCal versus the baseline (without Connect SoCal implementation). It is generally understood that potential future improvements in air quality deriving from Connect SoCal will likely be much smaller, since motor vehicle emissions have and will continue to be substantially reduced through technology (i.e., emission standards for new engines and in-use standards for existing fleets).

Under two different assumptions on future vehicle technology, Tables IV-B-1 and IV-B-2 compare VOC (ROG), ~~and~~ NOx, and PM2.5 emissions between implementation of Connect SoCal and the Connect SoCal Baseline[7] for the following years: 2025, 2035, and 2045. Specifically, the emission reduction benefits shown in Table IV-B-1 are based on the assumption that the EMFAC2021~~17~~ vehicle fleet mix and emission factors in the future years remain the same as in 2016 (the Connect SoCal base year); while the emission reduction benefits shown in Table IV-B-2 factor in the future improvements in the fleet mix and emission factors as reflected in the EMFAC2021~~17~~. Note that the Connect SoCal emission reductions in Tables IV-B-1 and IV-B-2 are not double-counted toward the emission reductions presented in the main report of the 2024 PM2.5 SIP because Connect SoCal is considered in the SIP air quality modeling baseline.

As shown in Table IV-B-1, if the future vehicle fleet mix and emission factors are held constant as those in the Connect SoCal base year 2016, Connect SoCal is estimated to yield a reduction in NOx emissions by about ~~1.5~~ 2.0 tons per day (tpd) in 2025, ~~4~~5.1 tpd in 2035, and 6.9~~8~~ tpd in 2045 compared with their respective Baselines without Connect SoCal. However, if accounting for mandated future improvement in vehicle fleet mix and emission factors, the estimated NOx reduction from Connect SoCal is reduced substantially by more than ~~half~~ 65 percent in 2025 to more than 94 percent in 2045, as shown in Table IV-B-2, because the vehicles as a whole are becoming much cleaner and reduction of every vehicle mile traveled from Connect SoCal yields less NOx reduction.

[7] Connect SoCal Baseline is defined as the future transportation system that will result from current programs without Connect SoCal's land use and transportation strategies. For Connect SoCal, the Baseline is based upon the adopted 2019 FTIP

TABLE IV-B-1
REGIONAL TRANSPORTATION EMISSIONS (ANNUAL AVERAGE) (TONS PER DAY)
ASSUMING CONSTANT 2016 VEHICLE FLEET MIX AND EMISSION FACTORS

	VOC (ROG)			NOx			PM2.5		
	2025	2035	2045	2025	2035	2045	2025	2035	2045
Connect SoCal	~~97.2~~107.5	~~99.9~~105.3	~~103.4~~105.6	~~227.2~~232.9	~~248.9~~224.9	~~280.5~~225.3	6.2	6.1	6.2
Connect SoCal Baseline	~~99.0~~109.5	~~104.2~~110.0	~~110.0~~106.6	~~228.8~~235.0	~~253.0~~230.0	~~287.3~~232.2	6.3	6.2	6.4
Connect SoCal Reduction	~~1.8~~ -2.0	~~4.4~~ -4.7	~~6.5~~ -1.0	~~1.5~~ -2.0	~~4.1~~ -5.1	~~6.8~~ -6.9	-0.1	-0.2	-0.2

~~Note: Calculated with EMFAC2017 Emission Model~~

Note: Calculated with EMFAC2021 Emission Model; PM2.5 emissions do not include fugitive dust.

TABLE IV-B-2
REGIONAL TRANSPORTATION EMISSIONS (ANNUAL AVERAGE) (TONS PER DAY)
BASED ON VEHICLE FLEET MIXES AND EMISSION FACTORS AS REFLECTED IN
~~EMFAC2017~~EMFAC2021

	VOC (ROG)			NOx			PM2.5		
	2025	2035	2045	2025	2035	2045	2025	2035	2045
Connect SoCal	~~51.1~~59.3	~~36.5~~42.2	~~31.8~~36.3	~~80.7~~75.2	~~66.6~~44.2	~~71.5~~37.4	3.9	3.6	3.7
Connect SoCal Baseline	~~52.0~~60.3	~~38.1~~44.0	~~33.8~~36.4	~~81.4~~75.9	~~67.7~~45.2	~~73.4~~37.8	3.6	3.8	3.7
Connect SoCal Reduction	~~0.9~~ -1.0	~~1.6~~ -1.8	~~2.0~~ -0.1	~~0.6~~ -0.7	~~1.1~~ -1.0	~~2.0~~ -0.4	-0.1	-0.1	0.0

~~Note: Calculated with EMFAC2017 Emission Model~~

Note: Calculated with EMFAC2021 Emission Model; PM2.5 emissions do not include fugitive dust.

TCM Emissions Reduction Benefits

To estimate the emission benefits of TCMs, the socio-economic data variables of Connect SoCal were held constant while the transportation network was modified to account for the TCMs in Connect SoCal (both TCM-type projects and committed TCMs). In other words, the TCM emissions reduction benefits are the difference between Connect SoCal with TCMs and Connect SoCal without TCMs. It should be noted that this analysis is done for illustrative purposes, as the regional transportation strategy is appropriately viewed on a systems-level basis, and not by its components since each of the individual transportation improvements and strategies affect each other and the system. Further, it should be noted that the TCM emission reductions in Tables IV-B-3 and IV-B-4 are not double-counted toward the emission reductions presented in the main report of the 2024 PM2.5 SIP because the TCMs are part of Connect SoCal which is considered in the SIP air quality modeling baseline.

Under the same two different assumptions on future vehicle technology, Tables IV-B-3 and IV-B-4 show the results of the TCM modeling analysis for years 2021 and 2035 (which covers the 2012 $PM_{2.5}$ Serious attainment year of 2025 and the extended attainment year of 2030). Specifically, the emission reduction benefits shown in Table IV-B-3 are based on the assumption that the EMFAC2021~~17~~ vehicle fleet mix and emission factors in the future years remain the same as in 2016 (the Connect SoCal base year); while the emission reduction benefits shown in Table IV-B-4 factor in the future improvement in the fleet mix and emission factors as reflected in the EMFAC2021~~17~~.

As shown in Tables IV-B-3 and IV-B-4 and compared to previous AQMPs/SIPs, potential future improvements in air quality deriving from TCMs are consistently diminishing for two reasons. On one hand, motor vehicle emissions have and will continue to be substantially reduced through technology. On the other hand, most of the TCM projects in the South Coast Air Basin have been adopted into the SIP and have already been implemented. Thus, the emission reductions associated with these projects are now included in the Connect SoCal baseline emissions and no longer show up in the TCM benefit values.

TABLE IV-B-3
TCM EMISSIONS (ANNUAL AVERAGE) (TONS PER DAY)
ASSUMING CONSTANT 2016 VEHICLE FLEET MIX AND EMISSION FACTORS

	VOC (ROG)		NOx		PM2.5	
	2021	2035	2021	2035	2021	2035
Connect SoCal	~~96.6~~ 109.2	~~99.9~~ 105.3	~~215.8~~ 225.6	~~268.0~~ 224.9	6.0	6.1
Connect SoCal without TCM	~~97.1~~ 109.9	~~101.1~~ 106.6	~~216.2~~ 231.9	~~269.3~~ 226.3	6.2	6.1
TCM Reduction	~~0.5~~ -0.7	~~1.2~~ -1.3	~~0.4~~ -6.3	~~1.3~~ -1.4	-0.2	-0.1

~~Note: Calculated with EMFAC2017 Emission Model~~

Note: Calculated with EMFAC2021 Emission Model; PM2.5 emissions do not include fugitive dust.

TABLE IV-B-4
TCM EMISSIONS (ANNUAL AVERAGE) (TONS PER DAY)
BASED ON VEHICLE FLEET MIXES AND EMISSION FACTORS AS REFLECTED IN ~~EMFAC2017~~ EMFAC2021

	VOC (ROG)		NOx		PM2.5	
	2021	2035	2021	2035	2021	2035
Connect SoCal	~~63.9~~ 75.1	~~36.5~~ 42.2	~~119.7~~ 116.0	~~66.6~~ 44.2	4.3	3.6
Connect SoCal without TCM	~~64.2~~ 75.4	~~36.9~~ 42.7	~~120.0~~ 117.8	~~66.9~~ 44.5	4.3	3.7
TCM Reduction	~~0.3~~ -0.3	~~0.4~~ -0.4	~~0.3~~ -1.8	~~0.3~~ -0.3	0.0	0.0

~~Note: Calculated with EMFAC2017 Emission Model~~

Note: Calculated with EMFAC2021 Emission Model; PM2.5 emissions do not include fugitive dust.

Plan Investment

To accomplish the ambitious goals of Connect SoCal through 2045, SCAG forecasts expenditures of $638.9 billion. Forecasted revenues comprise both existing and several new funding sources that are reasonably expected to be available for Connect SoCal through its horizon year of 2045, which together total $638.9 billion. Reasonably available revenues include adjustments to federal gas tax rates, and replacement of gas taxes with more direct mileage-based user fees (or equivalent fuel tax adjustment). These and other categories of funding sources were identified as reasonably available on the basis of their potential for revenue generation, historical precedence and the likelihood of their implementation within the time frame of Connect SoCal. In accordance with federal guidelines, the Connect SoCal includes strategies for ensuring the availability of these sources.

Cost-Benefit Analysis

Implementation of Connect SoCal will secure a safe, efficient, sustainable and prosperous future for the SCAG region. To demonstrate how effective Connect SoCal would be toward achieving our regional goals, SCAG conducted a Connect SoCal vs. Connect SoCal Baseline cost-benefit analysis – essentially comparing how the region would perform with and without implementation of the Connect SoCal.

The cost-benefit analysis utilizes the Cal-B/C Model to calculate regional network benefits. It calculates and aggregates scenario benefits after travel impacts are evaluated using a regional travel demand model. SCAG's regional travel demand model data for Connect SoCal was summarized in one mile per hour (1-mph) speed bins to facilitate analysis. The benefit/cost ratio compares the incremental benefits with the incremental costs of multimodal transportation investments. The benefits are divided into the following four categories:

- Travel time savings resulting from reduced travel delay

- Air quality improvements
- Safety improvements
- Reductions in vehicle operating costs

For these categories, the economic values and parameters found in Cal-B/C Model are utilized in conjunction with SCAG's regional travel demand model outputs to estimate the benefits of Connect SoCal compared with the Baseline alternative. Most of these benefits are a function of changes in VMT and Vehicle Hours Traveled (VHT). Not all impacts are linear, as reductions in congestion may potentially either increase or decrease vehicle operating costs and emissions. Delay savings are reflected directly in the VHT statistics.

To estimate the benefit/cost ratio, the benefits in each category are converted into dollars and added together. These are then divided by the total incremental costs of the Connect SoCal transportation system investments to generate a ratio.

The results of the benefit/cost analysis indicate that the investments contained in Connect SoCal provide a return of $2.06 for every dollar invested. For this analysis, all benefits and costs are expressed in 2016 dollars. Benefits are estimated over the 25-year Connect SoCal planning period from 2020 to 2045. The user benefits are estimated using the Cal-B/C benefit/cost framework and incorporate SCAG Regional Travel Demand Model outputs. The costs include the incremental capital expenditures over the entire Connect SoCal planning period. Further information on the economic values represented in the Cal-B/C Model can be found at the following:

https://dot.ca.gov/programs/transportation-planning/economics-data-management/transportation-economics

Compared with the alternative without the Plan, Connect SoCal would result in significant benefits to our region, not only with respect to mobility and accessibility, but also in the areas of air quality, economic growth and job creation, sustainability and environmental justice. Some of the benefits of Connect SoCal implementation include:

- Increase the combined percentage of work trips made by carpooling, active transportation, and public transit by 3 percent, with a commensurate reduction in the number of commuters traveling by single-occupancy vehicle.
- Reduce VMT per capita by 5 percent and vehicle hours traveled per capita by 9 percent (for automobiles and light/medium-duty trucks) as a result of regional transit service.
- Increase transit use for work trips by 2 percent, as a result of improved transit service and more transit-oriented, mixed-use development.
- Reduce travel delay per capita by 26 percent.

- Create more than 264,500 new jobs annually due to enhanced economic competitiveness and improved overall regional economic performance. This more competitive economic environment would be the result of an improved regional transportation system and reduced levels of congestion.
- Reduce greenfield development by 29 percent. Conservation of open space and agricultural lands are achieved by focusing new residential and commercial development in higher density areas already equipped with the requisite urban infrastructure.
- Increase the share of new regional household growth occurring in High Quality Transit Areas (HQTAs) by 6 percent, and increase the share of new job growth in HQTAs by about 15 percent. With more people living and working in locations near convenient and efficient transit options, congestion levels will be reduced accordingly.

Connect SoCal prioritizes the attainment of all applicable federal and state performance requirements. The plan meets all federal and state performance requirements. The plan meets all federal provisions for transportation conformity as defined under the federal CAA and therefore demonstrates transportation conformity. Connect SoCal achieves per capita GHG emission reductions relative to 2005 levels of eight percent in 2020, and 19 percent in 2035, thereby meeting the GHG reduction targets established by the California Air Resources Board (ARB) for the SCAG region.

For more details of the cost-benefit analysis of Connect SoCal, please refer to 1) Chapter 5: Measuring Our Progress, 2) Economic and Job Creation Analysis Technical Report, and 3) Performance Measures Technical Report (https://scag.ca.gov/read-plan-adopted-final-plan).

Section III. TCM Best Available Control Measure (BACM)/Most Stringent Measure (MSM) Analysis

Introduction

The South Coast Air Basin has been reclassified as a Serious nonattainment area under the 2012 fine particulate matter (PM2.5) NAAQS, effective December 9, 2020. Additionally, the South Coast AQMD's 2016 AQMP included a 2012 PM2.5 Serious Area SIP that demonstrated attainment by 2025. However, due to significant concerns raised by the US EPA regarding the PM2.5 SIP in response to a lawsuit filed against U.S. EPA for failure to act on the SIP, the South Coast AQMD withdrew the SIP to prevent U.S. EPA disapproval and initiated the development of a new SIP. Furthermore, the new SIP needs and will include a request to extend the attainment date to 2030, consistent with CAA Section 188(e), to allow more time for implementation. As a result, the South Coast Air Basin is required to implement BACM and MSM, including TCM, for the control of direct PM2.5 and PM2.5 precursors from on-road mobile sources. This section serves as the TCM BACM and MSM component for the South Coast 2012 $PM_{2.5}$ standard SIP.

While there is not a formal federal guidance on TCM BACM or MSM, the U.S. EPA has provided general guidance on the process of identifying measures that constitute BACM and MSM for PM2.5 nonattainment areas based on Subpart 4, as described in its proposed rule for implementing the 2012 PM2.5 NAAQS. The rule was finalized and published in the Federal Register on August 24, 2016.[8]

The final rule establishes the following four-step PM2.5 BACM/BACT selection process mirroring the four-step PM10 BACM/BACT selection process for PM10 Serious nonattainment areas:

Step 1: Develop a comprehensive inventory of sources and source categories of directly emitted PM2.5 and PM2.5 precursors.

Step 2: Identify potential control measures.

Step 3: Determine whether an available control measure or technology is technologically feasible.

Step 4: Determine whether an available control technology or measure is economically feasible.

U.S. EPA's final PM2.5 rule clarifies that BACM is generally independent of attainment to reaffirm U.S. EPA's past interpretation of BACM as "those measures that best control sources' emissions without regard to whether such measures are needed for the purposes of attainment of the relevant NAAQS." In other words, "the test for BACM puts a 'greater emphasis on the merits of the measure or technology alone,' rather than on 'flexibility in considering other factors,' in contrast to the approach for determining RACM." BACM "should represent a more stringent and potentially more costly level of control" compared with RACM. U.S. EPA expects the BACM analysis, at least, to examine all measures analyzed in the RACM analysis. In addition, BACM should include control measures "not previously considered RACM for the area, as well as additional measures not previously evaluated in the RACM/RACT analysis." To identify new measures for consideration in a BACM analysis, U.S. EPA recommends evaluation of both existing and potential control measures from a wide range of sources such as other PM nonattainment areas throughout the country as well as summaries of control measures developed by regional planning organizations, state and local air quality consortia.

The final rule also establishes a four-step process for determining MSM, similar to the process for determining BACM but applying more stringent feasibility criteria with longer implementation timeline:

Step 1: Update emissions inventories;

Step 2: Identify potential MSM;

Step 3: Compare MSM to control measures already adopted in the SIP for the nonattainment area; and

[8] 81 FR 58010, August 24, 2015 (https://www.gpo.gov/fdsys/pkg/FR-2016-08-24/pdf/2016-18768.pdf)

Step 4: Adopt and implement any MSM that are more stringent than any measures that are already approved into the SIP.

Significantly, the final rule clarifies that the MSM requirement may not result in more controls or more emissions reductions than those resulting from the implementation of BACM, because BACM represents the best level of control feasible. Nonetheless, the final rule further clarifies that any measures that were rejected during the BACM analysis are required to be reanalyzed to see if they are feasible given the extended attainment date or improved feasibility overtime.

Additional guidance on issues to be considered in a TCM BACM and MSM demonstration can be found in the proposed or final actions that U.S. EPA has recently promulgated over various Serious area PM2.5 SIPs, particularly those for the South Coast Air Basin and the San Joaquin Valley.

Effective March 14, 2019, U.S. EPA issued its final approval[9] of the TCM BACM demonstration under the 2006 PM2.5 NAAQS Serious classification as part of its final approval of portions of the South Coast AQMD's 2016 AQMP, as detailed in the U.S. EPA's proposed action[10] on October 3, 2018. In its evaluation and approval of the TCM BACM demonstration, U.S. EPA highlighted two primary justifications: (1) A standardized program has been adopted by SCAG to continuously select and fund cost effective TCMs; and (2) The significant increase in funding for TCMs is guaranteed within the SIP implementation timeframe and beyond by the local transportation sales tax measures in the four counties in the South Coast air basin. U.S. EPA also acknowledged that SCAG's four-step TCM BACM analysis approach below is consistent with EPA guidance:

1) A review of the on-going implementation of TCMs in the South Coast;
2) A review of TCMs implemented in other moderate and serious $PM_{2.5}$ and serious PM_{10} nonattainment areas throughout the country;
3) A review of TCM measures that are not implemented in the SCAG region and the justifications for not implementing them; and
4) TCM BACM conclusions.

It is important to note that, as stated in the 2016 AQMP Appendix IV-C, SCAG's TCM BACM demonstration in the 2016 AQMP was prepared to address both the 2006 PM2.5 and the 2012 PM2.5 NAAQS Serious classification.

On March 27, 2020, U.S. EPA proposed to approve the TCM BACM and MSM demonstration in the San Joaquin Valley's Serious Area PM2.5 SIP to address the 2006 $PM_{2.5}$ standards.[11] In the proposed rule, due

[9] 84 FR 3305, February 12, 2019 (https://www.govinfo.gov/content/pkg/FR-2019-02-12/pdf/2019-01922.pdf)

[10] 83 FR 49872, October 3, 2018 (https://www.govinfo.gov/content/pkg/FR-2018-10-03/pdf/2018-21560.pdf)

[11] 85 FR 17382, May 12, 2020 (https://www.govinfo.gov/content/pkg/FR-2020-05-12/pdf/2020-09731.pdf)

to "substantial overlap in the source categories and controls evaluated for BACM and those evaluated for MSM," U.S. EPA presented their evaluation of the TCM BACM and TCM MSM together.

The U.S. EPA's evaluation of TCMs in the PM2.5 SIP cited that: (1) The current efforts of the eight MPOs to implement cost-effective TCMs following the Congestion Mitigation and Air Quality (CMAQ) cost effectiveness policy adopted by the MPOs and in the development of each RTP in the San Joaquin Valley; (2) The adopted policy provides a standardized process for distributing 20 percent of the CMAQ funds to projects that meet a minimum cost-effectiveness threshold, beginning in fiscal year 2011; and (3) The MPOs reevaluated the minimum cost-effectiveness standard during the development of their 2018 RTPs and 2019 FTIPs and concluded that they were implementing all reasonable TCMs. The U.S, EPA's review concluded that "these TCMs implement BACM and MSM for transportation sources" in the San Joaquin Valley, because the evaluation process followed by the Air District to identify potential TCM BACM and MSM are generally consistent with the $PM_{2.5}$ SIP Requirements Rule; District's evaluation of potential TCM is appropriate; The District have provided reasoned justifications for their rejection of potential measures based on technological or economic infeasibility. However, it is important to note that the TCM BACM and MSM demonstration is not included in EPA's final approval, effective August 21, 2020, of the San Joaquin Valley's Serious Area $PM_{2.5}$ Plan to address the 2006 PM2.5 standards.[12]

On July 14, 2023, U.S. EPA published in the Federal Register its proposed approval of portions of the San Joaquin Valley's Serious Area PM2.5 Plan to address the 1997 PM2.5 standards including the TCM BACM demonstration.[13] The U.S. EPA's review of TCM in the 1997 PM2.5 SIP notes that: (1) The current efforts of the eight MPOs to implement cost-effective TCMs following the Congestion Mitigation and Air Quality (CMAQ) cost effectiveness policy adopted by the MPOs and in the development of each RTP in the San Joaquin Valley; (2) The adopted policy provides a standardized process for distributing 20 percent of the CMAQ funds to projects that meet a minimum cost effectiveness threshold beginning in fiscal year 2011; and (3) The MPOs reevaluated the minimum cost effectiveness standard during the development of their 2018 RTPs and 2019 FTIPs and concluded that they were implementing all reasonable TCMs. The U.S. EPA's review concluded that "these TCMs implement BACM for transportation sources," because the evaluation process followed by the District to identify potential TCM BACM are generally consistent with the PM2.5 SIP Requirements Rule; District's evaluation of potential TCM is appropriate; The District have provided reasoned justifications for their rejection of potential measures based on technological or economic infeasibility; And all reasonable TCMs are being implemented and additional TCMs are being considered by the MPOs as part of the CMAQ cost effectiveness policy. U.S. EPA also acknowledged strategies adopted by the MPOs to meet their SB375 greenhouse gas reduction targets.

Based on the applicable U.S. EPA guidance outlined above and primarily following the approach of the approved TCM BACM demonstration in the South Coast AQMD's 2016 AQMP, the following five-step approach is used to determine BACM and MSM for TCMs in the South Coast Air Basin:

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[12] 85 FR 44192, July 22, 2020 (https://www.govinfo.gov/content/pkg/FR-2020-07-22/pdf/2020-14471.pdf)
[13] 88 FR 45276, July 14, 2023 (https://www.govinfo.gov/content/pkg/FR-2023-07-14/pdf/2023-14687.pdf)

1) A review of emission reductions from implementation of TCMs in the South Coast;
2) A review of the on-going implementation of TCMs in the South Coast;
3) A review of TCMs implemented in other moderate and serious PM2.5 and serious PM10 nonattainment areas throughout the country;
4) A review of TCM measures that are not implemented in the SCAG region and the justifications for not implementing them; and
5) TCM BACM and MSM conclusions.

Review of Emission Reduction from Implementation of TCMs in the South Coast

Although it is for illustrative purposes, the implementation of all TCMs in the South Coast is roughly estimated to yield a reduction of only about 0.3-0.4 tpd of VOC or NOx emissions annually from 2021 through 2035. The analysis and the reasons behind such a moderate and decreasing TCM impact is detailed under the subsection “TCM Emissions Reduction Benefits” under the previous Section II. Regional Transportation Plan/Sustainable Communities Strategy and Transportation Control Measures (TCMs).

Given the nature of TCMs as either one of the types listed in CAA section 108, or any other measures to reduce vehicle use or change traffic flow or congestion conditions, the potential effect of TCMs is likely to be further reduced overtime in California, particularly in the South Coast region. This is primarily thanks to the increasingly stringent regulatory requirements and higher incentives offered by both the ARB and the South Coast AQMD to accelerate zero-emission transformation of personal transportation in the near future and goods movement over the longer term.

Review of On-Going Implementation of TCMs in the South Coast Air Basin

In the South Coast Air Basin, TCM projects and programs are defined in the following three main categories per the applicable SIPs as documented in the SCAG’s Final 2023 FTIP Guidelines:

- Transit, Intermodal Transfer Facilities, and Non-motorized Transportation Mode Facilities
- High Occupancy Vehicle (HOV) Lanes, High Occupancy Toll (HOT) Lanes, and their pricing alternatives
- Information-based Transportation Strategies

TCM Selection and TCM Rollover Process – TCMs in the South Coast Air Basin are developed[14] through a continuous and exhaustive process that replaced a typical process that developed TCMs each time a SIP was produced. Projects identified as TCMs in the RTP/SCS are tracked as they get programmed in the FTIP. Only projects that have money programmed for right-of-way and/or construction in the first two years of the FTIP are considered TCMs subject to the Clean Air Act timely implementation requirements. Approximately every two years, as the FTIP is updated, additional TCMs will be added to the South Coast AQMPs/SIPs based on the new FTIP and the FTIP Guidelines. The "rollover" of TCMs automatically updates the AQMPs/SIPs to include new projects in addition to ongoing projects from previous FTIPs. The "rollover" is monitored for adherence to the schedule established in the FTIP at the time a project is identified as a committed TCM. The identification of TCMs from the FTIP is agreed upon by both SCAG and the appropriate CTCs. As the FTIP gets adopted every two years, new TCMs emerge and completed TCMs get removed. This rollover process was included in the 1994 SIP and approved by the US EPA. The rollover process has been refined in the FTIP Guidelines adopted with every FTIP. The rollover process has worked remarkably well, and has resulted in hundreds of TCMs being implemented/constructed. Thus, the rollover process produces much more than RACM would produce and meets both BACM and MSM. This rollover process ensures that RTP/SCS projects that are potential TCMs will, through the rollover process, eventually become committed TCMs.

To illustrate the extraordinary past and future impact of the TCM rollover process, Table IV-B-4 summarizes the magnitude of major TCM infrastructure in the following four years:

- 2020: first year of the 2020 RTP/SCS
- 2025: statutory attainment year of 2012 $PM_{2.5}$ standards serious nonattainment area
- 2030: extended attainment year of 2012 $PM_{2.5}$ standards Serious nonattainment area
- 2045: planning horizon year of 2020 RTP/SCS

It shows that over the 25-year planning period, high occupancy lane miles will increase by 65 percent, transit bus operations will increase by more than 19,000 miles, express bus operations will increase by

[14] Rollover History: In the 1979 SIP, there were six TCMs adopted, most of which relied on Federal funding allocated or being allocated. However, in 1980, with the change in federal administration, all the federal funds were removed. So in the then new 1982 SIP, the 1979 measures were withdrawn, and new measures were adopted and subsequently approved by U.S. EPA. However, a lawsuit challenged the 1982 SIP and a court agreed and threw out the 1982 SIP, including the TCMs. The result was the 1979 TCMs were still operative, and until 1994 those TCMs had to be reported on for timely implementation. New AQMPs were developed and adopted, but lawsuits resulted in U.S. EPA having to do a Federal Implementation Plan (FIP). While the FIP was under development, the 1990 CAA amendments were passed. A lawsuit challenged the FIP process as being superseded by the new CAA amendments. However, a judge denied the challenge. Congress subsequently removed that FIP

As the 1993 SIP was being developed, all the parties desired a process that would be comprehensive and fully funded. Thus, the rollover process, with its guaranteed funding in the first two years of the TIP, was agreed upon and included in the SIP that was approved by U.S. EPA in 1994 about 9,000 miles, and both transit rail miles and bike lane miles will increase by about 180 percent respectively.

TABLE IV-B-5

MAGNITUDE OF MAJOR TCM INFRASTRUCTURE IN SCAG REGION 2020–2045

TCM Infrastructure Indicator	First Year (2020)	Attainment Year (2025)	Extended Attainment Year (2030)	Horizon Year (2045)	2020–2045 Increase	
					#	%
HOV and HOT Lanes (lane miles)	1,137	1,324	1,589	1,879	742	65%
Regular Transit Bus (operation miles[15])	451,464	467,478	466,010	470,896	19,437	4%
Express Bus (operation miles)	74,541	78,433	81,373	83,169	8,628	12%
Transit Rail (operation miles)	43,717	57,499	74,235	121,927	78,210	179%
Bikeway (Class 1-4) (miles)	5,069[16]	n/a	n/a	14,187	9,118	180%

TCM Funding – Funding for TCMs traditionally depended mostly on federal & state sources. But with gas tax revenues declining and both federal and state budgets constrained, local agencies in California asked the state legislature for permission to go to the voters in each county for a ½ percent sales tax for transportation. This required a two-thirds voter approval in each county, and all four counties in the South Coast Air Basin won approval. Extensions were subsequently approved in three counties: Orange County's Measure M sunsets in 2041, Riverside's Measure A sunsets in 2039 and San Bernardino County's Measure I sunsets in 2040; Los Angeles County has approved a permanent two percent sales tax (a combination of four ½ percent sales taxes - Proposition A, Proposition C, Measure R, and Measure M) as Measure M increases to one percent as Measure M sunsets in 2039.

As a result of these remarkable local sales tax measures, the mix of revenues in the current six-year 2023 FTIP is $21.8 billion local (60 percent), $8.5 billion state (24 percent), and $5.6 billion federal (16 percent) (see Figure 1); while in the last adopted 25-year 2020 RTP/SCS, the mix is $297.2 billion local (60.3 percent) (of which 69 percent is local sales tax), $154.8 billion state (31.4 percent), and $41.1 billion federal (8.3 percent). Note that the funding from the federal CMAQ program accounted for only about 13 percent of all federal transportation funding according to SCAG Revenue Model 2020 and will decline over the life of

[15] A transit route's operations miles or service miles is calculated by the number of transit services during a day times the route length

[16] Existing

the 2020 RTP/SCS due to the region achieving attainment or reducing the severity level of applicable air pollutants.

These local revenues fund mostly capital expenditures for TCM projects. For example, in the current 2023 FTIP, transit projects receive $8.8 billion, ITS/TDM/non-motorized about $2.7 billion, and HOV projects $459 million. In the 2020 RTP/SCS, transit projects receive $66.8 billion, passenger rail $53.3 billion, active transportation $17.7 billion, HOV/HOT lanes $13.4 billion, and TDM $7.3 billion. Major transit and passenger rail projects include the Metro Rail Regional Connector, the Crenshaw/LAX Line, the OC Street Car, the Arow/Redlands Rail, Metrolink's Southern California Optimized Rail Expansion (SCORE), and the Link Union Station (LinkUS). Major HOV/HOT lanes projects include HOV to HOT lane conversion and new HOT lane on I-405 in Orange County, new Express Lanes on I-10 in San Bernardino County, new HOV lane on US-101 in Ventura County, and new Express Lanes on I-15 in Riverside County.

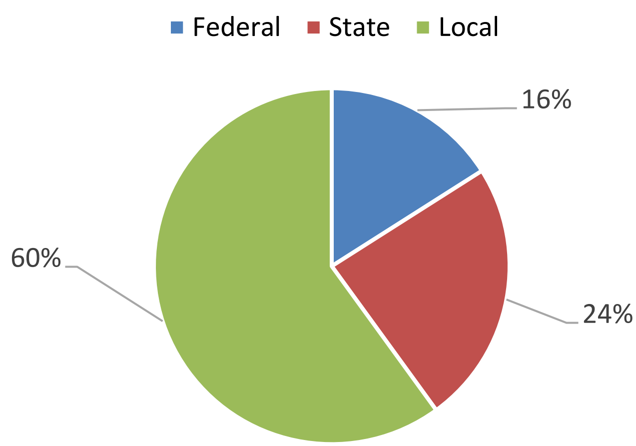

FIGURE IV-B-1
SUMMARY OF 2023 FTIP BY FUNDING SOURCE

Extraordinary efforts were undertaken to pass local sales taxes for transportation in each county (even after some did not reach the two-thirds necessary for approval, all subsequently met the approval threshold) and were successful. The effort to organize and pass these local sales taxes goes well beyond what could have been expected and provides substantial funding for TCMs which could not have been built without these local efforts. These efforts are certainly BACM and MSM, not just in revenue raised but without which, few of the major TCMs in transit rail, HOV, etc. could have been financed and constructed.

In summary, SCAG's robust and continuous TCM selection process and extraordinary local funding commitments clearly satisfy the latest criteria that U.S. EPA used to evaluate the TCM BACM and MSM demonstrations for the San Joaquin Valley and the South Coast PM2.5 Serious nonattainment areas:

- Adoption and enhancement of programs that reduce trips, travel and/or congestion – SCAG's rollover process ensures steady TCM infrastructure improvements through 2045 that will provide these reductions.
- Adoption of a standardized program to select cost-effective control measures – SCAG's FTIP Guidelines emphasize requirements for County assessments of control measure cost-effectiveness in TCM development and selection.
- TCM funding commitments – SCAG's multiple and long-term local sales tax commitments ensure substantial amount of guaranteed fund to implement TCM projects.

It is important to note that, as summarized in the previous Section II. Regional Transportation Plan/Sustainable Communities Strategy and Transportation Control Measures (TCMs), SCAG's 2020 RTP/SCS also includes an ambitious SCS to achieve the mandated 2035 regional GHG emissions reduction target set by ARB through reduced per-capita vehicle miles traveled (VMT) from automobiles and light trucks.

Finally, it is important to note that SCAG updates and adopts a Public Participation Plan every RTP/SCS cycle to guide the development of RTP/SCS and FTIP. The adopted Public Participation Plan ensures extensive interagency consultation, public outreach, open houses, web access, opportunity for comment and public participation in TCM development and selection.[17]

Review of TCMs Implemented in Other Moderate and Serious PM2.5 and Serious PM10 Nonattainment Areas

SCAG performed a comprehensive review of available TCMs in California, as well as in other states. The review encompassed SIPs for all the other Moderate and Serious $PM_{2.5}$ nonattainment areas and all Serious PM_{10} nonattainment areas. A list of the SIPs reviewed is presented in Table IV-B-6.

We also reexamined the RACMs identified in Section III. RACM Analysis of SCAG's Final 2022 AQMP Appendix IV-C. In addition, SCAG's review considered TCMs discussed and reviewed at numerous TCWG meetings as part of the 2020 RTP/SCS, 2023 FTIP, and 2022 AQMP development. Finally, SCAG considered information from the following sources:

- CAA Section 108(f)(1)(A);
- RTP and FTIP Amendments;
- Interagency Consultation (TCWG); and
- Transportation Committee, Energy and Environment Committee, and Transportation Working Group meeting materials and input

[17] http://www.scag.ca.gov/participate/Pages/PublicParticipationPlan.aspx

TABLE IV-B-6
OTHER MODERATE AND SERIOUS PM2.5 AND SERIOUS PM10 NONATTAINMENT AREA SIPS REVIEWED

Nonattainment Area	Standard and Area Designation				TCMs Included in SIP
	PM2.5			PM10	
	1997	2006	2012	1987	
Allegheny County, PA			Moderate		No
Coachella Valley, CA				Serious	No
East Kern Co, CA				Serious	No
Fairbanks, AK		Serious			No
Imperial County, CA		Moderate	Moderate		No
Klamath Falls, OR		Moderate			No
Libby, MT	Moderate				No
Liberty-Clairton, PA	Moderate	Moderate			No
Owens Valley, CA				Serious	No
Phoenix, AZ				Serious	No
Plumas County, CA			Serious		No
Provo, UT		Serious			No
Sacramento, CA		Moderate			No
Salt Lake City, UT		Serious			No
San Francisco Bay Area, CA		Moderate			No
San Joaquin Valley, CA	Serious	Serious	Serious		Yes, TCMs include: Improved Transit, High Occupancy Vehicle Lanes, Traffic Flow Improvements, Park and Ride Lots, Ridesharing/Trip Reduction Programs, and Bicycle/Pedestrian Facilities
West Central Pinal, AZ		Moderate			No
West Pinal, AZ				Serious	No

Source: U.S. EPA, https://www.epa.gov/green-book

The review found that (1) Most of those areas did not include TCMs in their respective PM SIPs; (2) No new TCMs were identified for consideration from control programs outside of the SCAG region or in public meetings within the SCAG region since South Coast's 2016 AQMP; and (3) The South Coast region has a much more robust process and commits much greater level of funding for TCMs.

Review of Candidate Measures Not Implemented in the South Coast Air Basin

As part of the TCM RACM analysis in the Final 2022 AQMP Appendix IV-C, SCAG identified 24 candidate RACM measures that were not implemented within the SCAG region. These measures are candidates for BACM and MSM and thus have been re-examined for potential implementation given the more stringent evaluation criteria and longer implementation timeline for BACM and MSM. However, the re-evaluation reaffirms that these 24 measures do not constitute BACM or MSM for the reasons listed below:

- No Authority – SCAG lacks the authority to implement the twelve (12) measures in this category. Lack of authority satisfies the technical infeasibility test for selecting BACM and MSM measures.
- No or Non-quantifiable Emission Reduction Benefits – SCAG's BACM and MSM analysis determined that no or non-quantifiable emission benefits would result from the seven (7) measures in this category. Since the key determinant of a TCM is the quantified emission benefit, these measures which cannot constitute BACM or MSM.
- Not Feasible – Infeasibility justification for this category was cited for three (3) separate measures. Since these three measures are not feasible, they cannot constitute BACM or MSM.
- Not Cost-Effective – Not cost-effective justification for this category was cited for two (2) separate measures. Measures that are not cost-effective cannot constitute BACM or MSM.

A list of these 24 measures and the justifications for not implementing them as BACM or MSM are presented in Table IV-B-7.

Conclusion

This analysis clearly demonstrates that the TCM projects being implemented in the South Coast Air Basin constitute BACM and MSM.

- Thanks to increasingly stringent regulatory requirements and increased incentives offered to accelerate zero-emission transformation of personal transportation and goods movement, the emission reduction benefit from implementation of TCM is rather moderate and is expected to diminish overtime.
- The South Coast region has been implementing a much more robust TCM selection process, has committed a much greater level of funding for TCMs particularly from local sources, has substantially

increased and will continue to dramatically increase the TCM infrastructure than other PM2.5 nonattainment areas.

- No new TCMs were identified for consideration from TCM programs outside of the South Coast region.
- The re-evaluation of the exclusion justifications for the 24 measures presented in the last TCM RACM analysis re-confirmed that they cannot be implemented as BACM or MSM because there is no authority to implement, there is no or non-quantifiable emission reduction benefits, it is not feasible, or it is not cost-effective.

TABLE IV-B-7
CANDIDATE TCMS NOT IMPLEMENTED IN SCAG BACM AND MSM ANALYSIS

Section 108(f) Type	Section 108(f) Description	Measure No.	Measure Title	Description	Has It Been Implemented	Reasoned Justification for Not Implementing Measure	BACM/MSM Exclusion Category
1	Improved Transit	1.7	Free transit during special events	Require free transit during selected special events to reduce event-related congestion and associated emission increases.	No *(The Mobile Source Air Pollution Reduction Review Committee has been co-funding free event center shuttle service demonstration projects)*	The Legislature significantly reduced authority of South Coast AQMD to implement indirect source control measures through revisions to the Health & Safety Code (HSC 40717.8). Transit agencies should decide individually whether this measure is economically feasible for them.	No Authority
1	Improved Transit	1.15	Maglev	Construct regional low-speed magnetic levitation transit	No	The region is already being serviced by light rail; Not Cost-effective.	Not Cost-Effective
3	Employer Transportation Management Plans (TMPs)	3.7	Merchant transportation incentives	Implement "non-work" related trip reduction ordinances requiring merchants to offer customers mode shift travel incentives such as free bus passes and requiring owners/managers/developers of large retail establishments to provide facilities for non-motorized modes.	No	Requires State legislation.	No Authority

Section 108(f) Type	Section 108(f) Description	Measure No.	Measure Title	Description	Has It Been Implemented	Reasoned Justification for Not Implementing Measure	BACM/MSM Exclusion Category
3	Employer TMPs	3.12	Income Tax Credit to Telecommuters	Provide tax relief to employees telecommuting.	No	Requires State legislation.	No Authority
5	Traffic Flow Improvements	5.12	Ban left turns	Banning all left turns would stop the creation of bottlenecks although slightly increase travel distances.	No	Left turns are not allowed in some heavy-traffic streets. No clear demonstration of emission reduction benefits.	No or Non-quantifiable Emission Reduction Benefits
5	Traffic Flow Improvements	5.22	55 mph speed limit during ozone season	Self-explanatory	No	Reductions in freeway speeds are governed by California Vehicle Code 22354, which authorizes Caltrans to lower speeds after doing an engineering and traffic survey, which shows that the legislatively set maximum speed of 65 mph is more than is reasonable or safe. No consideration of emissions is contemplated under this statute. This measure is not feasible until the statute is changed.	No Authority

Section 108(f) Type	Section 108(f) Description	Measure No.	Measure Title	Description	Has It Been Implemented	Reasoned Justification for Not Implementing Measure	BACM/MSM Exclusion Category
5	Traffic Flow Improvements	5.23	Require 40 mph speed limit on all facilities	Self-explanatory.	No	California Vehicle Code Sections 22357 and 22358 mandate a methodology for setting speed limits for local areas. This measure is not feasible until the statute is changed.	No Authority
5	Traffic Flow Improvements	5.24	Require lower speeds during peak periods	Self-explanatory.	No	California Vehicle Code Sections 22357 and 22358 mandate methodology for setting speed limits for local areas. This measure is not feasible until the statute is changed.	No Authority
7	Vehicle Use Restrictions	7.4	Adjust school hours so they do not coincide with peak traffic periods and ozone seasons	Measure to reduce travel during peak periods and ozone-contributing periods in the early morning.	No	School hours are dictated by many variables, including overcrowding and year-round schooling. This measure is not technically feasible.	Not Feasible
7	Vehicle Use Restrictions	7.6	Increase parking fees	Reduce driving by limiting parking through pricing measures.	No	Attorney General ruled South Coast AQMD lacks authority to implement this measure.	No Authority

Section 108(f) Type	Section 108(f) Description	Measure No.	Measure Title	Description	Has It Been Implemented	Reasoned Justification for Not Implementing Measure	BACM/MSM Exclusion Category
7	Vehicle Use Restrictions	7.9	Limit the number of parking spaces at commercial airlines to support mass transit	Reduce airport travel by limits on parking at airports.	No	Regulatory agencies do not have the legal authority to make local land use decisions. It is at the discretion of the regional or local airport authority to make local land use decisions pertaining to airports. Additionally, it is necessary to have significant mass transit available at airports before this measure can be implemented.	No Authority
7	Vehicle Use Restrictions	7.10	No Central Business District (CBD) vehicles unless LEV or alt fuel or electric	Define high-use area and ticket any vehicles present unless they are low-emitting, alternative-fueled or electric.	No	The Legislature significantly reduced authority to implement Indirect Source Control Measures through revisions to the Health & Safety Code (40717.6, 40717.8, and 40717.9).	No Authority
7	Vehicle Use Restrictions	7.14	Cash incentives to foster jobs/housing balance	Specific to locality – encouraged by California Clean Air Plan.	No	No dedicated source of funding for this measure.	Not Feasible
9	Non-Motorized Road Use	9.6	Free bikes	Provide free bikes in the manner of Boulder, CO. Simple utilitarian bikes that can be used throughout the metro area and dropped off at destination for use by anyone desiring use.	No	Bike share is being implemented in the South Coast region; free bikes are not cost-effective; In addition, evidence suggests that bicycle theft is a problem in other programs.	Not Cost-Effective

Section 108(f) Type	Section 108(f) Description	Measure No.	Measure Title	Description	Has It Been Implemented	Reasoned Justification for Not Implementing Measure	BACM/MSM Exclusion Category
9	Non-Motorized Road Use	9.9	Use condemned dirt roads for bike trails	Self-explanatory.	No	Not applicable because there are no condemned dirt roads in the region.	Not Feasible
11	Extended Idle Control Programs	11.1	Limit excessive car dealership vehicle starts	Require car dealers to limit the starting of vehicles for sale on their lot(s) to once every two weeks. Presently, a number of new and used car dealers start their vehicles daily to avoid battery failure and assure smooth start-ups for customer test drives.	No	This measure was investigated by the South Coast AQMD and it was determined that, in contrast to colder climates where vehicles are started on a daily basis, vehicles in the South Coast are started much less frequently. No clear demonstration of emission reduction benefits.	No or Non-quantifiable Emission Reduction Benefits
11	Extended Idle Control Programs	11.3	Turn off engines while stalled in traffic	Public outreach or police-enforced program.	No	This measure raises safety and congestion concerns. No clear demonstration of emission reduction benefits.	No or Non-quantifiable Emission Reduction Benefits
11	Extended Idle Control Programs	11.4	Outlaw idling in parking lots	Self-explanatory and police-enforced program.	No	No clear demonstration of emission reduction benefits.	Not or Non-quantifiable Emission Reduction Benefits

Section 108(f) Type	Section 108(f) Description	Measure No.	Measure Title	Description	Has It Been Implemented	Reasoned Justification for Not Implementing Measure	BACM/MSM Exclusion Category
11	Extended Idle Control Programs	11.5	Reduce idling at drive-throughs; ban drive-throughs	Mandate no idling or do not allow drive-through windows during ozone season.	No	No clear demonstration of emission reduction benefits.	No or Non-quantifiable Emission Reduction Benefits
14	SOV Reduction Programs	14.9	Increase State gas tax	Self-explanatory.	No	Need State legislation.	No Authority
14	SOV Reduction Programs	14.10	Pay-As-You-Drive Insurance	Self-explanatory.	No	Need State legislation. No clear demonstration of emission reduction benefits and does not advance attainment date.	No Authority
16	Voluntary Scrappage Programs	16.3	Demolish impounded vehicles that are high emitters	Self-explanatory.	No	South Coast AQMD Rule 1610 issues mobile source emission reduction credits in exchange for the scrapping of old, high emitting vehicles. No clear demonstration of emission reduction benefits due to small number of impounded old vehicles.	No or Non-quantifiable Emission Reduction

Section 108(f) Type	Section 108(f) Description	Measure No.	Measure Title	Description	Has It Been Implemented	Reasoned Justification for Not Implementing Measure	BACM/MSM Exclusion Category
16	Voluntary Scrappage Programs	16.4	Do whatever is necessary to allow cities to remove the engines of high emitting vehicles (pre-1980) that are abandoned and to be auctioned	Self-explanatory.	No	South Coast AQMD Rule 1610 issues mobile source emission reduction credits in exchange for the scrapping of old, high emitting vehicles. No clear demonstration of emission reduction benefits due to small number of abandoned or auctioned old vehicles.	No or Non-quantifiable Emission Reduction
17	Other	17.2	Promote business closures on high ozone days	Non-employer-based strategy to require local business to close on bad air quality days, thereby reducing travel.	No	No authority to implement; not economically feasible	No Authority

Attachment A: Committed Transportation Control Measures (TCMs)[18]

TABLE IV-B-A-1. LOS ANGELES COUNTY			
LEAD AGENCY	PROJECT ID	PROJECT DESCRIPTION	COMPLETION DATE
ALHAMBRA	LAMIPMR114	Replace existing traffic signal controllers with 2070 ATC traffic signal controllers and firmware at 14 signalized intersections along Atlantic Blvd from Huntington Drive to I-10 freeway. Install fiber optic cable connectivity to all signalized intersections, ethernet switches, communication hubs, vehicle detection. Update traffic signal timing and synchronization. Design a new central traffic signal management system to monitor and control all signalized intersections in the City.	7/31/2025
ALHAMBRA	LAMIPMR116	Replace existing traffic signal controllers with 2070 ATC traffic signal controllers and firmware at 20 signalized intersections along Valley Blvd from west City limit to east city limit. Install fiber optic cable connectivity to all signalized intersections, ethernet switches, communication hubs, vehicle detection. Update traffic signal timing and synchronization. Design a new central traffic signal management system to monitor and control all signalized intersections in the City.	2/29/2024
ALHAMBRA	LAMIPMR117	Replace existing traffic signal controllers with 2070 ATC controllers and firmware at 20 signalized intersections along Garfield Avenue from Huntington Drive to I-10 Freeway. Install fiber optic cable connectivity to all signalized intersections, communication hubs, ethernet switches, vehicle detection systems. Update traffic signal timing and synchronization. Design new central traffic signal management system to monitor and control all signalized intersections in the City.	7/31/2025
ANTELOPE VALLEY TRANSIT AUTHORITY	LA9918864	Five (5) Expansion Electric Buses - two (2) 30-ft & three (3) 35-ft to decrease headways to every 15 minutes on Route 12.	6/30/2023
AVALON	LAF9600	City of Avalon Five-Corner Comprehensive Pedestrian Project: The project proposes to construct new-permanent sidewalks, median safety islands, traffic calming (round-about) and lighting in order to provide safer access for pedestrians. The total project is approximately .25 miles in length.	12/31/2023
BALDWIN PARK	LAF3507	South Baldwin Park Commuter Bikeway Project. Construct 3-mile commuter Class I bike path along San Gabriel River and Walnut Creek connecting to major employment centers on Baldwin Park Blvd.	12/31/2023
BALDWIN PARK	LATP17S029	Construct 2.3 miles of Class I shared-use recreational path ("trail"). Develop conceptual designs for 6.8 mile Class I recreational trail along Walnut Creek and 15.3 miles of on-street Class II and Class III bikeways.	6/30/2023

[18] *Projects may include TCM and non-TCM portions. Committed TCMs include only that portion of the projects that meets the definition of TCMs. Updated as of June 2023 to reflect the latest information on completion dates through approved amendments to 2023 FTIP*

TABLE IV-B-A-1. LOS ANGELES COUNTY			
LEAD AGENCY	PROJECT ID	PROJECT DESCRIPTION	COMPLETION DATE
BELL	LA9919091	Atlantic Ave is a principal north/south arterial corridor that conveys approximately 28,000 vehicles per day and provides access to the I-5 Freeway for City of Bell and neighboring cities. Improvements will include curb/gutter improvements, directional signage, median barrier upgrades, new pedestrian facilities, planting/landscaping restoration, sidewalk/curb cuts, new streetlights, and safety improvements. Sidewalk improvements are estimated at 6200 linear ft and the boulevard is 0.75 mile long.	12/31/2035
BURBANK	LA9918844	4 TRAFFIC SIGNALS UPGRADED TO ENABLE REAL TIME SIGNAL SYNCHRONIZATION PLANS AND MONITORING TRAFFIC. MAGNOLIA/MARIPOSA, MAGNOLIA/REESE, MAGNOLIA/SCREENLAND & VICTORY/ELMWOOD.	10/31/2026
BURBANK	LA9918853	SYNCHRONIZE 18 INTERSECTIONS ALONG VICTORY BLVD BETWEEN LINCOLN ST AND ALAMEDA AVE, SAN FERNANDO BLVD BETWEEN COHASSET STREET AND LINCOLN ST, AND BUENA VISTA ST BETWEEN SAN FERNANDO BLVD AND GLENOAKS BLVD.	9/30/2025
BURBANK	LA9918855	SYNCHRONIZE 32 TRAFFIC SIGNALS ALONG OLIVE AVE BETWEEN GLENOAKS BLVD AND ALAMEDA AVE AND ON GLENOAKS BLVD BETWEEN BUENA VISTA ST AND ALAMEDA AVE. REPLACE 4 TRAFFIC CABINETS AND ELECTRICAL UTILITY CABINETS.	9/30/2025
CALTRANS	LA0B951	Route 71: ROUTE 10 TO 0.14 MILE SOUTH SAN BERNARDINO COUNTY LINE - EXPRESSWAY TO FREEWAY CONVERSION - ADD 1 HOV LANE AND 1 MIXED FLOW LANE. (2001 CFP 8349, TCRP #50) (EA# 210600, PPNO 2741=EA 21060, PPNO 2741 + EA 21061, PPNO 2741N, EA 21062, PPNO 1741S) (TCRP #50) (Use Toll Credits as Local Match).	11/21/2028
CARSON	LA0G1130	Active Transportation Program - City-wide Bike and Pedestrian Improvements - The infrastructure component includes a Class II bike lane (1.07 mile) on Santa Fe Ave, high visibility crosswalks, countdown pedestrian signals, curb ramps, etc. The non-infrastructure component includes, education, encouragement, and enforcement programming that will occur over a three year period. Utilizing Toll Credits.	12/31/2020
COMMERCE	LA0G1704	Project includes traffic signal upgrades, signal interconnect installation, adoptive signal detection, control system, software, signal sync, traffic lane alignments, traffic signage, freeway on and off ramp improvements, and other items to improve traffic flow and capacity. 4 intersections will receive signal sync: 1) Triggs St, Telegraph Rd, Atlantic Blvd, Goodrich Blvd, and Ferguson Dr; 2) Telegraph Rd and Atlantic Blvd; 3) Atlantic Blvd and Eastern Ave; and 4) Eastern Ave and Stevens Pl.	6/30/2026
COMMERCE	LA9919026	Eastern Avenue Transit Hub. This project includes improvements in the following areas: Install new bus shelters, solar power digital displays providing arrival times, street striping, pavement, and lighting. Using Toll Development Credits of $8K in FY 22/23 and $218K in FY 23/24.	12/31/2026
COMPTON	LA0G1711	This Wilmington Avenue Regional Bikeway Corridor connects existing bikeways and lanes at Rosecrans Ave on the north and continues south to Victoria St. This project will provide bicycle elements including Class II bike lanes, pedestrian lighting, and missing sidewalks gaps to provide safe travels for pedestrians and bicyclists. This corridor will eventually connect the Compton Creek bike path at El Segundo with the Metro Blue Line Artesia Station. Project is 2.5 miles long.	3/31/2025

TABLE IV-B-A-1. LOS ANGELES COUNTY			
LEAD AGENCY	PROJECT ID	PROJECT DESCRIPTION	COMPLETION DATE
COMPTON	LA0G1713	This project aims to develop and upgrade the existing and obsolete citywide traffic signal system to a state of the art intelligent transportation system that synchronizes traffic signal along Rosecrans Av from city limits to city limits. There are 20 signal intersections planned for synchronization.	6/30/2025
COMPTON	LAF9530	Enhance safety/improve non-motorized transportation travels along Central Av by installing protective buffered bike lanes, improving intersection crossings and closing sidewalk gaps.	12/31/2023
COMPTON	LATP17S012	This project is the final design and construction of 29.68 miles of gap closure in the bike lane network in the Cities of Compton and Carson. Project elements include Class I, II, and III bike lane improvements including striping, bike sharrows, directional painted green lines and wayfinding signage.	12/31/2023
COVINA	LA0G1729	Citrus Ave includes 80-100 feet of public R-O-W, two new bicycle travel lanes for N/B and S/B traffic (5,950 linear ft. of bike lanes to be added), repairing sidewalks and curb ramps. Foothill Transit serves the Citrus Ave corridor and provides additional multimodal transportation connectivity. Proposed improvements will enhance first/last mile connectivity, road/concrete infrastructure, pedestrian/bicycle safety, and add tree canopy and drought tolerant streetscaping amenities.	4/30/2026
CUDAHY	LAF9605	The Cudahy City Wide Complete Streets Improvement Project focuses on the Atlantic Avenue Corridor and City Wide multimodal transportation improvements for the first/last mile. Project is approximately 1.1 miles long.	12/31/2023
CULVER CITY MUNI BUS LINES	LAF3729	Real-Time Bus Arrival Information System. Develop & install on 60 bus stop real-time bus arrival information system using intelligent transportation system (ITS) technology to disseminate "next bus" info to travelers. The project's physical component is located at bus stops and transit center within the City of Culver City. The non-physical component of the project is located on a web server.	10/31/2024
CULVER CITY	LAF7303	NETWORK-WIDE SIGNAL SYNC WITH VID & ARTERIAL PERFORMANCE MEASUREMENT SYSTEM FOR ATCS: (1) Optimizes signal coordination timing network-wide. (2) Upgrades major intersections with enhanced system detection and arterial performance measurement capabilities along Washington Bl, Sepulveda Bl, Jefferson Bl, and others. (16 signals that are synched)	12/31/2023
DIAMOND BAR	LA0G1708	Diamond Bar Blvd from Golden Springs Drive to Palomino Drive. Reconstruct asphalt and construct enhanced crosswalks, pedestrian walkways, green bicycle lanes, ADA ramps, and bioswales. Upgraded green bicycle lanes and pedestrian pathways span the entire length of the project in each direction. The total length of green bicycle lanes and pedestrian pathways are approximately 2,500 feet each.	12/31/2024
DOWNEY	LAF7311	DOWNEY CITYWIDE TRANSIT PRIORITY SYSTEM PROGRAM: (1) Synchronizes traffic signals along existing transit routes. (2) Installs new fiber optic communication along 5.5 miles of arterial streets to connect signals to the central traffic management center. (3) Installs and integrates transit priority system with the traffic signal system.	8/1/2024
DOWNEY	LAF9525	This project implements 17 miles of Class II bike lanes on eight roadways (seven of them with Road Diets) providing enhanced access to activity centers and multi-modal assets such as the Green Line and bike paths.	3/31/2024

TABLE IV-B-A-1. LOS ANGELES COUNTY			
LEAD AGENCY	PROJECT ID	PROJECT DESCRIPTION	COMPLETION DATE
EL MONTE	LA9918839	Improvements include 1.9 miles of new enhanced Class III bike lanes on Fern St and Elliot Ave from Sastre Ave to Mountain View Rd and from Mountain View Rd to North Brookside, and 1 mile of new Class II bike lanes on Durfee Ave from Elliot Ave to Valley Blvd and Valley Blvd from Durfee Ave to San Gabriel River Trail. Other improvements include pavement maintenance, repair, reconstruction on Fern St/Elliot Ave, from Sastre Ave to Mountain View Rd.	12/31/2026
EL MONTE	LATP21MPO101	Construct 1.1 mile Class IV two-way cycle track with landscape buffer; remove existing speed humps; install median curb extensions, high-visibility continental crosswalks, ADA improvements, & signage; roadway narrowing & street trees to calm traffic.	12/31/2030
EL MONTE	LATP23F101	Install 1.1-mile Class IV cycle track, Class III route (2100 feet), landscape buffer, x-walks, curb extensions, ADA ramps, conflict striping, widen sidewalk, add stop control at 1 intersection.	12/31/2032
EL SEGUNDO	LA9918809	Existing pavement shows widespread signs of deterioration throughout the corridor which constitutes a need for rehabilitation. Existing conditions on El Segundo Boulevard are missing ADA compliant curb ramps, larger traffic signal poles, dedicated bicycle facilities including bicycle detection, and adequate pedestrian crossings which will be addressed at specific locations as part of the project. 12,000 linear feet of bike lanes (Class II and Class III) will be installed.	11/15/2026
FOOTHILL TRANSIT ZONE	LA0G1234	Mt. San Antonio College (MSAC) Transit Center. The Transit Center includes 10 bus bays, 2 chargers for electric buses, a transit store, lighted sheltered wait areas, real-time bus arrival kiosks, and upgraded ADA and pedestrian access.	12/31/2024
FOOTHILL TRANSIT ZONE	LA0G1501	Construct Bus Layover Facilities Jointly by AVTA, LADOT & Foothill Transit	12/31/2023
FOOTHILL TRANSIT ZONE	LA9918847	Project will install and upgrade bus traffic signal priority at key segments on Colorado Boulevard corridor for service Lines 187. The signal priority on this corridor will improve the communication between the bus and intersection equipment to help buses along Colorado Boulevard improve travel times and schedule performance.	12/31/2026
GARDENA MUNICIPAL BUS LINES	LATR02020	Implement transit signal priority for 8.4 miles from the Harbor Gateway Transit Station to 120th Street in the city of Gardena. Also implementing real time arrival information through variety of media including smart phones, SMS texts, call centers, and website. Computer aided dispatching (CAD) system and automated vehicle location (AVL) system will also be implemented.	6/30/2024
GLENDALE	LAF7709	GLENDALE REGIONAL BIKE PARKING NETWORK: Provides 2 high capacity bike parking facilities and 20 wayfinding signs for bicycle users within the City of Glendale, specifically Glendale Larry Zarian Transportation Center and the Glendale Marketplace/Public Library.	12/31/2023
HAWAIIAN GARDENS	LA9919050	Traffic signal improvements for upgrading signal hardware and synchronizing eight intersections along Carson Street from Pioneer Boulevard to Bloomfield Avenue. The City of Hawaiian Gardens will coordinate the project's scope and timeline with Lakewood and Long Beach for the shared intersections. The synchronization of signals will be completed at the same time and along with the City's HSIP project. Utilizing $10K of Toll Credits to match STP-L funds in FY23 in CON. Toll Credits Used.	12/31/2030

TABLE IV-B-A-1. LOS ANGELES COUNTY			
LEAD AGENCY	PROJECT ID	PROJECT DESCRIPTION	COMPLETION DATE
HAWTHORNE	LA0G1546	Imperial Hwy Signal Improvements and Intersection. PA/ED, PS&E, ROW, Construction. Modify and upgrade 5 traffic signal, traffic striping, utilities, excavation, removal of existing pavement, concrete, asphalt and construction of curb, gutter, sidewalks and driveways. Signal Synchronization at: Imperial Highway at Prairie Avenue, Imperial Highway at Freeman Avenue, Imperial Highway at Hawthorne Boulevard, Imperial Highway at Ramona Avenue, Imperial Highway at Inglewood Avenue.	6/30/2024
HAWTHORNE	LA0G1548	Widen intersections modify and upgrade four traffic signal system, traffic striping, adjustment of utilities, excavation and removal of existing pavement, concrete, asphalt and construction of curb, gutter, sidewalks, driveways and ADA ramps. Signal Synchronization at: El Segundo Blvd at Ramona Ave. El Segundo Blvd. at Aviation Ave. El Segundo Blvd. at Isis Ave. El Segundo Blvd. at Van Ness Ave.	11/30/2024
HAWTHORNE	LAF9102	5 intersection locations; Signal improvement include Upgrade traffic signal controller and cabinet enabling, Rewiring of the signalized intersection to ensure communication between signal equipment; Upgrade pedestrian signals to count down type and push buttons, Install battery backup system to minimize disruption of traffic during power outage new vehicle detection including bicycle loops/sensors; new bike lane will be one mile (each way).	10/18/2023
HUNTINGTON PARK	LA0G1669	This project will include new signal poles, conduit, wiring, controller cabinets and video detection (not CCTV). The improvement locations include Slauson Ave at Alameda St, Slauson Ave at Santa Fe Ave, Slauson Ave at Miles Ave/Soto St, Slauson Ave at Boyle Ave/State St, Slauson Ave at Downey Rd/Malburg Way. Six new (6) signal sync intersections on Slauson at Alameda, Santa Fe, Pacific, Miles, Bickett, and State.	12/31/2024
INGLEWOOD	LA9919191	Includes but shall not be limited to preliminary investigation, roadway resurfacing, utility coordination, PS&E. Landscape, Environmental Assessment to comply with CEQA and pavement rehab. Full traffic signal modification complete with timing sheets at 15 intersections. Fiber optic improvements of 3 mi long on Crenshaw Blvd. New crosswalks, ramps, lane delineation & improved raised medians at 3 intersections. Install CCTV at 10 intersections & CMS at 2 intersections. NO NEW SIGNAL SYNC.	12/31/2032
INGLEWOOD	LAF7319	Inglewood ITS - PHASE V: (1) Designs and constructs computerized traffic control and monitoring systems, (2) Expands central traffic control and advance traffic management at 39 interseections, (3) improves 6.13 miles of fiber optic communications, (4) expands Closed Circuit Television Cameras (CCTV) at 10 intersections, (5) installs Changeable Message Signs (CMS) at 2 intersections, and (6) installs ew communication hubs at 3 intersections. NO SIGNAL SYNC.	12/31/2023
INGLEWOOD	LAF9307	City of Inglewood ITS phase VI project: 5,280 feet of fiber optic along Pincay Drive; Replace 170 controllers with Type 2070 controllers at twelve intersections; Traffic signal synchronization along Pincay Drive between Prairie and Crenshaw; Install changeable message sign at Century/Prairie; and Modernizing City Hall TMC to provide Adaptive Traffic Control and meet current standards.	6/30/2024
LAKEWOOD	LA0G1262	Lakewood Bl Regional Corridor Capacity Enhancement project (Del Amo Bl to north City limit) - Class II bike lanes (1.9 mile) in each direction, new sidewalk, street resurfacing, ADA & stormwater compliance, traffic signal modifications, drought resistant landscaping & irrigation, signing & striping, and utility undergrounding within the existing City right of way.	12/31/2023

TABLE IV-B-A-1. LOS ANGELES COUNTY			
LEAD AGENCY	PROJECT ID	PROJECT DESCRIPTION	COMPLETION DATE
LANCASTER	LA0G928	SR-138 (SR-14) Avenue J Interchange. Project will include new northbound off-ramp and southbound on-ramp, mainline improvements to accommodate ramp modifications, improvements to Avenue J between 15th Street West and 25th Street West and traffic signal improvements. Project will reduce through lanes on Avenue J from 3 lanes to 2 lanes in each direction between 25th Street West and 15th Street West to provide bike lanes and wider sidewalks.	12/31/2023
LANCASTER	LA0G931	SR-138 (SR-14) Avenue M Interchange. Project will widen Avenue M from 10th Street to 20th Street West to provide a center turn-lane, bike lanes and sidewalks. The project includes geometric changes to the SR-138 (SR-14) ramps, intersection controls, and bike and pedestrian improvements from west of 20th Street West to 10th Street West.	12/31/2026
LAWNDALE	LAF7500	HAWTHORNE BOULEVARD CLASS II BICYCLE LANES: (1) Installs 1.0 mile of Class 2 bike lanes on Hawthorne Blvd for both directions. (2) Provides bicycle parking.	6/30/2021
LONG BEACH TRANSIT	LA0G1762	Expansion of fleet to take over a portion of the Metro Route 130 with up to (11) Battery Electric Buses (30'/35'40'). 5307 funds were awarded by BOS under the discretionary 15% suballocation. Federal funding for FY19 is $1.887M and FY20 is $1.548M. Adding an additional (7) buses for a total of (11) to the TIP. Utilizing TDC in FY23 for $901K to match 5307 funds. Transit Development Credits Used.	12/31/2025
LONG BEACH	LAF9314	The project consists of signal enhancements that will include synchronization and communications. Also are included are bicycle and pedestrian improvements and inclusion of the corridor into an Adaptive Traffic Control System	12/31/2024
LONG BEACH	LATP21F103	Transform Pacific Avenue from Ocean Blvd to PCH into a complete streets best practices corridor by upgrading 1.6 miles of Class III route to Class IV curb-protected bike lanes, protected intersections, and curb extensions. Non-infrastructure elements include pedestrian safety education, targeted messaging, and interactive activities that model desired safety behaviors.	12/31/2035
LOS ANGELES A	LA0G1380	Purchase of 170 solar-powered, real-time bus arrival information signs for bus stop improvement in the Los Angeles Promise Zone	12/31/2023
LOS ANGELES A	LA0G1566	Purchase of up to 120 electric 30' to 35' buses for the DASH program expansion	9/26/2024
LOS ANGELES A	LA0G901	Historic Los Angeles Streetcar	12/31/2023
LOS ANGELES A	LAE3764	Sepulveda Boulevard Closed-Circuit Television Traffic Signal Improvement Signal Sync	4/30/2025
LOS ANGELES A	LAF3644	Broadway Historic Theater District Pedestrian Improvements 4th-6th Streets. The project will improve pedestrian safety by installing curb extensions, widening sidewalks, improving pedestrian lighting, enhancing crosswalks, and provide pedestrian amenities; benches, street trees, landscaped buffers from traffic and 10 bike racks.	11/19/2025
LOS ANGELES A	LAF3647	Menlo Ave/MLK Vermont Expo Station Pedestrian Improvements. Improve pedestrian access to the new Expo station on Vermont Ave by installing sidewalks, landscaping, and lighting along Menlo Ave. and MLK Jr. Blvd. plus a median on MLK Blvd.	6/30/2024

TABLE IV-B-A-1. LOS ANGELES COUNTY			
LEAD AGENCY	PROJECT ID	PROJECT DESCRIPTION	COMPLETION DATE
LOS ANGELES A	LAF7123	MAGNOLIA BOULEVARD WIDENING (NORTH SIDE) - CAHUENGA BOULEVARD TO VINELAND: Instead of widening, it rescoped to include pedestrian and safety-related improvements such as curb extensions where appropriate, enhanced left turn protection at select locations, trees, additional safer crossings with the introduction of pedestrian hybrid beacons, sidewalk repairs, ADA-compliant access ramps, speed tables, storm drain extension, and additional catch basins.	10/1/2023
LOS ANGELES A	LAF7814	LADOT STREETS FOR PEOPLE: TRANSIT CORRIDOR PARKLETS AND PLAZAS: Installs 12 parklets and 3 plazas. The limits of the parklets will be equal to two curbside parking spaces (approx.. 40x 6). The plaza limit varies ranging from 2,000 to 6,000 SF.	12/31/2023
LOS ANGELES A	LAF9422	LADOT will procure seven (7) 30-ft Electric clean fuel vehicles to reduce headways on six selected DASH routes	4/30/2024
LOS ANGELES A	LAF9527	Project will construct a 3.1 mile cycletrack along Chandler Boulevard, connecting the Chandler and Orange Line Bike Paths and bridging a gap in the low-stress bicycle network	1/1/2023
LOS ANGELES A	LAMIP107	Transit infrastructure improvements include the procurement and installation or real-time arrival solar-powered bus signs at each bus stop on the DASH Highland Park/Eagle Rock route. Using TDC in FY22/23 for $194K to match CMAQ in CON.	12/31/2026
LOS ANGELES A	LARE1701A	Implementing Dynamic Corridor Ramp Metering System (DCRMS) in I-405 Sepulveda Pass Corridor (Interstate 405 from I-10 to SR101), a system-wide adaptive ramp metering strategy which simultaneously coordinates with arterial traffic signal operation. The system will dynamically adjust traffic according to current capacity restrictions caused by incidents or recurrent congestion. Improve traffic movement and access to freeway and major arterial including transit operation.	12/31/2022
LOS ANGELES A	LATP16S006	Boyle Heights Pedestrian Linkages. Pedestrian infrastructure improvements including sidewalk repairs, 3,400 linear feet of new sidewalk, and installation of pedestrian lighting, continental crosswalks, and curb ramps to improve connectivity within community and to 6th Street Viaduct Replacement Project. Utilizing Toll Credits.	12/31/2024
LOS ANGELES A	LATP17M014	Arts District Pedestrian & Cyclist Safety Project. The project will establish critical pedestrian and cyclist connections to and within the Arts District in Downtown Los Angeles which is a historic industrial neighborhood with a complex street system that challenges the mobility of all users whether they are on foot, on a bike or in a vehicle. Utilizing Toll Credits to match ATP funds.	6/30/2024
LOS ANGELES A	LATP19M013	Design and construction of 2.93 miles of greenway gap closure along the banks of the LA River, and adjacent on-street network of bicycle and pedestrian improvements	9/30/2026
LOS ANGELES A	LATP19M014	Safety and mobility improvements along 2.8 mile stretch of Broadway (Manchester Ave to Imperial Hwy) and Manchester Ave (Vermont Ave to Broadway). Includes a separated 4-mile Class IV cycle track), sidewalk and crossing improvements, signal upgrades, center median refuge island mods, and other improvements to slow speeding vehicles & increase pedestrian/bicyclist safety, plus pedestrian lighting, street trees, & pedestrian/bicyclist amenities, such as benches, bike racks, and trash receptacles.	12/31/2030

TABLE IV-B-A-1. LOS ANGELES COUNTY			
LEAD AGENCY	PROJECT ID	PROJECT DESCRIPTION	COMPLETION DATE
LOS ANGELES COUNTY	LA0D465	Colima Road-City of Whittier Limits to Fullerton Road, for a total distance of 4.9 miles. The project will widen Colima Rd by up to six feet at spot locations and restripe to accommodate three through lanes in each direction. A Class II bikeway from the City of Whittier will be extended to Larkvane Rd, a distance of 1.2 miles, and bus pads will be replaced. Includes median landscaping.	6/30/2024
LOS ANGELES COUNTY	LA0G1291	Huntington Dr - San Gabriel Bl to 132' w/o Michillinda Ave: Construct approx. 7200ft buffered Class II bike lanes, upgrade curbs & sidewalks to meet standards. Add pedestrian access through the median @S San Gabriel. Add drought tolerant landscaping/hardscape inside median. Install new traffic signal at Huntington Dr & Madre St/Muscatel Av which may require tree removal.	6/30/2023
LOS ANGELES COUNTY	LA0G1486	The Project consists of design and construction of 1.86 miles of Class I bike path along Puente Creek and 0.37 miles of enhanced Class III bike route along Rimgrove and Witzman Drive adjacent to the Rimgrove County Park. The non-infrastructure portion of the Project includes bicycle and pedestrian safety education and encouragement training workshops and rodeos to students at 3 elementary, 1 middle, and 1 high school located near the proposed bikeway.	6/30/2023
LOS ANGELES COUNTY	LA9918952	This project involves synchronizing the traffic signals at the 35 intersections on Avalon Boulevard between 126th Street and Sepulveda Boulevard. The attached map is missing the two I-405 freeway ramps, Carson Street, and Watson Center Rd/228th.	3/31/2024
LOS ANGELES COUNTY	LAF1311	South Bay Forum Traffic Signal Corridors Project. Design & construction of multijurisdictional traffic signal synchronization, intersection operational improvements, and intelligent transp. system components on regional arterials. Synchronizes 50 consecutive intersections.	6/30/2023
LOS ANGELES COUNTY	LAF1312	Gateway Cities Forum Traffic Signal Corridors, Phase V. Design and construction of multijurisdictional traffic signal synchronization and intersection operational improvements on regional arterials in the Gateway Cities region. Includes 86 consecutive intersections.	6/30/2024
LOS ANGELES COUNTY	LAF1321	San Gabriel Valley Forum Traffic Signal Corridors Project. Design & construction of multijurisdictional traffic signal synchronization, intersection operational improvements, and intelligent transportation system components. Synchronizes 83 consecutive intersections.	6/30/2023
LOS ANGELES COUNTY	LAF3519	North County Bikeways. Install three Class II and three Class III bikeway segments, including signage, striping, road widening, & road shoulder improvements (approx. 3.88 miles of bike lanes and 3.18 miles of bike routes).	6/30/2024
LOS ANGELES COUNTY	LAF5315	San Gabriel Valley Forum Traffic Signal Corridors Project. This project includes 6 intersections at Myrtle Av/Peck Rd between Huntington Dr and Clark St and provides for system wide coordination, timing and operational improvements and traffic signal synchronization, equipment upgrades and intersection operational improvements (approx. 20+ signals).	6/30/2024
LOS ANGELES COUNTY	LAF5316	South Bay Forum Traffic Signal Corridors Project - systemwide coordination, timing and operational improvements and traffic signal synchronization, equipment upgrades and intersection operational improvements in South Bay region. 25 signals system wide. Additionally, this project will install any warranted and feasible roadway improvements along the routes to improve overall progression.	6/30/2024

TABLE IV-B-A-1. LOS ANGELES COUNTY			
LEAD AGENCY	PROJECT ID	PROJECT DESCRIPTION	COMPLETION DATE
LOS ANGELES COUNTY	LAF7306	FOOTHILL BOULEVARD TRAFFIC SIGNAL CORRIDOR PROJECT: (1) Traffic signal synchronization, equipment upgrades and intersection operational improvements for 28 intersections along Foothill Bl between Lowell Av and Crown Av. (2) Installs two (2) Closed Circuit Television (CCTV) cameras and wireless network communications infrastructure which will provide for expansion of Advanced Transportation Management System (ATMS) along Foothill Bl.	6/30/2024
LOS ANGELES COUNTY	LAF7307	SAN GABRIEL VALLEY FORUM TRAFFIC SIGNAL CORRIDOR PROJECT: Implements ITS enhancements including synchronization and retiming of traffic signals, equipment upgrades, system detection, CCTV cameras, and changeable message signs to expand Advanced Transportation Management System (ATMS).	6/30/2024
LOS ANGELES COUNTY	LAF7310	SOUTH BAY FORUM TRAFFIC SIGNAL CORRIDORS PROJECT: Project area is Normandie Av between 92nd St and El Segundo Bl, Manhattan Beach Bl between Manhattan Av and Van Ness Av, and Hawthorne Bl between Imperial Highway and Manhattan Beach Bl. Project scope includes (1) Synchronization and retiming traffic signals, equipment upgrades, system detection, CCTV cameras, changeable message signs. (2) Upgrade traffic signal operations to be capable of time-based coordination.	6/30/2024
LOS ANGELES COUNTY	LAF7508	Vincent Community Bikeways. Install 2 miles of bike paths along the Big Dalton Wash between Irwindale Ave and Lark Ellen Ave and between Arrow Hwy and Citrus Ave, and 1.3 miles of bike lanes and 1.4 miles of bike routes to connect to the existing and proposed bikeways in the surrounding areas.	12/31/2023
LOS ANGELES COUNTY	LAF7700	WILLOWBROOK INTERACTIVE INFORMATION KIOSKS: Provides information to public transit users by installing 3 interactive kiosks displaying transit, neighborhood, and cultural information. The project will serve the Willowbrook area at Martin Luther King Jr. Hospital, Kenneth Hahn Plaza, and the Metro Willowbrook/Rosa Parks Blue and Green Line Station.	6/30/2024
LOS ANGELES COUNTY	LAF9302	The design and construction of traffic signal synchronization and intelligent transportation system improvements and installation of performance measurement devices in the San Gabriel Valley area.	12/31/2023
LOS ANGELES COUNTY	LAF9303	SOUTH BAY FORUM TRAFFIC SIGNAL CORRIDOR PROJECT. This project includes traffic signal synchronization on Crenshaw Boulevard between 120th Street and Rosecrans Avenue and Del Amo Boulevard between Avalon Boulevard and Susana Road (approx. 15+ signals) and also includes systemwide coordination timing, operational improvements and ITS.	6/30/2027
LOS ANGELES COUNTY	LAF9304	The design and construction of traffic signal synchronization and intelligent transportation system improvements and installation of performance measurement devices in the Gateway Cities area. There are 39 intersections in the TSSP route.	6/30/2027
LOS ANGELES COUNTY	LAF9504	E. Pasadena & E. San Gabriel Bikeway Access Improvements: Install approximately 4.8 miles of bike lanes and enhanced bike routes in the East Pasadena and East San Gabriel communities.	12/31/2022
LOS ANGELES COUNTY	LAF9511	South Whittier Community Bikeway Access Improvements: Construction of 3.1 miles of Class II and 1.8 miles of Class III bike facilities in the unincorporated County area of South Whittier along with various pedestrian intersection improvements.	6/30/2024

TABLE IV-B-A-1. LOS ANGELES COUNTY			
LEAD AGENCY	PROJECT ID	PROJECT DESCRIPTION	COMPLETION DATE
LOS ANGELES COUNTY	LATP17M025	Install a 1.6 mile long and 17-foot wide walkway adjacent to existing Marvin Braude Bike Trail to close the gap between the existing walkways connecting Pacific Palisades and the City of Santa Monica. This will increase safety for cyclists/pedestrians which will increase usage and physical activity opportunities.	12/31/2023
LOS ANGELES COUNTY	LATR02018	The Whittier Boulevard Transit Signal Priority Project (Project) includes the deployment of ITS infrastructure to enhance arterial operations and monitoring in East Los Angeles. Wireless communications and upgraded controller equipment will be deployed along a critical segment of Whitter Blvd. that serves Metro Rapid Line 720 and provides parallel capacity to the 1-10 ExpressLanes.	6/30/2024
LOS ANGELES COUNTY MTA	2018FBX00	Los Angeles County; software modifications and hardware upgrades of fare collection equipment at Metro rail stations and on Metro and Municipal Operator buses to address equipment obsolescence, enhance system security, communicate in near real-time, and support future TAP mobile app and other new payment technologies.	12/31/2023
LOS ANGELES COUNTY MTA	LA0D198	CRENSHAW/LAX TRANSIT CORRIDOR - The Crenshaw/LAX Transit Corridor Project is an 8.5-mile light rail transit (LRT) line extending from the intersection of Crenshaw and Exposition Boulevards allowing for transfer to the Exposition Light Rail Transit line to a connection with the Metro Green Line at the Aviation/LAX Station (PPNO 4027A).	6/30/2024
LOS ANGELES COUNTY MTA	LA0F075	LIGHT RAIL TRANSIT FLEET-UP TO 193 NEW CARS SYSTEMWIDE. These expansion rail cars will be assigned to Expo II, Gold Line Foothill and Vehicle Replacements. PPNO 4025.	8/31/2023
LOS ANGELES COUNTY MTA	LA0G010	Regional Connector - Light Rail in Tunnel allowing through movements of trains, Blue, Gold, Expo Lines. From Alameda / 1st Street to 7th Street/Metro Center $59.2M of Section 5309 NS ARPA-CIG (Capital Investment Grant) in FY22.	6/30/2024
LOS ANGELES COUNTY MTA	LA0G1052	Metro Purple Line Westside Subway Extension Section 2 - Wilshire/La Cienega to Century City FTA ARPA - CIG (Section 5309 NS) $58.4M in FY22.	6/30/2026
LOS ANGELES COUNTY MTA	LA0G1162	Airport Metro Connector.	12/31/2024
LOS ANGELES COUNTY MTA	LA0G1167	Design and construction of streetscape, pedestrian and bicycle access improvements in the Little Tokyo and Arts District neighborhood of Downtown Los Angeles within a one-mile radius of the 1st/Central Station of the Regional Connector light rail line.	9/30/2023
LOS ANGELES COUNTY MTA	LA0G1247	The Project consists of bicycle and pedestrian transportation linkage improvements to the Rail to Rail Active Transportation Corridor (ATC) Connector Project Segment A along an approximately 5.6-mile long corridor from the future Metro Crenshaw/LAX Fairview Heights Station to the existing Metro Blue Line Slauson Station.	12/31/2023
LOS ANGELES COUNTY MTA	LA0G1375	This is a large-scale deployment of the Freight Advanced Traveler Information System (FRATIS) Program to deploy advanced congestion management technologies which can achieve significant reductions in truck congestion, improve air quality, and reduce the use of fossil fuels in the Los Angeles region.	12/30/2023

TABLE IV-B-A-1. LOS ANGELES COUNTY			
LEAD AGENCY	PROJECT ID	PROJECT DESCRIPTION	COMPLETION DATE
LOS ANGELES COUNTY MTA	LA0G447	Metro Purple Line Westside Subway Extension Section 1 - Wilshire/Western to La Cienega FTA ARPA - CIG (Section 5309 NS) $66.4M in FY22.	12/31/2023
LOS ANGELES COUNTY MTA	LA0G635	Design and construction of pedestrian and transit enhancements along the public right-of-way of the Metro Gold Line Eastside Extension to surrounding neighborhood. Transit enhancements are within 3 miles of Eastside Goldline Extension station.	6/30/2023
LOS ANGELES COUNTY MTA	LA0G642	Metro Purple Line Westside Subway Extension Section 3 FTA ARPA - CIG (Section 5309 NS) $93.4M in FY22.	6/30/2027
MALIBU	LA0G1748	This project aims to improve safety and traffic flow by providing striping and signage for bicycles, a connecting bike path along the beach, separation of pedestrians and bicycles from the active roadway, connectivity to Pacific Coast Highway, a safe pathway for pedestrians, a sand wall, and driveways for Lifeguard Tower access. The proposed bicycle facility will include 1,200 ft of Class I, 1,800 ft of Class II, and 3,800 ft of Class III bike lanes. The pedestrian path is 1,350 ft.	6/30/2023
METRO GOLD LINE FOOTHILL EXTENSION CONSTRUCTION AU	LA29212XY	METRO RAIL GOLD LINE FOOTHILL EXTENSION - AZUSA TO CLAREMONT (LA County Line) 12 MILE, 5 STATION LRT EXTENSION. SAFETEA-LU # 285 LEAD AGENCY WILL CHANGE TO METRO GOLD LINE.	6/30/2025
MONTEREY PARK	LAF9502	Monterey Pass Road Complete Streets Bike Project is a 1.6 mile corridor providing multimodal transportation alternatives increasing ped, bike & transit use for the first last mile.	12/31/2023
NORWALK	LA0G1342	Imperial Highway ITS Project, from San Gabriel River to Shoemaker Road: Traffic Signal Synchronization.	12/31/2023
NORWALK	LATP17S028	Design and construct 12,000 LF of Class 2 bicycle lanes and improve 2,000 LF of sidewalk on Alondra Blvd. This is part of a long-range project identified in the Gateway Cities 2014 Strategic Transportation Plan to create over 14 miles of bike lanes along this corridor.	6/1/2026
PALMDALE	LATP17S025	The improvements would consist of implementing a "Complete Streets" element that includes crosswalk enhancements, bulb-out crossings, new Class II bike lanes (0.74 mile), the upgrade of a Class II bike lane to a Class IV facility (0.3 mile), mini-roundabouts, sidewalk gap closures, ADA-compliant curb ramps, and upgraded traffic control devices along 10th Street East from Avenue Q-9 to Q-12.	12/31/2030
PASADENA	LAF3522	Cordova Street Complete Streets Project. Convert the vehicular-oriented street to a complete street by removing 2 vehicular traffic lanes to accommodate bike and pedestrian facilities. City of Pasadena - Hill Street to Arroyo Parkway.	7/30/2023
PASADENA	LAMIPMR120	The Walnut Street ITS Project consist of the implementation of ITS assets along the corridor and integration of these assets into the DOT transportation network. Integration will feature point to point connectivity via fiber optics, upgrade in traffic signal hardware, inclusion of video surveillance systems, high resolution capable controllers, traffic safety analytics and collision prediction and short wave radio for vehicle to infrastructure or V2I applications.	12/31/2025

TABLE IV-B-A-1. LOS ANGELES COUNTY			
LEAD AGENCY	PROJECT ID	PROJECT DESCRIPTION	COMPLETION DATE
PASADENA	LATP17M021	The City of Pasadena will install a 1.5-mile, two-way, protected cycle track (Class I) on Union Street from Hill Avenue to Arroyo Parkway, including necessary signal upgrades with Road diet from 3 to 2 lanes. Also installing bike boulevard (0.3 miles, Class III) along Holliston Avenue between Union St and Cordova St (no Road Diet.)	12/31/2024
PICO RIVERA	LAF7502	Regional Bikeway Project. The project will install a bicycle/pedestrian bridge, Class II bicycle lanes, a Class I shared- use path, traffic calming medians, sidewalks, curb ramps, signal modifications, and wayfinding signage, connecting to two regional Class I routes.	12/31/2023
POMONA	LAF9526	Pomona ATP Phase 2 Bicycle Network for Community Assets: Nearly 9 miles of bikeways along 5 roads, improving access to community destinations and assets, enhancing access to the local and regional multi-modal transportation network.	12/1/2026
POMONA	LATP19S009	Priority projects of the Pomona Active Transportation Plan, including 10.2 miles of bike lanes, 1.8 miles of traffic calming measures, and 14 intersections of bike/ped improvements.	9/24/2024
REDONDO BEACH	LA0G1423	Purchase and install a Real Time Passenger Information System on Beach Cities Transit fixed route buses.	12/31/2023
REDONDO BEACH	LAF3502	Redondo Beach Bicycle Transportation Plan Implementation. Implement Class II and III bike facilities identified in the City of Redondo Beach's adopted Bicycle Transportation Plan. Approximately 2.1 centerline miles of bike lanes and 15.8 centerline miles of bike routes throughout the City of Redondo Beach.	12/31/2022
ROSEMEAD	LAMIPMR111	Install adaptive traffic signal control (ATSC) system, including necessary signal system upgrades for compliance with current standards at 39 signalized locations along Garvey Ave (9 intersections - W to E city limits), Valley Blvd (7 intersections - W to E city limits), San Gabriel Blvd (6 intersections N to S city limits), Walnut Grove Ave (16 intersections - N to S city limits), and Rosemead Blvd (5 intersections - N to S city limits).	6/30/2027
SAN GABRIEL	LAMIPMR102	The proposed project will replace and upgrade traffic signal equipment at 30 signalized intersections along major arterial in the City of San Gabriel. The proposed upgrades include, but are not limited to: new loop detection, video detection, battery back-up, new controllers, and communications. The City shall furnish a list intersection locations and equipment to the Metro Project Manager prior to installation and implementation. All 30 signals are proposed to be synchronized.	5/31/2024
SANTA CLARITA - TRANSIT	LA0G774	Vista Canyon Ranch Transit Center - relocate the existing, temporary Via Princessa Metrolink Station to the Vista Canyon project site; includes Metrolink Station and Bus Transfer Station, a pedestrian overpass or undercrossing of the tracks and an adjacent parking structure with up to 750 parking spaces.	6/30/2024
SANTA CLARITA	LAF7105	DOCKWEILER DR EXTENSION (1 of 2): The project consists of extension of two lanes to connect with a future extension planned for Dockweiler Drive. It includes new sidewalks, Class II bike lane, pedestrian signal heads, high visibility crosswalks, lighting, landscaping, bicycle actuation signals and wayfinding signs.	12/31/2024

TABLE IV-B-A-1. LOS ANGELES COUNTY			
LEAD AGENCY	PROJECT ID	PROJECT DESCRIPTION	COMPLETION DATE
SANTA CLARITA	LAF9118	LYONS AV/DOCKWEILER DR EXTENSION (2 of 2): Construct Dockweiler Drive gap closure between 12th St. and existing terminus of Dockweiler Dr, just west of Valle Del Oro. Constructs 8-ft sidewalks and Class II bike lanes on both sides.	12/31/2024
SANTA CLARITA	LAF9513	Railroad Avenue Class I Bike Path: Project will add 1.45 miles of Class I bike path on Railroad Avenue and enhance connectivity to the Jan Heidt Newhall Metrolink Station to the City's bicycle trail network	6/30/2023
SANTA MONICA	LA9918887	Project to make connectivity and safety improvements on Olympic Bl between Stewart & 26th St, including sidewalk & pedestrian crossings, to provide safer first/last mile access and enhance mobility. Project consists of approx. 1,300 LF (0.25 miles) of pedestrian improvement, enhance signal and intersection geometry at 26th St & Olympic Bl to remove a right turn slip lane and island, shorten pedestrian crossing distances & improve lighting. Use TC $221K in FY24 to match STPL. Toll Credits Used.	12/31/2023
SANTA MONICA	LATP21F109	Construction of Class IV separated bikeway, bus islands, and intersection reconfigurations along Stewart Street. Add new sidewalks and pedestrian scale lighting along Pennsylvania Ave. this project will include 1300 feet of new sidewalk and 3300 feet of new bikeways.	7/31/2027
SIGNAL HILL	LATP17S010	The project will install approximately 2.0 lane miles of bike lanes (Class II) on Spring Street, repave roadway to minimize drainage to bike lanes/level surface, revised striping, signing, modified pedestrian walkways/ramps, signal pedestrian countdown heads, safety lighting, and install bio-retention stormwater quality devices.	9/15/2026
SOUTH EL MONTE	LAF5516	Install Class II bike lanes on Santa Anita Ave from Klingerman St to end of City Limits south of Merced Ave (1.5 mi) and on Merced Ave from Fern Ave to Santa Anita Ave (1.3 mi). Install Class III bike routes with shared-lane markings on Lerma Ave from Merced Ave to SW City Limits (0.3 mi) and on Thienes Ave from Tyler Ave to SE City Limits (1 mi). Install bike parking at the Civic Center and wayfinding/signage. Utilizing TC $13K in FY24 to match STPL CON. Toll Credits Used $13,000 in FFY23/24.	12/31/2023
SOUTH GATE	LA9918774	Construct raised median included in the scope of work is Timing and Coordination and Intelligent Transportation System for existing three (3) traffic signals.	12/31/2023
SOUTH GATE	LATP17S006	Install a Class I bike path (750 ft), Class II bike lanes (2.65 miles), and Class III bike routes (1.61 miles) along with pedestrian improvements including sidewalk, curb extensions, ADA curb ramps, high visibility crosswalks, rectangular rapid flashing beacon, bus shelters, and bike racks.	5/24/2026
SOUTH PASADENA	LA9918928	Deploy advanced adaptive traffic management system along the north south Fair Oaks Avenue and adjacent Fremont corridor from the north City limit to Huntington Drive (12 Signals: 11 South Pasadena and 1 Pasadena). The all traffic signal systems need full scale upgrades to accommodate intelligent transportation systems technologies. The project includes ADA upgrades and changeable message signs to provide real time information for drivers to deploy Integrated Corridor Management strategies.	12/31/2026

TABLE IV-B-A-1. LOS ANGELES COUNTY			
LEAD AGENCY	PROJECT ID	PROJECT DESCRIPTION	COMPLETION DATE
SOUTH PASADENA	LAF5308	South Pasadena's ATMS, Central TCS and FOIC for Fair Oaks Av. This project is located in South Pasadena on Fair Oaks Av between Columbia St and Huntington Dr. It will establish a fiber-optic backbone communication system connection between 12 signals on Fair Oaks Av and City Hall and install the ATMS/central management/control system at its City Hall Building. Funds are for design and construction costs.	12/31/2023
SOUTHERN CALIF. REGIONAL RAIL AUTHORITY	LA0G1596	San Fernando Road Bike Path Phase III - Crossings Safety Improvement. The project is located along San Fernando Road between Branford Street in the City of Los Angeles to CP Hollywood in the City of Burbank and includes 4.2 mile of bike path and 5 at-grade crossings.	12/31/2023
TORRANCE	LA0G1589	Anza Ave from Del Amo Blvd to Sepulveda Blvd; asphalt pavement rehabilitation, repair damaged sidewalks and curb and gutter, traffic signal improvements to increase capacity and throughput (video detection, pedestrian actuation), installation of emergency vehicle preemption.	6/30/2024
VARIOUS AGENCIES	20191301	I-10 Corridor Contract 2: The project will provide one express lane in each direction from just east of I-15 to Pepper Avenue in Colton, connecting to the I-10 Corridor Contract 1 express lanes currently under construction (Toll Credits to match STP).	12/30/2027
WHITTIER	LAF5314	Gateway Cities Forum Traffic Signal Corridors Project - improve traffic signal operations by upgrading each traffic signal to federal and state standards, providing additional vehicle detection to enable operation as a fully traffic-actuated signal, installing the appropriate components to enable each signal to be capable of time-based coordination and retiming signals to improve the overall progression of traffic (approximately 17 signals included).	6/30/2023
WHITTIER	LAF7519	Project is located in the City of Whittier. It will implement a two-mile Class I bike/pedestrian path on a City-controlled easement along the Union Pacific Railroad corridor from Mills Av to Leffingwell Rd, and it will also provide a trailhead east of Mills Av. The project promotes a regional bikeway corridor by extending the 4.5-mile Whittier Greenway Trail east at the City and LA County limits. Utilizing TC of $247K in FY24 to match CMAQ in CON. Toll Credits Used.	12/31/2023
WHITTIER	LATP16S011	Whittier Greenway Trail East Extension Gap Closure. Acquisition of final 0.5 mile and construction/completion of final 2.8 miles of the 7.3-mile Whittier Greenway Trail, a Class I bicycle and pedestrian trail along southern boundary of Whittier, connecting LA & Orange County.	12/31/2023

TABLE IV-B-A-2. ORANGE COUNTY			
LEAD AGENCY	PROJECT ID	PROJECT DESCRIPTION	COMPLETION DATE
ANAHEIM	ORA152211	Nohl Ranch Open Space Trail - project will consist of a 10-foot wide Class I bikeway and a 3 to 10-foot wide pedestrian trail (pending clearance), in compliance with Caltrans standards. The project alignment would be approximately 5,100 LF and connect Anaheim Hills Road to the signalized crossing on the east side of Avenido Bernardo North. Ancillary features of the project include lighting, lane markings, signs, bicycle parking and pedestrian amenities.	6/30/2027
BREA	ORA190906	OC Loop Brea Gap Closure - Class I, 1.30-mile bikeway along the existing railroad ROW between North Palm Street and the Brea Canyon Channel in the City of Brea.	6/30/2028
GARDEN GROVE	ORA170202	City of Garden Grove, Bicycle Corridor Improvements - New bike lanes through road rebalancing on West Street and Gilbert Street, striping buffers to existing bike lanes on Brookhurst Street, Chapman Avenue, and Lampson Avenue, striping bike lane network gaps on Brookhurst Street, improving and creating bicycle routes on Lampson Avenue, Gilbert Avenue, Imperial Avenue, Shapel Street and Deadora Drive.	10/1/2025
LA HABRA	ORA113011	La Habra Union Pacific Railroad Bikeway. ENG for Union Pacific Railroad ROW between La Habra West City Limits and La Habra East City Limits. ROW for La Habra West City Limits to Beach Boulevard. Toll Credit Match for ATP-MPO - Split project with ORA190920 for ROW.	7/1/2025
ORANGE COUNTY	ORA170205	HAZARD AVENUE BIKEWAY PROJECT between Goldenwest Street and Euclid Avenue. Construct approximately 4 miles of a Class IV (paved, on-road protected) Bikeway in the cities of Westminster and Garden Grove.	12/1/2023
ORANGE COUNTY	ORA230801	OC Loop Segment P and Q - Class I trail along the Coyote Creek Flood Channel (1.6 miles) that closes a gap along the 66-mile multi-modal regional route known as the OC Loop. Split project from ORA151508.	12/19/2030
ORANGE COUNTY TRANSPORTATION AUTHORITY (OCTA)	ORA112702	Rideshare Vanpool Program - Capital Lease Cost FY12/13 - FY20/21. This project includes subsidy, marketing, database, ride guide and associated costs for the Rideshare/Vanpool program. Transit Development Credits: FY18/19 FTA 5307 Transfer @ $516, FY20/21 CMAQ @ $516 and FY21/22 CMAQ @ $516.	9/30/2024
ORANGE COUNTY TRANSPORTATION AUTHORITY (OCTA)	ORA210301	The project will install real-time display & Bravo! signage at up to 23 bus stops along the Bravo! Main Street Rapid Bus and OC Bus Route 53/53X corridor. Route 53/53X operates from Anaheim through Orange and Santa Ana to Irvine via Main Street and Bravo! Main Street Rapid Bus (Route 533) operates on Main Street from Anaheim Regional Transportation Intermodal Center to MacArthur Boulevard in Santa Ana.	12/31/2025
ORANGE COUNTY TRANSPORTATION AUTHORITY (OCTA)	ORA211701	Countywide Signal Synchronization Baseline This project aims to build and reset the synchronization baseline network for Orange County's Signal Synchronization Network or SSN for the weekday and weekend peak periods. This project will include data collection, timing optimization, implementation, fine-tuning and continuity testing of 2,500 signals along the SSN. Toll credits: CMAQ: $1,376 in FY22/23; STBG: $344 in FY22/23.	6/30/2029
SANTA ANA	ORA151502	Santa Ana and Fifth Protected Bike Lane - Install median protected bike lanes on Santiago, Sixth, Brown, Garfield, French, Fifth and Santa Ana with all applicable signage, striping, and signal improvements. ATP State only funding.	12/1/2026

TABLE IV-B-A-2. ORANGE COUNTY			
LEAD AGENCY	PROJECT ID	PROJECT DESCRIPTION	COMPLETION DATE
SANTA ANA	ORA151503	The Edinger Ave Protected Bike Lanes Project - Install bike lanes down the 1.7 mile corridor passing through residential homes, schools, parks, and small business shopping centers. The Project includes a Safe Routes to School program at 3 schools. ATP State-Only funded.	12/1/2026
SANTA ANA	ORA170802	First Street Pedestrian Improvements - Widen existing sidewalks by three feet, narrow the vehicle lanes, construct ADA improvements on sidewalks and wheel chair ramps, provide high visibility marked crosswalks, and add a signal controlled pedestrian crossing along First Street, 1.1 mile corridor.	12/14/2026
SANTA ANA	ORA190901	Fremont Elementary and Spurgeon Intermediate SRTS - Pedestrian/bicyclist traffic safety improvements for Fremont Elementary and Spurgeon Intermediate safe routes to school. Work includes bulbouts, curb ramps, 2,383 linear feet (lf) of new sidewalk, 10,824 lf of class 3 bikeways and a road diet with 5,280 lf of class 2 bikeways. State only funds.	7/15/2026
SANTA ANA	ORA190904	McFadden Ave. Protected Bike Lane and Bicycle Blvd. Project - McFadden Ave. 15,050 linear feet of class IV protected bike lanes and road diets and 6,365 linear feet of class III Bicycle Blvd from Harbor Blvd to Grand Ave in the City of Santa Ana. ATP toll credits.	7/15/2026
SANTA ANA	ORA190905	Standard Avenue Class IV Protected Bike Lane and Class II Buffered Bike Lane from 3rd Street to Warner Avenue and Protected Intersection Project at McFadden in the City of Santa Ana. Project includes 9,900 linear feet (lf) of road diets, 4,000 lf class II, 1,700 lf class III, and 5,900 lf class IV bikeways. ATP toll credits.	7/15/2026
SANTA ANA	ORA190915	Bristol Street Protected Bike Lanes - Phase II Warner to St. Andrew Place - Class IV, 1.0-mile bicycle lane installation on Bristol Street from Warner Avenue to St. Andrew Place. This segment will install a six-foot wide bicycle lane and a four-foot wide separation barrier as a buffer within the curb to curb street width after.	2/26/2026
SANTA ANA	ORA210901	Raitt Street Protected and Buffered Bike Lane Project - Raitt St. Class 4 protected bike lane from St. Gertrude to Santa Ana Blvd, Class 2 bike lane from Warner to Occidental, and Class 3 bicycle blvd from Santa Ana Blvd to Washington.	12/30/2030
VARIOUS AGENCIES	ORA100511	SR-55 WIDENING BETWEEN I-405 AND I-5 - ADD 1 MF AND 1 HOV LANE EACH DIRECTION AND FIX CHOKEPOINTS FROM I-405 TO I-5; ADD 1 AUX LANE EA DIR BTWN SELECT ON/OFF RAMP AND NON-CAPACITY OPERATIONAL IMPROVEMENTS THROUGH PROJECT LIMITS. Toll Credit for RSTP and CMAQ (Including street traffic signal improvement at I-5/Newport Avenue onramp for mitigation. non-capacity).	4/30/2029
VARIOUS AGENCIES	ORA111210	I-5 FROM SR 55 TO SR 57 - ADD 1 HOV LANE EACH DIRECTION (PPNO 2883A). Signage from PM 31.1 to 37.7 (Utilize toll credit match).	12/31/2021
VARIOUS AGENCIES	ORA111801	I-5 (Alicia Parkway to El Toro Road) Segment 3 - The project will add one general purpose lane on the I-5 in each direction between Alicia Parkway and El Toro Road (approximately 1.7 miles), Extend the 2nd HOV lane in both directions and add auxiliary lanes where needed.	9/30/2025

TABLE IV-B-A-3. RIVERSIDE COUNTY			
LEAD AGENCY	PROJECT ID	PROJECT DESCRIPTION	COMPLETION DATE
CALIMESA	RIV190623	IN WESTERN RIVERSIDE COUNTY FOR THE CITY OF CALIMESA (JOINT PROJECT WITH CITY OF YUCAIPA) - ON COUNTY LINE RD B/W PARK AV AND BRYANT ST, CONSTRUCT 4 SINGLE-LANE AND 1 MULTI-LANE ROUNDABOUTS; AND IMPROVEMENTS TO STREET, PEDESTRIAN FACILITIES, AND BICYCLE FACILITIES.	12/31/2030
CITY OF EASTVALE	RIV210627	In Western Riverside County in the City of Eastvale - Southeast Eastvale Safe Routes to School Equitable Access Project - Construct: 1 lane mile of Class II bikeway along Orange Street from Summer Ave to Scholar Way; a pedestrian signal with bulb-outs & pedestrian refuge island; 3 additional crossing improvements for existing Class 1 path; 4 bulb-outs.	10/28/2028
CITY OF JURUPA VALLEY	RIV200703	IN WESTERN RIVERSIDE CO. FOR THE CITY OF JURUPA VALLEY - SRTS SIDEWALK GAP CLOSURE ON VARIOUS STREETS NEAR SUNNYSLOPE ELEMENTARY SCHOOL: CONSTRUCT 9,715 LF OF SIDEWALKS, 15 CROSSWALKS (11 NEW & 4 UPGRADES), 19 ADA RAMPS, SOLAR FLASHING BEACONS AT 2 AWSC INTERECTIONS AND RRFB CONTROLLED CROSSWALK (STATE-ONLY FUNDS: SB1 & SHA).	12/30/2027
HEMET	RIV181010	IN CITY OF HEMET - HEMET VALLEY BIKEWAY CONX: INSTALL CLASS II (1,200 LF), III (10,500 LF) BIKE LNS, NEW S/W (4,000 LF) W/ ADA RAMPS, XING IMP., ON PALM BW ESPLANDE & JOHNSTN, WHITTIER BW PALM & GILBERT, JOHNSTN BW PALM & GILBERT, GILBERT BW WHITTIER & CHAMBERS, CHAMBERS BW GILBERT & STATE; BIKE STAGING W/ DETECTION, LOCKERS, REPAIR AREA; INCL OUTREACH. (ATP-3 AUG STATE) TC UTILIZ FOR FY19, FY20.	9/1/2023
PERRIS	RIV210619	In Western Riv. Co. in the City of Perris: Construct 9,240 linear ft of class IV bike lanes with hardscape buffer and reflective delineators, 3 high-visibility crosswalks, 700 linear ft of sidewalks, bike repair stations, and signage on Redlands Ave between Placentia Ave and Tahoe St, and on Citrus Ave between Redlands Ave and Perris Blvd. Includes public outreach campaign.	12/31/2028
RIVERSIDE COUNTY	RIV200707	IN WESTERN RIVERSIDE CO. FOR THE UNINCORPORATED AREA OF WARM SPRINGS AND IN THE CITY OF LAKE ELSINORE - EL TORO RD/DEXTER AVE SRTS SIDEWALK PROJECT: CONSTRUCT APPROX. 5,748 LF OF SIDEWALK, CURB AND GUTTER ON EL TORO/DEXTER FROM CARMELA CT TO 630' N/O CENTRAL AVE INCLUDING 7 NEW CURB RAMPS, A NEW CROSSWALK AND 2 FLASHING BEACONS. SRTS PROGRAM INCLUDES: WALK/BIKE AUDIT, PED SAFETY CLASS, MOCK CITY EVENTS, AND SRTS LAW ENFORCEMENT.	12/30/2028
RIVERSIDE COUNTY TRANS COMMISSION (RCTC)	RIV160101	IN WESTERN RIVERSIDE COUNTY ON SR-91/I-15: On I-15 -ADD TOLL EXPRESS LANE MEDIAN DIRECT CONNECT FROM SB15 TO WB91 & EB91 TO NB15, 1 TOLL EXPRESS LANE EACH DIRECTION FROM HIDDEN VALLEY TO SR91 DIRECT CONNECTOR. CONSTRUCT OPERATIONAL IMPROVEMENT BY EXTENDING THE EB91 EXPRESS LANE (2ND LN SPLIT TO RIV160101A) AND AUXILARY LANE ALONG SR91. CONSTRUCT ADDITIONAL SIGNAGE ALONG SR91 AT PM R18.0 IN OR COUNTY.	6/30/2024
RIVERSIDE COUNTY TRANS COMMISSION (RCTC)	RIV111207	IN WESTERN RIVERSIDE COUNTY - CONTINUE THE IMPLEMENTATION OF PARK & RIDE FACILITIES THROUGH PROPERTY LEASES (VARIOUS LOCATIONS THROUGHOUT THE WESTERN COUNTY).	12/30/2028
RIVERSIDE COUNTY TRANS COMMISSION (RCTC)	RIV151104	FREEWAY SERVICE PATROL (FSP) CONTINUED IMPLEMENTATION OF FSP ON SR-91 (ORANGE COUNTY LINE TO 60/91/215 INTERCHANGE), SR-60 (MILLKEN TO THEODORE), I-215 (SAN BERNARDINO COUNTY LINE TO MURRIETA HOT SPRINGS), I-15 (SR-60 TO SR-79/TEMECULA PARKWAY).	12/31/2028

TABLE IV-B-A-3. RIVERSIDE COUNTY			
LEAD AGENCY	PROJECT ID	PROJECT DESCRIPTION	COMPLETION DATE
RIVERSIDE COUNTY TRANS COMMISSION (RCTC)	RIV200105	In Western Riverside County - Continue the implementation of subsidies for eligible vanpools commuting to worksites in Western County. TDC used as follows: FFY 23/24 $49k; FFY24/25 $70k; & FFY25/26 $93k.	12/30/2030
RIVERSIDE COUNTY TRANS COMMISSION (RCTC)	RIV200801	In Western Riverside County in the City of Temecula: Installation of new vehicle detection and adaptive highway metering systems on I-15 NB from the San Diego county line to the I-15/I-215 split. Includes relocation of existing ramp meters at Rancho California Rd. (RCR) and Temecula Parkway, ramp modifications at RCR and Winchester Road, variable speed limit signs, and other ITS elements. TC Utilization for CMAQ and TC for Earmarks.	12/31/2025
RIVERSIDE TRANSIT AGENCY	RIV180131	IN WESTERN RIV CO IN THE CITY OF HEMET FOR RTA - CONSTRUCTION OF THE HEMET MOBILITY HUB ON 2 ACRE PARCEL LOCATED EAST OF RAIL ROW, SOUTH OF EAST DATE STREET, W/O NORTH JUANITA ST, AND NORTH OF EAST DEVONSHIRE AVE TO INCLUDE: 10 BUS BAYS, 10 SHELTERS/CANOPIES, 20 PARKING SPACES, 1 TRAFFIC SIGNAL AT DEVONSHIRE & CARMALITA, 1 CONTROLLED INTERSECTION AT DEVONSHIRE AND JUANITA; STORAGE AND RESTROOM FACILITY. (FTA 5339: FY15 $1,626 (URBAN) ; FY16 $317 AND FY17 $326 (SMALL URBAN).	12/31/2030
WILDOMAR	RIV210630	In Western Riverside County in the City of Wildomar: Bundy Canyon ATP Corridor (CIP 026-3): Between Monte Vista Drive and Harvest Way, construct a 2.2 mile ADA compliant 15-foot wide Class I Shared Bike/Pedestrian Path along Bundy Canyon Road with lighting, wood/rope barrier, and CA MUTCD signage. Includes community programs to enhance safety and comfort for residents and students.	12/31/2029

TABLE IV-B-A-4. SAN BERNARDINO COUNTY			
LEAD AGENCY	PROJECT ID	PROJECT DESCRIPTION	COMPLETION DATE
FONTANA	20131506	IN FONTANA: SAN SEVAINE TRAIL (PHASE 1, SEG 2) North/South 1.25 mile long, 12 ft wide paved multi-use trail from Banyan St. to the Pacific Electric Trail in Fontana.	12/31/2023
HIGHLAND	SBD230803	In Highland: Construction of 1 mile of new Class II and III bicycle lanes on Orange St from Greenspot Rd to Eucalyptus Ave (Class II), Orange St from Eucalyptus Ave to Tonner Dr. (Class III), Tonner Dr. from Orange St to Streater Dr. (Class III), Steater Dr. from Baseline to Glenheather Dr. (Class II and III), Glenheather Dr. from Streater Dr. to Church St/Love St. (Class II and III) and Love St. from Church St. to Elder Gulch Paseo (Class III).	6/30/2025
REDLANDS	SBD230802	In Redlands: Installation of 0.1 miles of a Class IV bikeway on Texas Street from Citrus Valley High School (CVHS) to Domestic Avenue. Installation of 0.5 miles of Class I bicycle/pedestrian path on Domestic Avenue from Texas Street to Orange Street connecting CVHS to Orange Street. Installation of 0.25 miles of Class I bicycle/pedestrian path on Orange Street from Pioneer Street to Domestic Avenue.	4/1/2024
OMNITRANS	20150307	COUNTY-WIDE VANPOOL PROJECT (Ongoing)(TDC: FY16/17 CMAQ CON $460k).	6/30/2023
SAN BERNARDINO COUNTY TRANSPORTATION AUTHORITY	20190010	Reconstruct Mt. Vernon Ave Bridge over I-10 to accommodate 2 new dedicated left turn and bike lanes and sidewalk, realign Mt. Vernon & E Valley Blvd Intersection, and modify portion of the WB on-ramp and EB off-ramp. Widen SB Mt Vernon Ave south of the bridge to 2 through lanes. Widen NB Mt Vernon Ave, south of the EB on-ramp, to accommodate 1 new dedicated left turn lane.	12/31/2025
SAN BERNARDINO COUNTY TRANSPORTATION AUTHORITY	20190702	SBCTA Metrolink Station Accessibility Improvement Project - Phase II: Bicycle and pedestrian accessibility improvements near five Metrolink transit stations (Montclair, Upland, Rancho Cucamonga, Fontana, and San Bernardino). Toll Credit to match ATP.	5/21/2024
VARIOUS AGENCIES	20159901	I-15 Express Lanes (Contract 1): Construct 1 Exp. Lane in each direction between Cantu-Galleano Ranch Rd. and SR-60 and 2 Exp. Lanes in each direction between SR-60 and north of Foothill Blvd. Additional improvements to AUX LN widening, undercrossing, and reconstruction of ramps and lane transitions where needed.	10/1/2026
VARIOUS AGENCIES	20191301	I-10 Corridor Contract 2: The project will provide one express lane in each direction from just east of I-15 to Pepper Avenue in Colton, connecting to the I-10 Corridor Contract 1 express lanes currently under construction (Toll Credits to match STP).	12/30/2027

South Coast AQMD

APPENDIX V

Contingency Measures Infeasibility Justification

Table of Contents

Introduction

The Clean Air Act (CAA) specifies that State Implementation Plans (SIPs) must provide for contingency measures, defined in section 172(c)(9) as "specific measures to be undertaken if the area fails to make reasonable further progress, or to attain the national primary ambient air quality standard by the attainment date." These measures must be in addition to existing measures including those proposed for attainment in this Plan.

Recently, the U.S. EPA released a guidance document, entitled Draft Guidance on the Preparation of State Implementation Plan Provisions that Address the Nonattainment Area Contingency Measure Requirements for Ozone and Particulate Matter[1] (hereafter, "Draft Guidance"). The Draft Guidance clarifies requirements for contingency measures including: (1) revising the quantity of emissions reductions that contingency measures should provide to account for declining emissions inventories over time; (2) allowing for an infeasibility justification if an area is unable to identify feasible contingency measures in sufficient quantities due to a scarcity of available, qualifying measures; and (3) revising the time period within which emission reductions from contingency measures should occur – 60 days to take effect and up to 2 years to achieve emission reductions from a triggering event.

An overview of South Coast AQMD's contingency measure and the amount of reductions anticipated from it are presented in Chapter 6. The contingency measure in place for this standard is anticipated to achieve less than one year's worth (OYW) of reductions, the amount of reductions recommended by the Draft Guidance. Therefore, consistent with the Draft Guidance, this appendix provides an infeasibility justification that no further opportunities for contingency measures or emission reductions exist.

To fulfill CAA requirements for PM2.5 SIP planning requirements, Appendix III of the PM2.5 Plan includes a robust control strategy analysis for Best Available Control Measures (BACM) and Most Stringent Measures (MSM). As part of the BACM/MSM analysis, staff compared rule requirements with those in other jurisdictions, focusing on potential deficiencies in South Coast AQMD's rules. In many ways, this analysis mirrored the evaluation process that U.S. EPA recommends for developing infeasibility justifications. U.S. EPA's Draft Guidance acknowledges the approach taken in this Plan by noting "[w]here the nonattainment plan associated with the [contingency measure] submission contains a robust control strategy analysis, that analysis can serve as a foundation for much of this effort." Therefore, for some categories, staff referenced the BACM/MSM analysis, and associated potential control measures identified, when developing the infeasibility justification.

[1] EPA, Office of Air Quality Planning and Standards, Air Quality Policy Division, "DRAFT: Guidance on the Preparation of State Implementation Plan Provisions that Address the Nonattainment Area Contingency Measure Requirements for Ozone and Particulate Matter" ("Draft Guidance"), March 16, 2023.
https://www.epa.gov/system/files/documents/2023-03/CMTF%202022%20guidance%203-17-23.pdf

Control Measure Identification and Evaluation Methodology

South Coast AQMD followed the procedures outlined in the Draft Guidance for the preparation of a reasoned justification for providing contingency measures achieving less than OYW of reductions. These procedures, which involve the identification of existing and potential controls not already included in the PM2.5 Plan and evaluation of the feasibility of such controls, are outlined below:

1. Thoroughly examine the emission sources in the South Coast Air Basin and identify applicable rules.

2. Compare existing rule requirements with those in other jurisdictions and identify potential control measures that were not identified as part of the BACM/MSM analysis in Appendix III and are surplus to the control strategy in Chapter 4.

3. Review each of the measures identified in Step 2 to determine whether it is technologically and economically feasible to implement within 2 years as a contingency measure. If feasible, include the measure in the contingency measure submission.

4. For the remaining infeasible measures from Step 3, document the reason why each measure is infeasible as a contingency measure, including whether the conclusion is based on technological, economic, or other infeasibility considerations.

Reasoned Justification for Proposing Measures Achieving Less than One Year's Worth of RFP

This section contains evaluation of all direct PM2.5, NOx, and ammonia (NH3) source categories in the South Coast Air Basin (Basin) and associated control measures. In order to identify relevant source categories for this evaluation, South Coast AQMD staff began by examining sources of emissions by major source categories (MSCs), then proceeded to examine the in-depth sub-categories in each MSC, and identified rules and controls applicable to each sub-category. Table V-1 lists the Basin's projected PM2.5, NOx, and NH3 baseline emissions in tons per day (tpd) for the 2030 attainment year by three-digit Emission Inventory Code (EIC) and description. For brevity, sub-category level emissions are not included in the table. Percentages of the total emissions for each source category are provided as well.

TABLE V-1
SOUTH COAST AIR BASIN MAJOR SOURCE CATEGORIES AND 2030 BASELINE EMISSIONS INVENTORY OVERVIEW

Major Source Category (EIC – Description)	PM2.5 Emissions (tpd)	% of 2030 PM2.5 Inventory	NOx Emissions (tpd)	% of 2030 NOx Inventory	NH3 Emissions (tpd)	% of 2030 NH3 Inventory
010 – Electric Utilities	0.43	0.80%	2.49	1.18%	0.53	0.67%
020 – Cogeneration	0.01	0.02%	0.02	0.01%	0.17	0.21%
030 – Oil and Gas Production (Combustion)	0.11	0.20%	0.93	0.44%	0.25	0.32%
040 – Petroleum Refining (Combustion)	1.79	3.31%	4.27	2.03%	1.54	1.94%
050 – Manufacturing and Industrial	1.29	2.39%	7.62	3.62%	2.20	2.77%
052 – Food and Agricultural Processing	0.05	0.09%	0.39	0.19%	0.06	0.08%
060 – Service and Commercial	1.11	2.05%	11.26	5.35%	2.21	2.79%
099 – Other (Fuel Combustion)	0.41	0.76%	2.41	1.15%	0.28	0.35%
110 – Sewage Treatment	0.00	0.00%	0.00	0.00%	0.22	0.28%
120 – Landfills	0.21	0.39%	0.39	0.19%	1.26	1.59%
130 – Incineration	0.05	0.09%	1.18	0.56%	0.24	0.30%
140 – Soil Remediation	0.00	0.00%	0.05	0.02%	0.00	0.00%
199 – Other (Waste Disposal)	0.00	0.00%	0.00	0.00%	1.67	2.10%
210 – Laundering	0.00	0.00%	0.00	0.00%	0.00	0.00%
220 – Degreasing	0.02	0.04%	0.00	0.00%	0.01	0.01%
230 – Coatings and Related Processes	1.54	2.85%	0.00	0.00%	0.10	0.13%
240 – Printing	0.00	0.00%	0.00	0.00%	0.04	0.05%
250 – Adhesives and Sealants	0.02	0.04%	0.00	0.00%	0.00	0.00%
299 – Other (Cleaning and Surface Coatings)	0.00	0.00%	0.04	0.02%	0.00	0.00%
310 – Oil and Gas Production	0.02	0.04%	0.01	0.00%	0.00	0.00%
320 – Petroleum Refining	0.88	1.63%	0.59	0.28%	0.07	0.09%
330 – Petroleum Marketing	0.00	0.00%	0.02	0.01%	0.00	0.00%
339 – Other (Petroleum Production and Marketing)	0.00	0.00%	0.01	0.00%	0.00	0.00%
410 – Chemical	0.39	0.72%	0.07	0.03%	0.01	0.01%
420 – Food and Agriculture	0.06	0.11%	0.03	0.01%	0.00	0.00%
430 – Mineral Processes	0.99	1.83%	0.38	0.18%	0.07	0.09%
440 – Metal Processes	0.26	0.48%	0.29	0.14%	0.00	0.00%
450 – Wood and Paper	3.23	5.98%	0.00	0.00%	0.01	0.01%
460 – Glass and Related Products	0.00	0.00%	0.00	0.00%	0.00	0.00%
470 – Electronics	0.00	0.00%	0.00	0.00%	0.00	0.00%
499 – Other (Industrial Processes)	0.48	0.89%	0.02	0.01%	8.59	10.83%
510 – Consumer Products	0.00	0.00%	0.00	0.00%	0.00	0.00%
520 – Architectural Coatings and Related Solvent	0.00	0.00%	0.00	0.00%	0.00	0.00%
530 – Pesticides/Fertilizers	0.00	0.00%	0.00	0.00%	1.17	1.47%
540 – Asphalt Paving/Roofing	0.03	0.06%	0.00	0.00%	0.00	0.00%
610 – Residual Fuel Combustion	6.59	12.19%	15.17	7.21%	0.11	0.14%
620 – Farming Operations	0.13	0.24%	0.00	0.00%	6.13	7.73%

Major Source Category (EIC – Description)	PM2.5 Emissions (tpd)	% of 2030 PM2.5 Inventory	NOx Emissions (tpd)	% of 2030 NOx Inventory	NH3 Emissions (tpd)	% of 2030 NH3 Inventory
630 – Construction and Demolition	2.49	4.61%	0.00	0.00%	0.00	0.00%
640 – Paved Road Dust	9.11	16.85%	0.00	0.00%	0.00	0.00%
645 – Unpaved Road Dust	1.67	3.09%	0.00	0.00%	0.00	0.00%
650 – Fugitive Windblown Dust	0.21	0.39%	0.00	0.00%	0.00	0.00%
660 – Fires	0.41	0.76%	0.08	0.04%	0.00	0.00%
670 – Waste Burning and Disposal	0.28	0.52%	0.09	0.04%	0.03	0.04%
690 – Cooking	12.30	22.76%	0.00	0.00%	0.00	0.00%
699 – Other (Miscellaneous Processes)	0.00	0.00%	0.00	0.00%	28.03	35.33%
710 through 890 (Mobile Source Categories)	7.44	13.77%	162.63	77.30%	21.32	26.87%
Total	**54.05**	**100.00%**	**210.39**	**100.00%**	**79.34**	**100.00%**

Mobile source categories (i.e., MSCs 710 through 890) comprise nearly 77 percent of the 2030 NOx emissions in the Basin. While CARB has unique authority to regulate certain mobile sources by obtaining a waiver from U.S. EPA, significant mobile source categories such as aircraft, ships, locomotives, and interstate trucks lie primarily under federal regulatory authority. It is important to note that U.S. EPA has taken the position that they are not obligated to evaluate contingency measures for sources under its authority. Furthermore, the dominance of mobile source NOx emissions significantly limits the ability for the South Coast AQMD to achieve OYW of NOx reductions from contingency measures.

Fuel Combustion

Fuel combustion emissions are shown in Table V-2 and consist of nine MSCs including 010 – Electric Utilities, 020 – Cogeneration, 030 – Oil and Gas Production (Combustion), 040 – Petroleum Refining (Combustion), 050 – Manufacturing and Industrial, 052 – Food and Agricultural Processing, 060 – Service and Commercial, 099 – Other (Fuel Combustion), and 610 – Residential Fuel Combustion. Staff examined direct PM2.5, NOx, and NH3 emissions by equipment category rather than source category because the analysis of feasible contingency measures is anticipated to be similar across each source category that combusts fuel. That is, the technologies available to minimize emissions from fuel combustion in each source category are predicted to be more dependent on the equipment combusting fuel than on the type of source generating the emissions.

As demonstrated in Table V-2, fuel combustion sources contribute 11.8 tpd of PM2.5, 44.6 tpd of NOx, and 7.36 tpd of NH3 to the 2030 baseline emissions inventory. The analysis of fuel combustion equipment was grouped into five categories: (1) boilers, stream generators, and process heaters; (2) engines; (3) combustion turbines; (4) residential and commercial fuel combustion; and (5) other fuel combustion. Each source group is evaluated separately below.

TABLE V-2
FUEL COMBUSTION SOURCE CATEGORY EMISSIONS BASED ON 2030 BASELINE INVENTORY IN THE SOUTH COAST AIR BASIN

Industry	PM2.5 (tpd)	NOx (tpd)	NH3 (tpd)
010 – Electric Utilities	0.43	2.49	0.53
020 – Cogeneration	0.01	0.02	0.17
030 – Oil and Gas Production (Combustion)	0.11	0.93	0.25
040 – Petroleum Refining (Combustion)	1.79	4.27	1.54
050 – Manufacturing and Industrial	1.29	7.62	2.20
052 – Food and Agricultural Processing	0.05	0.39	0.06
060 – Service and Commercial	1.11	11.26	2.21
099 – Other (Fuel Combustion)	0.41	2.41	0.28
610 – Residential Fuel Combustion	6.59	15.17	0.11
Total	**11.8**	**44.6**	**7.36**

1. Boilers, Steam Generators, and Process Heaters

a. Overview

Boilers, steam generators, and process heaters fueled by gas or liquid fuel are used to produce hot water, produce steam, and transfer heat from combustion gases to liquid or process streams. These units emit direct PM2.5, NOx, and NH3 and can be found at facilities representing a wide range of industries including, but not limited to, electrical utilities, cogeneration, oil and gas production, petroleum refining, manufacturing and industrial, food and agricultural processing, and service and commercial facilities as shown in Table V-3. These units have significant variability in technology, size, use and age of equipment, as well as variability in potential controls for various pollutants, the affected industries, and the regulatory requirements.

TABLE V-3
BOILERS, STEAM GENERATORS AND PROCESS HEATERS EMISSIONS BASED ON 2030 BASELINE INVENTORY IN THE SOUTH COAST AIR BASIN

Industry	PM2.5 (tpd)	NOx (tpd)	NH3 (tpd)
010 – Electric Utilities	0.06	0.48	0.10
020 – Cogeneration	0.00	0.00	0.00
030 – Oil and Gas Production (Combustion)	0.02	0.07	0.02
040 – Petroleum Refining (Combustion)	1.31	3.68	0.64
050 – Manufacturing and Industrial	0.18	1.15	0.23
052 – Food and Agricultural Processing	0.05	0.30	0.06
060 – Service and Commercial	0.47	3.58	0.20
099 – Other (Fuel Combustion)	0.00	0.00	0.00

Industry	PM2.5 (tpd)	NOx (tpd)	NH3 (tpd)
610 – Residential Fuel Combustion	0.00	0.00	0.00
Total	**2.54**	**9.26**	**1.25**

b. Evaluation

i. Available Control Technologies

Low NOx burners (LNB) and ultra-low NOx burners (ULNB), as well as flue gas recirculation (FGR), are commonly used combustion control technologies that manage NOx emissions in boilers, steam generators, and process heaters. The most popular post-combustion add-on control method is selective catalytic reduction (SCR). With ULNB, emission limits of 7 to 9 ppm[2] are often feasible to achieve. Current units burning gaseous fuels can achieve a 9 ppm NOx limit with ULNB and meeting 7 ppm is potentially possible with burner replacement.[3] Operators often utilize SCR to attain an emissions limit of 5 ppm or below.

There are emerging technologies that have demonstrated achieving 5 ppm without the use of SCR and these include next generation ULNB for boilers smaller than 20 million British thermal units per hour (MMBtu/hr).[4]

ii. South Coast AQMD Control Measures

Table V-4 summarizes two South Coast AQMD control measures for boilers, steam generators, and process heaters.

TABLE V-4
SOUTH COAST AQMD CONTROL MEASURES (BOILERS, STEAM GENERATORS, AND PROCESS HEATERS)

South Coast AQMD Rule	Applicability	Control Measure
Rule 1135 - Emissions of Oxides of Nitrogen from Electricity Generating Facilities	Electric generating units at electricity generating facilities.	Boilers must achieve 5 ppm NOx at 3% O_2
Rule 1146 – Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters (Amended 12/4/20)	Boilers, steam generators, and process heaters of equal to or greater than 5 MMBtu/hr rated input capacity used in all industrial, institutional, and commercial operations	The various limits in the rule apply to different types of units based on use and size but can be achieved using the following control technologies: LNB, ULNB, SCR

[2] All ppm emission limits are referenced at 3 percent volume stack gas oxygen (O_2) on a dry basis averaged over a period of 15 consecutive minutes
[3] Final Staff Report for PARs 1146, 1146.1 and 1146.2, and PR 1100, South Coast AQMD, December 2018
[4] John Zink Hamworthy SOLEX™ Burner: https://www.johnzinkhamworthy.com/wp-content/uploads/solex-burner.pdf. Accessed on September 27, 2023

South Coast AQMD Rule	Applicability	Control Measure
Rule 1146.1 – Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters (Amended 12/7/18)	Boilers, steam generators, and process heaters that are greater than 2 MMBtu/hr and less than 5 MMBtu/hr rated heat input capacity used in any industrial, institutional, or commercial operation	The various limits in the rule apply to different types of units based on use and size but can be achieved using the following control technologies: LNB, ULNB
Rule 1146.2 – Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers and Process Heaters (Amended 12/7/18)	Natural gas-fired water heaters, boilers, and process heaters that are less than 2 MMBtu/hr	The various limits in the rule apply to different types of units based on use and size
Rule 1109.1 – Emissions of Oxides of Nitrogen from Petroleum Refineries and Related Operations (Adopted 11/5/21)	Combustion equipment including, but not limited to, boilers and process heaters at petroleum refineries and facilities with related operations to petroleum refineries	The various limits in the rule apply to different types of units based on use and size but can be achieved using the following control technologies: LNB, ULNB, SCR

iii. Review of Control Measures in Other Jurisdictions

To find potential measures to consider as contingency measures, staff considered the control measures in place in other California jurisdictions such as San Joaquin Valley Air Pollution Control District (SJVAPCD) and Ventura County APCD (VCAPCD) that regulate boilers, steam generators, and process heaters. These rules are not structured identically across agencies or rules, which can make direct comparison difficult. For example, subcategories are organized differently among the rules. Table V-5 summarizes the applicable control measures identified in other jurisdictions. In the table, two South Coast AQMD rules for boilers, steam generators, and process heaters – Rules 1146 and 1109.1 – are compared with SJVAPCD Rules 4306 and 4320 and VCAPCD Rule 74.15. Note that the comparison could not be performed for all unit categories. For example, units fired on landfill gas have NOx limits at 25 ppm in Rule 1146, but not in SJVAPCD's rules or VCAPCD's rule. Although this unit category is excluded from the comparison in Table V-5, it shows that South Coast AQMD has a more stringent requirement than other jurisdictions for landfill gas-fired units. For the purpose of comparison, source category numbering follows the format used in SJVAPCD Rule 4320.

Boilers, steam generators, and process heaters permitted to operate in the Basin are sources of NOx emissions. Most of these units are installed with ULNB and/or SCR and predominantly burn natural gas so direct PM2.5 emissions are minimal. Nevertheless, a potential control measure in Appendix III evaluated PM2.5 control technologies for boilers, steam generators, and process heaters and concluded that these technologies are infeasible.

South Coast AQMD Rule 1146 is more stringent than VCAPCD Rule 74.15, but is less stringent than SJVAPCD Rules 4306 and 4320 for some of the unit categories listed below:

- Category A1 (fire tube boilers rated > 5 MMBtu/hr and ≤ 20 MMBtu/hr)
  - Rule 4320 limit: 5 ppm
  - Rule 1146 limit: 7 ppm
- Category A3 (units fired on digester gas rated > 5 MMBtu/hr and ≤ 20 MMBtu/hr)
  - Rules 4306 and 4320 limits: 9 ppm
  - Rule 1146 limit: 15 ppm
- Category A4 (thermal fluid heaters rated > 5 MMBtu/hr and ≤ 20 MMBtu/hr)
  - Rules 4306 and 4320 limits: 9 ppm
  - Rule 1146 limit: 12 ppm
- Category A5 (all other units rated > 5 MMBtu/hr and ≤ 20 MMBtu/hr)
  - Rule 4320 limit: 5 ppm
  - Rule 1146 limit: 9 ppm
- Categories B (B1, B2, and B3 – boilers rated > 20.0 MMBtu/hr and ≤ 75 MMBtu/hr)
  - Rule 4320 limit: 2.5 ppm
  - Rule 1146 limit: 7 ppm for B1 (20 to 75 MMBtu/hr) and 5 ppm for B2 (20 to 75 MMBtu/hr) and B3 (> 75 MMBtu/hr)
- Category C1 (oilfield steam generator rated > 5.0 MMBtu/hr and ≤ 20.0 MMBtu/hr)
  - Rule 4320 limit: 6 ppm
  - Rule 1146 limit: 9 ppm
- Category C2 (units rated > 20 MMBtu/hr and ≤ 75 MMBtu/hr)
  - Rule 4320 limit: 5 ppm
  - Rule 1146 limit: 9 ppm
- Category D3 (refinery boilers rated >110 MMBtu/hr)
  - Rule 4320 limit: 2.5 ppm
  - Rule 1109.1 limit: 5 ppm
- Category D4 (refinery process heaters rated > 5.0 MMBtu/hr and ≤ 40.0 MMBtu/hr)
  - Rule 4320 limit: 5 ppm
  - Rule 1109.1 limit: 9 ppm
- Category D6 (refinery process heaters rated >110 MMBtu/hr)
  - Rule 4320 limit: 2.5 ppm
  - Rule 1109.1 limit: 5 ppm

SJVAPCD Rule 4320 includes technology forcing NOx limits. For example, for categories A1 (5 ppm), B1 (2.5 ppm), C1 (6 ppm), and C2 (5 ppm), very few units have achieved these NOx limits in the SJVAPCD. As of 2020, only 2 percent of 550 units (i.e., 11 units) in these categories were permitted to comply with these NOx limits.[5] Another example is for categories B2 (2.5 pm), B3 (2.5 ppm), D3 (2.5 ppm), D4 (5 ppm), and D6 (2.5 ppm). These NOx limits have not been demonstrated to be achievable in practice for large scale

[5] SJVAPCD, Final Staff Report, "Proposed Amendment to Rule 4306 (Boilers, Steam Generators, and Process Heaters - Phase 3) Proposed amendments to Rule 4320 (Advanced Emission Reduction Options for Boilers, Steam Generators, and Process Heaters Greater Than 5.0 MMBtu/hr)," December 17, 2020, Appendix B: Emissions Reduction Analysis ("Boilers Staff Report: Appendix B")

applications. Because of the technological challenge to achieve such lower limits, Rule 4320 allows operators to pay a compliance fee in lieu of meeting the technology forcing limits until such limits are proven to be feasible in practice. This contrasts with the limits in South Coast AQMD's rules which are mandatory and do not offer fee based alternative compliance options.

South Coast AQMD Rule 1146 establishes NOx limits for existing boiler, steam generator and process heater units which have been demonstrated to be achieved in practice. The current NOx limits for gaseous fuel fired units, excluding digester and landfill gases and fire-tube boilers, with a rated heat input capacity between 5 and 75 MMBtu/hr is 9 ppm in Rule 1146. Based on vendor discussion, NOx emissions at a level of 7 ppm or lower are feasible only with ULNB replacement and new installation. The source test results also showed that it is technically feasible for existing Rule 1146 units (between 5 and 75 MMBtus/hr) to achieve an emission limit of 7 ppm or less with burner replacements. Achieving a 5 ppm NOx limit usually requires the use of SCR. SCR systems are generally utilized for units greater than 10 MMBtu/hr. Although it is potentially feasible, there are several limitations for SCR retrofits to meet 4 ppm or less, such the age, flow, and size of the catalyst bed of the existing SCR system. Another factor is ammonia slip. Meeting NOx emissions of 2.5 ppm is feasible but at the cost of higher ammonia slip (i.e., 10 ppm) which could contribute to the increased emissions of PM2.5 and enhance secondary PM2.5 formation. The most significant constraint is the inadequate safety margin between the permitted limit and the actual emissions to account for fluctuations in external factors such as ambient temperature or fuel heat input. Due to those limitations, it would not be technologically feasible for SCR retrofits to achieve the lower NOx emission limit (e.g., 2.5 ppm).[6]

The NOx emission limit for thermal fluid heaters in Rule 1146 is 12 ppm. Thermal fluid heaters use water as the heating fluid and typically operate at much higher temperatures than process heaters, which results in higher NOx emissions. At the time of rule development, ULNB replacement for existing units achieved 12 ppm NOx while an emission limit of 9 ppm was available for new units in certain applications. Based on the assumptions of 10–90 percent operating capacity of the thermal fluid heaters at different heat capacity sizes, lowering the emission limit from 12 ppm to 9 ppm for existing units would cost $58,000 to $523,000 per ton of NOx reduced.[7] Due to high cost-effectiveness, the 9 ppm NOx emission limit is considered not feasible.

The NOx emission limit for digester gas fired units in Rule 1146 is currently 15 ppm. In addition, South Coast AQMD Rule 1179.1 applies to boilers located at publicly owned treatment works (POTW) facilities and contains an identical 15 ppm NOx limit for digester gas fired units > 2 MMBtu/hr. Based on discussion with vendors, digester gas fired units can be guaranteed to meet 12 ppm while 9 ppm is dependent on fuel composition and heating value which can vary depending on facility. NOx concentration limits below 7 ppm are not feasible due to the presence of hydrogen sulfide (H_2S). Lowering NOx emissions in digester gas fired units might also cause an increase in carbon monoxide (CO) emissions.

[6] South Coast AQMD, Final Staff Report for PARs 1146, 1146.1 and 1146.2, December 2018. http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2018/2018-dec7-028.pdf?sfvrsn=6
[7] South Coast AQMD, 2022 Air Quality Management Plan, Attachment VI-A-1B to Appendix VI, December 2, 2022

Rule 1109.1 NOx limits are 5 ppm with an interim limit of 7.5 ppm for refinery boilers and process heaters with rated heat input > 110 MMBtu/hr. For boilers > 110 MMBtu/hr, the class and category are cost-effective for all units to meet the 5 ppm NOx limit; however, a couple of units were operating near the 5 ppm limit with very high cost-effectiveness (more than $200,000 per ton reduced). Five units were also operating at less than 7.5 ppm with potential emission reductions of 0.02 tpd at a cost of nearly $20 million. Refinery boiler and heater's NOx limits in Rule 1109.1 are less stringent than SJVAPCD's technology forcing limits in Rule 4320; however, as stated earlier in this section, it would be technologically infeasible to achieve the 2.5 ppm NOx limit in practice.

The implementation timeline is an additional consideration regarding the feasibility of the lower NOx limits discussed in this section. Achieving these limits would potentially require single stage SCR, two stage SCR systems, or next generation ULNB combined with SCR. These emission control technologies require complex retrofits or full unit replacement and require significantly longer than 2 years to implement. For this reason, South Coast AQMD rules typically provide more than 3 years for operators to install these technologies to comply with lower emission limits.[8] It is also worth noting that some heaters are incompatible with some of these control technologies (e.g., two stage SCR systems) due to space limitations.

NH3 emissions from fuel combustion are associated with SCR usage. NH3 is used as a reductant to convert NOx in the flue gas into nitrogen (N_2) and water (H_2O) in the SCR system, although unreacted NH3 is also emitted as ammonia slip due to a non-uniform distribution and mixing in the SCR reaction chamber. Ammonia has the potential to form secondary PM2.5 in the air, especially if there are high concentrations of sulfur in the flue gas. SCR catalyst manufacturers have developed an ammonia slip catalyst, which can be installed downstream of the SCR catalyst to convert NH3 to nitrogen and water. However, SCR system designers and catalyst manufacturers generally prefer to optimize the NH3 injection and distribution instead of recommending an ammonia slip catalyst since the additional catalyst adds to the cost and requires additional space which may not be available for existing SCR configurations. In addition, improvement in the SCR technology has helped to alleviate the need for an ammonia slip catalyst by achieving uniform NH3 to NOx distribution and mixing in the SCR design phase. South Coast AQMD considers ammonia slip limits on a case-by-case basis in the equipment permit. Under Regulation XIII – New Source Review, the BACT NH3 slip limit for SCR is 5 ppm.

[8] U.S. EPA similarly concluded that tighter limits for this source category are infeasible as a contingency measure due to SCR units requiring more than 2 years to install in its recently proposed Contingency Measures for Fine Particulate Matter Standards for San Joaquin Valley (88 FR 88008)

TABLE V-5
COMPARISON OF EXISTING CONTROL REQUIREMENTS (BOILERS, STEAM GENERATORS, AND PROCESS HEATERS)

	South Coast AQMD Rule 1146 – Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters (Amended 12/4/20)	**SJVAPCD Rule 4306 –** Boilers, Steam Generators, and Process Heaters (Amended 12/17/20)	**SJVAPCD Rule 4320 –** Advanced Emission Reduction Options for Boilers, Steam Generators, and Process Heaters Greater than 5.0 MMBtu/hr (Amended 12/17/20)	**VCAPCD Rule 74.15 –** Boilers, Steam Generators and Process Heaters (Amended 11/10/20)
Applicability	Boilers, steam generators, and process heaters of equal to or greater than 5 MMBtu/hr rated input capacity used in all industrial, institutional, and commercial operations	Gaseous or liquid fuel fired boilers, steam generator, or process heater with a total rated heat input greater than 5 MMBtu/hr	Gaseous or liquid fuel fired boilers, steam generator, or process heater with a total rated heat input greater than 5 MMBtu/hr	Portable and stationary boilers, steam generators, and process heaters fired on any gaseous fuel or liquid fuel with a rated heat input capacity equal to or greater than 5 MMBtu/hr, except for utility electric power generating units and any auxiliary boiler thereof and water heaters
A. Units with a total rated heat input > 5 MMBtu/hr to ≤ 20 MMBtu/hr, except for Categories C through G units				
A1. Fire Tube Boilers	7 ppm	7 ppm	5 ppm	9 ppm
A2. Units at Schools	9 ppm	9 ppm	9 ppm	9 ppm or 12 ppm
A3. Units fired on Digester Gas	15 ppm	9 ppm	9 ppm	15 ppm
A4. Thermal Fluid Heaters	12 ppm	9 ppm	9 ppm	9 ppm or 12 ppm
A5. All other units	9 ppm	9 ppm	5 ppm	9 ppm or 12 ppm
B. Units with a total rated heat input > 20 MMBtu/hr, except for Categories C through G units				
B1. Fire Tube Boilers with a total rated heat input > 20.0 MMBtu/hr and ≤ 75 MMBtu/hr	7 ppm	7 ppm	2.5 ppm	9 ppm

	South Coast AQMD Rule 1146 – Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters (Amended 12/4/20)	**SJVAPCD Rule 4306** – Boilers, Steam Generators, and Process Heaters (Amended 12/17/20)	**SJVAPCD Rule 4320** – Advanced Emission Reduction Options for Boilers, Steam Generators, and Process Heaters Greater than 5.0 MMBtu/hr (Amended 12/17/20)	**VCAPCD Rule 74.15** – Boilers, Steam Generators and Process Heaters (Amended 11/10/20)
B2. All other units with a total rated heat input > 20.0 MMBtu/hr and ≤ 75 MMBtu/hour	9 ppm for units with previous NOx limit ≤ 12 and > 5 ppm prior to 12/7/18 or 5 ppm	7 ppm	2.5 ppm	9 ppm or 12 ppm
B3. Units with a rated heat input > 75 MMBtu/hr	5 ppm	5 ppm	2.5 ppm	9 ppm or 12 ppm
C. Oilfield Steam Generators				
C1. Units with a total rated heat input > 5.0 MMBtu/hr and ≤ 20.0 MMBtu/hr	9 ppm for all others	9 ppm	6 ppm	9 ppm
C2. Units with a total rated heat input > 20.0 MMBtu/hr and ≤ 75.0 MMBtu/hr (90% are 62.5 MMBtu/hr)	9 ppm	9 ppm	5 ppm	9 ppm
C3. Units with a total rated heat input > 75.0 MMBtu/hr (98% are 85 MMBtu/hr)	5 ppm	7 ppm	5 ppm	9 ppm
C4. Units firing on less than 50%, by volume, PUC quality gas	No equivalent	15 ppm	5 ppm	No equivalent
D. Refinery Units				
D1. Boilers with a total rated heat input > 5.0 MMBtu/hr and ≤ 40.0 MMBtu/hr	40 ppm and 5 ppm for replacement units*	30 ppm and 5 ppm for replacement units	5 ppm	N/A
D2. Boilers with a total rated heat input > 40.0 MMBtu/hr and ≤110 MMBtu/hr	5 ppm*	9 ppm and 5 ppm for replacement units	5 ppm	N/A
D3. Boilers with a total rated heat input >110 MMBtu/hr	5 ppm* with an interim limit of 7.5 ppm	5 ppm	2.5 ppm	N/A

	South Coast AQMD Rule 1146 – Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters (Amended 12/4/20)	**SJVAPCD Rule 4306 –** Boilers, Steam Generators, and Process Heaters (Amended 12/17/20)	**SJVAPCD Rule 4320 –** Advanced Emission Reduction Options for Boilers, Steam Generators, and Process Heaters Greater than 5.0 MMBtu/hr (Amended 12/17/20)	**VCAPCD Rule 74.15 –** Boilers, Steam Generators and Process Heaters (Amended 11/10/20)
D4. Process Heaters with a total rated heat input > 5.0 MMBtu/hr and ≤ 40.0 MMBtu/hr	40 ppm and 9 ppm for replacement units*	30 ppm and 9 ppm for replacement units	5 ppm	N/A
D5. Process Heaters with a total rated heat input > 40.0 MMBtu/hr and ≤110 MMBtu/hr	5 ppm* with an interim limit of 18 ppm	15 ppm and 9 ppm for replacement units	5 ppm	N/A
D6. Process Heaters with a total rated heat input >110 MMBtu/hr	5 ppm* with an interim limit of 22 ppm	5 ppm	2.5 ppm	N/A
E. Lower Use Units				
E1. Units limited by a Permit to Operate to an annual heat input of 9 billion Btu/year to 30 billion Btu/year "Low Use" (no more than 10 percent operating capacity)	• Operate units so stack is maintained with gas oxygen concentrations less than or equal to three percent on a dry basis for 15 min averaging period • Tune units at least twice a year or follow different tune up procedure	30 ppm	9 ppm * Units limited by a Permit to Operate to an annual heat input >1.8 billion Btu/year but < 30 billion Btu/year	• Operate units so stack is maintained with gas oxygen concentrations less than or equal to three percent on a dry basis for 15 min averaging period • Tune units at least twice a year or follow different tune up procedure
Liquid Fueled Units	40 ppm	40 ppm	40 ppm	40 ppm
PM Control Requirements	None specified	None specified	• Gaseous fuels must be public utility quality • Sulfur content limits or operate an SO_2 control system	None specified

	South Coast AQMD Rule 1146 – Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters (Amended 12/4/20)	**SJVAPCD Rule 4306** – Boilers, Steam Generators, and Process Heaters (Amended 12/17/20)	**SJVAPCD Rule 4320** – Advanced Emission Reduction Options for Boilers, Steam Generators, and Process Heaters Greater than 5.0 MMBtu/hr (Amended 12/17/20)	**VCAPCD Rule 74.15** – Boilers, Steam Generators and Process Heaters (Amended 11/10/20)
			• Liquid fuels only to be used during gas curtailment periods	

* These emission limits are from South Coast AQMD Rule 1109.1 Emissions of Oxides of Nitrogen from Petroleum Refineries and Related Operations, which was adopted on November 5, 2021.

c. Conclusion

Staff does not propose any contingency measures for this category of units. Staff did not identify any PM2.5 control measures that are not required by South Coast AQMD for this source category. In addition, no applicable NH3 control measures were identified for consideration. For NOx, staff considered several potential measures such as lowering NOx limits using ULNB and SCR, but these were not suitable contingency measures considering that it would be technologically infeasible to design, install and operate advanced emission control technology within 2 years of the triggering event. This feasibility consideration is discussed in more detail in the evaluation section. A contingency measure that will not result in emission reductions until more than 2 years in the future would not satisfy the criteria of contingency measures as defined in the Draft Guidance.

2. Reciprocating Internal Combustion Engines (RICE)

a. Overview

A stationary RICE includes any internal combustion engine which uses reciprocating motion to convert heat energy into mechanical work and which is not mobile. Stationary RICEs are used in a wide array of industries, including electricity generation (either as stand-alone generators or in cogeneration applications); oil and gas production; agriculture; and commercial/institutional settings (including as back-up electricity generators). NOx and PM2.5 emissions are generated by engines combusting either gaseous or liquid fuels.

As summarized in Table V-6, from the South Coast AQMD 2030 baseline emissions inventory, engines contribute 8.79 tpd of NOx, 0.87 tpd of PM2.5, and 0.32 tpd of NH3 emissions.

TABLE V-6
STATIONARY ENGINE EMISSIONS BASED ON 2030 BASELINE INVENTORY IN THE SOUTH COAST AIR BASIN

Industry	PM2.5 (tpd)	NOx (tpd)	NH3 (tpd)
010 – Electric Utilities	0.04	0.25	0.00
020 – Cogeneration	0.00	0.00	0.00
030 – Oil and Gas Production (Combustion)	0.02	0.81	0.03
040 – Petroleum Refining (Combustion)	0.02	0.00	0.00
050 – Manufacturing and Industrial	0.65	3.32	0.25
052 – Food and Agricultural Processing	0.01	0.08	0.00
060 – Service and Commercial	0.12	2.05	0.04
099 – Other (Fuel Combustion)	0.04	2.27	0.00
Total	**0.87**	**8.79**	**0.32**

b. Evaluation

i. Available Control Technologies

Available control techniques for stationary engines vary by types of engine configurations. Each engine type produces emissions of NOx, PM2.5 and NH3 at different rates and can have differing approaches for controlling emissions. The engines are distributed among four categories: four-stroke rich-burn, four-stroke lean-burn, two-stroke lean-burn, and portable engines subject to the statewide Air Toxics Control Measure (ATCM).[9]

- Compression-ignition (CI) engines: CI engines are primarily diesel engines but could also be dual-fuel (diesel and natural gas) engines. Particulate matter emissions can be controlled by diesel particulate filters (DPF) and limiting fuel sulfur content. NOx can be controlled with either combustion controls (e.g., exhaust gas recirculation) and/or exhaust treatment such as diesel oxidation catalysts as part of a DPF and SCR;

- Spark-ignition (SI) four-stroke rich-burn (4SRB) engines: 4SRB engines use natural gas as primary fuel. NOx emissions are inherently lower from rich-burn engines compared to lean-burn and add-on controls include three-way catalysts (also known as non-selective catalytic reduction (NSCR)). PM emissions from burning natural gas are inherently low enough that any control approach generally focuses only on limiting fuel sulfur content;

- SI four-stroke lean-burn (4SLB) engines: Natural gas is the primary fuel for 4SLB engines. NOx emissions can be controlled by combustion techniques or exhaust controls, such as SCR. PM emissions from burning natural gas are inherently low enough that any control approach generally focuses only on limiting fuel sulfur content; and

- SI two-stroke lean-burn (2SLB) engines: 2SLB engines primarily use natural gas. Typically, combustion controls are applied to reduce NOx, including layered combustion.[10] As with other SI engines fired on natural gas, PM emissions are inherently low enough that any control approach generally focuses only on limiting fuel sulfur content.

Existing federal regulations require manufacturers to certify stationary CI engines to the U.S. EPA's tiered engine requirements (Tiers 1-4, with Tier 4 being the most stringent).[11] Since 2014, new CI engines have been required to meet Tier 4 criteria except for engines qualifying as emergency engines which must be certified to Tier 2 or Tier 3 standards. The U.S. EPA, on the other hand, does not mandate

[9] https://ww2.arb.ca.gov/resources/documents/perp-regulation-and-portable-engine-atcm

[10] In a layered or stratified charge arrangement: a pre-stratified control kit is applied that results in lower combustion temperatures and lower NO_x formation. Example technologies that could be considered layered stratification include turbochargers and inter-cooling, pre-chamber ignition or high energy ignition, improved fuel injection control, and air/fuel ratio control

[11] See 40 CFR Part 60, Subparts IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines, and 40 CFR Part 1039 – Control of Emissions from New and In-Use Nonroad Compression-Ignition Engines

owners/operators to replace older engines that are uncertified or certified to lower tier levels. U.S. EPA-certified Tier 4 engines are typically not required to install additional controls to meet Best Available Control Technology/Lowest Achievable Emission Rate (BACT/LAER) determination for NOx and PM. A search of the Reasonably Available Control Technology (RACT)/BACT/LAER Clearinghouse (RBLC) did not identify "beyond Tier 4" restrictions for CI engines.

Existing federal regulations require stationary SI engines to meet emissions standards, but do not require U.S. EPA certification for all new SI engines.[12] Like CI engines, these regulations do not require owner/operators to replace older engines or upgrade engines to meet the most recent standards. However, to meet BACT/LAER determinations for NOx, the addition of add-on NOx controls is often required (e.g., SCR or a NSCR, depending on engine type). Because SI engines typically burn cleaner gaseous fuels, add-on PM controls are not required to meet BACT/LAER.

ii. South Coast AQMD Control Measures

Table V-7 summarizes the applicable South Coast AQMD rules and control measures that are applicable to stationary engines. A potential control measure, which examined control technologies for emergency backup generators, is presented in Appendix III. In summary, new or modified units with ≥ 1,000 horsepower compression ignition engines are required to meet updated Lowest Achievable Emissions Rate (LAER) and BACT guidelines which require that the units achieve U.S. EPA's Tier 4 Final emission standards.[13] Existing Tier 2 units can achieve Tier 4 Final emission limits through the use of Diesel Particle Filters (DPF) and SCR.

The evaluation section for boilers, steam generators, and process heaters discusses the source of NH3 emissions from fuel combustion in detail. There is no applicable South Coast AQMD rule to control NH3 emissions from RICE. Furthermore, there are no unique considerations for RICE that would warrant further evaluation in this section.

TABLE V-7
SOUTH COAST AQMD RULES AND CONTROL MEASURES (RECIPROCATING ENGINES)

South Coast AQMD Rule	Applicability	Control Measure
Rule 1110.2 – Emissions from Gaseous- and Liquid-Fueled Engines (Amended 11/3/23)	All stationary and portable engines over 50 rated brake horsepower (bhp)	
	Stationary ICE ≥ 50 bhp, including landfill and digester gas (i.e., biogas) fired engines	11 ppm NOx
	Stationary, low-use engines	36 ppm NOx for ≥ 500 bhp 45 ppm NOx for < 500 bhp

[12] See 40 CFR Part 60, Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines
[13] http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2022/2022-sept2-030.pdf?sfvrsn=6You

South Coast AQMD Rule	Applicability	Control Measure
	Stationary, biogas-fired, low-use engines	36 x ECF* ppm NOx for ≥ 500 bhp, 45 x ECF ppm NOx for < 500 bhp
	Stationary, non-emergency electrical generators	0.070 lbs/MW-hr

* ECF is the efficiency correction factor and is no less than 1.0.

iii. Review of Control Measures in Other Jurisdictions

Table V-8 compares and summarizes the applicable control measures in South Coast AQMD with the requirements in other jurisdictions including SJVAPCD, the Sacramento Metropolitan Air Quality Management District (SMAQMD), and the Maricopa County Air Quality Department (MCAQD).

South Coast AQMD's Rule 1110.2 requires most engines to meet an 11 ppm NOx limit while non-emergency electrical generators require a 0.070 lbs/MW-hr NOx limit. Some engines used in agricultural operations can be exempt from this requirement if a Tier 4 diesel engine is installed and other requirements are met. Overall, South Coast AQMD's Rule 1110.2 is designed to require BARCT-level controls and has the most stringent NOx emission limits for stationary engines compared to other air districts. There are no applicable rules to control NH3 emissions from this category in other jurisdictions.

TABLE V-8
COMPARISON OF EXISTING CONTROL REQUIREMENTS (RECIPROCATING INTERNAL COMBUSTION ENGINES)

	South Coast AQMD Rule 1110.2 – Emissions from Gaseous and Liquid-Fueled Engines (Amended 11/1/19)	**SJVAPCD Rule 4702** – Internal Combustion Engines (Amended 8/19/21)	**SMAQMD Rule 412** – Stationary Internal Combustion Engines Located at Major Sources of NOx (Adopted 6/1/95)	**Maricopa County, AZ Rule 324** – Stationary Reciprocating Internal Combustion Engines (RICE) (Amended 6/23/21)	**CA ATCM** for Diesel Stationary Compression Ignition Engines (Amended 5/19/11)
Applicability (Equipment, size, fuel type)	All stationary and portable engines rated >50 bhp	All internal combustion engines >50 bhp* * For non-agriculture operations (AO) engines >25 to ≤50 bhp, if non-certified, these may not be offered for sale.	Stationary IC engines rated >50 bhp located at major sources of NOx* * Major sources have potential to emit >25 tpy	Stationary IC engines >125 bhp used for cogeneration; located not at a major NOx source Stationary IC engines >50 bhp used for cogeneration not at a major NOx source if all engines aggregate to >125 bhp Stationary IC engines >50 bhp at major NOx sources Nonroad engines >125 bhp with potential to emit: 0.5 tpy PM2.5; 1.0 tpy NOx, 0.5 tpy VOC; or 1.0 tpy CO	All stationary diesel engines >50 bhp
Control Measure					
NOx emissions limit(s)	Stationary engines with approved emission control plan: 11 ppm	Non-AO SI engines by 12/31/2023: 1. Rich-burn: a. 11 ppm	SI rich-burn: 25 ppm or 90% control	CI engines >250 bhp: 530 ppm	Generally the same as EPA certified standards

	South Coast AQMD Rule 1110.2 – Emissions from Gaseous and Liquid-Fueled Engines (Amended 11/1/19)	**SJVAPCD Rule 4702** – Internal Combustion Engines (Amended 8/19/21)	**SMAQMD Rule 412** – Stationary Internal Combustion Engines Located at Major Sources of NOx (Adopted 6/1/95)	**Maricopa County, AZ Rule 324 –** Stationary Reciprocating Internal Combustion Engines (RICE) (Amended 6/23/21)	**CA ATCM** for Diesel Stationary Compression Ignition Engines (Amended 5/19/11)
	Other stationary engines without an emission control plan, biogas-fired: 11 ppm Limits for low-use engines*: • <500 bhp = 45 ppm • ≥500 bhp = 36 ppm * Low use engines <500 HOP/yr or 1 billion Btu/yr. Slightly higher limits are also applicable to landfill or biogas fired engines to account for efficiency Non-emergency electrical generators: 2.5 ppm or 0.070 lb/MWh Note: agricultural and non-agricultural engines held to the same standards but with different compliance schedules applied.	2. Lean-burn: a. Gas compression engines: 40 ppm b. >50% waste gas: 40 ppm c. Others: 11 ppm AO SI Engines: • Rich-burn (by 12/31/23): 11 ppm or 0.15 g/bhp-hr • Lean-burn (by 12/31/29): 0.6 g/bhp-hr or 43 ppm Certified AO and non-AO compression-ignited (CI) engines (no later than 6/1/18): • EPA certified Tier 1 or 2: EPA Tier 4 • EPA certified Tier 3 or 4: CI standard in effect at time of installation Non-certified AO and non-AO CI engines (by 2011):	SI lean-burn: 65 ppm or 90% control CI: 80 ppm or 90% control	CI engines >399 bhp: 550 ppm (at major sources, all CI: 530 ppm) SI lean-burn: 110 ppm SI rich-burn: 20 ppm	

	South Coast AQMD Rule 1110.2 – Emissions from Gaseous and Liquid-Fueled Engines (Amended 11/1/19)	**SJVAPCD Rule 4702** – Internal Combustion Engines (Amended 8/19/21)	**SMAQMD Rule 412** – Stationary Internal Combustion Engines Located at Major Sources of NOx (Adopted 6/1/95)	**Maricopa County, AZ Rule 324 –** Stationary Reciprocating Internal Combustion Engines (RICE) (Amended 6/23/21)	**CA ATCM** for Diesel Stationary Compression Ignition Engines (Amended 5/19/11)
		• 50 – 500 bhp: EPA Tier 3 or Tier 4 • 500 – 750 bhp and <1000 annual HOP: EPA Tier 3 • >750 bhp and <1000 annual HOP: EPA Tier 4			
PM control requirements	None specified CI engines: via applicable EPA Tier requirements	SI engines: control via sulfur limits CI engines: via applicable EPA Tier requirements	None specified CI engines: via applicable EPA Tier requirements	CI: 0.40 g/bhp-hr All SI: not applicable CI engines: via applicable EPA Tier requirements (generally lower than 0.40 g/bhp-hr)	CI: 0.02 – 0.03 g/kW-hr, compliance deadlines vary based on engine type and whether engines were considered new or in-use (equal to or more stringent than federal standards)
Exemptions (to NO_x or particulate matter emissions limits)	• Engines powering orchard wind machines • Emergency standby engines, engines use for fire-fighting and flood control, and any other emergency engines limited to 200 hrs/yr • Laboratory engines	• Engines used to propel implements of husbandry • Engines used exclusively to power wind machines • Some de-rated AO and non-AO engines with de-rating before 6/1/2005 (below 50 bhp)	• Emergency standby engines • Engines used exclusively for agricultural purposes • Engine test stands • Engine control evaluations • Nonroad engines • Motor vehicle engines • Flight line engines • Low use engines:	• Emergency standby engines used for power, emergency services, sewage overflow • Compressed gas stationary RICE used for solar testing and research • Engine performance verification, including	Some emergency engines not required to install particulate matter controls

	South Coast AQMD Rule 1110.2 – Emissions from Gaseous and Liquid-Fueled Engines (Amended 11/1/19)	**SJVAPCD Rule 4702** – Internal Combustion Engines (Amended 8/19/21)	**SMAQMD Rule 412** – Stationary Internal Combustion Engines Located at Major Sources of NOx (Adopted 6/1/95)	**Maricopa County, AZ Rule 324 –** Stationary Reciprocating Internal Combustion Engines (RICE) (Amended 6/23/21)	**CA ATCM** for Diesel Stationary Compression Ignition Engines (Amended 5/19/11)
	• Engines used for performance testing • Auxiliary engines used to power other engines/ turbines during start-ups • Portable engines registered under state registration (Title 13, Article 5 of CCR) • Agriculture stationary engines that: cannot get electrical service or operator does not qualify for state funding under CA Health and Safety Code Section 44229; and replace engines with Tier 4 replacement engines; and does not operate the Tier 4 engines in a manner to exceed the not-to-exceed standards of 40 CFR Part 1039 Section 1039.101(e)	• Engines powering mobile agricultural equipment • State-registered or Rule 2280 registered portable equipment engines • Emergency standby or low use engines • Public safety equipment	○ SI: varies by engine size, range is 40-200 hrs/yr ○ CI: varies by engine size, range is 200-1,435 hrs/yr	at the production facility • Engine development and testing • Flight line engines • Nonroad engines • Low use engines: ○ Engines ≤1000 bhp operating <200 hrs/yr ○ Engines >1000 bhp operating <100 hrs/yr	

	South Coast AQMD Rule 1110.2 – Emissions from Gaseous and Liquid-Fueled Engines (Amended 11/1/19)	**SJVAPCD Rule 4702** – Internal Combustion Engines (Amended 8/19/21)	**SMAQMD Rule 412** – Stationary Internal Combustion Engines Located at Major Sources of NOx (Adopted 6/1/95)	**Maricopa County, AZ Rule 324 –** Stationary Reciprocating Internal Combustion Engines (RICE) (Amended 6/23/21)	**CA ATCM** for Diesel Stationary Compression Ignition Engines (Amended 5/19/11)
	• Some additional exemptions also apply				
NOx emissions compliance alternative	None listed	Payment of NOx emissions fee in lieu of meeting the emissions limits: sunsets 12/31/23 after which engines must meet limits for non-AO SI engines	None listed	None listed	None listed

c. Conclusion

Staff does not propose any contingency measures for stationary engines. No applicable NH3 or PM2.5 control measures were identified for consideration. While lower limits of NOx could be achieved by installing SCR, installing SCR and achieving reductions within 2 years of triggering would be technologically infeasible. Contingency measures should be measures that would result in the projected emission reductions within a year after the triggering event, or within 2 years with proper justification. A contingency measure that will not result in emission reductions until further in the future would not satisfy the criteria of contingency measures as defined in the Draft Guidance.

3. Combustion Turbines

a. Overview

Industries operating in the South Coast Air Basin that use combustion turbines include the following: electric utilities; cogeneration; oil and gas production; petroleum refining; and commercial operations. Most often, combustion turbines are used to generate power for supplying the electrical grid or for on-site use. Natural gas and diesel/distillate oil are the most common fuels combusted, however, according to the emissions inventory, other fuels used in the Basin include landfill gas, refinery gas, and process gas.

NOx, NH3, and PM2.5 emissions result from fuel combustion in various types of industry. Daily emissions are summarized below in Table V-9 by industry.

TABLE V-9
COMBUSTION TURBINE EMISSIONS BASED ON 2030 BASELINE INVENTORY IN THE SOUTH COAST AIR BASIN

Industry	PM2.5 (tpd)	NOx (tpd)	NH3 (tpd)
010 – Electric Utilities	0.33	1.76	0.44
020 – Cogeneration	0.00	0.01	0.01
030 – Oil and Gas Production (Combustion)	0.07	0.04	0.21
040 – Petroleum Refining (Combustion)	0.44	0.42	0.83
050 – Manufacturing and Industrial	0.06	0.08	0.06
060 – Service and Commercial	0.08	0.44	0.13
Total	**0.98**	**2.75**	**1.68**

The most common fuels used to generate power in the combustion turbine category are natural gas, landfill gas, process gas, and refinery gas. Electric utilities account for over 60 percent of the category total NOx emissions, and natural gas is the dominant fuel combusted in electric utility turbines taking up about 80 percent of NOx emissions. Service and commercial and petroleum refining are the second and third largest categories of NOx emissions for combustion turbines, respectively. For the service and commercial sector, NOx emissions are greatest from landfill gas-fired turbines, while combustion of process and refinery gases combined is the dominant (over 80 percent) source of NOx emissions from turbines for petroleum refining because refinery fuel gas (RFG) burns at higher temperatures and thus can increase NOx emissions compared to turbines burning natural gas. For example, dry low NOx (DLN) combustors can have approximately 10 percent greater NOx emissions when operating on refinery gas compared to natural gas.

Control of NOx from combustion turbines can be accomplished using combustion controls, such as water or steam injection DLN and ULNB, or post-combustion controls, including SCR.[14] DLN combustors can achieve between 9 ppm and 25 ppm in gas turbines operating with natural gas and between 10 ppm and 27.5 ppm in gas turbines operating on refinery gas. SCR can achieve about 95 percent NOx reduction in both types of gas turbines. It is common for both control technologies to be applied (e.g., DLN + SCR + oxidation catalyst). Combination of DLN and SCR can achieve 2 ppm NOx limit with proper engineering and design.

b. Evaluation

In the South Coast Air Basin, emissions from combustion turbines are regulated by Rules 1134, 1135, and 1109.1. Rule 1134 establishes limits for NOx emissions based on unit size (0.3 MW and greater) and fuel type (gas or oil). The rule has different compliance limits through the end of 2023 by unit size and has varied emission limits on and after January 1, 2024 by fuel type. Emission limits are expressed on a dry volume basis, corrected to 15 percent O_2. The current and future applicable emission limits under Rule 1134 are further detailed in Table V-10.

Rule 1135 establishes a 2 ppm NOx limit for combined cycle gas turbines fired with natural gas from electric generating units at electricity generating facilities (EGFs). Rule 1109.1 establishes NOx concentration limits that represent BARCT for combustion equipment located at petroleum refineries and facilities with operations related to petroleum refineries.

Ammonia slip from SCR is expected to be the primary source of NH3 emissions. This is discussed in detail in the evaluation section of boilers, steam generators, and process heaters. Staff did not identify any more stringent requirements for NH3 in other districts' rules. In addition, control measure BCM-09 – Ammonia Emission Reductions from NOx Controls commits to minimize the ammonia slip for the operation of SCRs.

[14] https://www.epa.gov/system/files/documents/2022-03/combustion-turbine-nox-technology-memo.pdf

TABLE V-10
SOUTH COAST AQMD CONTROL MEASURES FOR COMBUSTION TURBINES

South Coast AQMD Rule	Applicability	Control Measure
Rule 1134 – Emissions of Oxides of Nitrogen from Stationary Gas Turbines (Amended 2/4/22)	Applies to all stationary gas turbines, 0.3 MW and greater	NOx emission limits are identified below by unit size (MW rating) and by fuel type. Until 12/31/2023: Compliance limit = reference limit x (unit efficiency / 25%) Reference limits by MW rating: • 0.3 – <2.9 MW: 25 ppm • 2.9 – <10.0 MW: 9 ppm; 15 ppm without SCR • ≥10.0 MW: 9 ppm; 12 ppm without SCR • ≥60 MW combined cycle: 9 ppm; 15 ppm without SCR • 2.9 – <10.0 MW utilizing 60% or more digester gas: 25 ppm
		Beginning 1/1/2024: • Liquid fuel turbines on outer continental shelf (OCS): 30 ppm • Natural gas - combined cycle/cogeneration turbine: 2 ppm • Natural gas - simple cycle: 2.5 ppm • Produced gas: 9 ppm • Produced gas - OCS turbines: 15 ppm • Other (including recuperative gas turbines): 12.5 ppm • Natural gas - compressor gas turbines: 3.5 ppm
Rule 1135 – Emissions of Oxides of Nitrogen from Electricity Generating Facilities (Amended 1/7/22)	Applies to electric generating units at electricity generating facilities	Combined cycle gas turbines and associated duct burners: 2 ppm Simple cycle gas turbines: 2.5 ppm
Rule 1109.1 – Emissions of Oxides of Nitrogen from Petrochemical Refineries and Related Operations (Adopted 11/5/21)	Applies to owners or operators of facilities with units at petroleum refineries and facilities with related operations to petroleum refineries	Gas turbines fueled with natural gas: • 2 ppm NOx BARCT limit on a 24-hour rolling average • 2.5 ppm conditional limit for those operating close to BARCT limit • 5 ppm during natural gas curtailment periods

South Coast AQMD Rule	Applicability	Control Measure
		Gas turbines fueled with other gaseous fuel: 3 ppm on a 24-hour rolling average Gas turbines fueled with natural gas or other gaseous fuel: 20 ppm interim limit on a 365-day rolling average for facilities that exit RECLAIM but before the BARCT or conditional limit is met

Staff examined stationary gas turbine rules in other California air districts as well as the RACT/BACT/LAER Clearinghouse (RBLC) as summarized in Table V-11.

c. Conclusion

Staff compared South Coast AQMD's NOx emission limits for combustion turbines to those in other air districts. South Coast AQMD's NOx emission limits are generally the most stringent and are equivalent to BACT standards. While the RBLC contains slightly lower NOx emission limits for certain categories, lowering regulatory limits as a contingency measure would not be appropriate as affected sources would need to design and install advanced emission control technology such as SCR. This feasibility consideration is discussed in further detail in the evaluation section for boilers, steam generators, and process heaters. No contingency measures are proposed for combustion turbines, as implementing potential measures within 2 years is not feasible.

TABLE V-11

COMPARISON OF EXISTING CONTROL REQUIREMENTS FOR GAS TURBINES

Source Category	South Coast AQMD Rules 1134, 1135, and 1109.1	SJVAPCD Rule 4703	BAAQMD Rule 9-9	RACT/BACT/LAER Clearinghouse (RBLC)
<3 MW: gas fuel	Rules 1134/1135: 2.5 ppm (simple cycle NG) Rule 1134: 9 ppm (PG) 12.5 ppm (other) Rule 1109.1: 2 ppm (NG) 3 ppm (other gaseous fuel)	9 ppm	<0.5 MW units: exempt 42 (natural gas) 50 (RFG, WG, LPG)	2 ppm (<25 MW non-EGU NG)
<3 MW: liquid fuel	^	25 ppm	<0.5 MW units: exempt 65 ppm	No data
3-10 MW pipeline turbine: gas fuel*	Rule 1134: 3.5 ppm (gas compressors)	8 ppm	25-42 ppm (NG) 50 ppm (RFG, WG, LPG)	2 ppm (<25 MW non-EGU NG)
3-10 MW pipeline turbine: liquid fuel	^	25 ppm	65 ppm	--
3-10 MW other turbines (<877 hr/yr): gas fuel	Rule 1134/1135: 2.5 ppm (simple cycle NG) Rule 1134: 9 ppm (PG) 12.5 ppm (other) Rule 1109.1: 2 ppm (NG) 3 ppm (other gaseous fuel)	9 ppm	25-42 ppm (NG) 50 ppm (RFG, WG, LPG)	2 ppm (<25 MW non-EGU NG)
3-10 MW other turbines (<877 hr/yr): liquid fuel	^	25 ppm	65 ppm	--
3-10 MW other turbines (>877 hr/yr): gas fuel	Rule 1134/1135: 2.5 ppm (simple cycle NG) Rule 1134: 9 ppm (PG) 12.5 ppm (other) Rule 1109.1:	5 ppm	25-42 ppm (NG) 50 ppm (RFG, WG, LPG)	2 ppm (<25 MW non-EGU NG)

Source Category	South Coast AQMD Rules 1134, 1135, and 1109.1	SJVAPCD Rule 4703	BAAQMD Rule 9-9	RACT/BACT/LAER Clearinghouse (RBLC)
	2 ppm (NG) 3 ppm (other gaseous fuel)			
3-10 MW other turbines (>877 hr/yr): liquid fuel	^	25 ppm	65 ppm	--
>10 MW simple cycle (<200 hr/yr): gas fuel	Rule 1134/1135: 2.5 ppm (simple cycle NG) Rule 1109.1: 2 ppm (NG) 3 ppm (other gaseous fuel)	25 ppm	15 ppm (15 to 25 MW) 9 ppm (>25 to 50 MW) 5 ppm (>50 MW NG) 9 ppm (>50 MW RFG, WG)	2 ppm (>25 MW)
>10 MW simple cycle (<200 hr/yr): liquid fuel	^	42 ppm	42 ppm (15 to 25 MW) 25 ppm (>25 MW)	4 ppm (>25 MW EGU, ULSD)
>10 MW simple cycle (>200 hr/yr): gas fuel	Rule 1134/1135: 2.5 ppm (NG) Rule 1109.1: 2 ppm (NG) 3 ppm (other gaseous fuel)	5 ppm	15 ppm (15 to 25 MW) 9 ppm (>25 to 50 MW) 5 ppm (>50 MW NG) 9 ppm (>50 MW RFG, WG)	2 ppm (>25 MW)
>10 MW simple cycle (>200 hr/yr): liquid fuel	^	25 ppm	42 ppm (15 to 25 MW) 25 ppm (>25 MW)	4 ppm (>25 MW EGU ULSD)
>10 MW combined cycle, standard compliance: gas fuel	Rule 1134/1135: 2.5 ppm (NG) Rule 1109.1: 2 ppm (NG) 3 ppm (other gaseous fuel)	5 ppm	15 ppm (15 to 25 MW) 9 ppm (>25 to 50 MW) 5 ppm (>50 MW NG) 9 ppm (>50 MW RFG, WG)	2 ppm (>25 MW)
>10 MW combined cycle, standard compliance: liquid fuel	^	25 ppm	42 ppm (15 to 25 MW) 25 ppm (>25 MW)	4 ppm (>25 MW EGU ULSD)
>10 MW combined cycle, enhanced compliance: gas fuel	Rule 1134/1135: 2.5 ppm (NG) Rule 1109.1: 2 ppm (NG) 3 ppm (other gaseous fuel)	3 ppm	15 ppm (15 to 25 MW) 9 ppm (>25 to 50 MW) 5 ppm (>50 MW NG) 9 ppm (>50 MW RFG, WG)	2 ppm (>25 MW)

Source Category	South Coast AQMD Rules 1134, 1135, and 1109.1	SJVAPCD Rule 4703	BAAQMD Rule 9-9	RACT/BACT/LAER Clearinghouse (RBLC)
>10 MW combined cycle, enhanced compliance: liquid fuel	^	25 ppm	42 ppm (15 to 25 MW) 25 ppm (>25 MW)	4 ppm (>25 MW EGU ULSD)

Abbreviations: EGU – electricity generating unit; NG – natural gas; PG – process gas; RFG – refinery fuel gas; WG – waste gas; LPG – liquefied petroleum gas; ULSD – ultra-low sulfur diesel.

* 12 ppm is the limit under non-steady state operating conditions.

^ Rule 1134 disallows the use of liquid fuel in gas turbines except for units located in the outer continental shelf (OCS) or units providing emergency power to a health facility during a natural gas curtailment; Rule 1135 has similar provisions for EGUs during natural gas curtailment. NO_x limits during these periods are specified in the permit.

4. Residential and Commercial Fuel Combustion

a. Overview

Source categories 060-020 (Service and Commercial-Space Heating), 060-030 (Service and Commercial-Water Heating), 610-606 (Residential Fuel Combustion-Space Heating), and 610-608 (Residential Fuel Combustion-Water Heating) are comprised of combustion appliances or furnaces in commercial and residential buildings that typically burn natural gas leading to combustion emissions of criteria pollutants and GHGs. Space and water heating comprise nearly 90 percent of all building-related natural gas demand in California.[15] In the Basin, these commercial and residential heaters account for nearly 55 percent of the region's total stationary point and area NOx emissions in 2030. Table V-12 summarizes the annual emissions of NOx and PM2.5 from these sources in the 2030 baseline emissions inventory. Note that residential and commercial space and water heating has zero NH3 emissions and that residential wood combustion is evaluated in the miscellaneous processes section of this document.

TABLE V-12
SPACE AND WATER HEATERS EMISSIONS BASED ON 2030 BASELINE INVENTORY IN THE SOUTH COAST AIR BASIN

Source Category	NOx (tpd)	PM2.5 (tpd)
060-020: Service and Commercial – Space Heating	2.11	0.13
060-030: Service and Commercial – Water Heating	0.46	0.14
610-606: Residential Fuel Combustion – Space Heating	7.73	0.89
610-608: Residential Fuel Combustion – Water Heating	1.81	0.56
Total	**12.1**	**1.72**

Manufacturers of water heaters have implemented combustion modifications to meet the NOx limits required in rules by the South Coast AQMD and other jurisdictions. This is done using burner designs such as LNBs and ULNBs, incorporating design principles that include staged air burners, staged fuel burners, pre-mix burners, internal recirculation, and radiant burners.

It is important to note that the South Coast AQMD's existing rules for these emission categories, as well as existing rules in other jurisdictions, apply to new units manufactured or installed after the rule's compliance date. As a result, getting emission reductions from these sources is difficult because these restrictions do not apply to the existing population of units and only apply when an existing unit needs to be replaced or a unit is installed in a new home or establishment. According to the International Association of Certified Home Inspectors (NACHI), a conventional water heater has an expected service life of 6 to 12 years, a pool water

[15] Michael Kenney, Nicholas Janusch, Ingrid Neumann, and Mike Jaske. 2021. California Building Decarbonization Assessment. California Energy Commission. Publication Number: CEC-400-2021-006-CMF. Web link: https://www.energy.ca.gov/data-reports/reports/building-decarbonization-assessment

heater has a typical life of 8 years, furnaces have a typical life of 15 to 25 years, and heat pumps and heat exchangers typically last 10 to 15 years.[16] These life expectancies are guidelines only, and a number of factors can influence the actual life of these units including the quality of the unit, weather, usage, installation, and maintenance.

b. Evaluation

The South Coast AQMD currently has three rules that regulate NOx emissions from residential and commercial water heating (Rules 1121 and 1146.2, respectively) and residential space heating (Rule 1111). Rule 1121 regulates NOx emissions from residential type, natural gas-fired water heaters with heat input rates less than 75,000 Btu/hr; Rule 1146.2 regulates NOx emissions from small boilers, process heaters, and water heaters including the commercial sector with heat input rates less than or equal to 2,000,000 Btu/hr; and Rule 1111 regulates NOx emissions from residential type, natural gas-fired central furnaces for heating with heat input rate less than 175,000 Btu/hr or for combination of heating and cooling units with a cooling rate less than 65,000 Btu/hr. The emissions limits that currently apply to newly manufactured or installed residential space and water heaters and commercial water heaters are itemized in Table V-13.

TABLE V-13
SOUTH COAST AQMD CONTROL MEASURES FOR SPACE AND WATER HEATERS

South Coast AQMD Rule	Applicability	Control Measure
Rule 1121 – Control of Nitrogen Oxides from Residential Type, Natural Gas-Fired Water Heaters (Amended 9/3/04)	Residential type, natural gas-fired water heaters rated <75,000 Btu/hr; exemptions: • Water heaters rated ≥75,000 Btu/hr • Water heaters used in recreational vehicles • Water heaters in mobile homes (except where specified)	• 10 ng NOx/joule or 15 ppm • Gas-fired mobile home water heaters: 40 ng/joule or 55 ppm
Rule 1146.2 – Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers and Process Heaters (Amended 12/7/18)	Natural gas-fired water heaters, boilers, and process heaters with a rated heat input ≤2,000,000 Btu/hr	14 ng/joule or 20 ppm
Rule 1111 – Reduction of NOx Emissions from Natural Gas-Fired, Fan-Type Central Furnaces (Amended 9/1/23)	Natural gas-fired central furnaces rated < 175,000 Btu/hr or combined heating and cooling units rated cooling of <65,000 Btu/hr	14 ng/joule for both condensing and non-condensing furnaces, weatherized furnace, and mobile home furnaces;

[16] International Association of Certified Home Inspectors, InterNACHI's Standard Estimated Life Expectancy Chart for Homes, https://www.nachi.org/life-expectancy.htm, accessed November 1, 2023

South Coast AQMD Rule	Applicability	Control Measure
		Mitigation fee alternate compliance option end date extended to 9/30/25 for mobile home furnaces

As summarized in Tables V-13, South Coast AQMD's regulated limits are 10 ng NOx/joule for water heaters and 14 ng NOx/joule for space heaters. Staff also examined water and space heater emission rule requirements that have been implemented or recommended for implementation in other air districts in Table V-14.

TABLE V-14
OTHER AIR DISTRICTS' CONTROL MEASURES FOR SPACE AND WATER HEATERS

Rule	Applicability	Control Measure
SJVAPCD Rule 4308 – Boilers, Steam Generators, and Process Heaters - 0.075 MMBtu/hr to less than 2.0 MMBtu/hr (Amended 11/14/13)	Applies to boilers, steam generators, process heaters and water heaters rated from 0.075 to 2 MMBtu/hr; exemptions: • Units installed in manufactured homes • Units installed in recreational vehicles • Hot water pressure heaters	Pool Heaters using PUC gas: • ≥0.075 to ≤0.4 MMBtu/hr: 0.068 lb/MMBtu or 55 ppm • >0.4 to <2.0 MMBtu/hr: 0.024 lb/MMBtu or 20 ppm All other units using PUC gas: 0.024 lb/MMBtu or 20 ppm Units fired on non-PUC gas or liquid fuel: • ≥0.075 to ≤0.4 MMBtu/hr: 0.093 lb/MMBtu or 77 ppm • >0.4 MMBtu/hr: 0.036 lb/MMBtu or 30 ppm
SJVAPCD Rule 4905 – Natural Gas-Fired, Fan-Type Central Furnaces (Amended 12/16/21)	Applies to natural gas-fired, fan-type central furnaces <175,000 Btu/hr and combination heating and cooling units <65,000 Btu/hr; Exemptions: • Units to be installed with propane conversion kits for propane firing only	Condensing, Non-condensing, Weatherized, and Manufactured Home Units: 14 ng/joule of heat output Emission fee compliance option for manufacturers; fee end date has passed for all unit types except Manufactured Home units with fee end date of 9/30/2023
SJVAPCD Rule 4902 – Residential Water Heaters (Certified Water Heaters) (Amended 3/19/09)	Applies to PUC quality natural gas-fired residential water heaters ≤ 75,000 Btu/hr; exemptions: • Water heaters >75,000 Btu/hr • Water heaters using fuels other than PUC quality natural gas	Natural gas-fired mobile home water heater: 40 ng NOx/joule of heat output Natural gas-fired pool heater: 40 ng NOx/joule

Rule	Applicability	Control Measure
	• Water heaters used exclusively in recreational vehicles	Natural gas-fired water heater (excluding mobile home water heaters, instantaneous water heaters, and pool heaters): 10 ng NOx/joule Natural gas-fired instantaneous residential water heaters: 14 ng NOx/joule
SMAQMD Rule 414 – Water Heaters, Boilers and Process Heaters Rated Less Than 1,000,000 Btu per Hour (Amended 10/25/18)	Water Heaters, boilers, or process heaters rated <1 million Btu/hr fired with gaseous or nongaseous fuels; exemptions: • Water heaters in recreational vehicles • Pool/spa heaters <75,000 Btu/hr • Water heaters, boiler, and process heaters fired with liquefied petroleum gas • Hot water pressure washers fired with gaseous or liquid fuels	<75,000 Btu/hr: • Mobile Home: 40 ng NOx/joule or 55 ppm • All others: 10 ng NOx/joule or 15 ppm 75,000 to < 400,000 Btu/hr: • Pool/spa: 40 ng NOx/joule or 55 ppm • All others: 14 ng NOx/joule or 20 ppm 400,000 to < 1 million Btu/hr: • All types – 14 ng NOx/joule or 20 ppm
BAAQMD Regulation 9, Rule 6 – Nitrogen Oxides Emissions from Natural Gas-Fired Water Heaters (Amended 3/15/23)	Natural Gas-Fired Water Heaters and Boilers; exemptions: • Natural gas-fired water heaters and boilers rated > 2 million Btu/hr • Natural gas water heaters used in recreational vehicles • Water heaters using a fuel other than natural gas Natural gas-fired pool/spa heaters rated <400,000 Btu/hr	Natural gas-fired storage tank water heaters ≤75,000 Btu/hr: • 10 ng NOx/joule (excludes water heaters used for mobile homes) • *0 ng NOx/joule (manufactured after 1/1/27; excludes water heaters used for mobile homes)* Natural gas-fired boilers and water heaters >75,000 to 2 million Btu/hr: • 14 ng NOx/joule • *0 ng NOx/joule (manufactured after 1/1/31)* Natural gas-fired boilers and water heaters 400,000 to 2 million Btu/hr: 14 ng NOx/joule Natural gas-fired mobile home water heaters: 40 ng NOx/joule Natural gas-fired pool/spa heaters >400,000 to 2 million Btu/hr: 14 ng NOx/joule
San Diego Air Pollution Control District (SDAPCD) Rule	Natural Gas-Fired Water Heaters ≤ 75,000 Btu/hr; exemptions: • Water heaters rated >75,000 Btu/hr	Natural gas-fired water heater (excluding mobile home water heaters): 10 ng NOx/joule or 15 ppm

Rule	Applicability	Control Measure
69.5.1 – Natural Gas-Fired Water Heaters (Adopted 6/24/15)	• Water heaters used in recreational vehicles • Water heaters used exclusively to heat swimming pools and hot tubs • Water heaters using fuels other than natural gas • Instantaneous water heaters	Natural gas-fired mobile home water heater: 40 ng NOx/joule or 55 ppm
VCAPCD Rule 74.11 – Natural Gas-Fired Water Heaters (Revised 1/12/10)	Natural Gas-Fired Water Heaters <75,000 Btu/hr; exemptions: • Water heaters rated >75,000 Btu/hr • Natural gas water heaters used in recreational vehicles	Natural gas-fired water heater (excluding mobile home water heaters): 10 ng NOx/joule Natural gas-fired mobile home water heater: 40 ng NOx/joule
VCAPCD Rule 74.11.1 – Large Water Heaters and Small Boilers (Revised 9/11/12)	Large Water Heaters and Small Boilers; exemptions	Units rated 75,000 to 400,000 Btu/hr: 14 ng NOx/joule Units rated 400,000 to 1 million Btu/hr: 20 ppm NOx (after 1/1/13)
VCAPCD Rule 74.22 – Natural Gas-Fired, Fan-Type Central Furnaces (Adopted 11/9/93)	Natural Gas-Fired, Fan-Type Central Furnaces; exemptions: • Units installed in mobile homes	40 ng NOx/joule
BAAQMD Regulation 9, Rule 4 – Nitrogen Oxides from Natural Gas-Fired Furnaces (Amended 3/15/23)	Natural gas-fired furnaces rated 175,000 Btu/hr or less	Natural gas-fired fan type central furnace: • 40 ng NOx/joule (1984+) • *14 ng NOx/joule (2024+)* *0 ng NOx/joule (manufactured after 1/1/29)*
CARB Zero-Emission Standard for Space and Water Heaters	Space heaters and water heaters, implementation begins in 2030	Zero emission standard
Other Identified Potential Measures	Residential space and water heating	• Develop incentives for early replacement of residential space and water heaters with high-efficiency electric heat pumps or zero-emission heaters • Require a zero-NOx appliance standard in existing buildings.

None of the current limits in other jurisdictions are more stringent than those currently in place in the South Coast AQMD. BAAQMD's rules include zero emission limits for furnaces and water heaters that begin to phase in for new units starting in 2027. Staff analyzed the BAAQMD rules as part of the BACM/MSM evaluation in Appendix III and concluded that adoption of a zero emission standard for space and water heaters was needed to satisfy MSM requirements.

c. Conclusion

Staff has not identified any feasible controls to propose as contingency measures for this source category. The PM2.5 Plan control strategy already includes measures to require newly sold or installed residential fuel combustion units to be zero emission where feasible and low NOx where not. In addition, CARB has committed to adopt the Zero_-Emission Standard for Space and Water Heaters control measure to satisfy MSM requirements. The only potential contingency measure that would be surplus to those efforts would be to require replacement of existing units before the end of their useful life. Staff does not consider this to be economically feasible, especially due to the undue burden it would place on disadvantaged communities. Nevertheless, South Coast AQMD is committed to expanding access to incentives through rebate programs for zero emission space and water heaters, especially for disadvantaged communities. A rebate program is being developed through the public process associated with Proposed Amended Rules 1111 and 1121.[17]

5. Other Fuel Combustion

a. Overview

There are other gaseous and liquid fuel fired combustion equipment that contribute to fuel combustion emissions. These include, but are not limited to, dryers, kilns, afterburners, evaporators, fryers, and burn-off furnaces. Two South Coast AQMD rules – Rule 1147 and Rule 1147.1 – regulate NOx emissions from these combustion units. Rule 1147 – NOx Reductions from Miscellaneous Sources (Amended 5/6/22) establishes BARCT NOx emission limits from miscellaneous combustion equipment and Rule 1147.1 – NOx Reductions from Aggregate Dryers (Adopted 8/6/21) establishes NOx limits representative of BARCT for gaseous fuel fired aggregate dryers. Emissions associated with these combustion units are summarized in Table V-15.

TABLE V-15
OTHER FUEL COMBUSTION EQUIPMENT EMISSIONS BASED ON 2030 BASELINE INVENTORY IN THE SOUTH COAST AIR BASIN

Major Source Category	Process	NOx (tpd)	PM2.5 (tpd)	NH3 (tpd)
020-COGENERATION	995-OTHER	0.00	0.00	0.16
040-PETROLEUM REFINING (COMBUSTION)	070-IN-PROCESS FUEL	0.00	0.00	0.00
040-PETROLEUM REFINING (COMBUSTION)	070-IN-PROCESS FUEL	0.15	0.03	0.06
050-MANUFACTURING AND INDUSTRIAL	012-OVEN HEATERS (FORCE DRYING SURFACE COATINGS)	0.03	0.00	0.00
050-MANUFACTURING AND INDUSTRIAL	012-OVEN HEATERS (FORCE DRYING SURFACE COATINGS)	0.00	0.00	0.00

[17] https://www.aqmd.gov/home/rules-compliance/rules/scaqmd-rule-book/proposed-rules/rule-1111-and-rule-1121

Major Source Category	Process	NOx (tpd)	PM2.5 (tpd)	NH3 (tpd)
050-MANUFACTURING AND INDUSTRIAL	070-IN-PROCESS FUEL	0.25	0.03	0.04
050-MANUFACTURING AND INDUSTRIAL	070-IN-PROCESS FUEL	0.00	0.00	0.00
050-MANUFACTURING AND INDUSTRIAL	070-IN-PROCESS FUEL	0.00	0.02	0.01
050-MANUFACTURING AND INDUSTRIAL	070-IN-PROCESS FUEL	0.00	0.05	0.08
050-MANUFACTURING AND INDUSTRIAL	070-IN-PROCESS FUEL	0.00	0.00	0.00
050-MANUFACTURING AND INDUSTRIAL	995-OTHER	0.00	0.00	0.00
050-MANUFACTURING AND INDUSTRIAL	995-OTHER	2.22	0.30	1.52
050-MANUFACTURING AND INDUSTRIAL	995-OTHER	0.04	0.00	0.00
050-MANUFACTURING AND INDUSTRIAL	995-OTHER	0.00	0.00	0.00
050-MANUFACTURING AND INDUSTRIAL	995-OTHER	0.52	0.00	0.00
052-FOOD AND AGRICULTURAL PROCESSING	070-IN-PROCESS FUEL	0.00	0.00	0.00
052-FOOD AND AGRICULTURAL PROCESSING	995-OTHER	0.00	0.00	0.00
060-SERVICE AND COMMERCIAL	012-OVEN HEATERS (FORCE DRYING SURFACE COATINGS)	0.00	0.00	0.00
060-SERVICE AND COMMERCIAL	070-IN-PROCESS FUEL	0.04	0.00	0.00
060-SERVICE AND COMMERCIAL	070-IN-PROCESS FUEL	0.01	0.00	0.00
060-SERVICE AND COMMERCIAL	070-IN-PROCESS FUEL	0.00	0.00	0.00
060-SERVICE AND COMMERCIAL	995-OTHER	0.00	0.00	0.00
060-SERVICE AND COMMERCIAL	995-OTHER	0.10	0.03	0.02
060-SERVICE AND COMMERCIAL	995-OTHER	0.62	0.15	1.59
060-SERVICE AND COMMERCIAL	995-OTHER	1.07	0.14	0.22
060-SERVICE AND COMMERCIAL	995-OTHER	3.36	0.11	0.00
060-SERVICE AND COMMERCIAL	995-OTHER	0.00	0.00	0.00
099-OTHER (FUEL COMBUSTION)	080-RESOURCE RECOVERY	0.01	0.01	0.00
099-OTHER (FUEL COMBUSTION)	995-OTHER	0.13	0.36	0.28
Total		**8.56**	**1.24**	**4.00**

b. Evaluation

i. Available Control Technologies

LNB or ULNB is a commercially available combustion control technology and SCR is a post-combustion add-on control technology that is commercially available and commonly employed to control NOx emissions from a wide range of NOx sources. Current NOx limits in Rule 1147 are established between 20 and 60 ppm corrected to 3 percent O_2 for most unit categories, although turbines have a NOx limit set at 9 ppm corrected to 15% O2. Lower NOx emissions with LNB/ULNB are feasible for burner replacements and new installation. Achieving 20 ppm NOx using LNB/ULNB systems without SCR is feasible in certain applications. Source test data also showed existing Rule 1147 equipment and burner technology can feasibly achieve between 20 and 30 ppm NOx in existing applications. SCR systems typically require minimum exhaust temperatures of about 500 °F, and many applications subject to Rule 1147 would need the installation of additional heat input devices, such as duct burners, to achieve SCR minimum exhaust temperatures. Duct burner installation would lower the system's overall reduction potential and raise NOx emissions at the SCR's inlet. Additionally, according to vendor quotations, adding duct burners would raise the control system's total cost. Current Rule 1147 NOx limits can be feasibly achieved with burner only control technologies.[18]

The NOx limit for aggregate dryers in Rule 1147.1 is set at 30 ppm. Based on discussions with burner manufacturers, 25 ppm NOx is difficult to achieve in existing facilities due to limited excess air required for low NOx burners, while 30 ppm is achievable for most retrofit applications. Source test data also suggested existing equipment and burner technology can feasibly achieve 30 ppm NOx. Therefore, staff finalized NOx limits at 30 ppm in Rule 1147.1.[19] SCR is often infeasible for aggregate dryers due to low exhaust temperatures (refer to details above).

ii. South Coast AQMD Control Measures

Table V-16 summarizes NOx emission limits in Rule 1147.

TABLE V-16

NOX EMISSION LIMITS FOR COMBUSTION EQUIPMENT CATEGORIES IN RULE 1147

Equipment Categories	Process Temperature	Emission Limits (corrected to 3% O_2, dry)
Gaseous Fuel Fired Equipment[1]		
Afterburner, Degassing Unit, Thermal Oxidizer, Catalytic Oxidizer or Vapor Incinerator	All	20 ppm or 0.024 lb/MMBtu
Remediation Unit	All	60 ppm or 0.073 lb/MMBtu

[18] Final Staff Report for Proposed Amended Rule 1147 – NOx Reductions from Miscellaneous Sources, South Coast AQMD, May 2022. https://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2022/2022-May6-029.pdf?sfvrsn=6

[19] Final Staff Report for Proposed Rule 1147.1 – NOx Reductions from Aggregate Dryers, South Coast AQMD, August 2021. https://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2021/2021-Aug6-028.pdf?sfvrsn=6

Equipment Categories	Process Temperature	Emission Limits (corrected to 3% O_2, dry)
Burn-off Furnace, Burnout Oven, Incinerator or Crematory with or without Integrated Afterburner	All	30 ppm or 0.036 lb/MMBtu
Evaporator, Fryer, Heated Process Tank, or Parts Washer	All	60 ppm or 0.073 lb/MMBtu
Oven, Dehydrator, Dryer, Heater, Kiln, Calciner, Cooker, Roaster, Furnace, or Heated Storage Tank	<1,200°F	20 ppm or 0.024 lb/MMBtu
	≥1,200°F	30 ppm or 0.036 lb/MMBtu
Make-Up Air Heater or other Air Heater located outside of building with temperature-controlled zone inside building	All	30 ppm or 0.036 lb/MMBtu
Tenter Frame or Fabric or Carpet Dryer	All	20 ppm or 0.024 lb/MMBtu
Autoclave	All	30 ppm or 0.036 lb/MMBtu
Tunnel Kiln or Beehive Kiln	<1,200°F	30 ppm or 0.036 lb/MMBtu
	≥1,200°F	60 ppm or 0.073 lb/MMBtu
Chiller (Absorption or Adsorption)	All	20 ppm or 0.024 lb/MMBtu
Turbine <0.3 MW[2]	All	9 ppm or 0.033 lb/MMBtu
Rotary Dryer	All	30 ppm or 0.036 lb/MMBtu
Other Unit or Process Temperature	<1,200°F	30 ppm or 0.036 lb/MMBtu
	≥1,200°F	60 ppm or 0.073 lb/MMBtu
Liquid Fuel Fired Equipment		
All liquid fuel-fired Units[2]	<1,200°F	40 ppm or 0.053 lb/MMBtu
	≥1,200°F	60 ppm or 0.073 lb/MMBtu

[1] Emission limit applies to burners in Units fueled by 100% natural gas that are used to incinerate air toxics, VOCs, or other vapors; or to heat a Unit. The emission limit applies solely when burning 100% gaseous fuel and not when the burner is incinerating air toxics, VOCs, or other vapors. The Unit shall be tested or certified to meet the emission limit while fueled with natural gas.
[2] Emission limits in ppm for Turbines are corrected to 15% O_2, dry basis.

Rule 1147.1 requires that aggregate dryers achieve a NOx limit of 30 ppm at 3 percent O_2 dry. The compliance schedule depends on the age of the burner and current permit conditions. Equipment at aggregate facilities, potentially including aggregate dryers, are also subject to South Coast AQMD Rule 1155 – Particulate Matter

(PM) Control Devices (Amended 5/2/14). Rule 1155 establishes best management practices for PM air pollution control devices, such as baghouses, from a wide range of manufacturing operations, including aggregate dryers. Rule 1155 requires no visible emissions from any PM air pollution control devices required to have a South Coast AQMD permit. For the largest tier (Tier 3 as defined to have the filter surface area greater than 7,500 square feet) baghouse, the outlet PM concentration is required to meet 0.01 grains per dry standard cubic foot (gr/dscf) or less, and the installation of a bag leak detection system (BLDS) is required. The BLDS continuously monitors baghouse performance by detecting changes in particle mass loading in the exhaust. Facility operators are alerted when bag leakage and similar failures occur such that they can repair the problem areas in a timely manner to minimize excess PM being vented to the atmosphere.

iii. Review of Control Measures in Other Jurisdictions

Other analogous rules adopted by other air districts include SJVAPCD Rules 4309 and 4313 and VCAPCD Rule 74.34 and are summarized in Table V-17 for comparison.

TABLE V-17

OTHER AIR DISTRICTS' CONTROL MEASURES FOR OTHER FUEL COMBUSTION

<table>
<tr><th>Rule</th><th>Applicability</th><th colspan="3">Control Measure</th></tr>
<tr><td rowspan="6">SJVAPCD Rule 4309 – Dryers, Dehydrators, and Ovens (Adopted 12/15/05)</td><td rowspan="6">Any dryer, dehydrator, or oven that is fired on gaseous fuel, liquid fuel, or is fired on gaseous and liquid fuel sequentially, and the total rated heat input for the unit is ≥5.0 MMBtu/hr</td><td colspan="3">NOx Limit (ppm, corrected at 19% O_2)</td></tr>
<tr><td></td><td>Gaseous Fuel Fired</td><td>Liquid Fuel Fired</td></tr>
<tr><td>Asphalt/Concrete Plants</td><td>4.3</td><td>12.0</td></tr>
<tr><td>Milk, Cheese, and Dairy Processing <20 MMBtu/hr</td><td>3.5</td><td>3.5</td></tr>
<tr><td>Milk, Cheese, and Dairy Processing ≥20 MMBtu/hr</td><td>5.3</td><td>5.3</td></tr>
<tr><td>Other processes not described above</td><td>4.3</td><td>4.3</td></tr>
<tr><td>SJVAPCD Rule 4313 – Lime Kilns (Adopted 3/27/03)</td><td>Lime kilns</td><td colspan="3">Gaseous Fuel: 0.10 lb/MMBtu of NOx
Distillate Fuel: 0.12 lb/MMBtu of NOx
Residual Fuel Oil: 0.20 lb/MMBtu of NOx</td></tr>
<tr><td rowspan="6">VCAPCD Rule 74.34 – NOx Reductions from Miscellaneous Sources (Adapted 12/13/16)</td><td rowspan="6">Dryers, furnaces, heaters, incinerators, kilns, ovens, and duct burners where the total rated heat input for the unit is ≥5.0 MMBtu/hr</td><td colspan="3">NOx Emission Limits (ppm, corrected at 3% O_2)</td></tr>
<tr><td>Asphalt Manufacturing (Dryers)</td><td colspan="2">40 or 0.048 lb/MMBtu</td></tr>
<tr><td>Sand & Gravel Processing (Dryers)</td><td colspan="2">40 or 0.048 lb/MMBtu</td></tr>
<tr><td>Paper Products Manufacturing (Hot Air Furnace, Duct Burner, Paper Dryer)</td><td colspan="2">40 or 0.048 lb/MMBtu</td></tr>
<tr><td>Metal Heat Treating/ Metal Melting Furnace</td><td colspan="2">60 or 0.072 lb/MMBtu</td></tr>
<tr><td>Kiln</td><td colspan="2">80 or 0.096 lb/MMBtu</td></tr>
</table>

Rule	Applicability	Control Measure		
			Process Temperature <1,200°F	Process Temperature ≥1,200°F
		Oven, Dryer (besides asphalt, sand or paper dryer), Heater, Incinerator, Other Furnaces, or Other Duct Burner	30 or 0.036 lb/MMBtu	60 or 0.072 lb/MMBtu

SJVAPCD Rule 4309 contains NOx limits between 3.5 to 5.3 ppm corrected to 19 percent O_2 which are between 32 and 50 ppm NOx corrected to 3 percent O_2. Rule 4309 has no separate emission limits based on process temperature, so comparable NOx emission limits may be more or less stringent compared to existing South Coast AQMD Rule 1147 depending on the process and temperature. SJVAPCD Rule 4313 has an emission limit of 0.10 lb/MMBtu of NOx from gaseous fuel fired lime kilns which is higher than South Coast AQMD Rule 1147's NOx limits for kilns that range from 0.024 to 0.036 lb/MMBtu depending on the process temperature.

VCAPCD Rule 74.34 establishes a NOx emission limit of between 30 to 80 ppm corrected to 3 percent O_2 for any natural gas fired combustion unit where the unit total heat input is greater than or equal to 5 MMBtu/hr. Similar to South Coast AQMD Rule 1147, VCAPCD Rule 74.34 separates emission limits for ovens, dryers, heaters, incinerators, furnaces and duct burners depending on process temperature. Units operating below 1,200°F are limited to 30 ppm NOx while those operating above or equal to 1,200°F are limited to 60 ppm NOx. VCAPCD also contains separate limits for kilns of 80 ppm as well as separate limits for paper product manufacturing and aggregate processes limited to 40 ppm NOx. VCAPCD Rule 74.34 NOx limits are generally less stringent than existing Rule 1147 requirements and Rule 1147.1 requirement for the aggregate dryer category. For example, the NOx limit for aggregate dryers is 40 ppm in VCAPCD Rule 74.34 while the limit is 30 ppm in Rule 1147.1. The NOx limits for oven, dryer, heater, and furnaces range from 30 to 60 ppm in VCAPCD Rule 74.34, whereas those limits range from 20 to 30 ppm in Rule 1147.

c. Conclusion

Staff does not propose any contingency measures for this category of units. Staff did not identify any PM2.5 control measures that are not required by South Coast AQMD for this source category, nor were applicable NH3 control measures identified for consideration. Staff considered several potential measures such as lowering NOx limits using ULNB and SCR, but these were not suitable contingency measures considering that it would be technologically infeasible to design, install and operate advanced emission control technology within 2 years of the triggering event. In addition, SCR is not an appropriate control method for units with low exhaust temperatures.

Waste Disposal

a. Overview

Waste Disposal categories in the South Coast Air Basin emissions inventory include 110 – Sewage Treatment, 120 – Landfills, 130 – Incinerators, 140 – Soil Remediation, and 199 – Other (Waste Disposal). Collectively, these source categories contribute 0.26 tpd PM2.5 emissions, 1.58 tpd NOx emissions, and 6.39 tpd NH3 emissions to the 2030 South Coast Air Basin emissions inventory. These emissions are contributed by landfill flares, composting, and incinerators. Flare emissions under the waste disposal source categories are predominately generated by landfill flares. Smaller quantities of emissions are generated by sewage treatment and incineration flares combusting digester gas, process gas, waste gas, and natural gas. Composting emissions are generated by the decomposition of organic materials. Incinerator emissions are primarily generated by waste disposal activities in the industrial sector and involve combustion of distilled oil, liquified petroleum gas, natural gas, pathological waste and waste gas.

b. Evaluation

1. Landfills

The evaluation of control measures for flares, including landfill flares, is provided in the Petroleum Production and Marketing Section of this document. This evaluation focuses on control measures for landfill equipment other than flares. South Coast AQMD Rule 1150.1 – Control of Gaseous Emissions from Municipal Solid Waste Landfills regulates emissions from non-methane organic compounds (NMOC), VOCs and toxic air contaminant (TAC) emissions from Municipal Solid Waste (MSW) landfills to prevent public exposure to such emissions. This rule also reduces methane emissions, a greenhouse gas, but does not include particulate matter, NOx or ammonia control measures.

Existing regulations for landfill emissions sources in other jurisdictions include BAAQMD Regulation 8-34, Mojave Desert Air Quality Management District (MDAQMD) Rule 1126, and SJVPACD Rule 4642. These rules have requirements for the collection and destruction of VOCs from solid waste disposal sites, but do not include particulate matter, NOx, or ammonia control measures. As VOCs are not a significant PM2.5 precursor in the South Coast Air Basin, these rules were not evaluated. Staff did not identify any NOx, particulate matter, or ammonia controls for consideration as contingency measures.

2. Sewage Treatment

The only emissions from this source category are associated with the treatment of liquid waste. For an evaluation of combustion emissions at sewage treatment plants, refer to the fuel combustion section in this appendix. Evaluation of control measures for sewage treatment did not identify any NOx, particulate matter, or ammonia controls for consideration as contingency measures.

3. Composting

Composting is a process in which solid organic waste materials are decomposed in the presence of oxygen under controlled conditions through the action of bacteria and other microorganisms. Composting operations occur at facilities that process greenwaste, biosolids, manure, and/or foodwaste. Greenwaste composting means composting of greenwaste by itself or as a mixture with foodwaste, or with up to 20 percent manure, per pile volume basis. Agricultural composting is conducted in agricultural settings where the feedstock consists of wastes generated on-site by the production and processing of farm or agricultural products. While there are no PM2.5 or NOx emissions associated with composting in the Basin, 1.6 tpd of ammonia are emitted and the remainder of this evaluation focuses on those emissions.

South Coast AQMD's Rule 1133 series contains requirements to reduce ammonia emissions due to the decomposition of organic materials. Rule 223 – Emission Reduction Permits for Large Confined Animal Facilities includes composting as a class two mitigation measure and specifies minimum composting requirements. These rules are summarized in Table V-18.

TABLE V-18
SOUTH COAST AQMD CONTROL MEASURES FOR COMPOSTING

South Coast AQMD Rule	Applicability	Requirements
Rule 1133.1 – Chipping and Grinding Activities (Amended 7/8/11)	Chipping and grinding activities to produce materials other than active or finished compost	• Chip or grind and utilize on-site or remove curbside, non-curbside, or mixed greenwaste from the site within 48 hours of receipt • Foodwaste cannot be processed at the facility unless approved by the Local Enforcement Agency
Rule 1133.2 – Emission Reductions from Co-Composting Operations (Adopted 1/10/03)	Co-composting operations, defined as those where biosolids and/or manure are mixed with bulking agents to produce compost	• Utilize an enclosure that meets the following requirements: has an inward face velocity of at least 100 ft/min; area of all openings cannot exceed 2% of the enclosure's surface area; and no measurable increase in NH3 above background levels outside the enclosure • Conduct all curing under negative pressure

South Coast AQMD Rule	Applicability	Requirements
		• Exhaust from the enclosure must be vented to an emission control device of at least 80% efficiency for NH3 removal • Alternatively, new co-composting operations can submit a compliance plan demonstrating an overall reduction in NH3 emissions of at least 80%. The facilities would not have to comply with the above requirements
Rule 1133.3 – Emission Reductions from Greenwaste Composting Operations (Adopted 7/8/11)	Greenwaste composting operations that produce active or finished compost from greenwaste by itself or greenwaste in combination with manure or foodwaste	• Cover active phase piles with at least 6 inches of finished compost within 24 hours of pile formation • For the first 15 days, apply water such that the top half of the pile is wet at a depth of at least 3 inches • Compost containing more than 10% foodwaste must employ an emission control device with at least 80% control efficiency for NH3 emissions
Rule 223 – Emission Reduction Permits for Large Confined Animal Facilities (Adopted 6/2/06)	Applies to dairies with ≥ 1,000 cows and poultry farms with ≥ 650,000 chickens.	If composting is selected as a mitigation measure: • Employ an aerated static pile vented to a control device with at least 80% control efficiency • Compost in accordance with the requirements in Rule 1133.2

Staff evaluated regulations for composting in other jurisdictions. SJVAPCD Rule 4566 – Organic Material Composting and SJVAPCD Rule 4565 – Biosolids, Animal Manure, and Poultry Litter Operations were identified as potentially applicable. However, these rules only seek to reduce VOC emissions associated with composting and do not contain specific requirements for the control of ammonia emissions.

Antelope Valley Air Quality Management District (AVAQMD) Rule 1133 regulates emissions of VOCs and NH3 from composting and related operations and prevents inadvertent decomposition from occurring during chipping and grinding operations. AVAQMD Rule 1133 requirements include chipping, grinding, or removal of curbside greenwaste from the site within 3 days, non-curbside greenwaste within 14 days, and mixed greenwaste from the site within 7 days of receipt. South Coast AQMD Rule 1133.1 has more stringent requirements than AVAQMD for chipping and grinding, where operators must chip or grind and utilize on-site or remove curbside, non-curbside, or mixed greenwaste from the site within 2 days of receipt.

Imperial County Air Pollution Control District (ICAPCD) Rule 430 also regulates VOC and NH3 emissions from composting, co-composting and related operations involving animal manure and poultry litter. ICAPCD Rule 430 requires operators to select from a menu of mitigation options involving treatment of compost piles and manure management. South Coast AQMD Rule 1133.2 establishes performance standards for operations to achieve at least 70 percent and 80 percent control efficiency for VOC and NH3 emissions for existing and new operations, respectively. South Coast AQMD Rule 1133.3 requires emission control devices and establishes Best Management Practices (BMPs) for greenwaste composting operations based on the amount of foodwaste a facility processes. Therefore, staff concludes that South Coast AQMD's rules for composting are more stringent than the composting measures in ICAPCD Rule 430.

Emission reductions from composting operations were separately evaluated in Appendix III under potential control measure (PCM) 10. According to California Department of Resources Recycling and Recovery (CalRecycle's) Final Environmental Impact Report, 46 new or expanded compost facilities and 24 new or expanded anaerobic digester facilities would be required in the South Coast Air Basin by 2030 to process newly diverted waste due to implementation of SB 1383.[20] Implementation of SB 1383 may result in increased emissions from processing of organic waste via composting and anaerobic digestion. The PM2.5 Plan seeks to further control emissions from these facilities through BCM-11 – Emission Reductions from Organic Waste Composting.

Finally, BCM-10 – Emission Reductions from Direct Land Application of Chipped and Ground Uncomposted Greenwaste seeks to require composting of chipped and ground greenwaste prior to land application. BCM-10 is one of the control measures that staff identified as being needed to satisfy MSM requirements. Composting of the greenwaste in accordance with the BMPs in Rule 1133.3 will achieve NH3 emission reductions compared to natural decomposition.

With the inclusion of BCM-10 and BCM-11 in the control strategy, staff concludes that no further opportunities exist for a contingency measure. Furthermore, evaluation of rules in other air districts for composting did not identify any NH3 controls that have not been implemented in the South Coast Air Basin.

4. Incinerators

Incinerators are used to burn waste material at high temperatures until reduced to ash. Staff reviewed incinerator control measures in other jurisdictions. SJVAPCD Rule 4203 – Particulate Matter Emissions from

[20] CalRecycle SB 1383 Final Environmental Impact Report. https://www2.calrecycle.ca.gov/Docs/Web/119973

Incineration of Combustible Refuse limits particulate matter emissions from the incineration of combustible refuse, establishes concentration limits and establishes an allowable emissions rate, and prohibits the discharge of visible emissions. SJVAPCD Rule 4302 – Incinerator Burning prohibits the use of any incinerator except for a multiple chamber incinerator or one equally effective in controlling air pollution.

Neither South Coast AQMD nor BAAQMD implement rules with similar particulate matter emissions requirements as in the applicable SJVAPCD regulations. However, the PM2.5 Plan control strategy includes BCM-07 – Emission Reductions from Incinerators which is expected to require control technology that results in NOx and PM2.5 emission reductions. South Coast AQMD Proposed Rule 1165 – Control of Emissions from Incinerators, which is associated with implementation of control measure BCM-07, is currently under development.[21]

c. Conclusion

As detailed above, staff did not identify any potential contingency measures for the waste disposal categories in the South Coast Air Basin that are surplus to the PM2.5 Plan control strategy and would achieve quantifiable reductions within 2 years.

Cleaning and Surface Coating

Cleaning and Surface Coating source categories include 210 – Laundering, 220 – Degreasing, 230 – Coatings and Related Process Solvents, 240 – Printing, 250 – Adhesives and Sealants, and 299 – Other (Cleaning and Surface Coating). These source categories contribute 0.04 tpd of NOx, 1.59 tpd of PM2.5, and 0.16 tpd of NH3 emissions to the 2030 baseline emissions inventory.

VOCs are the primary pollutant emitted from these source categories and their main emission sources are the application and use of solvents, coatings, inks, adhesives, and sealants. Particulate matter emissions are generated by sources in these categories via spraying, material handling, and mixing processes. NH3 and amines are commonly used in the formulation of water-based inks, coatings, and adhesives, and can contribute fugitive emissions from various applications. The small quantity of NOx emissions is associated with dryers, which typically burn natural gas. An analysis of fuel combustion sources was presented earlier in this appendix.

Most air districts including South Coast AQMD require that source operators utilize an emissions control device with a control efficiency of at least 90 percent for VOCs. Additionally, most air agencies require implementation of similar BMPs and good housekeeping to minimize emissions (e.g., requirements to install enclosures for coating operations and prohibiting the use of spray coating unless a high transfer efficiency method is used). South Coast AQMD staff did not identify any particulate matter control measures that are not already implemented in the Basin, nor did staff identify applicable measures for NOx and NH3 emissions.

[21] https://www.aqmd.gov/home/rules-compliance/rules/scaqmd-rule-book/proposed-rules/rule-1165

Thus, staff has not identified any Cleaning and Surface Coating control measures for further consideration as contingency measures in the South Coast Air Basin.

Petroleum Production and Marketing

a. Overview

Petroleum Production and Marketing categories include 310 – Oil and Gas Production, 320 – Petroleum Refining, and 330 – Petroleum Marketing, and 399 – Other (Petroleum Production and Marketing). These source categories contribute 0.91 tpd PM2.5 emissions, 0.63 tpd NOx emissions, and 0.07 tpd NH3 emissions to the 2030 South Coast Air Basin emissions inventory. The primary emission sources in these categories are flares, cooling towers, refinery coking, and Fluid Catalytic Cracking Units (FCCUs).

b. Evaluation

1. Flares

A flare is a tall stack equipped with a burner, used to destroy any excess gases produced by industrial and miscellaneous processes. Flare systems are in continuous operation. Most of the time these systems are in standby mode, ready to combust gases as soon as they enter the flare. U.S. EPA requirements for flares are addressed under 40 CFR Part 60.18 (which specifies operational requirements for flares), 40 CFR Part 63.11 (which specifies work standard practices for flares), and 40 CFR Part 60 Subpart Ja – Standards of Performance for Petroleum Refineries for Which Construction, Reconstruction, or Modification Commenced After May 14, 2007. South Coast AQMD regulates non-refinery flares (i.e., landfill, sewage treatment, and incinerator flares for waste disposal) under Rule 1118.1 and refinery flares under Rule 1118.

Existing regulations for flares in other jurisdictions include SJVAPCD Rule 4311 that requires flares exceeding annual capacity throughput thresholds to install ultra-low NOx (ULN) flaring technologies and encourages alternative uses of waste gas to reduce flaring. Santa Barbara County Air Pollution Control District (SBCVAPCD) Rule 359 – Flares and Thermal Oxidizers, BAAQMD Rule 12-11 – Flare Monitoring at Petroleum Refineries, BAAQMD Rule 12-12 – Flares at Petroleum Refineries, and SDAPCD Rule 69.7 – Landfill Gas Flares also regulate emissions from flaring and are summarized in Table V-17. Because other districts typically regulate flaring activities under one rule, South Coast AQMD Rules 1118 and 1118.1 for refinery and non-refinery flares are listed under the same column in Table V-19.

TABLE V-19
COMPARISON OF EXISTING CONTROL MEASURES FOR FLARES

	South Coast AQMD Rule 1118 – Control of Emissions from Refinery Flares (Amended 01/06/2023) & Rule 1118.1 – Control of Emissions from Non-Refinery Flares (Amended 01/04/19)	SJVAPCD Rule 4311 – Flares (Amended 12/17/20)	SBCAPCD Rule 359 – Flares and Thermal Oxidizers (Amended 06/28/94)	BAAQMD Rule 12-11 – Flare Monitoring at Petroleum Refineries (Amended 11/03/21) & Rule 12-12 – Flares at Petroleum Refineries (Amended 11/03/21)	SDAPCD Rule 69.7 – Landfill Gas Flares (Adopted 03/09/23):
Applicability	1118 Flaring operations at petroleum refineries, sulfur recovery plants, and hydrogen production plants. 1118.1 Non-refinery facilities, including, but not limited to, oil and gas production facilities, wastewater treatment facilities, landfills, and organic liquid handling facilities.	Operations involving the use of flares.	Flares and thermal oxidizers at oil and gas production sources, petroleum refinery and related sources, natural gas services and transportation sources and wholesale trade in petroleum/petroleum products.	Flares at refineries.	All landfill gas flares at a municipal solid waste landfills where flare emissions are at or above the federal major stationary source threshold for NOx.
Requirements	1118 • Monitor and record data on refinery and related flaring operations and to control and minimize flaring and related emissions • Notify South Coast AQMD of flare events (both planned and unplanned) • Minimize all flaring, except during emergencies, shutdowns, startups, and turnarounds • Monitor emissions and submit quarterly emissions report • Meet performance target for sulfur dioxide emissions of less than 0.5 tons per million barrels of crude processing capacity, averaged over one year. • Any facility that exceeds performance targets must submit flare minimization plan and pay mitigation fees for excess	• Reduce flaring activities with emission limits, operation limits, requirements to monitor, record, and report flaring activities • NOx, VOC, and CO emission limits by operation category for flares at oil and gas, chemical, landfill, digester, or organic liquid loading operations. • NOx and VOC emission limits for ground level enclosed flares; • If emission limits cannot be met the operator must limit flaring to the required annual throughput	• Contains requirements for flares and thermal oxidizers including sulfur content limits, flare minimization plans, and emergency event provisions • NOx and VOC emission limits for ground level flares and thermal oxidizers exceeding 120 standard cubic feet per day	• Reduce emissions from flares at refineries by minimizing the frequency and magnitude of flaring • Monitoring flares in several ways that include vent gas flow and composition, pilots and purging, and video monitoring • Contains management practices for flaring such as flare minimization plans, operating and design standards, recordkeeping and reporting requirements.	• The landfill gas flare shall be properly maintained and operational at all times • In the event the landfill gas flare is inoperable, the gas mover equipment shall be shut down and closed within one hour • Monitoring and record keeping requirements • NOx and CO emission limits for enclosed landfill flares

	South Coast AQMD Rule 1118 – Control of Emissions from Refinery Flares (Amended 01/06/2023) & Rule 1118.1 – Control of Emissions from Non-Refinery Flares (Amended 01/04/19)	SJVAPCD Rule 4311 – Flares (Amended 12/17/20)	SBCAPCD Rule 359 – Flares and Thermal Oxidizers (Amended 06/28/94)	BAAQMD Rule 12-11 – Flare Monitoring at Petroleum Refineries (Amended 11/03/21) & Rule 12-12 – Flares at Petroleum Refineries (Amended 11/03/21)	SDAPCD Rule 69.7 – Landfill Gas Flares (Adopted 03/09/23):
	emissions. 1118.1 • Reduce NOx and VOC emissions from flaring produced gas, digester gas, landfill gas, and other combustible gases or vapors and to encourage alternatives to flaring. • Comply with applicable NOx, VOC, and CO emission limits • Comply with annual percent capacity	• If annual throughput thresholds are exceeded for 2 consecutive years, flare operator must replace or modify flare to meet applicable NOx and VOC limits • Refineries meet performance target for sulfur dioxide emissions of less than 0.5 tons per million barrels of crude processing capacity, averaged over one year.			
Exemptions	1118 • Flaring as a result of a catastrophic event including a major fire or an explosion at the facility • Constitutes a safety hazard to the sampling personnel at the sampling location approved in the Flare Monitoring and Recording • Any sulfur dioxide emissions from flare events caused by external power curtailment beyond the operator's control (excluding interruptible service agreements), natural disasters or acts of war or terrorism 1118.1 • Flares at asphalt plants, biodiesel plants, hydrogen production plants	• Flares used for well testing, tank degassing, and pipeline degassing operations • Flares that combust regeneration gas • Emergency flares not subject to emission limits • Flares operated at municipal solid waste landfills that combust less than 2,000 million standard cubic feet (MMscf) of landfill gas per calendar year and that have ceased accepting waste • Flares that combust only propane or butane or a	• Burning of sulfur, hydrogen sulfide, acid sludge or other sulfur compounds in the manufacturing of sulfur or sulfur compounds • Burning of any gas with a net heating value of less than 300 Btu/scf provided the fuel used to incinerate such gas does not contain sulfur compounds in excess of the rules set limits • Permitted flares at 1.7 MMBTU/hr or less are exempt from emission limits • Emergency Flares	• Flares that are used to control emissions from organic liquid storage, loading racks, marine vessel loading terminals, wastewater treatment systems, and pump seals.	• Standards, Test Methods, Source Test Requirements of this rule shall not apply to an existing open landfill gas flare, which commenced operation on or before March 9, 2023.

	South Coast AQMD Rule 1118 – Control of Emissions from Refinery Flares (Amended 01/06/2023) & Rule 1118.1 – Control of Emissions from Non-Refinery Flares (Amended 01/04/19)	SJVAPCD Rule 4311 – Flares (Amended 12/17/20)	SBCAPCD Rule 359 – Flares and Thermal Oxidizers (Amended 06/28/94)	BAAQMD Rule 12-11 – Flare Monitoring at Petroleum Refineries (Amended 11/03/21) & Rule 12-12 – Flares at Petroleum Refineries (Amended 11/03/21)	SDAPCD Rule 69.7 – Landfill Gas Flares (Adopted 03/09/23):
	fueled in part with refinery gas, petroleum refineries, sulfuric acid plants, and sulfur recovery plants • Flares subject to South Coast AQMD Rule 1147 • Flares routing only propane or butane or a combination of propane and butane directly into the flare burner • Flares at a landfill that collects less than 2,000 MMscf of landfill gas per calendar year and has either ceased accepting waste.	combination of propane and butane			
Annual Capacity Thresholds	1118.1 Non-refineries, expressed as the percentage of capacity used to flare gas: • Any gas combusted in an open flare: 5% • Digester gas: 70% • Landfill gas: 20% • Produced gas: 5%	• Oil and gas and chemical operations: 25,000 MMBtu per year • Landfill operations: 90,000 MMBtu per year • Digester operations: 100,000 MMBtu per year • Organic liquid loading operations: 25,000 MMBtu per year			
NOx Emission Limits	1118.1 Non-refineries: • Digester gas at major source: 0.025 lb/MMBtu • Digester gas at minor source: 0.06 lb/MMBtu • Landfill gas: 0.025 lb/MMBtu • Produced gas: 0.018 lb/MMBtu • Other flare gas: 0.06 lb/MMBtu	• Digester operations at major source: 0.025 lb/MMBtu • Digester operations not at major source: 0.060 lb/MMBtu • Landfill operations:0.025 lb/MMBtu • Flares at oil and gas operations or chemical	Enclosed flare exceeding 120,000 scf/day: • Without steam-assist (<10 MMBtu): 0.0952 lb/MMBtu • Without steam-assist (10-100 MMBtu): 0.1330 lb/MMBtu • Without steam-assist (>100 MMBtu): 0.5240 lb/MMBtu • With steam-assist: 0.068		Enclosed landfill gas flare: 0.06 lb/MMBtu

	South Coast AQMD Rule 1118 – Control of Emissions from Refinery Flares (Amended 01/06/2023) & Rule 1118.1 – Control of Emissions from Non-Refinery Flares (Amended 01/04/19)	SJVAPCD Rule 4311 – Flares (Amended 12/17/20)	SBCAPCD Rule 359 – Flares and Thermal Oxidizers (Amended 06/28/94)	BAAQMD Rule 12-11 – Flare Monitoring at Petroleum Refineries (Amended 11/03/21) & Rule 12-12 – Flares at Petroleum Refineries (Amended 11/03/21)	SDAPCD Rule 69.7 – Landfill Gas Flares (Adopted 03/09/23):
	• Organic liquid storage: 0.25 lb/MMBtu • Organic liquid loading: 0.034 lb/1,000 gallons loaded	operations: 0.018 lb/MMBtu • Organic liquid loading operations: 0.034 lb/1,000 gallons loaded Enclosed Flare: • Without steam-assist (<10 MMBtu): 0.0952 lb/MMBtu • Without steam-assist (10-100 MMBtu): 0.1330 lb/MMBtu • Without steam-assist (>100 MMBtu): 0.5240 lb/MMBtu • With steam-assist: 0.068 lb/MMBtu	lb/MMBtu		

Refinery Flares

Every petroleum refinery operating within the South Coast AQMD's jurisdiction has one or more flares to control emissions from process units and storage vessels. Eight petroleum refining facilities, three hydrogen plants, and one sulfur recovery plant within Los Angeles County operate a total of 31 flares subject to Rule 1118. Rule 1118 requires facilities to submit notifications and reports, monitor emissions, meet emission performance targets, and maintain a public inquiry hotline. Any facility that exceeds these performance targets is required to submit a flare minimization plan and to pay mitigation fees for the excess emissions. Refineries and related facilities are required to notify South Coast AQMD of flare events expected to exceed one or more thresholds of 100 pounds of VOCs, 500 pounds of sulfur dioxides (SO_2), or 500,000 standard cubic feet of gas combusted. Rule 1118 was last amended in January 2023 to address U.S. EPA's partial SIP disapproval of the rule to remove a clause that granted the Executive Officer sole authority to approve ASTM standards, and now includes CARB and U.S. EPA approval for ASTM standards.

Evaluation of Rule 1118 revealed potentially less stringent NOx controls compared to SJVAPCD Rule 4311. Specifically, Rule 4311 sets an annual throughput threshold of 25,000 MMBtu/year or a NOx emission limit of 0.018 lb/MMBtu for oil and gas flares, including refinery flares, while Rule 1118 does not set an explicit NOx limit. However, staff is currently pursuing an amendment of Rule 1118,[22] which is expected to address this issue. Proposed Amended Rule (PAR) 1118, tentatively scheduled for adoption in Spring 2024, will increase the stringency of Rule 1118 by lowering SO_2 performance targets, establishing new NOx performance targets for hydrogen clean service flares, and establishing a throughput threshold for liquified petroleum gas (LPG) clean service flares at refineries. For hydrogen clean service flares, the NOx performance target in PAR 1118 is 0.3 lbs. per million standard cubic feet of hydrogen production capacity. PAR 1118 addresses LPG flares by instituting a throughput threshold of 15,000 MMBtu/year, which is lower than the threshold in SJVAPCD Rule 4311. Operators are expected to comply with the more stringent threshold by installing an LPG recovery system (i.e., refrigeration/chiller system) or implementing flare operation changes through installing a new LPG flare or retrofitting an existing LPG flare, resulting in lower NOx emissions. Therefore, staff concludes that PAR 1118 is more stringent than SJVAPCD Rule 4311.

Non-refinery Flares

South Coast AQMD Rule 1118.1 – Control of Emissions from Non-Refinery Flares was adopted on January 4, 2019, to reduce NOx and VOC emissions from flaring produced gas, digester gas, landfill gas, and other combustible gases or vapors and to encourage alternatives to flaring. Non-refinery facilities include oil and gas production facilities, wastewater treatment facilities, landfills, organic liquid handling facilities, and others. At the time of rule adoption, there were 153 facilities subject to Rule 1118.1.

Table V-16 compares Rule 1118.1 with control measures for flares implemented in other jurisdictions. NOx limits under Rule 1118.1 are as stringent as those in other jurisdictions. Rule 1118.1 and SJVAPCD Rule 4311 both require either flare throughput reduction or flare replacement to meet applicable emission limits when the applicable annual capacity threshold is exceeded. However, each jurisdiction takes a different approach

[22] https://www.aqmd.gov/home/rules-compliance/rules/scaqmd-rule-book/proposed-rules/rule-1118

to setting annual capacity thresholds. Rule 1118.1 sets annual thresholds based on a percentage of capacity that a flare is used, while SJVAPCD Rule 4311 sets annual thresholds based on heat capacity in MMBtu per year. If a flare under Rule 1118.1 exceeds its annual capacity threshold, then the operator of the flare is required to take action to reduce the throughput or comply with more stringent emission limits. While direct comparison of rule requirements is challenging due to the different structures of the rules, staff concludes that Rule 1118.1 is generally as stringent as those from other agencies.

2. Wet Cooling Towers

Wet cooling towers are heat exchange devices used to remove large amounts of heat absorbed in the circulating cooling water systems at power plants, petroleum refineries, petrochemical plants, natural gas processing plants, and a wide variety of industrial operations. Small amounts of particulate matter can be emitted from cooling towers via the production of drift, when dissolved solids in the circulating fluid are entrained in the cooling air and discharged from the cooling tower. As described in the U.S. EPA's compilation of air pollutant emission factors (AP-42), drift eliminators are usually incorporated into cooling tower design to remove droplets from the air stream before exiting the tower.[23] Cooling towers contribute 0.49 tpd of PM2.5 emissions and zero NOx and NH3 emissions to the 2030 baseline emissions inventory.

Staff did not identify any federal, state, or local regulations that control PM emissions from cooling towers. The only federal requirement that applies to cooling towers is under 40 CFR 63.654 and requires monitoring and repair of leaks of VOC from heat exchange systems.

Cooling towers are evaluated in Appendix III of the PM2.5 Plan under PCM 3. Staff determined that prior to developing a policy to implement controls, an emissions inventory and an equipment universe must be established. Control measure BCM-13 – Emission Reductions from Industrial Cooling Towers proposes development of an emissions inventory, equipment universe, and improved emission factors for cooling towers and seeks reductions of PM2.5 emissions from industrial process cooling towers with drift eliminator technologies. BCM-13 aims to assess the feasibility of phasing in the use of drift eliminators with 0.001 percent drift rate for existing cooling towers where cost-effective, and a potential BACT drift rate of 0.0005 percent for new construction. Given the inclusion of BCM-13 in the control strategy, staff did not identify any potential contingency measures for cooling towers.

3. Coking

Delayed coking is a process in petroleum refining that involves the thermal decomposition of heavy hydrocarbons to produce valuable products like petroleum coke, gas oil, and other lighter hydrocarbons. This process is employed to convert the heavy residual fractions obtained from crude oil distillation into more valuable and marketable products. Delayed Coking Units (DCUs) emit 0.05 tpd PM2.5 emissions in the 2030 baseline inventory. DCUs are regulated by South Coast AQMD Rule 1114 – Petroleum Refinery Coking Operations. Rule 1114 requires depressurization of a coke drum to less than two pounds per square inch

[23] EPA's AP-42, Section 13.4 for Wet Cooling Towers, page 13.4-3 at https://www.epa.gov/sites/default/files/202010/documents/13.4_wet_cooling_towers.pdf

gauge prior to venting to the atmosphere, resulting in emission reductions. Staff did not identify any rules in other districts that control PM2.5 emissions from DCUs.

4. FCCUs

Catalytic cracking accounts for 0.48 tpd NOx, 0.33 tpd PM2.5, and 0.06 tpd NH3 emissions in the 2030 baseline inventory. Catalytic cracking is a refinery process conducted in FCCUs where petroleum derivative feedstock is charged and fractured into smaller molecules in the presence of a catalyst. FCCUs are regulated by South Coast AQMD Rules 1105.1 and 1109.1. Relevant requirements are summarized in Table V-20.

TABLE V-20
SOUTH COAST AQMD CONTROL MEASURES FOR FCCUs

South Coast AQMD Rule	Applicability	Requirements
Rule 1105.1 – Reduction of PM10 and Ammonia Emissions from Fluid Catalytic Cracking Units (Adopted 11/7/03)	Applies to fluid catalytic cracking units at petroleum refineries	• Filterable PM10 must be limited to: ○ 3.6 pounds per hour; or ○ 0.005 gr/dscf of flue gas corrected to 3% O_2 dry; or ○ 2.8 pounds per thousand barrels of fresh feed. • NH3 must be limited to 10 ppm corrected to 3% O_2 dry
Rule 1109.1 – Emissions of Oxides of Nitrogen from Petroleum Refineries and Related Operations (Adopted 11/5/21)	Applies to petroleum refineries and facilities with related operations to petroleum refineries	FCCUs must meet NOx limits of 2 ppm and 5 ppm @ 3% O_2 on a 365-day and 7-day rolling average, respectively, with an interim NOx limit of 40 ppm @ 3% O_2 on a 365-day rolling average

Staff reviewed control measures for FCCUs in other jurisdictions and identified BAAQMD Regulation 6, Rule 5 as potentially applicable. This regulation contains an NH3 emission limit that is identical to that in Rule 1105.1 and a PM10 emissions limit of 0.010 gr/dscf at 5 percent O_2 on an annual average basis. Staff concluded that the requirements in Rule 1105.1 are more stringent than those in BAAQMD Regulation 6, Rule 5. Staff also evaluated requirements for FCCUs contained in 40 CFR Part 60 Subpart Ja, which did not reveal any more stringent requirements than those in South Coast AQMD rules. Thus, staff concluded that South Coast AQMD currently implements the most stringent measures for FCCUs.

c. Conclusion

Staff did not identify any potential contingency measures for the petroleum production and marketing categories in the South Coast Air Basin that could achieve quantifiable reductions and be implemented within 2 years. While the NOx limit for refinery flares in Rule 1118 is currently not as stringent as those in other jurisdictions, a rule amendment to address this deficiency is underway which precludes consideration of this measure for contingency purposes. The current rule amendment is the second phase of a planned two-phase amendment for Rule 1118. The first phase, adopted in 2017, primarily focused on establishing mechanisms to gather more information through scoping documents prepared by the owners and operators of regulated facilities. The current rule amendment relies upon the information gathered from the scoping documents submitted after the 2017 amendment and South Coast AQMD staff's investigations on flare emission reductions.

Industrial Processes

1. Chemical

Processes that contribute emissions to source category 410 – Chemical include the manufacture of plastic products, rubber products, chemicals, and fiberglass. Such sources contribute 0.39 tpd direct PM2.5 emissions, 0.07 tpd NOx emissions, and 0.01 tpd NH3 emissions to the Basin's 2030 baseline emissions inventory, with the majority of emissions contributed by plastics and plastic products manufacturing. There is no source-specific rule for this source category in the Basin. However, such manufacturing processes are subject to general PM emission control requirements including Rule 404 – Particulate Matter – Concentration and Rule 405 – Solid Particulate Matter - Weight. Staff did not identify any potential control measures limiting particulate matter, NH3, or NOx for plastics and plastic manufacturing or the remaining processes covered by this category that can achieve quantifiable reductions. To the extent that any particulate matter, NH3, and NOx emissions are generated by fuel combustion sources in this category, refer to the evaluation of fuel combustion sources in this appendix.

2. Food and Agriculture

Source category 420 – Food and Agriculture includes emissions from various types of processing operations including agricultural products processing, bakeries, and breweries. The projected 2030 baseline emissions for this category include 0.06 tpd PM2.5 emissions, 0.03 tpd NOx emissions, and zero NH3 emissions. While there are no applicable PM2.5, NOx, or NH3 control measures specific to this source category, operations in the Basin are subject to the general PM emission control requirements in Rule 404 – Particulate Matter - Concentration and Rule 405 – Solid Particulate Matter - Weight. Most NOx emissions are associated with fuel combustion in food and agricultural products processing. Control measures for fuel combustion are evaluated in the fuel combustion section in this appendix. Staff did not identify additional control measures to propose for this source category.

3. Mineral Processes

a. Overview

Source category 430 – Mineral Processes contributes 0.99 tpd PM2.5 emissions, 0.38 tpd NOx emissions, and 0.07 tpd NH3 emissions to the 2030 Basin's baseline emissions inventory. PM2.5 emissions from this category are generated by storage piles of mineral and metal products, asphaltic concrete, and sand/aggregate, asphaltic concrete production, surface blasting, and other. The majority of NOx emissions for this source category come from "Other - Mineral and Metal Products (Unspecified)," followed by cement manufacturing and gypsum manufacturing. These processes are also responsible for the majority of ammonia emissions. Because these processes are associated with the manufacturing of mineral products such as asphalt roofing, cement and concrete, and non-metallic minerals, the source of ammonia as well as NOx emissions is likely to be fuel combustion in heaters, dryers, and engines. Staff evaluated control measures for fuel combustion sources in the fuel combustion section of this appendix.

Particulate matter emissions from the mineral processes source category come from non-combustion related activities including earth moving activities, surface blasting, bulk material handling and mixing, wind erosion of exposed surfaces and storage piles, and vehicle activity on unpaved and paved roadways. Point sources of particulate matter emissions can also emerge throughout the manufacturing process when dust collectors are utilized for material recovery and emissions control. Baghouses are used in asphalt batch plants where moist aggregate is delivered into the drum dryer to be dried out, and in concrete batch plants where concrete materials are introduced into the mixer and agitated.

b. Evaluation

Staff reviewed control measures for this source category implemented by South Coast AQMD and other state and local air agencies. Each jurisdiction has different rule structures, which can make direct comparison difficult. Table V-21 summarizes the control measures staff considered for this source category.

TABLE V-21
CONTROL MEASURES IMPLEMENTED BY SOUTH COAST AQMD AND OTHER DISTRICTS FOR MINERAL PROCESSES

Rule	Applicability	Control Measure
South Coast AQMD Rule 404 – Particulate Matter - Concentration (Amended 2/7/86)	Applies to any source which emits particulate matter	• Establishes particulate matter maximum concentrations based on gas volume discharged • 0.196 gr/dscf limit

Rule	Applicability	Control Measure
South Coast AQMD Rule 405 – Particulate Matter - Weight (Amended 2/7/86)	Applies to any source which emits solid particulate matter including lead and lead compounds	• Establishes solid particulate matter discharge rates based on process weight per hour, ranging from 0.99 lbs/hr to 30.0 lbs/hr
South Coast AQMD Rule 1140 – Abrasive Blasting (Amended 8/2/95)	Establishes requirements for materials used in an abrasive blasting operation and sets limits on the opacity of air contaminants produced by blasting	Comply with the following performance standards: • Confined blasting shall be used; • Wet abrasive blasting shall be used; • Hydroblasting shall be used; or • Dry unconfined blasting abrasives shall contain: ○ Before blasting, no more than 1% by weight material passing a No. 70 U.S. Standard sieve ○ After blasting, no more than 1.8% by weight material ≤5 µm Opacity limit requirements for abrasive blasting operations: • For a compliant operation, opacity limit is set at Ringelmann #2 for 3 minutes in any one hour • For a non-compliant operation, opacity limit is set at Ringelmann #1 for 3 minutes in any one hour
South Coast AQMD Rule 1155 – Particulate Matter Control Devices (Amended 5/2/14)	Applies to permitted PM air pollution control (APC) devices venting processes that have non-combustion PM emissions	• Requires weekly Method 22 visible emissions check for all APC devices • Requires 0.01 gr/dscf standard and BLDS for Tier 3 baghouse
South Coast AQMD Rule 1156 – Further Reductions of Particulate Emissions from Cement Manufacturing Facilities (Amended 11/6/15)	Applies to all operations, materials handling, and transport at a cement manufacturing facility, including, but not limited to, kiln and clinker cooler, material storage, crushing, drying, screening, milling, conveying, bulk loading and unloading systems, internal roadways, material transport, and track-out. After facility closure, also applies to the owner/operator of the property on which a cement manufacturing facility has operated on or after November 4, 2005	• Visible emissions not exceeding 10% opacity. For open piles, roadways, and other unpaved areas, visible emissions no greater than 20% opacity based on 12 readings or 50% opacity based on 5 readings • No visible dust plum from 100 feet in any direction from any operations • Require permitted air pollution control (APC) devices for various operations • APC device outlet PM concentration at BACT limit 0.005 gr/dscf
South Coast AQMD Rule 1157 – PM10 Emission Reductions from Aggregate	Applies to all permanent and temporary aggregate and related operations; exemptions listed under subparagraph (h) of Rule 1157	• Opacity limits • Requires control measures (such as watering, use of dust suppressant) for paved and unpaved roads, and

Rule	Applicability	Control Measure
and Related Operations (Amended 9/8/06)		unpaved vehicle and equipment traffic areas • Requires control of carry-out and trackout • Requirements for handling, storage and transport of bulk materials including storage piles, material loading, unloading, and transferring • Requirements for storage piles • Control requirements for conveyors, crushing equipment and screening equipment
South Coast AQMD Rule 2100 – Registration of Portable Equipment (Adopted 7/11/97)	Establishes standards for registration of certain portable emissions units. The complete list of units subject to Rule 2100 is provided in subparagraph (b) of the rule. Covered sources include confined and unconfined abrasive blasting, Portland concrete batch plants, sand and gravel screening, rock crushing, and unheated pavement crushing and recycling operations	• 20% opacity limits (40% for unconfined abrasive blasting) • Control equipment including fabric or cartridge type filter dust collectors, wet suppression systems • 99% particulate matter control efficiency requirement for dust collection equipment • Other source-specific requirements
SJVAPCD Rule 2280 – Portable Equipment Registration (Amended 12/20/18)	Establishes standards for registration of certain portable emissions units for operation at participating districts. The complete list of units subject to Rule 2280 is provided at section 2.0 of the rule. Covered sources include confined and unconfined abrasive blasting operations, concrete batch plants, sand and gravel screening, rock crushing, and pavement crushing and recycling operations	• 20% opacity limits (40% for unconfined abrasive blasting) • Control equipment including fabric or cartridge type filter dust collectors, wet suppression systems • 99% efficiency requirement for dust collection equipment • Other source-specific requirements
SJVAPCD Rule 4201 – Particulate Matter Concentration (Amended 12/17/92)	Applies to any source operation which emits or may emit dust, fumes, or total suspended particulate matter	0.1 gr/dscf dust emissions limit for all sources
SJVAPCD Rule 4202 – Particulate Matter - Emission Rate (Amended 12/17/92)	Applies to any source operation which emits or may emit particulate matter	Establishes emission limits based on process throughput, ranging from 0.36 lbs/hr to 46.72 lbs/hr
SJVAPCD Regulation VIII – Fugitive PM10 Prohibitions (Amended in 2004)	Applies to specified outdoor fugitive dust sources; complete list provided at SJVPACD Rule 8011, section 3.0 (Definitions)	• Rule 8011 establishes general requirements for fugitive dust sources

Rule	Applicability	Control Measure
		• Rule 8021 contains requirements for construction, demolition, excavation, extraction, and other earthmoving activities • Rule 8031 contains standards for the outdoor handling, storage and transport of bulk materials • Rule 8041 contains standards for control of carryout and trackout at those sources subject to a SJVAPCD fugitive dust rule • Rule 8061 contains requirements for paved and unpaved roads • Rule 8071 contains requirements for unpaved vehicle and equipment traffic areas
BAAQMD Regulation 6, Rule 1 – General Requirements (Amended 8/1/18)	Applies to all types of emission sources; exemptions include temporary sandblasting, open outdoor fires, wood burning devices, and metal recycling and shredding operations	• 20% opacity limit • 0.15 gr/dscf limit for exhaust gas • Throughput-based emission limits, ranging from 1.78 lbs/hr to 40.0 lbs/hr, or 0.99 lbs/hr to 30.0 lbs/hr if the potential to emit TSP is greater than 1,000 kg/year
BAAQMD Regulation 6, Rule 6 – Prohibition of Trackout (Adopted 8/1/18)	Applies to large bulk material sites, large construction sites, and large disturbed surface sites	• Prohibits trackout to the public paved road for a distance of 25 feet • 20% opacity limit during cleanup of trackout • Monitoring and recordkeeping requirements

The control measures identified for mineral processes include limiting opacity (e.g., 20 percent), particulate matter control efficiency (e.g., 99 percent), and particulate matter concentration standards. South Coast AQMD Rule 2100 and Rule 1157 are comparable to the rules being implemented in other jurisdictions. Rule 1140 sets emission standards of air pollutants from abrasive blasting operations using the Ringelmann Chart. The Ringelmann Chart No. 1 corresponds to an opacity of 20 percent and No. 2 to an opacity of 40 percent. In addition, Rule 1155 applies to particulate matter air pollution control devices including baghouses, HEPA filters, cyclones, and electrostatic precipitators. While the 0.01 gr/dscf particulate emissions standard and installation of BLDS apply to the largest Tier 3 baghouse, the requirement of no visible emissions applies to all types of PM air pollution control devices venting non-combustion processes including this mineral process source category. The no visible emissions requirement in Rule 1155 is more stringent than the 20 percent opacity limit in other rules implemented by South Coast AQMD and other districts. Typically, an opacity reading at 20 percent is approaching the lowest level human eyes can detect and any emissions at 10 percent opacity or lower is not detectable by human eyes and thus, is considered no visible emissions. Overall, staff did not identify any particulate matter control measures implemented in other jurisdictions that are not incorporated in South Coast AQMD rules to consider as potential contingency measures.

c. Conclusion

Staff evaluation of controls for this category did not identify any potential contingency measures that could be implemented and achieve quantifiable emission reductions within 2 years of being triggered.

4. Metal Processes

a. Overview

Source category 440 – Metal Processes includes secondary metal production, metal plating and coating operations, and other unspecified industrial processes that involve mineral and metal products, aluminum, iron, and steel. Sources in this category contribute 0.25 tpd PM2.5 emissions, 0.29 tpd NOx, and zero NH3 emissions to the 2030 Basin's baseline emissions inventory. Metal melting, metal heat treating, metal heating, and metal forging furnaces are the primary sources of NOx emissions in this category. Metal plating and coating also contributes NOx emissions. NOx can be generated as a byproduct from metal treatment processes where nitric acid is used as an oxidant. For example, plating or catalyst recovery involves the reaction of nitric acid and transition metals and emits NOx.

b. Evaluation

Staff reviewed control measures established for this source category by South Coast AQMD, SJVAPCD, BAAQMD, VCAPCD, Great Basin Unified APCD (GBUAPCD), and Amador County Air District. Table V-22 summarizes the metal process control measures identified. The metal process controls identified rely on a range of control measures that generally fall into several common categories. Particulate matter control requirements of the relevant South Coast AQMD rules are generally similar to those identified in SJVAPCD and BAAQMD, which include opacity limits, control device efficiency, enclosures, housekeeping and best management practices. While SJVAPCD and BAAQMD rules generally regulate the non-ferrous metal melting facilities in one rule, South Coast AQMD rules divide this source category into more facility types for which separate rules are implemented for chromium and non-chromium metal melting. For example, South Coast AQMD Rule 1147.2 applies to metal melting, metal heat treating, and metal heating and forging furnaces that are operated at non-RECLAIM, RECLAIM, and former RECLAIM facilities, requiring a South Coast AQMD permit. Staff also evaluated applicable NOx concentration limits in other air districts' rules, among which the lowest was 60 ppm. Rule 1147.2 has more stringent NOx concentration limits ranging from 15 to 60 ppm for metal melting, heating, forging, and treating furnaces. Note that there are zero emissions of PM2.5 and NOx for chrome plating and coating operations and thus, South Coast AQMD Rule 1169 – Hexavalent Chromium - Chrome Plating and Chromic Acid Anodizing, and similar requirements in other jurisdictions were not considered in this evaluation.

TABLE V-22
EXISTING CONTROL MEASURES IN SOUTH COAST AQMD AND OTHER JURISDICTIONS (METAL PROCESSES)

Rule	Applicability	Control Measure

South Coast AQMD Rule 1147.2 – NOx Reductions from Metal Melting and Heating Furnaces (Adopted 4/1/22)	Applies to non-RECLAIM, RECLAIM, and former RECLAIM facilities that operate metal melting, metal heat treating, and metal heating and forging furnaces that require a South Coast AQMD permit	**NOx limits for existing units**
		For unit size <40 MMBtu/hr:
		• Metal melting furnace: 40 ppm
		• Metal heat treating, metal heating, and metal forging:
		  ○ ≤1,200 °F: 40 ppm
		  ○ >1,200 °F: 50 ppm
		• Units with radiant-tube burners: 50 ppm
		For unit size ≥40 MMBtu/hr: 15 ppm
		
		Alternative NOx limits for existing units
		For unit size <40 MMBtu/hr:
		• Metal melting furnace: 50 ppm
		• Metal heat treating, metal heating, and metal forging:
		  ○ ≤1,200 °F: 50 ppm
		  ○ >1,200 °F: 60 ppm
		• Units with radiant-tube burners: 60 ppm
		
		NOx limits for new units
		For unit size <40 MMBtu/hr:
		• Metal melting furnace: 40 ppm
		• Metal heat treating, metal heating, and metal forging:
		  ○ ≤1,200 °F: 30 ppm
		  ○ >1,200 °F: 40 ppm
		• Units with radiant-tube burners: 40 ppm
		For unit size ≥40 MMBtu/hr: 15 ppm
		(All NOx limits above are corrected to 3% O_2)

South Coast AQMD Rule 1407 – Control of Emissions of Arsenic, Cadmium, and Nickel from Non-Chromium Metal Melting Operations (Amended 10/4/19)	Applies to facilities conducting non-chromium metal melting operations	• Particulate matter control device with 99% or greater control efficiency • Good operating practices and good housekeeping practices

Rule	Applicability	Control Measure
South Coast AQMD Rule 1407.1 – Control of Toxic Air Contaminant Emissions from Chromium Alloy Melting Operations (Adopted 1/8/21)	Applies to facilities conducting chromium alloy melting, including smelters (primary and secondary), foundries, die-casters, mills, and other establishments conducting miscellaneous melting processes	• Chromium emission limits requiring monitoring to demonstrate compliance • 10% opacity limit • Prescribes building requirements for chromium alloy melting operations • Requires cleaning using approved cleaning method and at certain minimum frequencies
South Coast AQMD Rule 1420.2 – Emission Standards for Lead from Metal Melting Facilities (Adopted 10/2/15)	Applies to metal melting facilities that melt 100 tons or more of lead per year	• Ambient lead concentration limits • Ambient air monitoring to demonstrate compliance • Requires total enclosure for select process areas • Particulate matter control devices of no less than 99% control efficiency • HEPA filter or equivalent filtration media that is of a minimum of 99.97% control efficiency for 0.3 µm particles
South Coast AQMD Rule 1426 – Emissions from Metal Finishing Operations (Amended 4/2/21)	Applies to owners and operators of metal finishing facilities	• Enclosure • Good housekeeping measures • Best management practices
South Coast AQMD Rule 1430 – Control of Emissions from Metal Grinding Operations at Metal Forging Facilities (Adopted 3/3/17)	Applies to metal grinding and metal cutting operations at metal forging facilities	• Enclosures for metal grinding and cutting operations • Emission control devices with 0.2 gr/dscf at control device outlet • HEPA filter or filters of equivalent control efficiency 99.97% for 0.3 µm particles at final stage of control device • Housekeeping requirements
South Coast AQMD Rule 1460 – Control of Particulate Emissions from Metal Recycling and Shredding Operations (Adopted 11/4/22)	Applies to metal recycling facilities and metal shredding facilities	• Good housekeeping • Best management practices
SJVAPCD Rule 7060 – Toxic Metals from Non-Ferrous Metal Melting (Adopted 12/15/94)	Applies to existing non-ferrous metal melting furnaces	• 99% particulate matter control efficiency requirement for dust collection equipment • 10% opacity limit

Rule	Applicability	Control Measure
		• Good operating practices demonstrated through a maintenance plan or procedures approved by the SJVAPCD • Good housekeeping practices
BAAQMD Regulation 11, Rule 15 – Airborne Toxic Control Measure for Emissions of Toxic Metals from Non-Ferrous Metal Melting (Adopted 4/6/94)	Applies to a wide range of non-ferrous metal melting operations	• Particulate matter control device with 99% or greater control efficiency • Good operating practices demonstrated through maintenance plan or procedures approved by BAAQMD • 10% opacity limit for fugitive emissions • Good housekeeping practices
VCAPCD Rule 74.34 – NOx Reductions from Miscellaneous Sources (Adopted 12/13/16)	Applies to metal heat treating and metal melting furnaces	• 60 ppm NOx at 3% O_2
GBUAPCD Rule 404-B – Oxides of Nitrogen (Amended 5/8/96)	Applies to combustion equipment	• 125 ppm with natural gas fuel • 225 ppm with liquid or solid fuel
BAAQMD Regulation 9, Rule 3 – Nitrogen Oxides from Heat Transfer Operations (Amended 4/24/18)	Heat transfer operations	• Existing heat transfer operation limits 175 ppm NOx when gaseous fuel is burned • New or modified heat transfer operation limits 125 ppm NOx when natural gas is burned
Amador County Air District Regulation II, SIP Rule 19 – Fuel Burning Equipment (Adopted 9/14/71)	Non-mobile fuel burning equipment	• 140 lbs/hr NOx
SJVAPCD Rule 4301 – Fuel Burning Equipment (Amended 12/17/92)	Applies to fuel burning equipment	• 140 lbs/hr NOx

c. Conclusion

Staff reviewed the available control measures for the metal processes category and found that the available measures are already being implemented in the Basin. Therefore, no contingency measures are proposed for this source category.

5. Wood and Paper

Source category 450 – Wood and Paper includes emissions from sawmills, woodworking, pulp and paper manufacturing, and paperboard/fiberboard manufacturing, and other related processes. These sources contribute 3.23 tpd PM2.5 emissions, 0.01 tpd NH3 emissions, and zero NOx emissions to the 2030 Basin's baseline emissions inventory. Almost all (98 percent) of the PM2.5 emissions come from wood-related other processes whereas all NH3 emissions come from paperboard/fiberboard manufacturing processes.

South Coast AQMD Rule 1137 – PM10 Emission Reductions from Woodworking Operations (Adopted 2/1/02), includes requirements to control PM10 emissions from woodworking operations with a pneumatic conveyance system. There are no other requirements for wood and paper sources implemented by the South Coast AQMD or other jurisdictions and thus, staff has not identified any controls from this category for consideration as contingency measures.

6. Glass and Related Products

No direct PM2.5, NOx, or NH3 emissions are reported from the source category 460 – Glass and Related Products in the 2030 South Coast Air Basin emissions inventory. Therefore, this source category was not evaluated.

7. Electronics

No direct PM2.5, NOx, or NH3 emissions are reported from the source category 470 – Electronics in the 2030 South Coast Air Basin baseline emissions inventory. Therefore, this source category was not evaluated.

8. Other (Industrial Processes)

Source category 499 – Other (Industrial Processes) consists of miscellaneous industrial sources, largely reported as “Cooling Towers-Hydrocarbon Compounds (Unspecified),” “Other-Material Not Specified,” “Other-Hydrocarbon Compounds (Unspecified),” and “Other-Textiles/Fabrics” in the South Coast Air Basin emissions inventory. These sources contribute 0.49 tpd PM2.5, 0.02 tpd NOx, and 8.59 tpd NH3 emissions to the 2030 baseline emissions inventory. For an evaluation of control measures for cooling towers, refer to the petroleum production and marketing section. Nearly all of the NH3 emissions in this category are associated with “Other-Material Not Specified.” Combustion sources most likely contribute to the emissions reported for this source category. Staff evaluation of control measures for fuel combustion sources is contained in the fuel combustion section of this appendix.

Solvent Evaporation

Source categories under Solvent Evaporation include 510 – Consumer Products, 520 – Architectural Coatings and Related Solvents, 530 – Pesticides/Fertilizers, and 540 – Asphalt Paving/Roofing. While these source categories emit primarily VOCs, there are also 0.03 tpd PM2.5, 1.17 tpd NH3, and zero NOx emissions for these categories. All PM2.5 emissions come from asphalt roofing operations. South Coast AQMD does not have a source-specific rule regulating asphalt roofing operations. Staff reviewed MDAQMD Rule 471 – Asphalt Roofing Operations, but determined that this rule only applies to VOC emissions. Staff did not identify rules in other jurisdictions with PM2.5 control measures specific to asphalt roofing operations. Agricultural fertilizers are the sole source of NH3 emissions under this source category. South Coast AQMD has not identified effective mechanisms within its authority to regulate NH3 emissions from agricultural fertilizers. Furthermore, South Coast AQMD is not aware of any other jurisdiction with existing rules or regulations controlling NH3 emissions from fertilizers. Staff did not identify any other applicable measures in other jurisdictions to consider as potential contingency measures for solvent evaporation.

Miscellaneous Processes

1. Residential Fuel Combustion

a. Overview

Source category 610 – Residential Fuel Combustion consists of several subcategories, including wood combustion and fuel combustion (space heating, water heating, cooking, and other appliances, such as clothes dryers, barbecues, and water heaters used for pools, spas and hot tubs). Residential wood combustion sources are evaluated in this section; fuel combustion sources (particularly space heaters and water heaters) were previously evaluated in this appendix.

Residential fuel combustion sources contribute 6.59 tpd direct PM2.5, 15.17 tpd NOx, and 0.11 tpd NH3 emissions to the 2030 baseline inventory (approximately 12.2 percent, 7.2 percent, and 0.14 percent of overall PM2.5, NOx, and NH3 emissions, respectively), with wood burning contributing the majority of direct PM2.5 emissions. Residential wood burning includes wood-burning heaters (i.e., woodstoves, pellet stoves, and wood-burning fireplace inserts), which are used primarily for heat generation, and wood-burning fireplaces, which are used primarily for aesthetic purposes.

One of the most effective ways to reduce wintertime smoke is a curtailment program that restricts use of wood-burning heaters and fireplaces on days that are conducive to buildup of particulate matter concentrations (i.e., days where ambient PM2.5 and/or PM10 concentrations are forecast to be above a particular level, known as a “curtailment threshold”).

South Coast AQMD Rule 445 – Wood Burning Devices establishes requirements for the sale, transfer, operation, and installation of wood burning devices and on the advertising of wood for sale intended for burning. Among those requirements is a wood burning curtailment program that implements an approved PM2.5 contingency measure.[24]

b. Evaluation

The BACM/MSM analysis in Appendix III contains an extensive evaluation of control measures for residential wood burning devices. <u>The analysis found that the curtailment threshold in Rule 445 would need to be lowered to 25 µg/m3 and the low-income exemption would need to be removed to match the stringency of other districts’ rules. This measure has been incorporated into the control strategy as BCM-18. Thus, it is ineligible for consideration as a contingency measure. However, staff determined that it would be feasible</u>

[24] Air Plan Approval; California; Los Angeles—South Coast Air Basin, 87 Fed. Reg. 12866 (March 8, 2022)

to achieve OYW of PM2.5 emission reductions through a contingency measure that would further lower the curtailment threshold to 23 µg/m3.~~Staff reviewed the analysis to determine whether the additional time allowed to implement a contingency measure (i.e., for an attainment contingency measure, up to 2 years after the finding of failure to attain is allowed) would enable a previously infeasible measure to be considered as a contingency measure. However, staff did not identify any instances where this consideration would change the conclusions of the BACM/MSM analysis for wood burning devices.~~

c. Conclusion

Staff ~~proposes to retain the~~identified a feasible contingency measure for~~s in~~ Rule 445 for the purposes of satisfying PM2.5 contingency measure requirements for the 2012 annual PM2.5 standard. The contingency measure would further lower the curtailment threshold beyond the level proposed in control measure BCM-18.~~If the curtailment threshold in Rule 445 is lowered in a future rule amendment, staff will seek to preserve the same contingency measure structure.~~ There were no additional measures identified for this source category that could be implemented within 2 years and result in quantifiable emission reductions.

2. Fugitive Dust Categories

Fugitive dust source categories include 620 – Farming Operations, 630 – Construction and Demolition, 640 – Paved Road Dust, 645 – Unpaved Road Dust, and 650 – Fugitive Windblown Dust. Fugitive dust emissions are typically generated through the pulverization of surface materials by mechanical force or by entrainment of dust particles in turbulent air streams.[25] Fugitive dust particulate matter emissions are typically reduced and managed using control techniques or measures that prevent materials from being deposited onto surfaces (preventative) or that remove deposited materials from surfaces (mitigative). Examples of these measures include watering, elimination of dirt carryout on paved roads at construction sites and cleaning of spillage on travel surfaces within a specific timeframe after said spillage occurs. South Coast AQMD Rule 401, Rule 403, and other rules (e.g., Rules 1127, 1156, 1157, 1158, 1186, 1460, and 1466) regulate these forms of fugitive particulate matter emissions.

The following sections contain an analysis of fugitive dust source categories and associated control measures.

General Requirements for Fugitive Dust Sources

South Coast AQMD has a comprehensive suite of rules regulating fugitive dust. The Rule 403 series establishes general requirements and definitions. Notably, fugitive dust from any active operation, storage pile, or disturbed surface area must not remain visible in the atmosphere beyond the property line of the emission source or, if the emission is the result of movement of a motorized vehicle, the dust plume cannot

[25] EPA, "Compilation of Air Pollutant Emissions Factors, Volume 1: Stationary Point and Area Sources," Chapter 13, Section 2, available at *https://www.epa.gov/sites/default/files/2020-10/documents/13.2_fugitive_dust_sources.pdf* (last updated January 1995)

exceed 20 percent opacity. Additionally, Rule 401 prohibits the discharge of any pollutant that exceeds the shading of No. 1 on the Ringelmann Chart, as published by the United States Bureau of Mines. Multiple source-specific rules contain requirements that seek to minimize fugitive dust emissions.

i. Farming Operations

a. Overview

Source category 620 – Farming Operations consists of fugitive dust particulate matter emissions caused by farming related activities, including tilling dust, harvesting operations, and various animal specific feedlot operations. Similarly, U.S. EPA's national emissions inventory indicates that dust emissions from this source category are generated from agricultural tilling and dust kicked up by animal hooves and feet. Farming operation dust emissions account for a very limited portion (about 0.2 percent) of the Basin's PM2.5 emissions inventory, contributing 0.13 tpd in 2030. About 0.12 tpd are from tilling, dairies, and poultry farms. The remaining 0.01 tpd of PM2.5 emissions in this source category are from harvesting operations. Staff did not further evaluate measures for harvesting as the achievable emission reductions for any potential measure would be far less than 0.01 tpd and would have an inconsequential impact on air quality. Finally, this source category emits 6.13 tpd of NH3 emissions in 2030, or about 8 percent of all NH3 emissions in the Basin.

b. Evaluation

Staff reviewed control measures for the farming operations category. While there are several states and districts that have established fugitive dust rules, many of them exempt agricultural sources from regulation. Table V-19 below summarizes the applicable control measures identified in other jurisdictions with existing fugitive dust requirements for farming operations.

Staff compared South Coast AQMD rule requirements with the requirements of the rules identified in other jurisdictions. South Coast AQMD does not have a single rule that is analogous to the Conservation Management Practices (CMP) rules in other jurisdictions. This is largely because the emissions inventory for agricultural operations in the Basin is much smaller than in areas that have CMP rules. Although a direct comparison to other districts' rules is challenging, if not impossible, qualitative inferences can be made. Rule 403 is a general fugitive dust rule that is most similar to other districts' rules and it is therefore used as the primary comparison in Table V-23. Rule 403 is accompanied by a Fugitive Dust Handbook, including Attachment A – Agricultural Handbook, that was also consulted for the analysis.[26] In addition to Rule 403, South Coast AQMD Rules 223, 1127, and 1186 have requirements to control fugitive dust emissions from dairies and other Confined Animal Facilities (CAFs).

[26] https://www.aqmd.gov/docs/default-source/compliance/rule-403-dust-control-forms/rule-403-fugitive-dust-implementation-handbook-0120km-arc.pdf?sfvrsn=6

TABLE V-23
COMPARISON OF EXISTING RULE REQUIREMENTS FOR FARMING OPERATIONS

	South Coast AQMD Rule 403 – Fugitive Dust (including Fugitive Dust Handbook) (Amended 6/3/05)	SJVAPCD Rule 4550 – Conservation Management Practices (including District CMP handbook and CMP list) (Adopted 8/19/04)	ICAPCD Rule 806 – Conservation Management Practices (Amended 10/16/12)	MDAQMD Rule 411 – Conservation Management Practices for Agricultural Operations (Adopted 5/3/21)
Applicability	Applies to agricultural vegetative crop sites with combined disturbed surface area greater than 10 acres unless the operator implements practices in the Agricultural Handbook and completes a self-monitoring form. <u>Exemptions</u>: • Dairy farms • CAFs with disturbed surface areas of one acre or less	• Applies to agricultural operation sites greater than 100 acres and with elevations less than 3,000 feet • Exempts dairies with less than 500 cows and poultry farms with less than 125,000 chickens. Other animal headcount exemptions. • Exempts forestry, grazing pastures, and nurseries.	Applies to agricultural operation sites greater than 40 acres	• Applies to agricultural operation sites greater than 100 acres when < 5 separate residences within ¼ mile or sites greater than 40 acres when > 5 separate residences within ¼ mile.

	South Coast AQMD Rule 403 – Fugitive Dust (including Fugitive Dust Handbook) (Amended 6/3/05)	SJVAPCD Rule 4550 – Conservation Management Practices (including District CMP handbook and CMP list) (Adopted 8/19/04)	ICAPCD Rule 806 – Conservation Management Practices (Amended 10/16/12)	MDAQMD Rule 411 – Conservation Management Practices for Agricultural Operations (Adopted 5/3/21)
Control Measures - Cropland (Other)	Cease soil preparation and/or maintenance activities during wind speeds > 25 mph; soil moisture monitoring; irrigate after land leveling; conservation tillage; mulching; cover crop; crop residue management; surface roughening; cross wind stripcropping; field windbreaks; ridge roughness; wind barriers; establish vegetation; dust suppressants; surface area modification	Alternate Tilling; Application Efficiencies; Baling/Large Bales; Bulk Materials Control; Chemigation/Fertigation; Conservation Irrigation; Fallow Land; Grinding/Chipping/Shredding; Integrated Pest Management; Irrigation Power Units; Mulching; Night Farming; No Burning; Non-Tillage/Chemical Tillage; Organic Practices; Permanent Crops; Reduced Pruning; Soil Amendments; Soil Incorporation; Sulfur; Reduction or Elimination of Dusting; Surface Roughening; Transgenic Crops; Wind Barrier	Alternate Tilling; Application Efficiencies; Baling/Large Bales; Bulk Materials Control; Chemigation/Fertigation; Conservation Irrigation; Fallow Land; Grinding/Chipping/Shredding; Integrated Pest Management; Irrigation Power Units; Mulching; Night Farming; No Burning; Non- Tillage/Chemical Tillage; Organic Practices; Permanent Crops; Reduced Pruning; Soil Amendments; Soil Incorporation; Sulfur; Reduction or Elimination of Dusting; Surface Roughening; Transgenic Crops; Wind Barrier	Alternate Tilling; Application Efficiencies; Baling/Large Bales; Bulk Materials Control; Chemigation/Fertigation; Conservation Irrigation; Fallow Land; Grinding/Chipping/Shredding; Integrated Pest Management; Irrigation Power Units; Mulching; Night Farming; No Burning; Non- Tillage/Chemical Tillage; Organic Practices; Permanent Crops; Reduced Pruning; Soil Amendments; Soil Incorporation; Sulfur; Reduction or Elimination of Dusting; Surface Roughening; Transgenic Crops; Wind Barrier

	South Coast AQMD Rule 403 – Fugitive Dust (including Fugitive Dust Handbook) (Amended 6/3/05)	SJVAPCD Rule 4550 – Conservation Management Practices (including District CMP handbook and CMP list) (Adopted 8/19/04)	ICAPCD Rule 806 – Conservation Management Practices (Amended 10/16/12)	MDAQMD Rule 411 – Conservation Management Practices for Agricultural Operations (Adopted 5/3/21)
Control Measures - Poultry Operations	Manure Handling & Storage Cover manure; spread manure under low wind conditions; Cleanout frequency Feeding Boot or Sock on feed auger Open Areas Soil moisture; irrigation; conservation tillage; mulching Unpaved Roads/Traffic Areas Pavement, gravel, or asphalt required for all access roads and feed lanes (Rule 1186); Restricted access; Dust suppressant Equipment Parking Areas Dust suppressant; Cover/pave with gravel, asphalt, concrete	Manure Handling & Storage Time of Manure Spreading; Cleanout frequency; Outdoor storage Feeding Boot or Sock Open Areas Vegetation; Reduced tillage; Windblocks; Dust suppressant Unpaved Roads/Traffic Areas Gravel; Restricted Access; Pave; Dust suppressant; Speed Limit; Track-Out Control; Vegetation	N/A	N/A

	South Coast AQMD Rule 403 – Fugitive Dust (including Fugitive Dust Handbook) (Amended 6/3/05)	SJVAPCD Rule 4550 – Conservation Management Practices (including District CMP handbook and CMP list) (Adopted 8/19/04)	ICAPCD Rule 806 – Conservation Management Practices (Amended 10/16/12)	MDAQMD Rule 411 – Conservation Management Practices for Agricultural Operations (Adopted 5/3/21)
Control Measures - Dairy Operations	<u>Unpaved Roads/Traffic Areas</u> Pavement, gravel, or asphalt required for all access roads and feed lanes (Rule 1186); Restricted Access; Dust suppressant <u>Equipment Parking Areas</u> Dust suppressant; Cover/pave with gravel, asphalt, concrete South Coast AQMD Rules 223 and 1127 Requirements <u>Corral/Manure Handling</u> Scrape/harrow before 9 am or when moisture content > 20%; water corral before manure removal; clear corrals without scraping down to soil; Pave feedlanes; minimize excess water <u>Overall Management/Feeding</u> Cover silage piles; feed according to National Research Council guidelines; feed high moisture corn; disposal requirements; flush milk parlor; enclose and vent parlor to control device	<u>Corral/Manure Handling</u> Sprinkling of Open Corral; Frequency of scraping/cleanout; Freestall housing; Fibrous layer in dusty areas; Pull-type manure harvesting equipment; Scraping/harrowing <u>Overall Management/Feeding</u> Bulk Materials Control; Feeding near dusk; Wet feed during mixing; Wet material in wagon first before feeding; Downwind shelterbelts/boundary trees <u>Unpaved Roads/Traffic Areas</u> Gravel; Restricted Access; Pave; Dust suppressant; Speed Limit; Track-Out Control; Speed bumps; Appropriate equipment and vehicles	N/A	N/A

	South Coast AQMD Rule 403 – Fugitive Dust (including Fugitive Dust Handbook) (Amended 6/3/05)	SJVAPCD Rule 4550 – Conservation Management Practices (including District CMP handbook and CMP list) (Adopted 8/19/04)	ICAPCD Rule 806 – Conservation Management Practices (Amended 10/16/12)	MDAQMD Rule 411 – Conservation Management Practices for Agricultural Operations (Adopted 5/3/21)
Control Measures - Feedlot Operations	Unpaved Roads/Traffic Areas Speed control; access restriction; pavement, gravel, or asphalt required for all access roads and feed lanes (Rule 1186); surface modification; track-out prevention; prohibit turning tractors and implements on paved public roads Below requirements are from South Coast AQMD Rules 223 and 1127: Pens/Manure Handling Vacuum/scrape freestalls; remove manure daily; rake/harrow/scrape bedding; dry manure handling system; flush freestalls; shade structures Overall Management/Feeding Cover silage piles; feed according to National Research Council guidelines; feed high moisture corn; disposal requirements; flush milk parlor; enclose and vent parlor to control device; cease hay grinding between 2 and 5 pm if visible emission extend more than 50 feet (Rule 1186)	Pens/Manure Handling Sprinkling of Open Corral; Frequency of scraping/cleanout; Shade for animal; Fibrous layer in dusty areas; Pull-type manure harvesting equipment Overall Management/Feeding Bulk Materials Control; Feeding near dusk; Wet feed during mixing; Wet material in wagon first before feeding; Downwind shelterbelts/boundary trees Unpaved Roads/Traffic Areas Gravel; Restricted Access; Pave; Dust suppressant; Speed Limit; Track-Out Control; Speed bumps; Appropriate equipment and vehicles	N/A	N/A

The NH3 emissions from this source category are associated with livestock waste. South Coast AQMD conducted an extensive evaluation of control measures for livestock waste as part of Potential Control Measure 4 - Emission Reductions from Livestock Waste at Confined Animal Facilities in Appendix III. Due to that evaluation, the PM2.5 Plan includes control measure BCM-08 - Emission Reductions from Livestock Waste at Confined Animal Facilities. As this control measure is part of the attainment strategy, it is ineligible for consideration as a contingency measure.

c. Conclusion

Staff compared South Coast AQMD rule requirements to measures in other jurisdictions and did not identify any PM2.5 measures for farming operations in other jurisdictions that could be implemented and achieve quantifiable emission reductions within 2 years of being triggered. In addition, the only feasible measures to further reduce NH3 emissions from livestock waste have been included as part of the control strategy. Therefore, no suitable measure can be considered as a potential contingency measure at this time.

ii. Construction and Demolition

a. Overview

Source category 630 – Construction and Demolition consists of fugitive dust particulate matter emissions caused by construction activities that result from building residential, commercial, industrial, institutional, or governmental structures. Construction and demolition activities include any on-site mechanical activities conducted in preparation of the building, alteration, rehabilitation, demolition, or improvement of property such as grading, excavation, loading, crushing, cutting, planning, shaping or ground-breaking. Construction and demolition sources contribute 2.49 tpd PM2.5 emissions representing 4.61 percent of the total PM2.5 emissions in the 2030 South Coast Air Basin emissions inventory.

b. Evaluation

South Coast AQMD regulates PM2.5 emissions from construction and demolition under Rule 403 – Fugitive Dust. Rule 403 requires the implementation of best available dust control measures during any active man-made operations capable of generating fugitive dust, and requires measures to prevent, reduce or mitigate fugitive dust emissions. This rule also requires activities defined as “large operations” to notify the South Coast AQMD by submitting specific forms and implement additional control measures. A large operation is defined as any active operation on property containing 50 or more acres of disturbed surface area; or any earth moving operation with a daily earth-moving or throughput volume of 3,850 cubic meters (5,000 cubic yards), three times during the most recent 365 day period.

Emissions from construction and demolition result predominantly from site preparation work, light-duty vehicle travel, and other operations. In addition to general rule requirements, Rule 403 requires active operations to utilize the best available control measures to minimize fugitive dust emissions from each dust source type within the active operation. Existing regulations for construction and demolition emissions sources in other jurisdictions include SJVAPCD Rule 8021 – Construction, Demolition, Excavation, Extraction, and Other Earthmoving Activities, SMAQMD Rule 403 – Fugitive Dust, SDAPCD Rule 55- Fugitive Dust Control, and Clark County Air Quality Regulations (AQR) Section 94 – Permitting and Dust Control for Construction and Temporary Commercial Activities. Table V-24 compares regulations for the construction and demolition source category in other jurisdictions to South Coast AQMD Rule 403.

TABLE V-24
COMPARISON OF EXISTING CONTROL MEASURES FOR CONSTRUCTION AND DEMOLITION

	South Coast AQMD Rule 403 – Fugitive Dust (Amended 06/03/05)	SJVAPCD Rule 8021 – Construction, Demolition, Excavation, Extraction, and Other Earthmoving Activities (Amended 08/19/04)	SMAQMD Rule 403 – Fugitive Dust (Adopted 08/03/77)	SDAPCD Rule 55 – Fugitive Dust Control (Adopted 06/24/09)	Clark County Air Quality Regulations Section 94 – Permitting and Dust Control for Construction and Temporary Commercial Activities (Amended 08/03/21)
Applicability	• Any activity or man-made condition capable of generating fugitive dust.	• Any construction, demolition, excavation, extraction, and other earthmoving activities, including, but not limited to, land clearing, grubbing, scraping, travel on site, and travel on access roads to and from the site • Construction of new landfill disposal sites or modification to existing landfill disposal sites prior to commencement of landfilling activities.	• Operations which periodically may cause fugitive dust emissions into the atmosphere.	• Any commercial construction or demolition activity capable of generating fugitive dust emissions, including active operations, open storage piles, and inactive disturbed areas.	• All construction and temporary commercial activities that disturb soils and emit PM.

Requirements	• No person shall cause fugitive dust emissions from any active operation, open storage pile, or disturbed surface area such that:
	  • dust remains visible in the atmosphere beyond the property line of emission source; or
	  • dust emission exceeds 20 percent opacity if the dust emission is the result of a motorized vehicle.
	<u>No person shall</u>:
	• conduct active operations without utilizing the applicable best available control measures; see Table V-21
		• Limit fugitive dust emissions from construction, demolition, excavation, extraction, and other earthmoving activities
		• No person shall perform any construction, demolition, excavation, extraction, or other earthmoving activities unless rule requirements are sufficiently implemented to limit VDE to 20% opacity and comply with conditions for a stabilized surface area
		• Implement the requirements below when using wrecking balls or other wrecking equipment to raze or demolish buildings:
		  • Apply sufficient water to building
			• A person shall take every reasonable precaution not to cause fugitive dust emissions from being airborne beyond the property line where the emissions originate, from any construction, handling or storage activity, or any wrecking, excavation, grading, clearing of land or solid waste disposal operation
			• Reasonable precautions shall include, but are
				• Airborne Dust Beyond the Property Line: No person shall engage in construction or demolition activity in a manner that discharges visible dust emissions into the atmosphere beyond the property line for a period more than 3 minutes in any 60 minute period
				• Track-Out/Carry-Out: Visible roadway dust from active operations, spillage from transport trucks, erosion, or track-out/carry-out shall:
				  ○ be minimized by trackout/carry-out and
					• Establishes requirements to obtain and comply with a dust control operating permit and a dust mitigation plan, and the procedures to maintain dust control of these activities.
					• Any person engaging in construction activities on a site having a Permit shall be subject to all conditions set forth in the permit
					• Construction site superintendent and all others designated as on-site representatives of the

	South Coast AQMD Rule 403 – Fugitive Dust (Amended 06/03/05)	SJVAPCD Rule 8021 – Construction, Demolition, Excavation, Extraction, and Other Earthmoving Activities (Amended 08/19/04)	SMAQMD Rule 403 – Fugitive Dust (Adopted 08/03/77)	SDAPCD Rule 55 – Fugitive Dust Control (Adopted 06/24/09)	Clark County Air Quality Regulations Section 94 – Permitting and Dust Control for Construction and Temporary Commercial Activities (Amended 08/03/21)

	• cause PM10 levels to be enhanced by 50 micrograms per cubic meter
	• allow track-out to extend 25 feet or more in cumulative length from the point of origin from an active operation
	  • All track-out from an active operation shall be removed at the conclusion of each workday or evening shift
	• Conduct an active operation with a disturbed surface area of five or more acres, or with a daily import or export of 100 cubic yards or more of bulk material without utilizing at least one of the following measures at each vehicle egress from the site to a paved public road:
	  • Install a pad consisting of washed gravel (minimum-size: one inch) maintained in a clean condition to a depth of at least six inches and extending at least 30 feet wide and at least 50 feet long.
	  • Pave the surface extending at least 100 feet and at least 20 feet wide.
	  • Utilize a wheel shaker/wheel spreading device consisting of raised dividers (rails, pipe, or
		exterior surfaces, unpaved surface areas where equipment will operate, and razed building materials to limit VDE to 20% opacity throughout the duration of razing and demolition activities.
		• Apply sufficient dust suppressants to unpaved surface areas within 100 feet where materials from razing or demolition activities will fall in order to limit VDE to 20% opacity.
		• Apply sufficient dust suppressants to unpaved surface areas where wrecking or hauling equipment will be operated in order to limit VDE to 20% opacity
		• Handling, storage, and transport of bulk materials on-site or off-site resulting from the demolition or razing of buildings shall comply with the requirements specified in Rule 8031 (Bulk Materials)
		• Apply water within 1 hour of demolition to unpaved surfaces within 100 feet of the demolished structure.
		• Prevention and removal of carryout or trackout on paved public access roads from demolition operations shall be
			not limited to:
			• Use, where possible, of water or chemicals for control of dust in the demolition of existing buildings or structures, construction operations, the construction of roadways or the clearing of land
			• Application of asphalt, oil, water, or suitable chemicals on dirt roads, materials stockpiles, and other surfaces which can give rise to airborne dusts
			• Other means approved by the Air Pollution Control Officer.
				erosion control measures- (1) track-out grates or gravel beds at each egress point, wheel-washing at each egress during muddy conditions, soil binders, chemical soil stabilizers, geotextiles, mulching, or seeding; and (2) for outbound transport trucks- using secured tarps or cargo covering, watering, or treating of transported material
				○ be removed at the conclusion of each work day when active operations cease, or every 24 hours for continuous operations
				○ The use of blowers for removal of track-out/carry-out is prohibited under any circumstances.
					Permittee; all construction supervisors and foremen of on-site contractors and subcontractors; water truck and water pull drivers for each construction project are required to complete the dust control class
					• Any person who engages in a construction activity or temporary commercial activity, with or without a permit, shall employ Best Management Practices and comply with soil stabilization standards and emissions standards

	South Coast AQMD Rule 403 – Fugitive Dust (Amended 06/03/05)	SJVAPCD Rule 8021 – Construction, Demolition, Excavation, Extraction, and Other Earthmoving Activities (Amended 08/19/04)	SMAQMD Rule 403 – Fugitive Dust (Adopted 08/03/77)	SDAPCD Rule 55 – Fugitive Dust Control (Adopted 06/24/09)	Clark County Air Quality Regulations Section 94 – Permitting and Dust Control for Construction and Temporary Commercial Activities (Amended 08/03/21)
	grates) at least 24 feet long and 10 feet wide OR install and utilize a wheel washing system to remove bulk material from tires and vehicle undercarriages before vehicles exit the site • Any other control measures approved by the EO and the U.S. EPA • Additional requirements for large operations • Dust control plan • implement additional dust control measures; see Table V-22	performed in accordance with Rule 8041- Carryout and Trackout • 15 mph speed limitation and posting of speed limit signs on uncontrolled unpaved access/haul roads on construction sites • Wind generated fugitive dust requirements • Cease outdoor construction, excavation, extraction, and other earthmoving activities that disturb the soil whenever VDE exceeds 20% opacity • Operator shall submit a Dust Control Plan to the APCD prior to the start of any construction activity that will include 10 acres or more of disturbed surface area for residential developments, or 5 acres or more of disturbed surface area for non-residential development, or will include moving, depositing, or relocating more than 2,500 cubic yards per day of bulk materials on at least three days • District notification of earthmoving activities on smaller construction sites Control Measures PRE-ACTIVITY:			

	South Coast AQMD Rule 403 – Fugitive Dust (Amended 06/03/05)	SJVAPCD Rule 8021 – Construction, Demolition, Excavation, Extraction, and Other Earthmoving Activities (Amended 08/19/04)	SMAQMD Rule 403 – Fugitive Dust (Adopted 08/03/77)	SDAPCD Rule 55 – Fugitive Dust Control (Adopted 06/24/09)	Clark County Air Quality Regulations Section 94 – Permitting and Dust Control for Construction and Temporary Commercial Activities (Amended 08/03/21)
		• Pre-water site sufficient to limit VDE to 20% opacity, and • Phase work to reduce the amount of disturbed surface area at any one time. DURING ACTIVE OPERATIONS: • Apply water or chemical/organic stabilizers/suppressants sufficient to limit VDE to 20% opacity; or • Construct and maintain wind barriers sufficient to limit VDE to 20% opacity. If utilizing wind barriers, control measure B1 above shall also be implemented. • Apply water or chemical/organic stabilizers/suppressants to unpaved haul/access roads and unpaved vehicle/equipment traffic areas sufficient to limit VDE to 20% opacity and meet the conditions of a stabilized unpaved road surface. TEMPORARY STABILIZATION DURING PERIODS OF INACTIVITY: • Restrict vehicular access to the area; and • Apply water or chemical/organic stabilizers/suppressants, sufficient to comply with the conditions of a stabilized surface			

	South Coast AQMD Rule 403 – Fugitive Dust (Amended 06/03/05)	SJVAPCD Rule 8021 – Construction, Demolition, Excavation, Extraction, and Other Earthmoving Activities (Amended 08/19/04)	SMAQMD Rule 403 – Fugitive Dust (Adopted 08/03/77)	SDAPCD Rule 55 – Fugitive Dust Control (Adopted 06/24/09)	Clark County Air Quality Regulations Section 94 – Permitting and Dust Control for Construction and Temporary Commercial Activities (Amended 08/03/21)
Exemptions	• Emergency situations • Active operations conducted during essential service utilities to provide electricity, natural gas, telephone, water and sewer during periods of service outages and emergency disruptions • Any contractor subsequent to the time the contract ends, provided that such contractor implemented the required control measures during the contractual period • Any grading contractor, for a phase of active operations, subsequent to the contractual completion of that phase of earthmoving activities, provided that the required control measures have been implemented during the entire phase of earth-moving activities, through and including five days after the final grading inspection • Weed abatement operations • Blasting operations are permitted by the California Division of Industrial Safety • Sandblasting operations.	• Emergency activities • Active operations conducted by essential service utilities to provide electricity, natural gas, telephone, water and sewer during periods of service outages and emergency disruptions. • Activities conducted at an elevation of 3,000 feet or higher above sea level. • On-field agricultural sources. • Blasting activities that have been permitted by the California Division of Industrial Safety • Maintenance or remodeling of existing buildings and additions to existing buildings where total building area is not increased by more than fifty percent, or 10,000 square feet, whichever is less • All additions to existing single family residential buildings. • Disking of weeds and dried vegetation related to fire prevention required by a Federal, State or local agency on a site less than one-half (½) acre. • The spreading of landfill daily cover necessary to cover garbage/rubbish in order to preserve public health and safety and to comply with the	• Emissions emanating from agricultural operations, currently unworked land designated as reclaimed for agriculture, or unpaved roads open to public travel (this exclusion shall not apply to industrial or commercial facilities).	• Noncommercial construction or demolition activities in support of any structure designed for and used exclusively as a dwelling for not more than four families • Emergency operations • Active operations conducted by essential service utilities to provide electricity, natural gas, telephone, water and/or sewer during periods of unplanned service outages and emergency disruptions; • Any active operation, open storage pile, or inactive disturbed area which the operator can demonstrate that necessary fugitive dust preventive or mitigating actions are in conflict with CA or federal Endangered Species Acts, or a local, state, or federal water quality requirement • Explosive blasting operations • Abrasive blasting operations regulated by Rule 71 (Abrasive Blasting) • Activities subject to an APCD permit to operate	• Operation of emission units or activities permitted under a stationary source permit • Normal farm cultural practices and equestrian facilities in compliance with zoning requirements • Emergency activities that may disturb soil performed or ordered under a directive by any utility or government agency in order to prevent public injury or restore critical utilities to functional status • Temporary commercial activities outside of hydrographic Areas 212 (Las Vegas Valley), 216 (Garnet Valley), and 217 (Hidden Valley North).

	South Coast AQMD Rule 403 – Fugitive Dust (Amended 06/03/05)	SJVAPCD Rule 8021 – Construction, Demolition, Excavation, Extraction, and Other Earthmoving Activities (Amended 08/19/04)	SMAQMD Rule 403 – Fugitive Dust (Adopted 08/03/77)	SDAPCD Rule 55 – Fugitive Dust Control (Adopted 06/24/09)	Clark County Air Quality Regulations Section 94 – Permitting and Dust Control for Construction and Temporary Commercial Activities (Amended 08/03/21)
		requirements of the California Integrated Waste Management Board during wind conditions which would generate fugitive dust.		• Permanent unpaved roads.	

Regulations for construction and demolition listed in Table V-24 present a variety of approaches used by other districts to mitigate fugitive dust. Staff evaluation concluded that South Coast AQMD's requirements in Rule 403 are at least as stringent as those in other districts. Some districts such as SVJAPCD have a specific rule for construction and demolition, with mitigation measures for other sources of fugitive dust such as trackout addressed under a separate rule. Other district rules listed in Table V-24 regulate multiple fugitive dust sources under the same rule. Clark County AQR Section 94 – Permitting and Dust Control for Construction and Temporary Commercial Activities is similar in structure to South Coast AQMD Rule 403 and includes best management practices for each dust source type within the active operation. Table V-25 compares South Coast AQMD Rule 403 best available control measures applicable to all construction activity to Clark County AQR Section 94 best management practices. South Coast AQMD implements additional control measures for large operations and includes contingency measures for when applicable performance standards cannot be met through these controls. South Coast AQMD Rule 403 control measures and contingency measures for large operations are presented in Table V-26.

TABLE V-25
BEST AVAILABLE CONTROL MEASURES (APPLICABLE TO ALL CONSTRUCTION ACTIVITY SOURCES)

Source Category	South Coast AQMD Rule 403 Best Available Control Measures	Clark County Air Quality Regulations, Section 94
Backfilling	• Stabilize backfill material when not actively handling; AND • Stabilize backfill material during handling; AND • Stabilize soil at completion of activity.	• Maintain optimum moisture content in backfill material and operate equipment in a manner that limits fugitive dust to comply with regulations before, during, and after handling of material and during storage until the long-term stabilization requirements are achieved.
Clearing and grubbing	• Maintain stability of soil through pre-watering of site prior to clearing and grubbing; AND • Stabilize soil during clearing and grubbing activities; AND • Stabilize soil immediately after clearing and grubbing activities.	• Maintain optimum moisture content in soil before, during, and after clearing and grubbing activities to prevent unstable soil conditions and limit fugitive dust until the long-term stabilization requirements are achieved
Clearing forms	• Use water spray to clear forms; OR • Use sweeping and water spray to clear forms; OR • Use vacuum system to clear forms.	• Limit visible emissions before, during, and after the clearing of forms, foundations, and slabs to no more than an average of 20% opacity for any period totaling 3 minutes in any 60-minute period, or to no more than 50% instantaneous opacity, pursuant to the AQRs. • At least one of the following must be used to clear forms, foundations, and slabs: (1) water spray (2) sweeping and water spray (3) industrial vacuum.
Crushing	• Stabilize surface soils prior to operation of support equipment; AND • Stabilize material after crushing.	• Maintain optimum moisture content in soil where support equipment and vehicles will operate to prevent unstable soil conditions and limit fugitive dust until the long-term stabilization requirements are achieved. • Maintain optimum moisture content in material before, during, and after crushing activities to limit emissions.
Cut and fill	• Pre-water soils prior to cut and fill activities; AND • Stabilize soil during and after cut and fill activities.	• Maintain optimum moisture content in soil where support equipment and vehicles will operate to prevent unstable soil conditions and limit fugitive dust until the long-term stabilization requirements listed in BMP 11 are achieved. • Maintain optimum moisture content in soils before, during, and after cut and fill activities to limit fugitive dust until the long-term stabilization requirements are achieved.
Demolition-mechanical/manual	• Stabilize wind erodible surfaces to reduce dust; AND • Stabilize surface soil where support equipment and vehicles will operate; AND • Stabilize loose soil and demolition debris and comply with South Coast AQMD Rule 1403.	• An asbestos survey must be conducted on any facility or structure subject to NESHAP requirements before demolition can commence. • A separate, complete Clark County NESHAP Demolition Notification Form must be submitted to DAQ for each structure at least 10 working days prior to demolition. The asbestos survey must be attached to this notification. • Maintain optimum moisture content in soil where support equipment and vehicles will operate to prevent unstable soil conditions and limit fugitive dust until the long-term stabilization requirements are achieved. • Maintain optimum moisture content in demolition debris before, during, and after demolition activities to limit emissions.

Source Category	South Coast AQMD Rule 403 Best Available Control Measures	Clark County Air Quality Regulations, Section 94
		• Stabilize surrounding area immediately following demolition by applying water and/or dust palliative to all disturbed soil surfaces.
Disturbed soil	• Stabilize disturbed soil throughout the construction site; AND • Stabilize disturbed soil between structures.	• Maintain optimum moisture content in soils before, during, and after all construction activities to prevent unstable soils and limit fugitive dust until the long-term stabilization requirements listed in BMP 11 are achieved. • If interior block walls are planned, install walls as early as possible in the construction project.
Earth-moving activities	• Pre-apply water to depth of proposed cuts; AND • Re-apply water as necessary to maintain soils in a damp condition and to ensure that visible emissions do not exceed 100 feet in any direction; AND • Stabilize soils once earth-moving activities are complete.	-
Importing/exporting of bulk materials	• Stabilize material while loading to reduce fugitive dust emissions; AND • Maintain at least six inches of freeboard on haul vehicles; AND • Stabilize material while transporting to reduce fugitive dust emissions; AND • Stabilize material while unloading to reduce fugitive dust emissions; AND • Comply with Vehicle Code Section 23114.	• Maintain optimum moisture content in surface soils and bulk material before, during, and after all importing/exporting activities to prevent unstable soils and limit fugitive dust until the long-term stabilization requirements listed in BMP 11 are achieved. • Clean the wheels and undercarriage of haul trucks before they leave the construction site. • Check belly/end dump truck seals regularly, and remove trapped rocks to prevent spillage.
Landscaping	• Stabilize soils, materials, slopes.	• Maintain optimum moisture content in soils and landscaping material before, during, and after landscaping activities to limit fugitive dust until the long-term stabilization requirements listed in BMP 11 are achieved. • Apply water, surfactant, or tackifier to maintain disturbed soils and landscaping material in a stable condition until the long-term stabilization requirements listed in BMP 11 are achieved.
Road shoulder maintenance	• Apply water to unpaved shoulders prior to clearing; AND • Apply chemical dust suppressants and/or washed gravel to maintain a stabilized surface after completing road shoulder maintenance.	-
Screening	• Pre-water material prior to screening; AND • Limit fugitive dust emissions to opacity and plume length standards; AND • Stabilize material immediately after screening.	• Maintain optimum moisture content in soil where support equipment and vehicles will operate to prevent unstable soil conditions and limit fugitive dust until the long-term stabilization requirements listed in BMP 11 are achieved. • Maintain optimum moisture content in material before, during, and after screening activities to limit emissions until the long-term stabilization requirements are achieved. • All stockpiles must be removed or leveled prior to project completion unless otherwise approved by the Control Officer. Stockpiles approved to be left in place must be in compliance with the long-term stabilization requirements

Source Category	South Coast AQMD Rule 403 Best Available Control Measures	Clark County Air Quality Regulations, Section 94
Staging areas	• Stabilize staging areas during use; AND • Stabilize staging area soils at project completion	• Maintain optimum moisture content in soils before, during, and after all staging area activities to prevent unstable soils and limit fugitive dust until the long-term stabilization requirements are achieved.
Stockpiles/Bulk Material Handling	• Stabilize stockpiled materials. • Stockpiles within 100 yards of off-site occupied buildings must not be greater than eight feet in height; or must have a road bladed to the top to allow water truck access or must have an operational water irrigation system that is capable of complete stockpile coverage.	• Maintain optimum moisture content in soil where support equipment and vehicles will operate to prevent unstable soil conditions and limit fugitive dust until the long-term stabilization requirements are achieved. • Maintain optimum moisture content in material before, during, and after stockpiling activities to limit fugitive dust until long-term stabilization is achieved.
Traffic areas for construction activities	• Stabilize all off-road traffic and parking areas; AND • Stabilize all haul routes; AND • Direct construction traffic over established haul routes.	• Limit visible dust emissions from vehicle operations and stabilize all unpaved routes, including unpaved parking areas.
Trackout	• Do not allow track-out to extend 25 feet or more in cumulative length from the point of origin from an active operation • All track-out from an active operation shall be removed at the conclusion of each workday or evening shift	• Install and maintain a trackout control device in an effective condition at all access points where Paved and unpaved access or travel routes intersect • Maintain dust control and clean all trackout that extends 50 feet or more from paved surfaces.
Trenching	• Stabilize surface soils where trencher or excavator and support equipment will operate; AND • Stabilize soils at the completion of trenching activities.	• Maintain optimum moisture content in soil where support equipment and vehicles will operate to prevent unstable soil conditions and limit fugitive dust until the long-term stabilization requirements are achieved • Maintain optimum moisture content in soils before, during, and after trenching activities to limit fugitive dust until the long-term stabilization requirements are achieved.
Truck Loading	• Pre-water material prior to loading; AND • Ensure that freeboard exceeds six inches	• Maintain optimum moisture content in soil where support equipment and vehicles will operate to prevent unstable soil conditions and limit fugitive dust until the long-term stabilization requirements are achieved. • Maintain optimum moisture content in material before, during, and after truck loading activities to limit fugitive dust.
Turf Overseeding	• Apply sufficient water immediately prior to conducting turf vacuuming activities to meet opacity and plume length standards; AND • Cover haul vehicles prior to exiting the site.	-
Unpaved roads/parking lots	• Stabilize soils to meet the applicable performance standards; AND • Limit vehicular travel to established unpaved roads (haul routes) and unpaved parking lots.	• Limit visible dust emissions from vehicle operations and stabilize all unpaved routes, including unpaved parking areas.
Vacant Land	• For vacant lots 0.10 acre or larger and have a cumulative area of 500 square feet or more that are driven over and/or used by motor vehicles and/or off-road vehicles: prevent motor vehicle and/or off-road vehicle trespassing, parking and/or access by installing barriers, curbs, fences, gates, posts, signs, shrubs, trees or other effective control measures.	-

TABLE V-26
SOUTH COAST AQMD RULE 403 ADDITONAL MEASURES FOR LARGE OPERATIONS

Source Category	Control Action	Contingency Measure
Earth-moving (except construction cutting and filling areas, and mining operations)	• Maintain soil moisture content at minimum of 12%, as determined by ASTM method D2216, or other equivalent method approved by Executive Officer, CARB, and the U.S. EPA. 2 soil moisture evaluations must be conducted during the first three hours of active operations during a calendar day, and 2 such evaluations each subsequent four-hour period of active operations; OR • For any earth-moving which is more than 100 feet from all property lines, conduct watering as necessary to prevent visible dust emissions from exceeding 100 feet in length in any direction.	For ALL earth-moving activities: • Cease all active operations; OR • Apply water to soil not more than 15 minutes prior to moving such soil.
Earth-moving: Construction fill areas	• Maintain soil moisture content at a minimum of 12 percent, as determined by ASTM method D2216, or other equivalent method approved by the Executive Officer, the California Air Resources Board, and the U.S. EPA. For areas which have an optimum moisture content for compaction of less than 12 percent, as determined by ASTM Method 1557 or other equivalent method approved by the Executive Officer, CARB, and the U.S. EPA, complete the compaction process as expeditiously as possible after achieving at least 70 percent of the optimum soil moisture content. Two soil moisture evaluations must be conducted during the first three hours of active operations during a calendar day, and two such evaluations during each subsequent four hour period of active operations.	• See above.
Earth-moving: Construction cut areas and mining operations	• Conduct watering as necessary to prevent visible emissions from extending more than 100 feet beyond the active cut or mining area unless the area is inaccessible to watering vehicles due to slope conditions or other safety factors.	• See above.
Disturbed surface areas (except completed grading areas)	• Apply dust suppression in sufficient quantity and frequency to maintain a stabilized surface. Any areas which cannot be stabilized, as evidenced by wind driven fugitive dust must have an application of water at least twice per day to at least 80 percent of the unstabilized area.	For ALL disturbed surface areas: • On the last day of active operations prior to a weekend, holiday, or any other period when active operations will not occur for not more than four consecutive days: apply water with a mixture of chemical stabilizer diluted to not less than 1/20 of the concentration required to maintain a stabilized surface for a period of six months; OR • Apply chemical stabilizers prior to wind event; OR • Apply water to all unstabilized disturbed areas 3 times per day. If there is any evidence of wind driven fugitive dust, watering frequency is increased to a minimum of four times per day; OR • Establish a vegetative ground cover within 21 days after active operations have ceased; OR

Source Category	Control Action	Contingency Measure
		• Utilize any combination of control actions such that, in total, these actions apply to all disturbed surface areas.
Disturbed surface areas: Completed grading areas	• Apply chemical stabilizers within five working days of grading completion; OR • Take actions specified for inactive disturbed surface areas.	• See above.
Inactive disturbed surface areas	• Apply water to at least 80 percent of all inactive disturbed surface areas on a daily basis when there is evidence of wind driven fugitive dust, excluding any areas which are inaccessible to watering vehicles due to excessive slope or other safety conditions; OR • Apply dust suppressants in sufficient quantity and frequency to maintain a stabilized surface; OR • Establish a vegetative ground cover within 21 days after active operations have ceased. Ground cover must be of sufficient density to expose less than 30 percent of unstabilized ground within 90 days of planting, and at all times thereafter; OR • Utilize any combination of control actions above such that, in total, these actions apply to all inactive disturbed surface areas.	• See above.
Unpaved roads	• Water all roads used for any vehicular traffic at least once per every two hours of active operations [3 times per normal 8 hour work day]; OR • Water all roads used for any vehicular traffic once daily and restrict vehicle speeds to 15 miles per hour; OR • Apply a chemical stabilizer to all unpaved road surfaces in sufficient quantity and frequency to maintain a stabilized surface.	• Apply chemical stabilizers prior to wind event; OR • Apply water twice per hour during active operation; OR • Stop all vehicular traffic.
Open storage piles	• Apply chemical stabilizers; OR • Apply water to at least 80 percent of the surface area of all open storage piles on a daily basis when there is evidence of wind driven fugitive dust; OR • Install temporary coverings; OR • Install a three-sided enclosure with walls with no more than 50 percent porosity which extend, at a minimum, to the top of the pile. This option may only be used at aggregate-related plants or at cement manufacturing facilities.	• Apply water twice per hour; OR • Install temporary coverings.
Paved road track-out	• N/A	• Cover all haul vehicles; OR • Comply with the vehicle freeboard requirements of Section 23114 of the California Vehicle Code for both public and private roads.
All Categories	• Any other control measures approved by EO and U.S. EPA	• Any other contingency measures approved by EO and U.S. EPA

c. Conclusion

Although a direct comparison to other districts' rules is challenging due to the different structures, qualitative inferences can be made. South Coast AQMD control measures for construction and demolition sources employ a variety of mitigation measures based on source type and are generally as stringent as rule in other districts. These measures focus on limiting VDE, stabilizing soils and storage piles, and minimizing trackout. Furthermore, South Coast AQMD Rule 403 includes additional, more stringent measures for large operations. Staff did not identify any applicable construction and demolition controls for consideration as contingency measures.

iii. Paved Road Dust

a. Overview

Source category 640 – Paved Road Dust includes emissions resulting from vehicles traveling over paved surfaces. Resuspended particulate emissions (e.g., vehicle-related deposition like exhaust, material spillage, pavement wear, litter, etc.) from paved roads originate from loose materials present on the surface. The average speed of vehicles traveling on the road, average daily vehicular traffic, number of lanes and average daily vehicular traffic per lane, percentage of heavy vehicles present, and presence of curbs, storm sewers and parking lanes are significant factors that can contribute to paved road dust emissions. Although control techniques for paved roads that prevent material from being deposited onto the surface (preventive controls) are usually more cost effective than control techniques that remove deposited materials from the travel lanes (mitigative controls), both methods are used in conjunction to minimize particulate emissions within this category. Determining the correct strategies in minimizing particulate matter emissions, however, can often be complicated. For example, street sweeping gutters and curb areas may actually increase the redistribution of loose material onto the traveled portion of the road, which may produce a short-term increase in particulate matter emissions.[27]

Paved road sources contribute 9.11 tpd direct PM2.5 emissions, representing 16.9 percent of 2030 baseline PM2.5 emissions. South Coast AQMD has a number of regulations to reduce trackout and prevent materials from being deposited on roadways. These include:

- Rule 403 series
- Rule 1156 – Further Reductions of Particulate Emissions from Cement Manufacturing Facilities
- Rule 1157 – PM10 Emission Reductions from Aggregate and Related Operations
- Rule 1158 – Storage, Handling, and Transport of Coke, Coal and Sulfur
- Rule 1460 – Control of Particulate Emissions from Metal Recycling and Shredding Operations
- Rule 1466 – Control of Particulate Emissions from Soils with Toxic Air Contaminants

[27] EPA, "Compilation of Air Pollutant Emissions Factors, Volume 1: Stationary Point and Area Sources," Chapter 13, Section 2.1, available at *https://www.epa.gov/sites/default/files/2020-10/documents/13.2.1_paved_roads.pdf* (last updated January 2011).

Additionally, Rule 1186 – PM10 Emissions from Paved and Unpaved Roads, and Livestock Operations contains requirements for the construction of roadways which are intended to reduce PM2.5 emissions. Rule 1186 also requires PM10-efficient street sweepers.

b. Evaluation

Appendix III contains an extensive evaluation of paved road dust control measures. Based on that evaluation, a potential control measure examining the feasibility of increased sweeping frequencies and requiring the use of the most efficient sweepers was identified. As a result, the control strategy includes BCM-14 – Further Emission Reductions from Paved Road Dust Sources, which calls for a pilot project to assess the effectiveness of closed system regenerative air sweepers as there is some evidence that these sweepers reduce entrained dust emissions compared to mechanical brush sweepers. Staff reviewed the BACM/MSM analysis in Appendix III and found that there weren't any areas where the analysis could be expanded for paved road dust contingency measures.

c. Conclusion

Staff conducted an extensive BACM/MSM analysis for paved road dust, which resulted in the inclusion of BCM-14 in the control strategy. There were no other potential control measures identified that would be surplus to the control strategy and result in quantifiable emission reductions within 2 years of being triggered.

iv. Unpaved Road Dust

a. Overview

Source category 645 – Unpaved Road Dust includes particulate emissions from vehicles traveling over unpaved roads or surfaces. The force and weight of vehicles on unpaved road surfaces grinds and minimizes surface materials on these roads. These particles are lifted and dropped onto the road surface, where they are then exposed and carried off by air currents. Determining the correct strategies in minimizing particulate matter emissions originating from unpaved roads is complex due to available control options that are broad in scope, effectiveness, and cost. For example, although paving is highly effective in terms of minimizing fugitive dust on unpaved roads, doing so is extremely costly and may not be optimal, or feasible, for industrial roads subject to heavy vehicle usage. Water and chemical suppressants, although requiring frequent re-application, may be a more feasible option as the associated costs are lower. Additionally, measures such as limiting access to unpaved roads based on vehicle type, vehicle speed, and vehicle daily trips (VDT) can be considered.[28]

[28] EPA, "Compilation of Air Pollutant Emissions Factors, Volume 1: Stationary Point and Area Sources," Chapter 13, Section 2.2, available at *https://www.epa.gov/sites/default/files/2020-10/documents/13.2.2_unpaved_roads.pdf* (last updated November 2006)

Unpaved road sources contribute 1.67 tpd of direct $PM_{2.5}$ emissions by 2030, representing 3.1 percent of the total PM2.5 emissions in the Basin. The Rule 403 series and multiple source-specific rules regulate fugitive particulate emissions, including those categorized as unpaved road fugitive dust. These rules reduce ambient concentrations of particulate matter by requiring actions to prevent, reduce, or mitigate fugitive dust emissions.

The PM2.5 Plan includes BCM-19 – Emission Reductions from Unpaved Road Dust Sources, which seeks to further assess the feasibility of paving as a PM2.5 control method for unpaved lots, roads, and shoulders. However, as mentioned above, other means exist to control emissions from unpaved roads and the remainder of the evaluation will therefore focus on these methods.

b. Evaluation

Unpaved road dust was evaluated in Appendix III as part of the BACM/MSM demonstration and a potential control measure was identified which served as the foundation for BCM-19. South Coast AQMD's existing rules for unpaved road dust are summarized in Table V-27, while Table V-28 summarizes control measures in other jurisdictions.

TABLE V-27
SOUTH COAST AQMD'S EXISTING RULES COVERING UNPAVED ROAD DUST

South Coast AQMD Rule	Applicability	Control Measure
Rule 403 – Fugitive Dust (Amended 6/3/05)	Applies to any activity or man-made condition capable of generating fugitive dust. Exemptions: • Unpaved roads used solely for the maintenance of wind-generating equipment • Unpaved public alleys as defined in Rule 1186 • Unpaved service roads that are less than 50 feet in width, are within 25 feet of the property line, and have less than 20 vehicle trips per day	Performance standards: • Dust must not remain visible beyond the property line of the emission source and the dust emission cannot exceed 20% opacity if the emission is the result of vehicle movement. For unpaved roads/lots, stabilize soil to meet the performance standards. Stabilize disturbed soil throughout a construction site and between structures. Apply water to unpaved shoulders prior to clearing. Apply chemical dust suppressants and/or washed gravel to maintain a stabilized surface after completing road shoulder maintenance. Limit vehicular travel to established unpaved roads (haul routes) and unpaved parking lots. For vacant lots that are 0.1 acres or larger and have a cumulative area of 500 square feet or more driven over and/or used by motor vehicles and/or off-road vehicles, prevent motor vehicle and/or off-road vehicle trespassing, parking and/or access by installing barriers, curbs, fences, gates, posts, signs, shrubs, trees or other effective control measures.

South Coast AQMD Rule	Applicability	Control Measure
Rule 403.2 – Fugitive Dust from Large Roadway Projects (Adopted 6/3/22)	Applies to large roadway projects conducted in close proximity to an area of public exposure or sensitive receptors.	For projects located within 500 feet of an area of public exposure or 1,000 feet of a sensitive receptor, requires: • the appointment of a Dust Control Supervisor who has completed the South Coast AQMD Fugitive Dust Control Class; and • that speeds be restricted to 15 mph on unpaved roads; and • that either water or a chemical stabilizer be applied to all unpaved roads.
Rule 1127 – Emission Reductions from Livestock Waste (Adopted 8/6/04)	Applies to dairy farms and related operations such as heifer and calf farms and manure processing operations.	Pave feedlanes at least 8 feet on the corral side of the feedlane fence.
Rule 1156 – Further Reductions of Particulate Emissions from Cement Manufacturing Facilities (Amended 11/6/15)	Applies to all operations, materials handling, and transport at a cement manufacturing facility.	For haul roads, chemical dust suppressants must be applied at least twice per year, signs must be posted requiring trucks to use those roads unless traveling to maintenance areas, and a 35 mph speed limit must be enforced. For other unpaved roadways, chemical dust suppressants must either be applied twice per year or a gravel pad must be used and speed must be limited to 15 mph. For roadways and other unpaved areas, dust emissions exceeding 20 percent or 50 percent opacity based on the average of 12 or 5 consecutive readings, respectively, is not allowed.

South Coast AQMD Rule	Applicability	Control Measure
Rule 1157 – PM10 Emissions Reductions from Aggregate and Related Operations (Amended 9/8/06)	Applies to all permanent and temporary aggregate and related operations.	Chemical stabilizers applied on internal unpaved haul roads to maintain a stabilized surface. Signs posted stating haul trucks must not use these roads unless traveling to maintenance areas. Apply chemical stabilizers to maintain a stabilized surface or gravel pad on unpaved non-haul roads and parking and staging areas.
Rule 1158 – Storage, Handling, and Transport of Coke, Coal and Sulfur (Amended 7/11/08)	Applies to the operator of a facility that produces, stores, handles, transports, or uses coke, coal or sulfur.	Requires paving of ground surfaces where material accumulations occur. Requires paving of roads used for transporting or moving material excluding material storage areas. Requires trucks to be driven only on paved roads.
Rule 1186 – PM10 Emissions from Paved and Unpaved Roads, and Livestock Operations (Amended 7/11/08)	Applies to specified land uses and activities which result in fugitive dust as a result of vehicular travel on paved and unpaved public roads, and at livestock operations. <u>Exemptions:</u> • Essential public services that are in compliance with SCAQMD Rule 403 (Fugitive Dust); • Visible roadway accumulations on roads with less than 500 Average Daily Trips (ADT). • Roads closed to vehicles; • Events that lead to a State	Annual treatment of unpaved roads that have greater than the ADT of all unpaved roads within a jurisdiction by either: • Paving at least 1 mile of such roads • Applying chemical stabilization to 2 miles of such roads • Installing signage at 1/4 mile intervals that prohibits vehicular speeds in excess of 15 mph; speed bumps; or maintaining road in manner that prohibits travel at speeds in excess of 15 mph For livestock operations, a requirement that all unpaved access connections and unpaved feed lane access areas are either paved or covered with gravel.

TABLE V-28
OTHER JURISDICTION'S RULES COVERING UNPAVED ROAD DUST

Rule	Applicability	Control Measure
SJVAPCD Rule 8051 – Open Areas (Amended 9/21/23)	Applies to any open area with at least 0.5 acres within urban areas or 3.0 acres within rural areas and at least 1,000 square feet of disturbed surface area. Exemptions: Exemptions listed in 8011; Any weed abatement activity utilizing mowing and/or cutting, and which leaves at least three inches of stubble immediately after such mowing/cutting has occurred.	Control measures include: • Apply and maintain water or dust suppressants to all unvegetated areas; • Establish vegetation on all previously disturbed areas; • Pave, apply and maintain gravel, or apply and maintain chemical/organic stabilizers/suppressants. For open areas: Implement, apply, maintain, and reapply, if necessary, at least one or a combination of the Control Measures to comply at all times with the conditions for a stabilized surface and limit VDE to 20% opacity as defined in Rule 8011. For vehicle use in open areas: Prevent unauthorized vehicle access upon evidence of trespassing by posting "No Trespassing" signs or installing physical barriers such as fences, gates, posts, and/or other appropriate barriers to effectively prevent access to the area.

Rule	Applicability	Control Measure
SJVAPCD Rule 8061 – Paved and Unpaved Roads (Amended 8/19/04)	Applies to any new or existing public or private paved or unpaved road, road construction project, or road modification project Exemptions: • Exemptions in Rule 8011; • Any unpaved road segment with less than 26 annual average daily vehicle trips (AADT); • Maintenance and resurfacing of existing paved roads do not apply to section 5.2 of this rule; • Agricultural sources subject to Rule 8081; • Emergency activities performed to ensure public health and safety; • Equipment used to remove debris beyond the capabilities of PM10-efficient street sweepers.	Control measures include: • Watering; • Uniform layer of washed gravel; • Roadmix; • Paving; • Chemical/organic dust stabilizer/suppressants; • APCO-approved method that limits VDE to 20% opacity. On any unpaved road segment with AADT equal to or greater than 26, limit VDE to 20% opacity and comply with the requirements of a stabilized unpaved road by application and/or re-application of at least one control measure or implement an APCO-approved Fugitive PM10 Management Plan specified in Rule 8011. Construction of any new unpaved road within an urban area is prohibited unless the road meets the definition of a temporary unpaved road within an urban area. Establish a maximum speed limit of 25 mph on each unpaved road with AADT equal to or greater than 26.

Rule	Applicability	Control Measure
SJVAPCD Rule 8071 – Unpaved Vehicle/Equipment Traffic Areas (Amended 9/16/04)	Applies to any unpaved vehicle/equipment traffic area Exemptions: • Unpaved vehicle and equipment traffic areas with less than 50 AADT; Agricultural sources subject to the requirements of Rule 8081.	Control measures include: • Watering; • Uniform layer of washed gravel; • Roadmix; • Paving; • Vegetative Materials; • Chemical/organic dust stabilizer/suppressants; • APCO-approved method that limits VDE to 20% opacity. Limit VDE to 20% opacity and comply with the requirements of a stabilized unpaved road by application and/or re-application of at least one control measure or implement an APCO-approved Fugitive PM_{10} Management Plan specified in Rule 8011: • Where 50 or more AADT will occur; • For unpaved vehicle/equipment traffic areas with 150 VDT, or 150 VDT that are utilized intermittently for a period of 30 days or less during the calendar year during the period that the unpaved vehicle/equipment traffic area is utilized; • On each day that 25 or more VDT with 3 or more axles will occur on an unpaved vehicle/equipment traffic area. The District must be notified at least 48 hours before a special event that will result in 1,000 or more vehicles traveling/parking on an unpaved area by the owner/operator. During the duration of the special event vehicle travel/parking, the owner/operator shall limit VDE to 20% opacity and comply with the requirements of a stabilized unpaved road by the application and/or reapplication/maintenance of water or chemical/organic dust stabilizers/suppressants.

Rule	Applicability	Control Measure
SJVAPCD Rule 8081 – Agricultural Sources (Amended 9/16/04)	Applies to off-field agricultural sources. Exemptions: • On-field agricultural sources; • Unpaved road segments with less than 75 VDT; Any unpaved vehicle and equipment parking and traffic area less than 1.0 acre and more than one mile from an urban area, or with less than 50 AADT or less than 150 VDT that are utilized intermittently for a period of 30 days or less during the calendar year.	Control measures include: • Watering; • Uniform layer of washed gravel; • Roadmix; • Paving; • Chemical/organic dust stabilizer/suppressants; • APCO approved method that limits VDE to 20% opacity On each day that 75 or more VDT, or 25 or more VDT with 3 or more axles, will occur on an unpaved road segment, limit VDE to 20% opacity and comply with the requirements of a stabilized unpaved road by application and/or re-application/maintenance of at least one control measure (including vegetative materials) or implement an approved Fugitive PM_{10} Management Plan as specified in section 7.0. Where 50 or more AADT will occur on an unpaved vehicle/equipment traffic area, limit VDE to 20% opacity and comply with the requirements of a stabilized unpaved road by the application and/or reapplication/maintenance of at least one control measure or implement an approved Fugitive PM_{10} Management Plan as specified in section 7.0. For unpaved vehicle/equipment traffic areas with 150 or more VDT, or 150 or more VDT that are utilized intermittently for a period of 30 days or less during the calendar year, implement at least one control option. On each day that 25 or more VDT with 3 or more axles will occur on an unpaved vehicle/equipment traffic area, the owner shall limit VDE to 20% opacity and comply with the requirements of a stabilized unpaved road by the application and/or re-application/maintenance of at least one of the control measures.

Rule	Applicability	Control Measure
Clark County Division of Air Quality Section 91 – Fugitive Dust from Unpaved Roads, Unpaved Alleys, and Unpaved Easement Roads (Amended 4/15/14)	Applies to unpaved roads, unpaved alleys, unpaved easements, and unpaved access roads for utilities and railroads. Exemptions: • Non-commercial, non- institutional private driveways, horse trails, hiking paths, bicycle paths, or other similar paths that have been officially designated by a governing body for exclusive use for purposes other than travel by motor vehicles; • Stationary sources, except that these control measures shall be considered as part of a BACT determination.	Implement the following control measures for all unpaved roads having an ADT of 150 or more: • Paving; • Apply Dust Palliatives in compliance with stabilization standards; • Apply and maintain an alternative control measure approved in writing by the Control Officer and Region IX Administrator. Unless as an interim component of an active paving project, no unpaved roads or alleys can be constructed in public thoroughfares in hydrographic area 212, 216, and 217. Control measures are considered effectively implemented when opacity does not exceed 20%.

South Coast AQMD’s rules seek to limit VDE, restrict vehicle speed, and require paving, watering, or stabilizing of road surfaces and are generally more stringent compared to rules in other districts. For example, SJVAPCD Rule 8051 and South Coast AQMD Rule 403 both require control measures for disturbed open areas. However, Rule 8051 applies to open areas of at least 0.5 acres within urban areas or 3.0 acres within rural areas and at least 1,000 square feet of disturbed surface area, while Rule 403 applies to lots that are 0.1 acres or larger and have a cumulative disturbed surface area of 500 square feet or more. Only one measure, SJVAPCD Rule 8061, was determined to be potentially more stringent as it prohibits new unpaved roads within urban areas unless the road is a temporary unpaved road. South Coast AQMD does not have an identical requirement. However, the South Coast Air Basin is highly urbanized and it is likely that few, if any, new roads are unpaved. Any new unpaved roads within urban areas are likely temporary and other South Coast AQMD rules already control emissions from these sources.

c. Conclusion

The South Coast Air Basin is a highly urbanized and highly paved environment. This contrasts with other jurisdictions included in this analysis, such as Clark County, Nevada and the San Joaquin Valley, where unpaved surfaces are much more common. Although there are approximately 1,900 miles of unpaved roads within the Basin, many of these are not well-traveled or are unsuitable for paving. For example, unpaved roads are located within regional parks or national forests. Mitigation measures other than paving, such as enforcing speed limits, are likely already in place in these locations.

Unpaved road emissions are regulated by multiple South Coast AQMD rules and the PM2.5 Plan includes BCM-19, which seeks further emission reductions from unpaved roads. Staff evaluated available control measures and did not identify any unpaved road dust controls that could be implemented and achieve quantifiable emission reductions within 2 years of being triggered. Therefore, no contingency measure is proposed.

v. Fugitive Windblown Dust

a. Overview

Source category 650 – Fugitive Windblown Dust includes particulate emissions resulting from wind erosion of exposed agricultural lands (non-pasture), erosion of pasture lands, and soil from unpaved roads and associated areas. Due to environmental complexities and the understanding that windblown activities occur to some extent at all times, it can be challenging to design control measures to minimize particulate matter emissions from this category. In the 2030 baseline emissions inventory, fugitive windblown dust sources contribute 0.21 tpd direct PM2.5 emissions, representing 0.4 percent of the total PM2.5 emissions in the Basin. Rule 403 and multiple source-specific rules regulate fugitive windblown dust from a wide range of activities (e.g., farming, storage, transferring materials within an open area, etc.).

b. Evaluation

Within the South Coast AQMD, fugitive windblown dust is primarily regulated by Rule 403, while multiple source-specific rules also have requirements to prevent wind-driven fugitive dust from being generated, including Rule 1156 for cement manufacturing facilities, Rule 1157 for aggregate and related operations, and Rule 1158 for storage, handling, and transport of coke, coal and sulfur. Rule 403 and other rules define wind-driven fugitive dust as “visible emissions (or particulate matter emissions) from any disturbed surface area which is generated by wind action alone.” Examples of applicable fugitive dust source types include, but are not limited to:

- Wind blowing across the surface of landfills can carry dust into the air;
- Any large areas with unpaved surfaces such as parking lots, open fields, or vacant lots can be a

source of fugitive windblown dust; and

- Outdoor open storage and improper handling of materials can contribute to fugitive dust in windy conditions.

Some industrial operations and construction/demolition activities can create an environment where materials become airborne due to wind if the site is not properly maintained and contained. Therefore, various man-made activities can also contribute indirectly to fugitive windblown dust, and measures need to be implemented to prevent, reduce, and mitigate wind-driven fugitive dust emissions.

Rule 403 establishes a visible opacity requirement and a number of dust control requirements to prevent wind-driven fugitive dust emissions from active and inactive operations, including best available control measures for all construction activities, contingency control measures for large operations, and conservation management practices for confined animal facilities. In addition, Rule 223 has feed and waste mitigation measures for dairy and poultry CAFs designed to reduce windblown dust.

South Coast AQMD's rule requirements for this source category and the control measures required by other jurisdictions were evaluated. Table V-29 and Table V-30 summarize the control measures representative of the available control measures for fugitive windblown dust by South Coast AQMD and other jurisdictions, respectively.

TABLE V-29
SOUTH COAST AQMD'S RULES FOR FUGITIVE WINDBLOWN DUST

South Coast AQMD Rule	Applicability	Control Measure
Rule 223 – Emission Reduction Permits for Large Confined Animal Facilities (Adopted 6/2/06)	Applies to dairies with ≥ 1,000 cows and poultry farms with ≥ 650,000 chickens.	Dairy operations: • Store grain in a weatherproof storage structure from October through May • Cover silage piles, except where feed is being removed • Cover dry manure and separated solids piles from October through May Poultry operations: • Store grain in a weatherproof storage structure from October through May • Cover waste outside the housing from October through May
Rule 403 – Fugitive Dust (Amended 6/3/05)	Applies to any activity or man-made condition capable of generating fugitive dust.	Requires that windblown dust emissions from any active operation, open storage pile, or disturbed surface area not remain visible in the atmosphere beyond the property line of the source.

South Coast AQMD Rule	Applicability	Control Measure
	Exemptions: • Dairy farms • Confined animal facilities with combined disturbed surface areas ≤ 1 acre • Agricultural vegetative crop operations with combined disturbed surface areas ≤ 10 acres • Agricultural vegetative crop operations with combined disturbed surface areas > 10 acres, provided that they implement conservation management practices • Active operations conducted during emergency life-threatening situations or state emergency • Essential service utilities operations • Contractors upon contract completion • Grading contractors upon contract completion • Weed abatement operations by counties or fire departments • Sandblasting operations	Application of best available control measures for active operations to minimize dust. For inactive disturbed surface areas: • Apply water to at least 80% of all inactive disturbed surface areas on a daily basis when there is evidence of wind-driven fugitive dust • Apply dust suppressants in sufficient quantities • Establish vegetative ground cover within 21 days after active operations have ceased. For unpaved roads: • Water all roads used for vehicular traffic at least once per every 2 hours of active operations, 3 times per normal 8 hour work day • Restrict vehicle speed to 15 mph • Apply a chemical stabilizer to all unpaved road surfaces in sufficient quantity and frequency to maintain a stabilized surface. For open storage piles: • Apply chemical stabilizers • Apply water to at least 80% of the surface area of all open storage piles on a daily basis when there is evidence of wind-driven fugitive dust • Install temporary coverings • Install a 3-sided enclosure with walls with no more than 50% porosity which extend, at least, to the top of the pile. For disturbed surface areas: Apply water to all unstabilized disturbed areas 3 times/day. If there is any evidence of wind-driven fugitive dust, watering frequency is increased to a minimum of 4 times/day For vacant land: In vacant lots that are 0.1 acres or larger and have a cumulative area of 500 square feet or more driven over and/or used by motor vehicles and/or off-road vehicles, prevent motor vehicle

South Coast AQMD Rule	Applicability	Control Measure
		and/or off-road vehicle trespassing, parking and/or access by installing barriers, curbs, fences, gates, posts, signs, shrubs, trees or other effective control measures.
Rule 1156 – Further Reductions of Particulate Emissions from Cement Manufacturing Facilities (Amended 11/6/15)	Applies to all operations, materials handling, and transport at a cement manufacturing facility, including, but not limited to, kiln and clinker cooler, material storage, crushing, drying, screening, milling, conveying, bulk loading and unloading systems, internal roadways, material transport, and track-out	For crushing, screening, milling, grinding, blending, drying, heating, mixing, sacking, palletizing, packaging, and other related operations: • Use wind fences on at least two sides of the primary crusher with one side facing the prevailing winds. This structure shall be equipped and operated with a wet suppression system • Apply dust suppressants during all operations to dampen and stabilize materials and prevent visible emissions For clinker material storage: • Use a 3-sided barrier with roof, provided the open side is covered with a wind fence material of a maximum 20% porosity, allowing a removal opening for vehicle access For active open non-clinker material storage: • Apply chemical dust suppressants to stabilize the entire surface area of the pile; or • Install and maintain a 3-side barrier or wind fences with one side facing the prevailing winds and with at least two feet of visible freeboard from the top of the storage pile to provide wind sheltering, maintain surface stabilization of the entire pile, and store the materials completely inside the three-sided structure at all times; or • Install and maintain a 3-sided barrier with roof, or wind fences with roof, to provide wind sheltering; or • Install and maintain a tarp over the entire surface area of the storage pile.
Rule 1157 – PM10 Emission Reductions from Aggregate and Related Operations (Amended 9/8/06)	Applies to all permanent and temporary aggregate and related operations	Performance standards: • Prohibit discharge of fugitive dust emissions exceeding 20% opacity from any activity, equipment, storage pile, or disturbed surface area, based on an average of 12

South Coast AQMD Rule	Applicability	Control Measure
		consecutive readings of South Coast AQMD Opacity Test Method 9B • Prohibit discharge of fugitive dust emissions exceeding 50% opacity based on five consecutive readings of Opacity Test Method 9B • Prohibit any visible fugitive dust plume from exceeding 100 ft in any direction from any activity, equipment, storage pile, or disturbed surface area. For storage piles: • Stabilize the entire surface area of the open storage piles of materials, except for areas that are actively disturbed during loading/unloading activities • Re-apply dust suppressants to re-stabilized disturbed areas of the piles at the end of each work day • Prohibit open storage piles taller than 8 ft if within 300 feet of buildings or homes. Alternatively, irrigate to stabilize the entire pile surface
Rule 1158 – Storage, Handling, and Transport of Coke, Coal and Sulfur (Amended 7/11/08)	Applies to the operator of a facility that produces, stores, handles, transports, or uses coke, coal or sulfur	Control measures: • Water spray system sufficient to control fugitive dust emissions during operations of material transfer and ships or railcars loading • Prohibit fugitive dust emissions exceeding 10% opacity • Apply chemical stabilizers to control fugitive dust emissions • Install temporary covers

South Coast AQMD Rule	Applicability	Control Measure
Rule 1460 – Control of Particulate Emissions from Metal Recycling and Shredding Operations (Adopted 11/4/22)	Applies to owners or operators of a Metal Recycling Facility or Metal Shredding Facility.	• Clean traffic areas and ground surfaces where scrap metal operations take places. All materials collected during cleaning must be stored in covered containers • Apply sufficient water during loading/unloading of scrap metal, transportation throughout facility, and during processing activities **Fugitive dust minimization Best Management Practices (BMPs)** For scrap metal storage piles: • Apply sufficient water daily, except on days of 0.1 inches of precipitation; and • Store within an enclosure with three walls that extend 2 ft. above the height of the piles; or • Store within a three-sided windscreen with no more than 50% porosity, at least 2 ft. above the height of the piles For high value grade metal piles: • Cover with 12 mil intact plastic sheeting; • Store within an enclosure with three walls that extend 2 ft. above the height of the piles; • Store within a three-sided windscreen with no more than 50% porosity, at least 2 ft. above the height of the piles; or • Apply sufficient water daily, except on days of 0.1 inches of precipitation Within 100 m from a sensitive receptor: • Cease scrap metal unloading/loading, sorting, shearing, baling, torch cutting, and shredding activities for 15 min if wind speed is > 25 mph averaged over 1 min Metal shredder residue: • Store within a three-walled enclosure that extends 2 ft above the height of the residue; and • Retain the metal shredder residue in the perimeter of the enclosure Vehicle egress: • Utilize a wheel shaker or wheel spreading device; • Maintain a wheel washing system on the manufacturer's specification; or

South Coast AQMD Rule	Applicability	Control Measure
		• A paved surface from facility loading/unloading area leading to a paved public road Other BMPs: • Limit vehicle speed at 15 mph • Maintain paved vehicle traffic areas and the areas where scrap metal unloading/loading, sorting, shearing, baling, torch cutting, shredding, and storage activities take place • Not allow track out to exceed 25 ft in cumulative length from the facility. Remove all track out at the conclusion of each workday or evening shift • Store waste material in a covered container

TABLE V-30
OTHER JURISDICTIONS' CONTROL MEASURES FOR FUGITIVE WINDBLOWN DUST

Rule	Applicability	Control Measure
SJVAPCD Rule 4550 – Conservation Management Practices (includes District CMP handbook and CMP list) (Re-adopted 8/19/04)	Applies to agricultural operation sites <u>Exceptions:</u> • Agricultural operation sites less than 100 acres; • Woodland and wasteland not under cultivation or used for pasture; • Agricultural operation sites with low limit thresholds for the number of dairy cows, cattle turkeys, chickens, or laying hens	Conservation management practices (CMPs) are provided for: • Poultry Operation: Open Areas (Vegetation, Reduced Tillage, Windblocks, Dust Suppressants) • Overall Management/Feeding: Dairy and Feedlot Operations (Downwind Shelterbelts/Boundary Trees, Bulk Materials Control) • Cropland: Other (Alternate Till, Wind Barrier, Surface Roughening, Permanent Crops, Mulching, Cover Crops, Bulk Materials Control, Night Farming) • Poultry Operations: Manure Handling & Storage (Outdoor Storage, Time of Manure Spreading) • Owner shall implement applicable CMPs, after preparing and submitting a CMP application to the Air Pollution Control Officer (APCO) for approval, for each agricultural operation site. This shall be done no later than ten days after notification by the APCO of the CMP application approval.
SJVAPCD Rule 8051 – Open Areas (Amended 9/21/23)	Applies to any open area with at least 0.5 acres within urban areas or 3.0 acres within rural areas and at least 1,000 square feet of disturbed surface area. <u>Exemptions:</u> • Exemptions listed in 8011; Any weed abatement activity utilizing mowing and/or cutting, and which leaves at least three inches of stubble immediately after such mowing/cutting has occurred.	<u>Control measures include:</u> • Apply and maintain water or dust suppressants to all unvegetated areas; • Establish vegetation on all previously disturbed areas; • Pave, apply and maintain gravel, or apply and maintain chemical/organic stabilizers/suppressants. <u>For open areas:</u> Implement, apply, maintain, and reapply, if necessary, at least one or a combination of the Control Measures to comply at all times with the conditions for a stabilized surface and limit VDE to

Rule	Applicability	Control Measure
		20% opacity as defined in Rule 8011. <u>For vehicle use in open areas:</u> Prevent unauthorized vehicle access upon evidence of trespassing by posting “No Trespassing” signs or installing physical barriers such as fences, gates, posts, and/or other appropriate barriers to effectively prevent access to the area.
SJVAPCD Rule 8081 – Agricultural Sources (Amended 9/16/04)	This rule applies to off-field agricultural sources. <u>Exemptions:</u> • On-field agricultural sources; • Any outdoor storage, handling, or transport of bulk materials that would be damaged by wetting; • Outdoor storage of any bulk storage at a single site where no material is actively being added or removed and the area size is less than 100 cubic yards; • Transport of bulk materials in an outdoor area for a distance of twelve feet or less with the use of a chute or conveyor device.	<u>Control measures include:</u> • Apply water or suitable chemical/organic stabilizers/suppressants; • Construct and maintain wind barriers with less than 50% porosity. <u>Control measures for storage of bulk materials:</u> • Comply with conditions for a stabilized surface; • Cover bulk materials with tarps, plastics, or other suitable materials and anchor the cover; • Construct and maintain fences or wind barriers with less than 50% porosity along with applying water or suitable chemical/organic stabilizers/suppressants; • Utilize a 3-sided structure with a height at least equal to the height of the storage pile and with less than 50% porosity. <u>Control measures for on-site transporting of bulk materials:</u> • Limit vehicular speed while traveling; • Load all haul trucks such that the freeboard is not less than 6 inches when material is transported on any paved public access road and apply water to the top of the load or cover haul trucks with a suitable closure. <u>Control measures for off-site transporting of bulk materials:</u> • Clean the interior of the cargo

Rule	Applicability	Control Measure
		compartment or cover the cargo compartment before the empty truck leaves the site; • Prevent spillage or loss of bulk material from cargo openings; • Load all haul trucks such that the freeboard is not less than 6 inches when material is transported on any paved public access road and apply water to the top of the load or cover haul trucks with a suitable closure. <u>Control measures for outdoor transport of bulk materials with a chute or conveyor:</u> • Fully enclose the chute or conveyor; • Operate water spray equipment that wets materials; • Wash separated or screened materials to remove conveyed materials. • Implement a 20% opacity VDE limit or comply with the conditions for a stabilized surface (as defined in Rule 8011), using the control measures listed above, prior to doing any outdoor handling, storage, and transporting of bulk materials.
ICAPCD Rule 804 – Open Areas (Amended 9/11/18)	Applies to any open area with at least 0.5 acres within urban areas or 3.0 acres within rural areas and at least 1,000 square feet of disturbed surface area. <u>Exemptions:</u> • Exemptions listed in ICAPCD Rule 800, Section E; • Agricultural Operation Sites subject to ICAPCD Rule 806; • Recreational OHV Use Areas on public lands subject to ICAPCD Rule 800.	<u>Control measures include:</u> • Apply and maintain water or dust suppressant(s) to all unvegetated areas; • Establish vegetation on all disturbed areas; • Pave, apply and maintain Gravel, or apply and maintain Chemical Stabilizers/Suppressants; • Implement alternative BACM if approved by both the APCD and EPA. Alternative BACM may be approved by the APCD and EPA in accordance with a technical evaluation demonstrating that the proposed alternative BACM achieves particulate matter emission

Rule	Applicability	Control Measure
		reductions equivalent to the BACM measures identified above and that the dust control method will achieve a stabilized surface and meet the 20% opacity requirement. <u>For open areas:</u> • Comply with one or more of the Control Measures to comply with the conditions of a Stabilized Surface (as defined in ICAPCD Rule 800) and limit VDE to 20% opacity. <u>For vehicle use in open areas:</u> Within 30 days following initial discovery of evidence of trespass, prevent unauthorized vehicle access by posting “No Trespassing” signs or installing physical barriers such as fences, gates, posts, and/or appropriate barriers to effectively prevent access to the area.

Rule	Applicability	Control Measure
Clark County Division of Air Quality (CCDAQ) Section 90 — Fugitive Dust from Open Areas and Vacant Lots (Amended 1/21/2020)	The provisions of this regulation shall apply to Open Areas and Vacant Lots which are located in a PM10 nonattainment area. <u>Exemptions:</u> • Farm cultural practices or the raising of fowl or animals. • Stationary sources, defined as buildings, structures, facilities, or installations that emit or may emit any regulated air pollutant, except that these control measures shall be considered as part of a BACT determination.	One or more of the following control measures shall be applied to open areas and vacant lots greater than 5,000 square feet that are disturbed: • Prevent motor vehicle and/or off-road vehicle trespassing, parking, and/or access by installing barriers, curbs, fences, gates, posts, signs, shrubs, trees, or other effective traffic control measures where there is evidence of soil disturbance; • Uniformly apply and maintain surface gravel or Dust Palliatives to all areas disturbed by Motor Vehicles in compliance with one of the stabilization standards described in this rule; • Apply and maintain an alternative control measure approved in writing by the Control Officer and the Region IX EPA Administrator. One or more of the following control measures shall be applied if machinery is used to clear weeds and/or trash from open areas and vacant lots greater than 5,000 square feet: • Pre-wet surface soils before mechanized weed abatement and/or trash removal occurs; • Maintain dust control measures while mechanized weed abatement and/or trash removal is occurring; • Pave, apply gravel, apply water, or apply a suitable Dust Palliative after mechanized weed abatement and/or trash removal occurs. Submit dust mitigation plans for open areas and vacant lots having a cumulative area of 10,000 acres or greater.

Our evaluation of available control measures for this category did not identify any available measures that are not being implemented in South Coast AQMD rules. Each of these rules requires the use of one or more control measures that requires the applicable sources to meet at least one of three conditions:

- Maintain a stabilized surface (e.g., any disturbed surface area or open bulk storage pile that is resistant to windblown fugitive dust emissions); or
- A 20 percent opacity VDE limit; or
- A three-sided walled enclosure with no more than 50 percent porosity.

Typically, those conditions need to be met for the applicable source to be in compliance with the rule. Evaluation of control measures in other jurisdictions in Table V-27 did not identify any potential new control measures to consider as contingency measures. In fact, some of South Coast AQMD's source-specific rules require more stringent opacity and porosity requirements compared to other districts' rules. For example, Rule 1156 requires a three-sided walled enclosure with a maximum 20 percent porosity, and Rule 1158 limits visible emissions to 10 percent opacity, both of which are more stringent than control measures in other jurisdictions. In addition, Rule 403 has lower thresholds (0.1 acres or 500 square feet of vehicle-driven area) for vacant lots, compared to SJVAPCD (0.5 acres for urban or 3.0 acres for rural area and 1,000 square feet of disturbed surface area), ICAPCD (0.5 acres for urban or 3.0 acres for rural area and 1,000 square feet of disturbed surface area), or CCDAQ (5,000 square feet of disturbed surface area).

c. Conclusion

Stringent requirements for fugitive windblown dust are already in place in the Basin, and staff did not identify any potential contingency measures that could be triggered within 2 years and achieve quantifiable emission reductions.

3. Fires

Source Category 660 – Fires includes emissions from automobile fires and structure fires. The structural fire subcategory includes residential and commercial structures as well as mobile home fires. The fires source category contributes 0.41 tpd direct PM2.5, 0.08 tpd NOx, and zero NH3 emissions to the 2030 emissions inventory. The reported emissions are based on the number of vehicle fires per year and based on structural fires data from California Fire Incident Reporting System from the California State Fire Marshall's Office.[103] Considering the fires under this source category are non-routine and unpredictable, no control measures have been identified to mitigate emissions from these sources.

4. Managed Burning and Disposal (Open Burning)

a. Overview

Source category 670 – Managed Burning and Disposal consists of numerous sub-categories including various agricultural burning, forest management, and non-agricultural open burning. This source category contributes 0.08 tpd direct PM2.5, 0.29 tpd NOx, and 0.03 NH3 emissions to the 2030 emissions inventory. Over 80 percent of the emissions involve range improvement and prescribed burning. South Coast AQMD Rule 444 – Open Burning has strict requirements for when and which types of burns are allowed.

1. Burning of Agricultural Materials:

Agricultural burning involves open burning of vegetative materials produced from growing and harvesting of crops. It includes the burning of grass and weeds in fence rows, ditch banks and berms in no-till orchard operations, the burning of fields being prepared for cultivation, the burning of agricultural wastes, and the operation or maintenance of a system for the delivery of water for agricultural operations.

2. Land Management and Hazard Reduction Burning:

Prescribed burning is the planned application of fire conducted by state and federal land managers, local governments, utilities and private land owners to meet planned resource management objectives, such as forest management, wildlife habitat management, range improvement, fire hazard reduction, wilderness management, weed abatement, watershed rehabilitation, vegetation manipulation, disease and pest prevention, and ecosystem management. Hazard reduction burning involves the disposal of dry brush surrounding homes and businesses in the wildland-urban interface in order to ensure a barrier of fire protection of 100 feet in all directions.

b. Evaluation

Table V-31 summarizes Rule 444 requirements and Table V-32 summarizes the control measures in other jurisdictions.

TABLE V-31
RULE 444 REQUIREMENTS

Applicability	Requirements
• Agricultural burning • Disposal of Russian thistle • Prescribed burning • Fire prevention/suppression training; • Open detonation or use of pyrotechnics • Fire hazard removal • Disposal of infectious waste, other than hospital waste, research of testing materials, equipment or techniques • Disposal of contraband • Residential burning • Beach burning. Exemptions: • Fire suppression training by fire agencies • Open burning to protect crops from freezing • Open burning on islands located 15 miles or more from the mainland • Fireworks display • Explosives detonation • Recreational and ceremonial fires • Food preparation fires and fires for warmth at social gatherings.	• No specific agricultural crop phase outs or bans. • Burning of waste/garbage is prohibited. • No burning except on permissive burn days or marginal burn days on which burning is permitted in the applicable source or receptor area, and such burning is not prohibited by the applicable public fire protection agency. • Specific requirements for burn authorization requests and permit conditions for each category of burning.

TABLE V-32
OTHER CONTROL MEASURES CONSIDERED (MANAGED BURNING AND DISPOSAL)

Measure	Applicability	Requirements
SJVAPCD Rule 4103 – Open Burning (Amended 4/15/10)	Open burning conducted in the San Joaquin Valley Air Basin, except for prescribed burning and hazard reduction burning (regulated under District Rule 4106) Exemptions: • Fires used for cooking, campfires, and religious fires with clean fuel, dry wood or charcoal • Emergency burning by a fire agency • Respectful burning of an unserviceable American Flag • Bags used for agricultural chemicals • Raisin trays.	• No burning of garbage or other materials • Burning shall be allocated by the APCO dependent on dispersion conditions and shall avoid negative impacts to receptors • No permit shall be issued for the burning of the field crops, prunings, weed abatement, orchard removals, vineyard removals, surface harvested prunings and other materials, except for crops covered by section 5.5.2 • Additional requirements for burning times, drying times, contraband burning • Permit required for burning of Russian Thistle • Conditional burning permit required for diseased materials with specific requirements • Burn plans required for fire suppression training, burning of contraband

Measure	Applicability	Requirements
SJVAPCD Rule 4106 –_Prescribed Burning and Hazard Reduction Burning (Adopted 6/21/01)	Applies to all prescribed burning and to hazard reduction burning in wildland-urban interface.	• No burning of garbage or green waste • District allocates burning permits based on predicted meteorological conditions and whether contaminants could create or contribute to an exceedance of an ambient air quality standard or impact smoke sensitive areas • Requirements such as minimizing smoke, ignition devices, keeping vegetation free of dirt, soil, and moisture • Requirement for prescribed burn conductors to complete prescribed burning smoke management training class approved by the APCO • Permits required for all hazard reduction burning, valid only on days that burning is not prohibited by the CARB, by the District
BAAQMD Regulation 5 – Open Burning (Adopted 11/20/19)	Open burning activities Exemptions: • Fires set only for cooking • Fires burning as safety flares or for the combustion of waste gases • Flame cultivation when the burning is performed with LPG or natural gas-fired burners designed and used to kill seedling grass and weeds and the growth is such that the combustion will not continue without the burner • Fires set for the purposes of fire training using one gallon or less of flammable liquid per fire.	• No specific agricultural crop phase-outs or bans • Recreational fires allowed on non-curtailment days • On permissive burn days, numerous select fire types are allowed with permission from the APCO.

Measure	Applicability	Requirements
SMAQMD Rule 501 – Agriculture Burning (Amended 4/3/97)	Agricultural burning, including: • Agricultural waste disease prevention • Range improvement • Forest, wildlife and game habitat, irrigation system, and wild land vegetation management • Paper containers of agricultural chemicals. Contains similar exemptions as San Joaquin Valley for agricultural operations, including burning of bags used for agricultural chemicals and emergency agricultural burns which would cause	• No specific crop phase outs or bans (subject to air basin-wide rice burning reduction) • Permit holder must contact District for permission to burn and ensure that it is not a no- burn day and must contact the fire protection agency having jurisdiction over the burn location • Contains specific drying time requirements for different agricultural materials.
VCAPCD Rule 56 – Open Burning (Adopted 11/11/03)	Combustible materials in open outdoor fires Exemptions: • Fires used only for the heating or cooking of food for human consumption • Recreational fires confined to a fireplace or barbecue pit • Flag burning • Fire suppression training • Fire agency or public officer may set fires to reduce hazards as needed.	• No specific crop phase-outs or bans • Permit required for open burning • Burning only allowed on permissive burn days • Open burning allowed for the disposal of agricultural wastes in the pursuit of agricultural operations, range improvement burning, wildland vegetation management burning, levee, reservoir, or ditch maintenance and the disposal of Russian thistle • Burn times, drying times, and permit conditions also specified.

Measure	Applicability	Requirements
PCAPCD Rule 301 – Nonagricultural Burning Smoke Management (Amended 8/9/18)	Open outdoor fires, including the use of burn barrels Exemptions: • Fire hazard reduction burning • Public officer waiver • Recreational or cooking fire • American Flag • Open burning conducted by public officers.	• No person shall ignite or allow open outdoor burning without a valid burn permit from the District for fire hazard reduction, mechanized burner, open burning conducted by public officers, right of way clearing, levee, ditch and reservoir maintenance. • Separate burn permit required from fire protection agency with jurisdiction in area of the proposed burn project. • Air Pollution Control Officer may prohibit or add additional specific burn permit conditions.

Staff did not identify any more stringent requirements in other districts' rules except SJVAPCD's near-complete prohibition of agricultural burning by 2025. Staff evaluated potential control measures for agricultural, prescribed, and training burns as part of the BACM/MSM analysis in Appendix III. The analysis found that agricultural burning is extremely limited in the Basin and the high incremental cost of chipping and grinding compared to burning renders this measure infeasible. Further, reductions that would be achieved (< 0.01 tpd PM2.5) would have an inconsequential impact on air quality. Regarding prescribed burns, Appendix III discusses why it is infeasible to place additional restrictions on a critical public safety program that is proven to reduce wildfire severity. For the same reasons, it is unreasonable to consider a contingency measure for prescribed burns.

c. Conclusion

Staff does not propose any contingency measures for this source category. Appendix III provides detailed discussions on the prescribed burns category.

5. Commercial Cooking

a. Overview

Source category 690 – Commercial Cooking mostly includes emissions from commercial charbroiling, deep fat frying, and general cooking. The majority of emissions in this category come from charbroiling, which consists of two types of commercial charbroilers: chain-driven and under-fired. A chain-driven charbroiler is a semi-enclosed broiler that moves food mechanically through the device on a grated grill to cook the food for a specific amount of time. An under-fired charbroiler has a metal "grid," a heavy-duty grill similar to that of a home barbecue, with gas burners, electric heating elements, or solid fuel (wood or charcoal) located under the grill to provide heat to cook the food. Under-fired charbroilers are widely used in commercial kitchens to cook meats, including beef, burgers, and chicken. These heavy-duty appliances commonly use evenly spaced, gas-fired burners to produce direct-flame, radiant heat a few inches below slatted, cast-iron cooking surfaces.[29] The slatted cooking surface allows fat, oil, and grease (FOG) from the meat to fall into the burner flames, which produces flaring that brings the flame into direct contact with the meat. Charbroilers do not include flat-top or plancha grills with continuous cooking surfaces that prevent the flame from directly contacting the meat.

Commercial cooking sources contribute 12.30 tpd direct PM2.5 emissions and zero NOx and NH3 emissions to the 2030 emissions inventory. Commercial charbroiling contributes about 75 percent of the PM2.5 emissions from commercial cooking. The remaining emissions are identified as "unspecified cooking operations." Therefore, the remainder of this analysis focuses on commercial charbroiling emissions.

The primary source of PM2.5 from charbroiling is the burning of FOG and entrainment of the resulting aerosols in the products of combustion from the cooking flames. It is estimated that greater than 85 percent (by weight) of FOG particles from under-fired charbroilers have aerodynamic diameters less than 1 µm.[30] The smoke and vapors generated by cooking on either type of charbroiler contain water, VOC, and PM. Larger particles and grease are typically captured by the grease filter of the ventilation hood over the charbroiler. The remaining VOC and particulate pollution are exhausted unless a secondary control is installed.

Catalytic oxidizers are used to control PM2.5 emissions from chain-driven charbroilers, but they are not effective for reducing emissions from under-fired charbroilers. For under-fired charbroilers, the exhaust from these devices loses heat as it is directed to the control device, and the reactions at the catalyst cannot take place under these lower temperatures. In a chain-driven charbroiler, charbroiling exhaust is directed through the catalytic oxidizer with little loss of temperature. Thus, electrostatic precipitators (ESP) and filter media are anticipated to be the potential control technologies for reducing PM2.5 emissions from

[29] Specifications for Commercial Hoods and Kitchen Ventilation in the 2019 California Mechanical Code are classified under four duty categories: light, medium, heavy, and extra-heavy duty cooking service. Gas underfired charbroilers are listed as heavy-duty cooking appliances. Charbroilers utilizing solid fuel (e.g., charcoal, wood) are classified as extra-heavy-duty and are outside the scope of this evaluation. Available at *https://epubs.iapmo.org/2019/CMC/index.html#p=136*

[30] South Coast AQMD, Approve and Adopt Technology Advancement Office Clean Fuels Program 2017 Annual Report and 2018 Plan Update and Resolution, Receive and File Revised Membership of Technology Advancement Advisory Group, and Approve and Adopt Membership Changes for Clean Fuels Advisory Group (March 2, 2018). Available at *http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2018/2018-mar2-034.pdf* (accessed June 16, 2022)

under-fired charbroilers.[31]

b. Evaluation

Rule 1138 reduces emissions by requiring catalytic oxidizers for chain-driven charbroilers that cook greater than or equal to 875 pounds of meat per week. Currently, Rule 1138 does not require emissions controls for under-fired charbroilers.

A thorough evaluation of the stringency of Rule 1138 as it compares to other districts' rules was conducted as part of the BACM/MSM analysis in Appendix III. Staff concluded that the applicability threshold for chain-driven charbroilers in Rule 1138 would need to be lowered to satisfy MSM requirements and, therefore, BCM-12 – Further Emission Reductions from Commercial Cooking is included in the control strategy.

c. Conclusion

The BACM/MSM analysis in Appendix III contains an exhaustive evaluation of potential controls for this source category and staff did not identify any areas where the analysis could be expanded. Therefore, there are no potential contingency measures for charbroilers that would be surplus to the control strategy.

6. Other (Miscellaneous Processes)

There are no direct PM2.5 or NOx emissions from this source category; however, there are 28.03 tpd of NH3 emissions in the 2030 baseline. Humans and pets are the source of these NH3 emissions and it would therefore be unreasonable to propose contingency measures for this source category.

[31] San Joaquin Valley Air Pollution Control District. *Commercial Underfired Charbroiler Emissions Control Technologies.* Available at *http://www.valleyair.org/Grants/documents/rctp/Charbroiler-Control-Technologies.pdf* (accessed 06/01/2022)

South Coast Air Basin Attainment Plan for the 2012 Annual PM2.5 Standard

ATTACHMENT A: California Smog Check Contingency Measure State Implementation Plan Revision

California Smog Check Contingency Measure State Implementation Plan Revision

Released: September 15, 2023

CALIFORNIA
AIR RESOURCES BOARD

Table of Contents

Executive Summary

The *California Smog Check Contingency Measure State Implementation Plan Revision* (Measure) addresses State Implementation Plan (SIP) contingency measure requirements of the federal Clean Air Act (Act) for certain areas designated as nonattainment of the national ambient air quality standards (NAAQS or standards) within the State. This Measure is necessary to address contingency measure requirements and respond to recent court actions to meet statutory deadlines related to contingency measures. This Measure includes an action that is triggered if a nonattainment area fails to attain by the applicable attainment date, fails to meet a reasonable further progress (RFP) milestone, fails to meet a quantitative milestone, or fails to submit a required quantitative milestone report or milestone compliance demonstration (collectively referred to as "Triggering Events").

The Motor Vehicle Inspection and Maintenance Program (Smog Check Program) is a vehicle inspection and maintenance program administered by the California Bureau of Automotive Repair (BAR) that identifies vehicles with faulty emission control components. Smog Check inspections are required biennially as a part of the vehicle registration process and/or when a vehicle changes ownership or is registered for the first time in California. In 2017, Assembly Bill (AB) 1274 added Health and Safety Code (H&SC) § 44011(a)(4)(B)(ii) which allowed vehicles eight or less model-years old to be exempt from requirements for Smog Check inspections. In lieu of an inspection, this law requires seven and eight model-year old vehicles owners to pay an annual Smog Abatement Fee of $25, $21 of which goes to the Air Pollution Control Fund for use to incentivize clean vehicles and equipment through the Carl Moyer Memorial Air Quality Standards Attainment Program (Moyer Program). This law also specifies that this exemption is allowed unless CARB determines that exempting these vehicles prohibits the State from meeting SIP commitments. At that time, the AB 1274 analysis[1] indicated that the emissions reductions from the increase in funding to the Moyer Program would outweigh the benefits of requiring seven and eight model-year old vehicles to obtain a Smog Check inspection.

CARB staff has now determined that removal of these exemptions may be needed to meet the contingency measure SIP requirements. CARB staff has also determined that in all of the relevant nonattainment areas, requiring a Smog Check inspection on eight model-year old vehicles provides more emission reductions than the potential loss in Moyer Program emission reductions that would result from the foregone funding. In 2017, when AB 1274 enacted this change in Smog Check exemptions, the benefit from additional funding for Moyer Program projects was estimated to outweigh the disbenefit from exempting additional vehicles. However, since 2017 the Program has successfully incentivized the

[1] *Bill Analysis - AB-1274 Smog check: exemption. (ca.gov)*

turnover of many dirty engines and equipment and Moyer Program projects are now less cost-effective than before, resulting in a net benefit from this Measure.

If a Triggering Event occurs, the Measure would:

- Change the existing smog check inspection exemptions in the California Smog Check Program in the applicable nonattainment area(s);
- Apply to the California nonattainment area(s) and standard(s) for which the Triggering Event occurs, from those listed on the next page in Table 1.; and
- Be implemented within 30 days of the effective date of a U.S. EPA finding that a Triggering Event occurred.

Seven areas in California under State jurisdiction are designated as nonattainment for the 75 parts per billion (ppb) 8-hour ozone standard, and ten areas in California under State jurisdiction are designated as nonattainment for the 70 ppb 8-hour ozone standard, with classifications of Moderate, Serious, Severe or Extreme. Additionally, the San Joaquin Valley is designated as nonattainment for the 80 ppb 8-hour ozone standard, the 12 microgram per meter cubed (μg/m^3) annual, 15 μg/m^3 annual, and 35 μg/m^3 24-hour PM2.5 standards. The South Coast Air Basin is also designated as nonattainment for the 12 μg/m^3 annual PM2.5 standard. For all of these standards, nonattainment areas were or will be required to submit SIP revisions meeting contingency measure and other applicable requirements of the Act.

CARB staff has worked with local air districts to prepare contingency measure SIP revisions which were adopted and submitted to the U.S. Environmental Protection Agency (U.S. EPA) through CARB. Further, in 2018, CARB staff submitted the *2018 Updates to the California State Implementation Plan* (2018 SIP Update) which included a statewide contingency measure that was developed following U.S. EPA guidance available at the time. However, multiple lawsuits challenging U.S. EPA's interpretation of the Act led to U.S. EPA's determination that the previously submitted 2018 SIP Update contingency measures did not fully meet the Act's requirements. CARB staff is now proposing to submit the Measure to be consistent with U.S. EPA's current interpretation of the contingency measure provisions of the Act. The Measure as included in this SIP revision will be applicable for the California nonattainment areas and standards as listed in Table 1.

Table 1. Nonattainment Areas and Applicable Standards

Area	Applicable Standards
Coachella Valley	70 ppb Ozone, 75 ppb Ozone
Eastern Kern County	70 ppb Ozone, 75 ppb Ozone
Mariposa County	70 ppb Ozone
Sacramento Metro Area	70 ppb Ozone, 75 ppb Ozone
San Diego County	70 ppb Ozone, 75 ppb Ozone
San Joaquin Valley	70 ppb Ozone, 75 ppb Ozone, 80 ppb Ozone, 15 $\mu g/m^3$ PM2.5, 35 $\mu g/m^3$ PM2.5, 12 $\mu g/m^3$ PM2.5
South Coast Air Basin	12 $\mu g/m^3$ PM2.5, 70 ppb Ozone, 75 ppb Ozone
Ventura County	70 ppb Ozone
Western Mojave Desert	70 ppb Ozone, 75 ppb Ozone
Western Nevada	70 ppb Ozone

CARB staff initiated the public process with release of a concept document and workshop in August 2023 to solicit input from the public. The concept document and other materials were available in English and Spanish, and the workshop provided a forum in both English and Spanish for the proposed Measure to be discussed in a public setting and provide additional opportunity for public feedback, input, and ideas. CARB staff also analyzed the impacts of the Measure on vehicle owners in disadvantaged communities (DACs). CARB staff compared the proportion of the vehicles subject to the Measure if triggered to those registered in DACs to the proportion of vehicles subject to the Measure in total using DMV data. CARB staff found that, in all nonattainment areas, the proportion of vehicle owners potentially impacted by the Measure, if triggered, is not disproportionate to the population as a whole.

CARB staff has determined that the Measure meets the Act contingency measure requirements and that exercising H&SC § 44011(a)(4)(B)(ii) is needed to meet the SIP requirements.

Further, CARB staff last submitted updates to the Smog Check Program to U.S. EPA for incorporation into the California SIP in 2009 and U.S. EPA approved them on July 1, 2010.[2] As previously mentioned, the additional exemptions from the Smog Check Program were made by AB 1274 in 2017. As a part of this SIP revision, CARB staff is submitting H&SC § 44011(a)(4)(A) and (B) into the California SIP to incorporate these changes in the Smog Check Program.

The Board is scheduled to consider the Measure on October 26, 2023. CARB staff recommends the Board to adopt the Measure addressing contingency measure requirements for the applicable standards and nonattainment areas as listed in Table 1 and approve submittal into the California SIP of California H&SC sections 44011(a)(4)(A) and (B). If adopted, CARB staff will submit the Measure and H&SC sections 44011(a)(4)(A) and (B) to U.S. EPA as a revision to the California SIP.

[2] 75 Fed. Reg. 38023 (July 1, 2010)

Section 1. Contingency Requirements and Litigation

The Clean Air Act ("Act") specifies that SIPs must provide for contingency measures, defined in section 172(c)(9) as "specific measures to be undertaken if the area fails to make reasonable further progress (RFP), or to attain the national primary ambient air quality standard by the attainment date…."[3] The Act is silent though on the specific level of emission reductions that must flow from contingency measures. In the absence of specific requirements for the amount of emission reductions, in 1992, U.S. EPA conveyed that the contingency measures should, at a minimum, ensure that an appropriate level of emissions reduction progress continues to be made if attainment of RFP is not achieved and additional planning by the State is needed (57 Federal Register 13510, 13512 (April 16, 1992)). While U.S. EPA's ozone guidance states "contingency measures should represent one year's worth of progress amounting to reductions of 3 percent of the baseline emissions inventory for the nonattainment area", U.S. EPA has accepted contingency measures that equal less than one year's worth of RFP in some situations. Specifically, U.S. EPA has historically accepted lesser amounts as they see appropriate considering "U.S. EPA's long-standing recommendation that states should consider 'the potential nature and extent of any attainment shortfall for the area' and that contingency measures 'should represent a portion of the actual emissions reductions necessary to bring about attainment in the area.'"[4]

In recent years, court decisions, as described below, have excluded a category of contingency measures from what U.S. EPA may properly approve. Historically, U.S. EPA allowed contingency measure requirements to be met via excess emission reductions from ongoing implementation of adopted emission reduction programs. In the past, CARB used this method to meet contingency measure requirements. In 2016, in *Bahr v. U.S. Environmental Protection Agency*[5] *(Bahr),* the Ninth Circuit determined U.S. EPA erred in approving a contingency measure that relied on an already-implemented measure for a nonattainment area in Arizona, thereby rejecting U.S. EPA's longstanding interpretation of section 172(c)(9) of the Act. U.S. EPA staff interpreted this decision to mean that contingency measures must include a future action triggered by a Triggering Event. This decision was applicable to only the states covered by the Ninth Circuit. In the rest of the country, U.S. EPA still allowed contingency measures using their pre-Bahr stance. In January 2021, in *Sierra Club v. Environmental Protection Agency*[6], the United States Court of Appeals for the D.C. Circuit, ruled that already implemented measures do not qualify as contingency measures for the rest of the country (*Sierra Club*).

[3] 42 U.S.C. § 7502(c)(9).

[4] See, e.g. 78 Fed.Reg. 37741, 37750 (Jun. 24, 2013), approval finalized with 78 Fed.Reg. 64402 (Oct. 29, 2013).

[5] *Bahr v. U.S. Environmental Protection Agency,* (9th Cir. 2016) 836 F.3d 1218.

[6] *Sierra Club v. Environmental Protection Agency,* (D.C. Cir. 2021) 985 F.3d 1055.

In response to *Bahr* and as part of the 75 ppb 8-hour ozone SIPs due in 2016, CARB staff developed the statewide Enhanced Enforcement Contingency Measure (Enforcement Contingency Measure) as a part of the *2018 Updates to the California State Implementation Plan* to address the need for a triggered action as a part of the contingency measure requirement. CARB staff worked closely with U.S. EPA regional staff in developing the contingency measure package that included the triggered Enforcement Contingency Measure, a district triggered measure and emission reductions from implementing CARB's mobile source emissions program. However, as part of the *San Joaquin Valley 2016 Ozone Plan for 2008 8-hour Ozone Standard* SIP action, U.S. EPA wrote in their final approval that the Enforcement Contingency Measure did not satisfy requirements to be approved as a "standalone contingency measure" and approved it only as a "SIP strengthening" measure[7]. U.S. EPA did approve the San Joaquin Valley Air Pollution Control District triggered measure and the implementation of the mobile reductions along with a CARB emission reduction commitment as meeting the contingency measure requirement for this SIP.

Subsequently, the Association of Irritated Residents filed a lawsuit against the U.S. EPA for its approval of various elements within the *San Joaquin Valley 2016 Ozone Plan for 2008 8--hour Ozone Standard*, including the contingency measure. The Ninth Circuit issued its decision in *Association of Irritated Residents v. EPA*[8] (*AIR*) that U.S. EPA's approval of the contingency element was arbitrary and capricious and rejected the triggered contingency measure that achieves much less than one year's worth of RFP. Most importantly, the Ninth Circuit said that, in line with U.S. EPA's longstanding interpretation of what is required of a contingency measure and the purpose it serves, together with *Bahr*, <u>all</u> reductions needed to satisfy the Act's contingency measure requirements must come from the contingency measure itself. The Ninth Circuit also said that the amount of reductions needed for contingency should not be reduced absent U.S. EPA adequately explaining its change from its historic stance on the amount of reductions required. U.S. EPA staff has interpreted *AIR* to mean that triggered contingency measures must achieve the entirety of the amount of emission reductions needed for the contingency measure requirement on their own. In addition, surplus emission reductions from ongoing programs cannot reduce the amount of reductions needed for the contingency measure requirements.

In response to *Bahr* and *Sierra Club*, in 2021, U.S. EPA convened a nationwide internal task force to develop guidance to support states in their development of contingency measures. The draft guidance was released in March 2023 and is currently undergoing a public review process. The draft guidance proposes a new method for how to calculate one year's worth of progress for the targeted amount of contingency measures reductions and provides new clarification on the reasoned justification U.S. EPA requires to facilitate approval of contingency measures with lesser amounts of reductions. Per the draft guidance, such a

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[7] 87 Fed. Reg. 59688 (October 3, 2022)

[8] *Association of Irritated Residents v. U.S. Environmental Protection Agency*, (9th Cir. 2021) 10 F.4th 937

reasoned justification would need to include an infeasibility analysis detailing why there are insufficient measures to meet one year's worth of progress. U.S. EPA relied on the draft guidance when they proposed a federal implementation plan to meet the PM2.5 contingency measure requirements in the San Joaquin Valley on August 8, 2023[9].

Section 2. CARB's Opportunities for Contingency Measures

Much has changed since U.S. EPA's 1992 guidance on contingency measures. Control programs across the country have matured as have the health-based standards. U.S. EPA strengthened ozone standards in 1997, 2008 and 2015 with attainment dates out to 2037 for areas in "extreme" nonattainment. California has the only three extreme ozone nonattainment areas in the country for the 2015 ozone NAAQS. Extreme ozone nonattainment areas are allowed to use a provision in the Act where emission reduction measures can wait for technology to advance. California also has multiple PM2.5 nonattainment areas with the highest possible classification and greatest attainment challenges. Thus, control measures are needed for meeting the NAAQS as expeditiously as possible, rather than being held in reserve.

To address contingency measure requirements given the courts' decisions and U.S. EPA's draft guidance, CARB staff and local air districts would need to develop a measure or measures that, when triggered by a Triggering Event, will achieve one year's worth of progress for the given nonattainment area unless it is determined that it is infeasible to achieve one year's worth of emission reductions. Given CARB's wide array of mobile source control programs, the relatively limited portion of emissions primarily regulated by the local air districts, and the fact that primarily-federally regulated sources are expected to account for approximately 52 percent of statewide nitrogen oxides (NOx) emissions by 2037[10], finding triggered measures that will achieve the required reductions is nearly impossible. That said, even discounting the amount to reflect the proportion of sources that are primarily federally regulated, additional control measures that can be identified by CARB staff are scarce or nonexistent that would achieve the required emissions reductions needed for a contingency measure.

Adding to the difficulty of identifying available control measures, not only does the suite of contingency measures need to achieve a large amount of reductions, but they will also need to achieve these reductions in the year following the year in which the Triggering Event has been identified. Although the newly released draft guidance proposes allowing for up to two years to achieve those reductions, control measures achieving the level of reductions required often take more than two years to implement and will likely not result in immediate reductions. In California's 2022 State SIP Strategy, CARB's three largest NOx reduction

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[9] 88 Fed. Reg. 53431 (August 8, 2023)

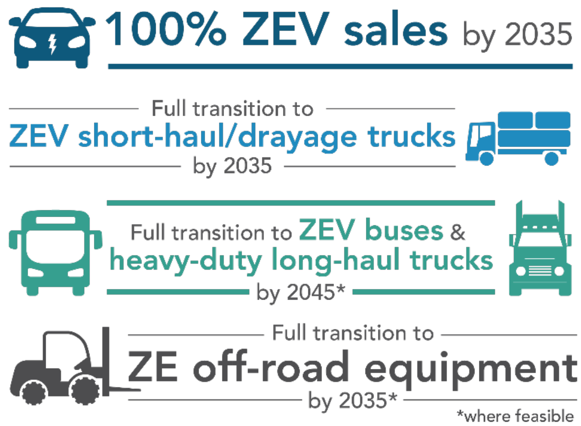
[10] Source: CARB 2022 CEPAM v1.01; based on 2037 emissions totals.

measures, In-Use Locomotive Regulation, Advanced Clean Fleets, and Transportation Refrigeration Unit II, rely on accelerated turnover of older engines/trucks. The need for buildout of potential infrastructure upgrades and market-readiness of new equipment options that meet requirements limits the availability to have significant emission reductions in a short amount of time. Options for a technically and economically feasible triggered measure that can be implemented and achieve the necessary reductions in the time frame required are scarce in California.

CARB has over 50 years of experience reducing emissions from mobile sources like cars and trucks, as well as other sources of pollution under State authority. The Reasonably Available Control Measures for State Sources analysis that CARB included in all of the 70 ppb 8-hour ozone SIPs illustrates the reach of CARB's current programs and regulations, many of which set the standard nationally for other states to follow. Few sources CARB has primary regulatory authority over remain without a control measure, and all control measures that are in place support the attainment of the NAAQS. There is a lack of additional control measures that would be able to achieve the necessary reductions for a contingency measure. Due to the unique air quality challenges California faces, should such additional measures exist, CARB would pursue those measures to support expeditious attainment of the NAAQS and would not reserve such measures for contingency purposes. Nonetheless, CARB staff has continued to explore options for potential statewide contingency measures utilizing its authorities and applying draft guidance.

A central difficulty in considering a statewide contingency measure under CARB's authority, is that CARB is already fully committed to driving sources of air pollution in California to zero-emission everywhere feasible and as expeditiously as possible. In 2020, Governor Newsom signed Executive Order N-79-20 (*Figure 1*) that established a first-in-the-nation goal for 100 percent of California sales of new passenger cars and trucks to be zero emission by 2035. The Governor's order also set a goal to transition 100 percent of the drayage truck fleet to zero- emission by 2035, all off-road equipment where feasible to zero -emission by 2035, and the remainder of the medium and heavy-duty vehicles to zero--emission where feasible by 2045.

Figure 1 - Governor Newsom Executive Order N-79-20



California is committed to achieving these goals, and CARB is pursuing an aggressive control program in conjunction with other state and local agencies. CARB's programs not only go beyond emissions standards and programs set at the federal level, but many include zero-emissions requirements or otherwise, through incentives and voluntary programs, that drive mobile sources to zero-emissions, as listed in Table 2 below. CARB is also exploring and developing a variety of new measures to drive more source categories to zero-emissions and reduce emissions even further, as detailed in the 2022 State SIP Strategy. With most source categories being driven to zero-emissions as expeditiously as possible, opportunities for having triggered measure that could reduce NOx, reactive organic gases (ROG) and PM2.5 emissions by the amount required for contingency measures are scarce.

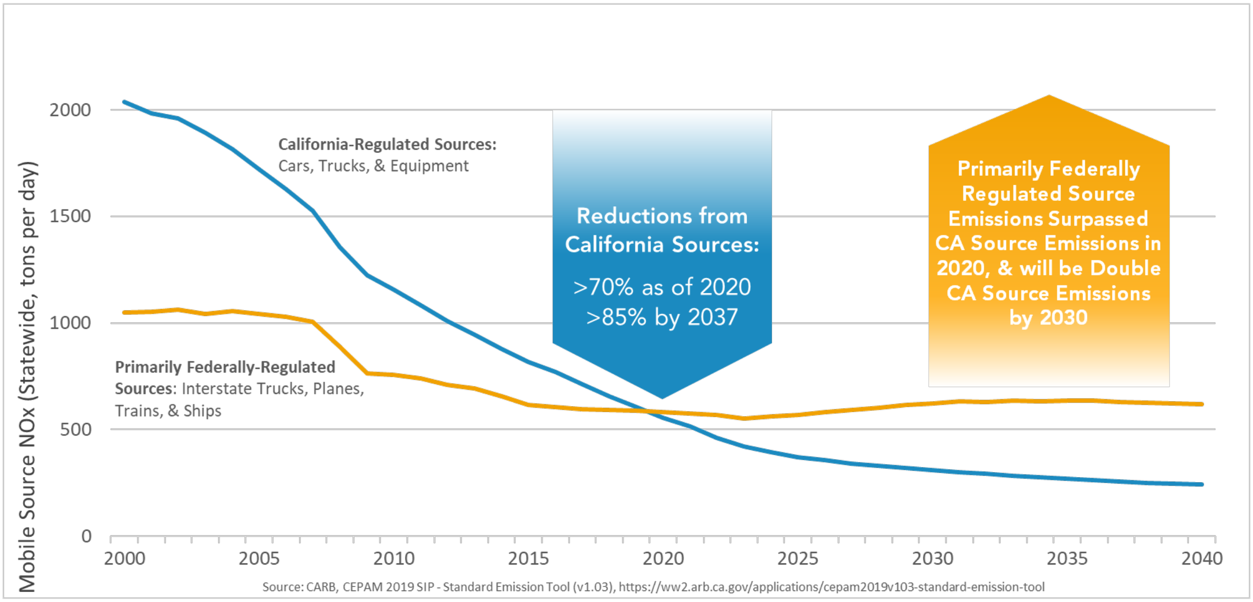
Table 2. Emissions Sources and Respective CARB Programs with a Zero-Emissions Requirement/Component

Emission Source	Regulatory Programs
Light-Duty Passenger Vehicles and Light-Duty Trucks	• Advanced Clean Cars Program (I and II), including the Zero Emission Vehicle Regulation • Clean Miles Standard
Motorcycles	• On-Road Motorcycle Regulation*
Medium Duty-Trucks	• Advanced Clean Cars Program (I and II), including the Zero Emission Vehicle Regulation • Zero-Emission Powertrain Certification Regulation • Advanced Clean Trucks Regulation • Advanced Clean Fleets Regulation
Heavy-Duty Trucks	• Zero-Emission Powertrain Certification Regulation • Advanced Clean Trucks Regulation • Advanced Clean Fleets Regulation
Heavy-Duty Urban Buses	• Innovative Clean Transit • Advanced Clean Fleets Regulation
Other Buses, Other Buses – Motor Coach	• Zero-Emission Airport Shuttle Regulation • Advanced Clean Fleets Regulation
Commercial Harbor Craft	• Commercial Harbor Craft Regulation
Recreational Boats	• Spark-Ignition Marine Engine Standards*
Transport Refrigeration Units	• Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units (Parts I and II*)
Industrial Equipment	• Zero-Emission Forklifts* • Off-Road Zero-Emission Targeted Manufacturer Rule*
Construction and Mining	• Off-Road Zero-Emission Targeted Manufacturer Rule*
Airport Ground Support Equipment	• Zero-Emission Forklifts*
Port Operations and Rail Operations	• Cargo Handling Equipment Regulation • Off-Road Zero-Emission Targeted Manufacturer Rule*
Lawn and Garden	• Small Off-Road Engine Regulation • Off-Road Zero-Emission Targeted Manufacturer Rule*
Ocean-Going Vessels	• At Berth Regulation
Locomotives	• In-Use Locomotive Regulation

*Indicates program or regulation is in development

Most air pollution sources in California that are not as well controlled are primarily-federally regulated sources. (Figure 2). This includes interstate trucks, ships, locomotives, aircraft, and certain categories of off-road equipment, constituting a large source of potential emissions reductions. Since these are primarily regulated at the federal and, in some cases, international level, options to implement a contingency measure with reductions approximately equivalent to one year's worth of progress are limited.

Figure 2 - State vs. Federal Mobile Source NOx Emissions



CARB staff has analyzed CARB's suite of control measures for all sources under CARB authority to identify potential contingency measure options. CARB currently has programs in place or under development for most sources and have evaluated a variety of regulatory mechanisms within existing and new programs for potential contingency triggers. After conducting a full analysis of measures for contingency measure opportunities, CARB staff determined that changes in the Smog Check Program are appropriate to use to meet the Act contingency measure requirement. The Measure was found to be the most feasible option given timing and technical constraints for adoption and implementation. The full infeasibility analysis can be found in Appendix A. Further, U.S. EPA recently released their own infeasibility analysis[11] in which they came to the same conclusion with respect to the scarcity of available contingency measures in CARB's mobile source control programs.

With this proposal, CARB staff would adopt and submit the Measure for the 70 ppb 8-hour ozone, 75 ppb 8-hour ozone, 80 ppb 8-hour ozone, the 12 µg/m^3 and 15 µg/m^3 annual PM2.5, and 35 µg/m^3 24-hour PM2.5 standards for the relevant nonattainment areas to address the contingency measure requirements of the Act as interpreted by U.S. EPA in the draft guidance. The Measure consists of a triggered contingency measure that, if triggered,

[11] EPA Source Category and Control Measure Assessment and Reasoned Justification Technical Support Document; Federal Implementation Plan for Contingency Measures for the Fine Particulate Matter Standards; San Joaquin Valley, California. *https://www.regulations.gov/docket/EPA-R09-OAR-2023-0352*

would change the exemptions for motor vehicles in the California Smog Check Program for the relevant local air district and applicable standard as specified in Table 1 that, together with the local air districts’ contingency measures, addresses the contingency measure requirements of the Act. A detailed description of the Measure is described in Section 4 below.

Section 3. California Smog Check Program

The Smog Check Program is a vehicle inspection and maintenance program administered by BAR. The Smog Check Program aims to reduce air pollution in the state by identifying vehicles with harmful excess emissions for repair or retirement. While BAR administers the Program, the California Department of Motor Vehicles (DMV) provides the vehicle registration and licensing information to support administration and enforcement of the Smog Check Program. Smog Check inspections are required biennially as a part of the vehicle registration process and/or when a vehicle changes ownership or is registered for the first time in California, depending on the area and severity of the air quality problem. Certain areas with worse air quality issues are subject to an enhanced version of the Program with stricter requirements. All gasoline-powered vehicles, hybrid vehicles, and alternative-fuel vehicles that are model-year 1976 and newer, as well as all diesel vehicles model-year 1998 and newer with a gross-vehicle weight rating of 14,000 pounds and less, are subject to Smog Check inspections.

However, there are several exceptions. Motorcycles and electric-powered vehicles are not subject to the Smog Check Program. Additionally, in 2017, California Assembly Bill (AB) 1274 was enacted, which amended the H&SC to exempt vehicles up to eight model -years old (MYO); previously, vehicles had been exempt up to six MYO. These seven and eight MYO vehicles that would otherwise be subject to a Smog Check inspection must pay an annual Smog Abatement Fee of $25, $21 of which goes to the Air Pollution Control Fund for use through the Moyer Program. Per H&SC § 44011(a)(4)(B)(ii), these motor vehicles eight or less MYO are exempted from biennial Smog Check inspection, unless CARB finds that providing an exception for these vehicles will prohibit the state from meeting the state commitments with respect to the SIP.

In 2017, when this change in Smog Check exemptions was enacted, the benefit from additional funding for Moyer Program projects was estimated to outweigh the disbenefit from exempting additional vehicles. However, since 2017, the cost-effectiveness of Moyer Program projects has increased as the program has successfully incentivized the turnover of many dirty engines and equipment. Moyer Program projects are now less cost-effective than before, resulting in a net benefit from this Measure.

As such, the ability to make the relevant finding for H&SC § 44011(a)(4)(B)(ii) purposes is within CARB's authority, and the other State agencies that implement California's Smog Check Program will be bound by it. CARB staff last submitted updates to the Smog Check Program to U.S. EPA for incorporation into the California SIP in 2009 and approved by U.S. EPA on July 1, 2010.[12] As previously mentioned, the additional exemptions from the Smog Check Program were made by AB 1274 in 2017. As a part of this SIP revision, CARB

[12] 75 Fed. Reg. 38023 (July 1, 2010)

staff is also proposing the Board approve submittal of H&SC § 44011(a)(4)(A) and (B) into the California SIP to incorporate these changes in the Smog Check Program. The H&SC sections are included in Appendix D.

Further the Smog Check Program meets federal requirements for an inspection and maintenance (I/M) program. On March 23, 2023, CARB adopted the California Smog Check Performance Standard Modeling (PSM) and Program Certification for the 70 parts per billion (ppb) 8-hour Ozone Standard (Smog Check Certification) to address I/M SIP requirements for the 70 ppb 8-hour ozone standard. CARB staff submitted it to U.S. EPA as a SIP revision. The Smog Check Certification demonstrated that the California's Smog Check Program meets the applicable federal I/M program requirements for all the 70 ppb 8-hour ozone nonattainment areas in California.

Section 4. Smog Check Contingency Measure

The Measure will consist of changing the existing Smog Check inspection exemptions in California's Smog Check Program in any applicable nonattainment area listed in Table 1. that fails to satisfy any one of the following (failures of which are collectively referred to as "Triggering Events"):

- Attain by the applicable attainment date;
- Meet a reasonable further progress (RFP) milestone;
- Meet a quantitative milestone; or
- Submit a required quantitative milestone report or milestone compliance demonstration.

The Measure will be initiated within 30 days of the effective date of a U.S. EPA determination of a Triggering Event. The exemption will change from the existing eight or less MYO to seven or less MYO in the applicable nonattainment area. If triggered, these additional vehicles would then be subject to Smog Check inspections based on the area in which the vehicle is registered (i.e., enhanced, basic, and change of ownership), resulting in additional emissions control equipment failures being identified and corrected, thereby reducing emissions that typically result when emissions control equipment is not performing as designed. The emissions reduction estimates from the Measure are detailed for each nonattainment area in Section 5 of this report. The methodology for calculating these estimates can be found in Appendix B. The Measure can be triggered a second time for a nonattainment area; if triggered a second time, the Smog Check exemption would then only apply to vehicles six or less MYO.

Implementation of the Measure will require coordination with other California State agencies. Their relevant roles and responsibilities are outlined below.

- **Bureau of Automotive Repair:** BAR, as part of the Department of Consumer Affairs, provides oversight of the automotive repair industry and administers vehicle emissions reduction and safety programs. Specifically, as it pertains to the Measure, BAR administers and enforces the Smog Check Program.
- **California Department of Motor Vehicles:** DMV administers vehicle registration and licensing and supports BAR in administering the Smog Check Program.

CARB staff will work closely with BAR and DMV staff throughout the process and leading up to a possible Triggering Event, so that both agencies have as much notice as possible for the work that will be required for full implementation of the Measure. For most potential failures to attain a relevant standard, preliminary data for the relevant ozone or PM2.5 season is available earlier and U.S. EPA makes their failure to attain findings six months after the attainment date, so CARB staff will be able to notify and work with BAR and DMV preemptively to ensure the Measure implementation is as smooth as possible.

CARB staff has quantified the emission reductions that would be achieved from implementation of the Measure, if triggered, and have documented the results in Section 5 of this report. The emission reductions anticipated are surplus to the current Smog Check Program in the nonattainment areas and they are not otherwise required by or assumed in a SIP-related program, or any other adopted State air quality program. The changes to Smog Check exemptions are enforceable since DMV requires a vehicle owner to obtain a Smog Check inspection certificate indicating a vehicle has passed its Smog Check inspection to renew their vehicle registration. The reductions from the Measure are permanent in that, if triggered, the vehicle will need to be repaired in order to renew their registration.

A. Implementation

Within 30 days of the effective date of U.S. EPA determining an applicable Triggering Event occurred, CARB will transmit a letter to BAR and DMV conveying its finding under H&SC § 44011(a)(4)(B)(ii) that providing the exception for certain motor vehicles from Smog Check inspection in specific nonattainment areas (defined by specified ZIP Codes) will prohibit the State from meeting commitments with respect to the SIP as required by the Act. This letter will explain that the Measure is being triggered to meet contingency measure requirements under Act section 172(c)(9) and/or 182(c)(9), and effectuating the change to the Smog Check exemptions for motor vehicles from eight or less MYO to seven or less MYO throughout the applicable nonattainment area (or six or less MYO in cases of the second trigger).

Prior to CARB staff submitting a letter to BAR and DMV, CARB staff will coordinate with BAR and DMV if there is potential for contingency to be triggered in the nonattainment areas in Table 1. CARB staff will meet regularly with BAR and DMV staff throughout the process to implement this Measure. Upon receipt of the CARB letter and the applicable ZIP Codes, CARB, BAR and DMV staff will begin implementation of the change in exemption length to Smog Check and take the following actions:

- DMV will update their Smog Check renewal programing to require a Smog Check inspection for the eight MYO vehicles (or seven MYO in the case of a second trigger) in the ZIP Codes provided by CARB staff;
- The eight to seven MYO (or seven to six MYO) exemption change will begin for registrations expiring beginning January 1st of the applicable year considering the time it takes for DMV to program this change and their registration renewal process;
- 60 days before the expiration date of the vehicle registration, DMV will send out registration renewals that include these newly impacted vehicles along with those already subject to Smog Check inspection;
- The notice will include information on the change in exemptions, reason for change, and resources for obtaining a Smog Check inspection from a certified station;

- CARB staff will work with DMV to develop and include an informational paper that will accompany the registration renewal with the information as included in the notice; and
- BAR and DMV will administer and enforce the new changes to the Smog Check Program.

B. Title VI and Environmental Justice

Title VI of the Civil Rights Act of 1964 (Title VI) provides that no person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance. Other relevant federal laws prohibit discrimination in the use of federal funds based on disability, sex, and age.[13] As a recipient of federal funds, CARB must ensure it complies with Title VI and U.S. EPA's Title VI implementation regulations[14] in its relevant programs and policies.

CARB's public process to engage with stakeholders in development of the Measures, its equity analysis of the Measure, and information about CARB's Civil Rights Policy and Compliant process is summarized below.

Public Process

In developing the proposed Measure, CARB staff engaged in a thorough public process that addresses the requirements of Title VI. CARB staff initiated the public process with release of a concept document and hosting a remote online workshop in August 2023 to solicit input from the public.[15] The workshop was hosted through Zoom in the late afternoon to allow more community members to participate without needing to travel. The public notice for the workshop provided a contact for special accommodation requests by interested stakeholders, and CARB staff also made available on the notice and its website a staff email address to accept public questions and comments. The concept document and other materials were available in English and Spanish on the website and through emails sent to relevant email list serves, including the Environmental Justice Stakeholders Group. The workshop included translation services that provided a forum in both English and Spanish for the proposed Measure to be discussed in a public setting and provide additional opportunity for public feedback, input, and ideas. After the workshop, CARB staff

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[13] Section 504 of the Rehabilitation Act of 1973, as amended, 29 U.S.C. § 794; Title IX of the Education Amendments of 1972, as amended, 20 U.S.C. §§ 1681 et seq.; Age Discrimination Act of 1975, 42 U.S.C. §§ 6101 et seq.; and Federal Water Pollution Control Act Amendments of 1972, Pub. L. 92-500 § 13, 86 Stat. 903 (codified as amended at 33 U.S.C. § 1251 (1972)).

[14] 40 C.F.R. Part 7.

[15]

https://ww2.arb.ca.gov/resources/documents/california-smog-check-contingency-measure has made the recording of the workshop available on its website. CARB staff considered the public feedback it received in developing the Measure. CARB staff will continue to address the requirements of Title VI in the event implementation of the Measure is triggered and provide continuing opportunities for public feedback.

Racial Equity, Environmental Justice, and Equity Analysis

Central to CARB's mission is the commitment to racial equity and environmental justice and ensuring a clean and healthy environment for all Californians. Many low-income and overburdened communities within the nonattainment areas, and across the State, continue to experience disproportionately high levels of air pollution and the resulting detrimental impacts to their health. To address longstanding environmental and health inequities from elevated levels of criteria pollutants (and toxic air contaminants), CARB prioritizes environmental justice, incorporating racial equity, and conducting meaningful community engagement in its policy and planning efforts and programs. It is imperative to optimize California's control programs to maximize emissions reductions and provide targeted near-term benefits in those communities that continue to bear the brunt of poor air quality.

Across the agency, CARB is engaged in specific localized efforts include development of community air monitoring networks to learn about local exposures, development of a racial equity assessment lens to consider benefits and burdens of CARB programmatic work in the planning stages, continuously increasing and improving community engagement efforts, and implementation of Assembly Bill (AB) 617 (C. Garcia, Chapter 136, Statutes of 2017), known as the Community Air Protection Program[10]. Significant progress has been made to address air pollution statewide and in local communities, and it is imperative to also ensure all Californians have access to healthy air quality.

Specific to this Measure, given the existing disproportionate impacts overburdened communities already face, CARB staff sought to evaluate whether the proposed Measure would itself impact disproportionately burden certain communities. In conducting this evaluation, CARB staff analyzed whether there would be disproportionate impact on disadvantaged communities within the affected nonattainment areas if the Measure is triggered.

CARB staff also analyzed the impacts of the Measure on vehicle owners in disadvantaged communities (DACs). CARB staff evaluated the potential impacts on owners of 8 MYO vehicles that reside in disadvantaged communities (DACs), which are defined by California Senate Bill 535[16] as census tracts receiving the highest 25 percent of overall scores in *CalEnviroScreen 4.0*[17]. These communities face the highest air pollution and other

[16] De Leon, *https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201120120SB535*

[17] *https://oehha.ca.gov/calenviroscreen*

environmental burdens, and CARB staff is working to ensure that policy changes do not have a negative disproportionate impact on these populations.

In order to evaluate whether vehicle owners in DACs will be disproportionately impacted by this Measure if it is triggered, CARB staff compared the proportion of 8 MYO vehicles subject to the Smog Check inspection that are registered in DACs in each nonattainment area to the proportion of vehicles that are subject to the Smog Check inspection at some point in their lifetime that are registered in DACs for each nonattainment area. CARB staff used DMV data reflecting vehicle registrations as of 2021; thus, model year 2013 was used to represent 8 MYO vehicles and calculate the proportion of vehicles subject to the change. CARB staff assumes that the proportion of 8 MYO vehicles subject to the Smog Check inspection will be approximately equivalent in future attainment years. Based on this analysis for all areas in Table 1, CARB staff found that the proportion of vehicle owners potentially impacted by the Measure, if triggered, is not disproportionate to the population as a whole in each of the nonattainment areas analyzed. The proportion of people impacted with vehicles registered in DACs is about equal to the proportion of vehicle owners residing in DACs area-wide and generally represent a relatively small portion of the total population being impacted.

$$\frac{8MYO\ vehicles\ registered\ in\ DACs\ in\ nonattainment\ area}{8MYO\ vehicles\ registered\ in\ nonattainment\ area} = \frac{all\ vehicles\ registered\ in\ DACs\ in\ nonttainment\ area}{all\ vehicles\ registered\ in\ nonattainment\ area}$$

If the Measure is triggered, though, there could be other potential impacts to vehicle owners that should be considered. The main impacts to vehicle owners are the additional monetary cost and time of obtaining a Smog Check inspection and potential repairs one year earlier than previously required. The inspection and certification costs are mostly offset by the Smog Abatement Fee that exempted vehicle owners must pay. A Smog Check inspection averages $55 and is required every other year in most areas of the State. The Smog Abatement Fee is $25 and paid annually as a part of renewal of vehicle registration, thus two years of the Smog Abatement Fee is roughly equivalent to the average cost of a Smog Check Inspection.

Repair costs can range, but generally cost $750 on average, which could be a significant cost burden. However, financial assistance is available through BAR’s Consumer Assistance Program, which provides up to $1,200 for repair costs. In terms of time to obtain a Smog Check inspection which can vary significantly due to location, many vehicles require regular service throughout the year, and owners may be able to schedule a Smog Check inspection concurrently. Additionally, the potential foregone dollars to the Moyer Program may reduce additional opportunities for emission reductions in districts where the local air district dedicates Moyer Program funds exclusively to disadvantaged communities. CARB staff will continue to explore additional activities or funding opportunities to mitigate these potential disproportionate impacts.

Civil Rights Policy and Discrimination Complaint Process

Under CARB's written Civil Rights Policy and Discrimination Complaint process (Civil Rights Policy), CARB has a policy of nondiscrimination in its programs and activities and implements a process for discrimination complaints filed with CARB, which is available on CARB's website. The Civil Rights Officer coordinates implementation of CARB's nondiscrimination activities, including as the Equal Employment Opportunity (EEO) Officer for employment purposes, and who can be reached at *EEOP@arb.ca.gov*, or (279) 208-7110.[18]

The Civil Rights Policy and Discrimination Complaint Process provides the following information about the nondiscrimination policy and its applicability:

> It is the California Air Resources Board (CARB) policy to provide fair and equal access to the benefits of a program or activity administered by CARB. CARB will not tolerate discrimination against any person(s) seeking to participate in, or receive the benefits of, any program or activity offered or conducted by CARB. Members of the public who believe they were unlawfully denied full and equal access to an CARB program or activity may file a civil rights complaint with CARB under this policy. This non-discrimination policy also applies to people or entities, including contractors, subcontractors, or grantees that CARB utilizes to provide benefits and services to members of the public. [. . .]

As described in the Civil Rights Policy and Discrimination Complaint Process, the Civil Rights Officer coordinates implementation of nondiscrimination activities:

> CARB's Executive Officer will have final authority and responsibility for compliance with this policy. CARB's Civil Rights Officer, on behalf of the Executive Officer, will coordinate this policy's implementation within CARB, including work with the Ombudsman's Office, Office of Communications, and the staff and managers within a program or activity offered by CARB. The Civil Rights Officer coordinates compliance efforts, receives inquiries concerning non-discrimination requirements, and ensures CARB is complying with state and federal reporting and record retention requirements, including those required by Code of Federal Regulations, title 40, section 7.10 et seq.

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[18] CARB. California Air Resources Board and Civil Rights. *https://ww2.arb.ca.gov/california-air-resources-board-and-civil-rights*; Civil Rights Policy and Discrimination Compliant Process. November 1, 2016. *https://ww2.arb.ca.gov/sites/default/files/2023-01/2016-11-03%20CARB%20Civil%20Rights%20Policy%20Revised%20Final.pdf*

The Civil Rights Policy and Discrimination Complaint Process also describes in detail the complaint procedure, as follows:

> A Civil rights complaint may be filed against CARB or other people or entities affiliated with CARB, including contractors, subcontractors, or grantees that CARB utilizes to provide benefits and services to members of the public. The complainant must file his or her complaint within one year of the alleged discrimination. This one-year time limit may be extended up to, but no more than, an additional 90 days if the complainant first obtained knowledge of the facts of the alleged violation after the expiration of the one-year time limit. [. . .]
>
> The Civil Rights Officer will review the facts presented and collected and reach a determination on the merits of the complaint based on a preponderance of the evidence. The Civil Rights Officer will inform the complainant in writing when CARB has reached a determination on the merits of the discrimination complaint. Where the complainant has articulated facts that do not appear discriminatory but warrants further review, the Civil Rights Officer, in his or her discretion, may forward the complaint to a party within CARB for action. The Civil Rights Officer will inform the complainant, either verbally or in writing, before facilitating the transfer. [. . .]
>
> CARB will not tolerate retaliation against a complainant or a participant in the complaint process. Anyone who believes that they have been subject to retaliation in violation of this policy may file a complaint of retaliation with CARB following the procedures outlined in this policy.

There is a Civil Rights Complaint Form available[19] on the webpage, which should be used by members of the public to file a complaint of discrimination against CARB that an individual believes occurred during the administration of its programs and services offered to the public. As described on CARB's webpage, for all complaints submitted, the Civil Rights Officer will review the complaint to determine if there is a prima facie complaint (which means, if all facts alleged were true, would a violation of the applicable policy exist). If the Civil Rights Officer identifies a prima facie complaint in the jurisdiction of the Civil Rights Office, the Civil Rights Office will investigate and determine whether there is a violation of the policy.

The laws and regulations that CARB implements through this policy include:

- Code of Federal Regulations, Title 40 Parts 5 and 7;
- Title VI of the U.S. Civil Rights Act of 1964, as amended;

[19] CARB. Civil Rights Complaint Form. July 2019. *https://ww2.arb.ca.gov/sites/default/files/2023-01/eo_eeo_033_civil_rights_complaints_form.pdf*

- Section 504 of the Rehabilitation Act of 1973;
- Age Discrimination Act of 1975;
- Title IX of the Education Amendments of 1972;
- California Government Code, title 2, Division 3, Part 1, Chapter 2, Article 9.5, *Discrimination*, section 11135 et seq.; and
- California Code of Regulations, title 2, section 10000 et seq.

As part of its overarching civil rights and environmental justice efforts, CARB is in the process of updating its Civil Rights Policy and will make those publicly available once complete. These updates will reflect available U.S. EPA and U.S. Department of Justice resources for Title VI and environmental justice policies. CARB encourages U.S. EPA to issue additional guidance to further clarify Title VI requirements and expectations to assist state implementation efforts.

C. Fiscal Impacts to State Programs

The Measure has some fiscal impacts. Previously exempted vehicles will no longer pay the annual Smog Abatement Fee of $25, but instead pay the biennial Smog Check inspection certification fee of $8.25, which is directed to BAR to fund the Smog Check Program. Of the Smog Abatement fee, $21 is directed to the Air Pollution Control Fund to fund the Moyer Program, which will no longer be collected if the exemption changes. If the Measure is triggered, this will result in fewer funds being directed towards the Air Pollution Control Fund for the Moyer Program, but an increase in certification fees for BAR. For each nonattainment area and standard, CARB staff used the estimated number of vehicles impacted by the change in exemption model year to estimate the fiscal impact of a potential change in exemption if the Measure is triggered. The estimated loss of funding if triggered is detailed for each nonattainment area in Section 5.

The potential loss of funds resulting from the Measure being triggered in an area may result in a loss of funds for the Moyer Program, which could result in fewer Moyer Program projects and fewer opportunities for additional emission reductions. If the Measure is triggered in a nonattainment area, the monetary impacts will be statewide. The Moyer Program funds are collected statewide but allocated to each local air district according to requirements set by H&SC §44299.2. For South Coast Air Basin only, the allocation is based on human population relative to the State as a whole. For the remaining local air districts, funds are allocated based on each local air district's population, air quality, and historical allocation awarded in Fiscal Year (FY) 2002-2003. CARB staff used the statewide average cost effectiveness of Moyer Program projects to estimate the Moyer Program emission reductions impact if the Measure is triggered. Based on CARB staff analysis, the resulting potential foregone emissions reductions from fewer potential projects funded through the Moyer Program will not outweigh the emissions reductions benefit from the Measure. The estimated loss in potential emissions reductions from the Moyer Program is detailed below in each nonattainment area section of this report. The methodology for calculating the impact of the loss of Moyer Program funds can be found in Appendix C.

D. CEQA

CARB staff has determined that the Measure is exempt from CEQA under the "general rule" or "common sense" exemption (14 CCR 15061(b)(3)). The common sense exemption states a project is exempt from CEQA if "the activity is covered by the general rule that CEQA applies only to projects which have the potential for causing a significant effect on the environment. Where it can be seen with certainty that there is no possibility that the activity in question may have a significant effect on the environment, the activity is not subject to CEQA." The Measure addresses contingency measure requirements under the Act and would remove an exemption from a Smog Check inspection for certain model year vehicles only in the event a Triggering Event occurs. The Measure would only go into effect in the area in which it is triggered. The change in exemptions for vehicles required to obtain a Smog Check inspection, only if triggered by an applicable event, would not require new equipment and has no potential to adversely affect air quality or any other environmental resource area. Based on CARB staff's review it can be seen with certainty that there is no possibility that the Measure may result in a significant adverse impact on the environment; therefore, this activity is exempt from CEQA.

CARB staff has also determined that the Measure is categorically exempt from CEQA under the "Class 8" exemption (Cal. Code Regs., tit. 14, § 15308). Class 8 exemptions apply to "actions taken by regulatory agencies, as authorized by state or local ordinance, to assure the maintenance, restoration, enhancement, or protection of the environment where the regulatory process involves procedures for protection of the environment." The proposed Measure is an action by CARB, a regulatory agency, to protect the environment in the event a Triggering Event occurs. The Measure will assure the maintenance and enhancement of the environment by removing exemptions from the Smog Check Program, resulting in additional emissions control equipment failures being identified and corrected, thereby reducing emissions that typically result when emissions control equipment is not performing as designed. CARB staff analysis indicates air emission benefits exceed the disbenefits in each relevant air basin. Therefore, the Smog Check Contingency Measure is also exempt as a Class 8 exemption.

Section 5. Nonattainment Area Analyses

California's nonattainment challenge for ozone and PM2.5 NAAQS in most of the State is driven in part due to motor vehicle emissions. While CARB's regulations require motor vehicles to meet emission standards throughout their useful lives, this is not guaranteed. CARB staff recommends the Board exercise the authority under this statute and find that exempting motor vehicles that are less than 8 years old from the requirements is preventing the State from meeting its commitments under the Act related to complying with the Act's contingency measure requirements. Subjecting vehicles to the Smog Check Program to reduce emissions as a contingency measure when a Triggering Event occurs would help the State meet its contingency measure requirement under the Act. In addition to CARB's actions, each local air district has either included a complementary contingency measure or measures in their SIP or will provide a reasoned justification for why they are unable to provide contingency measures for the full amount of reductions as specified in the draft guidance. Below, for each nonattainment area listed in Table 1, CARB staff is providing the estimate of the one year's worth of progress, estimate of contingency measure reductions, equity impacts, and Moyer Program impacts.

A. Coachella Valley

The Measure complements local air district efforts to meet contingency measure requirements for the 75 ppb and 70 ppb 8-hour ozone standards. The required amount of emission reductions from contingency measures, or one year's worth (OYW) of progress based on the draft guidance, is shown in Table 3.

Table 3. Coachella Valley OYW of Progress
(reductions calculated on summer planning inventory)

Standard	Attainment Year	NOx (tpd)	ROG (tpd)
75 ppb 8-hour Ozone	2031	0.34	0.14
70 ppb 8-hour Ozone	2037	0.17	0.10

Table 4 documents the emission reductions that occur after the attainment year due to implementation of the Measure if triggered.

Table 4. Coachella Valley Potential Reductions from Measure
(reductions calculated on summer planning inventory)

Standard	Attainment Year	NOx Benefits (tpd)	ROG Benefits (tpd)
75 ppb 8-hour Ozone	2031	0.008	0.003
70 ppb 8-hour Ozone	2037	0.008	0.003

Equity Impacts

Table 5 documents the potential impact of the Measure on DACs as identified in *CalEnviroScreen 4.0* in the Coachella Valley. The proportion of vehicles that are registered in DACs and would be impacted if the Measure is triggered is proportional to the general population of all vehicles registered in DACs overall, about 4 percent. There is not expected to be a disproportionate impact on disadvantaged communities should the measure be triggered.

Table 5. Coachella Valley Vehicle Populations

All Vehicles	All Vehicles Population	8MYO Vehicles* (MY 2013)	8MYO Vehicles* (MY 2013) Population
Total Vehicle Population	320,375	Vehicle Population	14,622
Vehicle Population in DACs	15,492	Vehicle Population in DACs	640
Proportion DAC	4.84%	Proportion DAC	4.38%

*MY 2013 Vehicle populations were used to represent 8MYO vehicles.

Carl Moyer Impacts

Should the Measure be triggered in Coachella Valley, the potential funds lost by year is listed below in Table 6. The loss in funding would have statewide impacts as the funds are collected and redistributed to districts based on the formula H&SC § 44299.2. Based on statewide cost effectiveness and historical allocations to each local air district, the estimated loss in potential emission reduction benefits in Coachella Valley if the Measure is triggered is shown in Table 7.

Table 6. Coachella Valley 8 MYO Smog Abatement Fees

Standard	Attainment Year	Potential Dollars
75 ppb 8-hour Ozone	2031	$ 311,468
70 ppb 8-hour Ozone	2037	$ 325,868

Table 7. Coachella Valley Carl Moyer Program Potential Foregone Emissions Reductions

(reductions calculated on annual planning inventory consistent with Moyer Program cost-effectiveness)

Standard	Attainment Year	NOx (tpd)
75 ppb 8-hour Ozone	2031	0.0002
70 ppb 8-hour Ozone	2037	0.0002

B. Eastern Kern County

The Measure complements local air district efforts to meet contingency measure requirements for the 75 ppb and 70 ppb 8-hour ozone standards. The required amount of emission reductions from contingency measures, or OYW of progress based on the draft guidance, is shown in Table 8.

Table 8. Eastern Kern County OYW of Progress

(reductions calculated on summer planning inventory)

Standard	Attainment Year	NOx (tpd)	ROG (tpd)
75 ppb 8-hour Ozone	2026	0.30	0.08
70 ppb 8-hour Ozone	2032	0.26	0.07

Table 9 documents the emission reductions that would occur after the attainment year due to implementation of the Measure if triggered.

Table 9. Eastern Kern County Potential Reductions from Measure
(reductions calculated on summer planning inventory)

Standard	Attainment Year	NOx Benefits (tpd)	ROG Benefits (tpd)
75 ppb 8-hour Ozone	2026	0.003	0.001
70 ppb 8-hour Ozone	2032	0.003	0.001

Equity Impacts

Table 10 documents the potential impact of the Measure on DACs as identified in *CalEnviroScreen 4.0* in Eastern Kern County. The proportion of vehicles that are registered in DACs and would be impacted if the Measure is triggered is proportional to the general population of all vehicles registered in DACs overall, about 4 percent. There is not expected to be a disproportionate impact on disadvantaged communities, should the measure be triggered.

Table 10. Eastern Kern County Vehicle Populations
(vehicle populations calculated from EMFAC2021 Fleet Database)

All Vehicles	All Vehicles Population	8MYO Vehicles* (MY 2013)	8MYO Vehicles* (MY 2013) Population
Total Vehicle Population	86,909	Vehicle Population	4,209
Vehicle Population in DACs	3,640	Vehicle Population in DACs	174
Proportion DAC	4.19%	Proportion DAC	4.12%

*MY 2013 Vehicle populations were used to represent 8MYO vehicles.

Carl Moyer Impacts

Should the Measure be triggered in Eastern Kern County, the potential funds lost statewide by year is listed below in Table 11. Based on statewide cost effectiveness and historical allocations to each local air district, the loss in potential emission reduction benefits in Eastern Kern County if the Measure is triggered is shown in Table 12.

Table 11. Eastern Kern County 8 MYO Smog Abatement Fees

Standard	Attainment Year	Potential Dollars
75 ppb 8-hour Ozone	2026	$ 112,514
70 ppb 8-hour Ozone	2032	$ 116,670

Table 12. Eastern Kern Carl Moyer Program Potential Foregone Emissions Reductions
(reductions calculated on annual planning inventory consistent with Moyer Program cost-effectiveness)

Standard	Attainment Year	NOx (tpd)
75 ppb 8-hour Ozone	2026	0.000003
70 ppb 8-hour Ozone	2032	0.000003

C. Mariposa County

The Measure complements local air district efforts to meet contingency measure requirements for the 70 ppb 8-hour ozone standard. The required amount of emission reductions from contingency measures, or OYW of progress based on the draft guidance, is shown in Table 13.

Table 13. Mariposa County OYW of Progress
(reductions calculated on summer planning inventory)

Standard	Attainment Year	NOx (tpd)	ROG (tpd)
70 ppb 8-hour Ozone	2026	0.02	0.13

Table 14 documents the emission reductions that would occur after the attainment year due to implementation of the Measure if triggered.

Table 14. Mariposa County Potential Reductions from Measure
(reductions calculated on summer planning inventory)

Standard	Attainment Year	NOx Benefits (tpd)	ROG Benefits (tpd)
70 ppb 8-hour Ozone	2026	0.0003	0.0001

Equity Impacts

Per scores in *CalEnviroScreen 4.0*, there are very few vehicles registered in DACs in Mariposa County. There is not expected to be a disproportionate impact on disadvantaged communities should the measure be triggered.

Carl Moyer Impacts

Should the Measure be triggered in Mariposa County, the potential funds lost by year is listed below in Table 15. Based on district allocations of Moyer Program funds per H&SC §44299.2, Mariposa County receives $200,000 regardless of the funding available statewide. Thus, there will be no emissions disbenefit from a decrease in Moyer Funds in Mariposa County if the measure is triggered, shown in Table 16.

Table 15. Mariposa County 8 MYO Smog Abatement Fees

Standard	Attainment Year	Potential Dollars
70 ppb 8-hour Ozone	2026	$ 8,691

Table 16. Mariposa County Carl Moyer Program Potential Foregone Emissions Reductions

(reductions calculated on annual planning inventory consistent with Moyer Program cost-effectiveness)

Standard	Attainment Year	NOx (tpd)
70 ppb 8-hour Ozone	2026	0.000

D. Sacramento Metro Area

The Measure complements the local air districts' efforts to meet contingency measure requirements for the 75 ppb and 70 ppb 8-hour ozone standards. The required amount of emission reductions from contingency measures, or OYW of progress based on the draft guidance, is shown in Table 17.

Table 17. Sacramento Metro OYW of Progress

(reductions calculated on summer planning inventory)

Standard	Attainment Year	NOx (tpd)	ROG (tpd)
75 ppb 8-hour Ozone	2024	2.20	1.78
70 ppb 8-hour Ozone	2032	1.26	0.99

Table 18 documents the emission reductions that occur after the attainment year due to implementation of the Measure if triggered.

Table 18. Sacramento Metro Area Potential Reductions from Measure
(reductions calculated on summer planning inventory)

Standard	Attainment Year	NOx Benefits (tpd)	ROG Benefits (tpd)
75 ppb 8-hour Ozone	2024	0.077	0.037
70 ppb 8-hour Ozone	2032	0.047	0.015

Equity Impacts

Table 19 documents the potential impact of the Measure on DACs as identified in *CalEnviroScreen 4.0* in the Sacramento Metro area. The proportion of vehicles that are registered in DACs and would be impacted if the Measure is triggered is proportional to the general population of all vehicles registered in DACs overall, about 7 percent. There is not expected to be a disproportionate impact on disadvantaged communities should the measure be triggered.

Table 19 Sacramento Metro Area Vehicle Populations
(vehicle populations calculated from EMFAC2021 Fleet Database)

All Vehicles		8 MYO Vehicles (MY 2013)	
Total Vehicle Population	1,766,464	MY13 Vehicle Population	88,163
Vehicle Population in DACs	135,377	MY13 Vehicle Population in DACs	6,387
Proportion DAC	7.66%	Proportion DAC	7.24%

Carl Moyer Impacts

Should the Measure be triggered in the Sacramento Metro Area, the potential funds lost by year is listed below in Table 20. Based on statewide cost effectiveness and historical allocations to each local air district, the loss in potential emission reduction benefits in Sacramento Metro Area if the Measure is triggered is shown in Table 21.

Table 20. Sacramento Metro Area 8 MYO Smog Abatement Fees

Standard	Attainment Year	Potential Dollars
75 ppb 8-hour Ozone	2024	$ 2,554,206
70 ppb 8-hour Ozone	2032	$ 2,020,844

Table 21. Sacramento Metro Area Carl Moyer Program Potential Foregone Emissions Reductions

(reductions calculated on annual planning inventory consistent with Moyer Program cost-effectiveness)

Standard	Attainment Year	NOx (tpd)
75 ppb 8-hour Ozone	2024	0.0009
70 ppb 8-hour Ozone	2032	0.0007

E. San Diego County

The Measure complements local air district efforts to meet contingency measure requirements for the 75 ppb and 70 ppb 8-hour ozone standards. The required amount of emission reductions from contingency measures, or OYW of progress based on the draft guidance, is shown in Table 22.

Table 22. San Diego County OYW of Progress

(reductions calculated on summer planning inventory)

Standard	Attainment Year	NOx (tpd)	ROG (tpd)
75 ppb 8-hour Ozone	2026	2.19	1.97
70 ppb 8-hour Ozone	2032	1.26	0.89

Table 23 documents the emission reductions that occur after the attainment year due to implementation of the Measure if triggered.

Table 23. San Diego County Potential Reductions from Measure
(reductions calculated on summer planning inventory)

Standard	Attainment Year	NOx Benefits (tpd)	ROG Benefits (tpd)
75 ppb 8-hour Ozone	2026	0.065	0.027
70 ppb 8-hour Ozone	2032	0.056	0.016

Equity Impacts

Table 24 documents the potential impact of the Measure on DACs as identified in *CalEnviroScreen 4.0* in San Diego County. The proportion of vehicles that are registered in DACs and would be impacted if the Measure is triggered is proportional to the general population of all vehicles registered in DACs overall, about 5.5 percent. There is not expected to be a disproportionate impact on disadvantaged communities, should the measure be triggered.

Table 24. San Diego County Vehicle Populations
(vehicle populations calculated from EMFAC2021 Fleet Database)

All Vehicles		8 MYO Vehicles (MY 2013)	
Total Vehicle Population	2,360,242	MY13 Vehicle Population	117,373
Vehicle Population in DACs	146,252	MY13 Vehicle Population in DACs	6,433
Proportion DAC	6.20%	Proportion DAC	5.48%

Carl Moyer Impacts

Should the Measure be triggered in San Diego County, the potential funds lost by year is listed below in Table 25. Based on statewide cost effectiveness and historical allocations to each local air district, the loss in potential emission reduction benefits in San Diego County if the Measure is triggered is shown in Table 26.

Table 25. San Diego County 8 MYO Smog Abatement Fees

Standard	Attainment Year	Potential Dollars
75 ppb 8-hour Ozone	2026	$ 2,308,061
70 ppb 8-hour Ozone	2032	$ 2,341,248

Table 26. San Diego County Carl Moyer Program Potential Foregone Emissions Reductions

(reductions calculated on annual planning inventory consistent with Moyer Program cost-effectiveness)

Standard	Attainment Year	NOx (tpd)
75 ppb 8-hour Ozone	2026	0.001
70 ppb 8-hour Ozone	2032	0.001

F. San Joaquin Valley

The Measure complements district efforts to meet contingency measure requirements for the 80 ppb, 75 ppb and 70 ppb 8-hour ozone standards, the 15 ug/m^3 and 12 ug/m^3 annual PM2.5 standards, and the 35 ug/m^3 24-hour PM2.5 standard. On May 18, 2023, specific to PM2.5 standards, the San Joaquin Valley Air Pollution Control District adopted their *PM2.5 Contingency Measure SIP Revision* which was submitted to U.S. EPA by CARB staff. Further, on June 23, 2023, CARB staff committed to submit to U.S. EPA a triggered contingency measure under State authority for the PM2.5 standards. If adopted, the Measure will be submitted to U.S. EPA to fulfill that commitment.

The required amount of emission reductions from contingency measures, or OYW of progress based on the draft guidance, is shown in Table 27 for the 80 ppb, 75 ppb and 70 ppb 8-hour ozone standards.

Table 27. San Joaquin Valley OYW of Progress

(reductions calculated on summer planning inventory)

Standard	Attainment Year	NOx (tpd)	ROG (tpd)
80 ppb 8-hour ozone	2023	7.57	2.40
75 ppb 8-hour Ozone	2031	4.25	1.88
70 ppb 8-hour Ozone	2037	2.35	1.73

Table 28 documents the emission reductions that occur after the attainment year due to implementation of the Measure if triggered.

Table 28. San Joaquin Valley Potential Reductions from Measure
(reductions calculated on summer planning inventory for ozone, annual planning inventory for PM2.5)

Standard	Attainment Year	NOx Benefits (tpd)	ROG Benefits (tpd)
80 ppb 8-hour Ozone	2023	0.112	0.056
15 µg/m³ Annual PM2.5	2023	0.117	0.052
35 µg/m³ 24-hour PM2.5	2024	0.120	0.052
12 µg/m³ Annual PM2.5	2030	0.086	0.027
75 ppb 8-hour Ozone	2031	0.079	0.025
70 ppb 8-hour Ozone	2037	0.076	0.024

Equity Impacts

Table 29 documents the potential impact of the Measure on DACs as identified in *CalEnviroScreen 4.0* in the San Joaquin Valley. The proportion of vehicles that are registered in DACs and would be impacted if the Measure is triggered is proportional to the general population of all vehicles registered in DACs overall, about 28-29 percent, though the percentage of people residing in DACs in San Joaquin Valley is relatively higher compared to other districts. There is not expected to be a disproportionate impact on disadvantaged communities should the measure be triggered.

Table 29. San Joaquin Valley Vehicle Populations
(vehicle populations calculated from EMFAC2021 Fleet Database)

All Vehicles		8 MYO Vehicles (MY 2013)	
Total Vehicle Population	2,493,831	MY13 Vehicle Population	113,744
Vehicle Population in DACs	738,064	MY13 Vehicle Population in DACs	31,906
Proportion DAC	29.60%	Proportion DAC	28.05%

Carl Moyer Impacts

Should the Measure be triggered in San Joaquin Valley, the potential funds lost by year is listed below in Table 30. Based on statewide cost effectiveness and historical allocations to each local air district, the loss in potential emission reduction benefits in the San Joaquin Valley if the Measure is triggered is shown in Table 31.

Table 30. San Joaquin Valley 8 MYO Smog Abatement Fees

Standard	Attainment Year	Potential Dollars[20]
80 ppb 8-hour Ozone	2023	$ 3,781,802
15 µg/m^3 Annual PM2.5	2023	$ 3,781,802
35 µg/m^3 Annual PM2.5	2024	$ 3,880,753
12 µg/m^3 Annual PM2.5	2030	$ 3,171,435
75 ppb 8-hour Ozone	2031	$ 3,167,124
70 ppb 8-hour Ozone	2037	$ 3,300,289

Table 31 San Joaquin Valley Carl Moyer Program Potential Foregone Emissions Reductions

(reductions calculated on annual planning inventory consistent with Moyer Program cost-effectiveness)

Standard	Attainment Year	NOx (tpd)
80 ppb 8-hour Ozone	2023	0.004
15 µg/m^3 Annual PM2.5	2023	0.004
35 µg/m^3 Annual PM2.5	2024	0.004
12 µg/m^3 Annual PM2.5	2030	0.003
75 ppb 8-hour Ozone	2031	0.003
70 ppb 8-hour Ozone	2037	0.003

[20] For years with multiple standards/ triggers in the same year, the loss in smog abatement fees would only be triggered once.

G. South Coast Air Basin

The Measure complements local air district efforts to meet contingency measure requirements for the 75 ppb and 70 ppb 8-hour ozone standards, and the 12 ug/m^3 annual PM2.5 standard. The required amount of emission reductions from contingency measures, or OYW of progress based on the draft guidance, is shown in Table 32 for the 75 ppb and 70 ppb 8-hour ozone standards.

Table 32. South Coast Air Basin OYW of Progress
(reductions calculated on summer planning inventory)

Standard	Attainment Year	NOx (tpd)	ROG (tpd)
75 ppb 8-hour Ozone	2031	4.12	6.38
70 ppb 8-hour Ozone	2037	2.62	3.54

Table 33 documents the emission reductions that occur after the attainment or final RFP milestone year due to implementation of the Measure if triggered.

Table 33. South Coast Air Basin Potential Reductions from Measure
(reductions calculated on summer planning inventory for ozone, annual planning inventory for PM2.5)

Standard	Attainment/RFP Year	NOx Benefits (tpd)	ROG Benefits (tpd)
75 ppb 8-hour Ozone	2029	0.295	0.096
70 ppb 8-hour Ozone	2035	0.254	0.077
12 µg/m^3 Annual PM2.5	2030	0.300	0.093

Equity Impacts

Table 34 documents the potential impact of the Measure on DACs as identified in *CalEnviroScreen 4.0* in the South Coast Air Basin. The proportion of vehicles that are registered in DACs and would be impacted if the Measure is triggered is lower than the proportion of the general population of all vehicles registered in DACs overall, though the percentage of people residing in DACs in the South Coast Air Basin is relatively higher compared to other local air districts. There is not expected to be a disproportionate impact on disadvantaged communities should the measure be triggered.

Table 34. South Coast Vehicle Populations
(vehicle populations calculated from EMFAC2021 Fleet Database)

All Vehicles		8 MYO Vehicles (MY 2013)	
Total Vehicle Population	11,296,609	MY13 Vehicle Population	504,562
Vehicle Population in DACs	3,324,206	MY13 Vehicle Population in DACs	129,225
Proportion DAC	29.43%	Proportion DAC	25.61%

Carl Moyer Impacts

Should the measure be triggered in the South Coast Air Basin, the potential funds lost by year is listed below in Table 35. Based on statewide cost effectiveness and historical allocations to each local air district, the loss in potential emission reduction benefits in the South Coast Air Basin if the Measure is triggered is shown in Table 36.

Table 35. South Coast 8 MYO Smog Abatement Fees

Standard	Attainment/RFP Year	Potential Dollars
75 ppb 8-hour Ozone	2029	$ 11,273,782
70 ppb 8-hour Ozone	2035	$ 11,195,217
12 µg/m³ Annual PM2.5	2030	$ 11,122,871

Table 36. South Coast Carl Moyer Program Potential Foregone Emissions Reductions
(reductions calculated on annual planning inventory consistent with Moyer Program cost-effectiveness)

Standard	Attainment/RFP Year	NOx (tpd)
75 ppb 8-hour Ozone	2029	0.024
70 ppb 8-hour Ozone	2035	0.024
12 µg/m³ Annual PM2.5	2030	0.024

H. Ventura County

The Measure complements local air district efforts to meet contingency measure requirements for the 70 ppb 8-hour ozone standard. The required amount of emission reductions from contingency measures, or OYW of progress based on the draft guidance, is shown in Table 37.

Table 37. Ventura County OYW of Progress
(reductions calculated on summer planning inventory)

Standard	Attainment Year	NOx (tpd)	ROG (tpd)
70 ppb 8-hour Ozone	2026	0.48	0.20

Table 38 documents the emission reductions that occur after the attainment year due to implementation of the Measure if triggered.

Table 38. Ventura County Potential Reductions from Measure
(reductions calculated on summer planning inventory)

Standard	Attainment Year	NOx Benefits (tpd)	ROG Benefits (tpd)
70 ppb 8-hour Ozone	2026	0.013	0.005

Equity Impacts

Table 39 documents the potential impact of the Measure on DACs as identified in *CalEnviroScreen 4.0* in Ventura County. The proportion of vehicles that are registered in DACs and would be impacted if the Measure is triggered is proportional to the general population of all vehicles registered in DACs overall, about 3 percent. There is not expected to be a disproportionate impact on disadvantaged communities, should the measure be triggered.

Table 39. Ventura County Vehicle Populations
(vehicle populations calculated from EMFAC2021 Fleet Database)

All Vehicles		8 MYO Vehicles (MY 2013)	
Total Vehicle Population	661,147	MY13 Vehicle Population	29,970
Vehicle Population in DACs	22,466	MY13 Vehicle Population in DACs	899
Proportion DAC	3.40%	Proportion DAC	3.00%

Carl Moyer Impacts

Should the Measure be triggered in Ventura County, the potential funds lost by year is listed below in Table 40. Based on statewide cost effectiveness and historical allocations to each local air district, the loss in potential emission reduction benefits in Ventura County if the Measure is triggered is shown in Table 41.

Table 40. Ventura County 8 MYO Smog Abatement Fees

Standard	Attainment Year	Potential Dollars
70 ppb 8-hour Ozone	2026	$ 459,328

Table 41. Ventura County Carl Moyer Program Potential Foregone Emissions Reductions
(reductions calculated on annual planning inventory consistent with Moyer Program cost-effectiveness)

Standard	Attainment Year	NOx (tpd)
70 ppb 8-hour Ozone	2026	0.00008

I. West Mojave Desert

The Measure complements local air districts efforts to meet contingency measure requirements for the 75 ppb and 70 ppb 8-hour ozone standards. The required amount of emission reductions from contingency measures, or OYW of progress based on the draft guidance, is shown in Table 42.

Table 42. West Mojave Desert OYW of Progress
(reductions calculated on summer planning inventory)

Standard	Attainment Year	NOx (tpd)	ROG (tpd)
75 ppb 8-hour Ozone	2026	1.50	0.39
70 ppb 8-hour Ozone	2032	1.18	0.35

Table 43 documents the emission reductions that occur after the attainment year due to implementation of the Measure if triggered.

Table 43. West Mojave Desert Potential Reductions from Measure
(reductions calculated on summer planning inventory)

Standard	Attainment Year	NOx Benefits (tpd)	ROG Benefits (tpd)
75 ppb 8-hour Ozone	2026	0.021	0.009
70 ppb 8-hour Ozone	2032	0.018	0.006

Equity Impacts

Table 44 documents the potential impact of the Measure on DACs as identified in *CalEnviroScreen 4.0* in the West Mojave Desert. The proportion of vehicles that are registered in DACs and would be impacted if the Measure is triggered is proportional to the general population of all vehicles registered in DACs overall, about 8.5 percent. There is not expected to be a disproportionate impact on disadvantaged communities, should the measure be triggered.

Table 44. West Mojave Desert Vehicle Populations
(vehicle populations calculated from EMFAC2021 Fleet Database)

All Vehicles		8 MYO Vehicles (MY 2013)	
Total Vehicle Population	665,512	MY13 Vehicle Population	23,721
Vehicle Population in DACs	56,624	MY13 Vehicle Population in DACs	2,047
Proportion DAC	8.5%	Proportion DAC	8.6%

Carl Moyer Impacts

Should the measure be triggered in West Mojave Desert, the potential funds lost by year is listed below in Table 45. Based on statewide cost effectiveness and historical allocations to each local air district, the loss in potential emission reduction benefits in West Mojave Desert if the Measure is triggered is shown in Table 46.

Table 45. West Mojave Desert 8 MYO Smog Abatement Fees

Standard	Attainment Year	Potential Dollars
75 ppb 8-hour Ozone	2026	$ 746,890
70 ppb 8-hour Ozone	2032	$ 752,076

Table 46. West Mojave Desert Carl Moyer Program Potential Foregone Emissions Reductions

(reductions calculated on annual planning inventory consistent with Moyer Program cost-effectiveness)

Standard	Attainment Year	NOx (tpd)
75 ppb 8-hour Ozone	2026	0.00006
70 ppb 8-hour Ozone	2032	0.00006

J. Western Nevada County

The Measure complements local air district efforts to meet contingency measure requirements for the 70 ppb 8-hour ozone standard. The required amount of emission reductions from contingency measures, or OYW of progress based on the draft guidance, is shown in Table 47.

Table 47. Western Nevada County OYW of Progress

(reductions calculated on summer planning inventory)

Standard	Attainment Year	NOx (tpd)	ROG (tpd)
70 ppb 8-hour Ozone	2026	0.09	0.08

Table 48 documents the emission reductions that occur after the attainment year due to implementation of the Measure if triggered.

Table 48. Western Nevada County Potential Reductions from Measure
(reductions calculated on summer planning inventory)

Standard	Attainment Year	NOx Benefits (tpd)	ROG Benefits (tpd)
70 ppb 8-hour Ozone	2026	0.002	0.001

Equity Impacts

Per scores in *CalEnviroScreen 4.0*, there is only one vehicle registered in a DAC within the Western Nevada County nonattainment area. There is not expected to be a disproportionate impact on disadvantaged communities, should the measure be triggered.

Carl Moyer Impacts

Should the Measure be triggered in Western Nevada County, the potential funds lost by year is listed below in Table 49. Based on district allocations of Moyer Program funds per H&SC §44299.2, Northern Sierra Air Quality Management District, the local air district for Western Nevada County, receives $200,000 regardless of the funding available statewide. Thus, there will be no emissions disbenefit from a decrease in Moyer Funds in Western Nevada County if the measure is triggered, shown in Table 50.

Table 49. Western Nevada County 8 MYO Smog Abatement Fees

Standard	Attainment Year	Potential Dollars
70 ppb 8-hour Ozone	2026	$ 79,262

Table 50. Western Nevada County Carl Moyer Program Potential Foregone Emissions Reductions
(reductions calculated on annual planning inventory consistent with Moyer Program cost-effectiveness)

Standard	Attainment Year	NOx Benefits (tpd)
70 ppb 8-hour Ozone	2026	0.000

Section 6. Staff Recommendation

CARB staff recommends the Board:

1. Adopt the Measure addressing contingency measure requirements for the applicable nonattainment areas and standards as listed in Table 1;

2. Approve submittal into the California SIP of H&SC sections 44011(a)(4)(A) and (B); and

3. Direct the Executive Officer to submit the Measure, and H&SC sections 44011(a)(4)(A) and (B), to U.S. EPA as a revision to the California SIP.

Appendix A:
Infeasibility Analysis

Infeasibility Analysis

Measure Analysis

CARB staff analyzed CARB's suite of control measures for all sources under CARB authority to identify potential contingency measure options. CARB control measures reduce NOx, ROG and PM2.5 emissions. CARB currently has programs in place or under development for most of these sources and have evaluated a variety of regulatory mechanisms within existing and new programs for potential contingency triggers.

Criteria for Contingency Feasibility

CARB staff has evaluated potential options for a contingency measure within each of CARB's regulations (Table 51) using three criteria to determine its feasibility given the contingency measure requirements under the Act, recent court decisions and draft guidance. First, each measure was evaluated on whether it could be implemented within 30 days of being triggered and achieve the necessary reductions within 1-2 years of being triggered. Second, the technological feasibility of each option was considered to assess whether the measure would be technically feasible to implement. Measure requirements may be unavailable or cost prohibitive to implement, especially in the time frame required for contingency. Lastly, CARB staff evaluated whether the timeline for adoption would be compatible with the current consent decree deadline of September 30, 2024[21]. The contingency measure must be adopted by CARB and submitted to and fully approved by U.S. EPA by this date to resolve a San Joaquin Valley PM2.5 Federal Implementation Plan (FIP) published by U.S. EPA on August 7, 2023. A CARB statewide measure needing a full regulatory process typically requires five years for development and adoption by CARB and additional time for U.S. EPA's approval process including obtaining an Act waiver or authorization.

Challenges for CARB Measures

Based on CARB's feasibility analysis, there are a few common components of CARB regulations that limit the options for contingency measures. All new engine and emissions standards set by CARB require waivers or authorizations from federal preemption under the Clean Air Act; this process can take anywhere from months to several years, and then U.S. EPA must also act to approve the regulation into the California SIP. Further, CARB regulations that require fleet turnover or new engine standards require a long lead time for implementation. Engine manufacturers would need lead time to design, plan, certify, manufacture, and deploy cleaner engines to meet a new or accelerated engine standard, while fleet regulations necessitate that manufacturing is mature so that there is enough supply available to meet that demand. On the consumer side, additional time would be required for procurement implementation and there may be additional infrastructure

[21] See 87 Fed.Reg. 71631 (Nov. 23, 2022).

needed to meet new requirements. Thus, measures that require fleet turnover or new engine standards are not appropriate to be used as a triggered contingency measure.

CARB regulations are also technology-forcing, which makes it difficult to amend regulations or pull compliance timelines forward with only 1-2 years notice as industry needs time to plan, develop, and implement these new technologies. It would be infeasible to require industry to turn over their fleets within one year if the technology is not readily available at a reasonable cost. CARB regulations are also the most stringent air quality control requirements in the country, so there are few opportunities to require additional stringency. CARB is driving sources under our authority to zero-emission everywhere feasible to ensure attainment of air quality standards across the State, and to support near-source toxics reductions and climate targets. However, the zero-emissions targets also eliminates opportunities for contingency.

Lastly, many of CARB's options for a contingency measure would require a full rulemaking process and would not be adopted by CARB, received an Act waiver/authorization, and approved by U.S. EPA within the timeframe specified, making many of the options infeasible. Based on the U.S. EPA FIP timeline, CARB staff would need to find a measure that could realistically be adopted and approved by U.S. EPA within the next year. However, most CARB measures must go through a regulatory process for adoption that can take approximately five years from start to finish.

Table 51. Assessment of Potential CARB Contingency Measures

Emission Source	Regulatory Programs	Latest Amendment Requirements	Contingency Options	Trigger Feasibility	Technological Feasibility
Light-Duty Passenger Vehicles and Light-Duty Trucks	Advanced Clean Cars Program (I and II), including the Zero Emission Vehicle (ZEV) Regulation	Amended 8/25/22 Requires 100% ZEV new vehicle sales by 2035 and increasingly stringent standards for gasoline cars and passenger trucks.	Pulling compliance timelines forward. Setting more stringent standards.	No; standards need years of lead time to be developed, certified, and implemented; infeasible to implement new standard or manufacturing requirements within 60 days and achieve reductions within one year.	No; current standards and requirements are technology forcing and most stringent in the nation, including a zero-emission requirement. Further stringency would not be feasible.
	Clean Miles Standard	Adopted 5/20/21 Set eVMT (electric miles traveled) and greenhouse gas (GHG) requirements for Transportation Network Companies (TNCs).	Pulling forward timeline to achieve 100% eVMT.	No; standards and fleet requirements need lead time to be implemented; infeasible to implement new standard or purchasing requirements within 60 days and achieve reductions within one year.	No; zero-emissions technology requirement is most stringent standard; TNCs are only a small portion of on-road vehicles, depending on area, may not achieve many reductions.

Emission Source	Regulatory Programs	Latest Amendment Requirements	Contingency Options	Trigger Feasibility	Technological Feasibility
	On Board Diagnostics II (OBD)	Amended July 22, 2021 Required updates to program to address cold start emissions and diesel particulate matter (PM) monitoring. Many of the regulatory changes included phase-ins that are not 100% until 2027.	Removing or pulling phase-in timelines forward. Setting more stringent OBD requirements.	No; OBD requirements need significant lead time to be developed, adopted, and implemented; infeasible to fully implement new requirements within 60 days and achieve similar reductions within one year.	No; the OBD requirements require sufficient lead time to implement with significant development time needed for hardware/ software changes and verification/validation testing.
	California Smog Check Program	Amended 2010 via legislation Smog Check Program enhancements, including new technologies and test methods.	Change the exemptions from 8 to 7 and/or 6 model years. Require annual Smog Check. Require annual Smog Check for only high mileage vehicles.	Yes (changing the exemptions) because it is not a regulatory change; No (other options); Smog Check requirements need significant lead time to be developed, adopted, and implemented; infeasible to fully implement new requirements within 60 days and achieve similar reductions within one year.	Yes (changing the exemptions) and would not have disproportionate impacts; Yes (other options), but would disproportionately impact low-income populations and disadvantaged communities.
	Reformulated Gasoline	Amended May 2003 Required removal of methyl tert-butyl ether (MTBE) and included refinery limits and cap limits.	Require more stringent standards. Change cap limits and refinery limits.	No; fuel standards need years of lead time to be developed, certified, and implemented; infeasible to implement new standard within 60 days and achieve reductions within one year.	No; current standards and requirements are some of most stringent in the world; not feasible to require further stringency of specifications and develop or manufacture in a compressed timeline.
Motorcycles	On-Road Motorcycle Regulation*	Proposed hearing: 2023 May require exhaust emissions standards (harmonize with European standards), evaporative emissions standards, and Zero Emission Motorcycle sales thresholds.	Pulling compliance timelines forward. Require more stringent emissions standards.	No; standards need years of lead time to be developed, certified, and implemented; infeasible to implement new standard within 60 days and achieve reductions within one year.	No; Any increase to the stringency of proposed standards would require an additional 1 to 2 years of lead time for 1) CARB staff to evaluate feasibility, and 2) manufacturers to develop and certify compliant motorcycles.

Emission Source	Regulatory Programs	Latest Amendment Requirements	Contingency Options	Trigger Feasibility	Technological Feasibility
Medium Duty-Trucks	Clean Diesel Fuel	Amended 2013 Established more stringent standards for diesel fuel.	Require more stringent fuel standard.	No; fuel standards need years of lead time to be developed, certified, and implemented; infeasible to implement new standard within 60 days and achieve reductions within one year.	No; infeasible to require more stringent standards in compressed timeline.
	Heavy-Duty Engine and Vehicle Omnibus Regulation	Adopted 8/27/20 Established new low NOx and lower PM tailpipe standards and lengthened the useful life and emissions warranty of in-use heavy-duty diesel engines.	Require more stringent standard, make optional idling standard required. Update testing requirements or corrective action procedures.	No; standards need years of lead time to be implemented; infeasible to implement new sales requirement within 60 days and achieve reductions within one year.	No; infeasible to require more stringent standards in compressed timeline.
	Advanced Clean Trucks Regulation	Adopted 6/25/20 Established manufacturer zero-emission truck sales requirement and company and fleet reporting.	Move up timeline for ZEV sales requirement. Reduce threshold for compliance.	No; manufacturer sales requirements need years of lead time to be implemented; infeasible to implement new sales requirement within 60 days. Sales requirement would not happen immediately or within one year of trigger; infeasible to achieve reductions within one year.	No; current sales requirement is technology forcing and most stringent in the nation.
	Advanced Clean Cars Program (I and II), including the Zero Emission Vehicle Regulation	Amended 8/25/22 Requires 100% ZEV new vehicle sales by 2035 and increasingly stringent standards for gasoline cars and passenger trucks.	Pulling compliance timelines forward. Setting more stringent standards.	No; standards need years of lead time to be developed, certified, and implemented; infeasible to implement new standard or manufacturing requirements within 60 days and achieve reductions within one year.	No; current standards and requirements are technology forcing and most stringent in the nation, including a zero-emission requirement. Further stringency would not be feasible.

Emission Source	Regulatory Programs	Latest Amendment Requirements	Contingency Options	Trigger Feasibility	Technological Feasibility
	Advanced Clean Fleets Regulation	Adopted 4/27/23 Establishes zero-emission purchasing requirements for medium- and heavy-duty vehicle fleets (including state and local agencies, and drayage fleets, high priority, and federal fleets); would also require 100% zero-emission new vehicle sales starting 2040.	Pulling compliance timelines forward. Reduce threshold for compliance.	No; fleet requirements need years of lead time to be implemented; infeasible to implement new purchasing requirements within 60 days. Purchasing requirement and turnover would not happen immediately; infeasible to achieve reductions within one year. Because of near term compliance deadlines, moving forward deadlines would not result in many reductions.	No; current fleet requirements are technology forcing and most stringent in the nation, eventually requiring zero-emissions only.
Heavy-Duty Trucks	Heavy-Duty Low NOx Engine Standards	See Omnibus.	More stringent standards were set with Omnibus Regulation.	No; engine standards need years of lead time to be developed, certified, and implemented; infeasible to implement new standard or purchasing requirements within 60 days and achieve reductions within one year.	No; infeasible to require more stringent technology forcing standards in compressed timeline if technology/ alternatives are not widely available.
	Optional Low-NOx Standards for Heavy-Duty Diesel Engines	Amended 8/27/20 as a part of Omnibus to lower the optional low NOx emission standards for on-road heavy-duty engines.	Make option required.	No; engine standards need years of lead time to be developed, certified, and implemented; infeasible to implement new standard or purchasing requirements within 60 days and achieve reductions within one year.	No; infeasible to require more stringent technology forcing standards in compressed timeline if technology/ alternatives are not widely available.
	Heavy-Duty Inspection and Maintenance Regulation	Adopted 12/9/21 Requires periodic vehicle emissions testing and reporting on nearly all heavy-duty vehicles operating in California.	Increase frequency of testing.	No; increased I/M requirements need significant lead time to be developed, adopted, and implemented; infeasible to fully implement new requirements within 60 days and achieve similar reductions within one year.	Yes, but costs would disproportionally impact small businesses and low-income populations.

Emission Source	**Regulatory Programs**	**Latest Amendment Requirements**	**Contingency Options**	**Trigger Feasibility**	**Technological Feasibility**
	Heavy-Duty OBD	Amended July 22, 2021 Required updates to program to address cold start emissions and diesel PM monitoring. Many of the regulatory changes included phase-ins that are not 100% until 2027.	Removing or pulling phase-in timelines forward. Setting more stringent OBD requirements.	No; OBD requirements need significant lead time to be developed, adopted, and implemented; infeasible to fully implement new requirements within 60 days and achieve similar reductions within one year.	No; the OBD requirements require sufficient lead time to implement with significant development time needed for hardware/ software changes and verification/validation testing.
	Heavy-Duty Engine and Vehicle Omnibus Regulation	Adopted 8/27/20 Established new low NOx and lower PM Standards and lengthened the useful life and emissions warranty of in-use heavy-duty diesel engines.	Require more stringent standard, make optional idling standard required. Update testing requirements or corrective action procedures.	No; standards need years of lead time to be developed, certified, and implemented; infeasible to implement new standard or sales requirements within 60 days and achieve reductions within one year.	No; infeasible to require more stringent technology forcing standards in compressed timeline.
	Cleaner In-Use Heavy-Duty Trucks (Truck and Bus Regulation)	Adopted 12/17/10 Requires heavy-duty diesel vehicles that operate in California to reduce exhaust emissions. By January 1, 2023, nearly all trucks and buses will be required to have 2010 or newer model year engines to reduce PM and NOx.	None	-	-
	Zero-Emission Powertrain Certification Regulation	Adopted 12/6/19 Establishes certification requirements for zero-emission powertrains.	None	-	-

Emission Source	**Regulatory Programs**	**Latest Amendment Requirements**	**Contingency Options**	**Trigger Feasibility**	**Technological Feasibility**
	Advanced Clean Trucks Regulation	Adopted 6/25/20 Established manufacturer zero-emission truck sales requirement and company and fleet reporting.	Move up timeline for ZEV sales requirement. Reduce threshold for compliance.	No; manufacturer sales requirements need years of lead time to be implemented; infeasible to implement new sales requirement within 60 days. Sales requirement would not happen immediately or within one year of trigger; infeasible to achieve reductions within one year.	No; current sales requirement is technology forcing and most stringent in the nation.
	Advanced Clean Fleets Regulation	Adopted 4/27/23 Establishes zero-emission purchasing requirements for medium- and heavy-duty vehicle fleets (including state and local agencies, and drayage fleets, high priority, and federal fleets); would also require 100% zero-emission new vehicle sales starting 2040.	Pulling compliance timelines forward. Reduce threshold for compliance.	No; fleet requirements need years of lead time to be implemented; infeasible to implement new purchasing requirements within 60 days. Purchasing requirement and turnover would not happen immediately; infeasible to achieve reductions within one year. Because of near term compliance deadlines, moving forward deadlines would not result in many reductions.	No; current fleet requirements are technology forcing and most stringent in the nation, eventually requiring zero-emissions only.
Heavy-Duty Urban Buses	Innovative Clean Transit	Adopted 12/14/2018 Requires all public transit agencies to gradually transition to a 100% zero-emission bus fleet.	Move compliance timelines forward. Remove various exemptions or compliance options.	No; fleet requirements need years of lead time to be implemented; infeasible to implement new purchasing requirements within 60 days. Purchasing requirement and turnover would not happen immediately; infeasible to achieve reductions within one year.	No; current requirements are technology forcing and most stringent (zero-emission requirement). Further stringency is not possible; expediting timelines would not be feasible.

Emission Source	Regulatory Programs	Latest Amendment Requirements	Contingency Options	Trigger Feasibility	Technological Feasibility
	Advanced Clean Fleets Regulation	Adopted 4/27/23 Establishes zero-emission purchasing requirements for medium- and heavy-duty vehicle fleets (including state and local agencies, and drayage fleets, high priority, and federal fleets); would also require 100% zero-emission new vehicle sales starting 2040.	Pulling compliance timelines forward. Reduce threshold for compliance.	No; fleet requirements need years of lead time to be implemented; infeasible to implement new purchasing requirements within 60 days. Purchasing requirement and turnover would not happen immediately; infeasible to achieve reductions within one year. Because of near term compliance deadlines, moving forward deadlines would not result in many reductions.	No; current fleet requirements are technology forcing and most stringent in the nation, eventually requiring zero-emissions only.
Other Buses, Other Buses – Motor Coach	Zero-Emission Airport Shuttle Regulation	Adopted 6/27/19 Requires airport shuttles to transition to zero-emission fleet.	Pull compliance timelines forward. Remove reserve airport shuttle exemption.	No; fleet requirements need years of lead time to be implemented; infeasible to implement new purchasing requirements within 60 days. Purchasing requirement and turnover would not happen immediately; infeasible to achieve reductions within one year.	No; current requirements are technology forcing and most stringent (zero-emission requirement). Further stringency is not possible. Not many shuttles in area, would not achieve many reductions.
	Advanced Clean Fleets Regulation	Adopted 4/27/23 Establishes zero-emission purchasing requirements for medium- and heavy-duty vehicle fleets (including state and local agencies, and drayage fleets, high priority, and federal fleets); would also require 100% zero-emission new vehicle sales starting 2040.	Pulling compliance timelines forward. Reduce threshold for compliance.	No; fleet requirements need years of lead time to be implemented; infeasible to implement new purchasing requirements within 60 days. Purchasing requirement and turnover would not happen immediately; infeasible to achieve reductions within one year. Because of near term compliance deadlines, moving forward deadlines would not result in many reductions.	No; current fleet requirements are technology forcing and most stringent in the nation, eventually requiring zero-emissions only.

Emission Source	Regulatory Programs	Latest Amendment Requirements	Contingency Options	Trigger Feasibility	Technological Feasibility
Commercial Harbor Craft	Commercial Harbor Craft (CHC) Regulation	Amended 3/24/22 Established more stringent standards, all CHC required to use renewable diesel, expanded requirements, and mandates zero-emission and advanced technologies.	Set more stringent standards. Pull compliance timelines forward.	No; Technology requirements and standards need years of lead time to be developed, certified, and implemented; infeasible to implement new standard or requirements within 60 days and achieve reductions within one year.	No; standards set are technology forcing and most stringent; not technologically feasible to require increased stringency in compressed timeline.
Recreational Boats	Spark-Ignition Marine Engine Standards*	Proposed hearing: 2029 Would establish catalyst-based emission standards and percentage of zero-emission technologies for certain applications.	Set more stringent standard.	No; standards need years of lead time to be developed, certified, and implemented; infeasible to implement new standard within 60 days and achieve reductions within one year.	No; standards being set will be most stringent feasible, including zero-emission requirement); would not save a more stringent standard for contingency
Transport Refrigeration Units	Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units (TRUs) (Parts I and II*)	Amended 2/24/22 (Part I), Part II proposed CARB hearing in 2025 Requires diesel-powered truck TRUs to transition to zero-emission, PM emission standard for newly manufactured non-truck TRUs. Part II would establish zero-emission options for non-truck TRUs.	Set more stringent standards. Pull compliance timelines forward	No; standards and fleet requirements need years of lead time to be implemented; infeasible to implement new standard or purchasing requirements within 60 days and achieve reductions within one year.	No; current requirements are technology forcing and most stringent (zero-emission requirement). Further stringency is not possible; expediting timelines would not be feasible; would not save a more stringent standard for contingency
Industrial Equipment	Large Spark-Ignition (LSI) Engine Fleet Requirements Regulation	Amended July 2016 Extended recordkeeping requirements, established labeling, initial reporting, and annual reporting requirements.	Set more stringent performance standards	No; standards and fleet requirements need years of lead time to be implemented; infeasible to implement new standard or purchasing requirements within 60 days and achieve reductions within one year.	No; Infeasible to require further stringency within one year given timeline for technology development and certification. See Zero-Emission Forklifts below.

Emission Source	**Regulatory Programs**	**Latest Amendment Requirements**	**Contingency Options**	**Trigger Feasibility**	**Technological Feasibility**
	Off-Road Regulation	Amended 11/17/22 Requires phase out of oldest and highest-emitting engines, restricts addition of Tier 3 and 4i engines, mandates renewable diesel for all fleets.	Pull phase-out or compliance timelines forward	No; fleet requirements need years of lead time to be implemented; infeasible to implement new purchasing and turnover requirements within 60 days and achieve reductions within one year.	No; Infeasible to require further stringency within one year given timeline for technology development and certification.
	Zero-Emission Forklifts*	Proposed CARB hearing in 2023. Would require model-year phase-out and reporting requirements and manufacturer sales restrictions.	Pull phase-out or compliance timelines forward	No; standards requirements need years of lead time to be developed, certified, and implemented; infeasible to implement new standard within 60 days and achieve reductions within one year.	No; standards being set will be technology forcing and most stringent feasible, including zero-emission requirement; would not save a more stringent standard for contingency
	Off-Road Zero-Emission Targeted Manufacturer Rule*	Proposed CARB hearing in 2027. Would require manufacturers of off-road equipment and/or engines to produce for sale zero-emission equipment and/or powertrains as a percentage of their annual statewide sales volume.	Pull forward compliance timelines or increase percentage sales requirements	No; Manufacturing and sales requirements need years of lead time to be implemented; infeasible to pull forward standards within 60 days and achieve reductions within one year.	No; standards being set will be technology forcing and most stringent feasible, including zero-emission requirement; would not save a more stringent standard for contingency
Construction and Mining	Off-Road Zero-Emission Targeted Manufacturer Rule*	Proposed CARB hearing in 2027. Would require manufacturers of off-road equipment and/or engines to produce for sale zero-emission equipment and/or powertrains as a percentage of their annual statewide sales volume.	Pull forward compliance timelines or increase percentage sales requirements	No; Manufacturing and sales requirements need years of lead time to be implemented; infeasible to pull forward standards within 60 days and achieve reductions within one year.	No; standards being set will be technology forcing and most stringent feasible, including zero-emission requirement; would not save a more stringent standard for contingency

Emission Source	**Regulatory Programs**	**Latest Amendment Requirements**	**Contingency Options**	**Trigger Feasibility**	**Technological Feasibility**
	Off-Road Regulation	Amended 11/17/22 Requires phase out of oldest and highest-emitting engines, restricts addition of Tier 3 and 4i engines, mandates renewable diesel for all fleets.	Pull phase-out or compliance timelines forward	No; fleet requirements need years of lead time to be implemented; infeasible to implement new purchasing and turnover requirements within 60 days and achieve reductions within one year.	No; Infeasible to require further stringency within one year given timeline for technology development and certification.
Airport Ground Support Equipment	Zero-Emission Forklifts*	Proposed CARB hearing in 2023. Would require model-year phase-out and reporting requirements and manufacturer sales restrictions.	Pull phase-out or compliance timelines forward	No; standards requirements need years of lead time to be developed, certified, and implemented; infeasible to implement new standard within 60 days and achieve reductions within one year.	No; standards being set will be technology forcing and most stringent feasible, including zero-emission requirement; would not save a more stringent standard for contingency
	Large Spark-Ignition (LSI) Engine Fleet Requirements Regulation	Amended July 2016 Extended recordkeeping requirements, established labeling, initial reporting, and annual reporting requirements.	Set more stringent performance standards	No; standards and fleet requirements need years of lead time to be implemented; infeasible to implement new standard or purchasing requirements within 60 days and achieve reductions within one year.	No; Infeasible to require further stringency within one year given timeline for technology development and certification.
	Off-Road Regulation	Amended 11/17/22. Requires phase out of oldest and highest-emitting engines, restricts addition of Tier 3 and 4i engines, mandates renewable diesel for all fleets.	Pull phase-out or compliance timelines forward	No; fleet requirements need years of lead time to be implemented; infeasible to implement new purchasing and turnover requirements within 60 days and achieve reductions within one year.	No; Infeasible to require further stringency within one year given timeline for technology development and certification.

Emission Source	**Regulatory Programs**	**Latest Amendment Requirements**	**Contingency Options**	**Trigger Feasibility**	**Technological Feasibility**
Port Operations and Rail Operations	Cargo Handling Equipment Regulation*	Proposed CARB hearing in 2025. Amendments to transition to zero-emission technology.	None	No; Standards requirements need years of lead time to be developed, certified, and implemented; infeasible to implement new standard within 60 days and achieve reductions within one year. Fully implemented in 2017 and relies on other engine standards, making it infeasible to trigger without regulatory process changing other standards.	No; Considering regulation to move towards zero-emissions. Currently assessing availability of technologies.
	Off-Road Zero-Emission Targeted Manufacturer Rule*	Proposed CARB hearing in 2027. Would require manufacturers of off-road equipment and/or engines to produce for sale zero-emission equipment and/or powertrains as a percentage of their annual statewide sales volume.	Pull forward compliance timelines or increase percentage sales requirements	No; Manufacturing and sales requirements need years of lead time to be implemented; infeasible to pull forward standards within 60 days and achieve reductions within one year.	No; standards being set will be technology forcing and most stringent feasible, including zero-emission requirement; would not save a more stringent standard for contingency
Lawn and Garden	Small Off-Road Engine (SORE) Regulation	Amended 12/9/21 Requires most newly manufactured SORE to meet emission standards of zero starting in model year (MY) 2024.	Move up implementation deadlines	No; Standards requirements need years of lead time to be implemented; infeasible to pull forward standards within 60 days. Purchasing would not happen immediately or within one year of trigger; infeasible to achieve reductions within one year.	No; current standards and requirements are a technology forcing zero-emission certification requirement. Further stringency would not be possible.

Emission Source	Regulatory Programs	Latest Amendment Requirements	Contingency Options	Trigger Feasibility	Technological Feasibility
Ocean-Going Vessels	At Berth Regulation	Amended 8/27/20 Expands requirements to roll-on roll-off vessels and tankers, smaller fleets, and new ports and terminals.	Remove option to use alternate control technology or set more stringent alternate control technology requirements. Reduce threshold for 'low activity terminals' exemption.	No; control technology requirements need years of lead time to be implemented; infeasible to pull forward standards within 60 days and achieve reductions within one year.	No; regulation already requires use of shore power or alternate control technology for every visit.
	Ocean-going Vessel Fuel Regulation	Amended 2011 Extended clean fuel zone and included exemption window.	Set more stringent requirements	No; fleet requirements need years of lead time to be implemented; infeasible to implement new purchasing and turnover requirements within 60 days and achieve reductions within one year.	No; not feasible to require further stringency in a compressed timeline.
Locomotives	In-Use Locomotive Regulation	Adopted 4/27/23, Requires each operator to deposit funds into spending account for purchasing cleaner locomotive technology, sets idling limits, and requires registration and reporting. Starting in 2030, only locomotives less than 23 years old can operate in the state. Newly built passenger, switch, and industrial locomotives must operate in a zero emission configuration, and in 2035 newly built freight line haul locomotives.	Move up implementation deadlines. Set stricter idling requirements.	No; Fleet requirements need years of lead time to be implemented; infeasible to pull forward standards within 60 days and reductions within one year. No, for idling requirements.	No; current standards and requirements are technology forcing, include a zero-emission requirement. Further stringency would not be possible. No, for idling requirements, CARB is committing to re-evaluate the requirement during next assessment.

Emission Source	Regulatory Programs	Latest Amendment Requirements	Contingency Options	Trigger Feasibility	Technological Feasibility
Areawide Sources	Zero-Emission Standard for Space and Water Heaters	Proposed CARB hearing in 2025. Beginning in 2030, 100% of sales of new space heaters and water heaters would need to meet a zero-emission standard.	Set trigger for more stringent standards or timelines.	No; Standards requirements need years of lead time to be implemented; infeasible to pull forward standards within 60 days. Purchasing would not happen immediately or within one year of trigger; infeasible to achieve reductions within one year.	No; current standards and requirements are a technology forcing zero-emission certification requirement. Further stringency would not be possible.

There were few options identified for a contingency measure based on the infeasibility analysis. As previously stated, there are limitations to utilizing CARB regulations for contingency measures and CARB currently has programs in place or under development for most of these sources to reduce NOx, ROG and PM2.5 emissions. However, the analysis did result in identifying the ability to utilize provisions within the Smog Check Program for a viable contingency measure, which is now being proposed.

Appendix B:
Smog Check Contingency Measure Emissions Benefits Methodology

Smog Check Contingency Measure Emissions Benefits

Table 52. List of Non-Attainment Areas and Attainment Years

Standard	Area	Attainment Year
80 ppb 8-hour Ozone	San Joaquin	2023
75 ppb 8-hour Ozone	Sac Metro	2024
	Eastern Kern	2026
	West Mojave	2026
	San Diego	2026
	South Coast	2029
	Coachella Valley	2031
	SJV	2031
70 ppb 8-hour Ozone	Ventura	2026
	Western Nevada	2026
	Mariposa	2026
	Eastern Kern	2032
	Sacramento Metro	2032
	San Diego	2032
	West Mojave	2032
	South Coast	2035
	Coachella	2037
	SJV	2037
15 ug PM2.5	San Joaquin	2023
35 ug PM2.5	San Joaquin	2024
12 ug PM2.5	San Joaquin	2030
	South Coast	2030

Review Of Current Information

The EMission FACtor (EMFAC) model is California's official emissions inventory model for on-road mobile sources. EMFAC2021 is the latest U.S. Environmental Protection Agency (U.S. EPA) approved version for use in California for State Implementation Plan (SIP) development and transportation conformity analysis[22], and reflects the most recent emission and activity updates and newly adopted regulations at the time of its release. At the present time, almost the entire California vehicle fleet is subjected to the Smog Check Program and hence, in-use testing programs that inform emission rates in EMFAC2021 implicitly incorporate the emissions benefits of California's Smog Check Program in the model output. In addition, EMFAC2021 does not have functionality to output emissions from the light-duty

[22] https://www.govinfo.gov/content/pkg/FR-2022-11-15/pdf/2022-24790.pdf

fleet without the effects of Smog Check Program. However, an earlier version of the model, EMFAC2011, used a different modeling framework that allows users to estimate emissions impacts of the Smog Check based on user-defined program requirements specific to each NAA.[23]

Unlike the latest version of the model, EMFAC2011 baseline outputs reflect emissions from a fleet without an I/M Program. Because California's Smog Check Program began in 1984, emissions data without an I/M program in EMFAC2011 were derived from U.S. EPA data collected on approximately 7,000 vehicles in Hammond, Illinois and Ann Arbor, Michigan in the 1990s before an I/M program was in effect.[24] CARB staff used these data for several versions of the model, up through EMFAC2011, to inform emission rates by vehicle technology group for a theoretical California fleet without an I/M program. Using data from CARB's longstanding Light-Duty Vehicle Surveillance Program (VSP), where vehicles failing the California Smog Check Program were tested before and after repairs, CARB staff adjusted baseline emission rates to reflect the benefits of having an I/M program based on requirements for each region in the State.

Approach

Since the Measure would change the current 8 model-year exemption to 7 model-years, CARB staff applied emission benefits of the change to the calendar year when vehicles would become 8 model-years old. Using this approach, all vehicles, regardless of when annual registration is due and the initial I/M Program inspections were performed during the year the vehicles turned 7 model-years old, will reflect the impacts of being initially subject to the I/M Program requirements for a full calendar year.

CARB staff used EMFAC2011 to derive the emissions impact of an I/M Program for each pollutant and vintage of vehicle newly becoming 8 model-years old in the attainment years listed in Table 52. The emissions impact is reflected as a ratio of emissions with no I/M Program relative to a baseline with an I/M program. As a fraction, this would be: (no-I/M) / (I/M), where ratios greater than one reflect the degree of emissions benefits of having an I/M program in place. CARB staff applied the ratios calculated using EMFAC2011 to the output from EMFAC2021[25] because the newest model represents the current California fleetwide emissions reflecting the current model year distribution, populations, accrual rates (miles driven per year), and emissions rates. The details of EMFAC2011 setup and run are provided in in the next section.

CARB staff applied the following equation:

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[23] *https://www.federalregister.gov/documents/2013/03/06/2013-05245/official-release-of-emfac2011-motor-vehicle-emission-factor-model-for-use-in-the-state-of-california*

[24] *https://ww2.arb.ca.gov/sites/default/files/2023-03/emfac2000-ef.pdf*

[25] Downloaded from EMFAC2021 web database: *https://arb.ca.gov/emfac/emissions-inventory*

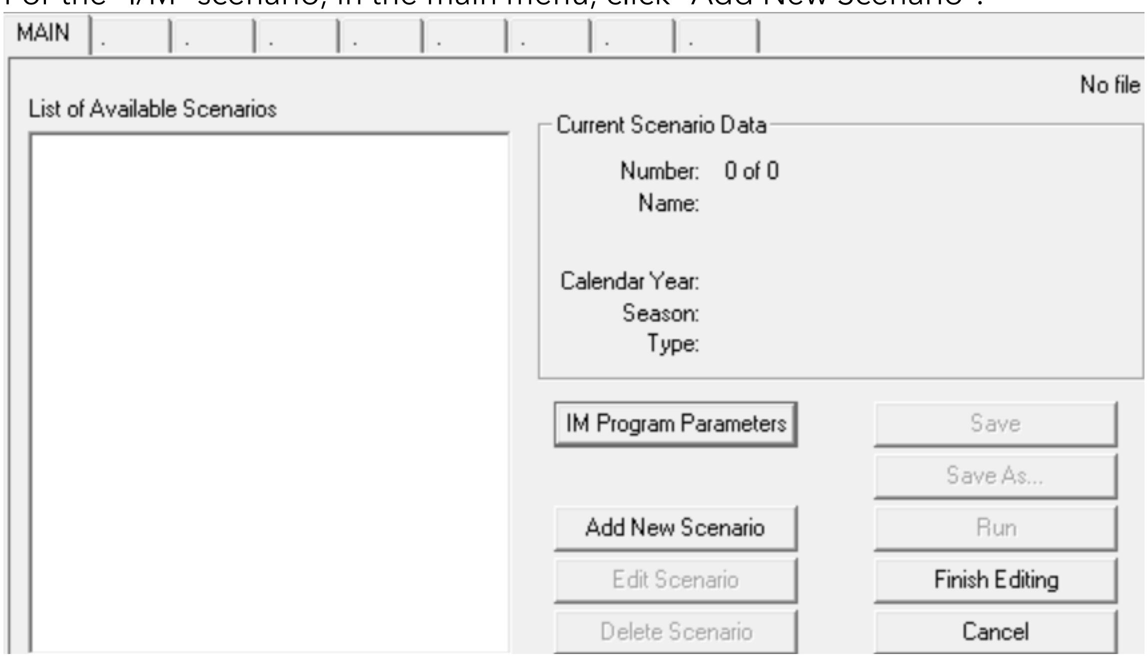
Benefits of removing 8-year exemption = Age 8 No-I/M emissions – Age 8 I/M emissions = (EMFAC2021 Age 8 Gasoline Vehicle Emissions[26] *× EMFAC2011 Age 8 No-IM/IM Ratio*[27] *) – EMFAC2021 Age 8 Gasoline Vehicle Emissions*[26]

For ozone nonattainment areas, the estimated benefits include NOx and ROG in tons per day for summer season. For $PM_{2.5}$ nonattainment areas, because EMFAC2011 does not reflect benefits from tailpipe PM emissions from the Smog Check Program, the annual NOx and ROG emission benefits are included instead, as these are precursors to secondary $PM_{2.5}$ formation in the atmosphere.

It should be noted that, some of CARB's recent regulations, including Advanced Clean Cars II (ACC II) and Advanced Clean Fleets (ACF) were finalized and adopted after release of EMFAC2021. Therefore, the emission benefits estimated for this Measure using EMFAC2021 do not reflect the impacts from these regulations.

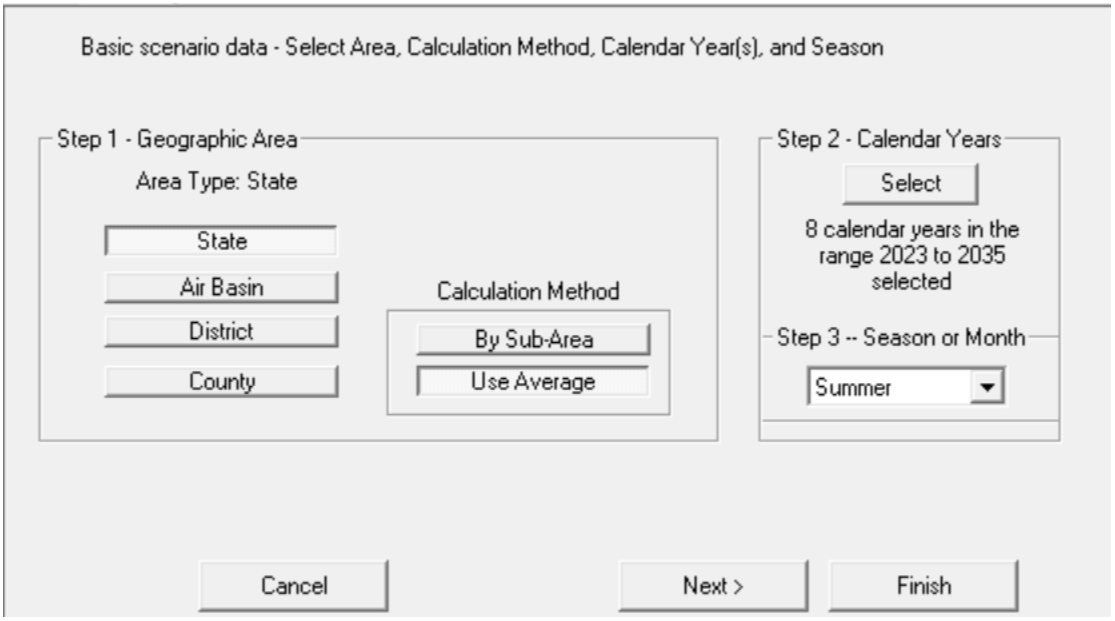
Instructions For Configuring and Running EMFAC2011

1. For the “I/M” scenario, in the main menu, click “Add New Scenario”.

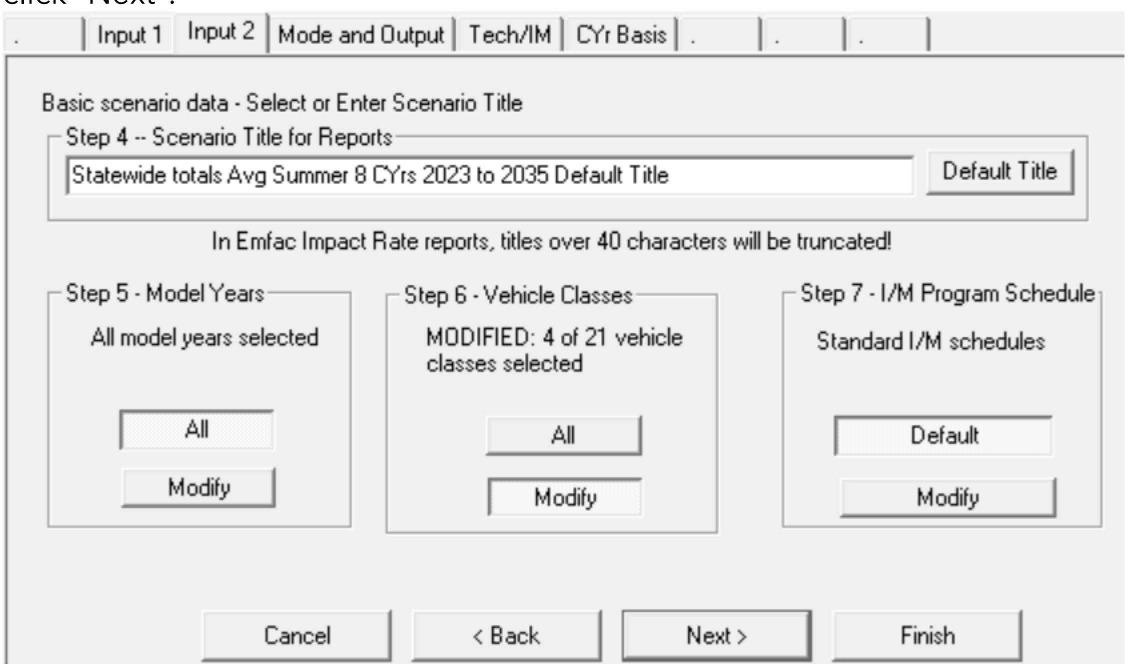


2. Select “State”, “Use Average” in “Step 1 – Geographic Area”, select modeled calendar year(s) in “Step 2 – Calendar Years”, Select “Summer” for ozone NAAs or “Annual” for PM NAAs in “Step 3 - Season or Month”, then click “Next”.

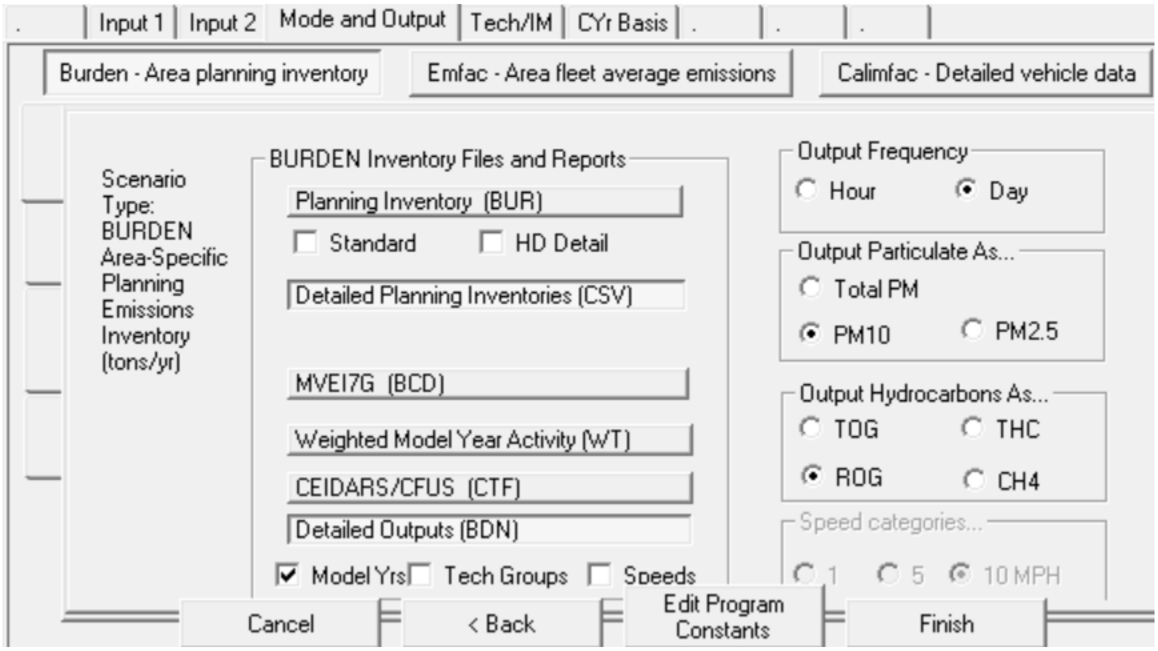
[26] Include all gasoline vehicle classes subject to California Smog Check Program
[27] Derived based on light-duty vehicle classes under 8,500 lbs. in EMFAC2011



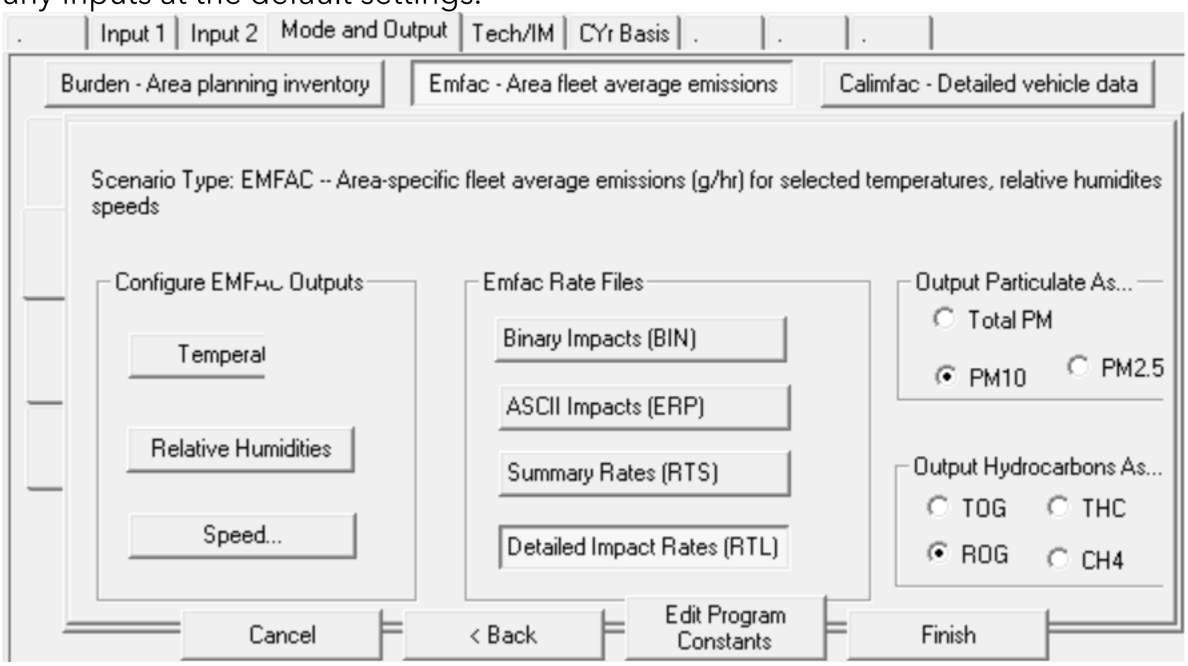
3. Click “Default Title” in “Step 4 – Scenario Title for Reports”, select “All” in “Step 5 – Model Years”, select “Modify” in “Step 6 – Vehicle Classes” and choose “PC/T1/T2/T3” from the pop-up window, select “Default” in “Step 7 – I/M Program schedule”, then click “Next”.



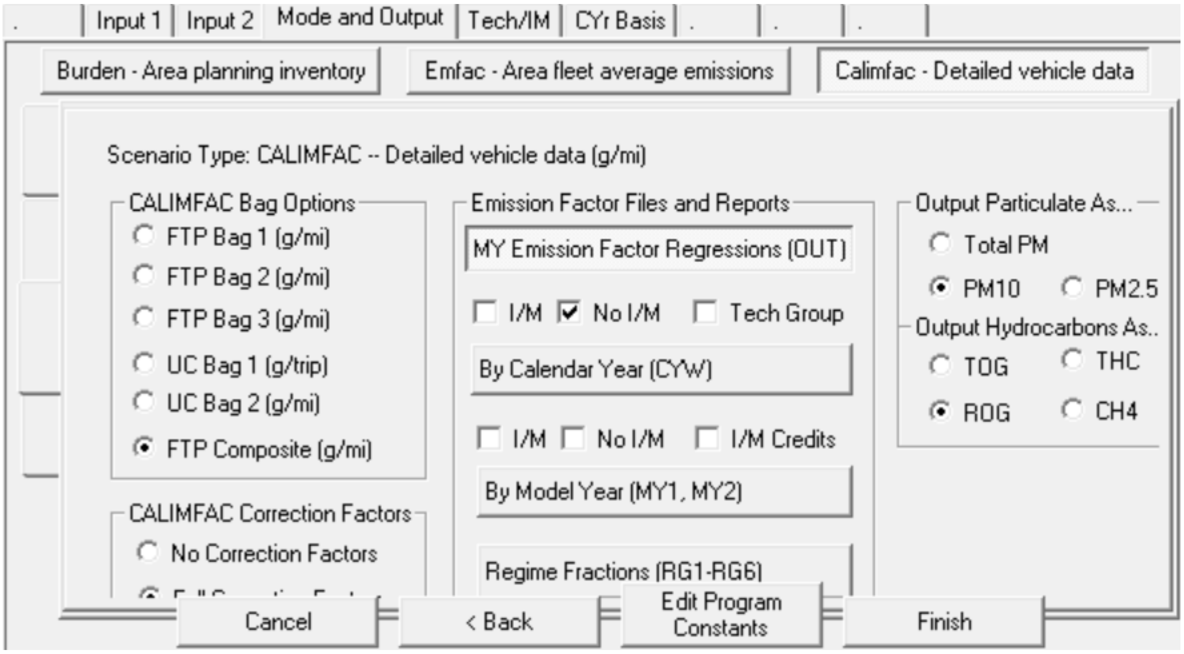
4. In the tab “Burden – Area planning inventory”, choose “Detailed Planning Inventories (CSV)” and click “Model Yrs”. Select “Output Frequency” as “Day”.



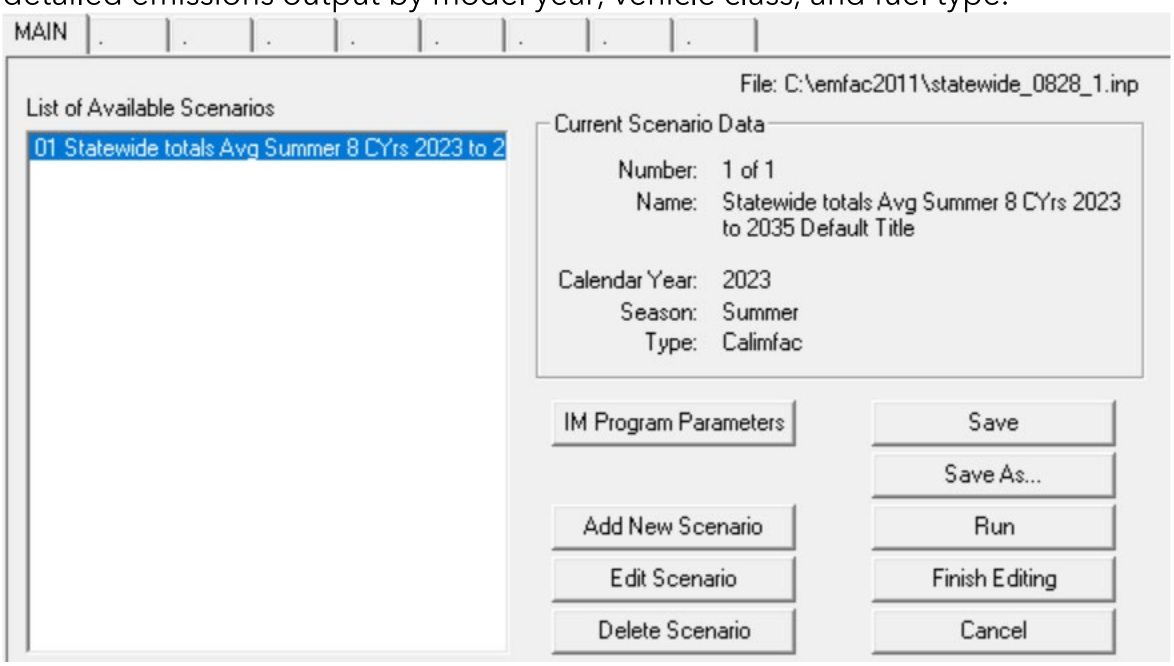
5. No need to change any inputs in tab "Emfac – Area fleet average emissions". Leave any inputs at the default settings.



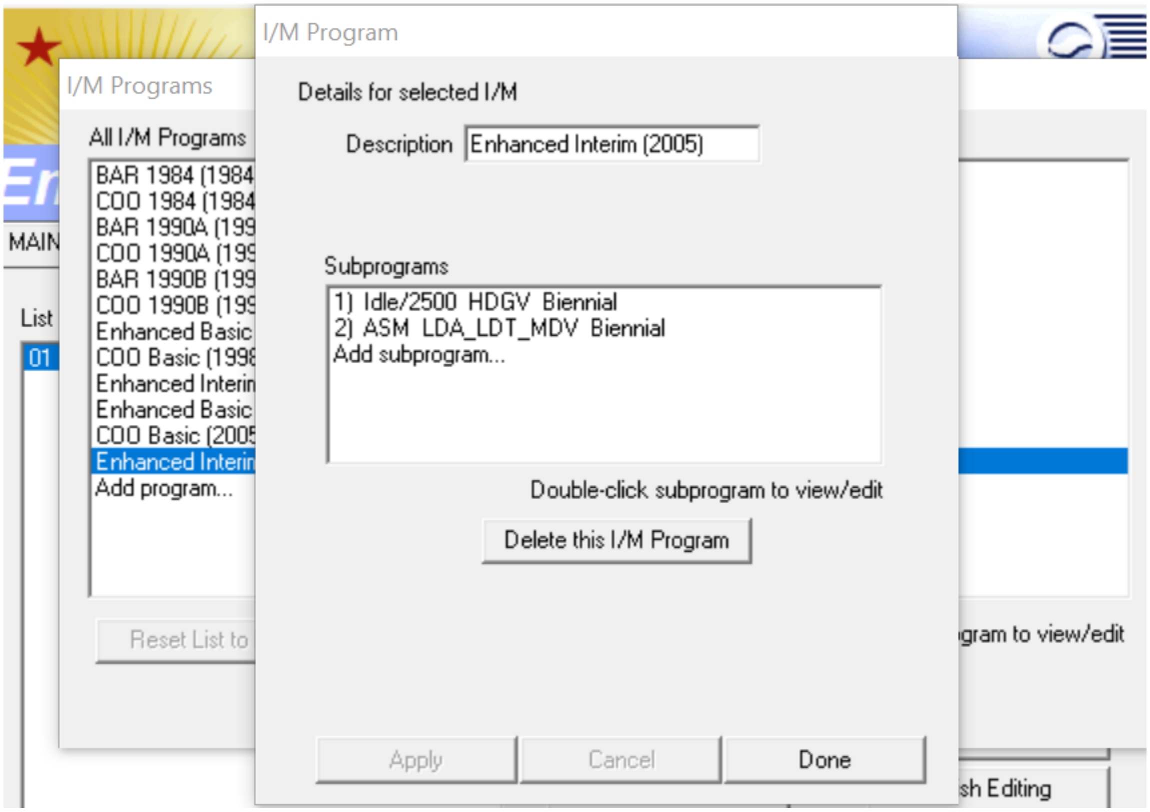
6. No need to change any inputs in tab "Calimfac – Detailed vehicle data". Leave any inputs at the default settings. Click "Finish" to go back to the main menu.



7. In the "MAIN" menu, save the current input by clicking "Save", then click "Run" to start the model run. Only the .bdn output file is needed for data analysis, which shows the detailed emissions output by model year, vehicle class, and fuel type.



8. For "No-I/M" scenario, repeat Steps 1 to 6, except that in the main menu, click "IM Program Parameters", double click each program and delete, and click "Done" to go back to the main menu. Then proceed to Step 7 to start the model run.


I/M Programs
All I/M Programs
BAR 1984 (1984
COO 1984 (1984
BAR 1990A (199
COO 1990A (199
BAR 1990B (199
COO 1990B (199
Enhanced Basic
COO Basic (1998
Enhanced Interin
Enhanced Basic
COO Basic (2005
Enhanced Interin
Add program...
Reset List to
MAIN
List
01
I/M Program
Details for selected I/M
Description
Enhanced Interim (2005)
Subprograms
1) Idle/2500 HDGV Biennial
2) ASM LDA_LDT_MDV Biennial
Add subprogram...
Double-click subprogram to view/edit
Delete this I/M Program
Apply
Cancel
Done
gram to view/edit
sh Editing

Appendix C: Carl Moyer Program Emissions Impacts Analysis Methodology

Moyer Program Emissions Reductions Estimates Methodology

CARB staff conducted analysis to determine the potential disbenefit of the Measure resulting from a potential loss in funding for the Moyer Program. If the Measure is triggered, the Moyer Program would receive less funding from fewer smog abatement fees being collected, as discussed in section 4C of this document. The calculation of the potential emissions disbenefit from losing Moyer Program funding consisted of two main components:

1. Vehicle Population
2. Moyer Program Statewide NOx Cost Effectiveness

The vehicle populations were estimated using EMFAC2021 and calculated as described in Appendix B. The statewide cost effectiveness was estimated as described in Appendix H of the Fiscal Year 2022-23 Funding Plan for Clean Transportation Incentives.[28]

The methodology for calculating the potential emissions reductions loss is as follows:

First, CARB staff calculated the potential loss in funding by multiplying the smog abatement fee directed towards the Moyer Program of $21 by the estimated vehicle population affected in each area for their respective attainment year. This results in the statewide total potential loss in funding if triggered in the respective area. An example calculation from a theoretical area missing attainment in 2023 is shown below.

$$Total\ potential\ loss\ in\ funding\ resulting\ from\ an\ area\ missing\ attainment\ in\ 2023 = Portion\ of\ smog\ abatement\ fee\ to\ Moyer * 8MYO\ vehicle\ population\ in\ nonattainment\ area\ in\ 2023$$

Next, to find the area-specific foregone funding and related emission reductions, CARB staff used three years of historical Moyer Program funding allocations to local air districts to calculate the average proportion of funding typically awarded to each district. This district allocation calculation is done for each nonattainment area's corresponding local air district. An example calculation for a single local air district (District X) is shown below.

$$District\ Allocation\ (\%) = \frac{Historical\ Average\ allocation\ to\ District\ X\ (\$)}{Total\ Carl\ Moyer\ Program\ Funding\ (\$)}$$

The local air district allocation percentage for each area is then applied to the calculated loss in funding. This results in the potential loss in funding for each specific local air district.

[28] https://ww2.arb.ca.gov/sites/default/files/2022-10/proposed_fy2022_23_funding_plan_final.pdf

$$Loss\ in\ funding\ for\ District\ X\ (\$) = District\ Allocation\ (\%) * Total\ potential\ loss\ in\ funding$$

Divide the total loss in funding calculated for each area by the statewide NOx cost effectiveness and convert to tons per day. Each project is assumed to have a 10-year project life.

$$Loss\ in\ reductions\ (tpd) = \frac{Loss\ in\ funding\ for\ District\ X\ (\$)}{statewide\ NOx\ cost\ effectiveness/10/365\ \left(\frac{\$}{ton}\right)}$$

The result is the total loss in potential emissions reductions for each district from foregone funding for Moyer Program projects.

Appendix D:
California Health and Safety Code § 44011(a)(4)(A) and (B)

State of California

HEALTH AND SAFETY CODE

Section 44011

44011. (a) All motor vehicles powered by internal combustion engines that are registered within an area designated for program coverage shall be required biennially to obtain a certificate of compliance or noncompliance, except for the following:

[redacted]

(4) (A) Except as provided in subparagraph (B), all motor vehicles four or less model-years old.

(B) (i) Beginning January 1, 2005, all motor vehicles six or less model-years old, unless the state board finds that providing an exception for these vehicles will prohibit the state from meeting the requirements of Section 176(c) of the federal Clean Air Act (42 U.S.C. Sec. 7401 et seq.) or the state's commitments with respect to the state implementation plan required by the federal Clean Air Act.

(ii) Notwithstanding clause (i), beginning January 1, 2019, all motor vehicles eight or less model-years old, unless the state board finds that providing an exception for these vehicles will prohibit the state from meeting the requirements of Section 176(c) of the federal Clean Air Act (42 U.S.C. Sec. 7401 et seq.) or the state's commitments with respect to the state implementation plan required by the federal Clean Air Act.

(iii) Clause (ii) does not apply to a motor vehicle that is seven model-years old in year 2018 for which a certificate of compliance has been obtained.

[redacted]

[redacted].

(Amended by Stats. 2017, Ch. 633, Sec. 1. (AB 1274) Effective October 10, 2017.)

South Coast Air Basin Attainment Plan for the 2012 Annual PM2.5 Standard

Appendix V

ATTACHMENT B: CARB'S AREA SOURCE INFEASIBILITY JUSTIFICATION

CARB Reactive Organic Gases Area Source Measure Analysis

CARB adopted the *California Smog Check Contingency Measure* to address contingency measure requirements throughout the State. U.S. EPA proposed to approve the *California Smog Check Contingency Measure* as a contingency measure on December 20, 2023. The Smog Check Contingency Measure, if triggered in a nonattainment area, would reduce the exemption for vehicles that are 8 model years old and newer to seven model years old and newer, thereby increasing the number of vehicles subject to Smog Check. This measure, if triggered, would achieve additional NOx and ROG reductions beyond what is currently achieved by the Smog Check Program by identifying additional emissions control equipment failures from vehicles previously exempt.

The *California Smog Check Contingency Measure* includes, in Appendix A, analysis on the feasibility of contingency measures related to CARB's mobile source control programs that target both ROG and NOx. CARB staff are now evaluating potential options for a contingency measure achieving ROG reductions from area sources that the State has authority to regulate, including both CARB and Department of Pesticide Regulation (DPR) 's regulations (Table 2), to determine feasibility given the contingency measure requirements under the Clean Air Act, recent court decisions and U.S. EPA draft guidance. The State currently has programs in place for these area sources and has evaluated a variety of regulatory mechanisms within existing and new programs for potential contingency triggers. Each measure was evaluated on whether it could be implemented within 60 days of being triggered and achieve the necessary reductions within 1-2 years of being triggered. Additionally, the technological feasibility of each option was considered to assess whether the measure would be technologically feasible to implement. More stringent requirements may be unavailable or economically infeasible to implement, especially in the time frame required for contingency measure implementation. Some measures aim to reduce VOC emissions as opposed to ROG emissions. However, VOC and ROG emissions are virtually equivalent. Thus, both terms are used interchangeably throughout this document.

Challenges for CARB Measures

Based on CARB's feasibility analysis, which is similar to our mobile source analysis, there are a few common components of CARB area source regulations that limit the options for contingency measures. CARB regulations that require development of new emissions control technologies or new product formulations require a long lead time for implementation. Manufacturers would need lead time to research, plan, certify, manufacture, and deploy lower-emitting alternatives to meet a new or accelerated standard.

Additionally, consumer-based regulations necessitate that manufacturing is mature so that there is enough supply available to meet the additional demand. On the consumer side, additional time would be required for procurement implementation based on the new requirements. Thus, measures that require product turnover, new standards or reformulation are not appropriate to be used as a triggered contingency measure given the compressed timeline required for contingency.

CARB regulations are also technology-forcing, which makes it difficult to amend regulations or pull compliance timelines forward with only 1-2 years notice as industry needs time to research, plan, develop, and implement these new technologies and product formulations. It would be infeasible to require industry to purchase and install large numbers of new control technologies within one year if the technology is not readily available at a reasonable cost. CARB regulations are also the most stringent air quality control requirements in the country, so there are few opportunities to require additional stringency. CARB is driving sources under our authority to near-zero and zero-emissions everywhere feasible to provide for attainment of air quality standards across the State, and to support near-source toxics reductions and climate targets. However, these targets which are already being addressed in many CARB regulations also eliminate opportunities for a contingency measure.

Lastly, many of CARB's options for a contingency measure would require a full rulemaking process and would not be adopted by CARB and approved by U.S. EPA within the timeframe needed, making many of the options infeasible. Given U.S. EPA failure to submit and disapproval actions for the 75 ppb 8-hour ozone standard, sanction clocks have started and sanctions could be triggered in San Joaquin Valley, Coachella Valley, Mojave Desert and the Sacramento region in 2024. As such, CARB and these local air districts need to identify measure(s) that could realistically be adopted and submitted to U.S. EPA prior to that time. However, most CARB measures must go through a regulatory process that can take approximately five years from beginning development of a regulation to it being adopted by the CARB Board.

Based on CARB staff analysis, no additional measures were identified at this time to serve as a contingency measure to reduce ROG emissions beyond the California Smog Check Contingency Measure. More detail on the CARB staff analysis, including potential emission reduction options for each area source category are described in the following sections.

Consumer Products

Consumer products refer to chemically formulated products used by household and institutional consumers, such as detergents, personal care and cosmetics products, home and garden products, and disinfectants. CARB regulations for consumer products aim to reduce the amount of VOCs, toxic air contaminants, and greenhouse gases that are emitted from using these consumer products.

CARB is actively seeking further emission reductions to support ozone attainment in the South Coast and elsewhere in California. Towards this end, CARB's 2022 State SIP Strategy includes a consumer products statewide emissions reduction commitment of 20 tons per day (tpd) of VOCs.

To achieve the 20 tpd VOCs emission reduction, CARB staff anticipates casting a wide net in its review of product categories. CARB staff plans to launch a survey in early 2024 to collect sales and formulation data for products sold recently in California. Survey data will identify opportunities to further reduce ozone formation from consumer products. Staff expects to bring regulatory proposals to the Board by 2027.

The Consumer Products Rulemaking Process

In granting CARB authority to regulate consumer products, which were previously regulated by local air pollution control districts and air quality management districts, it was the Legislature's intent to have a single set of regulatory requirements applicable statewide, rather than a patchwork of regulations. CARB's Consumer Products Regulation applies statewide.

For any consumer products rulemaking, proposed amendments are the culmination of a multi-year public process by CARB to identify the most promising, technically-sound strategies to effectively help California meet its air quality challenges. The recent 2021 rulemaking took close to seven years and included the following three phases of regulatory development: 1) development and implementation of the three-year survey; evaluation and publication of 2013 through 2015 Consumer and Commercial Products Survey data; 2) evaluation of potential regulatory strategies based upon the survey data; and 3) development and refinement of Proposed Amendments.

Manufacturers need lead time to reformulate existing products to meet new VOC standards. Based on previous rulemakings, five significant milestones exist and are associated with reformulating products to meet new consumer product regulatory requirements: 1) research and development; 2) efficacy testing; 3) stability testing; 4) safety testing; and 5) consumer acceptance testing. In addition, manufacturers must make modifications to product labels. While there is some opportunity for manufacturers to run these processes concurrently, often a problem in any one of these milestones require the manufacturer to start the process again.

Draft CARB Contingency Measure Analysis

When setting technology forcing standards, CARB may provide for a Technical Assessment prior to effective dates. This enables CARB to assess progress made by manufacturers in developing complying products. In cases where product development challenges result in infeasibility of timely implementation, the assessment could result in amendments to the standards or to extensions in compliance deadlines.

Additionally, technology forcing standards often require modifications to facilities, equipment, and manufacturing processes. This would be the case if a product is reformulated to use compressed gas propellant instead of liquefied gas propellant. Use of compressed gas propellant requires the purchase and installation of new equipment and modifications to facility assembly lines, necessitating sufficient lead time for implementation as well as certainty about implementation dates for the technology forcing standards. CARB staff will be evaluating increased use of compressed gas propellant for the upcoming consumer product rulemaking.

Trigger Feasibility

To provide reductions qualifying for contingency purposes, CARB would need to adopt regulatory amendments which yield emission reductions that could be implemented within a short period of time from a triggering event.

For a given product category for which CARB proposes more stringent VOC standards, CARB cannot call for earlier implementation of those standards for contingency purposes. This is because CARB already requires implementation under short timelines to maximize air quality benefits in support of expeditious attainment of ambient air quality standards.

Neither can CARB set lower limits for products that would be produced and warehoused, but not sold unless a triggering event occurred. Warehousing of “contingency” products would be cost prohibitive for manufacturers and would not provide the Consumer Products Program with the maximum feasible air quality benefits, as required by the Legislature. Some consumer products also have limited shelf life and given the uncertainty of when a triggering event may occur, such an approach is not feasible.

Technological Feasibility

The Legislature, in Health and Safety Code (H&SC) Section 41712(b)(2) and 41712(d), stipulates that CARB’s consumer product regulations must set standards which are commercially and technologically feasible. Therefore, during every consumer products rulemaking, CARB sets VOC limits that are the most technologically and commercially feasible at the time.

Draft CARB Contingency Measure Analysis

CARB's Consumer Products Regulation does not require lower VOC content products in some parts of California, which could then be required in other parts of California in need of contingency reductions.

When proposing more stringent VOC standards, CARB cannot establish two increasingly restrictive sets of VOC limits: one limit in support of attainment, which would go into place by a defined date; and a second, more stringent limit which would only be implemented if contingency needs were triggered. This is because: (1) State law, stated in H&SC section 41712(b)(1), requires CARB to adopt the most stringent feasible standards for attainment purposes; and (2) further reductions from consumer products are needed for attainment of ozone ambient air quality standards.

Neither could CARB set a single, more restrictive VOC standard, implement those requirements, and then hold back a portion of the anticipated emission reductions for contingency purposes while still dedicating the majority of accruing reductions towards attainment targets. In such a case, additional actual emission reductions would not occur if contingency requirements were triggered. This approach would therefore not satisfy requirements for contingency reduction.

Even if no further VOC reductions were needed for attainment, setting more stringent standards for contingency purposes would still not be a viable undertaking. This is because the testing and development of lower VOC products meeting more stringent standards could take years and much investment by manufacturers. Timelines would not mesh with the quick turnaround time needed for contingency reductions. In short, CARB cannot require development of new consumer products just in case additional emission reductions are needed. This means CARB cannot produce contingency reductions by setting more stringent standards for consumer product categories other than those which CARB would regulate further to secure the 20 tpd VOC emission reduction target for attainment purposes.

Further, CARB cannot, when seeking reductions in the very near-term (and consistent with contingency reduction timelines), rely on other jurisdictions whose regulations are resulting in lower-emitting consumer products which they could then offer for sale in California. California's Consumer Products Program is world-leading, cutting-edge and technology forcing. Manufacturers have not already developed products, and marketed them elsewhere, which they could direct to California in case a need for contingency reductions is triggered.

In summary, a consumer product contingency measure seeking additional emission reductions either by setting more restrictive standards, or by accelerating effective dates of standards, is infeasible.

Oil and Gas

For decades, air districts with significant oil production have adopted and implemented rules designed to reduce criteria pollutant precursor emissions from the oil and gas sector to meet national ambient air quality standards (NAAQS) and Clean Air Act requirements. The air district rules control emissions of reactive organic gases (ROG) from tanks, separators, and compressors, and specify requirements for leak detection and repair (LDAR). The air district rules do not cover methane specific sources.

In 2017, CARB adopted the Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities (also known as the Oil and Gas Methane Regulation) to address methane emissions from equipment and processes not already controlled for ROG purposes by existing air district rules. Although the Oil and Gas Methane Regulation is intended to reduce methane emissions, many of the covered sources also emit ROG as co-pollutants, and therefore the regulation also reduces ROG emissions. Only four air districts in California with nonattainment areas have oil and gas equipment subject to the regulation: Sacramento Metropolitan Air Quality Management District, San Joaquin Valley Air Pollution Control District, South Coast Air Quality Management District, and Ventura County Air Pollution Control District. The air district rules and the Oil and Gas Methane Regulation complement one another and together reduce ROG emissions from California’s oil and natural gas sector.

Starting in 2012, U.S. EPA established regulations to reduce air pollution from the oil and natural gas industry consisting of new source performance standards. U.S. EPA also promulgated a Control Techniques Guideline in 2016 for the Oil and Natural Gas Industry which requires all states with applicable nonattainment areas to meet the prescribed levels of control in order to satisfy reasonably available control technology requirements. The CTG requirements are met in California via air district rules and CARB’s submittal of the Oil and Gas Methane Regulation. In December 2023, U.S. EPA finalized updated regulations for the oil and natural gas industry including more stringent new source performance standards and, for the first time, Emissions Guidelines. U.S. EPA’s recent Emissions Guidelines will require that CARB amend the Oil and Gas Methane Regulation to meet the more stringent requirements.

Methane and ROG emissions can originate from oil and gas infrastructure when natural gas is either intentionally released (“vented” emissions) or unintentionally leaked (“fugitive” emissions). Intentional releases can occur due to process designs (e.g., as a fluid to operate pneumatic devices), for safety or maintenance reasons, or for when no other control or disposal options exist (where allowed). Unintentional leaks can occur due to factors such as defects or wear in connections, valves, seals, and similar mechanisms, or due to process upsets, system malfunctions, or human error. Vented emissions can be controlled primarily by replacing equipment with lower-emitting models or adding vapor collection systems to equipment, and the further controls that will be required under the recent U.S. EPA Emissions Guidelines represent all controls that are technologically feasible. Fugitive emissions are addressed through leak detection and repair (LDAR) to find and fix unintentional leaks. In each of these areas, there are no additional available feasible control measures that could meet the requirements of a contingency measure.

First, there are not currently any additional measures in the Oil and Gas Methane Regulation that could be triggered without undertaking amendments to the regulation. The process for amending a regulation takes years to complete and requires the development of new measures, stakeholder engagement, and the formal regulatory process itself.

Second, even if the length of the regulatory process were not a barrier, no available surplus emission reductions could reasonably be implemented within the short timeframe required upon a triggering event. Implementation of additional controls requires at least two to three years for oil and gas facilities to comply with. New controls are not easily installed on equipment and would take additional time to upgrade, which likely does not fit in the contingency timeline required. Each of the potential emission reduction mechanisms in the Oil and Gas Methane Regulation are analyzed below:

- Reduce venting through equipment replacement or vapor control (control venting emissions):
  - The Oil and Gas Methane Regulation already includes strict venting standards for most categories of equipment designed to vent natural gas as part of normal operation. The areas where further control of vented emissions may be feasible are all being addressed by U.S. EPA's Emissions Guidelines (finalized December 2023), which are standards that CARB must meet for existing sources to demonstrate compliance with the Clean Air Act; these are measures that must be implemented and cannot be held in reserve for use as triggered contingency measures. These include banning all associated gas venting, requiring all pneumatic controllers to be zero-emission, and requiring minimization of emissions from liquids unloading to the greatest extent possible.
- Expand/increase LDAR (control fugitive emissions):
  - Under the Oil and Gas Methane Regulation, LDAR is already mandated on a quarterly basis using a very sensitive methodology (U.S. EPA’s Method 21). The only exemption that results in a significant number of sources not being subject to LDAR is for equipment handling exclusively heavy oil[1], which is not

[1] Oil with an API gravity of less than 20.

economically feasible to control based on analysis using currently available data.

In summary, there are no new technologically feasible control measures that CARB can implement in the Oil and Gas Methane Regulation that could meet the triggering timelines and other requirements, and are available to use as contingency measures.

Petroleum Marketing – Vehicle Refueling

Vapor recovery systems are installed at gasoline dispensing facilities (GDFs) to collect, contain, and return gasoline vapors that would otherwise escape into the atmosphere. Gasoline vapor emissions contain smog forming volatile organic compounds (VOCs) that are controlled in two phases at GDFs. Phase I vapor recovery collects vapors displaced from a storage tank when a cargo tank truck delivers gasoline. Phase II vapor recovery collects and stores vapors displaced during the transfer of gasoline from the GDF storage tanks into the vehicle tank. Stored gasoline vapors in the GDF tanks are then transferred into gasoline cargo tank trucks during Phase I activities and returned to gasoline terminals for processing. CARB regulations establish statewide performance standards for vapor recovery systems that must be achieved during the transfer and storage of gasoline. In addition, all vapor recovery systems must undergo CARB certification tests to demonstrate compliance with applicable performance standards before those systems can be sold, offered for sale, or installed in California.

Vapor recovery system performance standards for GDFs have become more stringent over the years. Since 2001, CARB has adopted over a dozen significant advancements as part of the Enhanced Vapor Recovery (EVR) program. Phase I EVR requires more durable and leak-tight components, along with an increased collection efficiency of 98%. Phase II EVR includes three major advancements: (1) dispensing nozzles with less spillage and required compatibility with ORVR (onboard refueling vapor recovery) vehicles, (2) a processor to manage the headspace pressure within the GDF storage tank, and (3) an in-station diagnostic (ISD) system that provides warning alarms to alert a GDF operator of potential vapor recovery system malfunctions. Phase I EVR was fully implemented in 2005 and Phase II EVR was fully implemented by 2011.

Additionally, CARB's air toxic control measure for benzene requires retail GDFs to install Phase I and Phase II systems to reduce public exposure. Exceptions to the measure include gasoline (1) dispensed from or transferred to a storage tank with a capacity less than 260 gallons, (2) dispensed to implements of animal husbandry; or (3) dispensed to vehicles with fuel tanks less than 5 gallons capacity.

Draft CARB Contingency Measure Analysis

Since the implementation of Phase I and Phase II EVR in 2011, CARB staff has made additional improvements to the vapor recovery program. For GDF equipped with underground storage tanks, a total of four regulatory amendments were completed between 2011 and 2023 to strengthen performance standards, adjust implementation dates to reflect evolving technology, clarify dimension requirements for nozzles and vehicle fill pipes, and improve cost effectiveness for system upgrade requirements. Two of the most recently implemented control measures, hose permeation and more stringent nozzle spillage standard, are described below.

- Hose Permeation Standard:
  CARB adopted performance standards for gasoline dispensing hose permeation on July 26, 2012. The intent of this standard is limiting the amount of gasoline that permeates through the dispensing hose. Hose permeation performance standards only apply to hoses in which liquid gasoline contacts the outer hose wall, specifically: Phase II vacuum assist and conventional hoses (latter are installed in facilities that are exempt from Phase II because they fueled predominately vehicles equipped with ORVR). Existing facilities subject to the performance standard were allowed four years from the effective date to attain compliance. The effective date is defined as the date when the first dispensing hose meeting the performance standard is certified by CARB.

  The first conventional and vacuum assist hoses that met the new permeation standard were certified by CARB on June 10, 2014, and September 24, 2014, respectively. These certification dates establish the effective dates and associated four-year periods (commonly referred to as "the four-year clock") for existing subject GDFs to comply. Existing GDFs that used conventional hoses and vacuum assist hoses had until June 10, 2018, and September 24, 2018, respectively to comply with the low permeation hose standard. New GDFs constructed after the effective dates that use vacuum assist or conventional hoses are required to install low permeation hoses at the time of construction.

- More Stringent Nozzle Spillage Standard:
  In April 2015, CARB adopted new performance standards and specifications for Enhanced Conventional (ECO) nozzles that are installed at non-retail GDFs, which are exempt from Phase II requirements by district rules. These GDFs fueled predominantly vehicles that are equipped with ORVR, which collects displaced vapor during vehicle refueling.

  CARB staff have compiled and evaluated mass emission factors for nozzle spillage based on CARB certification test data for three EVR nozzles and two ECO nozzles. In April 2020, staff found that the mass emission factors based on certification data for all five nozzles are substantially lower than applicable performance standards. This finding demonstrated nozzles are performing much better than predicted for EVR implementation at the time CARB adopted the EVR regulations.

Consequently, in December 2020, the Board approved a more stringent performance standard of 0.05 lbs/kgal for nozzle spillage for both EVR and ECO nozzles to preserve emission reductions that are already occurring and prevent emissions from increasing.

Recent analysis indicates that CARB certified vapor recovery systems designed for use at GDFs are well over 90% effective[2] in reducing VOC emissions that would otherwise be emitted to the atmosphere. Given the maturity and robustness of the program and the stringency of existing control measures that have been implemented statewide, there are no available additional control measures that would be feasible to implement within the timeframes required for contingency measures. Even if more stringent control measures could be adopted, they would not be able to be implemented in the contingency timeframe required as manufacturers and retailers would need more than two years of lead-time, as has been provided in the past, to comply with new standards.

CARB staff believes future amendments will improve existing test procedures and ease the burden of compliance for GDF operators without causing any increase in emissions or costs. Further, absent any changes to vapor recovery controls, CARB staff expects that gasoline vapor emissions will track proportionally to fuel dispensed. As California transitions to more fuel-efficient vehicles, zero emission vehicles, and alternative fuel sources, gasoline consumption and associated vapor emissions are expected to decrease. However, as long as gasoline remains a major fuel source, CARB will need to maintain an active and effective vapor recovery program.

In summary, California has the most comprehensive vapor recovery program applicable to GDFs in the country, and there are no new technologically feasible control measures that could meet the triggering timelines and other requirements, and are available to use as contingency measures. California's program includes:

1. rigorous performance standards for Phase I transfer, Phase II transfer, In-Station Diagnostic systems, hose permeation, storage tank pressure management, and nozzle spillage,
2. strong enforcement of performance standards by local air districts, and

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[2] https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2023/vapor_recovery_2023/isor.pdf

3. going well beyond US EPA’s Stage I (Phase I in California), which is the sole focus of US-EPA’s vapor recovery requirements.

Going forward, the vapor recovery program will remain an important part of California’s efforts to control regional ozone levels and reduce public exposure to benzene.

Petroleum Marketing – Cargo Tanks

In California, gasoline vapor emissions are controlled to reduce emissions of air pollutants, specifically VOCs and various toxic air contaminants (TACs) such as benzene. Emissions are controlled during the transfer of gasoline from storage tanks at refineries or terminals/bulk plants to tanker trucks also called cargo tanks (CTs). Cargo tanks transport gasoline to service stations also called GDFs. The Cargo Tank Vapor Recovery Program (CTVRP) regulations require annual testing of CTs to ensure that they do not exceed the allowable leak rate. Such tests are performed by CT owner/operators or independent testing contractors. Test results are submitted to CARB CTVRP staff for review and provide the basis for issuing a certification document with a decal, which must be renewed annually. To ensure the integrity of the program, CTVRP staff monitors the testing conducted by CT owners, operators, and contractors. Additionally, CTVRP staff perform random inspections and testing of CTs. Also, loading facilities are prohibited from transferring gasoline to CTs with invalid or expired certifications. Because of the severe and unique air pollution problems facing California, CARB’s gasoline vapor control standards for CTs are more stringent than comparable federal standards.

CARB first adopted the cargo tank vapor recovery certification regulations on April 18, 1977. These regulations established a five-minute static pressure test with an allowable leak rate to prevent excessive gasoline vapor emissions and a one-minute test for CARB inspectors to monitor CTs loaded with gasoline. There have been six amendments to this regulation (1984, 1995, 1998, 2013, 2017, 2023). These amendments were mostly administrative in nature. However, the 1995 amendment reduced the allowable leak rate by 50%, making the CTVRP the strictest emission standards in the nation.

Altering of a CT design to control emissions would require input and approval from federal agencies such as Department of Transportation (DoT) and U.S. EPA, along with State agencies such as State Fire Marshal and California Highway Patrol. Getting such approval to implement new controls may take years due to the cumbersome approval process. The CTVRP already requires more stringent emission standards than the U.S. EPA. The current CARB and U.S. EPA standard is measured in Inches of Water Column (WC"). As an example, a cargo tank in California is not allowed to leak more than 0.5 WC" (0.018psi) in a five-minute test. CTs are as vapor tight as the current industry standards and design allows for.

There is currently no design or technology that can reduce this number. Additionally, as mentioned, design alterations would require numerous and lengthy federal, State(s), and local municipalities approvals. Implementation of any new standards would also require long lead times to deploy new technologies and would likely take more than two years. As the population of zero emission vehicles increases on California roads, emissions from CTs will be reduced due to a decline in demand for gasoline.

In summary, due to the timelines involved in development of technology, altering CT designs, and anticipated drop in gasoline demand, there are no new technologically feasible control measures in the CTVRP that could meet the triggering timelines and other requirements, and are available to use as contingency measures.

Portable Fuel Containers (Gas Cans)

Portable Fuel Containers (PFCs), or gas cans, are used to fill a variety of equipment, including lawnmowers, vehicles, and personal watercraft. However, spillage and evaporative emissions can occur, which can result in ozone-forming smog and health related problems. In California, gas cans use low permeation materials and automatic sealing nozzles to minimize or eliminate spillage and evaporative emissions. All gas cans sold in California must be certified by CARB as meeting the low-emission requirements.

CARB staff analyzed PFCs to identify potential contingency measure options. It would not be possible to begin implementation of any contingency measures for PFCs within 60 days. CARB does not regulate consumer use of PFCs and must achieve emission reductions through performance requirements, including emission standards, for new PFCs. Manufacturers would need more than 1-2 years to design, certify, and manufacture PFCs that meet more stringent emission standards. Additionally, CARB regulations typically need to allow additional time for sell-through provisions to allow for consumers and retailers to transition to the new products, which further extends the implementation timeline. Adopting more stringent emission standards is not feasible to implement as a contingency measure because the regulatory process would take approximately 5 years from start to finish. The standards currently in place are also the most stringent standards across the nation.

In summary, there are no new technologically feasible control measures in the PFC regulations that could meet the triggering timelines and other requirements and are available to use as contingency measures.

Pesticides

Pesticides are used for urban and agricultural pest management across the State and are an area-wide source of ROG and other types of emissions. Pesticides are regulated under both federal and state law. Under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), the U.S. EPA has authority to control pesticide distribution, sale, and use. The Department of Pesticide Regulation (DPR) has primary and broad authority to regulate the sale and use of pesticides in California. The pesticide element of the ozone SIP requires DPR to develop and implement regulations to reduce ROG emissions by specified amounts from agricultural and structural pesticide applications in nonattainment areas. CARB is supporting DPR to use its broad authorities to reduce ROG emissions as well as limit harmful exposures to pesticides impacting communities across the State.

DPR can generally reduce exposures to pesticides through the development and implementation of necessary restrictions on pesticide sales and use and by encouraging integrated pest management. Mitigation measures may be implemented by several methods, including regulations, local permit conditions, pesticide label changes, or product cancellation. Current regulations set limits on applications of certain pesticides and specify methods for application to protect public health. DPR regulations have been found by U.S. EPA to meet RACT, RACM, and BACM requirements as a part of past SIP submittals. Most recently, as a part of the 2022 State SIP Strategy developed to support of attainment of the 70 ppb ozone standard across California, DPR committed to update their 1,3-Dichloropropene (1,3-D) regulations for health risk mitigation and volatile organic compound emissions reductions. The regulatory updates address both cancer and acute risk to non-occupational bystanders through requirements including those on applicators to use totally impermeable film tarpaulins or other mitigation measures that provide a comparable degree of protection from exposure. DPR submitted the rulemaking documents to the Office of Administrative Law on November 7, 2023, for final review and if approved will go into effect on January 1, 2024.

DPR has divided pesticide products into two groups for SIP purposes: fumigants and non-fumigants. The lead time needed to develop regulations for both groups of pesticide products may not fit in the contingency timeline required. For fumigant pesticide products, the primary measure to reduce ROG emissions is to change fumigation methods, such as deeper injection into the soil and covering fumigated areas with tarps that have low permeability. Developing new fumigation methods normally requires several years of research followed by rulemaking that usually requires two years or more to complete. For non-fumigant pesticide products, the primary measure to reduce ROG emissions is to change product formulations to reduce the ROG content. This also takes several years of research and rulemaking to complete. Additionally, changing product formulation normally requires review and registration of a new product by U.S. EPA and this takes a year or more to complete. For both fumigant and non-fumigant products, little work on contingency measures can be done beforehand due to changing pesticide use patterns. Pesticide products that contribute the most emissions currently may not be the ones that contribute the most in the future due to changing cropping patterns, introduction of new pesticide products, and other factors.

Further, DPR regulations are the most stringent pesticide controls in the country and represent all measures that are technologically feasible at this time. For example, U.S. EPA's Office of Pesticide Programs also works to reduce emissions to reduce toxic exposure and their measures are implemented through nationwide product label changes. U.S. EPA has nearly completed its most recent review of 1,3-D with minimal label changes, while DPR's 1,3-D regulations include fumigation method requirements that will further reduce emissions. CARB and DPR are not aware of any other states with regulatory requirements to reduce ROG emissions from pesticide products.

At this time, no additional measures for regulating pesticides have been identified for use as a contingency measure. However, DPR has developed a process to identify possible additional control measures through its roadmap for sustainable pest management (SPM). SPM is a process of continual improvement that integrates an array of practices and products aimed at creating healthy, resilient ecosystems, farms, communities, cities, landscapes, homes, and gardens. SPM examines the interconnectedness of pest pressures, ecosystem health, and human wellbeing. Going forward, CARB will continue to partner with DPR and explore the best methods to limit pesticide exposures, while also reducing emissions of volatile organic compounds.

Summary

At this time, CARB is including a zero-emission component in most of our regulations, both those already adopted and those that are in development, and the vast majority of these regulations are statewide in scope. Beyond the wide array of sources CARB has been regulating over the last few decades, and especially considering those we are driving to zero-emission, there are few area sources of emissions left for CARB to implement additional controls upon under its authorities for contingency purposes in the Coachella Valley.

Beyond the Smog Check Contingency Measure, no additional contingency measures were identified for mobile and non-mobile sources through CARB's analysis as shown in Table 1. Considering the air quality challenges California faces, if a measure achieving such reductions were feasible, CARB would implement the measure to support expeditious attainment of the NAAQS as the Clean Air Act requires rather than withhold it for contingency measure purposes. Further, should there be a measure achieving the required emission reductions, the measure would likely take more than 1-2 years to implement during which time the expected emission benefits could be reduced due to natural turnover of products and equipment.

Table 1: Assessment of Potential CARB Contingency Measures

Emission Source	Regulatory Programs	Latest Amendment Requirements	Contingency Options	Trigger Feasibility	Technological Feasibility
Pesticides	Fumigant products ROG reduction	Effective 4/1/16; Revise existing field fumigation methods.; Effective 1/1/24; Restrict use of 1,3-D for only agricultural commodities, set limits on application rate and methods to limit exposure/ emissions.	Require more stringent limitations and stricter application methods.	No; Trigger for use limit for 4 NAAs included in existing regulations; Standards requirements need years of lead time to be implemented; infeasible to pull forward standards within 60 days. Infeasible to achieve reductions within two years.	No; Research needed to achieve additional reductions.
	Non-fumigant products ROG reduction	Effective 11/1/13; Sale and use restrictions for products that have any of 4 primary active ingredients and applied to any of 7 crops in San Joaquin Valley.	Require use of "low-VOC" products.	No; Trigger requiring "low-VOC" products that have any of 4 primary active ingredients and applied to any of 7 crops in San Joaquin Valley included in existing regulations; Standards requirements need years of lead time to be implemented; infeasible to pull forward standards within 60 days. Infeasible to achieve reductions within two years.	No; Research needed to achieve additional reductions.

Draft CARB Contingency Measure Analysis

Emission Source	Regulatory Programs	Latest Amendment Requirements	Contingency Options	Trigger Feasibility	Technological Feasibility
Oil and Gas	Oil and Gas Methane Regulation	Adopted 3/23/17. Requires quarterly monitoring of methane emissions and some equipment will require vapor collection systems.	Reduce venting through equipment replacement or vapor control (control venting emissions). Expand/increase LDAR (control fugitive emissions).	No; Standards and requirements need years of lead time to be implemented; infeasible to pull forward standard within 60 days. Purchasing would not happen immediately or within one year of trigger; infeasible to achieve reductions within one 1-2 years.	No; only feasible controls are required to be implemented under U.S. EPA's Emissions Guidelines (finalized December 2023). No; current LDAR requirements are the most stringent in the country.
Consumer Products	Consumer Products	Amended 3/25/21. Lowered VOC standards for hair-care products, personal fragrance, manual aerosol air fresheners, and aerosol crawling bug insecticide.	Adopt and implement more stringent emission standards; pull forward compliance deadlines	No; Standards and requirements need years of lead time to be implemented; infeasible to pull forward standard within 60 days. Purchasing and manufacturing would not happen immediately or within one year of trigger; infeasible to achieve reductions within one 1-2 years.	No; cannot require manufacturers to develop new formulations and products only for contingency and to warehouse just for contingency purposes. Also, since California has the most stringent requirements, cannot bring in lower-emitting products already manufactured for other markets.
Consumer Products	Portable Fuel Container (PFC) Regulation	Amended 4/1/2017. Updated certification test fuel, established 4 year certification term, and streamlined test procedures with U.S. EPA.	Adopt and implement more stringent emission standards	No; Standards requirements need years of lead time to be implemented; infeasible to enforce more stringent standards within 60 days. Purchasing would not happen immediately or within one year of trigger; infeasible to achieve reductions within 1-2 years.	No; standards currently in place are the most stringent.

Draft CARB Contingency Measure Analysis

Emission Source	Regulatory Programs	Latest Amendment Requirements	Contingency Options	Trigger Feasibility	Technological Feasibility
Cargo Tanks (hauling gasoline)	Cargo Tank Vapor Recovery Program	Amended 10/01/23, Administrative in nature; corrected grammatical errors, removed imprecise language regarding alternative test procedures.	Setting more stringent standards	No; technology in this field has no new innovations and standards are more stringent than federal guidelines.	No; current standards and requirements are the most stringent in the nation and current technologies are most advanced.
Petroleum Marketing – Vehicle Refueling	Enhanced Vapor Recovery	Adopted July 26, 2012; performance standards for gasoline dispensing hose permeation April 2015; New performance standards and specifications for ECO Nozzles, including a more stringent nozzle spillage standard over EVR nozzles. December 2020; more stringent performance standard of 0.05 lbs/kgal for nozzle spillage for both EVR and ECO nozzles	Adopt and implement more stringent emission and performance standards	Standards requirements need years of lead time to be implemented; infeasible to enforce more stringent standards within 30 or 60 days. Purchasing would not happen immediately or within one year of trigger; infeasible to achieve reductions within one year.	California has the most comprehensive vapor recovery program applicable to GDFs in the country; no additional opportunities for increased stringency

South Coast AQMD

APPENDIX VI

Precursor Demonstration

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Introduction

Fine particulate matter (PM2.5) is composed of particles that are both directly emitted, such as soot and dust, or formed as a result of secondary reactions between atmospheric chemicals. The United States Environmental Protection Agency (U.S. EPA) identifies four gaseous species as precursors of PM2.5 due to their participation in reactions resulting in secondary PM2.5 formation: oxides of nitrogen (NOx), oxides of sulfur (SOx), volatile organic compounds (VOCs), and ammonia (NH3).

As a part of the EPA's PM2.5 State Implementation (SIP) Requirements Rule (PM2.5 Rule)[1], these four precursor pollutants are subject to PM2.5 SIP planning requirements. The PM2.5 Precursor Demonstration Guidance [2] (Guidance) permits air agencies to "submit an optional precursor demonstration designed to show that for a specific PM2.5 nonattainment area, emissions of a particular precursor from sources within the nonattainment area do not or would not contribute significantly to PM2.5 levels that exceed" the national ambient air quality standards (NAAQS). If the agency's demonstration is approved by U.S. EPA, the attainment plan "may exclude that precursor from certain control requirements under the Clean Air Act."

The following contains demonstrations that two PM2.5 precursors, SOx and VOCs do not contribute significantly to ambient PM2.5 levels that exceed the 2012 annual PM2.5 standard in the South Coast Air Basin (Basin) and therefore, South Coast Air Quality Management District (AQMD) is requesting for exclusion from certain control requirements specified in the Clean Air Act (Act). The other two precursors, NOx and NH3, are significant precursors to annual PM2.5 in the Basin and are consequently not included in this demonstration.

The contents of the demonstration are as follows: 1) An overview of EPA guidelines surrounding the PM2.5 precursor demonstration is provided, and it includes the introduction of modeling methods, the calculation of the PM2.5 design value, 2) and an overview of the concentration- and sensitivity-based analyses which serve as the basis of the precursor demonstration. 3~~2~~) The methodology behind the calculation of contribution thresholds, originally outlined by the U.S. EPA, is described. Following this methodology, the calculations of a confidence interval and contribution threshold specific to the Basin are outlined. And the alternative contribution threshold calculated for the Basin is discussed. 4~~3~~) The results of precursor demonstration relative to the alternative contribution threshold is presented. Furthermore, the concentration- and sensitivity-based analyses are discussed.

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[1] PM25 NAAQS Final SIP Requirements Rule July 2016 | US EPA. Available at: https://www.epa.gov/pm-pollution/pm25-naaqs-final-sip-requirements-rule-july-2016

[2] PM2.5 Precursor Demonstration Guidance, May 2019. Available at: https://www.epa.gov/sites/default/files/2019-05/documents/transmittal_memo_and_pm25_precursor_demo_guidance_5_30_19.pdf

U.S. EPA PM2.5 Precursor Demonstration Guidance

The Guidance, finalized by the U.S. EPA in May 2019, is available to "assist air agencies who may wish to submit PM2.5 precursor demonstrations." The Guidance provides recommendations or guidelines, as authorized under the Act, "that will be useful to air agencies in developing the precursor demonstrations by which the U.S. EPA can ultimately determine whether sources of a particular precursor contribute significantly to PM2.5 levels that exceed the standard in a particular nonattainment area." The recommendations encompass methods for modeling the essential analysis and establishing thresholds for assessing how a precursor affects PM2.5 levels.

Following the Guidance, the following precursor demonstration analyzes "the relationship between precursor emissions and the formation of secondary PM2.5 components" using an air quality model and take into consideration additional relevant factors. The following features two PM2.5 precursors: VOCs and SOx emissions in the South Coast Air Basin. The Guidance outlines a process for conducting the precursor demonstration, which comprises an initial analysis based on concentration, followed by a sensitivity analysis, and the addition of supporting information that complements the sensitivity-based analysis.

The purpose of the precursor demonstration is to determine the presence or absence of significance corresponding to the contribution of a given PM2.5 precursor to PM2.5 levels. The U.S. EPA defines significance in terms of a contribution threshold, a mathematically determined cutoff derived using an approach similar to that used for the Significant Impact Level (SIL) developed in the Prevention of Significant Deterioration (PSD) memorandum.[3] Discussions of significance and the development of SILs are based on an understanding of the inherent variability of regional air quality arising from changes in meteorological conditions. Similarly~~Consequently~~, in the context of PM2.5 precursors, when observing changes in air quality, small changes ~~– defined as those lower than the SIL –~~ are considered insignificant, as their contributions are lower than the day-to-day variability in air quality in a given region.

The Guidance recommends using a contribution threshold based on nationwide data, as well as the statistical methodology behind its calculation. However, it specifically states that "if the estimated air quality impact is greater than or equal to the recommended contribution threshold, this fact would not necessarily preclude approval of the precursor demonstration". The U.S. EPA allows air agencies to submit additional information regarding other pertinent factors they deem relevant for assessing whether the contribution of emissions of a particular precursor to levels that exceed the NAAQS~~NAQQS~~ is "significant" or not. The significance of a precursor's contribution is to be determined "based on the facts and circumstances of the area".

[3] PM2.5 Precursor Demonstration Guidance, May 2019. Available at: https://www.epa.gov/sites/default/files/2019-05/documents/transmittal_memo_and_pm25_precursor_demo_guidance_5_30_19.pdf

The emissions inventory, air quality modeling system and design values (DV) employed for this precursor demonstration are identical to those used in the rest of the PM2.5 plan. While a brief description of emissions inventory and modeling configuration are provided in this section, details are available in Chapters 3 and 5 of the PM2.5 plan and Appendices I and II.

Emissions Inventory and Air Quality Modeling

The emissions inventory consists of stationary sources and mobile sources. Stationary sources are divided into two major subcategories: point sources and area sources. Point sources are permitted facilities with one or more emission sources at an identified location (e.g., power plants, refineries, and industrial processes factories) and subject to Annual Emission Report (AER) program[4]. These facilities generally have annual emissions of 4 tons or more of either VOCs, NOx, SOx, or PM, or annual emissions of over 100 tons of CO. Facilities are required to report their emissions of criteria pollutants and selected air toxics pursuant to Rule 301 to the South Coast AQMD on an annual basis, subject to audit, if any of these thresholds are exceeded. The 2018 annual reported emissions are used to update the stationary source inventory.

Area sources consist of many small emission sources (e.g., residential water heaters, architectural coatings, consumer products, and permitted sources that are smaller than the above thresholds) which are distributed across the basin and are not required to individually report their emissions. CARB and the South Coast AQMD jointly develop emission estimates for approximately 400 area source categories. Emissions from these sources are estimated using the latest activity information and representative emission factors if available. Activity data are usually obtained from survey data or scientific reports, e.g., U.S. Energy Information Administration (EIA) reports for fuel consumption other than natural gas fuel, natural gas consumption data from Southern California Gas Company (SoCalGas), and solvent, sealant and architectural coatings sales reports required under the South Coast AQMD Rules 314, 1113 and 1168. Some activity data, such as population, housing, and vehicle miles travelled (VMT), as well as a large portion for area sources are from SCAG. Emission factors are based on rule compliance factors, source tests, manufacturer's product or technical specification data, default factors (mostly from AP-42, the U.S. EPA's published emission factor compilation), or weighted emission factors derived from point source facilities' annual emissions reports. Additionally, emissions over a given area may be calculated using socioeconomic data, such as population, number of households, or employment in different industry sectors.

Mobile sources consist of two subcategories: on-road sources and off-road sources. On-road vehicle emissions were calculated with CARB's EMFAC2021 model and travel activity data provided by SCAG from their adopted 2020 RTP/SCS. EMFAC2021 calculates exhaust and evaporative emission rates by vehicle type for different vehicle speeds and environmental conditions. Temperature and humidity profiles are used to produce monthly, annual, and episodic inventories. Emission rate data in EMFAC2021 is collected from various sources, such as individual vehicles in a laboratory setting, tunnel studies, and certification

[4] https://www.aqmd.gov/home/rules-compliance/compliance/annual-emission-reporting

data. The EMFAC2021 model incorporates recently adopted regulations, such as Advanced Clean Trucks (ACT),[5] and Heavy-Duty Low NOx Omnibus Regulations. EMFAC2021 does not incorporate Heavy-Duty Inspection and Maintenance (I/M) Regulation, because this regulation was approved after the development of EMFAC2021. However, the effect of Heavy Duty I/M is incorporated in this plan as an external adjustment to EMFAC2021 emissions.

Emissions from off-road vehicle categories are primarily based on estimated activity levels and emission factors using a suite of category-specific models or the OFFROAD2007 model where a new model was not available. Separate models have been developed for estimating emissions from different categories of off-road mobile sources. The emissions presented here are consistent with the off-road emissions developed for the 2022 AQMP, except for a small change in construction equipment emissions. After the development of the 2022 AQMP, an error was discovered in the emission allocations for in-use emissions from off-road construction equipment in Riverside County. This error only affected future year emissions and is now corrected.

The emissions obtained from the above were used as inputs to calculate pollutant concentrations. Pollutant concentrations were calculated using the U.S. EPA-supported Community Multiscale Air Quality (CMAQ) (version 5.3.3) model, with chemistry input from the Statewide Air Pollution Research Center (SAPRC) 07 chemistry and the Weather Research and Forecasting (WRF) (version 4.4.2) model supplying meteorology data. The modeling platform tracks primary pollutants directly emitted that includes precursors of ozone and particulate matter (PM2.5) and the formation of secondary pollutants like ozone and particles formed from the chemical reactions that occur in the atmosphere. The PM2.5 simulations spanned an entire year, from January to December, using meteorological conditions from 2018. The simulations were conducted over an area with a western boundary over 100 miles west of the Ports of Los Angeles and Long Beach. The eastern boundary extends slightly beyond the Colorado River while the northern and southern boundaries of the domain extend to the San Joaquin Valley and the Northern portions of Mexico, respectively. CMAQ was simulated with a 4-kilometer grid resolution.

PM2.5 concentrations were simulated with CMAQ for the base 2018 and the attainment year, 2030.The modeling setup for 2030 remains consistent with the attainment scenario outlined in Chapter 5, with the exception of increased ammonia and NOx emissions by 9 and 4 tons per day, respectively. These adjustments were made to rectify technical errors identified in earlier emissions scenarios. This simulation is referred as 2030 Reference Scenario in this Appendix. These adjustments are not anticipated to alter the precursor sensitivities discussed in this Appendix. Figure VI-1 provides the PM precursors as well as direct emitted PM2.5 emission over the South Coast Air Basin in 2018 and in the attainment year, 2030. For reference, the 2023 baseline (business-as-usual) emission inventory is also provided in the plot.

Future growth projections were based on demographic growth forecasts for various socioeconomic categories (e.g., population, housing, employment by industry) developed by SCAG for their 2020 RTP/SCS. Industry growth factors for 2030 were also provided by SCAG. Table VI-1 summarizes key socioeconomic parameters used in emissions inventory development.

TABLE VI-1
BASELINE DEMOGRAPHIC FORECASTS

Category	2018	2030	2030 % Growth from 2018
Population (Millions)	16.7	18.0	7.9
Housing Units (Millions)	5.3	6.0	11.7
Total Employment (Millions)	7.7	8.3	7.3
Daily VMT (Millions)	388	395	1.8

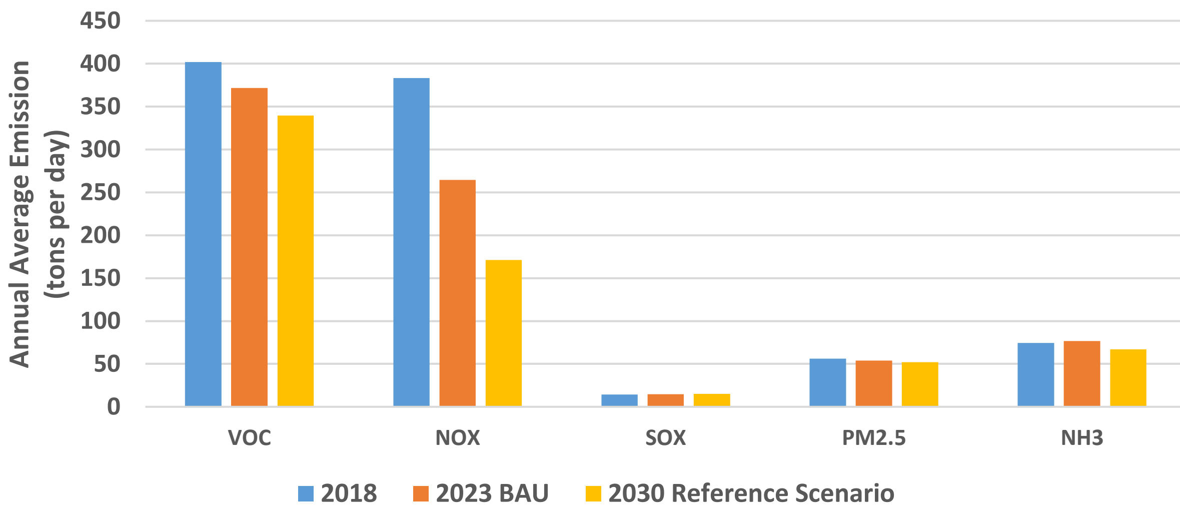

FIGURE VI-1
SOUTH COAST AIR BASIN TOTAL VOC, NOX, SOX, PM2.5, AND NH3 EMISSIONS IN 2018, 2023 BASELINE (BAU), AND 2030 REFERENCE SCENARIO

The air quality modeling platform utilized in this precursor demonstration is the same modeling platform used for the PM2.5 plan. This modeling platform underwent comprehensive model evaluation against available meteorological and air quality measurements at monitoring sites. The WRF model effectively captures synoptic flows, daily land-sea breezes, and mountain-valley circulations. Crucial meteorological parameters for air quality modeling, such as ground temperature, relative humidity, and wind speed, closely align with observed data. The CMAQ model simulates seasonal variations and diurnal changes in PM mass across the basin adequately, albeit with underestimations in the San Fernando region and overestimations in the Foothills and Urban source regions. Additionally, the CMAQ model generally reproduces the spatial distribution of PM species, exhibiting higher levels of nitrate and organic matter for receptors in urban areas compared to inland stations. Refer to Appendix II of this Plan for further details on model performance evaluation.

Design Values

The PM2.5 annual DV for a specific year is determined by averaging the annual PM2.5 concentrations over a three-year period that includes the given year and the two preceding years. However, U.S. EPA guidance on modeling the attainment demonstration[1] recommends using a 5-year weighted DV centered on the base year selected for the attainment demonstration as the modeling Base Design Value (DVB). This 5-year weighted average approach recommended by EPA is to reduce year-to-year variability compared to a single 3-year DV. In the context of this plan, the DVB for each monitoring station is calculated as the average of the DVs for 2018 through 2020 (denoted as DV 2018, DV 2019, and DV 2020 in Figure VI-2). This calculation covers a 5-year period from 2016 through 2020, centered at the base year 2018. Under certain circumstances, the U.S. EPA allows modification of DVB calculation, such as in the case of exceptional events. Figure VI-2 presents the U.S. EPA-recommended DVB calculation on the left. The 2020 DV calculation includes the year 2020, which was marked by several extraordinary events that significantly altered PM2.5 concentrations in the basin. These events include the COVID-19 pandemic and subsequent changes in human activity, and record-setting wildfires. Thus, this precursor demonstration uses a modified DVB for 2018 that excludes the 2020 DV from DVB calculations and replaces it with the average of 2018 and 2019 annual means (Figure VI-2, right). In addition, exceptional events on July 4 and 5 due to Fourth of July fireworks are also excluded.

2018 Base Design Value (DVB)

DV 2018	DV 2019	DV 2020
2016-2018	2017-2019	2018-2020

Average = DVB =

$$\frac{(DV\ 2018) + (DV\ 2019) + (DV\ 2020)}{3}$$

2018 Base Design Value (DVB)

DV 2018	DV 2019	DV Modified
2016-2018	2017-2019	2018-2019

Average = DVB =

$$\frac{(DV\ 2018) + (DV\ 2019) + (\frac{Avg2018 + Avg2019}{2})}{3}$$

FIGURE VI-2

PM2.5 5-YEAR WEIGHTED AVERAGE FOR 2018 BASE DESIGN VALUE

Precursor Demonstration Methods

EPA's Guidance allows for two types of analyses to be used as a part of a precursor demonstration:

1. The **concentration-based** analysis is the initial required step in the precursor demonstration. The goal of the concentration-based analysis is to analyze the contribution of SOx and VOC to overall PM2.5 DVs, through the use of ambient data and, optionally, air quality modeling. The following demonstration estimates the contribution of precursors to overall PM2.5 DVs based on speciated measurements during the period of 2017-2019. This approach is consistent with the speciation used in the attainment demonstration in the PM2.5~~Draft PM~~ Plan. The contribution of individual precursor was evaluated with a concentration-based analysis using ambient data to determine whether precursor emissions contribute to total annual PM2.5 concentrations.

2. The **sensitivity-based analysis** is an optional analysis that may be necessary should the concentration-based analysis fail to demonstrate that a precursor does not significantly contribute to PM2.5 DVs. In contrast to the concentration-based analysis, which reports the direct contributions of precursors to PM2.5 DVs, the sensitivity-based analysis reports the changes in PM2.5 DVs in response to a decrease in precursor emissions. If reductions scenarios show that a pre-specified percentage drop in precursor concentrations results in a change in DV that is less than the contribution threshold, then the contribution of these reductions can be deemed non-significant. The U.S. EPA recommends multiple percentage emissions reductions sensitivities in the range of 30-70 percent precursor reductions, with a strict recommendation of keeping percent reductions above 30 percent. In light of U.S. EPA's recommendations, we conducted a sensitivity analysis of SOx and VOC emissions, testing reductions of 30 and 50 percent. Emission reductions are applied to all anthropogenic emissions throughout the Basin, including emissions over water up to 100 nautical miles from the shore.

This demonstration follows the EPA-approved methodology previous employed in the San Joaquin Valley SIP revision.[5] The sensitivity-based analysis is focused on the future year 2030 DVs. To estimate future PM2.5 DVs, the U.S. EPA recommends the use of relative response factors (RRF). In this approach, future year concentration predictions require two elements: base year (2018) DVs and RRFs. The RRF is simply a ratio of the future year predicted air quality to the simulated air quality in the base year, representing the model predicted change in air quality in response to predicted emissions changes. For the annual PM2.5 attainment demonstration, base year and future modeled concentrations are calculated as a quarterly average of a 3-by-3 grid centered at each station for each specific component. The ratio of base to future

[5] San Joaquin Valley Air Pollution Control District 2018 PM2.5 SIP Precursor Demonstrations for Ammonia, SOx, and OG. Available at: https://www.valleyair.org/pmplans/documents/2018/pm-plan-adopted/G.pdf. U.S. EPA approved the precursor demonstration for the SJVAPCD 2018 plan (85 FR 44192) and 2021 plan revision (88 FR 86581) ~~Precursor demonstration for the 1997 Annual PM2.5 Standard for the San Joaquin Valley, available at: https://ww2.valleyair.org/media/3cme1oo5/chapter-4-precursor-demonstration.pdf. U.S. EPA proposed the approval of the precursor demonstration (88 FR 45276)~~

year quarterly mean concentrations for each component is the RRF for that component. Future year DVs were calculated using species- and site-specific RRFs by the corresponding quarterly DVs. The total future quarterly values at each site are then calculated by adding all the individual components and the blank and the four quarterly average concentrations are then averaged at each site to determine the future annual DVs.

The Guidance allows air agencies to conduct precursor demonstration modeling to illustrate that precursor emissions do not significantly contribute to PM2.5 concentrations in nonattainment areas, "either in a base year or a future year". Following the precursor demonstration included in the San Joaquin Valley SIP revision for the 1997 annual PM2.5 standard[6], this demonstration conducted a sensitivity analysis using projected emissions for 2030, the future attainment year. The projected emissions for 2030 encompass measures from the 2022 AQMP/SIP that can be implemented by 2030, as detailed in the attainment control strategy presented in Chapter 4 of this Plan. Using 2030 as the reference year for the precursor demonstration is justified because emission levels for PM2.5 precursors in 2030 are closer to the emission levels in 2023, the conditions during the development of this Plan, than ~~to~~ the emission levels in 2018 are (as shown in Figure VI-1). Although 2023 is closer to 2018 than to 2030, emission inventories indicate that between 2018 and 2023, the South Coast Air Basin experienced a sharper yearly decline in PM2.5 precursor emissions compared to the period from 2023 to 2030. The average NOx emission decrease rate is 24 tons per year during the years 2018 to 2023, compared with 13 tons per year during 2023 to 2030. The reduction in PM2.5 precursor emissions is primarily driven by cleaner vehicles and equipment mandated by regulations such as CARB's 2010 Truck~~, resulting in corresponding declines in NOx emissions, which are already in place~~ and Bus regulation and ~~will continue to decrease with defined~~ stationary source NOx RECLAIM shave for the period of 2018 to 2023.~~and mobile control measures included in the 2022 AQMP/SIP and CARB's 2022 State SIP Strategies[7] and this Plan.~~ In addition, with the expected rapid change of baseline NOx emissions over the basin in coming years, the atmospheric chemistry conditions in modeling base year 2018 may not be representative at the 2030 attainment year nor in the future beyond that. Model response in the 2030 attainment year provides a more realistic assessment of the potential impact of PM precursors controls than transient current or base year conditions.

The sensitivity-based analysis is based on the sensitivity of PM2.5 DVs to reductions of 30-50 percent in the PM2.5 precursor emissions. The results of the sensitivity-based analyses for SOx and VOC emission reductions are discussed in following sections.

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[6] *Ibid*.

~~[7] 2022 State Strategy for the State Implementation Plan, available at: https://ww2.arb.ca.gov/sites/default/files/2022-08/2022_State_SIP_Strategy.pdf.~~

Development of Contribution Threshold for Annual PM2.5 in South Coast Air Basin

This section describes the calculation of a contribution threshold that is specific to the South Coast Air Basin. The Basin is characterized by distinctive atmospheric conditions owing to its complex terrain and diverse land use. Unlike any other areas in the country, the terrain in the basin extends from coastal areas at sea-level altitude to mountain ranges with elevations above 11,000 feet, within 60 miles. This relatively small area confined between seashore and high mountains houses over 17 million people and encompasses a wide range of land use, ranging from dense urban clusters to inland residential areas and foothills, further extending to the Coachella Valley near deserts. The rugged orography creates complex circulation patterns that transports air pollutants back and forth the basin, with sea-to-land breeze to recirculated layer aloft due to the presence of high mountain ranges. Some monitoring sites near coastal areas frequently experience impacts from emissions by ships, while two sites situated near busy major freeways are heavily influenced by on-road mobile sources. As a result, variation of air pollutant concentrations within the Basin is wider than the average variation observed throughout the entire US. Therefore, we propose the use of a contribution threshold that is based on observations from the South Coast Air Basin alone. Past Federal Reference Method (FRM) 24-hour PM2.5 data are first used to calculate a bootstrapped confidence interval for DVs and then this confidence interval is used to calculate the contribution threshold using only observations from monitors within the Basin.

Calculation of Bootstrapped Confidence Interval

The FRM 24-hour PM2.5 data (with likely exceptional events removed) are used to calculate the confidence interval in the region. DV periods each include three consecutive years (with exceptions[8]) and labeled with the last year of the three-year period. The DV periods used in this analysis are: 2017, 2018, 2019, 2020, 2019, 2021, and 2022. The data from each single year are grouped by quarter (i.e., Jan-Mar as Q1, Apr-Jun as Q2, Jul-Sep as Q3, and Oct-Dec as Q4). Bootstrap re-sampling with replacement using the Matlab function "bootstrp" is performed on the individual quarter 20,000 times, following the U.S. EPA recommendation in the Technical Basis for the EPA's Development of the Significant Impact Thresholds for PM2.5 and Ozone[9] (Technical Basis Document) to ensure the stability of all the cases, and the default seed was chosen to allow the repeatability of resampling results. Each resampling dataset

[8] Exceptional events include exceedances caused by Independence Days fireworks for all years, 2017 Thomas Fire, 2018 Woolsey Fire, 2018 Camp Fire, 2020 Bobcat and El Dorado Fires, 2020 long range transport of wildfire smoke from Central and Northern California, 2020 Blue Ridge and Silverado Fires, and the 2020 Airport and Bond Fires. To ensure that the contribution threshold is not biased high from exceptional events, these days are removed for the contribution threshold calculation.

[9] Technical Basis for the EPA's Development of the Significant Impact Thresholds for PM2.5 and Ozone. April 2018. Available at: https://www.epa.gov/sites/default/files/2018-04/documents/ozone_pm2.5_sils_technical_document_final_4-17-18.pdf

keeps the original data size and is then averaged to obtain the quarterly mean. For example, if Q1 has 80 samples, Q2 has 86 samples, Q3 has 91 samples and Q4 has 85 samples, then for Q1, 20,000 new sample datasets, Q1(1), Q1(2), Q1(3), …, Q1(20,000), each with 80 measurements of PM2.5 are sampled with replacement from the original dataset Q1. A similar process is applied to the other three quarters, resulting in 20,000 datasets of Q2 with 86 samples in each set, 20,000 datasets of Q3 with 91 samples in each set and 20,000 datasets of Q4 with 85 samples in each set. The 20,000 averaged $\overline{Q1}$, $\overline{Q2}$, $\overline{Q3}$, and $\overline{Q4}$ are then calculated respectively and rounded to the hundredth µg/m3 (i.e., two decimal places).

The quarterly means are further averaged to obtain the annual mean. The same calculations are also applied on the other two years in the defined DV period. The DV for the annual PM2.5 NAAQS were then computed as the average of the three annual means and rounded to the tenth µg/m3 (i.e., one decimal place) for the defined DV period. This process is consistent with the annual PM2.5 DV calculation and yields 20,000 resampling DV values. To determine the confidence interval (CI) from these 20,000 DVs, the DV are ranked from low to high. According to the Technical Basis Document, "*the lower bound for the 50 percent CI is the 5000th ranked DV, and the upper bound for the 50 percent CI is the 15,000th ranked DV. That is, the CI are determined simply by ranking the resulting distribution of DVs and the (1-q) percent CI for the mean is the bounds of the center of the data that contains q percentage of the results (i.e., the lower bound is the (q/2) percentile and the upper bound is the (1-q/2) percentile).*" We used the MATLAB function "prctile" to determine the 50 percent CI for the threshold contribution calculation.

Calculation of Contribution Threshold

Based on the definition of contribution threshold, (i.e., the SIL defined in the Technical Basis Document), "the median variability from the 50 percent CI from the entire US ambient monitoring network is used to calculate SIL values" and then "a representative value can be multiplied by the level of that NAAQS to obtain a value in concentration units" where "variability" and "representative value" both refer to the relative variability. Relative variability is defined as "the difference between the bounds of the bootstrapped CI and the actual design value for a single monitoring site, divided by the actual design value for the site". To develop the contribution threshold for the Basin, CI values from all 17 sites (see TABLE~~Table~~ VI-7~~6~~) with regulatory monitoring data in the Basin are used. For each DV period, 17 relative variabilities for 17 FRM sites can be obtained, and median value of relative variabilities is chosen to avoid the interference of extreme values in the calculation. The contribution threshold values for the Basin are calculated using three approaches:

1. Take the average of the median relative variability in the three most recent DV periods as recommended by the U.S. EPA, i.e., 2018-2020, 2019-2021 and 2020-2022 for most sites and 2017-2019, 2018-2020, and 2019-2021 for the four sites containing PM2.5 monitors that were temporarily or permanently discontinued in 2022.
2. Take the average of the median relative variability for the DV periods used in the 2018 base year, i.e., 2016-2018, 2017-2019, and 2018-2019 in the Basin. Note that in this approach, the 2018-2019 DV period only includes two years due to the unrepresentative and anomalous emissions in 2020.

3. Take the average of all the DV periods from 2015 to 2022.

The mean values from these three methods are multiplied by the annual PM2.5 NAAQS (12.0 µg/m^3) to obtain a value in concentration units (i.e., µg/m^3 for PM2.5), respectively.

Results

Table VI-2 shows the annual relative variability values for all the sites in the Basin which are also depicted in Figure VI-3 along with the national relative variability values. Figure VI-3 shows that the annual median relative variability for all the sites ~~in the Basin~~ are consistently higher than the national relative variability (1.66 percent), which is likely due to the large range (difference between highest and lowest concentration) of PM2.5 variation in the Basin. For example, the observed ranges at the Compton and Long Beach-Route 710 Near Road sites – both situated near ~~a~~ major roadways – both exceed 100 µg/m^3 (Table VI-3~~2~~), which may be due to various factors including emissions, meteorological conditions and terrain characteristics in the area. It is also noted that the relative variability for the Big Bear site is much higher with a mean value of 6.9 percent compared with other sites, but it decreases to 5.3 percent for the DV period of 2020-2022. The sampling frequency at Big Bear was one in 6-day sampling until 2021 and changed to everyday sampling in 2022 (Table VI-4~~3~~). The Technical Basis Document shows the relationship between the sampling frequency and relative variability, suggesting that a low sampling frequency usually leads to high variability. Based on the analysis, the variability pattern at Big Bear may be related to its sampling frequency. The decreasing variability from 4.2 percent to 2.3 percent is also found at the Compton site, corresponding to the change of sampling frequency from one-in-three-day to everyday sampling in 2019.

TABLE VI-2

ANNUAL RELATIVE VARIABILITY FOR ALL THE 17 SITES IN THE JURISDICTION

Station	2017	2018	2019	2020	2021	2022
Anaheim	0.0297	0.0187	0.0280	0.0189	0.0187	0.0275
Azusa	0.0400	0.0385	0.0396	0.0388	0.0377	----*
Big Bear	0.0746	0.0615	0.0806	0.0735	0.0725	0.0526
Compton	0.0417	0.0403	0.0403	0.0320	0.0238	0.0231
Fontana	0.0431	0.0342	0.0354	0.0354	0.0345	0.0431
Long Beach (North)	0.0187	0.0278	0.0286	0.0377	0.0286	----*
Long Beach (South)	0.0194	0.0280	0.0189	0.0187	0.0187	----*
Long Beach-Route 710 Near Road	0.0238	0.0159	0.0244	0.0163	0.0163	0.0159
Los Angeles-North Main Street	0.0250	0.0164	0.0252	0.0167	0.0250	0.0167
Mira Loma (Van Buren)	0.0221	0.0217	0.0224	0.0221	0.0221	0.0150
Mission Viejo	0.0267	0.0250	0.0375	0.0366	0.0357	----*
Ontario-Route 60 Near Road	0.0205	0.0207	0.0217	0.0217	0.0217	0.0219
Pasadena	0.0417	0.0306	0.0417	0.0396	0.0392	0.0388
Pico Rivera #2	0.0342	0.0328	0.0424	0.0413	0.0410	0.0403
Reseda	0.0435	0.0412	0.0412	0.0303	0.0408	0.0412
Rubidoux	0.0246	0.0242	0.0250	0.0246	0.0248	0.0250
San Bernardino	0.0364	0.0360	0.0367	0.0273	0.0357	0.0345

* These stations did not have enough data to determine a design value in 2022

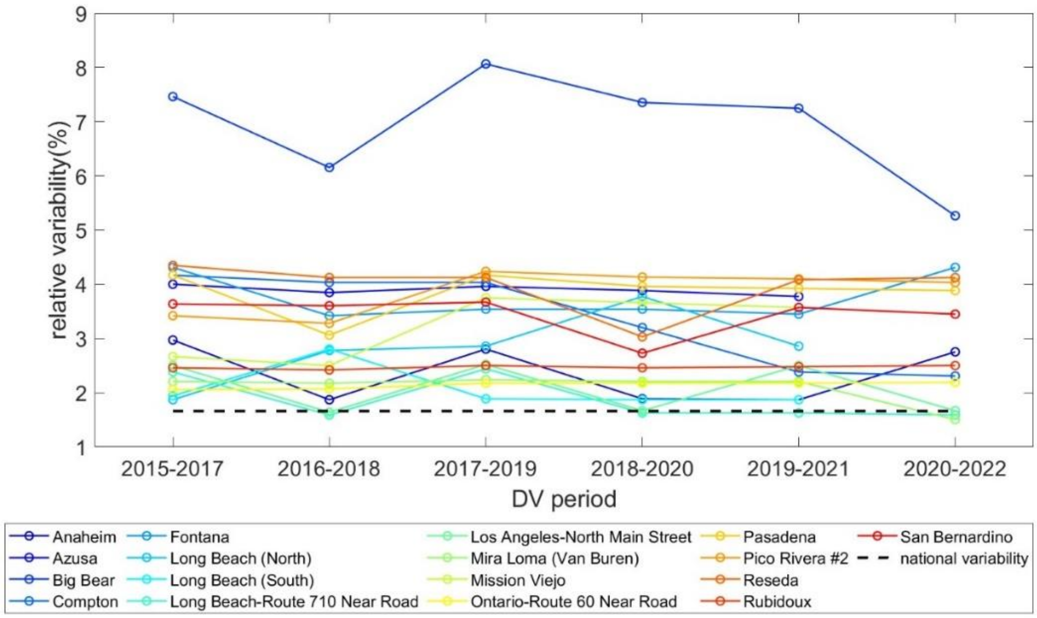

FIGURE VI-3

ANNUAL RELATIVE VARIABILITY FOR ALL THE 17 SITES IN THE JURISDICTION AS WELL AS THE NATIONAL VARIABILITY (1.66 PERCENT) REPORTED IN THE TECHNICAL BASIS DOCUMENT

TABLE VI-3~~-2~~

STATISTICAL OVERVIEW OF OBSERVATION FOR 17 SITES (NOT BOOTSTRAPPING RESULTS) IN THE BASIN

Station	Count	Mean	Std Error*	Std Dev+	Var^	Min	Max	Range
Anaheim	2819	10.5	0.1	6.2	37.9	1.2	63.1	61.9
Azusa	832	10.3	0.2	6.2	38.6	0.7	61.9	61.2
Big Bear	743	7.5	0.2	5.0	25.4	0.3	39.4	39.1
Compton	1824	12.5	0.2	7.5	56.8	1.5	102.1	100.6
Fontana	922	11.4	0.2	6.4	41.4	0.1	55.1	55.0
Long Beach (North)	1778	10.7	0.1	6.2	37.9	1.9	79.6	77.7
Long Beach (South)	2505	10.6	0.1	6.1	37.8	1.1	77.3	76.2
Long Beach-Route 710 Near Road	2868	12.4	0.1	6.7	44.6	1.7	103.8	102.1
Los Angeles-North Main Street	2840	12.0	0.1	6.5	42.6	1.7	61.4	59.7
Mira Loma (Van Buren)	2830	13.4	0.1	7.9	61.6	0.1	86.0	85.9
Mission Viejo	1037	8.4	0.1	4.5	20.1	0.5	38.9	38.4
Ontario-Route 60 Near Road	2856	13.9	0.1	6.8	46.3	0.2	65.4	65.2
Pasadena	953	9.8	0.2	5.6	31.4	1.3	63.6	62.3
Pico Rivera #2	937	11.9	0.2	6.6	43.8	0.1	66.0	65.9
Reseda	916	9.5	0.2	5.4	29.1	0.6	55.5	54.9
Rubidoux	2875	12.0	0.1	6.9	47.9	1.2	82.0	80.8
San Bernardino	903	11.2	0.2	6.1	37.5	1.2	57.9	56.7

*Standard Error
+Standard Deviation
^Variance

TABLE VI-4 ~~3~~

NUMBER OF CREDIBLE SAMPLES (EXCLUDING LIKELY EXCEPTIONAL EVENTS) FOR EACH STATION FROM 2015 TO 2022

Station	2015	2016	2017	2018	2019	2020	2021	2022
Anaheim	295	349	364	363	364	355	364	365
Azusa	119	122	115	120	120	116	120	0
Big Bear	58	55	49	54	46	58	59	364
Compton	111	115	119	117	303	353	349	357
Fontana	113	110	118	110	114	117	120	120
Long Beach (North)	338	356	348	344	156	117	119	0
Long Beach (South)	347	350	363	362	362	357	364	0
Long Beach-Route 710 Near Road	336	361	362	359	365	356	365	364
Los Angeles-North Main Street	342	357	358	346	360	353	363	361
Mira Loma (Van Buren)	343	352	358	351	356	353	352	365
Mission Viejo	115	117	113	107	110	119	356	0
Ontario-Route 60 Near Road	338	361	357	358	364	356	362	360
Pasadena	118	119	121	121	118	117	119	120
Pico Rivera #2	117	120	118	114	118	114	122	114
Reseda	113	113	109	106	118	116	120	121
Rubidoux	341	357	364	364	364	357	364	364
San Bernardino	110	113	116	114	97	115	120	118

Figure VI-4 shows the contribution threshold for each DV period, i.e., the median variability × 12.0 µg/m^3, from 2015 to 2022. A linear regression is applied to the annual values. The coefficient of determination (R^2) of 0.62 and negative slope of -0.02 (not shown here) suggest that the annual variability exhibits a decreasing trend from 2015 to 2022 with relatively high confidence, similar to the national variation reported in the Technical Basis Document, which is also attributed to the change in sampling frequency. Note that this linear regression should not be used to extrapolate the contribution threshold beyond 2022 as there is no way to predict any future changes in sampling schedules, which could heavily influence the future slope.

The calculated contribution threshold is 0.3 μg/m^3 for the most recent three DV periods (Approach 1), 0.4 μg/m^3 for the 2018 base year (Approach 2) and 0.4 μg/m^3 for all the three-year DV periods from 2015 to 2022 (Approach 3). A contribution threshold of 0.4 μg/m^3 (Approach 2) is recommended for the PM2.5 precursor demonstration as the project is also based on the same DV periods.

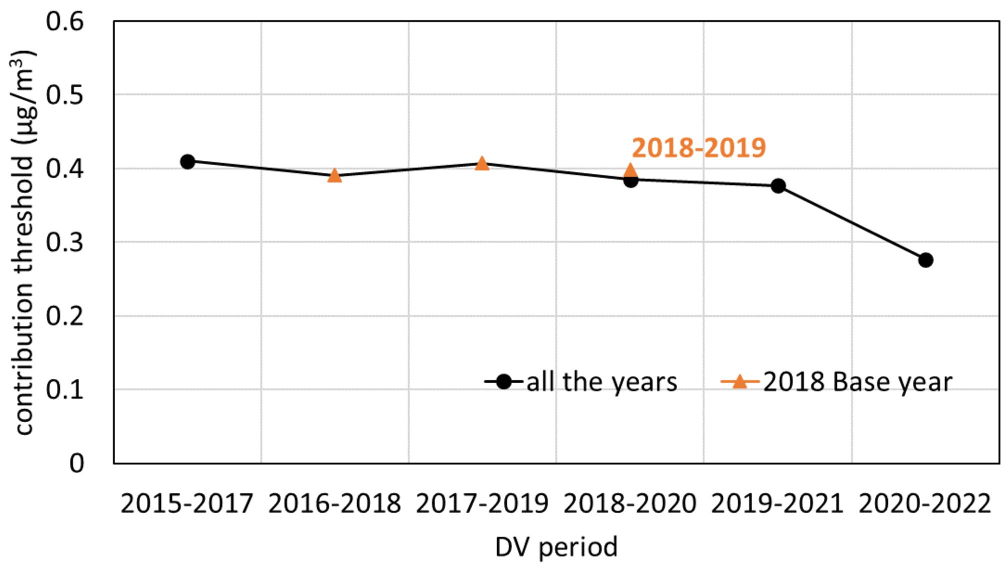

FIGURE VI-4

ANNUAL VARIATION OF THE CONTRIBUTION THRESHOLD (μG/M^3) FOR THE BASIN (17 SITES INCLUDED) FROM 2015 TO 2022. THE PERIODS INCLUDED IN THE 2018 BASE YEAR DESIGN VALUE (I.E., 2016-2018, 2017-2019 AND 2018-2019) ARE MARKED AS ORANGE TRIANGLES

Precursor Demonstration Results

Concentration-based Analysis

The contribution of individual precursor was evaluated with a concentration-based analysis using ambient data to determine whether precursor emissions contribute to total annual PM2.5 concentrations. Each precursor's impact on total PM2.5 mass is compared to contribution thresholds. As previously noted, the primary use of contribution thresholds is to generate a threshold that matches "the inherent variability in the measured atmospheric conditions." This demonstration defines the alternative contribution threshold for the South Coast Air Basin as 0.4 μg/m^3. This is driven from the data collected during 2016 to 2019, the same period used to estimate the weighted design values for the base year 2018, as described previous section.

Table VI-5~~4~~ shows the speciation fractions of sulfate and organic carbon based on speciation measurements collected between 2017 and 2019. The chemical components are measured at four stations: Anaheim, Central Los Angeles, Riverside and Fontana. Speciation for other stations is interpolated using inverse distance squared weighting. Table VI-6~~5~~ shows speciated DVs for the base year 2018. The DVs are based on a modified 5-year weighted average from 2016 to 2019 (described in previous section), with speciation data based on measurements and interpolation from 2017 to 2019. Speciated values exceed the Guidance recommended contribution threshold of 0.4 µg/m^3. On the rightmost column of Table VI-6~~5~~, VOC contributions to SOA formation were estimated by multiplying the contribution of organic carbon by 2/3.

TABLE VI-5~~-4~~

SPECIATION FRACTIONS FOR SULFATE AND ORGANIC CARBON FROM MEASUREMENTS DURING THE PERIOD 2017-2019. BASE YEAR DESIGN VALUES ARE IDENTICAL TO THOSE PRESENTED IN CHAPTER 5 OF THIS PLAN

Site	Sulfate	Organic Carbon	Base Year Design Value
Anaheim	10.2%	38.0%	10.54
Azusa	11.1%	37.1%	10.13
Big Bear	9.0%	34.9%	6.34
Central Los Angeles	10.7%	40.2%	11.96
Compton	9.9%	39.1%	12.25
Fontana	9.8%	33.9%	11.35
Long Beach Near Road	9.9%	38.8%	12.28
Long Beach	10.1%	38.3%	10.53
Mira Loma	9.3%	35.4%	13.52
Mission Viejo	10.4%	36.2%	7.95
Ontario Near Road	9.6%	34.9%	13.98
Pasadena	11.0%	39.3%	9.68
Pico Rivera	10.2%	38.6%	11.87
Reseda	10.7%	38.6%	9.73
Riverside	9.6%	36.9%	12.13
South Long Beach	9.9%	38.2%	10.57
San Bernardino	9.9%	35.5%	10.88

TABLE VI-6~~5~~

DESIGN VALUES SHOWING CONTRIBUTION OF SOX (CENTER COLUMN) AND VOCS (RIGHT COLUMN) TO PM2.5 MASS DESIGN VALUE, BY SITE

Site	SOx contribution to PM2.5 design value (μg/m^3)	VOC contribution to PM2.5 design value (μg/m^3)
Anaheim	1.1	2.7
Azusa	1.1	2.5
Big Bear	0.6	1.5
Central Los Angeles	1.3	3.2
Compton	1.2	3.2
Fontana	1.1	2.6
Long Beach Near Road	1.2	3.2
Long Beach	1.1	2.7
Mira Loma	1.3	3.2
Mission Viejo	0.8	1.9
Ontario Near Road	1.3	3.3
Pasadena	1.1	2.5
Pico Rivera	1.2	3.1
Reseda	1.0	2.5
Riverside	1.2	3.0
South Long Beach	1.1	2.7
San Bernardino	1.1	2.6

This concentration-based analysis, however, does not accurately capture the impact of reductions of precursor emissions on PM2.5 levels. Since the concentration-based analysis shows the precursors contribute to total PM2.5 mass in amounts over U.S. EPA's recommended thresholds, a sensitivity-based analysis is conducted to demonstrate that reductions of SOx and VOCs would not significantly contribute to PM2.5 concentrations, and consequently, that SOx and VOC can be excluded from SIP planning requirements.

Sensitivity-based Analysis

With regards to the South Coast Air Basin, Table VI-7~~6~~ lists the monitoring sites in the Basin alongside their baseline 2018 and 2030 DVs. As shown in Table VI-7~~6~~, five out of 17 sites in the area had DVs over the 12 μg/m^3 annual standard. The Guidance suggests focusing on the sites that fail to reach attainment in the precursor demonstrations. Therefore, this sensitivity-based analyses focus strictly on these five sites.

TABLE VI-7~~-6~~

BASELINE PM2.5 DESIGN VALUES (µg/m³~~µG/M³~~) FOR YEARS 2018 AND 2030. THE FIVE SITES EXCEEDING 12 µg/m³ IN 2018 ARE BOLDED

Site	2018 DV (µg/m³)	2030 Reference Scenario DV (µg/m³)
Anaheim	10.54	9.70
Azusa	10.13	9.03
Big Bear	6.34	5.60
Los Angeles	11.96	10.76
Compton	**12.25**	**11.08**
Fontana	11.35	9.77
Long Beach Near Road	**12.28**	**11.11**
Long Beach	10.53	9.55
Mira Loma	**13.52**	**11.74**
Mission Viejo	7.95	7.18
Ontario Near Road	**13.98**	**12.11**
Pasadena	9.68	8.75
Pico Rivera	11.87	10.73
Reseda	9.73	8.56
Riverside	**12.13**	**10.60**
South Long Beach	10.57	9.60
San Bernardino	10.88	9.37

Sulfur Dioxide Analysis

SOx are emitted from stationary and mobile combustion sources, predominantly in the form of SO_2. Petroleum refining, ocean going vessels, aircrafts and on-road vehicles are among the largest contributors. Once emitted into the atmosphere, SOx compounds are oxidized into sulfuric acid (H_2SO_4), which then forms ammonium sulfate ($(NH_4)_2SO_4$) after reacting with NH_3. Ammonium sulfate is in particulate form, thus making SOx a particulate matter precursor.

The contribution of SOx to annual PM2.5 was tested by reducing basin-wide SOx emissions in 2030 by 30 and 50 percent. Table VI-8A~~7~~ lists the DVs projected for 2030, as well as modeled PM2.5 DVs under the 30 and 50 percent SOx reduction scenarios. The difference between the 2030 DV and the two design values (shown in parentheses) represents the modeled impact on PM2.5 levels of 30-50 percent reduction in SOx emissions in 2030. This is the value that is compared to the contribution threshold. As shown in Table VI-8~~7~~, the difference remains below the Guidance recommended contribution threshold of 0.2 µg/m³.

TABLE VI-8A

PM2.5 DESIGN VALUES FROM 2030 BASE CASE, 30 PERCENT, AND 50 PERCENT SOX REDUCTION SCENARIOS

Site	2030 DV	30 percent SOx reduction (difference)	50 percent SOx reduction (difference)	Significant Contribution
Compton	11.08	10.98 (0.10)	10.93 (0.15)	No
Long Beach Near Road	11.11	10.98 (0.13)	10.93 (0.18)	No
Mira Loma	11.74	11.77 (-0.03)	11.75 (-0.01)	No
Ontario Near Road	12.11*	12.07 (0.04)	12.04 (0.07)	No
Riverside	10.60	10.64 (-0.04)	10.62 (-0.02)	No

*This value represents RRF adjusted CMAQ predictions, not the final attainment demonstration

The precursor demonstration modeling shows disbenefit from SOx controls at some sites for annual PM2.5 DV (e.g. Mira Loma and Riverside). The nonlinear response of PM2.5 mass to SOx emission reductions in specific locations within South Coast Air Basin may be attributed to the competition of sulfate (SO4) and nitrate (NO3) for available ammonium (NH4) to form particulates of ammonium nitrate (NH4NO3) or ammonium sulfate ($(NH_4)_2SO_4$). Given the one-to-one combination ratio for NH4NO3 compared to the two-to-one ratio for $(NH_4)_2SO_4$, reducing one unit of SOx would reduce one unit of $(NH_4)_2SO_4$, but it free two units of ammonium that could form two units of NH4NO3, resulting in a net increase of PM2.5 mass.[10] The approved precursor demonstration for San Joaquin Valley SIP revision also discusses how the inorganic aerosol thermodynamic equilibrium module ISORROPIA used to model inorganic secondary PM2.5 in the CMAQ model may introduce nonlinearity for SOx reductions.[11] Figure VI-5 illustrates the annual mean sulfate (SO4), nitrate (NO3), ammonium (NH4) as well as PM2.5 total mass concentration differences spatial patterns for the 30 percent SOx reduction scenario compared with the 2030 base case. The circles in the figure indicate the five stations that exceed the 12 μg/m^3 standard in 2018. CMAQ simulations show the increase of nitrate concentration with the reduction of SOx emissions, especially over the inland foothill area near Mira Loma and Riverside station.

[10] West, J.J. Ansari, A.S. Pandis, S.N., 1999. Marginal PM2.5: Nonlinear aerosol mass response to sulfate reductions in the eastern United States, Journal~~Jounrnal~~ of the Air & Waste Management Association, 49, 1415-1424. http://doi.org/10.1080/10473289.1999.10463973.

[11] San Joaquin Valley Air Pollution Control District 2018 PM2.5 SIP Precursor Demonstrations for Ammonia, SOx, and OG. Available at: https://www.valleyair.org/pmplans/documents/2018/pm-plan-adopted/G.pdf. U.S. EPA approved the precursor demonstration for the SJVAPCD 2018 plan (85 FR 44192) and 2021 plan revision (88 FR 86581) ~~Precursor demonstration for the 1997 Annual PM2.5 Standard for the San Joaquin Valley, available at: https://ww2.valleyair.org/media/3cme1oo5/chapter-4-precursor-demonstration.pdf. U.S. EPA proposed the approval of the precursor demonstration (88 FR 45276)~~

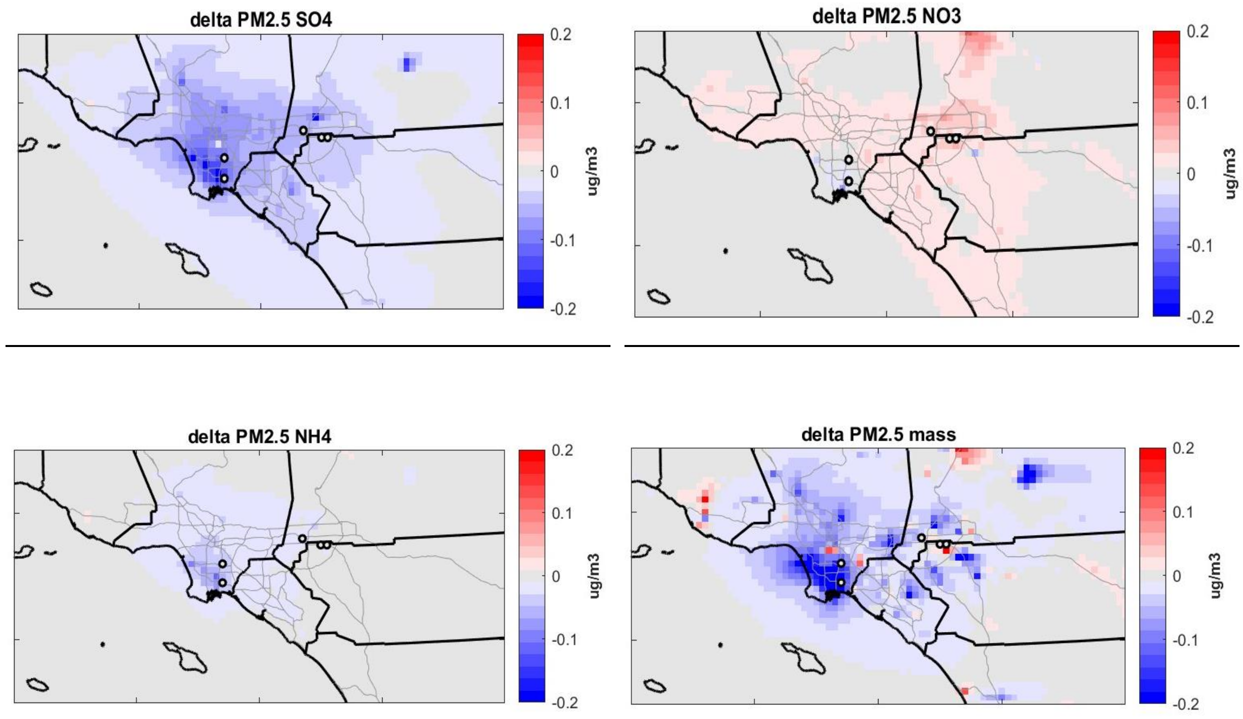

FIGURE VI-5
DELTA ANNUAL MEAN CONCENTRATION SPATITAL PATTERNS FOR NITRATE, SULFATE, AMMONIUM AND PM2.5 TOTAL MASS BETWEEN 30 PRECENT SOX REDUCTION SCENARIO AND 2030 BASE CASE

For reference, Table VI-8B presents the PM2.5 sensitivity responses to SOx for the base year 2018. Reducing SOx emissions by 30% does not decrease design values significantly, whereas 50% reductions in SOx decrease design values at Compton and Long Beach by 0.21 μg/m^3, only slightly higher than the nationwide threshold but well below the Basin-specific contribution threshold. However, it is important to note that emissions have been changeds significantly from 2018 to 2023. Given that the current emissions are closer to those and, considering the shift of emissions closer to theprojected for 2030 condition, modeled sensitivity for 2030 was used to determine the significance of PM2.5 precursors contributing to the annual PM2.5 levels in the Basin. However, it is important to note that emissions have changed significantly from 2018 to 2023.. Given that the current emissions are closer to those projected for 2030, modeled sensitivity for 2030 was used to determine the significance of PM2.5 precursors contributing to the annual PM2.5 levels in the Basin.

~~TABLE VI-7~~

~~PM2.5 DESIGN VALUES FROM 2030 BASE CASE, 30 PERCENT, AND 50 PERCENT SOX REDUCTION SCENARIOS~~

~~Site~~	~~2030 DV~~	~~30 percent SOx reduction (difference)~~	~~50 percent SOx reduction (difference)~~	~~Significant Contribution~~
~~Compton~~	~~11.08~~	~~10.98 (0.10)~~	~~10.93 (0.15)~~	~~No~~
~~Long Beach Near Road~~	~~11.11~~	~~10.98 (0.13)~~	~~10.93 (0.18)~~	~~No~~
~~Mira Loma~~	~~11.74~~	~~11.77 (-0.03)~~	~~11.75 (-0.01)~~	~~No~~
~~Ontario Near Road~~	~~12.11*~~	~~12.07 (0.04)~~	~~12.04 (0.07)~~	~~No~~
~~Riverside~~	~~10.60~~	~~10.64 (-0.04)~~	~~10.62 (-0.02)~~	~~No~~

~~*This value represents RRF adjusted CMAQ predictions, not the final attainment demonstration~~

TABLE VI-8B

PM2.5 DESIGN VALUES FROM 2018 BASE CASE, 30 PERCENT, AND 50 PERCENT SOX REDUCTION SCENARIOS

Site	2018 DV	30 percent SOx reduction (difference)	50 percent SOx reduction (difference)
Compton	12.25	12.12 (0.13)	12.04 (0.21)
Long Beach Near Road	12.28	12.15 (0.13)	12.07 (0.21)
Mira Loma	13.52	13.46 (0.06)	13.42 (0.1)
Ontario Near Road	13.98	13.89 (0.09)	13.84 (0.14)
Riverside	12.13	12.06 (0.07)	12.03 (0.1)

Consideration of Additional Information

To supplement modeling analysis, the Guidance allows agencies to consider additional information. South Coast AQMD has accordingly evaluated trends in SOx emissions to support the sensitivity-based analysis. Estimated SOx emissions (tons/day) by major source between 2018 and 2030, are shown in Figure VI-6~~5~~. While there are small variations in sources contributing to SOx emissions, overall SOx emissions from the base year to 2030 remain flat. With marginal fluctuations in point source emissions, there is no discernable trend in SOx emissions, and overall, emissions are projected to stay constant.

As SOx requires the presence of NH3 to form secondary PM2.5, we also visualized trends in NH3 emissions across the same time period in Figure VI-7~~6~~. Like SOx, relative levels of ammonia remain similar through the attainment year. The largest contributor to NH3 is the emissions from human and animal perspiration that is not controllable. However, the strategy to attain the 2015 8-hour ozone in 2037 requires economywide transition to zero emission technology, which will result in substantial reductions in all pollutants including NH3. The SOx and NH3 emissions ensure that no significant changes are expected in their contribution to future annual PM2.5 levels, and therefore, SOx is expected to be insignificant to annual PM2.5 in the South Coast Air Basin.

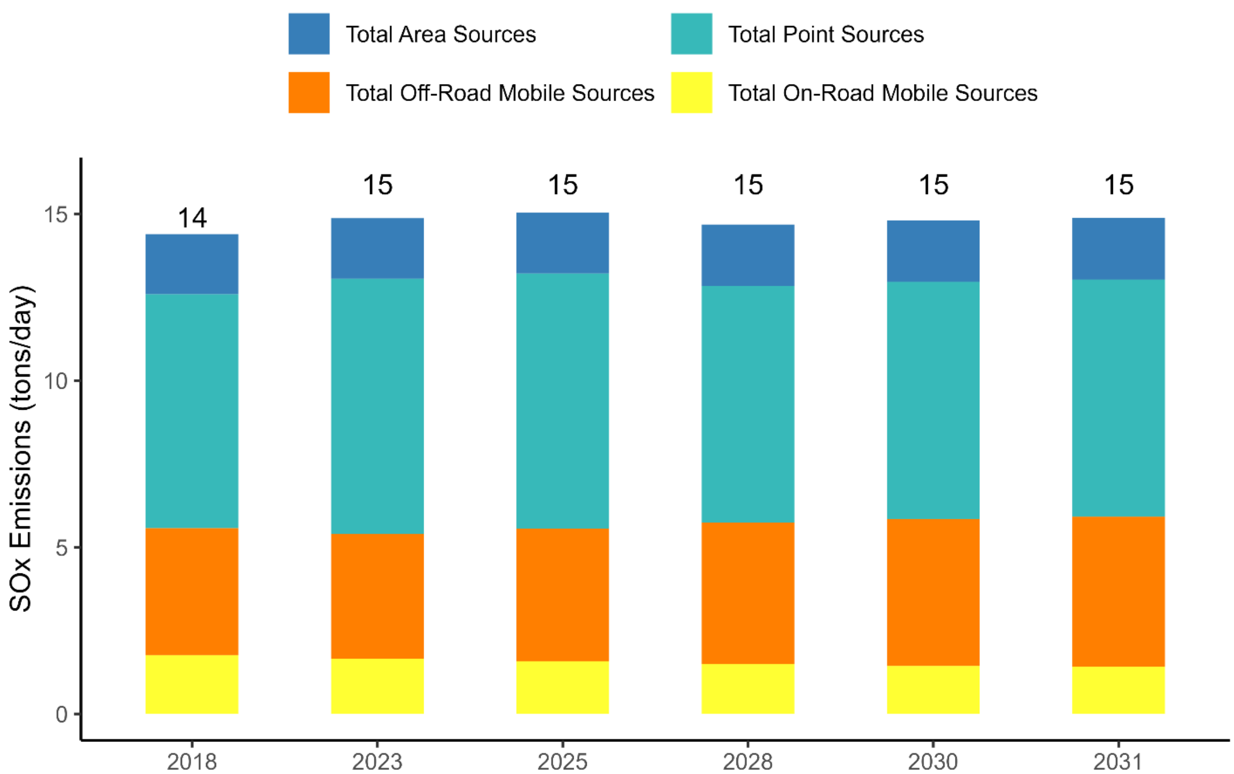

FIGURE VI-6~~-5~~
SOX EMISSION (TONS/DAY) TREND, BY SOURCE, IN THE SOUTH COAST AIR BASIN BETWEEN 2018 AND 2031

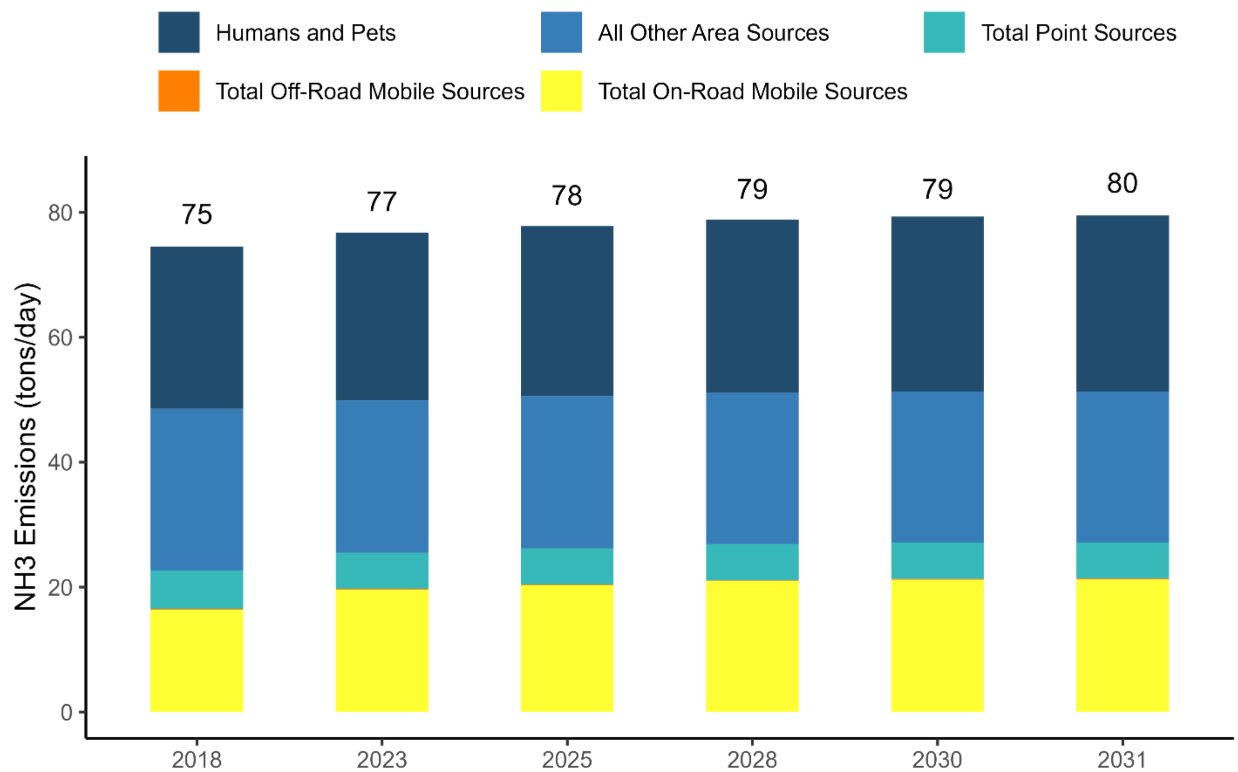

FIGURE VI-7-~~6~~
NH3 EMISSIONS (TONS/DAY) TREND, BY SOURCE, IN THE SOUTH COAST AIR BASIN BETWEEN 2018 AND 2031

Volatile Organic Carbon Analysis

Formation of secondary organic aerosols (SOA) strongly depend on the presence of VOCs, making VOCs a potentially important precursor to PM2.5. VOC contribution to annual PM2.5 is tested by reducing basin-wide VOC emissions in 2030 by 30 and 50 percent. Table VI-9~~8~~ lists the DVs projected for 2030, as well as modeled PM2.5 DVs under 30 and 50 percent VOC reduction scenarios. The difference between the 2030 DV and the two design values (shown in parentheses) represents the modeled impact on PM2.5 levels of 30-50 percent reduction in VOC emissions in 2030. This is the value that is compared to the contribution threshold. As shown in Table VI-9~~8~~, the difference remains below the Guidance recommended contribution threshold of 0.2 µg/m^3 for most sites, except for the case of a 50 percent reduction in VOCs at the Long Beach Near Road site, where the contribution to the annual DV is 0.22 µg/m^3. While this value is slightly above the contribution threshold of 0.2 µg/m^3, it is lower than the alternative contribution threshold of 0.4 µg/m^3 that is calculated for the South Coast Air Basin (as described in previous section). Even if the contribution threshold is calculated with more recent observational data, this contribution threshold is 0.3 µg/m^3 (shown in Figure VI-4), which is higher than the VOC contribution at the Long Beach

Near Road site. Furthermore, the Guidance does not definitively state whether a single monitor recording above the contribution threshold implies significance of the precursor.

Similar to the SOx demostration, the CMAQ model shows disbenefit~~disbenifit~~ for VOC controls on annual PM2.5 DV at specific locations (e.g. Mira Loma and Riverside) with 30 percent VOC control across the basin. The reduction of VOCs under different NOx conditions may trigger various chemical reaction regimes, thus yielding different responses to PM2.5 formation. Decreasing VOC emissions in NOx-saturated environments reduces oxidant levels, subsequently lowering sulfate and organic aerosols. However, in NOx lean environments, such as the 2030 attainment year utilized in this analysis, VOC reduction can produce negative feedback, leading to an increase in the OH radical concentration and thus accelerated VOC oxidation. Consequently, due to this negative feedback effect, VOC emission reduction becomes less effective in reducing aerosol mass.[12] [13]

For reference, Table VI-9B presents the PM2.5 sensitivity responses to VOC for the base year 2018. The changes in design values resulting from 30% reductions in VOC are larger than the nationwide contribution threshold but are below the contribution threshold calculated for the Basin. Reducing VOC emissions by 50% with respect to the levels in 2018 decreases design values beyond the Basin-specific contribution threshold of 0.4 $\mu g/m^3$. As discussed above, the high NOx environment in 2018 favors a high response of organic aerosol to changes in VOC emissions. However, NOx emissions are projected to decline through 2024 and beyond. With lowering NOx emissions, the response of design values to VOC changes are reduced notably, as shown in Table VI-9A. However, as in the case for SOx, it is important to note that emissions have changed significantly from 2018 to 2023. Given that the current emissions are closer to those projected for 2030, modeled sensitivity for 2030 was used to determine the significance of PM2.5 precursors contributing to the annual PM2.5 levels in the Basin.

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[12] Alexandra P. Tsimpidi, Vlassis A. Karydis & Spyros N. Pandis (2008)
Response of Fine Particulate Matter to Emission Changes of Oxides of Nitrogen and Anthropogenic Volatile Organic Compounds in the Eastern United States, Journal of the Air & Waste Management Association, 58:11, 1463-1473, DOI: 10.3155/1047-3289.58.11.1463

[13] Liao, Kuo-Jen, et al. “Current and Future Linked Responses of Ozone and PM2.5 to Emission Controls.” Environmental Science & Technology, vol. 42, no. 13, July 2008, pp. 4670–75. ACS Publications, https://doi.org/10.1021/es7028685.

TABLE VI-9A~~-8~~

PM2.5 DESIGN VALUES FROM 2030 BASE CASE, 30 PERCENT, AND 50 PERCENT VOC REDUCTION SCENARIO

Site	2030 DV	30 percent VOC reduction (difference)	50 percent VOC reduction (difference)	Significant Contribution
Compton	11.08	10.97 (0.11)	10.89 (0.19)	No
Long Beach Near Road	11.11	10.96 (0.15)	10.89 (0.22)	No (30 precent) Yes (50 percent)
Mira Loma	11.74	11.77 (-0.03)	11.73 (0.01)	No
Ontario Near Road	12.11*	12.08 (0.03)	12.03 (0.08)	No
Riverside	10.60	10.63 (-0.03)	10.60 (0.00)	No

*This value represents RRF adjusted CMAQ predictions, not the final attainment demonstration

TABLE VI-9B

PM2.5 DESIGN VALUES FROM 2018 BASE CASE, 30 PERCENT, AND 50 PERCENT VOC REDUCTION SCENARIO

Site	2018 DV	30 percent VOC reduction (difference)	50 percent VOC reduction (difference)
Compton	12.25	11.96 (0.29)	11.79 (0.46)
Long Beach Near Road	12.28	11.96 (0.32)	11.8 (0.48)
Mira Loma	13.52	13.31 (0.21)	13.13 (0.39)
Ontario Near Road	13.98	13.71 (0.27)	13.5 (0.48)
Riverside	12.13	11.94 (0.19)	11.79 (0.34)

Consideration of Additional Information

As shown in Figure VI-8~~7~~, VOC emissions are projected to decrease between 2018 and 2030, with major reductions from on-road and off-road emissions. The biggest reductions are projected to occur between 2018 and 2023 driven by the reductions in mobile sources. Area sources such as consumer products are tied with population growth. However, regulations on stationary and mobile sources are expected to compensate the growth, leading to overall reductions in total VOC emissions. VOC emissions are projected to decline from 402 tons per day in 2018 to 344 tons per day in 2030. This reduction represents a decrease of 15 percent in VOC emissions. While the contribution of VOCs to annual PM2.5 levels are less than significant, these reductions will further assure improvement of annual PM2.5 levels in the Basin.

Another approach to justify that VOC is not a significant precursor is demonstrating reasonable VOC controls would not advance the attainment date for annual PM2.5. The 2030 baseline design value at Mira

Loma is predicted to be 12.5 µg/m³, necessitating an improvement exceeding 0.45 µg/m³ for attainment. However, with only a 0.01 µg/m³ response resulting from a 50 percent VOC reduction, the impact is deemed inconsequential. In addition, achieving a 50 percent reduction in emissions~~emission reductions~~ from consumer products, one of the top three categories contributing to VOC emissions~~source categories~~, is not feasible within next six years leading up to~~until~~ 2030. This is because the processes involved in~~, as~~ the development, production at a commercial scale, and distribution of such products require significant time. In the South Coast Air Basin, the top three sources of VOC emissions are Consumer Products (122 tons per day), Light and medium-duty Vehicles (45 tons per day), and Off-Road Equipment (29 tons per day) in 2030. 50 percent VOC reductions in the mobile source categories are infeasible within the next six years as well. in summary, VOC controls are not expected to advance attainment of the annual PM2.5 standard in the Basin.

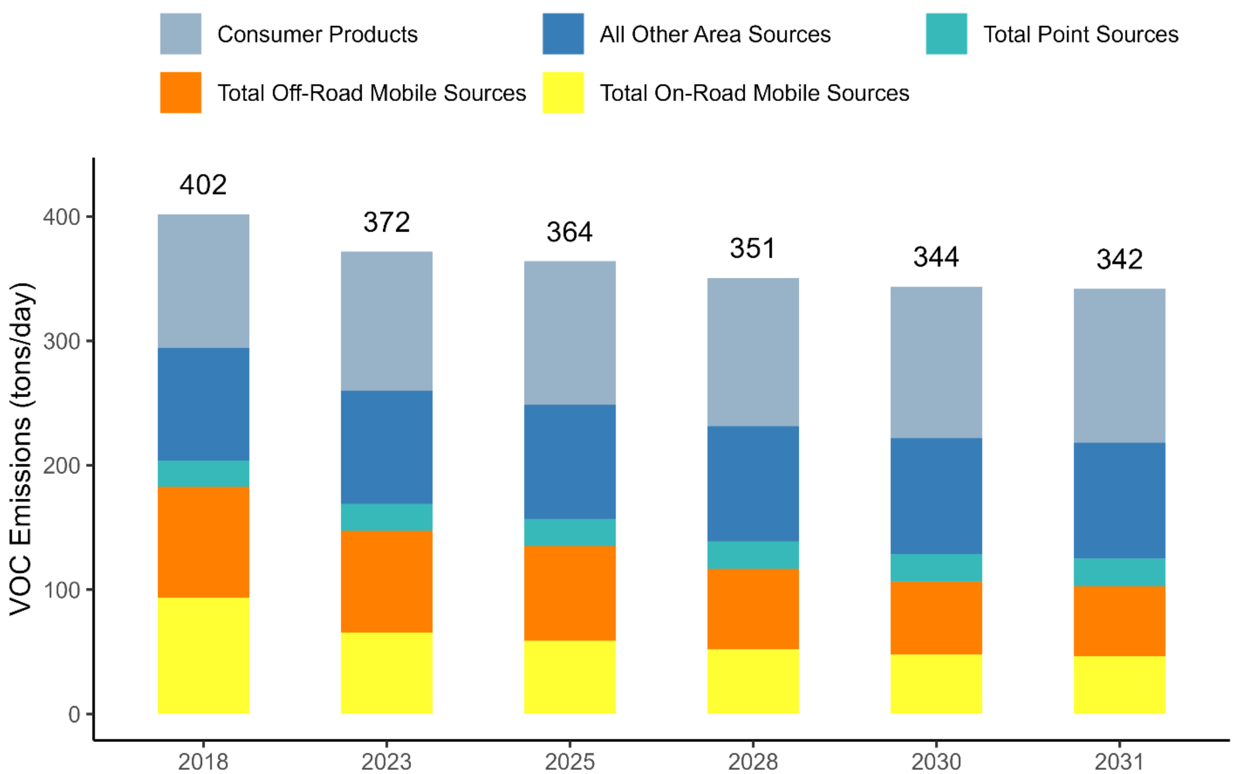


FIGURE VI-8~~-7~~
VOC EMISSION TREND, BY SOURCE, IN THE SOUTH COAST AIR BASIN BETWEEN 2018 AND 2031

Conclusion

This precursor analysis evaluated whether VOC and SOx emissions contribute significantly to annual PM2.5 levels that exceed the 12 μg/m^3 annual NAAQS following the U.S. EPA precursor demonstration guidance. The methodologies related to modeling and design value calculation are identical to those used in the rest of this Plan. In consideration of emission trends spanning between 2018 and 2030, which include existing regulations, adopted control measures and the control strategy in this PM2.5 plan, emissions levels in 2023, the time that this PM2.5 plan was under development, are more closely related to projected emissions in 2030 than to 2018. Emissions in the Basin decrease sharply from 2018 to 2023 and marginally slowed down afterwards. This trend is evident in both VOC and NOx emissions. Consequently, the sensitivity-based analysis included in this precursor demonstration is based on the 2030 emissions, because the chemical regime under the 2030 emissions is expected to be closer to current conditions than to the chemical regime caused by 2018 emissions.

It is noted that the variability in PM2.5 observed nationwide may not represent the conditions in the South Coast Air Basin accurately. The Guidance permits air agencies some discretion to develop precursor demonstrations that differ from the guidance on a case-by-case basis. Thus, this precursor demonstration derived a region-specific contribution threshold, applying the same methodology solely to monitors within the South Coast Air Basin. The contribution threshold specific to the Basin is 0.4 μg/m^3 if derived using the same years (2016 to 2019) utilized for design value this Plan, and it is 0.3 μg/m^3 if derived using more recent data. Thus, the contribution threshold for the Basin is higher than the threshold established nationally. The South Coast Air Basin exhibits distinctive atmospheric conditions owing to its complex terrain and diverse land use~~, ranging from dense urban clusters to inland residential areas and farmlands, further extending to the Coachella Valley near deserts.~~ ~~Some monitoring sites near coastal areas frequently experience impacts from emissions by ships, while two sites situated near busy major freeways are heavily influenced by on-road mobile sources.~~. This suggests that the adoption of the nationwide contribution threshold may overestimate the significance of PM2.5 precursors in the basin. Calculating a value specific to the basin may better capture the local variability in PM2.5 concentrations.

The contribution of SOx and VOC emissions to PM2.5 concentrations were evaluated using concentration- and sensitivity-based methods. The concentration-based analysis shows that both precursors contribute to PM2.5 concentrations, with an impact that exceeds the contribution threshold. However, the concentration-based analysis does not measure the degree to which PM2.5 DVs would change in response to changes in precursor emissions. Therefore, the analysis was supplemented with a sensitivity-based analysis. The sensitivity analysis estimated changes in 2030 PM2.5 design values using the emissions and air quality modeling platform identical to the one used in the rest of this PM Plan. Precursor sensitivities were tested with 30 and 50 percent reductions of VOCs and SOx emissions to assess consequent changes to annual PM2.5 DVs. The sensitivity-based analysis showed that 30 and 50 percent reductions in SOx and VOC emissions fail to significantly impact annual PM2.5 DVs. Therefore, SOx and VOC are not significant precursors to annual PM2.5 in the South Coast Air Basin.

South Coast AQMD

APPENDIX VII

Socioeconomic Impact Assessment

APPENDIX VII

SOCIOECONOMIC IMPACT ASSESSMENT

Table of Contents

Introduction

The South Coast Air Basin Attainment Plan for the 2012 Annual PM2.5 Standard (hereafter, referred as PM2.5 Plan) outlines a suite of control strategies that are designed to attain the 2012 annual PM2.5 NAAQS no later than December 31, 2030. PM2.5 is known to cause substantial negative health impacts, including respiratory and cardiovascular disease, worsening asthma symptoms, and premature death. As such, the air quality improvements resulting from the control measures proposed in the PM2.5 Plan are expected to yield meaningful public health benefits. Following a similar methodology to the health benefit analysis performed for the 2022 AQMP, South Coast AQMD staff has worked closely with Industrial Economics, Inc. (IEc) to quantify the public health benefits associated with attainment of the 2012 annual PM2.5 NAAQS by 2030 and discuss the associated uncertainties in estimates. Despite these efforts, a full assessment of all clean air benefits in monetary terms is not possible until further advances occur in human health sciences, physical science, and economic disciplines that will allow monetary estimates to be made for currently unquantifiable areas.

The control strategy outlined in the PM2.5 Plan relies on previously adopted control measures from the 2022 AQMP and 2016 AQMP to reduce emissions of nitrogen oxides (NOx), ammonia (NH3), and directly emitted Particulate Matter with a diameter of 2.5 µm or less (PM2.5). The PM2.5 Plan models the impacts of these control strategies in the attainment year of 2030, a year in which emissions reductions and health benefits have not been previously quantified, and also reflects refined air quality modeling procedures[1]. As such, the health benefits quantified in this Socioeconomic Impact Assessment should be considered as supplemental to those previously discussed and quantified in the 2022 AQMP and 2016 AQMP, rather than incremental, as they present another data point on how health benefits are expected to accrue over time.

Costs and Macroeconomic Impacts

Because the control measures in the PM2.5 Plan were previously adopted in either the 2022 AQMP or 2016 AQMP, the compliance costs, impacts on small business, and macroeconomic impacts of these control measures have already been analyzed and presented in the Socioeconomic Reports of the respective AQMPs. Since there are no incremental costs associated with the control measures in the PM2.5 Plan relative to the previous analyses, no additional assessment of costs or macroeconomic impacts has been prepared. For detailed discussions of costs and macroeconomic impacts associated with these control measures, please refer to the AQMP Chapters referenced in Table 1. Additional detailed socioeconomic analysis will be conducted as part of rule development for each control measure and presented to the Governing Board prior to its consideration of whether to adopt the rule.

[1] See Appendix II of the PM2.5 Plan for a discussion of the modeling methodology: https://www.aqmd.gov/docs/default-source/clean-air-plans/pm2.5-plans/appendix-ii---air-quality-modeling.pdf?sfvrsn=10

Projected Emission Reductions and Changes in Pollutant Concentrations

Ambient PM2.5 levels can be improved by reducing either direct PM2.5 emissions or PM2.5 precursor emissions. NOx is a precursor for both ozone and PM2.5. The 2022 AQMP committed to a strategy to reduce NOx emissions substantially to meet the 2015 8-hour ozone NAAQS. NOx emission reductions expected from the continued implementation of the 2022 AQMP and 2016 AQMP control measures are expected to contribute substantially to the attainment of the 2012 annual PM2.5 standard. Additional limited controls to meet federal Clean Air Act Section 188(e) requirements are proposed in this PM2.5 Plan. These include measures to marginally reduce direct PM2.5 and NH3 emissions.

The benefit assessment in this document analyzes the differences in the projected PM2.5 concentrations in the Basin between a baseline scenario (without the PM2.5 Plan control measures) and the control or policy scenario (with the PM2.5 Plan control measures) at the level of a 4km-by-4km grid. The control measures considered in this analysis and expected emissions reductions of PM2.5 and its precursors are listed in Table 1.

TABLE 1: PM2.5 PLAN CONTROL MEASURES

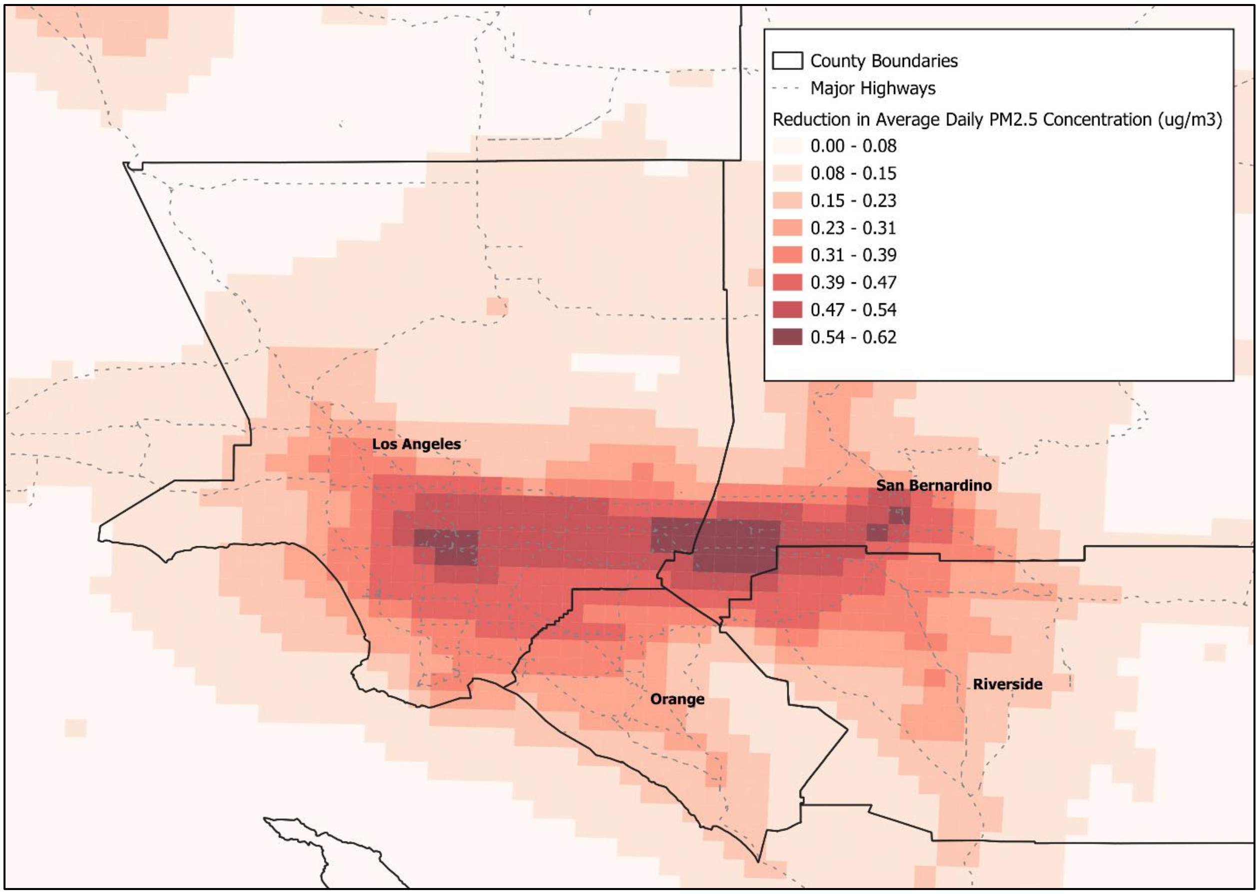
PM 2.5 Plan Control Measure	Control Measure Name	Cost Previously Analyzed In	Emission Reductions [Pollutant] (2030 tpd)
BCM-05	Emission Reductions from Emergency Standby Engines	2022 AQMP[1]	0.04 [PM2.5]
BCM-06	Emission Reductions from Diesel Electricity Generating Facilities	2022 AQMP[1]	0.16 [NOx]
BCM-07	Emission Reductions from Incinerators	2022 AQMP[1]	0.81 [NOx]
BCM-08	Livestock Waste at Confined Animal Facilities (CAFs)	2016 AQMP[2]	0.27 [NH3]
BCM-10	Chipped and Ground Greenwaste	2016 AQMP[2]	0.08 [NH3]

Note: tpd = tons per day

1. Chapters 2 and 4 of the Final Socioeconomic Report for the 2022 AQMP: https://www.aqmd.gov/docs/default-source/clean-air-plans/socioeconomic-analysis/final/aqmp-2022-socioeconomic-report-main-final.pdf
2. Chapters 2 and 4 of the Final Socioeconomic Report for the 2016 Air Quality Management Plan: https://www.aqmd.gov/docs/default-source/clean-air-plans/socioeconomic-analysis/final/sociofinal_030817.pdf

The quantified public health benefits discussed in this Socioeconomic Impact Assessment are based on the projected change in PM2.5 concentrations within each grid cell. Figure 1 shows the modeled changes in PM2.5 concentrations due to the control measures proposed in the PM2.5 Plan. Note that air quality modeling methods in this analysis have already accounted for background concentrations of pollutants and thus concentrations projected in the control scenarios are above background concentration levels.

FIGURE 1: MODELED REDUCTIONS IN PM2.5 CONCENTRATIONS, 2030



Note: PM2.5 concentrations shown in this figure are the annual average of the 24-hour means.

Quantified Public Health Benefits

Numerous epidemiological as well as controlled laboratory studies have demonstrated a positive association between ambient air pollution exposure and increases in illness and other health effects (morbidity endpoints) and increases in death rates from various causes (mortality endpoints) (U.S. EPA 2019). Groups that are most sensitive to the effects of air pollution are children, elderly persons, and people with certain respiratory or heart conditions.

Table 2 summarizes the likelihood of causal relationship between PM2.5 exposure and various health endpoints documented in the U.S. EPA Integrated Science Assessments (ISAs) (U.S. EPA 2019) [2]. Due to concerns of potentially double counting over the same health endpoint, not all causal or likely causal relationships listed in Table 2 are quantified in this Socioeconomic Impact Assessment.

[2] Descriptions of the evidence for causal relationships between PM2.5 exposure and various health endpoints can be found in Appendix 3-A of the Final Socioeconomic Report Appendices of the 2022 AQMP, https://www.aqmd.gov/home/air-quality/air-quality-management-plans/air-quality-mgt-plan/socioeconomic-analysis

TABLE 2: SUMMARY OF U.S. EPA'S CAUSAL DETERMINATIONS FOR PM2.5 EXPOSURE

Health Category	Causal Determination	Quantified?
Short-Term Exposure to PM2.5		
Mortality	**Causal relationship**[1]	No
Cardiovascular Effects	**Causal relationship**	**Yes**
Respiratory Effects	**Likely to be a causal relationship**	**Yes**
Central Nervous System Effects	*Suggestive of a causal relationship*	No
Long-Term Exposure to PM2.5		
Mortality	**Causal relationship**	**Yes**
Cardiovascular Effects	**Causal relationship**[2]	No
Respiratory Effects	**Likely to be a causal relationship**	**Yes**
Central Nervous System Effects	**Likely to be a Causal Relationship**	**Yes**
Reproductive and Developmental Effects	*Suggestive of a causal relationship*	No
Cancer, Mutagenicity, Genotoxicity	***Likely to be a causal relationship***	**Yes**

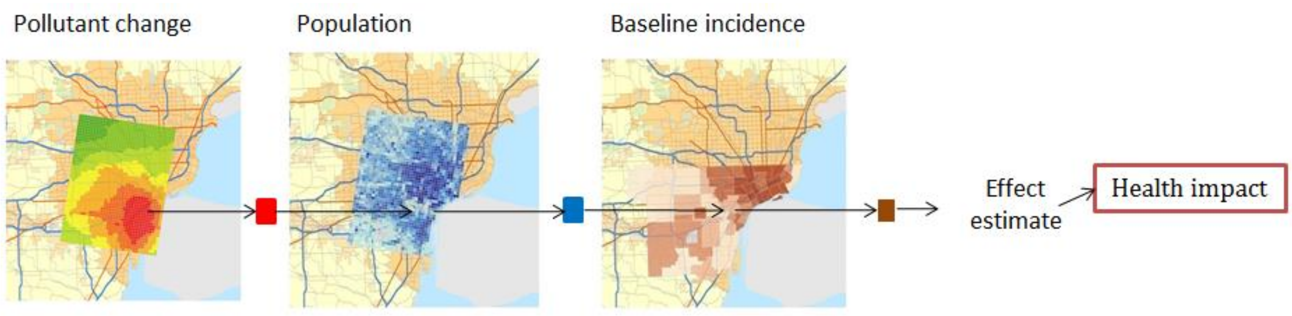
Notes:

1. Mortality due to short-term exposure to PM2.5 is not quantified because mortality due to long-term exposure to PM2.5 is expected to be inclusive of any short-term exposure impacts.
2. Although cardiovascular morbidity effects using risk models with long-term exposure to PM2.5 are not quantified, a number of cardiovascular effects modeled based on short-term exposure to PM2.5 are likely to have chronic impacts following the initial event (e.g., stroke, out-of-hospital cardiac arrest, and AMI). The valuation of the short-term cardiovascular endpoints reflects long-term, multi-year costs-of-illness.

Source: U.S. EPA ISA (2019)

The first step of a public health benefits analysis is the health effects quantification. Appropriate concentration-response (C-R) functions need to be selected, which numerically characterize the causal and likely causal relationships between exposure to a pollutant and various health endpoints. Specifically, as presented in Figure 2, the C-R functions used in this analysis relate changes in ambient air pollution concentration with changes in mortality or morbidity incidence, the magnitude of which also depends on the baseline incidence rate and the population exposed to a specific health risk being analyzed.

FIGURE 2: HEALTH EFFECTS QUANTIFICATION



Source: U.S. EPA BenMAP Community Edition User's Manual.

C-R functions were selected based on a systematic review of the epidemiological literature, where studies were evaluated for quality and applicability according to numerous criteria (See Appendix 3-C of the Final Socioeconomic Report Appendices of the 2022 AQMP; Industrial Economics and Thurston 2016a; Industrial Economics and Thurston 2016b). These criteria include: 1) peer-review; 2) date of the study; 3) geography and population characteristics; and 4) study design. Thus, the C-R functions applied in this analysis are mostly from recent, peer-reviewed articles, and derived from local studies of the Basin or studies that report separate estimates using sub-samples pertaining to the Basin, where feasible. Population projections from the 2020 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) were provided by the Southern California Association of Governments (SCAG) for each air quality modeling grid. When feasible, local health data based on public administrative records were utilized to obtain baseline incidence rates. The Technical Details section of this Appendix describes the input data and methodology used in greater depth, as well as analytical assumptions such as cessation lags for mortality effects associated with long-term PM2.5 exposure, which have implications for monetizing health benefits.

The public health benefit analysis described in this Appendix is implemented using U.S. EPA's Environmental Mapping and Analysis Program – Community Edition (BenMAP-CE) Version 1.5.8.29. BenMAP-CE is a free and open-source application maintained by the U.S. EPA. Earlier editions of BenMAP were used to quantify the public health benefits of the 2007, 2012, and 2016 AQMPs, as well as for numerous other studies.

Health Effect Estimates

Table 3 presents a summary of the health effect estimates for each health endpoint. In total, approximately 665 premature deaths will be avoided in 2030 due to improved air quality by implementing the PM2.5 Plan control measures. Basin residents are also expected to benefit from the avoidance of large numbers of hospital admissions (HA), emergency department (ED) visits, school and work loss days, as well as various respiratory and cardiovascular symptoms.

TABLE 3: HEALTH EFFECT ESTIMATES[1]

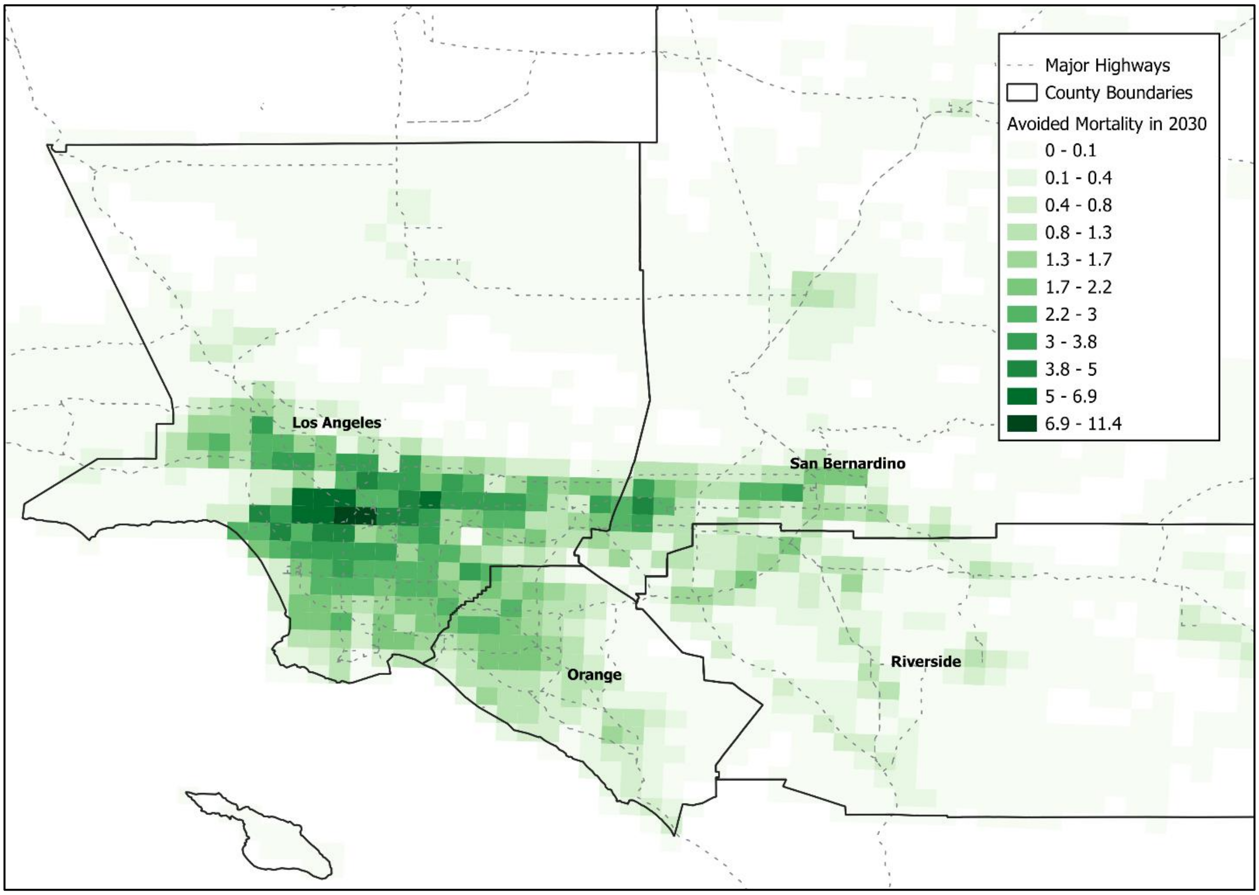
	2030
Premature Deaths Avoided, All cause	
Long-term PM 2.5 Exposure	665
Reduced Morbidity Incidence	
Long term PM 2.5 Exposure	
Asthma, New Onset	1,031
HA, Alzheimer's Disease	70
HA, Parkinson's Disease	28
Incidence, Hay Fever/Rhinitis	4,867
Incidence, Lung Cancer (non-fatal)	57
Short-Term PM 2.5 Exposure	
Acute Myocardial Infarction, Nonfatal	9
Asthma Symptoms, Albuterol use	170,343
ED Visits, Asthma	35
ED Visits All Cardiac Outcomes	72
ED Visits, All Respiratory Minus Asthma	172
Emergency Hospitalizations (EHA, Asthma)	2
HA, All Cardiac Outcomes	24
HA, All Respiratory	69
Incidence, Ischemic Stroke	37
Incidence, Out-of-Hospital Cardiac Arrest	7
Minor Restricted Activity Days	230,393
Work Loss Days[2]	39,204

Notes:

1. Each health effect represents the point estimate of a statistical distribution of potential outcomes. Please see the Technical Details section of this Appendix where the 95-percent confidence intervals are reported. The study population of each C-R function utilized can be found on page 3-B-7 of the Final Socioeconomic Report Appendices of the 2022 AQMP: https://www.aqmd.gov/docs/default-source/clean-air-plans/socioeconomic-analysis/final/aqmp-2022-socioeconomic-report-appendices-final.pdf?sfvrsn=6
2. Expressed in person-days. Minor Restricted Activity (MRAD) refer to days when some normal activities are avoided due to illness

Figure 3 displays the geographic distribution of avoided premature mortalities. Mortality risk will be reduced in each of the four counties, with the largest number of avoided premature deaths concentrated in the densely populated Los Angeles County area.

FIGURE 3: SPATIAL DISTRIBUTION OF ESTIMATED PREMATURE DEATHS AVOIDED (YEAR 2030)

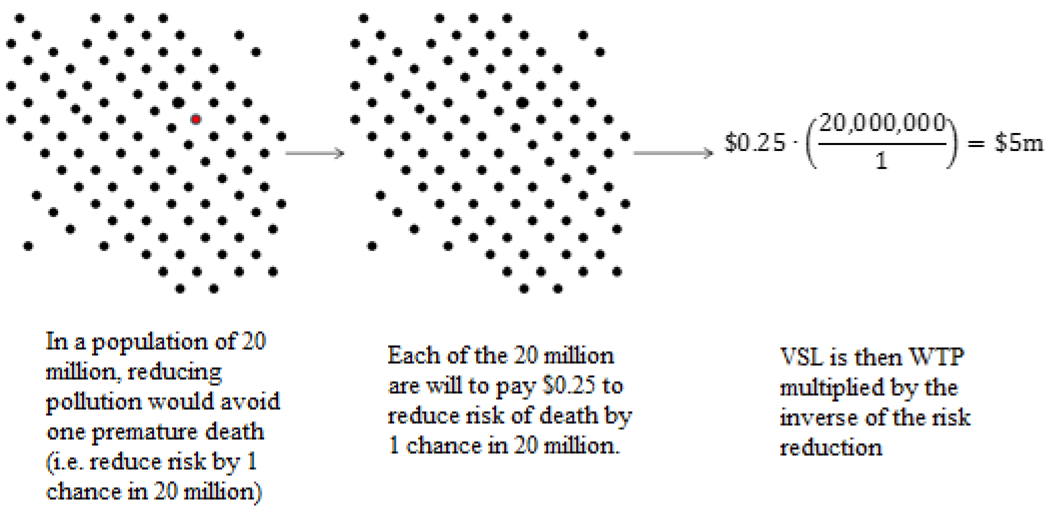


It should be noted that the health effect estimation does not use a concentration threshold below which the affected population would stop benefiting from further reduced exposure to ambient air pollution. In the analysis, health benefits will continue to accrue due to reduced exposure at all levels of pollutant concentration, even at levels below the latest NAAQS. This practice was recommended by Industrial Economics, Inc. and based on the latest scientific evidence, including those summarized in the ISAs (U.S. EPA 2019; U.S. EPA 2020). It is also consistent with the current analytical approach adopted by the U.S. EPA in its regulatory impact analyses (U.S. EPA 2021).

Monetized Health Impacts

After the health effects are quantified, they are then translated into dollar values using two types of valuation methodologies. Benefits associated with avoided premature deaths are monetized based on a population's willingness-to-pay (WTP) for a small reduction of mortality risk in a year and generally expressed as the "value of statistical life (VSL)." As illustrated in Figure 4, the concept of VSL does not place a monetary value on saving a life with certainty; instead, it is an aggregate WTP of a population so that the associated risk reductions across this population are statistically equivalent to one case of premature death avoided. Then, the total monetized benefits of avoided premature deaths are calculated by multiplying the number of estimated premature mortalities reduced by the VSL.

FIGURE 4: ILLUSTRATIVE EXAMPLE OF VALUE OF STATISTICAL LIFE



Source: U.S. EPA, modified by Industrial Economics, Inc. and South Coast AQMD staff

To monetize reductions in morbidity risk, WTP is the preferred valuation method, but in many cases when such estimates are not yet available or reliable, cost of illness (COI) avoided were used instead. Avoided COI is conceptually regarded as a conservative estimate of monetized health benefits, as it only accounts for avoided resource costs including direct medical costs and indirect productivity losses, but generally cannot fully account for the benefits of preventing pain and suffering associated with health-related issues.

As shown in Table 4, the overall quantifiable and monetized annual public health benefits are estimated to be $9.0 billion[3] in 2030. About 99 percent of these public health benefits are attributable to mortality-related benefits. The estimates are based on a VSL of $12.4 million in 2023 dollars and the assumption that the WTP for mortality risk reductions will increase as per-capita income grows. Specifically, a one percent increase in income is assumed to raise VSL by 1.1 percent (i.e., an income elasticity of 1.1) (Industrial Economics and Robinson 2016a). Additionally, this estimate includes a cessation lag, which accounts for the timing differences between emission reductions and realized health benefits[4]. A more in-depth discussion, as well as sensitivity and uncertainty analyses regarding these public health benefits estimations, can be found in the Technical Details section of this Appendix.

3 Reported in 2023 US Dollars

4 Consistent with South Coast AQMD practices, the cessation lag relies on a discount rate of 4% to discount the value of future benefits resulting from current-year emissions reductions.

TABLE 4: MONETIZED PUBLIC HEALTH BENEFITS in 2030 (BILLIONS OF 2023 DOLLARS)

Endpoint Category	Monetized Benefit
Mortality-Related Benefits	\$8.84
Morbidity-Related Benefits	\$0.13
Total	**\$8.97**

The analysis is careful in avoiding potentially double counting health effects by using C-R functions that minimize overlapping health endpoints for the same age group or by subtracting health benefits from a health endpoint that could be potentially part of benefits associated with another broader health endpoint (for example, the avoided ED Asthma benefits are deducted from the avoided ED All Respiratory benefits). However, it needs to be emphasized that the health benefits presented here likely underestimate the total actual health benefits. This is because not enough information is currently available in scientific literature to allow for all adverse health effects identified to be measured and valued in dollars, mainly because sufficient data are not available to establish a quantitative relationship between these pollutant levels and some of these health effects.

Moreover, improved public health can generate direct economic benefits other than increased productivity and fewer lost workdays in the short-term. As an example of other health benefits that can occur, but are not quantified here, a 2017 study (Isen et al. 2017) showed that improvement in early childhood health has long-term economic benefits throughout adulthood. Reductions of in-utero and early-infancy exposure to air pollution were found to increase labor participation among the affected individuals 30 years later; that is, working-age adults are more likely to hold a job when they were less exposed to air pollution as an infant.

Other Public Welfare Benefits

NAAQSs for criteria pollutants, set pursuant to the federal CAA, include both primary standards designed to protect public health and secondary standards to protect public welfare, including preventing damage to agriculture, ecology, visibility, buildings, and materials. In the previous section, the estimated public health benefits associated with the PM2.5 Plan for achieving attainment of the 2012 Annual PM2.5 Standard were discussed. The P2.5 Plan is additionally expected to provide benefits protective of public welfare. Although these additional benefits are not specifically quantified in this Appendix, a qualitative description of these public welfare benefits is provided. In addition, a discussion of the benefits estimated for these categories as described in the Socioeconomic Reports of previous AQMPs and the scientific literature that provided the methodological basis for quantification is included.

Material Benefit

Material benefit is the benefit accrued by the reduction of damage to materials from air pollution. Studies have identified the types of damage that can occur from air pollution and estimated their monetary value. For total suspended particulate matter (TSP) in particular, it causes accelerated wear and breakdown of painted wood and stucco surfaces of residential and commercial properties (Murray et al. 1985). In addition, TSP leads to additional household cleaning costs due to soiling damages (Cummings et al. 1985).

In addition to these damages, a link exists between several pollutants (ozone, sulfur dioxide, PM2.5, and

NOx) and ferrous metal corrosion; erosion of cement, marble, brick, tile, and glass; and the fading of fabric and coated surfaces (Cummings et al. 1985; Murray et al. 1985). The damage and conversely the potential benefits from reducing the exposure to these items currently cannot be quantified and valued in dollars.

There will also be benefits of reduced damage to materials as a result of the PM2.5 Plan, which will reduce PM2.5 and correspondingly TSP. However, these material benefits are not quantified in this report. In 2013, South Coast AQMD contracted with Abt Associates Inc. to review the South Coast AQMD socioeconomic assessments for AQMPs with the goal of providing recommendations that could enhance South Coast AQMD's socioeconomic analyses[5]. In this report, Abt Associates recommended against quantifying material benefits until a systematic literature review of current research on this topic could be conducted, as the studies which South Coast AQMD relied upon in previous AQMPs to quantify material benefits were outdated.

Visibility Benefit

Visibility benefits are the benefits individuals place on the ability to see distant vistas, in places where they live, work, and travel. In qualitative terms, an example of this for the Basin is the value people place on being able to see the San Gabriel Mountains, which were designated a National Monument, from much greater distances, more often. Studies have found that individuals place a monetary value on being able to see distant vistas (Smith and Osborne 1996). A local study by Beron et al. (2001), which estimated parameters that could quantify the value of these visibility benefits,[6] was applied to valuation of the visibility improvements of previous AQMPs. The visibility benefit of the 2007 AQMP was projected to be $5.2 billion (in 2000 dollars) for the year 2020, and $649 million (in 2005 dollars) as a result of the 2012 AQMP for the year 2023. The larger benefit from the 2007 AQMP is due to a greater reduction of PM2.5 concentrations than those achieved in the 2012 AQMP.

There will also be benefits to visibility because of the air quality improvements achieved from implementing the PM2.5 Plan. However, quantification of these benefits was not performed in this analysis based on a recommendation in the Abt report which argued that the local study used to monetize the visibility benefits in previous AQMPs had shortcomings and was outdated;[7] therefore, an updated methodology is needed to accurately estimate these benefits. This methodology update is planned for socioeconomic impact assessments conducted for future AQMPs.

Technical Details

Methodology

The methodology employed to quantify public health benefits consists of several components. The first component is the health impact analysis as presented in Figure 5. This analysis is based on the use of a health impact function to estimate the change in incidence of a particular endpoint which results from a

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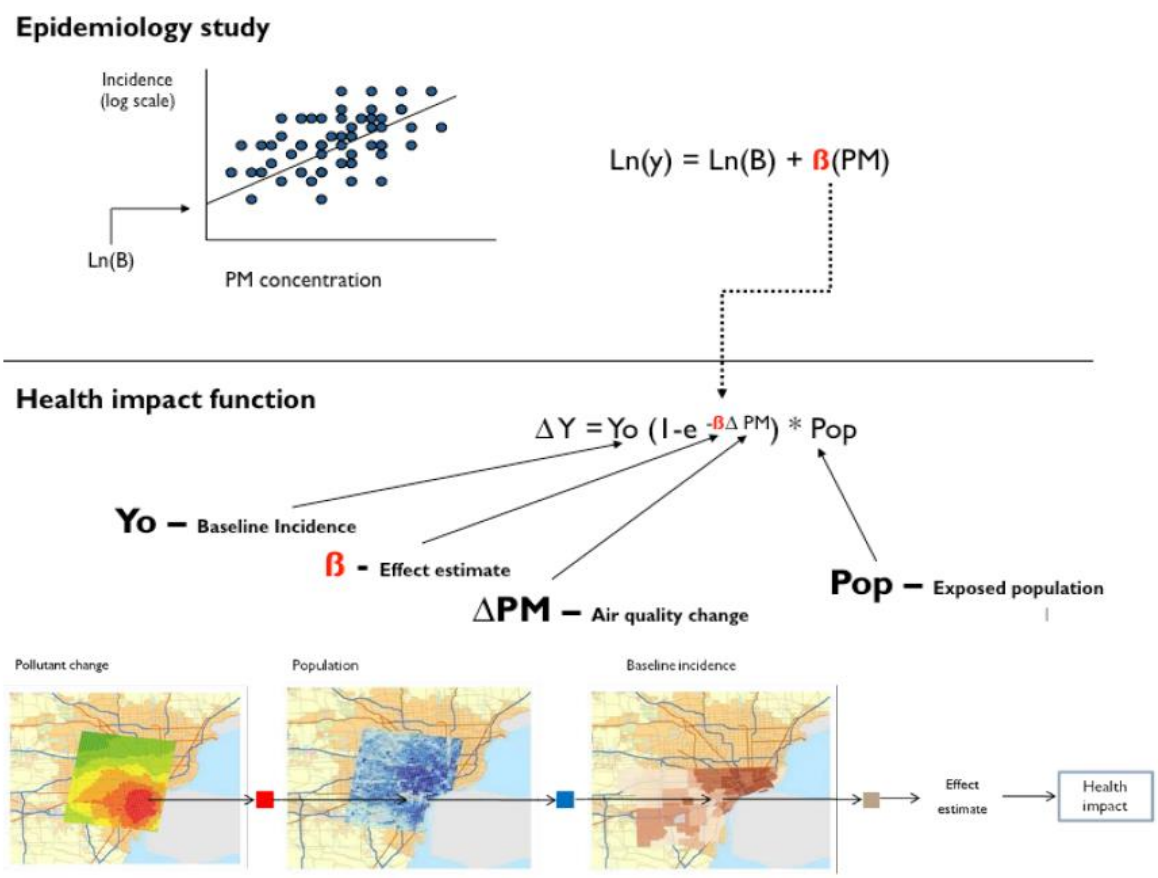
5 Abt Associates Inc, August 2014, Review of the SCAQMD Socioeconomic Assessments, https://www.aqmd.gov/docs/default-source/Agendas/aqmp/scaqmd-report---review-socioeconomic-assessments.pdf, accessed April 5, 2024.

6 This study used a method called hedonic price analysis, which uses property values along with a diverse set of attributes to estimate the implicit prices of attributes that are associated with a good exchanged in the market.

7 The methodological improvements since Beron et al. (2001) was published addresses issues such as endogeneity in spatial sorting of communities, choice of functional form for the econometric model, and the difficulty of measuring amenities from available data that are likely present in that research.

change in air quality. The variables in the analysis include: 1) the change in air quality concentrations; 2) baseline incidence rates for each endpoint; 3) population exposed to a particular health risk; and 4) an effect estimate. The effect estimate is derived from epidemiology studies, which use health and air quality data to estimate C-R functions which relate the concentration of PM2.5 to a mortality or morbidity endpoint. With all of these data taken together, the health impact function can be evaluated to estimate the health effect for a given geographic unit. In the case where there are multiple different C-R functions in epidemiology literature that need to be considered, a pooling method can be used. Pooling allows for a calculation of change in incidence of particular endpoint using multiple effect estimates from different epidemiology studies combined together. Once the health impacts have been estimated (pooled or un-pooled), a valuation function is applied, which places a monetary value on the change in incidence of a given endpoint which is either a scalar value or a distribution of values for a given type of incidence. The valuation function can also be pooled together to account for differences among valuation studies.

FIGURE: 5: HEALTH IMPACT METHODOLOGY



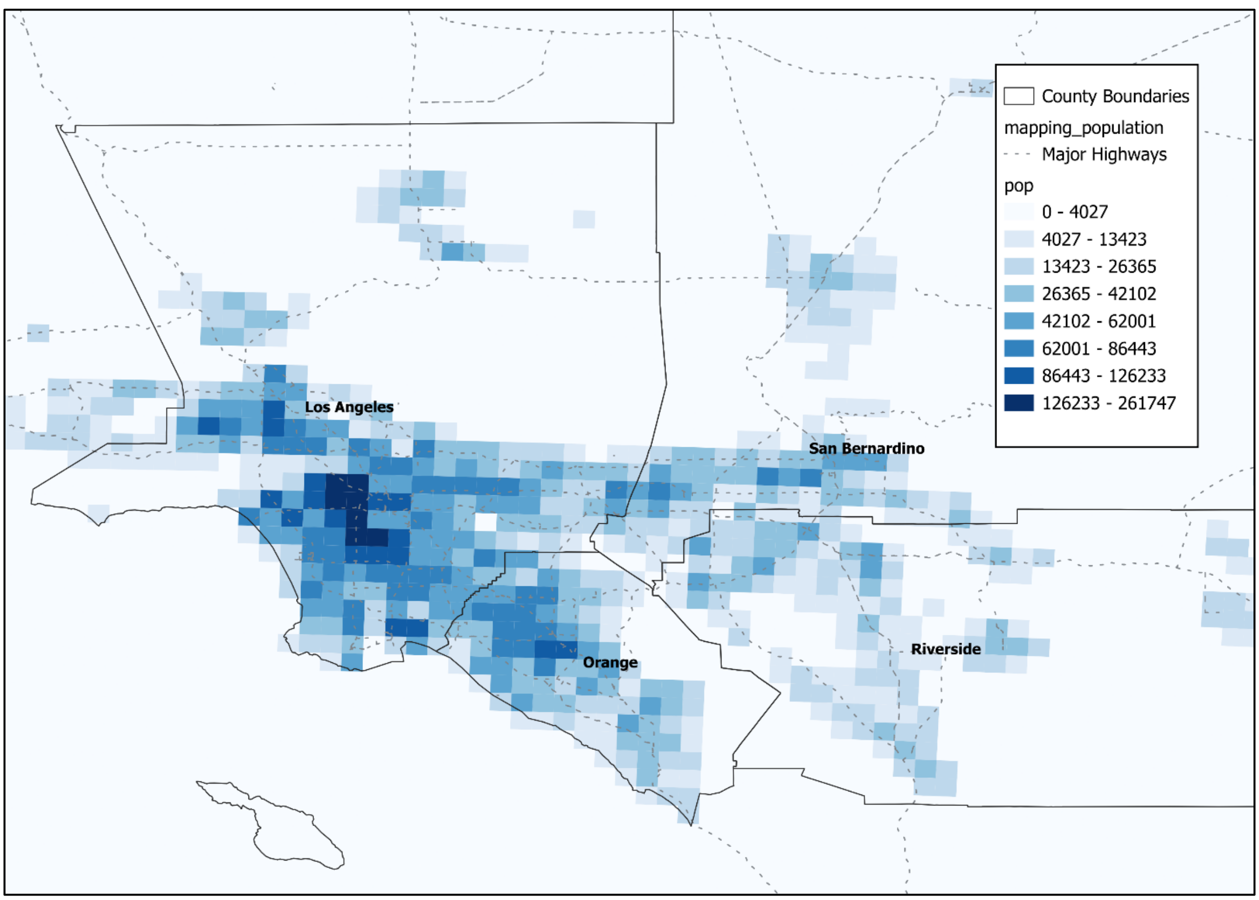
Source: BenMAP CE User's Manual, U.S. EPA

Data

The first input into the health impact calculation is the projected changes in PM2.5 concentrations, which are derived from the difference between the “control” and the “baseline” air quality scenarios, or the scenarios with and without the 2024 attainment plan respectively. The projected baseline and control air quality scenarios are the result of emission inventories (see Appendix I of the PM2.5 Plan) and air quality simulations developed by South Coast AQMD staff based on these emission inventories and other variables (see Appendix II of the PM2.5 Plan). These air quality projections are produced at the level of a 4km x 4km grid for the Basin. The projections are hourly for each modeled year and consist of 365 days for PM2.5. These hourly data are converted into daily metrics of air quality changes for PM 2.5 (daily 24-hour mean), then loaded into BenMAP-CE for analysis.

The population projections in 2030 as displayed in Figure 6 are based on the 2020 RTP/SCS growth forecast (SCAG 2020) that were provided by SCAG staff at the 4km x 4km grid-cell level. For the purposes of this analysis, SCAG staff converted the population forecast, originally modeled at the level of Transportation Analysis Zones (TAZs), to the 4km x 4km grid-cell used for air quality modeling.

FIGURE: 6: PROJECTED POPULATION IN 2030



Due to the substantial amount of time required to produce updated incidence projections at the 4km grid level and the small changes in incidence across multiple years, the analysis relied upon the projected incidence rates for the year 2032 which had been produced for the 2022 AQMP. Since incidence rates for the health endpoints studied are projected to decline over time, the choice to use rates from 2032 will result in a smaller, and thus more conservative, estimated health effect than if rates from 2030 were used. Baseline all-cause mortality incidence rates are provided by the California Department of Finance (DoF) at the county level, by five-year age group, for the base year 2018 and projected through 2032. Historical baseline respiratory mortality incidence rates are collected from the U.S. Centers for Disease Control and Prevention (CDC)'s WONDER database at the county level, by five-year age group. Historical rates are projected to 2032 using an adjustment factor based on the DoF all-cause mortality projection. Baseline incidence for hospital admissions and emergency department visits are based on incidence rates provided by the California Department of Health Care Access and Information (HCAI) at the zip-code and county-level. County-level estimates of baseline incidence for nonfatal myocardial infarctions and ischemic stroke are obtained from the CDC Interactive Atlas of Heart Disease and Stroke. Baseline incidence rates for new onset of asthma in children are provided by IEc for the Los Angeles area for 2002-2005 from the Children's Health Study cohort (McConnell et al. 2010). Baseline incidence for all other endpoints not discussed here are based on the data included with BenMAP-CE.

C-R and Valuation Functions

The effect estimates for each health impact function are from C-R functions as described in Table 5. Local estimates in the South Coast AQMD four-county region were selected whenever available and meeting other selection criteria recommended by IEc (see Appendix 3C of the 2022 AQMP Final Socioeconomic Report Appendices). The health effect is often estimated as a relative risk (RR), which is the ratio of the probability of an incidence of a particular endpoint in an exposed group to the probability of it occurring in an unexposed group. The RRs from the recommended studies for all-cause mortality from long-term PM2.5 exposure are: 1.14 (Jerrett et al. 2005), 1.104 (Jerrett et al. 2013), 1.17 and 1.14 from Krewski et al. (2009)'s Kriging and land-use regression estimates, respectively.

Table 5: C-R FUNCTIONS, STUDY POPULATIONS AND VALUATION FUNCTIONS BY ENDPOINT GROUP

Endpoint	C-R Function	C-R Function Study Population	Valuation Function ($2015)[1]
Long-Term Exposure to PM2.5			
Mortality, All Cause	Pooling of: LA-specific estimates (Jerrett et al. 2005; Jerrett et al. 2013), Kriging and LUR (Krewski et al. 2009), Woodruff et al. 2008 (infants only, not pooled).	<1 year; > 30 years	VSL (Robinson and Hammitt 2016). $9.2 million ($4.3-$14.2 million)
Incidence, Asthma	Pooling of: Tetreault et al. (2016); Garcia et al. (2019)	0-17 years	$17,232 (Belova et al. 2020)
Incidence, Hay Fever/Rhinitis	Parker et al. (2009)	3-17 years	$600 (Soni 2008)
Incidence, Lung Cancer	Gharibvand et al. (2016)	> 30 years	$33,809 (Kaye et al. 2018)

Endpoint	C-R Function	C-R Function Study Population	Valuation Function ($2015)[1]
Hospital Admissions, Alzheimer's Disease	Kioumourtzoglou et al. (2016)	> 65 years	Average of: $156,920 (Alzheimer's Association 2020); $184,500 (Jutkowitz et al., 2017)
Hospital Admissions, Parkinson's Disease	Kioumourtzoglou et al. (2016)	> 65 years	$567,285 (Yang et al. 2020)
Short-Term Exposure to PM2.5			
Minor Restricted Activity Days	B. D. Ostro and Rothschild (1989)	18-64 years	$70/day (Tolley et al. 1986)
Hospital Admissions, All Cardiac Outcomes	Pooling of: 7 study location-specific risk estimates (all from Talbott et al. 2014)	All ages	$16,045 (HCUP 2016)
Hospital Admissions, All Respiratory	Zanobetti et al. (2009); Ostro et al. (2009)	0-17 years; > 64 years	$9,075 to $35,402 depending on age (HCUP 2016, Chestnut et al. 2006)
Emergency Room Visits, All Cardiac Outcomes	Ostro et al. (2016)	All ages	$1,161 (HCUP 2016)
Emergency Room Visits, All Respiratory	Ostro et al. (2016)	All ages	$875 (HCUP 2016)
Incidence, Ischemic Stroke	Shin et al. (2014)	> 65 years	$33,962 (Mu et al. 2017)
Incidence, Out of Hospital Cardiac Arrest	Ensor et al. (2013)	> 18 years	$35,753 (O'Sullivan et al. 2011)
Emergency Hospital Admissions, Asthma	Delfino et al. (2014)	0-17 years	$6,564 (HCUP 2014)

Endpoint	C-R Function	C-R Function Study Population	Valuation Function ($2015)[1]
Emergency Room Visits, Asthma	Ostro et al. (2016)	All ages	Average of: $447/visit (Standford et al. 1999); $534/visit (Smith et al. 1997)
Asthma Symptoms, Albuterol Use	Rabinovitch et al. (2006)	6-17 years	$0.35/inhaler use (derived from Epocrates.com and goodrx.com)
Work Loss Days	Ostro (1987)	18-64 years	$167/day (BLS, 2015)
Acute Myocardial Infarction, Nonfatal	Wei et al. (2019)	> 65 years	$48,796 to $162,112 depending on age (Sullivan et al. 2011)

Notes:

The values presented in this table are in 2015 dollars, consistent with the current base year / dollar year in BenMAP-CE. As such, the VSL estimates reported in this table appear to differ from the VSL estimates reported in earlier tables (in 2023 dollars). The built-in functionality in BenMAP-CE was relied upon to adjust all benefits estimates to 2023 dollars.

The valuation functions associated with each endpoint are also described in Table 5. The highest valued endpoint is premature mortality. Avoided premature deaths are valued using the concept of the Value of Statistical Life (VSL). VSL is a measure of the willingness-to-pay (WTP) of a society to reduce the risk of a mortality, aggregated up to the amount of risk reduction required to avoid one statistical death over the population. A range of VSL is recommended by IEc (2016) from $4.3 to $14.2 million, with a midpoint of $9.3 million, all of which are expressed in 2015 dollars and reflect 2013 income levels. These are subsequently adjusted to reflect growth in real income through 2030. This range is found in Robinson and Hammitt (2016) and falls within the range of Viscusi (2015). Avoided morbidity conditions are valued primarily based on the concept of cost of illness (COI) avoided, which includes the cost of healthcare and the cost of lost productivity, though a few endpoints do include a WTP component. The COI and WTP valuations functions for morbidity endpoints are based on recommendations from the IEc Report (2016). It is also recommended that WTP valuations be adjusted for income growth, based on the concept that the income elasticity (ε_I) of VSL is positive. The recommended income elasticity for VSL is 1.1 based on Viscusi (2015), with alternatives of 0 and 1.4 presented for sensitivity analyses. An income elasticity of 0.5 is recommended for WTP portions of morbidity endpoints.

Per-capita income growth data for historical years 2013-2022 and projections for 2023-2025 are from the California Department of Finance (DOF). The DOF publishes forecasts of total personal (nominal) income growth, a forecast of the consumer-product index (CPI-U), and a population forecast. Using the inflation forecast to adjust the nominal income forecast and the population forecast, a forecast of real per-capita income growth to 2025 was derived. The post-2025 per-capita income growth is estimated based on the forecasted 2025 total income growth rate and the DOF's population forecast, resulting in an average annual growth rate of per capita income of 1.4 percent.

Results

Health impacts are categorized into two different types of exposure: short-term PM2.5 exposure, and long-term PM2.5 exposure. Annual health impacts from short-term PM2.5 exposure are calculated as the sum of daily impacts for 365 days of a year. Annual health impacts for long-term PM2.5 exposure are calculated based on the annual average of the mean daily concentrations.

Annual health impacts for all endpoints are estimated with no threshold effects for all types of PM2.5 exposure. This practice is recommended by Industrial Economics, Inc. and based on the latest scientific evidence, including those summarized in the Integrated Science Assessments (U.S. EPA 2019; U.S. EPA 2020).

Pooling methods are used to calculate the annual health impact from pollutant exposure for endpoints where multiple C-R functions are recommended as described in Table 5. The pooling method used in this analysis for overlapping C-R functions is either Fixed Effects or Random Effects as implemented in BenMAP-CE. The choice between using Fixed Effects or Random Effects for pooling is made automatically by BenMAP-CE based on a statistical test evaluated at an alpha of 5% (RTI International, 2015). The independent sum pooling method is used for C-R functions with non-overlapping age-groups.

The mortality and morbidity health impacts and 95% confidence intervals (CIs) based on the recommended C-R functions are shown in Table 6. The lower and upper bounds of the 95% CI are presented in parentheses in Table 6. Reduced long-term PM2.5 levels result in an estimated reduction of 665 premature deaths per year in 2030, as well as fewer school loss days, fewer hospital admissions related to all respiratory causes, and fewer asthma-related emergency room visits.

The valuation of reduced mortality and morbidity incidence is based on the valuation functions described in Table 5, along with an income elasticity and cessation lag. The valuation of avoided premature deaths is based on the recommended VSL and income elasticity as described above, along with a 20-year cessation lag for long-term PM2.5 exposure as recommended by IEc (2016a). Cessation lag describes how the avoided premature deaths from annual exposure are lagged over time, as some health impacts are not fully realized in the same year in which emission reductions occur. For a given emission year, the 20-year cessation lag assigns 30% of the total estimated mortality reduction to that emission year, an additional 13% in each of years two through five, and an additional 1% in each of the following years until the total estimated health benefit is fully realized. Using the estimated health impacts from Table 6, valuations were estimated by multiplying the number of avoided health outcomes in each endpoint by the associated monetized value per occurrence. The total monetized benefit attributed to avoided premature mortalities is $8.8 billion dollars. The monetized value of the various morbidity endpoints is summarized in Table 7, totaling $120.7 million.

TABLE 6: ANNUAL MORTALITY AND MORBIDITY HEALTH EFFECT ESTIMATES

Endpoint	Health Benefit in 2030 (95% CI)
Premature Deaths Avoided, All causes	
Long-term PM 2.5 Exposure	665 (104; 1,237)
Reduced Morbidity Incidence	
Long term PM 2.5 Exposure	
Asthma, New Onset	1031 (991; 1,073)
HA, Alzheimer's Disease	70 (52; 86)
HA, Parkinson's Disease	28 (14; 41)
Incidence, Hay Fever/Rhinitis	4867 (1,177; 8,405)
Incidence, Lung Cancer (non-fatal)	57 (17; 94)
Short-Term PM 2.5 Exposure	
Acute Myocardial Infarction, Nonfatal	9 (6; 13)
Asthma Symptoms, Albuterol use	170,343 (-83,009; 413,656)
ED Visits, Asthma	35 (6; 63)
ED Visits All Cardiac Outcomes	72 (-28; 167)
ED Visits, All Respiratory Minus Asthma	172 (4; 296)
Emergency Hospitalizations (EHA, Asthma)	2 (0; 4)
HA, All Cardiac Outcomes	24 (-167; 120)
HA, All Respiratory	69 (37; 99)
Incidence, Ischemic Stroke	37 (11; 67)
Incidence, Out-of-Hospital Cardiac Arrest	7 (1; 12)
Minor Restricted Activity Days	230,393 (186,818; 272,312)
Work Loss Days	39,204 (33,054; 45,124)

TABLE 7: MONETIZED ANNUAL MORBIDITY BENEFITS

Morbidity Endpoint	Monetized Benefits (Millions of 2023 Dollars)
Long term PM 2.5 Exposure (Total)	**$87.0**
Asthma, New Onset	$51.4
HA, Alzheimer's Disease	$13.3
HA, Parkinson's Disease	$17.8
Incidence, Hay Fever/Rhinitis	$3.3
Incidence, Lung Cancer (non-fatal)	$1.3
Short-Term PM 2.5 Exposure (Total)	**$33.8**
Acute Myocardial Infarction, Nonfatal	$0.6
Asthma Symptoms, Albuterol use	$0.1
ED Visits, Asthma	$0.02
ED Visits All Cardiac Outcomes	$0.1
ED Visits, All Respiratory Minus Asthma	$0.2
Emergency Hospitalizations (EHA, Asthma)	$0.01
HA, All Cardiac Outcomes	$0.5
HA, All Respiratory	$2.3
Incidence, Ischemic Stroke	$1.4
Incidence, Out-of-Hospital Cardiac Arrest	$0.3
Minor Restricted Activity Days	$21.2
Work Loss Days	$7.2
Total Morbidity Benefits	**$120.7**

Note: Totals may not sum due to rounding

Sensitivity and Uncertainty Analyses

It should be emphasized that, as with all scientific studies and evaluations, there are various sources of uncertainty surrounding the estimated public health benefits, including the uncertainty embedded in data inputs, uncertainty of the C-R functions chosen, and uncertainty of valuation. Given the substantial contribution of mortality-related benefits, two sensitivity and uncertainty analyses were conducted for three major sources of uncertainties in public health benefits estimations.

The first sensitivity analysis considers two sources of uncertainty: alternative VSL and income elasticities. The base VSL of $12.4 million represents the mid-point of the recommended VSL range of $5.8 million to $18.8 million, adjusted for inflation (Industrial Economics and Robinson 2016a). This VSL range is based on a review of peer-reviewed studies on the value of mortality risk reductions and is considered to be reasonable for conducting a regulatory analysis (Robinson and Hammitt 2016). In addition, a lower income elasticity of 0 (i.e., VSL does not change with income level) and a higher income elasticity of 1.4 (i.e., a one percent income growth increases VSL by 1.4 percent) were also recommended to be used in the sensitivity analysis, based on a study by Viscusi (2015). Table 8 shows the range of monetized public health benefits broken down by county, where the lower bound assumes a VSL of $5.8 million and an income elasticity of 0 while the upper bound assumes a VSL of $18.8 million and an income elasticity of 1.4. In 2030, the range of benefits is from $2.8 to $14.9 billion. The lower bound is about 32 percent of the midpoint benefits, while the upper bound is about 169 percent of the midpoint estimate.

TABLE 8: SENSITIVITY OF MONETIZED PUBLIC HEALTH BENEFITS (BILLIONS OF 2023 DOLLARS)

Mortality, All Causes	VSL = $5.8M $\varepsilon_I = 0.0$	VSL = $12.4 M $\varepsilon_I = 1.1$	VSL = $18.8M $\varepsilon_I = 1.4$
By County	**$2.8**	**$8.8**	**$14.9**
Los Angeles	$1.8	$5.6	$9.5
Orange	$0.4	$1.2	$2.1
Riverside	$0.3	$0.9	$1.4
San Bernardino	$0.4	$1.1	$1.9

Note: Totals may not sum due to rounding

Mortality-related health benefit estimates are also sensitive to the C-R function selected, as this determines the magnitude of the health impact for a given change in air quality. To test the sensitivity of mortality-related health benefits to the recommended C-R functions for long-term exposure to PM2.5, two alternative sets of C-R functions are used to estimate the number of avoided premature deaths. These alternative C-R functions are estimated based on data from larger study populations that are not confined to the South Coast region. Specifically, the analysis includes two different sets of C-R functions as a sensitivity test: the first which pools studies using data from the entire state of California (Thurston et al 2016; Jerrett et al 2013) and the second which pools studies based on nationwide data (Wu et al. 2020, Pope et al. 2019). The two California studies have RRs of 1.03 and 1.01, respectively, and the two National study estimates have RRs of 1.07 and 1.13, respectively. The two sets of C-R functions consider studies conducted at progressively larger geographic scales, generally with larger sample sizes.

Table 9 shows the results of the sensitivity analysis for health impacts using the two different sets of C-R functions, and monetized benefits based on the midpoint VSL and income elasticity in the year 2030. The quantified public health benefits are lower under both alternative sets of C-R functions, ranging from about 61 percent of the main scenario for the national estimates to 19 percent for the California estimates. The key difference between the main estimates and the sensitivity analysis stems from the estimated magnitude of how mortality risk responds to a change in PM2.5 concentration, which is lower in the national and California-wide studies used.

TABLE 9: SENSITIVITY ANALYSIS OF PREMATURE DEATHS AVOIDED AND MONETIZED BENEFITS ASSOCIATED WITH REDUCED LONG-TERM EXPOSURE TO PM2.5

Scenarios	Health Impacts (premature deaths avoided in 2030)	Monetized Benefit (Billions of 2023 Dollars)
Main Scenario (Los Angeles Studies)	665	$8.8
California Studies	123	$1.6
National Studies	406	$5.4

South Coast AQMD

APPENDIX VIII

California Environmental Quality Act

Table of Contents

Introduction

The California Environmental Quality Act (CEQA) is comprised of Public Resources Code Section 21000 *et seq.* and the CEQA Guidelines which are codified at Title 14 California Code of Regulations, Section 15000 *et seq.* CEQA requires the evaluation of all potential adverse environmental impacts of proposed projects and the identification and implementation of methods to reduce or avoid significant adverse environmental impacts of these projects, if feasible. [Public Resources Code Section 21061.1 and CEQA Guidelines Section 15364]. The purpose of the CEQA process is to inform decision makers, public agencies, and interested parties of potential adverse environmental impacts that could result from implementing a proposed project and to identify feasible mitigation measures or alternatives, when an impact is significant.

The South Coast Air Basin Attainment Plan for the 2012 Annual PM2.5 Standard (hereafter, referred as PM2.5 Plan) provides the strategy for how the region will meet the 2012 annual PM2.5 NAAQS in the South Coast Air Basin (Basin) as expeditiously as practicable, but no later than December 31, 2030, by relying on previously adopted control measures from the 2022 AQMP[1] and the 2016 AQMP[2] to reduce emissions of nitrogen oxides (NOx), ammonia (NH3) and directly emitted Particulate Matter of which diameter is 2.5 µm or less (PM2.5).

At the time the 2022 AQMP and 2016 AQMP were developed, each was considered a "project" as defined by CEQA Guidelines Section 15378 and the South Coast AQMD was lead agency under CEQA because it was the "public agency that has the principal responsibility for carrying out or approving a project that may have a significant effect upon the environment." [Public Resources Code Section 21067]. Further, since the South Coast AQMD Governing Board had the primary responsibility for approving the entirety of both projects, the South Coast AQMD was the most appropriate public agency to act as lead agency for the projects. [CEQA Guidelines Section 15051(b)].

The 2022 AQMP and 2016 AQMP each: 1) had environmental impacts which were evaluated in a Final Program Environmental Impact Report (Program EIR); and 2) were discretionary actions which were individually considered and approved by the South Coast AQMD Governing Board.

Therefore, the proposed project, the PM2.5 Plan, is integrally related to the 2022 AQMP and the 2016 AQMP for which two previous environmental analyses have been prepared: 1) the Final Program EIR for 2022 AQMP which was certified by the South Coast AQMD Governing Board on December 2, 2022[3]; and

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1 South Coast AQMD, 2022 Air Quality Management Plan, December 2022. https://www.aqmd.gov/home/air-quality/air-quality-management-plans/air-quality-mgt-plan

2 South Coast AQMD, 2016 Air Quality Management Plan, March 2017. https://www.aqmd.gov/home/air-quality/air-quality-management-plans/final-2016-aqmp

3 South Coast AQMD, Final Program Environmental Impact Report for the 2022 Air Quality Management Plan, December 2022. https://www.aqmd.gov/docs/default-source/ceqa/documents/aqmd-projects/2022/2022-aqmp-final-peir.pdf

2) the Final Program EIR for 2016 AQMP which was certified by the South Coast AQMD Governing Board on March 3, 2017[4].

The Final Program EIRs for the 2022 AQMP and the 2016 AQMP identified potentially significant impacts, mitigation measures were made a condition of approval of the 2022 AQMP and the 2016 AQMP and were adopted. Further, since mitigation measures were adopted for the 2022 AQMP and the 2016 AQMP, a Mitigation, Monitoring, and Reporting Plan for the 2022 AQMP and the 2016 AQMP, pursuant to Public Resources Code Section 21081.6 and CEQA Guidelines 15097 was also required and adopted.

Further, because the Final Program EIRs concluded that the 2022 AQMP and the 2016 AQMP will each have potentially significant and unavoidable adverse impacts on the environment, Findings were made pursuant to CEQA Guidelines Section 15091, and a Statement of Overriding Considerations pursuant to CEQA Guidelines Section 15093 was adopted.

The 2022 AQMP, along with the December 2022 Final Program EIR for the 2022 AQMP (State Clearinghouse No. 2022050287) and its corresponding Findings, Statement of Overriding Considerations, and Mitigation, Monitoring, and Reporting Plan, and the 2016 AQMP along with the March 2017 Final Program EIR for the 2016 AQMP (State Clearinghouse No. 2016071006) and its corresponding with Findings, Statement of Overriding Considerations, and Mitigation, Monitoring, and Reporting Plan, upon which the analysis of the PM2.5 Plan relies, are incorporated by reference pursuant to CEQA Guidelines Section 15150 and are available from the South Coast AQMD's website at:

December 2022 Final Program EIR for the 2022 AQMP
Master webpage: https://www.aqmd.gov/home/research/documents-reports/lead-agency-scaqmd-projects/south-coast-aqmd-projects---year-2022

> **December 2022 Final Program EIR for the 2022 AQMP (including Appendices)**
> https://www.aqmd.gov/docs/default-source/ceqa/documents/aqmd-projects/2022/2022-aqmp-final-peir.pdf
>
> **Findings, Statement of Overriding Considerations, and Mitigation Monitoring and Reporting Plan:** https://www.aqmd.gov/docs/default-source/ceqa/documents/aqmd-projects/2022/2022-aqmp-attachment1toresolution.pdf
>
> **2022 AQMP:** https://www.aqmd.gov/home/air-quality/air-quality-management-plans/air-quality-mgt-plan

March 2017 Final Program EIR for the 2016 AQMP
Master webpage: http://www.aqmd.gov/home/research/documents-reports/lead-agency-scaqmdprojects/scaqmd-projects---year-2017

[4] South Coast AQMD, Final Program Environmental Impact Report for the 2016 Air Quality Management Plan, March 2017. https://www.aqmd.gov/docs/default-source/ceqa/documents/aqmd-projects/2016/2016aqmpfpeir.pdf

March 2017 Final Program EIR for the 2016 AQMP (without Appendices)
https://www.aqmd.gov/docs/default-source/ceqa/documents/aqmd-projects/2016/2016aqmpfpeir.pdf

Appendices A through C: https://www.aqmd.gov/docs/default-source/ceqa/documents/aqmd-projects/2016/2016aqmpfpeir_appendicesac.pdf

Appendices D through E: https://www.aqmd.gov/docs/default-source/ceqa/documents/aqmd-projects/2016/2016aqmpfpeir_appendicesde.pdf

Findings, Statement of Overriding Considerations, and Mitigation Monitoring and Reporting Plan: https://www.aqmd.gov/docs/default-source/ceqa/documents/aqmd-projects/2017/att2toresolutionfor-2016aqmp.pdf

2016 AQMP: https://www.aqmd.gov/home/air-quality/air-quality-management-plans/final-2016-aqmp

Copies of these documents may also be obtained from:

Derrick Alatorre, Deputy Executive Officer/Public Advisor
South Coast AQMD 21865 Copley Drive, Diamond Bar, CA 91765
Phone: (909) 396-2432
Email: publicadvisor@aqmd.gov

For both of these projects, a Program EIR was considered to be the appropriate document for each AQMP pursuant to CEQA Guidelines Section 15168(a)(3) because each AQMP constituted a series of actions that can be characterized as one large project in connection with the issuance of rules, regulations, plans, or other general criteria required to govern the conduct of a continuing program. In addition, the use of a Program EIR had the following advantages by:

- Providing an occasion for a more exhaustive consideration of effects and alternatives than would be practical in an EIR on an individual action;
- Ensuring a consideration of cumulative impacts that might be slighted in a case-by-case analysis;
- Avoiding duplicative reconsideration of basic policy considerations;
- Allowing consideration of broad policy alternatives and program-wide mitigation measures at an early time when the Lead Agency has greater flexibility to deal with basic problems of cumulative impacts; and
- Allowing its use with a later activity if the later activity is within the scope of the project analyzed in the Program EIR without requiring further environmental documents.

Because the PM2.5 Plan relies on several previously adopted control measures from the 2022 AQMP and the 2016 AQMP, this appendix examines whether the PM2.5 Plan qualifies as a later activity within the scope of the analyses in the Final Program EIRs for the 2022 AQMP and the 2016 AQMP pursuant to CEQA Guidelines 15168(c) – Use with Later Activities. As such, this appendix: 1) compares the proposed control measures in the PM2.5 Plan with the applicable control measures adopted in the 2022 AQMP and 2016 AQMP; 2) summarizes the environmental impacts analyzed in the Final Program EIRs for the 2022 AQMP and the 2016 AQMP for each control measure applicable to the PM2.5 Plan; 3) identifies the differences in environmental impacts, if any, between the analyses in the Final Program EIRs for 2022 AQMP and 2016 AQMP for the applicable control measures upon which the PM2.5 Plan relies and as needed, identifies any other impact areas which may require further analysis; 4) considers the evidence and determines whether: a) the PM2.5 Plan is a later activity within the scope of the program approved earlier for the 2022 AQMP and 2016 AQMP; and b) the Final Program EIRs for the 2022 AQMP and the 2016 AQMP adequately describe the activities of the PM2.5 Plan for the purposes of CEQA such that no new environmental document will be required.

Comparison of Proposed Control Measures in the PM2.5 Plan with Control Measures in the 2022 AQMP and 2016 AQMP

The PM2.5 Plan proposes a total of 38 control measures with:

- 23 measures targeting reductions from stationary sources; and
- 15 measures targeting reductions from mobile sources.

The stationary source control measures are grouped into the following categories:

- NOx measures
- Direct PM2.5 measures
- Ammonia (NH3) measures
- Co-benefits from energy and climate change programs
- Other measures

The mobile source control measures are grouped into the following categories:

- Emission growth management measures
- Facility-based mobile source measures
- On-road and off-road measures
- Incentive-based measures
- Other measures

Overall, between 2018 and 2030, implementation of the PM2.5 Plan is expected to result in emission reductions of 34.94 tons per day of NOx and 1.36 tons per day of PM2.5 that are beyond the emission reductions anticipated from the implementation of already adopted rules and regulations by the South Coast AQMD and CARB.

Table VIII-1 lists the control measures which are proposed in the PM2.5 Plan, lists the equivalent applicable control measure which was previously adopted in either the 2022 AQMP or 2016 AQMP, and describes the proposed method of control and effects of implementing the control measures as adopted in the 2022 AQMP or 2016 AQMP. If a control measure in the PM2.5 Plan proposes a different control method that what was contemplated for the previously adopted control measures in the 2022 AQMP or 2016 AQMP, additional details are provided.

TABLE VIII-1
COMPARISON OF PROPOSED CONTROL MEASURES IN PM2.5 PLAN WITH APPLICABLE CONTROL MEASURES ADOPTED IN EITHER 2022 AQMP OR 2016 AQMP

Proposed Control Measure in PM2.5 Plan	Equivalent Applicable Adopted AQMP Control Measure	Proposed Method of Control and Effect of Implementation as Adopted in the AQMP
Stationary Source NOx Measures		
BCM-01: Emission Reductions from Replacement with Zero Emission or Low NOx Appliances – Residential Water Heating	R-CMB-01 in 2022 AQMP	Installation of zero emission water heaters and low NOx technologies (when zero emission is infeasible) in new and existing residences.
BCM-02: Emission Reductions from Replacement with Zero Emission or Low NOx Appliances – Residential Space Heating	R-CMB-02 in 2022 AQMP	Installation of zero emission space heaters and low NOx technologies (when zero emission is infeasible) in new and existing residences.
BCM-03: Emission Reductions from Residential Cooking Devices	R-CMB-03 in 2022 AQMP	Installation of electric cooking devices, induction cooktops, or low NOx burners in new and existing residences.
BCM-04: Emission Reductions from Replacement with Zero Emission or Low NOx Appliances – Residential Other Combustion Sources	R-CMB-04 in 2022 AQMP	Installation of zero emission or low NOx technologies in new and existing residences to replace equipment such as pool heaters, dryers, grills, etc.
BCM-05: Emission Reductions from Emergency Standby Engines	L-CMB-04 in 2022 AQMP	Installation of zero emission and low NOx technology alternatives to emergency ICEs, and requiring the use of renewable diesel for emergency standby ICEs.
BCM-06: Emission Reductions from Diesel Electricity Generating Facilities	L-CMB-06 in 2022 AQMP	Replacement of boilers with lower-emitting turbines, installation of zero emission and low NOx emissions technologies, and the application of stricter emission requirements for diesel internal combustion engines.
BCM-07: Emission Reductions from Incinerators	L-CMB-09 in 2022 AQMP	Installation of low NOx and ultra-low NOx burners for incinerators and other associated equipment.

TABLE VIII-1 (continued)
COMPARISON OF PROPOSED CONTROL MEASURES IN PM2.5 PLAN WITH APPLICABLE CONTROL MEASURES ADOPTED IN EITHER 2022 AQMP OR 2016 AQMP

Proposed Control Measure in PM2.5 Plan	Equivalent Applicable Adopted AQMP Control Measure	Proposed Method of Control and Effect of Implementation as Adopted in the AQMP
Co-Benefits from Energy and Climate Change Programs		
ECC-01: Co-benefits from Existing and Future Greenhouse Gas Programs, Policies, and Incentives	ECC-01 in 2022 AQMP	Evaluation of renewable energy targets with existing and further greenhouse gas (GHG) emission reduction mechanisms, including market, incentive and rebate programs, and promotion of implementation and development of new technologies.
ECC-02: Co-benefits from Existing and Future Residential and Commercial Building Energy Efficiency Measures	ECC-02 in 2022 AQMP	Quantification of the criteria air pollutant and GHG emission reduction benefits from existing and future energy efficiency programs adopted by other regulatory authorities.
ECC-03: Additional Enhancements in Reducing Existing Residential Building Energy Use	ECC-03 in 2022 AQMP	Incentivization of additional reductions in energy use associated with space heating, water heating, and other large residential energy sources through facilitating weatherization, replacing older appliances with highly efficient technologies and encouraging renewable energy adoption such as solar thermal and photovoltaics.
Ammonia Measures		
BCM-08: Emission Reductions from Livestock Waste at Confined Animal Facilities	BCM-04 in 2016 AQMP	Acidifier application, incorporation of manure into soil, and lowering applicability thresholds for Rule 223 – Emission Reduction Permits for Large Confined Animal Facilities.
BCM-09: Ammonia Emission Reductions from NOx Controls	BCM-05 in 2016 AQMP	Reduction of ammonia slip by upgrading the SCR systems by tuning and optimizing to achieve the NOx limits specified in each rule.
BCM-10: Emission Reductions from Direct Land Application of Chipped and Ground Uncomposted Greenwaste	BCM-10 in 2016 AQMP	Composting of chipped and ground greenwaste.

TABLE VIII-1 (continued)
COMPARISON OF PROPOSED CONTROL MEASURES IN PM2.5 PLAN WITH APPLICABLE CONTROL MEASURES ADOPTED IN EITHER 2022 AQMP OR 2016 AQMP

Proposed Control Measure in PM2.5 Plan	Equivalent Applicable Adopted AQMP Control Measure	Proposed Method of Control and Effect of Implementation as Adopted in the AQMP
BCM-11: Emission Reductions from Organic Waste Composting	BCM-10 in 2016 AQMP	Emerging organic waste processing technology such as the co-digestion of food waste with biosolids, and increased anaerobic digestion such as through the integration of food waste digestate with greenwaste composting.
Direct PM2.5 Measures		
BCM-12: Further Emission Reductions from Commercial Cooking	BCM-01 in 2016 AQMP	BCM-01 in the 2016 AQMP identified PM control equipment for under-fired charbroilers, such as electrostatic precipitators (ESPs), filters, centrifugal separators, and misters. BCM-12 in the proposed PM2.5 Plan proposes PM control equipment for chain-driven charbroilers, such as catalytic oxidizers.
BCM-13: Emission Reductions from Cooling Towers	BCM-02 in 2016 AQMP	Phased-in use of drift eliminators with 0.001 percent drift rate for existing cooling towers. This could be achieved by retrofitting older cooling towers with modification to the cooling fans to accompany the drift eliminators, which will also result in water conservation. Newly constructed cooling towers have demonstrated ultra-low drift rates down to 0.0005 percent.
BCM-14: Further Emission Reductions from Paved Road Dust Sources	BCM-03 in 2016 AQMP	Increased street sweeping.
BCM-15: Emission Reductions from Abrasive Blasting Operations	BCM-06 in 2016 AQMP	Incentivization of portable blasting enclosures/booths with dust collection systems, primarily focusing on dry abrasive blasting operations conducted in open areas using portable blasting equipment.
BCM-16: Emission Reductions from Stone Grinding, Cutting and Polishing Operations	BCM-07 in 2016 AQMP	Dry and wet dust control options to control PM including silica particles.
BCM-17: Emission Reductions from Prescribed Burning for Wildfire Prevention	MCS-02 in 2022 AQMP	Mechanical thinning and chipping activities.

TABLE VIII-1 (continued)
COMPARISON OF PROPOSED CONTROL MEASURES IN PM2.5 PLAN WITH APPLICABLE CONTROL MEASURES ADOPTED IN EITHER 2022 AQMP OR 2016 AQMP

Proposed Control Measure in PM2.5 Plan	Equivalent Applicable Adopted AQMP Control Measure	Proposed Method of Control and Effect of Implementation as Adopted in the AQMP
BCM-18: Further Emission Reductions from Wood-Burning Fireplaces and Wood Stoves	BCM-09 in 2016 AQMP	Removal of the low-income exemption allowing wood burning on no-burn days (but retaining the sole-source of heat exemption).
BCM-19: Emission Reductions from Unpaved Road Dust Sources	N/A	BCM-19 was not previously adopted in either the 2022 AQMP or the 2016 AQMP. BCM-19 in the PM2.5 Plan seeks to develop an inventory of unpaved roads and parking lots within urban areas in the Basin for the purpose of assessing their suitability for paving.
Other Measures		
BCM-20: Application of All Feasible Measures	MCS-01 in 2022 AQMP	Retrofit existing equipment and install newer, lower-emitting equipment to replace older, higher-emitting equipment for sources as a result of new emission limits introduced through federal, state, or local regulations.
Emission Growth Management Measures		
EGM-01: Emission Reductions from New Development and Redevelopment	EGM-01 in 2022 AQMP	Replacement or upgrade of off-road construction equipment as part of development/redevelopment efforts may result in the use of zero-emission technologies in construction, the installation of charging and alternative fueling infrastructure, the use of alternative fuels, and the use of construction equipment with low-emitting engines fitted with diesel PM filters.
EGM-02: Emission Reductions from Clean Construction Policy	EGM-03 in 2022 AQMP	Incentivization of the use of zero emission and low NOx equipment by adopting a voluntary measure for municipalities and public agencies to reduce emissions generated by construction activities may include use of zero emission and low NOx construction equipment, dust control, alternative fuels, diesel PM filtration, low-emitting engines, and low VOC materials.
Facility-Based Measures		
MOB-01: Emission Reductions at Commercial Marine Ports	MOB-01 in 2022 AQMP	Development of cleaner technologies at commercial marine ports (e.g., from on-road heavy-duty vehicles, ocean-going vessels, cargo handling equipment, locomotives, and harbor craft) along with corresponding infrastructure development.

TABLE VIII-1 (continued)
COMPARISON OF PROPOSED CONTROL MEASURES IN PM2.5 PLAN WITH APPLICABLE CONTROL MEASURES ADOPTED IN EITHER 2022 AQMP OR 2016 AQMP

Proposed Control Measure in PM2.5 Plan	Equivalent Applicable Adopted AQMP Control Measure	Proposed Method of Control and Effect of Implementation as Adopted in the AQMP
MOB-02: Emission Reductions at New and Existing Rail Yards	MOB-02A and MOB-02B in 2022 AQMP	Development of cleaner technologies at rail yards and intermodal facilities (e.g., from on-road heavy-duty vehicles, off-road equipment, and locomotives) along with corresponding infrastructure development.
MOB-03: Emission Reductions at Warehouse Distribution Centers	MOB-03 in 2022 AQMP	Reducing emissions and exposure of mobile sources associated with warehouse distribution centers by requiring actions or investments to offset the emissions of the mobile sources (trucks) attracted to the warehouses is being implemented via Rule 2305 which was adopted by the South Coast AQMD Governing Board on May 7, 2021.
MOB-04: Emission Reductions at Commercial Airports	MOB-04 in 2022 AQMP	Deployment of additional cleaner technologies, such as increasing efficiencies, implementing air quality improvement options or by deploying zero emission and low NOx technologies, alternative fuels, diesel PM filters, and low-emitting engines for additional equipment beyond the commitments made in the existing Memoranda of Understanding with the commercial airports.
On-Road and Off-Road Measures		
MOB-05: Accelerated Retirement of Light-Duty and Medium-Duty Vehicles	MOB-05 in 2022 AQMP	Acceleration of the retirement of light- and medium-duty vehicles per year through the Replace Your Ride Program and accelerating the penetration of zero and near–zero emission vehicles.
MOB-06: Accelerated Retirement of On-Road Heavy-Duty Vehicles	MOB-06 in 2022 AQMP	Retirement of older, heavy-duty vehicles and replacing them with low-NOx vehicles fueled with CNG or other alternative fuels (e.g., battery electric and hydrogen fuel cells).
MOB-07: On-Road Mobile Source Emission Reduction Credit Generation Program	MOB-07 in 2022 AQMP	Incentivization of the early deployment of zero emission and low NOx emission heavy-duty trucks through the generation of mobile source emission credits.

TABLE VIII-1 (concluded)
COMPARISON OF PROPOSED CONTROL MEASURES IN PM2.5 PLAN WITH APPLICABLE CONTROL MEASURES ADOPTED IN EITHER 2022 AQMP OR 2016 AQMP

Proposed Control Measure in PM2.5 Plan	Equivalent Applicable Adopted AQMP Control Measure	Proposed Method of Control and Effect of Implementation as Adopted in the AQMP
MOB-08: Small Off-Road Engine Equipment Exchange Program	MOB-08 in 2022 AQMP	Promotion of the accelerated turn-over of in-use small off-road engines and other engines, such as gasoline- and diesel-powered commercial lawn and garden equipment through expanded voluntary exchange programs.
MOB-09: Further Emission Reductions from Passenger Locomotives	MOB-09 in 2022 AQMP	Promotion of earlier and cleaner replacement or upgrade of existing passenger locomotives capable of achieving Tier 4 emission standards and supporting the development of zero emission or low NOx technologies (e.g., battery electric and hydrogen fuel cells).
MOB-10: Off-Road Mobile Source Emission Reduction Credit Generation Program	MOB-10 in 2022 AQMP	Acceleration of the deployment of zero (e.g. battery-electric or fuel cell powered equipment) and low NOx emission off-road mobile equipment (e.g., 90 percent cleaner than Tier 5) that do not receive public funding.
Incentive-Based Measures		
MOB-11: Emission Reductions from Incentive Programs	MOB-11 in 2022 AQMP	Allows the South Coast AQMD to take credit for emission reductions for SIP purposes achieved through past and future projects funded by incentive programs (e.g., replacing heavy-duty vehicle/equipment, installing retrofit units, and repowering engines for marine vessels, locomotives, trucks, school buses, agricultural equipment, construction equipment, commercial harbor craft, airport support equipment, and oil drilling equipment).
MOB-12: Pacific Rim Initiative for Maritime Emission Reductions	MOB-12 in 2022 AQMP	Allows the South Coast AQMD to recognize ocean-going vessel emission reductions that are the result of voluntary actions and may be considered surplus to the emission reduction commitments of the State SIP Strategy "Federal Action: Cleaner fuel and Vessel Requirements for Ocean-Gong-Vessels."
Other Mobile Source Measures		
MOB-13: Rule 2202 – On-Road Motor Vehicle Mitigation Options	MOB-14 in 2022 AQMP	Amendment of Rule 2202 to take into account emission reductions due to telecommuting strategies such as allowing employees to work from home.

As summarized in Table VIII-1, the PM2.5 Plan proposes to expand the methods of control and effects of implementation for only one control measure, BCM-12, when compared to the previous control measure it relies on, BCM-01 in the 2016 AQMP. In addition, the PM2.5 Plan proposes one new control measure, BCM-19, which does not rely on any previously adopted control measure in either the 2022 AQMP or 2016 AQMP.

1) Proposed control measure BCM-12 in the PM2.5 Plan proposes a future amendment to South Coast AQMD Rule 1138 – Control of Emissions From Restaurant Operations to make the exemption criteria applicable to chain-driven charbroilers in paragraph (e)(1) , more stringent by providing an option for the owner or operator to either accept a permit condition limiting the amount of meat cooked per week from 875 pounds to 400 pounds or install integrated catalytic oxidizer technology. By comparison, control measure BCM-01 of the 2016 AQMP contemplated the reliance on add-on air pollution control equipment and devices such as such as ESPs, filters, centrifugal separators, and misters for under-fired charbroilers in order to achieve reductions in PM.

   The potential for increased deployment of PM control equipment for under-fired charbroilers and the potential environmental impacts associated with the installation and operation of the aforementioned PM control equipment were analyzed in the Final Program EIR for the 2016 AQMP.

   Implementation of BCM-12 of the PM2.5 Plan is expected to result in the potential installation and operation of catalytic oxidizers for certain chain-driven charbroilers that were either not originally manufactured with a catalytic oxidizer or equivalent or more stringent PM control equipment or device. Therefore, the potential retrofit of chain-driven charbroilers with catalytic oxidizers is the only new physical change anticipated from implementing control measure BCM-12 of the PM2.5 Plan that was not previously contemplated or analyzed in the Final Program EIR for the 2016 AQMP.

2) Control measure BCM-19 is a new control measure which proposes to develop an inventory of unpaved roads and parking lots within urban areas in the Basin, and assess their suitability for paving.

   Implementation of control measure BCM-19 of the PM2.5 Plan is an administrative exercise that will not require physical changes. Therefore, no potential adverse environmental impacts are expected from implementation of this control measure.

Except for control measures BCM-12 and BCM-19, all of the other control measures proposed in the PM2.5 Plan are essentially equivalent to the applicable adopted control measure either in the 2022 AQMP or the 2016 AQMP such that their implementation is not expected to result in new physical changes and new or worsened environmental impacts relative to what was previously analyzed in the Final Program EIRs for the 2022 AQMP and the 2016 AQMP. The following section, “Summary of Environmental Impact Analysis from Final Program EIRs for the 2022 AQMP and the 2016 AQMP” will detail the potential adverse environmental impacts, conclusions of significance, mitigation measures, and cumulative impacts resulting from physical changes of all AQMP control measures on which the PM2.5 Plan relies.

Summary of Environmental Impact Analysis from the Final Program EIRs for the 2022 AQMP and the 2016 AQMP

The CEQA Guidelines require environmental documents to identify significant environmental effects that may result from a proposed project. [CEQA Guidelines Section 15126.2(a)]. Direct and indirect significant effects of a project on the environment should be identified and described, with consideration given to both short- and long-term impacts. The discussion of environmental impacts may include, but is not limited to, the resources involved; physical changes; alterations of ecological systems; health and safety impacts caused by physical changes; and other aspects of the resources involved including water, scenic quality, and public services. If significant adverse environmental impacts are identified, the CEQA Guidelines require a discussion of measures that could either avoid or substantially reduce any adverse environmental impacts to the greatest extent feasible. [CEQA Guidelines Section 15126.4].

The categories of environmental impacts to be studied in a CEQA document are established by CEQA (Public Resources Code Section 21000 et seq.) and the CEQA Guidelines (codified in Title 14 California Code of Regulations Section 15000 et seq). Under the CEQA Guidelines Appendix G: Environmental Checklist Form, there are 20 environmental topic areas categories in which potential adverse impacts from a project are evaluated. The South Coast AQMD, as lead agency, has taken into consideration the environmental checklist questions in Appendix G, but has reorganized the contents to consolidate the environmental topic areas to avoid repetition. For example, South Coast AQMD's customized the environmental checklist by: 1) combining the topics of "air quality" and "greenhouse gas emissions" into one section; 2) combining the topics of "cultural resources" and "tribal cultural resources" into one section; 3) separating the "hazards and hazardous materials" topic into two sections: "hazards and hazardous materials" and "solid and hazardous waste;" and 4) distributing the questions from the topic of "utilities/service systems" into other more specific environmental areas such as "energy," "hydrology and water quality," and "solid and hazardous waste." For each environmental topic area, per CEQA Guidelines Section 15064.7(a), "[a] threshold of significance is an identifiable quantitative, qualitative, or performance level of a particular environmental effect, noncompliance with which means the effect will normally be determined to be significant by the agency and compliance with which means the effect normally will be determined to be less than significant." The South Coast AQMD has developed unique thresholds of significance for the determination of significance in accordance with CEQA Guidelines Section 15064.7(b).

The CEQA Guidelines indicate that the degree of specificity required in a CEQA document depends on the type of project being proposed. [CEQA Guidelines Section 15146]. The detail of the environmental analysis for certain types of projects cannot be as great as for others. For example, an EIR for a project, such as the adoption or amendment of a comprehensive zoning ordinance or a local general plan, should focus on the secondary effects that can be expected to subsequently occur as a result of the adoption or amendment, but the analysis need not be as detailed as the analysis of any specific construction project(s) that may also occur.

The CEQA Guidelines also includes provisions for the preparation of Program EIRs in connection with the issuance of plans, such as the 2022 AQMP and 2016 AQMP, to govern the conduct of a continuing program, including adoptions of broad policy programs as distinguished from those prepared for specific types of projects such as land use projects, for example. [CEQA Guidelines Section 15168]. A Program EIR also allows for the consideration of broad policy alternatives and program-wide mitigation measures at an early time when an agency has greater flexibility to deal with basic problems or cumulative impacts. [CEQA Guidelines Section 15168 (b)(4)]. Lastly, a Program EIR also plays an important role in establishing a structure within which a CEQA review of future related actions can be effectively conducted. A Program EIR, by design, provides the basis for future environmental analyses and will allow future project-specific CEQA documents, if necessary, to focus solely on the new effects or detailed environmental issues not previously considered. If an agency finds that no new effects could occur, or no new mitigation measures would be required, the agency can approve the activity as being within the scope of the project covered by the Program EIR and no new environmental document would be required. [CEQA Guidelines Section 15168(c)(2)].

The Final Program EIR for the 2016 AQMP analyzed the impacts of the 2016 AQMP project on 18 environmental topic areas: aesthetics, agriculture and forestry resources, air quality and greenhouse gas emissions, biological resources, cultural resources, energy, geology and soils, hazards and hazardous materials, hydrology and water quality, land use and planning, mineral resources, noise, population and housing, public services, recreation, solid and hazardous waste, transportation and traffic, and mandatory findings of significance. In 2019, the CEQA Guidelines were amended to add the environmental topic areas of tribal cultural resources and wildfires, and the transportation analysis was changed from Level of Service (LOS) to Vehicle Miles Traveled (VMT) with a corresponding update to the name of the environmental topic area from “transportation and traffic” to “transportation.” Thus, the Final Program EIR for the 2022 AQMP analyzed the impacts of implementing the various control measures in the 2022 AQMP on 19 environmental topic areas: aesthetics, agriculture and forestry resources, air quality and greenhouse gas emissions, biological resources, cultural and tribal cultural resources, energy, geology and soils, hazards and hazardous materials, hydrology and water quality, land use and planning, mineral resources, noise, population and housing, public services, recreation, solid and hazardous waste, transportation, wildfire, and mandatory findings of significance.

The Final Program EIR for the 2022 AQMP concluded that the implementation of all of the control measures in the 2022 AQMP would result in potentially significant impacts for the following environmental topic areas: air quality and GHG, energy, hazards and hazardous materials, hydrology and water quality, noise, and solid and hazardous waste. All other environmental topic areas were either concluded to have less than significant impacts or no impact. Mitigation measures to minimize significant impacts from implementation of the 2022 AQMP were adopted in the Mitigation, Monitoring, and Reporting Plan which can be found in Attachment 1 to the Governing Board Resolution for the Final Program EIR for the 2022 AQMP.[5]

The Final Program EIR for the 2016 AQMP concluded that the implementation of all of the control measures in the 2016 AQMP would result in potentially significant impacts for the following environmental topic areas: aesthetics, air quality and greenhouse gas emissions, energy, hazards and hazardous materials, hydrology and water quality, noise, solid and hazardous waste, and transportation and traffic. All other environmental topic areas were either concluded to have less than significant impacts or no impact. Mitigation measures to minimize significant impacts from implementation of the 2016 AQMP were adopted in the Mitigation, Monitoring, and Reporting Plan which can be found in Attachment 2 to the Governing Board Resolution for the Final Program EIR for the 2016 AQMP.[6]

While the Final Program EIR for the 2016 AQMP concluded potentially significant aesthetics impacts from implementation of the 2016 AQMP, the 2016 AQMP control measures that the PM2.5 Plan relies on: control measures BCM-01 through BCM-07, and BCM-09 through BCM-10, were concluded to have no potential adverse aesthetics impacts. Because no 2022 AQMP control measures were concluded to have potential adverse aesthetics impacts either, implementation of the PM2.5 Plan will not have potential adverse aesthetics impacts. For this reason, this analysis of environmental impacts from implementation of the PM2.5 Plan will not discuss aesthetics as a potential adverse impact.

Table VIII-2 summarizes the 2022 AQMP and 2016 AQMP control measures upon which the PM2.5 Plan control measures rely, their effect of implementation and nature of potential impact(s), and which of the environmental topic areas are potentially adversely impacted by implementation of a specific control measure. The control measures are presented and organized in the same manner as in Table VIII-1.

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5 South Coast AQMD, Attachment 1 to the Governing Board Resolution for the Final Program Environmental Impact Report for the 2022 Air Quality Management Plan, December 2022. https://www.aqmd.gov/docs/default-source/ceqa/documents/aqmd-projects/2022/2022-aqmp-attachment1toresolution.pdf

6 South Coast AQMD, Attachment 2 to the Governing Board Resolution for the Final Program Environmental Impact Report for the 2016 Air Quality Management Plan, March 2017. https://www.aqmd.gov/docs/default-source/ceqa/documents/aqmd-projects/2017/att2toresolutionfor-2016aqmp.pdf

TABLE VIII-2
ENVIRONMENTAL TOPIC AREAS ADVERSELY IMPACTED BY AQMP CONTROL MEASURES

			Potential Adverse Impact(s)							
Control Measure Number	**Title**	**Effect of Implementation and Nature of Potential Impact(s)**	**No Impact**	**Air Quality/ GHG**	**Energy**	**Hazards/ Hazardous Materials**	**Hydrology/ Water Quality**	**Noise**	**Solid/ Hazardous Waste**	**Transportation**
R-CMB-01 in 2022 AQMP	Emission Reductions from Replacement with Zero Emission or Low NOx Appliances – Residential Water Heating	Installation of zero emission water heaters and low NOx technologies (when zero emission is infeasible) in new and existing residences may cause impacts to: 1) air quality and GHGs during minor construction activities and from utilities producing more electricity; 2) energy due to a potential increased demand for electricity which may be produced from natural gas; and 3) noise and solid waste during minor construction activities.		X	X			X	X	
R-CMB-02 in 2022 AQMP	Emission Reductions from Replacement with Zero Emission or Low NOx Appliances – Residential Space Heating	Installation of zero emission space heaters and low NOx technologies (when zero emission is infeasible) in new and existing residences may cause impacts to: 1) air quality and GHGs during minor construction activities and from utilities producing more electricity; 2) energy due to a potential increased demand for electricity which may be produced from natural gas; and 3) noise and solid waste during minor construction activities.		X	X			X	X	
R-CMB-03 in 2022 AQMP	Emission Reductions from Residential Cooking Devices	Installation of electric cooking devices, induction cooktops, or low-NOx burners in new and existing residences may cause impacts to: 1) air quality and GHGs during minor construction activities and from utilities producing more electricity; 2) energy due to a potential increased demand for electricity which may be produced from natural gas; and 3) noise and solid waste during minor construction activities.		X	X			X	X	
R-CMB-04 in 2022 AQMP	Emission Reductions from Replacement with Zero Emission or Low NOx Appliances – Residential Other Combustion Sources	Installation of zero emission or low NOx technologies in new and existing residences to replace equipment such as pool heaters, dryers, grills, etc. may cause impacts to: 1) air quality and GHGs during minor construction activities and from utilities producing more electricity; 2) energy due to a potential increased demand for electricity which may be produced by natural gas; and 3) noise and solid waste during minor construction activities.		X	X			X	X	

TABLE VIII-2 (continued)
ENVIRONMENTAL TOPIC AREAS ADVERSELY IMPACTED BY AQMP CONTROL MEASURES

			Potential Adverse Impact(s)							
Control Measure Number	**Title**	**Effect of Implementation and Nature of Potential Impact(s)**	**No Impact**	**Air Quality/ GHG**	**Energy**	**Hazards/ Hazardous Materials**	**Hydrology/ Water Quality**	**Noise**	**Solid/ Hazardous Waste**	**Transportation**
L-CMB-04 in 2022 AQMP	Emission Reductions from Emergency Standby Engines	Installation of zero emission and low NOx technology alternatives to emergency ICEs may cause impacts to: 1) air quality and GHGs during minor construction, and from utilities producing more electricity and hydrogen; 2) energy due to a potential increased demand for electricity and hydrogen which may be produced by natural gas and natural gas to operate new equipment; 3) hazards associated with the increased production of hydrogen; and 4) noise and solid waste during minor construction activities.		X	X	X		X	X	
L-CMB-06 in 2022 AQMP	NOx Emission Reductions from Electricity Generating Facilities	Replacement of boilers with lower-emitting turbines, installation of zero emission and low NOx emissions technologies, and the application of stricter emission requirements for diesel internal combustion engines may result in the installation and operation of additional NOx pollution control equipment, including SCRs which may cause impacts to: 1) air quality and GHGs during construction, due to the potential use of ammonia during operation of SCR equipment, if installed, and the periodic replacement of catalyst and from utilities producing more electricity and hydrogen; 2) energy due to a potential increased demand for electricity which may be produced by natural gas and hydrogen and natural gas to operate new equipment; 3) hazards and hazardous materials due to the potential use of ammonia during operation of SCR equipment, if installed, and increased hydrogen production; 4) hydrology and water quality if new steam turbines are installed; 5) noise during construction; and 6) solid waste due to disposal of replaced equipment and spent SCR catalyst during operation.		X	X	X	X	X	X	
L-CMB-09 in 2022 AQMP	NOx Reductions from Incinerators	Installation of low NOx and ultra low NOx burners for incinerators and other associated equipment may cause impacts to: 1) air quality and GHGs during minor construction activities; and 2) noise and solid waste during minor construction activities.		X				X	X	

TABLE VIII-2 (continued)
ENVIRONMENTAL TOPIC AREAS ADVERSELY IMPACTED BY AQMP CONTROL MEASURES

			Potential Adverse Impact(s)							
Control Measure Number	**Title**	**Effect of Implementation and Nature of Potential Impact(s)**	**No Impact**	**Air Quality/ GHG**	**Energy**	**Hazards/ Hazardous Materials**	**Hydrology/ Water Quality**	**Noise**	**Solid/ Hazardous Waste**	**Transportation**
ECC-01 in 2022 AQMP	Co-Benefits from Existing and Future Greenhouse Gas Programs, Policies, and Incentives	Evaluating renewable energy targets with existing and further GHG emission reduction mechanisms, including market, incentive and rebate programs, and promoting the implementation and development of new technologies, which may involve the use of electricity in order to reduce emissions of criteria air pollutants and GHGs, may cause impacts to energy due to potential increased demand for electricity.			X					
ECC-02 in 2022 AQMP	Co-Benefits from Existing and Future Residential and Commercial Building Energy Efficiency Measures	Quantifying the criteria air pollutant and GHG emission reduction benefits from existing and future energy efficiency programs adopted by other regulatory authorities (e.g., improving weatherization and energy efficiency) is an administrative exercise with no impacts.	X							
ECC-03 in 2022 AQMP	Additional Enhancements in Reducing Existing Residential Building Energy Use	Incentivizing additional reductions in energy use associated with space heating, water heating, and other large residential energy sources through facilitating weatherization, replacing older appliances with highly efficient technologies and encouraging renewable energy adoption such as solar thermal and photovoltaics may reduce emissions of criteria air pollutants and GHGs but may also cause impacts to air quality and GHGs, noise, and solid waste during construction.		X				X	X	
BCM-04 in 2016 AQMP	Emission Reductions from Manure Management Strategies	Hazard, water, and waste impacts associated with acidifier application, manure removal, and manure slurry injection. Air and energy impacts associated with poultry manure thermal gasification. No impacts associated with dietary manipulation/feed additives.		X	X	X	X		X	X
BCM-05 in 2016 AQMP	Ammonia Emission Reduction from NOx Controls	Air, energy, hazard, and waste impacts associated with the use SCR control equipment. Air, noise, and traffic impacts associated with construction activities.		X	X	X		X	X	X

TABLE VIII-2 (continued)
ENVIRONMENTAL TOPIC AREAS ADVERSELY IMPACTED BY AQMP CONTROL MEASURES

			Potential Adverse Impact(s)							
Control Measure Number	Title	Effect of Implementation and Nature of Potential Impact(s)	No Impact	Air Quality/ GHG	Energy	Hazards/ Hazardous Materials	Hydrology/ Water Quality	Noise	Solid/ Hazardous Waste	Transportation
BCM-10 in 2016 AQMP	Emission Reductions from Greenwaste Composting	Air, energy, hazard, water, and waste impacts associated with controls such as anaerobic digestion and organic processing technology. No impacts associated with improved emissions characterization or restrictions for direct applications of un-composted waste to public lands.		X	X		X		X	
BCM-01 in 2016 AQMP	Further Emission Reductions from Commercial Cooking	Air, water, and waste impacts associated with installation and operation of control equipment, such as ESPs, filters, centrifugal separators, and misters. Energy impacts associated with electricity used to operate equipment.		X	X		X		X	
BCM-02 in 2016 AQMP	Emission Reductions from Cooling Towers	Air impacts associated with installation of drift elimination technologies. Waste impacts associated with disposal of deconstructed equipment and replacement. Water savings.		X					X	
BCM-03 in 2016 AQMP	Further Emission Reductions from Paved Road Dust Sources	Water impacts associated with required wheel washing systems. Potential noise, traffic, and waste impacts associated with minimum street sweeping frequencies and enhanced street cleaning or enhanced best management practices.					X	X	X	X
BCM-06 in 2016 AQMP	Emission Reductions from Abrasive Blasting Operations	Air, noise, and traffic impacts associated with construction of exhaust ventilation to a fabric filter for permanent in-building abrasive blasting activities. Energy and waste impacts associated with the use of additional portable control equipment, such as negative air machines, portable fume extractors and portable dust collectors with HEPA filters.		X	X			X	X	X
BCM-07 in 2016 AQMP	Emission Reductions from Stone Grinding, Cutting and Polishing Operations	Air, noise, and traffic impacts associated with construction of engineering controls, such as exhaust ventilation with dust collectors. Energy impacts associated with the use of engineering controls. Water impacts associated with wet methods to prevent dust release. Waste impacts associated with housekeeping measures, such as vacuuming with HEPA filter, wet-wiping, or wet sweeping.		X	X		X	X	X	X

TABLE VIII-2 (continued)
ENVIRONMENTAL TOPIC AREAS ADVERSELY IMPACTED BY AQMP CONTROL MEASURES

			Potential Adverse Impact(s)							
Control Measure Number	**Title**	**Effect of Implementation and Nature of Potential Impact(s)**	**No Impact**	**Air Quality/ GHG**	**Energy**	**Hazards/ Hazardous Materials**	**Hydrology/ Water Quality**	**Noise**	**Solid/ Hazardous Waste**	**Transportation**
MCS-02 in 2022 AQMP	Wildfire Prevention	Mechanical thinning and chipping activities during fuel reduction and removal efforts may cause impacts to: 1) air quality and GHGs associated with decomposition of greenwaste/woodwaste; 2) hazards (potential fire hazard during chipping and grinding activities); 3) hydrology (increased water use for composting); 4) noise due to chipping and grinding; and 5) solid waste (collected greenwaste/woodwaste).		X		X	X	X	X	
BCM-09 in 2016 AQMP	Further Emission Reductions from Wood-Burning Fireplaces and Wood Stoves	Air and waste impacts associated with the construction/upgrading of wood-burning hearths to cleaner hearths. Energy impacts associated with cleaner hearths, such as natural gas or electric hearths. No impacts associated with increasing the stringency of the curtailment program or with education.		X	X				X	X
MCS-01 in 2022 AQMP	Application of All Feasible Measures	Retrofitting existing equipment and installation of newer, lower-emitting equipment to replace older, higher-emitting equipment for sources as a result of new emission limits introduced through federal, state, or local regulations may cause impacts to: 1) air quality and GHGs during construction and due to the potential use of ammonia during operation of SCR equipment, if installed, and the periodic replacement of catalyst; 2) energy due to a potential increased demand in electricity to operate new equipment; 3) hazards and hazardous materials due to the potential use of ammonia during operation of SCR equipment, if installed; 4) noise during construction; and 5) solid and hazardous waste due to potential replacement of burners during construction and spent SCR catalyst during operation.		X	X	X		X	X	

TABLE VIII-2 (continued)
ENVIRONMENTAL TOPIC AREAS ADVERSELY IMPACTED BY AQMP CONTROL MEASURES

			Potential Adverse Impact(s)							
Control Measure Number	Title	Effect of Implementation and Nature of Potential Impact(s)	No Impact	Air Quality/ GHG	Energy	Hazards/ Hazardous Materials	Hydrology/ Water Quality	Noise	Solid/ Hazardous Waste	Transportation
EGM-01 in 2022 AQMP	Emission Reductions from New Development and Redevelopment (NOTE: Potential Indirect Source Rule and ports affected).	Replacing or upgrading off-road construction equipment as part of development/redevelopment efforts may result in the use of zero-emission technologies in construction, the installation of charging and alternative fueling infrastructure, the use of alternative fuels; and the use construction equipment with low-emitting engines fitted with diesel PM filters, may cause impacts to: 1) air quality and GHGs during construction and the periodic replacement of diesel PM filters; 2) energy due to a potential increased demand in electricity to operate vehicles, rail, or new equipment; 3) hazards associated with the increased alternative fuels production (e.g., hydrogen); 4) noise during construction; and 5) solid waste due to potential replacement of diesel PM filters.		X	X	X		X	X	
EGM-03 in 2022 AQMP	Emission Reductions from Clean Construction Policy	Incentivizing the use of zero emission and low NOx equipment by adopting a voluntary measure for municipalities and public agencies to reduce emissions generated by construction activities may include use of zero emission and low NOx construction equipment, dust control, alternative fuels, diesel PM filtration, low-emitting engines, and low VOC materials. Implementation of this control measure may cause impacts to: 1) air quality and GHGs from installing electricity charging infrastructure and utilities producing more electricity; 2) energy due to a potential increased demand for electricity which may be produced from natural gas; and 3) noise and solid waste during minor construction activities.		X	X	X		X	X	

TABLE VIII-2 (continued)
ENVIRONMENTAL TOPIC AREAS ADVERSELY IMPACTED BY AQMP CONTROL MEASURES

Control Measure Number	Title	Effect of Implementation and Nature of Potential Impact(s)	Potential Adverse Impact(s): No Impact	Air Quality/ GHG	Energy	Hazards/ Hazardous Materials	Hydrology/ Water Quality	Noise	Solid/ Hazardous Waste	Transportation
MOB-01 in 2022 AQMP	Emission Reductions at Commercial Marine Ports	Infrastructure development required to achieve emission reductions at commercial marine ports from on-road heavy-duty vehicles, ocean-going vessels, cargo handling equipment, locomotives, and harbor craft may cause impacts to: 1) air quality and GHGs from construction activities and the combustion of alternative fuels; 2) energy due to increased demand for electricity (for vehicles, rail, and equipment) and natural gas; 3) hazards and hazardous materials associated with engine replacements; 4) noise during construction; and 5) solid and hazardous waste associated with engine replacements.		X	X	X		X	X	
MOB-02A in 2022 AQMP	Emission Reductions at New Rail Yards and Intermodal Facilities	Infrastructure development required to achieve emission reductions at new rail yards and intermodal facilities from on-road heavy-duty vehicles, off-road equipment, and locomotives may cause impacts to: 1) air quality and GHGs from construction activities and the combustion of alternative fuels; 2) energy due to increased demand for electricity (for vehicles, rail, and equipment) and natural gas; 3) hazards and hazardous materials associated with engine replacements; 4) noise during construction; and 5) solid and hazardous waste associated with engine replacements.		X	X	X		X	X	
MOB-02B in 2022 AQMP	Emission Reductions at Existing Rail Yards and Intermodal Facilities	Infrastructure development required to achieve emission reductions at existing rail yards and intermodal facilities from on-road heavy-duty vehicles, off-road equipment, and locomotives may cause impacts to: 1) air quality and GHGs from construction activities and the combustion of alternative fuels; 2) energy due to increased demand for electricity (for vehicles, rail, and equipment) and natural gas; 3) hazards and hazardous materials associated with engine replacements; 4) noise during construction; and 5) solid and hazardous waste associated with engine replacements.		X	X	X		X	X	

TABLE VIII-2 (continued)
ENVIRONMENTAL TOPIC AREAS ADVERSELY IMPACTED BY AQMP CONTROL MEASURES

			Potential Adverse Impact(s)							
Control Measure Number	**Title**	**Effect of Implementation and Nature of Potential Impact(s)**	**No Impact**	**Air Quality/ GHG**	**Energy**	**Hazards/ Hazardous Materials**	**Hydrology/ Water Quality**	**Noise**	**Solid/ Hazardous Waste**	**Transportation**
MOB-03 in 2022 AQMP	Emission Reductions at Warehouse Distribution Centers	Reducing emissions and exposure of mobile sources associated with warehouse distribution centers by requiring actions or investments to offset the emissions of the mobile sources (trucks) attracted to the warehouses has been executed in Rule 2305 which was adopted by the South Coast AQMD Governing Board on May 7, 2021. The environmental effects from implementing Rule 2305 were previously analyzed in the certified Final Environmental Assessment.[7] Since this control measure does not propose any additional elements for achieving emission reductions at warehouse distribution centers, no new impact areas have been identified.	X							
MOB-04 in 2022 AQMP	Emission Reductions at Commercial Airports	Deploying additional cleaner technologies, such as increasing efficiencies, implementing air quality improvement options or by deploying zero emission and low NOx technologies, alternative fuels, diesel PM filters, and low-emitting engines for additional equipment beyond the commitments made in the existing Memoranda of Understanding with the commercial airports may cause impacts to: 1) air quality and GHGs during minor construction activities and from utilities producing more electricity and hydrogen; 2) energy due to a potential increased demand for electricity and hydrogen; 3) hazards and hazardous materials associated with increased production of alternative fuels (e.g., hydrogen); and 4) noise and solid waste during construction.		X	X	X		X	X	

[7] South Coast AQMD, Final Environmental Assessment for Proposed Rule 2305 – Warehouse Indirect Source Rule – Warehouse Actions and Investments To Reduce Emissions (WAIRE) Program and Proposed Rule 316 – Fees for Rule 2305, May 2021. https://www.aqmd.gov/docs/default-source/ceqa/documents/aqmd-projects/2021/attachment_j_pr2305_finalea.pdf

TABLE VIII-2 (continued)
ENVIRONMENTAL TOPIC AREAS ADVERSELY IMPACTED BY AQMP CONTROL MEASURES

			Potential Adverse Impact(s)							
Control Measure Number	Title	Effect of Implementation and Nature of Potential Impact(s)	No Impact	Air Quality/ GHG	Energy	Hazards/ Hazardous Materials	Hydrology/ Water Quality	Noise	Solid/ Hazardous Waste	Transportation
MOB-05 in 2022 AQMP	Accelerated Retirement of Older Light-Duty and Medium-duty Vehicles	Accelerating the retirement of up to 2,000 light- and medium-duty vehicles per year through the Replace Your Ride Program and accelerating the penetration of zero and near–zero emission vehicles may cause impacts to: 1) air quality and GHGs during construction of infrastructure, from scrapping retired vehicles, and from utilities producing more electricity and refineries manufacturing more hydrogen; 2) energy due to potential increased demand for electricity produced by, natural gas, and hydrogen; 3) hazards and hazardous materials from the use of alternative fuels and fuel additives and scrapping retired vehicles; 4) hydrology and water quality(surface and ground water) from accidental spills; 5) noise during construction; and 6) solid and hazardous waste from scrapping retired vehicles and disposal of batteries and fluids.		X	X	X	X	X	X	
MOB-06 in 2022 AQMP	Accelerated Retirement of Older On-Road Heavy-duty Vehicles	Retiring older, heavy-duty vehicles and replacing them with low-NOx vehicles fueled with CNG or other alternative fuels (e.g., battery electric and hydrogen fuel cells) may cause impacts to: 1) air quality and GHGs from construction activities associated with installing electric charging infrastructure, scrapping retired vehicles, combusting alternative fuels, and refineries manufacturing more hydrogen and other alternative fuels; 2) energy due to potential increased demand for electricity produced from, natural gas, and hydrogen; 3) hazards and hazardous materials from scrapping retired vehicles and disposal of batteries and fluids and increased production of alternative fuels; 4) hydrology and water quality (surface and ground water) from disposal of batteries and fluids and accidental spills; 5) noise during construction; and 6) solid and hazardous waste from scrapping retired vehicles and disposal of batteries and fluids.		X	X	X	X	X	X	

TABLE VIII-2 (continued)
ENVIRONMENTAL TOPIC AREAS ADVERSELY IMPACTED BY AQMP CONTROL MEASURES

			Potential Adverse Impact(s)							
Control Measure Number	**Title**	**Effect of Implementation and Nature of Potential Impact(s)**	**No Impact**	**Air Quality/ GHG**	**Energy**	**Hazards/ Hazardous Materials**	**Hydrology/ Water Quality**	**Noise**	**Solid/ Hazardous Waste**	**Transportation**
MOB-07 in 2022 AQMP	On-Road Mobile Source Emission Reduction Credit Generating Program	Incentivizing the early deployment of zero emission and low NOx emission heavy-duty trucks through the generation of mobile source emission credits may cause impacts to: 1) air quality and GHGs from construction activities associated with installing electric charging infrastructure, scrapping retired vehicles, combusting alternative fuels, and refineries manufacturing more hydrogen and other alternative fuels; and 2) energy due to potential increased demand for electricity, natural gas and hydrogen; 3) hazards and hazardous materials from scrapping retired vehicles and disposal of batteries and fluids and increased production of alternative fuels (e.g., hydrogen); 4) hydrology and water quality (surface and ground water) from disposal of batteries and fluids and accidental spills; 5) noise during construction ; and 6) solid and hazardous waste from scrapping retired vehicles and disposal of batteries and fluids.		X	X	X	X	X	X	
MOB-08 in 2022 AQMP	Small Off-Road Engine Equipment Exchange Program	Promoting the accelerated turn-over of in-use small off-road engines and other engines, such as gasoline- and diesel-powered commercial lawn and garden equipment through expanded voluntary exchange programs will contribute to the retirement of older off-road engines which may cause impacts to: 1) air quality and GHGs from scrapping retired equipment; 2) energy due to potential increased demand for electricity; 3) hazards and hazardous materials from scrapping retired equipment and disposal of batteries and fluids; 4) hydrology and water quality (surface and ground water) from disposal of batteries and fluids and accidental spills; and 5) solid and hazardous waste from scrapping retired equipment and disposal of batteries and fluids.		X	X	X	X		X	

TABLE VIII-2 (continued)
ENVIRONMENTAL TOPIC AREAS ADVERSELY IMPACTED BY AQMP CONTROL MEASURES

Control Measure Number	Title	Effect of Implementation and Nature of Potential Impact(s)	Potential Adverse Impact(s): No Impact	Air Quality/ GHG	Energy	Hazards/ Hazardous Materials	Hydrology/ Water Quality	Noise	Solid/ Hazardous Waste	Transportation
MOB-09 in 2022 AQMP	Further Emission Reductions from Passenger Locomotives	Promoting earlier and cleaner replacement or upgrade of existing passenger locomotives capable of achieving Tier 4 emission standards and supporting the development of zero emission or low NOx technologies (e.g., battery electric and hydrogen fuel cells) may cause impacts to: 1) air quality and GHGs from construction activities installing electric charging infrastructure and the combustion of alternative fuels, and refineries manufacturing more hydrogen and other alternative fuels; 2) energy due to potential increased demand for electricity produced from natural gas, and hydrogen; 3) hazards and hazardous materials from scrapping retired locomotives and increased production and use of alternative fuels; 4) noise during construction; and 5) solid and hazardous waste from scrapping retired locomotives.		X	X	X		X	X	
MOB-10 in 2022 AQMP	Off-Road Mobile Source Emission Reduction Credit Generation Program	Accelerating the deployment of zero (e.g. battery-electric or fuel cell powered equipment) and low NOx emission off-road mobile equipment (e.g., 90 percent cleaner than Tier 5) that do not receive public funding may cause impacts to: 1) air quality and GHGs from construction activities installing electric charging infrastructure and the combustion of alternative fuels, and refineries manufacturing more hydrogen and other alternative fuels; 2) energy due to potential increased demand for electricity, produced from natural gas, and hydrogen; 3) hazards and hazardous materials associated with the increased production and use of alternative fuels and fuel additives; 4) noise during construction; and 5) solid and hazardous waste from scrapping retired equipment.		X	X	X		X	X	

TABLE VIII-2 (concluded)
ENVIRONMENTAL TOPIC AREAS ADVERSELY IMPACTED BY AQMP CONTROL MEASURES

Control Measure Number	Title	Effect of Implementation and Nature of Potential Impact(s)	Potential Adverse Impact(s)							
			No Impact	Air Quality/ GHG	Energy	Hazards/ Hazardous Materials	Hydrology/ Water Quality	Noise	Solid/ Hazardous Waste	Transportation
MOB-11 in 2022 AQMP	Emission Reductions from Incentive Programs	Allowing the South Coast AQMD to take credit for emission reductions for SIP purposes achieved through past and future projects (e.g., replacing heavy-duty vehicle/equipment, installing retrofit units, and repowering engines for marine vessels, locomotives, trucks, school buses, agricultural equipment, construction equipment, commercial harbor craft, airport support equipment, and oil drilling equipment) is an administrative exercise which is not expected to cause any environmental impacts.	X							
MOB-12 in 2022 AQMP	Pacific Rim Initiative for Maritime Emission Reductions	This measure seeks to recognize ocean-going vessel emission reductions that are the result of voluntary actions and may be considered surplus to the emission reduction commitments of the State SIP Strategy "Federal Action: Cleaner fuel and Vessel Requirements for Ocean-Gong-Vessels." Allowing the South Coast AQMD to take credit for emission reductions achieved through this SIP measure is an administrative exercise which is not expected to cause any environmental impacts.	X							
MOB-14 in 2022 AQMP	Rule 2202 – On-Road Motor Vehicle Mitigation Options	Amending Rule 2202 to take into account emission reductions due to telecommuting strategies such as allowing employees to work from home is expected to provide a benefit to air quality and GHGs without causing any adverse environmental impacts.	X							

Implementation of control measures ECC-02, MOB-03, MOB-11, MOB-12, and MOB-14 of the 2022 AQMP were determined to have no impacts that required analysis under the Final Program EIR for the 2022 AQMP. More specifically, control measures ECC-02, MOB-11, MOB-12, and MOB-14 are administrative exercises with no impacts on the environment while control measure MOB-03, at the time of writing the Final Program EIR for the 2022 AQMP, was already implemented by Rule 2305 which was adopted by the South Coast AQMD Governing Board on May 7, 2021. The environmental effects from implementing Rule 2305 were previously analyzed in the certified Final Environmental Assessment. Since control measure MOB-03 did not propose any additional elements for achieving emission reductions at warehouse distribution centers, no new impact areas have been identified.

Air Quality and Greenhouse Gas Emissions

This section summarizes the potentially significant air quality and greenhouse gas emissions impacts from implementing the proposed PM2.5 Plan control measures which rely on previously adopted control measures in the 2022 AQMP and 2016 AQMP. The air quality and greenhouse gas emissions impacts for the 2022 AQMP and 2016 AQMP control measures were previously analyzed in the Final Program EIRs for the 2022 AQMP and the 2016 AQMP.

Significance Criteria

A threshold of significance is an identifiable quantitative, qualitative, or performance level of a particular environmental effect. Proposed projects that do not exceed the significance threshold for the effect under evaluation normally will be determined to be less than significant. Exceeding any significance threshold means the effect will normally be determined to be significant by the lead agency. [CEQA Guidelines Sections 15064(a) and (b)(2)].

To determine whether air quality and GHG emissions impacts from the 2022 AQMP and the 2016 AQMP were significant, the Final Program EIRs for the 2022 AQMP and the 2016 AQMP estimated the potential emissions of criteria pollutants, toxic air contaminants, and GHGs and compared those estimates to the significance criteria in Table VIII-3.

TABLE VIII-3
SOUTH COAST AQMD AIR QUALITY SIGNIFICANCE THRESHOLDS

Mass Daily Thresholds[a]		
Pollutant	**Construction**	**Operation**
NOx	100 lb/day	55 lb/day
VOC	75 lb/day	55 lb/day
PM10	150 lb/day	150 lb/day
PM2.5	55 lb/day	55 lb/day
SOx	150 lb/day	150 lb/day
CO	550 lb/day	550 lb/day
Lead	3 lb/day	3 lb/day
Toxic Air Contaminants, Odor, and GHG Thresholds		
TACs (including carcinogens and non-carcinogens)	Maximum Incremental Cancer Risk $\geq$ 10 in 1 million Cancer Burden $\geq$ 0.5 excess cancer cases (in areas $\geq$ 1 in 1 million) Chronic and Acute Hazard Index $\geq$ 1.0 (project increment)	
Odor	Project creates an odor nuisance pursuant to South Coast AQMD Rule 402	
GHG	10,000 MT/yr CO_2eq for industrial facilities	
Ambient Air Quality for Criteria Pollutants[b]		
NO2 1-hour average annual arithmetic mean	South Coast AQMD is in attainment; project is significant if it causes or contributes to an exceedance of the following attainment standards: 0.18 ppm (state) 0.03 ppm (state) and 0.0534 ppm (federal)	
PM10 24-hour average annual average	 10.4 $\mu g/m^3$ (construction)[c] and 2.5 $\mu g/m^3$ (operation) 1.0 $\mu g/m3$	
PM2.5 24-hour average	 10.4 $\mu g/m^3$ (construction)[c] and 2.5 $\mu g/m^3$ (operation)	
SO2 1-hour average 24-hour average	 0.25 ppm (state) and 0.075 ppm (federal – 99th percentile) 0.04 ppm (state)	
Sulfate 24-hour average	 25 $\mu g/m^3$ (state)	
CO 1-hour average 8-hour average	South Coast AQMD is in attainment; project is significant if it causes or contributes to an exceedance of the following attainment standards: 20 ppm (state) and 35 ppm (federal) 9.0 ppm (state/federal)	
Lead 30-day average Rolling 3-month average	 1.5 $\mu g/m^3$ (state) 0.15 $\mu g/m^3$ (federal)	

a) Source: South Coast AQMD CEQA Handbook (South Coast AQMD, 1993)
b) Ambient air quality thresholds for criteria pollutants based on South Coast AQMD Rule 1303, Table A-2 unless otherwise stated.
c) Ambient air quality threshold based on South Coast AQMD Rule 403.

KEY: lb/day = pounds per day ppm = parts per million µg/m3 = microgram per cubic meter ≥ = greater than or equal to
MT/yr CO2eq = metric tons per year of CO2 equivalent > = greater than

Potential Air Quality and Greenhouse Gas Emissions Impacts

The Final Program EIRs for the 2022 AQMP and the 2016 AQMP identified and evaluated the control measures that have the potential to generate air quality impacts. Table VIII-4 summarizes the 2022 AQMP and 2016 AQMP control measures upon which the PM2.5 Plan control measures rely, the control methodology, and the nature of the potential adverse impacts to air quality and greenhouse gas emissions. The control measures are presented and organized in the same manner as in Table VIII-2.

TABLE VIII-4
AQMP CONTROL MEASURES WITH POTENTIAL AIR QUALITY AND GHG IMPACTS

Control Measure Number	Control Methodology	Potential Air Quality Impact	Potential GHG Impact
R-CMB-01 in 2022 AQMP	Installation of zero emission water heaters and low NOx technologies (when zero emission is infeasible) in new and existing residences.	Potential air quality impacts associated with construction; and producing and using more electricity.	+ (construction emissions; increase electricity usage) - (reduce GHG emissions; reduction in conventional fuel combustion emissions; increase energy efficiency)
R-CMB-02 in 2022 AQMP	Installation of zero emission space heaters and low NOx technologies (when zero emission is infeasible) in new and existing residences.	Potential air quality impacts associated with construction; and producing and using more electricity.	+ (construction emissions; increase electricity usage) - (reduce GHG emissions; reduction in conventional fuel combustion emissions; increase energy efficiency)
R-CMB-03 in 2022 AQMP	Installation of electric cooking devices, induction cooktops, or low NOx burners in new and existing residences.	Potential air quality impacts associated with construction; and producing and using more electricity.	+ (construction emissions; increase electricity usage) - (reduce GHG emissions; reduction in conventional fuel combustion emissions; increase energy efficiency)
R-CMB-04 in 2022 AQMP	Installation of zero emission or low NOx technologies in new and existing residences to replace equipment such as pool heaters, dryers, grills, etc.	Potential air quality impacts associated with construction; and producing and using more electricity.	+ (construction emissions; increase electricity usage) - (reduce GHG emissions reduction in conventional fuel combustion emissions; increase energy efficiency)
L-CMB-04 in 2022 AQMP	Installation of zero emission and low NOx technology alternatives to emergency ICEs, and requiring the use of renewable diesel for emergency standby ICEs.	Potential air quality impacts associated with construction; and producing and using more electricity and alternative fuels.	+ (construction emissions; increase electricity usage) - (reduce GHG emissions; conversion to alternative fuels; reduction in conventional fuel combustion emissions) + (increase GHG emissions if emergency ICEs are replaced with new low NOx emergency ICEs) = (equivalent GHG emissions if existing emergency ICEs are retrofitted with low NOx technologies) - (reduce GHG emissions if existing emergency ICEs are replaced with zero emission technologies)

TABLE VIII-4 (continued)

AQMP CONTROL MEASURES WITH POTENTIAL AIR QUALITY AND GHG IMPACTS

Control Measure Number	Control Methodology	Potential Air Quality Impact	Potential GHG Impact
L-CMB-06 in 2022 AQMP	Replacement of boilers with lower-emitting turbines, installation of zero emission and low NOx emissions technologies, and the application of stricter emission requirements for diesel internal combustion engines.	Potential air quality impacts associated with construction; ammonia use in SCRs; periodic catalyst replacement; and producing and using more electricity and alternative fuels.	+ (construction emissions; increase electricity usage) - (reduce GHG emissions; conversion to alternative fuels; reduction in conventional fuel combustion emissions) + (increase GHG emissions if existing boilers are replaced with low NOx turbines) = (equivalent GHG emissions if existing boilers are retrofitted with low NOx technologies) - (reduce GHG emissions if existing boilers are replaced with zero emission technologies)
L-CMB-09 in 2022 AQMP	Installation of low NOx and ultra-low NOx burners for incinerators and other associated equipment.	Potential air quality impacts associated with construction.	+ (construction emissions) = (equivalent GHG emissions if existing turbines are retrofitted with low NOx technologies)
ECC-03 in 2022 AQMP	Incentivization of additional reductions in energy use associated with space heating, water heating, and other large residential energy sources through facilitating weatherization, replacing older appliances with highly efficient technologies and encouraging renewable energy adoption such as solar thermal and photovoltaics.	Potential air quality impacts associated with construction.	+ (construction emissions) - (reduce GHG emissions; reduction in conventional fuel combustion emissions; increase energy efficiency)
BCM-04 in 2016 AQMP	Acidifier application, manure removal, manure slurry injection, manure thermal gasification, and dietary manipulation/feed additives.	Potential air quality impacts from thermal gasification and vehicle trips.	+ (construction emissions, control equipment)
BCM-05 in 2016 AQMP	Installation and use of advanced catalyst technology for the conversion of ammonia.	Potential air quality impacts associated with construction.	+ (construction emissions)

TABLE VIII-4 (continued)

AQMP CONTROL MEASURES WITH POTENTIAL AIR QUALITY AND GHG IMPACTS

Control Measure Number	Control Methodology	Potential Air Quality Impact	Potential GHG Impact
BCM-10 in 2016 AQMP	Controls such as anaerobic digestion and organic processing technology, and restrictions for direct applications of un-composted waste to public lands.	Potential air quality impacts associated with construction.	None contemplated in the Final Program EIR for the 2016 AQMP
BCM-01 in 2016 AQMP	Installation of control equipment such as ESPs, filters, centrifugal separators, and misters.	Potential air quality impacts associated with construction; and producing and using more electricity.	+ (construction emissions; increase electricity usage)
BCM-02 in 2016 AQMP	Phased-in use of drift eliminators with 0.001 percent drift rate for existing cooling towers.	Potential air quality impacts associated with construction.	+ (construction emissions)
BCM-06 in 2016 AQMP	Exhaust ventilation to a fabric filter for permanent in-building abrasive blasting activities, and use of additional portable control equipment, such as negative air machines, portable fume extractors and portable dust collectors with HEPA filters.	Potential air quality impacts associated with construction; and producing and using more electricity.	+ (construction emissions; increase electricity usage)
BCM-07 in 2016 AQMP	Dry and wet dust control options to control PM including silica particles.	Potential air quality impacts associated with construction; and producing and using more electricity.	+ (construction emissions; increase electricity usage)
MCS-02 in 2022 AQMP	Mechanical thinning and chipping and grinding activities during fuel reduction and removal efforts.	Potential air quality impacts associated with decomposition of wood and greenwaste.	+ (increase GHG from gasoline- or diesel-fueled chipping and grinding equipment is used and from decomposition of wood and greenwaste) = (no GHG emissions if zero emission chipping and grinding equipment is used) - (reduce GHG emissions from preventing or reducing potential for intense wildfires)
BCM-09 in 2016 AQMP	Construction/upgrading of wood burning hearths to cleaner hearth as well as an increase in the stringency of the curtailment program and education.	Potential air quality impacts associated with construction.	None contemplated in the Final Program EIR for the 2016 AQMP

TABLE VIII-4 (continued)

AQMP CONTROL MEASURES WITH POTENTIAL AIR QUALITY AND GHG IMPACTS

Control Measure Number	Control Methodology	Potential Air Quality Impact	Potential GHG Impact
MCS-01 in 2022 AQMP	Retrofitting existing equipment and installation of newer, lower-emitting equipment to replace older, higher-emitting equipment for sources as a result of new emission limits introduced through federal, state, or local regulations.	Potential air quality impacts associated with construction; ammonia use in SCRs; and periodic catalyst replacement.	+ (construction emissions) + (increase GHG emissions if existing equipment is replaced with low NOx equipment) = (equivalent GHG emissions if existing equipment are retrofitted with low NOx technologies) - (reduce GHG emissions if existing equipment are replaced with zero emission technologies)
EGM-01 in 2022 AQMP	Replacing or upgrading off-road construction equipment as part of development/redevelopment efforts may result in the use of zero emission technologies in construction, the installation of electrical and alternative fuel infrastructure, the use of alternative fuels; and the use construction equipment with low-emitting engines fitted with diesel particulate filters (DPFs).	Potential air quality impacts associated with construction; and the periodic replacement of diesel particular filters (DPF); and producing and using more electricity and alternative fuels.	+ (construction emissions; increase electricity usage) + (increase GHG emissions if existing equipment is replaced with low NOx equipment) = (equivalent GHG emissions if existing equipment are retrofitted with low NOx technologies) - (reduce GHG emissions if existing equipment are replaced with zero emission technologies)
EGM-03 in 2022 AQMP	Incentivizing the use of zero emission and low NOx equipment by adopting a voluntary measure for municipalities and public agencies to reduce emissions generated by construction activities may include use of zero emission and low NOx construction equipment, dust control, alternative fuels, DPF, low-emitting engines, and low VOC materials.	Potential air quality impacts associated with construction of electrical and alternative fuel infrastructure; and producing and using more electricity and alternative fuels.	+ (construction emissions; increase electricity usage) - (reduce GHG emissions; conversion to alternative fuels; reduction in conventional fuel combustion emissions)
MOB-01 in 2022 AQMP	Infrastructure development required to achieve emission reductions at commercial marine ports from on-road heavy-duty vehicles, ocean-going vessels, cargo handling equipment, locomotives, and harbor craft.	Potential air quality impacts associated with construction; and the combustion of alternative fuels.	+ (construction emissions; increase electricity usage) - (reduce GHG emissions; conversion to alternative fuels; reduction in conventional fuel combustion emissions)

TABLE VIII-4 (continued)

AQMP CONTROL MEASURES WITH POTENTIAL AIR QUALITY AND GHG IMPACTS

Control Measure Number	Control Methodology	Potential Air Quality Impact	Potential GHG Impact
MOB-2A in 2022 AQMP	Infrastructure development required to achieve emission reductions at new rail yards and intermodal facilities from on-road heavy-duty vehicles, off-road equipment, and locomotives; and deploying the cleanest locomotives, switchers, on-road heavy-duty trucks, cargo-handling equipment, transportation refrigeration units available.	Potential air quality impacts associated with construction; and the combustion of alternative fuels.	+ (construction emissions; increase electricity usage) - (reduce GHG emissions; conversion to alternative fuels; reduction in conventional fuel combustion emissions)
MOB-2B in 2022 AQMP	Infrastructure development required to achieve emission reductions at existing rail yards and intermodal facilities from on-road heavy-duty vehicles, off-road equipment, and locomotives; and deploying the cleanest locomotives, switchers, on-road heavy-duty trucks, cargo-handling equipment, transportation refrigeration units available.	Potential air quality impacts associated with construction; and the combustion of alternative fuels.	+ (construction emissions; increase electricity usage) - (reduce GHG emissions; conversion to alternative fuels; reduction in conventional fuel combustion emissions)
MOB-04 in 2022 AQMP	Deploying additional cleaner technologies, such as increasing efficiencies, implementing air quality improvement options or by deploying zero emission and low NOx technologies, alternative fuels, DPFs, and low-emitting engines for additional equipment beyond the commitments made in the existing Memoranda of Understanding with the commercial airports.	Potential air quality impacts associated with construction; and producing and using more electricity and alternative fuels.	+ (construction emissions; increase electricity usage) - (reduce GHG emissions; conversion to alternative fuels; reduction in conventional fuel combustion emissions)

TABLE VIII-4 (continued)

AQMP CONTROL MEASURES WITH POTENTIAL AIR QUALITY AND GHG IMPACTS

Control Measure Number	Control Methodology	Potential Air Quality Impact	Potential GHG Impact
MOB-05 in 2022 AQMP	Accelerating the retirement of up to 2,000 light- and medium-duty vehicles per year through the Replace Your Ride Program and accelerating the penetration of zero and near–zero emission vehicles.	Potential air quality impacts during construction of infrastructure, from scrapping retired vehicles, and from utilities producing and using more electricity and alternative fuels.	+ (construction emissions; increase electricity usage) - (reduce GHG emissions; conversion to alternative fuels; reduction in conventional fuel combustion emissions)
MOB-06 in 2022 AQMP	Retiring older, heavy-duty vehicles and replacing them with low NOx vehicles fueled with CNG or other alternative fuels (e.g., battery electric and hydrogen fuel cells).	Potential air quality impacts from construction activities associated with installing electrical and alternative fuel infrastructure, scrapping retired vehicles; and producing and using more alternative fuels.	+ (construction emissions; increase electricity usage) - (reduce GHG emissions; conversion to alternative fuels; reduction in conventional fuel combustion emissions)
MOB-07 in 2022 AQMP	Incentivizing the early deployment of zero emission and low NOx emission heavy-duty trucks through the generation of mobile source emission credits.	Potential air quality impacts from construction activities associated with installing electrical and alternative fuel infrastructure; scrapping retired vehicles and producing and using more alternative fuels.	+ (construction emissions; increase electricity usage) - (reduce GHG emissions; conversion to alternative fuels; reduction in conventional fuel combustion emissions)
MOB-08 in 2022 AQMP	Promoting the accelerated turn-over of in-use small off-road engines and other engines, such as gasoline- and diesel-powered commercial lawn and garden equipment through expanded voluntary exchange programs will contribute to the retirement of older off-road engines.	Potential air quality impacts from scrapping retired equipment.	+ (increased electricity usage from scrapping equipment) - (reduce GHG emissions; conversion to alternative fuels; reduction in conventional fuel combustion emissions)

TABLE VIII-4 (concluded)
AQMP CONTROL MEASURES WITH POTENTIAL AIR QUALITY AND GHG IMPACTS

Control Measure Number	Control Methodology	Potential Air Quality Impact	Potential GHG Impact
MOB-09 in 2022 AQMP	Promoting earlier and cleaner replacement or upgrade of existing passenger locomotives capable of achieving Tier 4 emission standards and supporting the development of zero emission or low NOx technologies (e.g., battery electric and hydrogen fuel cells).	Potential air quality impacts from construction activities associated with installing electrical and alternative fuel infrastructure; and producing and using more alternative fuels,	+ (construction emissions; increase electricity usage) - (reduce GHG emissions; conversion to alternative fuels; reduction in conventional fuel combustion emissions)
MOB-10 in 2022 AQMP	Accelerating the deployment of zero (e.g., battery-electric or fuel cell powered equipment) and low NOx emission off-road mobile equipment (e.g., 90 percent cleaner than Tier 5) that do not receive public funding.	Potential air quality from construction activities associated with installing electrical and alternative fuel infrastructure; and producing and using more alternative fuels.	+ (construction emissions; increase electricity usage) - (reduce GHG emissions; conversion to alternative fuels; reduction in conventional fuel combustion emissions)

Analysis in the Final Program EIR for the 2022 AQMP

The Final Program EIR for the 2022 AQMP determined that the 2022 AQMP control measures presented in Table VIII-4 have the following potential impacts to: 1) air quality during construction impacts; 2) operational air quality impacts associated with producing and using more electricity and alternative fuels, ammonia use in SCRs, decomposition of wood and greenwaste, periodic replacement of catalyst, periodic replacement of DPF, and scrapping retired vehicles and equipment; and 3) greenhouse gas emissions impacts associated with construction, increased electricity usage, and replacement of existing equipment with low NOx equipment.

<u>Summary of Construction Air Quality Impacts</u>

The Final Program EIR for the 2022 AQMP presented construction emissions associated with burner replacements, installation of a new SCR with an ammonia storage tank, upgrade to an SCR, and conversion of an alternative fuels facility. While individually, most components of the construction activities would not have emissions exceeding the South Coast AQMD's air quality significance thresholds, it is foreseeable and likely that on any given day, construction activities associated with one or more new or existing air pollution control devices overlapping with other types of construction activities associated with producing alternative fuels in order to comply with the 2022 AQMP could occur at more than one facility. Therefore, the Final Program EIR for the 2022 AQMP concluded that construction air quality impacts are potentially significant, mitigation measures AQ-1 to AQ-26 should be implemented to minimize significant air quality impacts, but overall construction air quality impacts after mitigation is applied would remain significant.

Summary of Operational Air Quality Impacts

Table VIII-5 summarizes the nature of the operational air quality emission impacts analyzed in the Final Program EIR for the 2022 AQMP by category, and lists the significance determination for each.

TABLE VIII-5
SUMMARY OF OPERATIONAL AIR QUALITY IMPACTS

Category	Nature of Emission Impacts	Significance Determination
Air Quality Impacts from Increased Electricity Demand		
Electrification of Residential and Commercial Equipment	Increase in electricity use but a decrease in natural gas use with overall net reduction in combustion emissions	Less than Significant
Large Industrial Combustion Equipment including Hydrogen Production	Increase in electricity use	Potentially Significant
Mobile Source Conversion	Increase in electricity use but a decrease in diesel and gasoline combustion emissions with overall net reduction in combustion emissions	Less than Significant
Air Quality Impacts from Control of Stationary and Area Sources		
SCR Technology	Increase in ammonia slip emissions but with an overall reduction in PM2.5 regionwide concentration	Less than Significant
Alternative Fuels Production	Conversions of existing facilities to produce renewable fuels could result in emission reductions, but the actual outcome will vary depending on site-specific conditions. Since the current supplies of hydrogen production for the purposes of producing renewable fuels are limited, assumed additional hydrogen production facilities would need to be built and operating.	Potentially Significant if new hydrogen production facilities are built and operating
Air Quality Impacts from Mobile Sources		
Alternative Fuels Use	Alternative fuel use would reduce emissions (alternative fuels production impacts presented separately above).	Less than Significant
Zero Emission Technology Deployment	Emission reduction (electricity production impacts presented separately above).	Less than Significant
Add-on Controls	Reduced fuel economy results in increase in emissions.	Less than Significant
Vehicle Scrapping	Increase in PM10 and PM2.5 emissions.	Less than Significant

TABLE VIII-5 (concluded)
SUMMARY OF OPERATIONAL AIR QUALITY IMPACTS

Category	Nature of Emission Impacts	Significance Determination
Air Quality Impacts from Miscellaneous Sources		
Chipping and Grinding for Wildfire Control	Increase in combustion emissions from chipping and grinding equipment	Less than Significant

The analysis in the Final Program EIR for the 2022 AQMP indicated that the air quality impacts from criteria pollutants were expected from producing electricity needed to meet the increased demand, operating air pollution control equipment installed on various stationary and area sources, proposed emission reduction methods for mobile sources, and proposed control of miscellaneous sources. Use of electric-powered equipment (for short-term construction use or in long-term residential and commercial, large, and mobile sources) would cause associated emissions from increased electricity demand, but these replace combustion emissions that would otherwise occur with use of diesel- or gasoline-powered equipment, ultimately expected to provide an emissions benefit. The identified air pollution control options for stationary and area sources include SCR technology , and alternative fuels production (based on the three renewable fuels projects approved in California, has the potential to decrease mobile source emissions and increase facility emissions). The identified air pollution control options for mobile sources will have air quality impacts relating to electricity demand, alternative fuels production, vehicle scrapping, and add-on air pollution control equipment; but these air quality impacts would be less than significant. Lastly, the control measures focusing on achieving emission reductions from miscellaneous sources, such as from increased chipping and grinding operations in control measure MCS-02 of the 2022 AQMP, were not expected to generate significant adverse air quality impacts.

The South Coast AQMD air quality significance thresholds for mass daily emissions of criteria pollutants are in units of pounds per day. The 2022 AQMP quantifies NOx reductions in tons per day (2,000 pounds = 1 ton). The 2022 AQMP is designed to attain the 8-hour ozone standard by reducing NOx and to a lesser degree VOC emissions. Other emissions of criteria pollutants (i.e., CO, SOx, PM10, and PM2.5) are also expected to be reduced. While most of the activities associated with the adopted control measures were individually projected to have air quality impacts that are less than significant, activities associated with implementation of some individual control measures (i.e., increased electricity demand for large combustion equipment including hydrogen production, alternative fuels production, and product reformulation) may result in potentially significant impacts. The precise magnitude of those emission increases is dependent on the type and size of projects designed to comply with the control measures, and the quantification of the emissions impacts was not known at the time the 2022 AQMP was adopted and is not currently known because implementation of the control measures are in the early stages. Nonetheless, when the effects of all of the control measures were considered together, a net NOx emission reduction of 124 tons per day was expected, which is an order of magnitude greater than any of the adverse air quality impacts from some of the individual control measures. Thus, the 2022 AQMP was expected to achieve an overall air quality benefit. Therefore, the Final Program EIR for the 2022 AQMP concluded that operational air quality impacts are less than significant. Since no significant air quality impacts relating to operational activities were identified, no mitigation measures were necessary or required.

Summary of Other Air Quality Impacts

Implementing the control measures were concluded to be capable of reducing emissions of carcinogenic diesel PM from engine exhaust, as well as toxic components of gasoline such as benzene and 1,3-butadiene through the replacement of existing vehicles or equipment with more efficient, zero emission, or alternative fueled vehicles or equipment. Therefore, the Final Program EIR for the 2022 AQMP concluded no significant air quality impacts relating to toxic air contaminants. Since no significant air quality impacts relating to toxic air contaminants were identified, no mitigation measures were necessary or required.

Construction activities and increased ammonia use have the potential to create odors; however, construction odors were anticipated to be low in concentration, temporary, and not expected to affect a substantial amount of people. Ammonia emissions from SCR exhaust stacks are required to comply with BACT and are limited by permit condition to 5 ppm. Due to the low concentration, elevated release height, elevated temperature, and buoyancy, ammonia slip emissions were concluded to not have the potential to cause an odor nuisance. Therefore, the Final Program EIR for the 2022 AQMP concluded less than significant air quality impacts relating to odor. Since no significant air quality impacts relating to odor were identified, no mitigation measures were necessary or required.

Summary of Greenhouse Gas Emissions Impacts

Many control measures were concluded to have GHG emissions associated with construction over the short-term; however, construction GHG emissions are amortized over 30 years and are much less than the overall potential operational emissions reductions of GHGs over the long-term. Intermixed with the short-term GHG impacts and long-term GHG emission reductions are the potentially significant GHG increases that may occur if existing combustion equipment is replaced with new lower NOx emitting combustion equipment. Further, GHG emissions from the generation and use of additional electricity and alternative fuels, are not expected to be significant because there will be concurrent decreases in the use of diesel- and gasoline-fueled equipment over time as more electric and alternative fuel vehicles are deployed. Finally, electricity generation is required to transition to 100 percent renewables by 2045 as required by Senate Bill 100. Thus, implementation of the 2022 AQMP was concluded to result in potentially significant GHG operational emissions over the short-term and less than significant GHG emission impacts over the long-term. Since less than significant greenhouse gas impacts overall were identified, no mitigation measures were necessary or required.

Analysis in the Final Program EIR for the 2016 AQMP

The analysis in the Final Program EIR for the 2016 AQMP indicated that the 2016 AQMP control measures presented in Table VIII-4 have the following potential impacts to: 1) air quality during construction; 2) operational air quality impacts associated with producing and using more electricity, and thermal gasification; and 3) greenhouse gas emissions impacts associated with construction and increased electricity usage.

Summary of Construction Air Quality Impacts

The Final Program EIR for the 2016 AQMP identified construction emissions associated with grading/site preparation, paving, and installing/constructing air pollution control devices. Although the construction emissions at each individual facility might not exceed the South Coast AQMD's air quality significance thresholds, the analysis concluded that it is foreseeable and likely that on any given day, construction of one or more control devices in order to comply with the 2016 AQMP could occur at more than one facility. If more than four facilities or more than four control devices were concurrently constructed on any given day, the emissions would exceed the South Coast AQMD's air quality significance thresholds. Therefore, the Final Program EIR for the 2016 AQMP concluded that construction air quality impacts are potentially significant and mitigation measures AQ-1 to AQ-23 were crafted and adopted with the intent of minimizing the significant air quality impacts. However, the analysis concluded that the overall construction air quality impacts would remain significant after mitigation is applied.

Summary of Operational Air Quality Impacts

Control measures BCM-01, BCM-06, and BCM-07 of the 2016 AQMP seek further control of PM emissions through control devices or technologies which typically require electricity to operate. The 2016 AQMP concluded that increased electricity demand would occur; however, the existing and future air quality and GHG rules and regulations were expected to minimize operational emissions associated with increased electrical generation because electricity providers committed to meeting the increased demand while complying with applicable regulations, and future sources of electricity were increasingly being generated by renewable resources. Therefore, implementation of the 2016 AQMP control measures was concluded not to generate significant adverse air quality impacts due to increased demand for electricity.

The goal of control measure BCM-04 of the 2016 AQMP is to reduce ammonia emissions from livestock waste, with an emphasis on reducing emissions from dairy manure. A number of control approaches could be implemented to achieve these reductions, but only thermal gasification was identified as having the potential to generate air quality impacts from control equipment operation. Thermal gasification, as applied to chicken manure generated during egg-laying, for example, requires a reduction in the manure moisture content by approximately 20 percent. To achieve this reduction in moisture content, the chicken manure is fed into a thermal gasifier where moisture is evaporated, organic solids are converted into "syngas," and mineral-rich ash is produced. Because thermal gasification requires a combustion source, combustion emissions, including NOx, are generated. Thermal gasification related to manure management was in the testing stages, so the technology was not expected to be widespread and any air quality impacts were considered to be minimal. Two other methods of control would be to apply sodium bisulfate (SBS) which reduces the pH level in manure and thus reduces ammonia spiking, or increasing the manure cleaning frequency. Because the application of sodium bisulfate may only be needed for eight weeks out of the year, and manure haul truck trips would not occur on the same day as haul truck trips that were then currently occurring, implementation of control measure BCM-04 of the 2016 AQMP was not expected to generate a substantial number of new vehicle trips on a peak day, if any, related to control requirements.

The Final Program EIR for the 2016 AQMP concluded that operational air quality impacts were less than significant. Since no significant air quality impacts relating to operational activities were identified, no mitigation measures were necessary or required.

Summary of Greenhouse Gas Emissions Impacts

The analysis in the Final Program EIR of the 2016 AQMP control measures BCM-01, BCM-02, BCM-04, BCM-05, BCM-06, and BCM-07 concluded that while GHG emissions associated with construction would occur over the short-term, because construction GHG emissions are amortized over 30 years, the net GHG emissions during construction would be much less than the overall potential reductions of operational GHGs over the long-term.

The analysis in the Final Program EIR of the 2016 AQMP control measures BCM-01, BCM-06, and BCM-07 concluded that the project would have the potential to increase energy demand using electricity to power control devices. The electricity needed to power these control measures was expected to be provided by public utility companies subject to AB-32 and required to reduce GHG emissions by 2020, and any future power generating stations would be subject to stringent emission control requirements, including GHG emissions. Therefore, the need for additional electricity generation in order to provide power to operate the projected add-on control devices was not expected to generate significant adverse GHG emissions, after taking into account the reductions expected to result from the decreased use of gasoline and diesel fuels from the 2016 AQMP's other control measures.

The Final Program EIR for the 2016 AQMP concluded that greenhouse gas emissions impacts were less than significant. Since no significant greenhouse gas emissions impacts were identified, no mitigation measures were necessary or required.

Mitigation Measures

The Final Program EIRs for the 2022 AQMP and the 2016 AQMP developed targeted mitigation measures based on project-specific impacts related to air quality which were adopted in the Mitigation, Monitoring, and Reporting Plan which can be found in Attachment 1 to the Governing Board Resolution for the Final Program EIR for the 2022 AQMP and the Mitigation, Monitoring, and Reporting Plan which can be found in Attachment 2 to the Governing Board Resolution for the Final Program EIR for the 2016 AQMP, respectively, and are applicable to the proposed PM2.5 Plan control measures. These measures were crafted to reduce particulate emissions, including diesel PM, as well as certain NOx and VOC emissions. However, only a portion of the mitigation measures adopted for the 2022 AQMP and the 2016 AQMP are applicable to PM2.5 Plan control measures, as follows:

Construction Air Quality Mitigation Measures in the Final Program EIR for the 2022 AQMP

AQ-1 Develop a Construction Emission Management Plan to minimize emissions from vehicles including, but not limited to: consolidating truck deliveries so as to minimize the number of trucks on a peak day; scheduling deliveries to avoid peak hour traffic conditions; describing truck routing; describing deliveries including logging delivery times; describing entry/exit points; identifying locations of parking; identifying construction schedule; and prohibiting truck idling in excess of five consecutive minutes or another time-frame as allowed by the California Code of Regulations, Title 13 Section 2485 - CARB's Airborne Toxic Control Measure to Limit Diesel-Fueled Commercial Motor Vehicle Idling. The Construction Emission Management Plan shall be submitted to South Coast AQMD – PRDI/CEQA for approval prior to the start of construction. At a minimum, the Construction Emission Management Plan would include the following types of mitigation measures and Best Management Practices.

AQ-2 Tune and maintain all construction equipment to be in compliance with the manufacturer's recommended maintenance schedule and specifications that optimize emissions without nullifying engine warranties. All maintenance records for each equipment and their construction contractor(s) shall be made available for inspection and remain onsite for a period of at least two years from completion of construction.

AQ-3 Survey and document the construction areas and identify all construction areas that are served by electricity. Onsite electricity, rather than temporary power generators, shall be used in all construction areas that are demonstrated to be served by electricity. This documentation shall be provided as part of the Construction Emissions Management Plan.

AQ-4 Require the use of electric or alternative-fueled (i.e., renewable combustion fuels and hydrogen) construction equipment, if available, including but not limited to, concrete/industrial saws, pumps, aerial lifts, material hoist, air compressors, forklifts, excavator, wheel loader, and soil compactors.

AQ-5 Require all off-road diesel-powered construction equipment rated greater than 50 hp to meet Tier-4 off-road emission standards at a minimum. In addition, if not already supplied with a factory-equipped diesel particulate filter, all construction equipment shall be outfitted with Best Available Control Technology (BACT) devices certified by CARB. Any emissions control device used by the contractor shall achieve emissions reductions that are no less than what could be achieved by a Level 3 diesel emissions control strategy for a similarly sized engine as defined by CARB regulations. Construction equipment shall incorporate, where feasible, emissions-reducing technology such as hybrid drives and specific fuel economy standards. In the event that any equipment required under this mitigation measure is not available, the project proponent shall provide documentation in the Construction Emissions Management Plan or associated subsequent status reports as information becomes available.

AQ-6 Require the use of zero-emission (ZE) or near-zero emission (NZE) on-road haul trucks such as heavy-duty trucks with natural gas engines that meet CARB'S adopted optional NO_X emissions standard.

AQ-7 Provide electric vehicle (EV) charging stations or at a minimum, provide the electrical infrastructure and electrical panels which shall be appropriately sized. Electrical hookups should be provided for trucks to plug in any onboard auxiliary equipment.

AQ-8 Provide temporary traffic controls such as a flag person, during all phases of significant construction activity to maintain smooth traffic flow, where necessary.

AQ-9 Provide dedicated turn lanes for the movement of construction trucks and equipment on- and off-site, where applicable.

AQ-10 Clearly identify truck routes with trailblazer signs to guide and ensure that the route shall avoid congested streets and sensitive land uses (e.g., residences, schools, day care centers, etc.), where applicable

AQ-11 Improve traffic flow by signal synchronization, where applicable and ensure that check-in point for trucks is inside the project site.

AQ-12 Ensure that vehicle traffic inside the project site is as far away as feasible from sensitive receptors.

AQ- 13 Restrict overnight truck parking in sensitive land uses by providing overnight truck parking inside the project site.

AQ-14 Design the project such that truck entrances and exits are not facing sensitive receptors and trucks will not travel past sensitive land uses to enter or leave the project site.

AQ-15 Reduce traffic speeds on all unpaved roads to 15 miles per hour (mph) or less.

AQ-16 Prohibit truck idling in excess of five minutes, on- and off-site.

AQ-17 Schedule construction activities that affect traffic flow on the arterial system to off-peak hours to the extent practicable.

AQ-18 Suspend all excavating and grading operations when wind speeds (as instantaneous gusts) exceed 25 mph.

AQ-19 Suspend use of all construction activities that generate air pollutant emissions during first stage smog alerts.

AQ-20 Configure construction parking to minimize traffic interference.

AQ-21 Require covering of all trucks hauling dirt, sand, soil, or other loose materials.

AQ-22 Install wheel washers where vehicles enter and exit the construction site onto paved roads or wash off trucks and any equipment leaving the site for each trip.

AQ-23 Apply non-toxic soil stabilizers according to manufacturers' specifications to all inactive construction areas (previously graded areas inactive for ten days or more).

AQ-24 Replace ground cover in disturbed areas as quickly as possible to minimize dust.

AQ-25 Pave road and road shoulders, where applicable.

AQ-26 Sweep streets at the end of the day with sweepers compliant with South Coast AQMD Rules 1186 and 1186.1 if visible soil is carried onto adjacent public paved roads (recommend water sweepers that utilize reclaimed water).

Construction Air Quality Mitigation Measures in the Final Program EIR for the 2016 AQMP

AQ-1 During construction, require the use of 2010 and newer diesel haul trucks (e.g., material delivery trucks and soil import/export). If the Lead Agency determines that 2010 model year or newer diesel trucks cannot be obtained, the Lead Agency shall instead requires the use of trucks that meet EPA 2007 model year NOx emissions requirements.

AQ-2 Require all on-site construction equipment to meet the following:

- All off road diesel-powered construction equipment greater than 50 hp shall meet the Tier 4 emission standards, where available. In addition, all construction equipment shall be outfitted with BACT devices certified by CARB. Any emissions control device used by the contractor shall achieve emissions reductions that are no less than what could be achieved by a Level 3 diesel emissions control strategy for a similarly sized engine as defined by CARB regulations.
- A copy of each unit's certified tier specification, BACT documentation, and CARB or SCAQMD operating permit shall be provided at the time of mobilization of each applicable unit of equipment.
- Encourage construction contractors to apply for SCAQMD "SOON" funding incentives. The "SOON" program provides funds to accelerate the clean up of off-road diesel vehicles, such as heavy duty construction equipment. More information on this program can be found at the following website: http://www.aqmd.gov/tao/Implementation/SOONProgram.htm.

AQ-3 Prohibit vehicles and construction equipment from idling longer than five minutes at the construction site by including these restrictions in the construction company contract(s) and by posting signs on-site, unless the exceptions in the CARB regulations which pertain to idling requirements are applicable.

AQ-4 All on-road heavy-duty diesel trucks or equipment with a gross vehicle weight rating (GVWR) of 19,500 pounds or greater shall comply with EPA 2007 on-road emission standards for PM and NOx (0.01 gram per brake horsepower - hour (g/bhp-hr) and at least 0.2 g/bhp-hr, respectively).

AQ-5 Maintain construction equipment tuned up and with two to four-degree retard diesel engine timing or tuned to manufacturer's recommended specifications that optimize emissions without nullifying engine warranties.

AQ-6 The project proponent shall survey and document the proposed project's construction areas and identify all construction areas that are served by electricity. Onsite electricity, rather than temporary power generators, shall be used in all construction areas that are demonstrated to be served by electricity.

AQ-7 Provide temporary traffic controls such as a flag person, during all phases of significant construction activity to maintain smooth traffic flow.

AQ-8 Provide dedicated turn lanes for the movement of construction trucks and equipment on- and off-site.

AQ-9 Re-route construction trucks away from congested streets or sensitive receptor areas.

AQ-10 Improve traffic flow by signal synchronization.

AQ-11 Reduce traffic speeds on all unpaved roads to 15 mph or less.

AQ-12 Prohibit truck idling in excess of five minutes, on- and off-site.

AQ-13 Schedule construction activities that affect traffic flow on the arterial system to off-peak hours to the extent practicable.

AQ-14 Suspend all excavating and grading operations when wind speeds (as instantaneous gusts) exceed 25 mph.

AQ-15 Suspend all construction activities that generate air pollutant emissions during first stage smog alerts.

AQ-16 Configure construction parking to minimize traffic interference.

AQ-17 Use alternative clean fueled off-road equipment or give extra points in the bidding process for contractors committing to use such equipment.

AQ-18 Require covering of all trucks hauling dirt, sand, soil, or other loose materials.

AQ-19 Install wheel washers where vehicles enter and exit the construction site onto paved roads or wash off trucks and any equipment leaving the site for each trip.

AQ-20 Apply non-toxic soil stabilizers according to manufacturers' specifications to all inactive construction areas (previously graded areas inactive for ten days or more).

AQ-21 Replace ground cover in disturbed areas as quickly as possible to minimize dust.

AQ-22 Pave road and road shoulders.

AQ-23 Sweep streets at the end of the day with SCAQMD Rule 1186 and 1186.1 compliant sweepers if visible soil is carried onto adjacent public paved roads (recommend water sweepers with reclaimed water).

Cumulative Impacts

Analysis in the Final Program EIR for the 2022 AQMP

The Final Program EIR for the 2022 AQMP concluded that implementation of the 2022 AQMP control measures would result in significant adverse air quality impacts during construction and, when combined with past, present, and reasonably foreseeable activities, in particular with transportation projects projected in the SCAG Connect SoCal Plan[8] and the CARB Proposed 2022 State SIP Strategy,[9] would contribute to cumulatively considerable impacts to air quality related to criteria pollutant emissions during construction, a significant, unavoidable cumulative impact.

Emission increases would be expected from implementation of the 2022 AQMP; however, the overall emission reductions associated with implementation of the 2022 AQMP, as well as the SIP measures developed by CARB and the Regional Transportation Strategy and Transportation Control Measures developed by SCAG, were expected to result in a substantial reduction in criteria pollutant emissions. Therefore, the overall emission reductions were expected to outweigh any emission increases and provide an overall benefit. Therefore, the cumulative air quality impacts were concluded to be less than significant.

Implementation of the control measures in the 2022 AQMP was expected to result in substantial GHG emission reductions from replacing diesel- and gasoline-fueled equipment with electric-powered and alternative-fueled equipment which would offset potential increases in GHG emissions from construction projects and additional electricity use and generation, resulting in a net benefit overall anticipated. The Proposed 2022 State Strategy also considered GHG emissions reductions to be beneficial. However, the GHG emissions reductions in the SCAG Connect SoCal Plan were considered significant because they did not reach the mandated target. The 2022 AQMP was not cumulatively considerable to the significant impact and in fact, was expected to improve the goal towards the mandated GHG reduction target. Therefore, the cumulative GHG impacts were considered beneficial and less than significant.

Mitigation measures for construction impacts resulting from the 2022 AQMP are listed in the previous section titled "Construction Air Quality Mitigation Measures in the Final Program EIR for the 2022 AQMP," and mitigation measures were identified in the environmental assessments for the Connect SoCal Plan and the Proposed 2022 State Strategy; however, no mitigation measures to reduce the significant cumulative impacts to air quality related to construction activities were identified. Operational air quality impacts for criteria pollutants, toxic air contaminants, and GHG emissions were considered beneficial both for the project and cumulatively. Therefore, mitigation measures were not required.

Cumulative impacts to air quality for past, present, and reasonably foreseeable future projects would remain significant and unavoidable for construction. Cumulative air quality impacts for past, present, and reasonably foreseeable future projects may show quantitively that the emissions benefit of implementing the 2022 AQMP is greater than the expected emissions increases. Therefore, the cumulative operational air quality and GHG impacts were expected to be less than significant.

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[8] Southern California Association of Governments, Connect SoCal (2020–2045 Regional Transportation Plan/Sustainable Communities Strategy), May 2020. https://scag.ca.gov/read-plan-adopted-final-connect-socal-2020

[9] California Air Resources Board, 2022 State Strategy for the State Implementation Plan (2022 State SIP Strategy), September 2022. https://ww2.arb.ca.gov/resources/documents/2022-state-strategy-state-implementation-plan-2022-state-sip-strategy

Analysis in the Final Program EIR for the 2016 AQMP

The Final Program EIR for 2016 AQMP concluded that implementation of the 2016 AQMP control measures would result in significant adverse construction air quality impacts because emissions associated with construction activities would have the potential to exceed the South Coast AQMD's significance thresholds. Mitigation measures were identified, but air quality impacts from construction would remain significant. The analysis in the Final Program EIR concluded that the 2016 AQMP control measures would result in significant adverse air quality impacts during construction and when combined with past, present, and reasonably foreseeable activities, and in particular with transportation projects projected in the SCAG 2016 Regional Transportation Plan/Sustainable Communities Strategy (2016 RTP/SCS),[10] would contribute to cumulatively considerable impacts to air quality identified in the 2016 RTP/SCS. No additional mitigation measures to reduce the significant cumulative impacts to air quality were identified. Cumulative impacts to air quality from implementation of the 2016 AQMP would remain significant and unavoidable.

Energy

This section summarizes the potentially significant energy impacts from implementing the proposed the proposed PM2.5 Plan control measures which rely on previously adopted control measures in the 2022 AQMP and 2016 AQMP. The energy impacts for the 2022 AQMP and 2016 AQMP control measures were previously analyzed in the Final Program EIRs for the 2022 AQMP and the 2016 AQMP.

Significance Criteria

Energy impacts are significant if any of the following conditions occur:

- The project conflicts with adopted energy conservation plans or standards.
- The project results in substantial depletion of existing energy resource supplies.
- An increase in demand for utilities impacts the current capacities of the electric and natural gas utilities.
- The project uses non-renewable energy resources in a wasteful and/or inefficient manner.

Potential Impacts

The Final Program EIRs for the 2022 AQMP and the 2016 AQMP identified and evaluated the control measures that have the potential to generate energy impacts. Table VIII-6 summarizes the control methodologies and potential adverse impacts to energy for the 2022 AQMP and 2016 AQMP control

[10] Southern California Association of Governments, Connect SoCal (2016–2040 Regional Transportation Plan/Sustainable Communities Strategy), April 2016. https://scag.ca.gov/sites/main/files/file-attachments/f2016rtpscs.pdf

measures upon which the PM2.5 Plan relies. The control measures are presented and organized in the same manner as in Table VIII-2.

TABLE VIII-6
AQMP CONTROL MEASURES WITH POTENTIAL ENERGY IMPACTS

Control Measure Number	Control Methodology	Potential Energy Impact
R-CMB-01 in 2022 AQMP	Installation of zero emission water heaters and low NOx technologies (when zero emission is infeasible) in new and existing residences.	Potential energy impacts due to potential increased demand for electricity which may be produced from natural gas.
R-CMB-02 in 2022 AQMP	Installation of zero emission space heaters and low NOx technologies (when zero emission is infeasible) in new and existing residences.	Potential energy impacts due to potential increased demand for electricity which may be produced from natural gas.
R-CMB-03 in 2022 AQMP	Installation of electric cooking devices, induction cooktops, or low-NOx burners in new and existing residences.	Potential energy impacts due to potential increased demand for electricity which may be produced from natural gas.
R-CMB-04 in 2022 AQMP	Installation of zero emission or low NOx technologies in new and existing residences to replace equipment such as pool heaters, dryers, grills, etc.	Potential energy impacts due to potential increased demand for electricity which may be produced from natural gas.
L-CMB-04 in 2022 AQMP	Installation of zero emission and low NOx technology alternatives to emergency ICEs.	Potential energy impacts due to increased demand for electricity and hydrogen which may be produced by natural gas; and natural gas to operate new equipment.
L-CMB-06 in 2022 AQMP	Replacement of boilers with lower-emitting turbines, installation of zero emission and low NOx emissions technologies, and the application of stricter emission requirements for diesel internal combustion engines.	Potential energy impacts due to increased demand for electricity and hydrogen which may be produced by natural gas; and natural gas to operate new equipment.
ECC-01 in 2022 AQMP	Evaluating renewable energy targets with existing and further GHG emission reduction mechanisms, including market, incentive and rebate programs, and promoting the implementation and development of new technologies, which may involve the use of electricity in order to reduce emissions of criteria air pollutants and GHGs.	Potential energy impacts due to potential increased demand for electricity.
BCM-04 in 2016 AQMP	Acidifier application, manure removal, manure slurry injection, and dietary manipulation and feed additives to reduce ammonia in manure.	Potential increased demand for fuel used and fuel generated by thermal gasification.
BCM-05 in 2016 AQMP	Installation and use of advanced catalyst technology for the conversion of ammonia.	Potential increased demand for electricity to operate the control equipment.

TABLE VIII-6 (continued)

AQMP CONTROL MEASURES WITH POTENTIAL ENERGY IMPACTS

Control Measure Number	Control Methodology	Potential Energy Impact
BCM-10 in 2016 AQMP	Controls such as anaerobic digestion and organic processing technology, and restrictions for direct applications of un-composted waste to public lands.	Potential increased demand for natural gas needed for anaerobic digestion.
BCM-01 in 2016 AQMP	Installation of control equipment such as ESPs, filters, centrifugal separators, and misters.	Potential increased demand for electricity to operate the new control equipment.
BCM-06 in 2016 AQMP	Exhaust ventilation to a fabric filter for permanent in-building abrasive blasting activities, and use of additional portable control equipment, such as negative air machines, portable fume extractors and portable dust collectors with HEPA filters.	Potential increased demand for electricity to operate the control equipment.
BCM-07 in 2016 AQMP	Dry and wet dust control options to control PM including silica particles.	Potential increased demand for electricity due to the use of engineering controls.
BCM-09 in 2016 AQMP	Construction/upgrading of wood burning hearths to cleaner hearth as well as an increase in the stringency of the curtailment program and education.	Potential increased demand for natural gas or electricity needed due to converting wood burning hearths to natural gas or electric hearths.
MCS-01 in 2022 AQMP	Retrofitting existing equipment and installation of newer, lower-emitting equipment to replace older, higher-emitting equipment for sources as a result of new emission limits introduced through federal, state, or local regulations.	Potential energy impacts due to increased demand for electricity to operate new equipment.
EGM-01 in 2022 AQMP	Replacing or upgrading off-road construction equipment as part of development/redevelopment efforts may result in the use of zero emission technologies in construction, the installation of charging and alternative fueling infrastructure, the use of alternative fuels; and the use construction equipment with low-emitting engines fitted with diesel PM filters.	Potential energy impacts due to increased demand for electricity to operate vehicles, rail, or new equipment.
EGM-03 in 2022 AQMP	Incentivizing the use of zero emission and low NOx equipment by adopting a voluntary measure for municipalities and public agencies to reduce emissions generated by construction activities may include use of zero emission and low NOx construction equipment, dust control, alternative fuels, diesel PM filtration, low-emitting engines, and low VOC materials.	Potential energy impacts due to increased demand for electricity which may be produced from natural gas.
MOB-01 in 2022 AQMP	Infrastructure development required to achieve emission reductions at commercial marine ports from on-road heavy-duty vehicles, ocean-going vessels, cargo handling equipment, locomotives, and harbor craft.	Potential energy impacts due to increased demand for electricity (for vehicles, rail, and equipment) and natural gas.

TABLE VIII-6 (continued)

AQMP CONTROL MEASURES WITH POTENTIAL ENERGY IMPACTS

Control Measure Number	Control Methodology	Potential Energy Impact
MOB-2A in 2022 AQMP	Infrastructure development required to achieve emission reductions at new rail yards and intermodal facilities from on-road heavy-duty vehicles, off-road equipment, and locomotives; and deploying the cleanest locomotives, switchers, on-road heavy-duty trucks, cargo-handling equipment, transportation refrigeration units available.	Potential energy impacts due to increased demand for electricity (for vehicles, rail, and equipment) and natural gas.
MOB-2B in 2022 AQMP	Infrastructure development required to achieve emission reductions at existing rail yards and intermodal facilities from on-road heavy-duty vehicles, off-road equipment, and locomotives; and deploying the cleanest locomotives, switchers, on-road heavy-duty trucks, cargo-handling equipment, transportation refrigeration units available	Potential energy impacts due to increased demand for electricity (for vehicles, rail, and equipment) and natural gas.
MOB-04 in 2022 AQMP	Deploying additional cleaner technologies, such as increasing efficiencies, implementing air quality improvement options or by deploying zero emission and low NOx technologies, alternative fuels, diesel PM filters, and low-emitting engines for additional equipment beyond the commitments made in the existing Memoranda of Understanding with the commercial airports.	Potential energy impacts due to increased demand for electricity and hydrogen.
MOB-05 in 2022 AQMP	Accelerating the retirement of up to 2,000 light- and medium-duty vehicles per year through the Replace Your Ride Program and accelerating the penetration of zero and near–zero emission vehicles.	Potential energy impacts due to increased demand for electricity (produced by natural gas) and hydrogen.
MOB-06 in 2022 AQMP	Retiring older, heavy-duty vehicles and replacing them with low NOx vehicles fueled with CNG or other alternative fuels (e.g., battery electric and hydrogen fuel cells).	Potential energy impacts due to increased demand for electricity (produced by natural gas) and hydrogen.
MOB-07 in 2022 AQMP	Incentivizing the early deployment of zero emission and low NOx emission heavy-duty trucks through the generation of mobile source emission credits.	Potential energy impacts due to increased demand for electricity, natural gas, and hydrogen.
MOB-08 in 2022 AQMP	Promoting the accelerated turn-over of in-use small off-road engines and other engines, such as gasoline- and diesel-powered commercial lawn and garden equipment through expanded voluntary exchange programs will contribute to the retirement of older off-road engines.	Potential energy impacts due to increased demand for electricity.
MOB-09 in 2022 AQMP	Promoting earlier and cleaner replacement or upgrade of existing passenger locomotives capable of achieving Tier 4 emission standards and supporting the development of zero emission or low NOx technologies (e.g., battery electric and hydrogen fuel cells).	Potential energy impacts due to increased demand for electricity produced from natural gas, and hydrogen.

TABLE VIII-6 (concluded)
AQMP CONTROL MEASURES WITH POTENTIAL ENERGY IMPACTS

Control Measure Number	Control Methodology	Potential Energy Impact
MOB-10 in 2022 AQMP	Accelerating the deployment of zero (e.g., battery-electric or fuel cell powered equipment) and low NOx emission off-road mobile equipment (e.g., 90 percent cleaner than Tier 5) that do not receive public funding.	Potential energy impacts due to increased demand for electricity produced from natural gas, and hydrogen.

Analysis in the Final Program EIR for the 2022 AQMP

The Final Program EIR for the 2022 AQMP determined that the 2022 AQMP control measures listed in Table VIII-6 have potential energy impacts due to increased demand for electricity, natural gas, and hydrogen.

The Final Program EIR for the 2022 AQMP discussed increases in electricity demand according to types of sources. Control measures affecting residential and commercial sources (R-CMB-01 through R-CMB-04, and also C-CMB-01 through C-CMB-05 which the PM2.5 Plan is not relying on) were estimated to increase annual electricity use by 12,960 Gigawatt hours (GWh) per year. Estimates could not be made for control measures affecting large stationary sources (L-CMB-01 through L-CMB-08), but the installation of air pollution control technology, replacement of existing equipment with higher tier equipment, and replacement of equipment with zero emission technology would result in potentially significant increases in the amount of electricity needed. Similarly, estimates could not be made for control measures affecting other sources (such as ECC-01 and MCS-01), but electricity demand was expected to increase. Lastly, control measures affecting mobile sources (EGM-01 through EGM-03, and MOB-01 through MOB-10) were estimated to increase annual electricity use by 319.1 GWh per year. Therefore, the Final Program EIR for the 2022 AQMP concluded that energy impacts due to increased electricity demand were potentially significant and mitigation measures E-1 to E-7 were crafted and adopted with the intent of minimizing the significant electricity demand impacts. However, the overall energy impacts due to increased electricity demand was concluded to remain significant after mitigation is applied.

Control measures in the 2022 AQMP were determined to have the potential to result in: 1) an increase in demand for natural gas primarily associated with the production of electricity in the short term, the production of hydrogen in the short-term, and fueling vehicles; and 2) a decreased demand for natural gas appliances in commercial and residential setting. The combined increase in natural gas demand needed for producing electricity and hydrogen and for fueling vehicles may be somewhat offset over the long-term by a decrease in demand for natural gas appliances in commercial and residential setting. However, over the short-term, the natural gas demand is expected to increase. Therefore, the Final Program EIR for the 2022 AQMP concluded that energy impacts due to increased natural gas demand were potentially significant and mitigation measures E-8 and E-9 were crafted and adopted with the intent of minimizing the significant natural gas demand impacts. However, the overall energy impacts due to increased natural gas demand was concluded to remain significant after mitigation is applied.

One of the goals of the 2022 AQMP was to shift from conventional petroleum fuels to low NOx or zero emission technologies, including hydrogen. The 2022 AQMP does not mandate hydrogen fuel use by fleet operators, and hydrogen fuels need further technology demonstration and deployment for vehicles larger than passenger cars (i.e., medium- and heavy-duty vehicles). The hybrid and electric vehicle technologies and deployment are much further developed than the hydrogen fuel cell vehicles for industrial and commercial uses (i.e., heavy-duty truck uses). Therefore, early advancement of light-duty fuel cell electric vehicles (FCEVs) along with the further development of heavy-duty FCEVs is expected to increase hydrogen demand for mobile sources. Little excess hydrogen capacity is available to meet the increase in hydrogen demand and additional hydrogen production facilities will be necessary. Thus, the increased demand impacts for hydrogen fuel are expected to be significant. Therefore, the Final Program EIR for the 2022 AQMP concluded that energy impacts due to increased hydrogen demand were potentially significant and mitigation measures E-10 to E-12 were crafted and adopted with the intent of minimizing the significant hydrogen demand impacts. However, the overall energy impacts due to increased hydrogen demand was concluded to remain significant after mitigation is applied.

Analysis in the Final Program EIR for the 2016 AQMP

The Final Program EIR for the 2016 AQMP determined that the 2016 AQMP control measures listed in Table VIII-6 have potential energy impacts due to increased demand for electricity, natural gas, and fuel use and fuel generated by thermal gasification.

The analysis in the Final Program EIR for the 2016 AQMP indicated that implementation of control measures BCM-01, BCM-05, BCM-06, BCM-07, and BCM-10 could result in the installation of air pollution control equipment which generally require electricity to operate. The analysis also identified a potential increase in electricity demand and use associated with the electrification of stationary sources through control measure BCM-09. Because the estimated 2024 electricity usage increase would exceed baseline electricity consumption by 7.8 to 12.7 percent, the projected increases to electricity demand were concluded to be potentially significant. Mitigation measures E-1 to E-7 were crafted and adopted with the intent of minimizing the significant electricity demand impacts. However, the overall energy impacts due to increased electricity demand was concluded to remain significant after mitigation is applied.

The analysis in the Final Program EIR for the 2016 AQMP also indicated that implementation of control measures BCM-01, BCM-05, BCM-06, BCM-07, and BCM-10 could result in an increased demand for natural gas associated with stationary sources due to the need for additional emission controls. In addition, the projected increased demand for electricity will also require additional natural gas since most of the power plants in California generate electricity from equipment that uses natural gas. Nonetheless, an overall decline in the demand for natural gas in the power generation sector in California was expected to occur over the next decade as more renewable generation and efficiency measures would reduce the need for natural gas-fired electricity generation. In addition, natural gas supplies were considered abundant as a result of technological innovations; the natural gas outlook in 2007 predicted that 700 trillion cubic feet of natural gas would be economically recoverable, but that outlook at the time of writing the Final Program EIR for the 2016 AQMP, increased to nearly 1,400 trillion cubic feet of natural gas, a 100 percent increase.

Therefore, the Final Program EIR for the 2016 AQMP concluded that energy impacts due to increased natural gas demand were less than significant.

Finally, the analysis in the Final Program EIR for the 2016 AQMP indicated that implementation of control measure BCM-04 could result in the thermal gasification of manure which would potentially generate a biogas (e.g., methane gas similar to natural gas) for use in other processes such as electricity production. Added into the discussion of renewable energy impacts from other control measures from the 2016 AQMP, the Final Program EIR for the 2016 AQMP concluded that energy impacts due to renewable energy were less than significant.

Mitigation Measures

The Final Program EIRs for the 2022 AQMP and the 2016 AQMP developed targeted mitigation measures based on project-specific impacts related to energy which were adopted in the Mitigation, Monitoring, and Reporting Plan which can be found in Attachment 1 to the Governing Board Resolution for the Final Program EIR for the 2022 AQMP and in the Mitigation, Monitoring, and Reporting Plan which can be found in Attachment 2 to the Governing Board Resolution for the Final Program EIR for the 2016 AQMP, respectively, and are applicable to the proposed PM2.5 Plan control measures. The following mitigation measures adopted for the 2022 AQMP and the 2016 AQMP, respectively are applicable to the implementation of PM2.5 Plan control measures:

Energy Mitigation Measures in the Final Program EIR for the 2022 AQMP

E-1 Project sponsors should pursue incentives to encourage the use of energy efficient equipment and vehicles and promote energy conservation during electricity generation.

E-2 Utilities should increase capacity of existing transmission lines to meet forecast demand that supports sustainable growth where feasible and appropriate in coordination with local planning agencies.

E-3 Project sponsors should submit projected electricity calculations to the local electricity provider for any project anticipated to require substantial electricity consumption. Any infrastructure improvements necessary should be completed according to the specifications of the electricity provider.

E-4 Project sponsors should include energy analyses in environmental documentation with the goal of conserving energy through the wise and efficient use of energy.

E-5 Project sponsors should evaluate the potential for reducing peak energy demand by encouraging charging of electrical vehicles and other mobile sources during off-peak hours.

E-6 Project sponsors should evaluate the potential for reducing peak energy demand by encouraging the use of catenary or way-side electrical systems developed for transportation systems to operate during off-peak hours.

E-7 Project sponsors should evaluate the potential for reducing peak energy demand by encouraging the use of electrified stationary sources during off-peak hours.

E-8 Projects that require a substantial increase in natural gas demand should consider the use of renewable gas, where available and feasible, including biofuel landfill gas and gas produced from renewable fuels projects.

E-9 Project sponsors should submit projected natural gas demand use to the local natural gas provider for any project anticipated to require substantial natural gas consumption. Any infrastructure improvements necessary should be completed according to the specifications of the natural gas provider.

E-10 Project sponsors should pursue incentives to encourage the use of energy efficient equipment and vehicles, and promote energy conservation associated with hydrogen production.

E-11 Project sponsors should site new facilities in areas where infrastructure exists to reduce the amount of energy necessary to build new hydrogen production facilities.

E-12 Project sponsors should pursue hydrogen production and delivery through the most energy efficient, least environmentally impactful methods, where feasible.

Energy Mitigation Measures in the Final Program EIR for the 2016 AQMP

E-1 Project sponsors should pursue incentives to encourage the use of energy efficient equipment and vehicles and promote energy conservation.

E-2 Utilities should increase the capacity of existing transmission lines to meet forecast demand that supports sustainable growth, where feasible and appropriate, in coordination with local planning agencies.

E-3 Project sponsors should submit projected electricity calculations to the local electricity provider for any project anticipated to require substantial electricity consumption. Any infrastructure improvements necessary should be completed according to the specifications of the electricity provider.

E-4 Project sponsors should include energy analyses in environmental documentation (e.g., CEQA document) with the goal of conserving energy through the wise and efficient use of energy.

E-5 Project sponsors should evaluate the potential for reducing peak energy demand by encouraging the charging of electrical vehicles and other mobile sources during off-peak hours.

E-6 Project sponsors should evaluate the potential for reducing peak energy demand by encouraging the use of catenary or way-side electrical systems developed for transportation systems to operate during off-peak hours.

E-7 Project sponsors should evaluate the potential for reducing peak energy demand by encouraging the use of electrified stationary sources during off-peak hours (e.g., cargo handling equipment).

Cumulative Impacts

Analysis in the Final Program EIR for the 2022 AQMP

The Final Program EIR for the 2022 AQMP concluded that implementation of the 2022 AQMP could result in significant adverse electricity consumption impacts because the potential electricity usage increase would exceed baseline electricity consumption by an estimated 11 percent. Significant impacts were also concluded for natural gas and hydrogen demand. When combined with the Connect SoCal Plan, the SIP strategies, state policies, and other past, present, and reasonably foreseeable activities, the 2022 AQMP would result in a significant increase in electricity, natural gas, and hydrogen demand which may not currently be available, and would contribute to cumulatively considerable impacts. No additional mitigation measures to reduce the significant cumulative impacts to energy were identified. Cumulative impacts to energy demand for past, present, and reasonably foreseeable future projects would remain significant and unavoidable for electricity, natural gas, and hydrogen demand.

Analysis in the Final Program EIR for the 2016 AQMP

The Final Program EIR for 2016 AQMP concluded that implementation of the 2016 AQMP control measures would result in significant adverse electricity consumption impacts because the potential electricity usage increase would exceed baseline electricity consumption by 7.8 to 12.7 percent. No significant impacts on natural gas supplies and petroleum fuels associated with the 2016 AQMP were identified because of the anticipated reduction in future demand and wide availability of natural gas. The 2016 AQMP control measures would result in significant adverse energy demand impacts and, when combined with past, present, and reasonably foreseeable activities, and in particular with transportation projects projected in the 2016 RTP/SCS, would contribute to cumulatively considerable impacts to energy identified in the 2016 RTP/SCS, therefore resulting in a significant cumulative impact. No additional mitigation measures to reduce the significant cumulative impacts to energy were identified. Cumulative impacts to energy from implementation of the 2016 AQMP would remain significant and unavoidable.

Hazards and Hazardous Materials

This section summarizes the potentially significant hazards and hazardous materials impacts from implementing the proposed PM2.5 Plan control measures which rely on previously adopted control measures in the 2022 AQMP and 2016 AQMP. The hazards and hazardous materials impacts for the 2022 AQMP and 2016 AQMP control measures were previously analyzed in the Final Program EIRs for the 2022 AQMP and the 2016 AQMP.

Significance Criteria

Hazards and hazardous materials impacts are significant if any of the following conditions occur:

- Non-compliance with any applicable design code or regulation.
- Non-conformance to National Fire Protection Association standards.
- Non-conformance to regulations or generally accepted industry practices related to operating policy and procedures concerning the design, construction, security, leak detection, spill containment, or fire protection.
- Exposure to hazardous chemicals in concentrations equal to or greater than the Emergency Response Planning Guideline (ERPG) 2 levels.

Potential Impacts

The Final Program EIRs for the 2022 AQMP and the 2016 AQMP identified and evaluated the control measures that have the potential to generate hazards and hazardous materials impacts. Table VIII-7 lists the 2022 AQMP and 2016 AQMP control measures with potential adverse impacts to hazards and hazardous materials, control methodology, and potential impacts. The control measures are presented and organized in the same manner as in Table VIII-2.

TABLE VIII-7
AQMP CONTROL MEASURES WITH POTENTIAL HAZARDS AND HAZARDOUS MATERIALS IMPACTS

Control Measure Number	Control Methodology	Potential Hazards and Hazardous Materials Impact
L-CMB-04 in 2022 AQMP	Installation of zero emission and low NOx technology alternatives to emergency ICEs.	Potential hazard impacts associated with the increased production and use of hydrogen.
L-CMB-06 in 2022 AQMP	Replacement of boilers with lower-emitting turbines, installation of zero emission and low NOx emissions technologies, and the application of stricter emission requirements for diesel internal combustion engines.	Potential hazard impacts associated with ammonia use in SCRs, if installed, and the increased production and use of hydrogen.
BCM-04 in 2016 AQMP	Acidifier application, manure removal, manure slurry injection, and feed additives to reduce ammonia in manure.	Potential hazards generated by acidifier application, manure removal, and manure slurry injection.
BCM-05 in 2016 AQMP	Installation and use of advanced catalyst technology for the conversion of ammonia.	Use of new catalysts could generate potential hazards.
MCS-02 in 2022 AQMP	Mechanical thinning and chipping activities during fuel reduction and removal efforts.	Potential fire hazards associated with chipping and grinding activities.

TABLE VIII-7 (continued)

AQMP CONTROL MEASURES WITH POTENTIAL HAZARDS AND HAZARDOUS MATERIALS IMPACTS

Control Measure Number	Control Methodology	Potential Hazards and Hazardous Materials Impact
MCS-01 in 2022 AQMP	Retrofitting existing equipment and installation of newer, lower-emitting equipment to replace older, higher-emitting equipment for sources as a result of new emission limits introduced through federal, state, or local regulations.	Potential hazard impacts associated with ammonia use in SCRs, if installed.
EGM-01 in 2022 AQMP	Replacing or upgrading off-road construction equipment as part of development/redevelopment efforts may result in the use of zero-emission technologies in construction, the installation of electrical and alternative fuel infrastructure, the use of alternative fuels; and the use construction equipment with low-emitting engines fitted with DPFs.	Potential hazard impacts associated with the increased alternative fuels production and use (e.g., hydrogen).
EGM-03 in 2022 AQMP	Incentivizing the use of zero emission and low NOx equipment by adopting a voluntary measure for municipalities and public agencies to reduce emissions generated by construction activities may include use of zero emission and low NOx construction equipment, dust control, alternative fuels, DPFs, low-emitting engines, and low VOC materials.	Potential hazard impacts associated with the increased alternative fuels production and use (e.g., hydrogen).
MOB-01 in 2022 AQMP	Infrastructure development required to achieve emission reductions at commercial marine ports from on-road heavy-duty vehicles, ocean-going vessels, cargo handling equipment, locomotives, and harbor craft.	Potential hazard impacts associated with engine replacements.
MOB-2A in 2022 AQMP	Infrastructure development required to achieve emission reductions at new rail yards and intermodal facilities from on-road heavy-duty vehicles, off-road equipment, and locomotives; and deploying the cleanest locomotives, switchers, on-road heavy-duty trucks, cargo-handling equipment, transportation refrigeration units available.	Potential hazard impacts associated with engine replacements and with the increased production and use of alternative fuels (e.g., hydrogen).
MOB-2B in 2022 AQMP	Infrastructure development required to achieve emission reductions at existing rail yards and intermodal facilities from on-road heavy-duty vehicles, off-road equipment, and locomotives; and deploying the cleanest on-road heavy-duty vehicles, off-road equipment including cargo handling equipment and transportation refrigeration units, and both line-haul and switcher locomotives.	Potential hazard impacts associated with engine replacements and with the increased production and use of alternative fuels (e.g., hydrogen).

TABLE VIII-7 (concluded)
AQMP CONTROL MEASURES WITH POTENTIAL HAZARDS AND HAZARDOUS MATERIALS IMPACTS

Control Measure Number	Control Methodology	Potential Hazards and Hazardous Materials Impact
MOB-04 in 2022 AQMP	Deploying additional cleaner technologies, such as increasing efficiencies, implementing air quality improvement options or by deploying zero emission and low NOx technologies, alternative fuels, diesel PM filters, and low-emitting engines for additional equipment beyond the commitments made in the existing Memoranda of Understanding with the commercial airports.	Potential hazard impacts associated with engine replacements and with the increased production and use of alternative fuels (e.g., hydrogen).
MOB-05 in 2022 AQMP	Accelerating the retirement of up to 2,000 light- and medium-duty vehicles per year through the Replace Your Ride Program and accelerating the penetration of zero and near–zero emission vehicles.	Potential hazard impacts associated with the production and use of alternative fuels and fuel additives, and scrapping retired vehicles.
MOB-06 in 2022 AQMP	Retiring older, heavy-duty vehicles and replacing them with low NOx vehicles fueled with CNG or other alternative fuels (e.g., battery electric and hydrogen fuel cells).	Potential hazard impacts associated with scrapping retired vehicles and disposal of batteries and fluids, and increased production and use of alternative fuels.
MOB-07 in 2022 AQMP	Incentivizing the early deployment of zero emission and low NOx emission heavy-duty trucks through the generation of mobile source emission credits.	Potential hazard impacts associated with scrapping retired vehicles and disposal of batteries and fluids, and increased production and use of alternative fuels (e.g., hydrogen).
MOB-08 in 2022 AQMP	Promoting the accelerated turn-over of in-use small off-road engines and other engines, such as gasoline- and diesel-powered commercial lawn and garden equipment through expanded voluntary exchange programs will contribute to the retirement of older off-road engines.	Potential hazard impacts associated with scrapping retired vehicles and disposal of batteries and fluids.
MOB-09 in 2022 AQMP	Promoting earlier and cleaner replacement or upgrade of existing passenger locomotives capable of achieving Tier 4 emission standards and supporting the development of zero emission or low NOx technologies (e.g., battery electric and hydrogen fuel cells).	Potential hazard impacts associated with scrapping retired locomotives and increased production and use of alternative fuels.
MOB-10 in 2022 AQMP	Accelerating the deployment of zero (e.g., battery-electric or fuel cell powered equipment) and low NOx emission off-road mobile equipment (e.g., 90 percent cleaner than Tier 5) that do not receive public funding.	Potential hazard impacts associated with the increased production and use of alternative fuels and fuel additives (e.g., natural gas and hydrogen).

Analysis in the Final Program EIR for the 2022 AQMP

The Final Program EIR for the 2022 AQMP determined that the 2022 AQMP control measures listed in Table VIII-7 have potential hazards and hazardous materials impacts due to use of ammonia in SCRs, increased use of alternative fuels including increased use of electric and hybrid vehicles, increased use and production of hydrogen, and fire hazards associated with chipping and grinding activities.

Operation of SCR technology requires transport and use of ammonia and SCR catalyst. Three accidental release scenarios for ammonia were evaluated for: 1) routine transport; 2) use at non-RECLAIM facilities; and 3) use at RECLAIM facilities. Each scenario was concluded to generate significant adverse hazards impacts. However, the routine transport, use, or disposal of fresh and spent catalyst was determined to generate less than significant hazards impacts. Therefore, the Final Program EIR for the 2022 AQMP concluded that hazards and hazardous materials impacts due to increased ammonia use were potentially significant and mitigation measures HZ-1 to HZ-6 were crafted and adopted with the intent of minimizing the significant hazards and hazardous materials impacts. However, the overall hazards and hazardous materials impacts due to increased ammonia use was concluded to remain significant after mitigation is applied.

Use of alternative fuels requires additional knowledge and training of owners/operators of fueling stations regarding maintaining and operating alternative fuel refueling stations and emergency responders. Further, as use of alternative fuels increases within the South Coast AQMD’s jurisdiction, use of conventional fuels such as gasoline and diesel will decline. As a result, explosion and flammability hazards associated with conventional fuels will also decline. In addition, hazards and hazardous clean-up associated with accidental releases of conventional fuels, especially diesel, will be reduced as the use of alternative fuels increases. For the storage and dispensing of alternative fuels, compliance with existing regulations and recommended safety procedures will ensure that any potential hazards impacts associated with alternative clean-fuels are expected to be the same or less than those of conventional fuels. Accordingly, the Final Program EIR concluded that the hazards impacts from the increased use of alternative fuels would be similar to or less than hazards associated with conventional fuels. Therefore, the analysis concluded that no significant hazard impacts would be expected from the increased storage and use of alternative fuels and so no mitigation measures were required.

The majority of the 2022 AQMP control measures focused on maximizing the implementation of zero emission and low NOx technologies which are expected to include electrification of mobile sources (light-duty vehicles, medium-duty vehicles, and heavy-duty vehicles). Since gasoline is a conventional fuel, any difference in hazards associated with hybrid and electric vehicles would be from the batteries. The likelihood to overheat or ignite is increased if the batteries are poorly packaged, damaged, or exposed to a fire or a heat source; however, internal combustion engines also can result in fires and other hazards so switching to battery power would not likely result in an increased fire risk. Thus, the Final Program EIR concluded that the hazard impacts associated with using batteries in electric vehicles were expected to be less than the hazards associated with gasoline-powered vehicles. Thus, no remaining hazard impacts associated with using batteries for these types of vehicles were expected.

When comparing the use of diesel fuel and gasoline to hydrogen, the Final Program EIR for the 2022 AQMP presented various characteristics such as that diesel fuel and gasoline are toxic to the skin and lungs while hydrogen is non-toxic and non-reactive, so if released, it does not present a health hazard to humans; and hydrogen has a lower radiant heat when compared to gasoline, meaning the air around the hydrogen flame is not as hot as around a gasoline flame. Therefore, the risk of hydrogen secondary fires is lower. Hazards associated with hydrogen are approximately equivalent or less when compared to conventional fuels. In addition, fire hazards associated with hydrogen when compared to fires involving conventional fuels are equivalent but will require different firefighting protocols due to the nature of hydrogen. Therefore, the Final Program EIR concluded that no significant increase in hazards would be expected from using hydrogen in mobile sources when compared to conventional fuels.

In evaluating the hazards impacts from production of hydrogen, the Final Program EIR for the 2022 AQMP referenced a recent hazard analysis completed for a proposed new hydrogen plant at a renewable fuels facility in Southern California. The results of the analysis indicated that the worst-case hazard zones associated with an upset of the hydrogen plant and related pipelines were related to a torch fire and would create hazards to surrounding areas within approximately 90 feet of the fire. The hazards associated with the rupture of the related natural gas pipeline that would feed the hydrogen plant was also identified as a potential torch fire risk which could create hazards to surrounding areas within approximately 183 feet of a release. Therefore, the Final Program EIR concluded that the hazards associated with the potential increase in transmission of natural gas via pipeline to service hydrogen plants would be considered potentially significant.

Control measure MCS-02 of the 2022 AQMP would result in thinning and chipping to reduce excess fuel at properties located in the residential urban wild-interface areas of the San Bernardino National Forest. These thinning activities would reduce flammable materials from the urban wild-interface by removing dead, dying, and decaying material. Further the practice of thinning and use of chips as ground cover can facilitate defensible space modification by removing excess surface and ladder fuels and enhance the resiliency of underlying soil through increased water retention, complementing home hardening efforts. Therefore, the Final Program EIR concluded that control measure MCS-02 would be expected to provide a beneficial impact by reducing the potential spread and impacts from wildfires.

Analysis in the Final Program EIR for the 2016 AQMP

The Final Program EIR for the 2016 AQMP determined that the 2016 AQMP control measures listed in Table VIII-7 have potential hazards and hazardous materials impacts due to acidifier application, manure removal, and manure slurry injection; and the use of new catalysts in SCR.

Implementation of control measure BCM-04 of the 2016 AQMP would control ammonia emissions from livestock operations through the application of the acidifier sodium bisulfate. Because sodium bisulfate is a salt, the transportation and flammability risks are very low. In a worst case-scenario if a spill was to occur, the hazards impacts would be negligible. Therefore, the Final Program EIR for the 2016 AQMP concluded that the routine use of acidifiers would create a less than significant hazard impact.

Implementation of control measure BCM-05 of the 2016 AQMP could result in the increased use of catalysts as well as an increase in the quantity of catalyst disposed of as hazardous materials. With a projected increase in the frequency of truck transportation trips to remove the spent catalyst as hazardous materials or hazardous waste from each affected facility, facility operators may choose to either dispose of the spent catalyst in a landfill or recycle it, which may be the more popular (and potentially lucrative) consideration since catalyst contains recoverable and valuable precious metals. The composition and type of the catalyst will determine the type of landfill that would be eligible to handle the disposal. It is likely that spent catalysts would be considered a “designated waste,” which is characterized as a non-hazardous waste consisting of, or containing pollutants that, under ambient environmental conditions, could be released at concentrations in excess of applicable water objectives, or which could cause degradation of the waters of the state. Depending on its actual waste designation, spent catalysts would likely be disposed of in a Class II landfill or a Class III landfill that is fitted with liners. Therefore, the Final Program EIR for the 2016 AQMP concluded that the routine use of catalysts would create a less than significant hazard impact.

Mitigation Measures

The Final Program EIR for the 2022 AQMP developed targeted mitigation measures based on project-specific impacts related to hazards and hazardous materials which were adopted in the in the Mitigation, Monitoring, and Reporting Plan which can be found in Attachment 1 to the Governing Board Resolution for the Final Program EIR for the 2022 AQMP and in the Mitigation, Monitoring, and Reporting Plan which can be found in Attachment 2 to the Governing Board Resolution for the Final Program EIR for the 2016 AQMP, respectively, and are applicable to the proposed PM2.5 Plan control measures. However, no hazards and hazardous materials mitigation measures were proposed for the 2016 AQMP control measures upon which the PM2.5 Plan relies.

Thus, only the following mitigation measures adopted for the 2022 AQMP are applicable to the implementation of PM2.5 Plan control measures.

Hazards and Hazardous Materials Mitigation Measures in the Final Program EIR for the 2022 AQMP

HZ-1 Use of aqueous ammonia at concentrations less than 19 percent by weight.

HZ-2 Install safety devices, including but not limited to: continuous tank level monitors (e.g., high and low level), temperature and pressure monitors, leak monitoring and detection system, alarms, check valves, and emergency block valves.

HZ-3 Install secondary containment such as dikes and/or berms to capture 110 percent of the storage tank volume in the event of a spill.

HZ-4 Install a grating-covered trench around the perimeter of the delivery bay to passively contain potential spills from the tanker truck during the transfer of aqueous ammonia from the delivery truck to the storage tank.

HZ-5 Equip the truck loading/unloading area with an underground gravity drain that flows to a large on-site retention basin to provide sufficient ammonia dilution to minimize the offsite hazards impacts to the maximum extent feasible in the event of an accidental release during transfer of aqueous ammonia.

HZ-6 Install tertiary containment that is capable of evacuating 110 percent of the storage tank volume from the secondary containment area.

Cumulative Impacts

Analysis in the Final Program EIR for the 2022 AQMP

The Final Program EIR for the 2022 AQMP concluded that implementation of the 2022 AQMP could result in the following significant adverse hazards and hazardous materials impacts:

1) Increased usage of ammonia due to implementation of control measures in the 2022 AQMP could generate significant adverse hazard impacts during routine transport as a result of an accidental release of delivered aqueous ammonia.

2) The hazards impact from a catastrophic rupture of an ammonia tank is considered a potentially significant adverse hazards impact since off-site receptors could be exposed to concentrations that would exceed the ERPG-2 toxic endpoint concentration for ammonia.

3) Hazards impacts from the construction of new natural gas pipeline to service new hydrogen plants would be considered potentially significant.

Mitigation Measures HZ-1 through HZ-6 pertaining to the storage of aqueous ammonia were identified as having the potential to reduce impacts; however, these mitigation measures were not expected to reduce impacts to less than significant levels. Therefore, the remaining hazardous and hazardous materials impacts from exposure to aqueous ammonia due to tank rupture were considered to be significant after mitigation. No mitigation measures were identified for construction of a new natural gas pipeline. When combined with the Connect SoCal Plan, the SIP strategies, state policies, and other past, present, and reasonably foreseeable activities, the 2022 AQMP would result in a significant increase in the use of hazards and hazardous materials, and would contribute to cumulatively considerable impacts. No additional mitigation measures to reduce the significant cumulative impacts to hazards and hazardous materials were identified. Therefore, the Final Program EIR concluded that cumulative impacts to hazards and hazardous materials for past, present, and reasonably foreseeable future projects would remain significant and unavoidable.

Analysis in the Final Program EIR for the 2016 AQMP

The Final Program EIR for 2016 AQMP concluded that implementation of the 2016 AQMP control measures would result in significant adverse hazards and hazardous materials impacts; however, for the specific subset of 2016 AQMP control measures upon which the PM2.5 Plan relies, the Final Program EIR concluded less than significant adverse hazards and hazardous materials impacts. Other 2016 AQMP control measures would result in significant adverse hazards and hazardous materials impacts and, when combined with past, present, and reasonably foreseeable activities, and in particular with transportation projects projected in the 2016 RTP/SCS, would contribute to cumulatively considerable impacts to hazards and hazardous materials identified in the 2016 RTP/SCS, therefore resulting in a significant cumulative impact. No additional mitigation measures to reduce the significant cumulative impacts to hazards and hazardous materials were identified. Cumulative impacts to hazards and hazardous materials from implementation of the 2016 AQMP would remain significant and unavoidable.

Hydrology and Water Quality

This section summarizes the potentially significant hydrology and water quality impacts from implementing the proposed PM2.5 Plan control measures which rely on previously adopted control measures in the 2022 AQMP and 2016 AQMP. The hydrology and water quality impacts for the 2022 AQMP and 2016 AQMP control measures were previously analyzed in the Final Program EIRs for the 2022 AQMP and the 2016 AQMP.

Significance Criteria

Hydrology and water quality impacts are significant if any of the following conditions occur:

Water Demand

- The existing water supply does not have the capacity to meet the increased demands of the project, or the project would use more than 262,820 gallons per day of potable water.
- The project increases demand for total water by more than five million gallons per day.

Water Quality

- The project will cause degradation or depletion of ground water resources substantially affecting current or future uses.
- The project will cause the degradation of surface water substantially affecting current or future uses.
- The project will result in a violation of National Pollutant Discharge Elimination System (NPDES) permit requirements.
- The capacities of existing or proposed wastewater treatment facilities and the sanitary sewer system are not sufficient to meet the needs of the project.
- The project results in substantial increases in the area of impervious surfaces, such that interference with groundwater recharge efforts occurs.
- The project results in alterations to the course or flow of floodwaters.

Potential Impacts

The Final Program EIRs for the 2022 AQMP and the 2016 AQMP identified and evaluated the control measures that have the potential to hydrology and water quality impacts. Table VIII-8 lists the 2022 AQMP and 2016 AQMP control measures with potential adverse impacts to hydrology and water quality, control methodology, and potential impacts. The control measures are presented and organized in the same manner as in Table VIII-2.

TABLE VIII-8

AQMP CONTROL MEASURES WITH POTENTIAL HYDROLOGY AND WATER QUALITY IMPACTS

Control Measure Number	Control Methodology	Potential Hydrology and Water Quality Impact
L-CMB-06 in 2022 AQMP	Replacement of boilers with lower-emitting turbines, installation of zero emission and low NOx emissions technologies, and the application of stricter emission requirements for diesel internal combustion engines.	Potential hydrology and water quality impacts if new steam turbines are installed.
BCM-04 in 2016 AQMP	Acidifier application, manure removal, manure slurry injection, manure thermal gasification, and dietary manipulation/feed additives.	Potential increase in water use associated with the acidifier application process and slurry injections.
BCM-10 in 2016 AQMP	Controls such as anaerobic digestion and organic processing technology, and restrictions for direct applications of un-composted waste to public lands.	Potential increase in water use associated with waste treatment processes.
BCM-01 in 2016 AQMP	Installation of control equipment such as ESPs, filters, centrifugal separators, and misters.	Potential increases in water use to operate wet ESPs and misters.
BCM-03 in 2016 AQMP	Reduction of track out from stationary sources by specifying street sweeping methods and frequency.	Potential increase in water use associated with wheel washing systems for dust suppression.
BCM-07 in 2016 AQMP	Dry and wet dust control options to control PM including silica particles.	Potential increase in water use from applying wet methods to prevent dust.
MCS-02 in 2022 AQMP	Mechanical thinning and chipping and grinding activities during fuel reduction and removal efforts.	Potential hydrology impacts (increased water use) associated with composting activities.
MOB-05 in 2022 AQMP	Accelerating the retirement of up to 2,000 light- and medium-duty vehicles per year through the Replace Your Ride Program and accelerating the penetration of zero and near–zero emission vehicles.	Potential hydrology and water quality impacts (surface and ground water) from disposal of batteries and fluids, and accidental spills.
MOB-06 in 2022 AQMP	Retiring older, heavy-duty vehicles and replacing them with low NOx vehicles fueled with CNG or other alternative fuels (e.g., battery electric and hydrogen fuel cells).	Potential hydrology and water quality impacts (surface and ground water) from disposal of batteries and fluids, and accidental spills.

TABLE VIII-8 (concluded)
AQMP CONTROL MEASURES WITH POTENTIAL HYDROLOGY AND WATER QUALITY IMPACTS

Control Measure Number	Control Methodology	Potential Hydrology and Water Quality Impact
MOB-07 in 2022 AQMP	Incentivizing the early deployment of zero emission and low NOx emission heavy-duty trucks through the generation of mobile source emission credits.	Potential hydrology and water quality impacts (surface and ground water) from disposal of batteries and fluids, and accidental spills.
MOB-08 in 2022 AQMP	Promoting the accelerated turn-over of in-use small off-road engines and other engines, such as gasoline- and diesel-powered commercial lawn and garden equipment through expanded voluntary exchange programs will contribute to the retirement of older off-road engines.	Potential hydrology and water quality impacts (surface and ground water) from disposal of batteries and fluids, and accidental spills.

Analysis in the Final Program EIR for the 2022 AQMP

The Final Program EIR for the 2022 AQMP determined that the 2022 AQMP control measures listed in Table VIII-8 have potential hydrology and water quality impacts due to construction and operation of new steam turbines, composting activities, and disposal of batteries and fluids, and accidental spills.

Summary of Water Demand and Supply Impacts

Implementing the 2022 AQMP was expected to result in construction activities related to the installation of air pollution control equipment (e.g., low NOx burners, SCR systems, and gas scrubbers) and replacement of existing equipment with low NOx and zero emission equipment such as fuel cells and electrified equipment. Modifications to existing industrial and commercial facilities were expected to require minimal site preparation/excavation and grading activities as the facilities were already developed, graded and paved for safety reasons. Therefore, while water could be applied to soil as a dust suppressant during site preparation/excavation and grading, since none to minimal grading was expected, minimal water, if any, would be needed for dust suppression activities during construction. Further, there are other types of dust suppressants, such as soil stabilizers, that may be used in lieu of water as set forth in South Coast AQMD Rule 403 – Fugitive Dust. For the previously discussed reasons, the Final Program EIR for the 2022 AQMP concluded that impact to water demand relating to construction activities was less than significant.

Control measure L-CMB-06 of the 2022 AQMP sought further NOx emission reductions from electric generating units using near-zero and zero emission technologies through a regulatory approach under South Coast AQMD Rule 1135 - Emissions of Oxides of Nitrogen from Electricity Generating Facilities. Gas-fired boilers operating at electricity generating facilities can be repowered with lower NOx-emitting turbines. Similarly, gas-fired turbines or diesel engines operating at electricity generating facilities can be transitioned to electrified units, units fueled by non-fossil energy sources (e.g., hydrogen-fueled turbines), fuel cells for power generation, or gas-fired units that meet CARB's Distributed Generation Certification Regulation standards. While none of these technologies would require the use of steam or additional water resources, fuel cells generate wastewater at a rate of 1.1 gallons of wastewater for every pound of hydrogen fuel used.

Control measure MCS-02 of the 2022 AQMP was designed to mitigate PM emissions and bolster fuel reduction efforts within the residential urban-wild-interface areas of the San Bernardino National Forest. This entails employing techniques like hand-thinning, mechanical thinning, and the utilization of chipping and grinding equipment to clear wood and green waste. The wood and green waste collected and processed through chipping and grinding can be repurposed as organic mulch, offering multifaceted benefits such as moisture retention, soil insulation, erosion control, and weed suppression. The most cost-effective strategy involves distributing the generated mulch at or near the collection site, minimizing the necessity for additional water. However, if the mulch is transported to offsite compost facilities, water may be required for proper decomposition and fire prevention. These composting facilities operate under the regulatory framework established by South Coast AQMD Rule 1133.1 – Chipping and Grinding Activities and Rule 1133.3 – Emission Reductions from Green waste Composting Operations. These rules mandate water irrigation to maintain adequate moisture levels in compost piles, ensuring compliance and fire prevention. Based on estimates, composting 20,000 tons of wood and green waste would necessitate approximately 4,870 gallons of water per day. It is important to note that this estimate is conservative, as some mulch is anticipated to be utilized on-site, reducing the quantity hauled to offsite facilities.

The Final Program EIR for 2022 AQMP concluded that for control measures where water demand could be estimated, the increase in daily water demand ranged from 338,137 to 438,137 gallons. This increased water demand does not exceed the South Coast AQMD's significance threshold of 5,000,000 gallons per day of total water (comprised of potable, recycled and groundwater) demand, but it exceeded the 262,820 gallons per day significance threshold for potable water. Due to the extreme drought conditions and uncertainty about future water supplies, even though each county has various projects for providing recycled water, most of the recycled water projects, except for those in Los Angeles and Orange Counties, are to provide recycled water for landscape purposes. Therefore, the Final Program EIR for the 2022 AQMP concluded that implementation of the control measures in the 2022 AQMP as a whole may have a significant impact on both water demand and water supplies. Mitigation measures HWQ-1 to HWQ-4 were crafted and adopted with the intent of minimizing significant water demand impacts. However, while generally the mitigation measures could help minimize some of the water demand and water supply impacts on an individual facility-basis, the availability of water supplies varies throughout the region. Thus, not all mitigation measures would be applied in all situations. For this reason, the mitigation measures were not expected to fully eliminate the significant water demand and water supply impacts. Therefore, the Final Program EIR concluded that the water demand and water supply impacts that may result from implementing the 2022 AQMP were expected to remain significant.

Summary of Water Quality Impacts

The Final Program EIR for the 2022 AQMP discussed the potential water quality impacts due to increased generation of wastewater from installation and operation of new fuel cells and steam turbines per control measure L-CMB-06, and increased production of and potential for accidental spills of alternative fuels, increased scrapping of vehicles, increased use of electric vehicles, and increased potential for accidental spills associated with handling and recycling electric vehicle batteries per control measures MOB-05, MOB-06, MOB-07, and MOB-08. In the absence of facility-specific information regarding the potential increased amounts of wastewater that could be generated in order to determine whether a revision to an Industrial Waste Discharge Permit and/or a NPDES permit would be needed and whether a relocation or construction of new or expanded wastewater or storm water treatment facility would be needed, out of an abundance of caution, the analysis in this Program EIR concluded that implementation of the 2022 AQMP had the potential for one or more facilities to increase the amount of wastewater to be discharged by 25 percent above the current discharge permit limit such that permit revision would be necessary. For the same reasons, the analysis in the Final Program EIR for the 2022 AQMP also concluded that implementation of the 2022 AQMP had the potential to require or result in the relocation or construction of new or expanded wastewater treatment or storm water drainage facilities. Thus, the 2022 AQMP would result in significant adverse wastewater impacts associated with the quantity of effluent to be treated and discharged and the potential lack of existing capacity in the existing wastewater and stormwater treatment systems to handle the potential increases. Mitigation measure HWQ-5 was crafted and adopted with the intent of minimizing the significant water quality impacts. However, the overall water quality impacts would remain significant after mitigation is applied.

Analysis in the Final Program EIR for the 2016 AQMP

The Final Program EIR for the 2022 AQMP determined that the 2016 AQMP control measures listed in Table VIII-8 have potential hydrology and water quality impacts due to water use in emissions control, from acidifier application and slurry injections to dust suppression.

Implementation of control measure BCM-01 of the 2016 AQMP may result in the use of add-on air pollution control equipment such as wet ESPs which require water to operate and would generate wastewater. The potential increase in the volume of wastewater estimated as a result of implementing all of the control measures in the 2016 AQMP identified as having potential wastewater impacts was estimated to be 2.1 million gallons per day, which represents about a 0.1 percent increase in wastewater generated within the Basin. Further, the increase in wastewater was well within the capacity of the existing wastewater treatment plants of about 1,911 million gallons. Therefore, the wastewater impacts pertaining to the existing capacity of wastewater treatment plants were expected to be less than significant.

Implementation of control measure BCM-04 of the 2016 AQMP would control ammonia emissions from livestock operations through the application of sodium bisulfate. While sodium bisulfate is considered an irritant because of its low pH, it is safe for use in water treatment. In particular, sodium bisulfate has been used as a disinfectant to prevent damage of the membrane used in reverse osmosis during water treatment. Sodium bisulfate is certified for treating drinking water (e.g., for chlorine removal, corrosion and scale control, and pH adjustment) and is used to lower the pH of water for effective chlorination, including water in swimming pools. The Final Program EIR for the 2016 AQMP concluded that implementation of the 2016 AQMP control measures, including increased use of sodium bisulfate, would have less than significant impact on hydrology and water quality impacts.

Implementation of control measure BCM-01 of the 2016 AQMP may result in the use of add-on air pollution control equipment such as wet ESPs that could result in an increased water demand. Other control measures, such as control measures BCM-03 and BCM-07, encourage the use of wet methods to prevent dust release. The overall water demand from the 2016 AQMP was estimated to be between 8,834,094 and 8,868,594 gallons per day, exceeding the significance threshold of 262,820 gallons per day for potable water demand and five million gallons per day of total water demand. Therefore, the Final Program EIR for the 2016 AQMP concluded that water demand impacts were potentially significant and mitigation measures WQ-1 to WQ-4 were crafted and adopted with the intent of reducing the significant water demand impacts. However, the overall water impacts would remain significant after mitigation is applied.

Mitigation Measures

The Final Program EIRs for the 2022 AQMP and the 2016 AQMP developed targeted mitigation measures based on project-specific impacts related to hydrology and water quality which were adopted in the Mitigation, Monitoring, and Reporting Plan which can be found in Attachment 1 to the Governing Board Resolution for the Final Program EIR for the 2022 AQMP and in the in the Mitigation, Monitoring, and Reporting Plan which can be found in Attachment 2 to the Governing Board Resolution for the Final Program EIR for the 2016 AQMP, respectively, and are applicable to the proposed PM2.5 Plan control measures. The following mitigation measures for the 2022 AQMP and the 2016 AQMP, respectively are applicable to the implementation of PM2.5 Plan control measures:.

Hydrology and Water Quality Mitigation Measures in the Final Program EIR for the 2022 AQMP

HWQ-1 Local water agencies should continue to evaluate future water demand and establish the necessary supply and infrastructure to meet that demand, as documented in their Urban Water Management Plans.

HWQ-2 Project sponsors should coordinate with the local water provider to ensure that existing or planned water supply and water conveyance facilities are capable of meeting water demand/pressure requirements. In accordance with California law, a Water Supply Assessment should be required for projects that meet the size requirements specified in the regulations. In coordination with the local water provider, each project sponsor will identify specific on- and off-site improvements needed to ensure that impacts related to water supply and conveyance demand/pressure requirements are addressed prior to issuance of a certificate of occupancy. Water supply and conveyance demand/pressure clearance from the local water provider will be required at the time that a water connection permit application is submitted.

HWQ-3 Project sponsors should implement water conservation measures and use recycled or reclaimed water for appropriate end uses.

HWQ-4 Project sponsors should consult with the local water provider to identify feasible and reasonable measures to reduce water consumption.

HWQ-5 For any project that would increase the generation of wastewater, the facility must review diversion options for reusing the treated wastewater on-site, in lieu of discharge, where applicable and feasible.

Hydrology and Water Quality Mitigation Measures in the Final Program EIR for the 2016 AQMP

WQ-1 Local water agencies should continue to evaluate future water demand and establish the necessary supply and infrastructure to meet that demand, as documented in their Urban Water Management Plans.

WQ-2 Project sponsors should coordinate with the local water provider to ensure that existing or planned water supply and water conveyance facilities are capable of meeting water demand/pressure requirements. In accordance with State Law, a Water Supply Assessment should be required for projects that meet the size requirements specified in the regulations. In coordination with the local water provider, each project sponsor will identify specific on- and off-site improvements needed to ensure that impacts related to water supply and conveyance demand/pressure requirements are addressed prior to issuance of a certificate of occupancy. Water supply and conveyance demand/pressure clearance from the local water provider will be required at the time that a water connection permit application is submitted.

WQ-3 Project sponsors should implement water conservation measures and prioritize the use recycled water over potable or groundwater whenever available and appropriate for end uses.

WQ-4 Project sponsors should consult with the local water provider to identify feasible and reasonable measures to reduce water consumptions.

Cumulative Impacts

Analysis in the Final Program EIR for the 2022 AQMP

The Final Program EIR for the 2022 AQMP concluded that implementation of the 2022 AQMP could result in significant adverse water demand, water supply, and water quality impacts. While industrial facilities that may be impacted by the 2022 AQMP have industrial waste discharge permits and NPDES that may require modification, these permits include requirements for treatment, monitoring, and sampling, prior to discharge, to prevent significant water quality impacts. However, if any facility's existing wastewater treatment capacity is not sufficient such that physical modifications would need to be made, then based on the significance criteria, potentially significant water quality impacts would be expected. Therefore, while actions required to implement the 2022 AQMP were expected to result in additional pollutant loading over what is currently discharged because of permit limits, physical modifications to wastewater treatment and stormwater collection systems may be needed and therefore, would be expected to contribute to cumulative water quality impacts. When combined with the Connect SoCal Plan, the SIP strategies, state policies, and other past, present, and reasonably foreseeable activities, the 2022 AQMP would result in significant adverse water demand, water supply, and water quality impacts, and would contribute to cumulatively considerable impacts. No additional mitigation measures to reduce the significant cumulative impacts to water demand, water supply, and water quality were identified. Cumulative impacts to water demand, water supply, and water quality demand for past, present, and reasonably foreseeable future projects would remain significant and unavoidable.

Analysis in the Final Program EIR for the 2016 AQMP

The Final Program EIR for 2016 AQMP concluded that implementation of the 2016 AQMP control measures would result in significant adverse water demand impacts because the overall water demand would exceed the significance threshold of 262,820 gallons per day for potable water demand and five million gallons per day of total water demand. The 2016 AQMP control measures would result in significant adverse water demand impacts and, when combined with past, present, and reasonably foreseeable activities, and in particular with transportation projects projected in the 2016 RTP/SCS, would contribute to cumulatively considerable impacts to water demand identified in the 2016 RTP/SCS, therefore resulting in a significant cumulative impact. No additional mitigation measures to reduce the significant cumulative impacts to hydrology and water quality were identified. Cumulative impacts to hydrology and water quality from implementation of the 2016 AQMP would remain significant and unavoidable.

Noise

This section summarizes the potentially significant noise impacts from implementing the proposed PM2.5 Plan control measures which rely on previously adopted control measures in the 2022 AQMP and 2016 AQMP. The noise impacts for the 2022 AQMP and 2016 AQMP control measures were previously analyzed in the Final Program EIRs for the 2022 AQMP and the 2016 AQMP.

Significance Criteria

Noise impacts are significant if any of the following conditions occur:

- Construction noise levels exceed the local noise ordinances or, if the noise threshold is currently exceeded, project noise sources increase ambient noise levels by more than three decibels (dBA) at the site boundary. Construction noise levels will be considered significant if they exceed federal Occupational Safety and Health Administration (OSHA) noise standards for workers.

- The proposed project operational noise levels exceed any of the local noise ordinances at the site boundary or, if the noise threshold is currently exceeded, project noise sources increase ambient noise levels by more than three dBA at the site boundary.

Potential Impacts

The Final Program EIRs for the 2022 AQMP and the 2016 AQMP identified and evaluated the control measures that have the potential to generate noise impacts. Table VIII-9 lists the 2022 AQMP and 2016 AQMP control measures with potential adverse impacts to noise, control methodology, and potential impacts. The control measures are presented and organized in the same manner as in Table VIII-2.

TABLE VIII-9

AQMP CONTROL MEASURES WITH POTENTIAL NOISE IMPACTS

Control Measure Number	Control Methodology	Potential Noise Impact
R-CMB-01 in 2022 AQMP	Installation of zero emission water heaters and low NOx technologies (when zero emission is infeasible) in new and existing residences.	Removing older water heaters and installing zero emission water heaters and low NOx technologies (when zero emission is infeasible) in new and existing residences.
R-CMB-02 in 2022 AQMP	Installation of zero emission space heaters and low NOx technologies (when zero emission is infeasible) in new and existing residences.	Removing older residential space heaters and installing zero emission space heaters and low NOx technologies (when zero emission is infeasible) in new and existing residences.
R-CMB-03 in 2022 AQMP	Installation of electric cooking devices, induction cooktops, or low NOx burners in new and existing residences.	Removing older residential cooking devices and installing electric cooking devices, or induction cooktops, in new and existing residences.
R-CMB-04 in 2022 AQMP	Installation of zero emission or low NOx technologies in new and existing residences to replace equipment such as pool heaters, dryers, grills, etc.	Removing older pool heaters, dryers, grills etc. and installing zero emission or low NOx technologies in new and existing residences
L-CMB-04 in 2022 AQMP	Installation of zero emission and low NOx technology alternatives to emergency ICEs, and requiring the use of renewable diesel for emergency standby ICEs.	Removing older, emergency standby engines and installing zero emission and low NOx technology alternatives to emergency standby engines.
L-CMB-06 in 2022 AQMP	Replacement of boilers with lower-emitting turbines, installation of zero emission and low NOx emissions technologies, and the application of stricter emission requirements for diesel internal combustion engines.	Removing or decommissioning older boilers and installing lower-emitting turbines, or zero emission and low NOx emissions technologies
L-CMB-09 in 2022 AQMP	Installation of low NOx and ultra-low NOx burners for incinerators and other associated equipment.	Installing low NOx and ultra-low NOx burners for incinerators and other associated equipment.

TABLE VIII-9 (continued)
AQMP CONTROL MEASURES WITH POTENTIAL NOISE IMPACTS

Control Measure Number	Control Methodology	Potential Noise Impact
ECC-03 in 2022 AQMP	Incentivization of additional reductions in energy use associated with space heating, water heating, and other large residential energy sources through facilitating weatherization, replacing older appliances with highly efficient technologies and encouraging renewable energy adoption such as solar thermal and photovoltaics.	Removing older appliances and installing highly efficient technologies such as solar thermal heating and photovoltaic panels.
BCM-05 in 2016 AQMP	Installation and use of advanced catalyst technology for the conversion of ammonia	Potential temporary changes in noise volume due to construction activities needed for installation of equipment.
BCM-03 in 2016 AQMP	Reduction of track out from stationary sources by specifying street sweeping methods and frequency.	Increased street sweeping frequencies have the potential to increase noise frequency/volume.
BCM-06 in 2016 AQMP	Construction of exhaust ventilation to a fabric filter for permanent in building abrasive blasting activities and the use of additional portable equipment like negative air machines, fume extractors, and dust collectors with HEPA filters.	Potential temporary changes in noise volume due to construction activities needed for installation of equipment.
BCM-07 in 2016 AQMP	Installation of engineering controls, such as exhaust ventilation with dust collectors, the use of wet methods like wet-wiping or wet sweeping and vacuuming with a HEPA filter.	Potential temporary changes in noise volume due to construction activities needed for installation of equipment.
MCS-02 in 2022 AQMP	Mechanical thinning and chipping and grinding activities during fuel reduction and removal efforts.	Conducting mechanical thinning and chipping and grinding activities during fuel reduction and removal efforts.
MSC-01 in 2022 AQMP	Retrofitting existing equipment and installation of newer, lower-emitting equipment to replace older, higher-emitting equipment for sources as a result of new emission limits introduced through federal, state, or local regulations.	Retrofitting existing equipment and removing older, higher-emitting equipment and installing newer, lower-emitting equipment to for sources.

TABLE VIII-9 (continued)

AQMP CONTROL MEASURES WITH POTENTIAL NOISE IMPACTS

Control Measure Number	Control Methodology	Potential Noise Impact
EGM-01 in 2022 AQMP	Replacing or upgrading off-road construction equipment as part of development/redevelopment efforts may result in the use of zero emission technologies in construction, the installation of electrical and alternative fuel infrastructure, the use of alternative fuels; and the use construction equipment with low-emitting engines fitted with diesel particulate filters (DPFs).	Installing charging and alternative fueling infrastructure for the storage and dispensing of alternative fuels for use in replaced or upgraded offroad construction equipment.
EGM-03 in 2022 AQMP	Incentivizing the use of zero emission and low NOx equipment by adopting a voluntary measure for municipalities and public agencies to reduce emissions generated by construction activities may include use of zero emission and low NOx construction equipment, dust control, alternative fuels, DPF, low-emitting engines, and low VOC materials.	Installing charging and alternative fueling infrastructure for the storage and dispensing of alternative fuels for use in replaced or upgraded offroad construction equipment.
MOB-01 in 2022 AQMP	Infrastructure development required to achieve emission reductions at commercial marine ports from on-road heavy-duty vehicles, ocean-going vessels, cargo handling equipment, locomotives, and harbor craft.	Installing charging and alternative fueling infrastructure for the storage and dispensing of alternative fuels for use in on-road heavy-duty vehicles, ocean-going vessels, cargo handling equipment, locomotives, and harbor craft operating at commercial marine ports.
MOB-02A in 2022 AQMP	Infrastructure development required to achieve emission reductions at new rail yards and intermodal facilities from on-road heavy-duty vehicles, off-road equipment, and locomotives; and deploying the cleanest locomotives, switchers, on-road heavy-duty trucks, cargo-handling equipment, transportation refrigeration units available.	installing charging and alternative fueling infrastructure for the storage and dispensing of alternative fuels for use in on-road heavy-duty vehicles, off-road equipment, and locomotives. operating at new rail yards and intermodal facilities; and deploying the cleanest locomotives, switchers, on-road heavy-duty trucks, cargo-handling equipment, transportation refrigeration units available.

TABLE VIII-9 (continued)
AQMP CONTROL MEASURES WITH POTENTIAL NOISE IMPACTS

Control Measure Number	Control Methodology	Potential Noise Impact
MOB-02B in 2022 AQMP	Infrastructure development required to achieve emission reductions at existing rail yards and intermodal facilities from on-road heavy-duty vehicles, off-road equipment, and locomotives; and deploying the cleanest locomotives, switchers, on-road heavy-duty trucks, cargo-handling equipment, transportation refrigeration units available.	installing charging and alternative fueling infrastructure for the storage and dispensing of alternative fuels for use in on-road heavy-duty vehicles, off-road equipment, and locomotives. operating at new rail yards and intermodal facilities; and deploying the cleanest locomotives, switchers, on-road heavy-duty trucks, cargo-handling equipment, transportation refrigeration units available.
MOB-04 in 2022 AQMP	Deploying additional cleaner technologies, such as increasing efficiencies, implementing air quality improvement options or by deploying zero emission and low NOx technologies, alternative fuels, DPFs, and low-emitting engines for additional equipment beyond the commitments made in the existing Memoranda of Understanding with the commercial airports.	Installing charging and alternative fueling infrastructure for the storage and dispensing of alternative fuels for use in on-road heavy-duty vehicles, off-road equipment at commercial airports.
MOB-05 in 2022 AQMP	Accelerating the retirement of up to 2,000 light- and medium-duty vehicles per year through the Replace Your Ride Program and accelerating the penetration of zero and near–zero emission vehicles.	Retiring and scrapping up to 2,000 light- and medium-duty vehicles per year; and installing charging and alternative fueling infrastructure for the storage and dispensing of alternative fuels for use in zero and near–zero emission vehicles.
MOB-06 in 2022 AQMP	Retiring older, heavy-duty vehicles and replacing them with low NOx vehicles fueled with CNG or other alternative fuels (e.g., battery electric and hydrogen fuel cells).	Retiring and scrapping older, heavy-duty vehicles and installing charging and alternative fueling infrastructure for the storage and dispensing of alternative fuels for use in low NOx vehicles fueled with CNG or other alternative fuels (e.g., battery electric and hydrogen fuel cells).
MOB-07 in 2022 AQMP	Incentivizing the early deployment of zero emission and low NOx emission heavy-duty trucks through the generation of mobile source emission credits.	Retiring and scrapping older, heavy-duty vehicles and installing charging and alternative fueling infrastructure for the storage and dispensing of alternative fuels for use in low NOx vehicles fueled with CNG or other alternative fuels (e.g., battery electric and hydrogen fuel cells).

TABLE VIII-9 (concluded)
AQMP CONTROL MEASURES WITH POTENTIAL NOISE IMPACTS

Control Measure Number	Control Methodology	Potential Noise Impact
MOB-09 in 2022 AQMP	Promoting earlier and cleaner replacement or upgrade of existing passenger locomotives capable of achieving Tier 4 emission standards and supporting the development of zero emission or low NOx technologies (e.g., battery electric and hydrogen fuel cells).	Retiring and scrapping or retrofitting existing passenger locomotives so that they are capable of achieving Tier 4 emission standards; and installing charging and alternative fueling infrastructure for the storage and dispensing of alternative fuels for use zero emission or low NOx technologies (e.g., battery electric and hydrogen fuel cells).
MOB-10 in 2022 AQMP	Accelerating the deployment of zero (e.g., battery-electric or fuel cell powered equipment) and low NOx emission off-road mobile equipment (e.g., 90 percent cleaner than Tier 5) that do not receive public funding.	Retiring and scrapping off-road mobile equipment and installing charging and alternative fueling infrastructure for the storage and dispensing of alternative fuels for use in zero (e.g. battery-electric or fuel cell powered equipment) and low NOx emission off-road mobile equipment (e.g., 90 percent cleaner than Tier 5).

Analysis in the Final Program EIR for the 2022 AQMP

The Final Program EIR for the 2022 AQMP determined that the 2022 AQMP control measures list in Table VIII-9 have potential noise impacts due to construction and conducting mechanical thinning and chipping and grinding activities during fuel reduction and removal efforts.

Implementing the 2022 AQMP was expected to require construction activities that include: 1) installation of new equipment or devices; 2) removal of older equipment or devices; 3) modification or retrofit of existing equipment and facilities; and 4) modification of existing roadways to install new equipment and roadway infrastructure. The potential noise impact of construction activities would vary depending on the existing noise levels in the environment and the location of sensitive receptors (e.g., residences, hotels, hospitals, etc.) with respect to construction activities. Because no specific projects were proposed, the noise impacts were speculative. Potential modifications would occur at facilities typically located in appropriately zoned industrial or commercial areas, so construction noise impacts at stationary sources on sensitive receptors were expected to be less than significant. In addition, some of the control measures could result in minor construction activities that could create some minimal noise associated with replacing appliances such as water heaters, space heaters, cooking equipment, and pool heaters located in residential settings. Sources of noise for appliance replacement activities would be relatively brief and comprised of trucks delivering new appliances and hauling away old appliances, electronic hand trucks to maneuver the appliances to/from the truck to the residential location, and hand-tools to disconnect the old appliance and connect new appliance to the necessary electronic and plumbing components, as applicable. For these reasons, the Final Program EIR concluded that the construction noise impacts at residences would be less than significant.

The construction of roadway infrastructure would result in additional construction noise sources near transportation corridors, and it is not uncommon for residences and other sensitive receptors to be located within several hundred feet of the existing roadways, so noise levels associated with construction activities could increase three dBA or greater and generate potentially significant noise impacts, although temporary. Vibration from construction activities could exceed the 72 vibration decibels (VdB) threshold for structures and sensitive receptors within 200 feet of construction activities if certain types of construction equipment were used and so was considered potentially significant. Therefore, the Final Program EIR for the 2022 AQMP concluded that noise and vibration impacts during construction activities were potentially significant and mitigation measures NS-1 to NS-14 were crafted and adopted with the intent of minimizing thee significant noise and vibration impacts. However, the overall noise and vibration impacts during construction activities would remain significant after mitigation is applied.

Control measure MCS-02 of the 2022 AQMP was designed as a preventative measure to thin out forestland by chipping and grinding greenwaste and wood waste to reduce the amount of fuel available for wildfires. Once the chipping and grinding work is completed for the season, no new sources of permanent operational noise are expected. Thinning and chipping activities typically require the use of chainsaws, dozers, and chippers/grinders. The noise levels for this type of equipment ranging from 85 to 110 dBA (forestryequipmentguide.com, 2019). The thinning and chipping activities should not require blasting, pile driving, and heavy earthmoving, therefore should not generate significant vibrations. Further, the areas that are most likely to require additional thinning and chipping are in San Bernardino Urban Wildland Interface where there are few sensitive receptors. For areas in forestlands where sensitive receptors are present, the areas surrounding existing structures are already required to be periodically cleared of woodwaste and greenwaste in order to maintain a defensible space around any structures. Therefore, the Final Program EIR for the 2016 AQMP concluded that operational noise impacts due to chipping and grinding greenwaste and wood waste were less than significant.

Analysis in the Final Program EIR for the 2016 AQMP

The Final Program EIR for the 2016 AQMP determined that the 2016 AQMP control measures in Table VIII-9 would create potential noise impacts due to construction and the increased occurrence of street sweeping activities.

Potential noise impacts associated with control measures BCM-05, BCM-06, and BCM-07 of the 2016 AQMP relate primarily to construction activities which could include the construction related to the installation of air pollution control equipment (e.g., enclosures and filtration systems). Because no specific projects were proposed, the noise impacts were speculative. Nonetheless, construction activities associated with control measures in the 2016 AQMP could occur throughout the Basin. The 2016 AQMP may require existing commercial or industrial owners/operators of affected facilities to install air pollution control equipment of modify their existing operations to reduce stationary source emissions. Potential modifications would occur at facilities typically located in appropriately zoned industrial or commercial areas. Installing air pollution control equipment could generate noise impacts, but virtually all of the control equipment would be installed within industrial and commercial facilities, so that construction noise impacts at stationary sources on sensitive receptors were expected to be less than significant.

Street sweepers generally travel at slow speeds; so as to minimize traffic impacts, they are often used in the early morning or after peak hour traffic. The nominal operating speed for a street sweeper is about five miles per hour to ensure a thorough pickup of debris. In residential areas, street sweepers would likely be used during normal work hours as residential streets generally have less parking during these hours so the use of street sweepers on residential areas is generally conducted during the daytime. Street sweeping in commercial and industrial areas is generally conducted during off-peak hours to avoid traffic conflicts. Control measure BCM-03 of the 2016 AQMP was not expected to require new street sweeping in areas where there was no current street sweeping program in place. Instead, in areas that street sweeping was already conducted, the frequency when roads are swept may increase. The roads that were most likely to require additional sweeping are those located in industrial and commercial areas where sensitive receptors were typically not located. Therefore, because additional street sweeping was not expected to be required in residential or other noise-sensitive areas, additional street sweeping activities that may be required under control measure BCM-03 were not expected to result in significant noise impacts.

Mitigation Measures

The Final Program EIRs for the 2022 AQMP and the 2016 AQMP developed targeted mitigation measures based on project-specific impacts related to noise which were adopted in the Mitigation, Monitoring, and Reporting Plan which can be found in Attachment 1 to the Governing Board Resolution for the Final Program EIR for the 2022 AQMP and in the Mitigation, Monitoring, and Reporting Plan which can be found in Attachment 2 to the Governing Board Resolution for the Final Program EIR for the 2016 AQMP, respectively, and are applicable to the proposed PM2.5 Plan control measures. The following mitigation measures for the 2022 AQMP and the 2016 AQMP, respectively are applicable to the PM2.5 Plan control measures.

Noise Mitigation Measures in the Final Program EIR for the 2022 AQMP

NS-1 Install temporary noise barriers to protect sensitive receptors from excessive noise levels during construction.

NS-2 Schedule construction activities consistent within the allowable hours pursuant to the applicable general plan noise element or noise ordinance. For construction activities located near sensitive receptors, ensure noise-generating construction activities (including truck deliveries, pile driving, and blasting) are limited to the least noise-sensitive times of day (e.g., weekdays during the daytime hours). Where construction activities are authorized to occur outside of the limits established by the noise element of the general plan or noise ordinance, notify affected sensitive receptors and all parties who will experience noise levels in excess of the allowable limits for the specified land use, of the anticipated level of exceedance and duration of exceedance; and provide a list of protective measures that can be undertaken by the individual, including temporary relocation or use of hearing protective devices.

NS-3 Prohibit idling of construction equipment for extended periods of time in the vicinity of sensitive receptors.

NS-4 Post procedures and phone numbers at the construction site for notifying the Lead Agency staff, local Police Department, and construction contractor (during regular construction hours and off-hours), along with permitted construction days and hours, complaint procedures, and who to notify in the event of a problem.

NS-5 Notify neighbors and occupants within 300 feet of the project construction area at least 30 days in advance of anticipated times when noise levels are expected to exceed limits established in the noise element of the general plan or noise ordinance.

NS-6 Hold a preconstruction meeting with job inspectors and the general contractor/onsite project manager to confirm that noise measures and practices (including construction hours, neighborhood notification, posted signs, etc.) are completed.

NS-7 Designate an on-site construction complaint and enforcement manager for the project.

NS-8 Ensure that construction equipment is properly maintained per manufacturers' specifications and fitted with the best available noise suppression devices (e.g., improved mufflers, equipment redesign, use of intake silencers, ducts, engine enclosures, and acoustically attenuating shields or shrouds silencers, wraps). All intake and exhaust ports on power equipment shall be muffled or shielded.

NS-9 Use hydraulically or electrically powered tools (e.g., jack hammers, pavement breakers, and rock drills) for project construction to avoid noise associated with compressed air exhaust from pneumatically powered tools. However, where use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust should be used; this muffler can lower noise levels from the exhaust by up to about 10 dBA. External jackets on the tools themselves should be used, if such jackets are commercially available, and this could achieve a further reduction of 5 dBA. Quieter procedures should be used, such as drills rather than impact equipment, whenever such procedures are available and consistent with construction procedures.

NS-10 Locate fixed/stationary equipment (such as generators, compressors, rock crushers, and cement mixers) as far as possible from noise-sensitive receptors.

NS-11 Consider using flashing lights instead of audible back-up alarms on mobile equipment.

NS-12 For construction activities that require pile driving or other techniques that result in excessive noise or vibration, such as blasting, develop site-specific noise/vibration attenuation measures under the supervision of a qualified acoustical consultant.

NS-13 For construction activities at locations that require pile driving due to geological conditions, utilize quiet pile driving techniques such as predrilling the piles to the maximum feasible depth, where feasible. Predrilling pile holes will reduce the number of blows required to completely seat the pile and will concentrate the pile driving activity closer to the ground where pile driving noise can be shielded more effectively by a noise barrier/curtain.

NS-14 Monitor the effectiveness of noise reduction measures by taking noise measurements and installing adaptive mitigation measures to achieve the standards for ambient noise levels established by the noise element of the general plan or noise ordinance.

Cumulative Impacts

Analysis in the Final Program EIR for the 2022 AQMP

The Final Program EIR for the 2022 AQMP concluded that implementation of the 2022 AQMP could result in significant adverse noise and vibration impacts during construction because vibration from construction activities could exceed the 72 vibration decibels (VdB) threshold for structures and sensitive receptors within 200 feet of construction activities if certain types of construction equipment were used. When combined with the Connect SoCal Plan, the SIP strategies, state policies, and other past, present, and reasonably foreseeable activities, the 2022 AQMP would result in a significant increase to noise and vibration impacts during construction, and would contribute to cumulatively considerable impacts. No additional mitigation measures to reduce the significant cumulative impacts to noise and vibration during construction have been identified. Cumulative impacts to noise and vibration during construction for past, present, and reasonably foreseeable future projects would remain significant and unavoidable for noise and vibration.

Analysis in the Final Program EIR for the 2016 AQMP

The Final Program EIR for 2016 AQMP concluded that implementation of the 2016 AQMP control measures would result in significant adverse noise and vibration impacts; however, the specific 2016 AQMP control measures upon which the PM2.5 Plan relies would not cause significant adverse noise and vibration impacts. The Final Program EIR concluded that there are other 2016 AQMP control measures which would result in significant adverse noise and vibration impacts, however, and, when combined with past, present, and reasonably foreseeable activities, and in particular with transportation projects projected in the 2016 RTP/SCS, would contribute to cumulatively considerable impacts to noise and vibration impacts identified in the 2016 RTP/SCS, therefore resulting in a significant cumulative impact. No additional mitigation measures to reduce the significant cumulative impacts to noise were identified. Cumulative impacts to noise from implementation of the 2016 AQMP would remain significant and unavoidable.

Solid and Hazardous Waste

This section summarizes the potentially significant solid and hazardous waste impacts from implementing the proposed PM2.5 Plan control measures which rely on previously adopted control measures in the 2022 AQMP and 2016 AQMP. The solid and hazardous waste impacts for the 2022 AQMP and 2016 AQMP control measures were previously analyzed in the Final Program EIRs for the 2022 AQMP and the 2016 AQMP.

Significance Criteria

Solid and hazardous waste impacts are significant if the generation and disposal of hazardous and non-hazardous waste exceeds the capacity of designated landfills.

Potential Impacts

The Final Program EIRs for the 2022 AQMP and the 2016 AQMP identified and evaluated the control measures that have the potential to generate solid and hazardous waste impacts. Table VIII-10 lists the 2022 AQMP and 2016 AQMP control measures with potential adverse impacts to solid and hazardous waste, control methodology, and potential impacts. The control measures are presented and organized in the same manner as in Table VIII-2.

TABLE VIII-10
AQMP CONTROL MEASURES WITH POTENTIAL SOLID AND HAZARDOUS WASTE IMPACTS

Control Measure Number	Control Methodology	Potential Solid and Hazardous Waste Impact
R-CMB-01 in 2022 AQMP	Installation of zero emission water heaters and low NOx technologies (when zero emission is infeasible) in new and existing residences.	Generation of waste from construction activities and disposal of old equipment.
R-CMB-02 in 2022 AQMP	Installation of zero emission space heaters and low NOx technologies (when zero emission is infeasible) in new and existing residences.	Generation of waste from construction activities and disposal of old equipment.
R-CMB-03 in 2022 AQMP	Installation of electric cooking devices, induction cooktops, or low-NOx burners in new and existing residences.	Generation of waste from construction activities and disposal of old equipment.
R-CMB-04 in 2022 AQMP	Installation of zero emission or low NOx technologies in new and existing residences to replace equipment such as pool heaters, dryers, grills, etc.	Generation of waste from construction activities and disposal of old equipment.
L-CMB-04 in 2022 AQMP	Installation of zero emission and low NOx technology alternatives to emergency ICEs.	Generation of waste from construction activities and disposal of old equipment.
L-CMB-06 in 2022 AQMP	Replacement of boilers with lower-emitting turbines, installation of zero emission and low NOx emissions technologies, and the application of stricter emission requirements for diesel internal combustion engines.	Generation of waste from construction activities, installation and operation of new catalyst technologies, and disposal of any replaced machinery.

TABLE VIII-10 (continued)

AQMP CONTROL MEASURES WITH POTENTIAL SOLID AND HAZARDOUS WASTE IMPACTS

Control Measure Number	Control Methodology	Potential Solid and Hazardous Waste Impact
L-CMB-09 in 2022 AQMP	Installation of low NOx and ultra-low NOx burners for incinerators and other associated equipment.	Generation of waste from construction activities and disposal of old equipment.
ECC-03 in 2022 AQMP	Incentivization of additional reductions in energy use associated with space heating, water heating, and other large residential energy sources through facilitating weatherization, replacing older appliances with highly efficient technologies and encouraging renewable energy adoption such as solar thermal and photovoltaics.	Generation of waste from construction activities and disposal of old equipment.
BCM-04 in 2016 AQMP	Acidifier application, manure removal, manure slurry injection, manure thermal gasification, and dietary manipulation/feed additives.	Generation of additional waste matter from use of acidifiers and removal of manure.
BCM-05 in 2016 AQMP	Installation and use of advanced catalyst technology for the conversion of ammonia.	Generation of waste from installing and maintaining new catalyst technologies and disposal of any replaced machinery.
BCM-10 in 2016 AQMP	Controls such as anaerobic digestion and organic processing technology, and restrictions for direct applications of un-composted waste to public lands.	Generation of additional waste due to restrictions on application of uncomposted greenwaste.
BCM-01 in 2016 AQMP	Installation of control equipment such as ESPs, filters, centrifugal separators, and misters.	Generation of solid waste from disposal of old equipment.
BCM-02 in 2016 AQMP	Phased-in use of drift eliminators with 0.001 percent drift rate for existing cooling towers.	Generation of solid waste from disposal of old equipment.
BCM-03 in 2016 AQMP	Reduction of track out from stationary sources by specifying street sweeping methods and frequency.	Generation of waste from additional street sweeping activities.
BCM-06 in 2016 AQMP	Exhaust ventilation to a fabric filter for permanent in-building abrasive blasting activities, and use of additional portable control equipment, such as negative air machines, portable fume extractors and portable dust collectors with HEPA filters.	Generation of waste from portable control equipment such as dust collectors.
BCM-07 in 2016 AQMP	Dry and wet dust control options to control PM including silica particles.	Generation of waste from dust collection measures.

TABLE VIII-10 (continued)

AQMP CONTROL MEASURES WITH POTENTIAL SOLID AND HAZARDOUS WASTE IMPACTS

Control Measure Number	Control Methodology	Potential Solid and Hazardous Waste Impact
MCS-02 in 2022 AQMP	Mechanical thinning and chipping and grinding activities during fuel reduction and removal efforts.	Generation of additional mulch from chipping and grinding wood and greenwaste due to wildfire prevention.
BCM-09 in 2016 AQMP	Construction/upgrading of wood burning hearths to cleaner hearth as well as an increase in the stringency of the curtailment program and education.	Generation of waste from disposal of old hearths and additional limitations on wood burning.
MCS-01 in 2022 AQMP	Retrofitting existing equipment and installation of newer, lower-emitting equipment to replace older, higher-emitting equipment for sources as a result of new emission limits introduced through federal, state, or local regulations.	Generation of waste from construction activities, installation and operation of new catalyst technologies, and disposal of any replaced machinery.
EGM-01 in 2022 AQMP	Replacing or upgrading off-road construction equipment as part of development/redevelopment efforts may result in the use of zero emission technologies in construction, the installation of electrical and alternative fuel infrastructure, the use of alternative fuels; and the use construction equipment with low-emitting engines fitted with diesel particulate filters (DPFs).	Generation of solid waste from disposal of old equipment and DPFs.
EGM-03 in 2022 AQMP	Incentivizing the use of zero emission and low NOx equipment by adopting a voluntary measure for municipalities and public agencies to reduce emissions generated by construction activities may include use of zero emission and low NOx construction equipment, dust control, alternative fuels, DPF, low-emitting engines, and low VOC materials.	Generation of solid waste from disposal of old equipment and DPFs.
MOB-01 in 2022 AQMP	Infrastructure development required to achieve emission reductions at commercial marine ports from on-road heavy-duty vehicles, ocean-going vessels, cargo handling equipment, locomotives, and harbor craft.	Generation of waste from construction activities and disposal of old equipment and DPFs.

TABLE VIII-10 (continued)

AQMP CONTROL MEASURES WITH POTENTIAL SOLID AND HAZARDOUS WASTE IMPACTS

Control Measure Number	Control Methodology	Potential Solid and Hazardous Waste Impact
MOB-2A in 2022 AQMP	Infrastructure development required to achieve emission reductions at new rail yards and intermodal facilities from on-road heavy-duty vehicles, off-road equipment, and locomotives; and deploying the cleanest locomotives, switchers, on-road heavy-duty trucks, cargo-handling equipment, transportation refrigeration units available.	Generation of waste from construction activities and disposal of old equipment and DPFs.
MOB-2B in 2022 AQMP	Infrastructure development required to achieve emission reductions at existing rail yards and intermodal facilities from on-road heavy-duty vehicles, off-road equipment, and locomotives; and deploying the cleanest locomotives, switchers, on-road heavy-duty trucks, cargo-handling equipment, transportation refrigeration units available.	Generation of waste from construction activities and disposal of old equipment and DPFs.
MOB-04 in 2022 AQMP	Deploying additional cleaner technologies, such as increasing efficiencies, implementing air quality improvement options or by deploying zero emission and low NOx technologies, alternative fuels, DPFs, and low-emitting engines for additional equipment beyond the commitments made in the existing Memoranda of Understanding with the commercial airports.	Generation of waste from construction activities and disposal of old equipment and DPFs.
MOB-05 in 2022 AQMP	Accelerating the retirement of up to 2,000 light- and medium-duty vehicles per year through the Replace Your Ride Program and accelerating the penetration of zero and near–zero emission vehicles.	Generation of waste disposal of batteries and vehicle scrapping.
MOB-06 in 2022 AQMP	Retiring older, heavy-duty vehicles and replacing them with low NOx vehicles fueled with CNG or other alternative fuels (e.g., battery electric and hydrogen fuel cells).	Generation of waste disposal of batteries and vehicle scrapping.

TABLE VIII-10 (concluded)
AQMP CONTROL MEASURES WITH POTENTIAL SOLID AND HAZARDOUS WASTE IMPACTS

Control Measure Number	Control Methodology	Potential Solid and Hazardous Waste Impact
MOB-07 in 2022 AQMP	Incentivizing the early deployment of zero emission and low NOx emission heavy-duty trucks through the generation of mobile source emission credits.	Generation of waste disposal of batteries and vehicle scrapping.
MOB-08 in 2022 AQMP	Promoting the accelerated turn-over of in-use small off-road engines and other engines, such as gasoline- and diesel-powered commercial lawn and garden equipment through expanded voluntary exchange programs will contribute to the retirement of older off-road engines.	Generation of waste disposal of batteries and vehicle scrapping.
MOB-09 in 2022 AQMP	Promoting earlier and cleaner replacement or upgrade of existing passenger locomotives capable of achieving Tier 4 emission standards and supporting the development of zero emission or low NOx technologies (e.g., battery electric and hydrogen fuel cells).	Generation of waste disposal of batteries and vehicle scrapping.
MOB-10 in 2022 AQMP	Accelerating the deployment of zero (e.g., battery-electric or fuel cell powered equipment) and low NOx emission off-road mobile equipment (e.g., 90 percent cleaner than Tier 5) that do not receive public funding.	Generation of waste disposal of batteries and vehicle scrapping.

Analysis in the Final Program EIR for the 2022 AQMP

The Final Program EIR for the 2022 AQMP determined that the 2022 AQMP control measures listed in Table VIII-10 have potential solid and hazardous waste impacts due to the: 1) generation of waste from construction activities (including disposal of old equipment); 2) generation of waste from operational activities such as disposal of spent batteries and DPFs, and the installation and operation of new catalyst technologies; and 3) generation of mulch from chipping and grinding wood, and greenwaste.

<u>Summary of Construction Solid and Hazardous Waste Impacts</u>

In general, construction activities associated with installing air pollution control equipment and new industrial equipment (especially large equipment) could generate solid waste due to demolition and site preparation, grading, and excavating. Specifically, demolition activities could generate demolition waste while site preparation, grading, and excavating could uncover contaminated soils since the facilities affected by the proposed project that would require additional air pollution control equipment are located in existing industrial or commercial areas. Excavated soil, if found to be contaminated, would need to be characterized, treated, and disposed of offsite in accordance with applicable regulations. Where appropriate, the soil can be recycled for reuse if it is considered or classified as non-hazardous waste, or it can be disposed of at a landfill that accepts non-hazardous waste. Otherwise, the material will need to be disposed of at a hazardous waste facility.

Residential and commercial control measures identified as requiring construction activities will entail a combination of: 1) swapping out old appliances or equipment that rely on natural gas (e.g., water heaters, space heaters, cooking devices, clothes dryers, pool heaters, small I.C. engines and other small combustion devices) and replacing them with new, electrified or low NOx appliances or equipment at existing residential and commercial land uses; and 2) installing new, electrified or low NOx appliances as part of new residential and commercial developments. In general, the motivation for replacing existing appliances and equipment with new zero emission or low NOx technology which will be more energy efficient is due to the existing equipment having reached the end of its useful life and/or the cost of repairs exceeding the cost for a replacement. The motivation is stimulated further if financial incentives are offered, such as those offered by local utilities to install more energy efficient appliances; an existing appliance may be replaced sooner than the end of its useful life. For any appliance or equipment that is removed and replaced with new zero emission or low NOx technology, the removed appliance or equipment will either be dismantled with the metals sold as scrap, or if the removed appliance or equipment still works, it may be sold for re-use outside of the South Coast AQMD jurisdiction. Based upon these considerations, the residential and commercial control measures are expected to generate minimal quantities of construction waste that would need to be sent to a landfill.

Due to the uncertainty of the future capacity of the landfills within South Coast AQMD's jurisdiction and the broad scope of equipment that could undergo modifications or replacement, the solid and hazardous waste impacts from construction were concluded to be potentially significant and mitigation measures were required. Since the project-specific mitigation for solid and hazardous waste impacts are the same for waste generated during construction and operation, the mitigation measures follow the discussion of operational impacts.

Summary of Operational Solid and Hazardous Waste Impacts

An increased use of fuel cell and electric hybrid vehicles is correspondingly expected to reduce the use of conventional vehicles within California and the South Coast AQMD jurisdiction. Conventional vehicles use lead-acid batteries; therefore, a reduction in the use of conventional vehicles would lead to a reduction in use of lead-acid batteries. The increased operation of electric vehicles associated with the implementation of the 2022 AQMP may actually result in a reduction of the amount of solid and hazardous waste generated in the South Coast AQMD's jurisdiction, as Li-ion batteries have a much longer life span than conventional lead-acid batteries. The recycling of batteries is also required under law. Further some manufacturers pay for used electric vehicle batteries. The value, size, and length of life of Li-ion batteries are such that recycling is expected to be more predominant than with lead acid batteries. Therefore, the use of electric vehicles is not expected to result in an increase in the illegal or improper disposal of electric batteries. Further, batteries associated with electric cars are required to be diverted from landfills. Therefore, no significant increase in the disposal of hazardous or solid waste is expected due to increased use of electric vehicles.

A DPF is an exhaust aftertreatment device that traps diesel particulate matter as ash which are by-products of combustion engines that use diesel fuel. In order to reduce emissions from diesel engines, a DPF captures and stores exhaust soot, which must be periodically burned off to regenerate the filter media. The lifespan of a DPF varies based on the application and type of engine but can last from five to ten years or 10,000 or more hours of operation. During the regenerative process, no solid waste is generated. However, during the periodic cleaning of the DPF, the process involves manually removing the filter element from the housing and placing it in a cleaning station designed for this purpose. The ash is collected in the cleaning station and sent for disposal as solid waste. DPF ash is not specifically listed in the Federal Code of Regulations as a hazardous materials, but there may be metallic oxides in the ash which are hazardous to the environment and public health. Waste generators that operate DPF cleaning stations can either dispose of the DPF ash as hazardous waste or can have the waste tested using the Toxicity Characteristic Leaching Procedure (TCLP) which is a process that replicates the leaching process that would naturally occur when waste is buried in a municipal landfill. If the leachate contains any of the regulated contaminants at concentrations that are equal to or greater than the regulatory levels, then the DPF ash is considered hazardous waste. There are no hazardous waste landfills within the South Coast AQMD's jurisdiction. If the DPF ash is determined to be hazardous, the waste can be transported to permitted facilities located within and outside of California. There are two hazardous waste landfills in California: Clean Harbors landfill located in Buttonwillow and CWMI Kettleman Hills landfill in Kings County. The permitted capacity of Clean Harbors is in excess of 13 million cubic yards of waste material and the permitted capacity of CWMI Kettleman Hills is over 33 million cubic yards. Therefore, these two hazardous materials landfills would have sufficient capacity to handle the small amounts of waste that could be generated by ash collected from DPFs employed on equipment as part of implementing the proposed control measures. Therefore, the use of DPFs will generate less than significant levels of solid and hazardous waste in the form DPF ash which will need to be disposed of in either a municipal or hazardous waste landfill.

Selective catalytic reduction (SCR) technology is used to reduce NOx emissions from certain combustion sources, and requires periodic regeneration or replacement of the catalyst bed. Reuse and regeneration of catalyst is preferred due to the presence of precious metals in a variety of SCR catalysts and the cost of new catalyst; however, if the catalyst cannot be regenerated, the facilities are likely to haul the spent catalyst to a local cement manufacturing facility for recycling in lieu of disposal. The use of SCRs is expected to be limited to heavy industrial processes and not wide-spread. Therefore, due to the regeneration and recycling of catalysts used in SCRs and the fact that this technology is not expected to be widely used, less than significant impacts on solid and hazardous waste are expected.

The primary solid waste impact from retiring more vehicles as part of implementing the control measures is the accelerated replacement and disposal of equipment and parts earlier than the end of their useful life. It is important to note that control measures do not mandate that older vehicle, engines, or other equipment be scrapped. The control measures allow for a number of different control methods to achieve the desired emission reductions, and the most cost-effective methods would be expected to be implemented. Control measures that would foster a transition to putting new equipment into service will also generally result in the concurrent retirement of the older equipment. Alternatively, some measures may encourage the advanced deployment of cleaner technologies without waiting for an equipment's end of useful life which will result in an air quality benefit. Scrap metal from vehicle replacements is expected to be recycled; however, some amount of waste scrapped vehicles and parts may be sent to landfills for disposal. Although the recycling and diversion activities will reduce the amount of waste entering landfills, it is difficult to quantify the waste that will be generated from the early retirement of equipment or the salvageable amount that would be recycled. Therefore, the early retirement of equipment is to have significant solid and hazardous waste impacts since available landfill space is limited to approximately 100,000 tons per day and only four of the solid waste landfills within the South Coast AQMD's jurisdiction have capacity past 2039.

Wood and greenwaste that is collected, chipped, and ground is a class of organic mulch that may be spread at or near the site where the wood and greenwaste is collected, spread on private or governmental properties, or delivered to processing facilities for composting. Mulch is natural wildfire preventative because it helps retain moisture whereby reducing water consumption for adjacent plants, enhances soil temperature insulation, reduces invasive week propagation, improves erosion and dust control, and mitigates soil compaction. The most cost-effective approach to implementing control measure MCS-02 is if the mulch generated from chipping and grinding greenwaste and woodwaste is spread at or near the location where the greenwaste and woodwaste was originally collected. Under this scenario, the chipped and ground greenwaste and woodwaste would not need to be transported via heavy-duty trucks to offsite compost facilities for processing. In the unlikely event that the site location or other unique circumstances makes the spreading of the mulch at its source infeasible, the chipped and ground greenwaste and woodwaste would need to be transported to a compost facility for processing. Within the South Coast AQMD jurisdiction, approximately 70 composting facilities are currently operating. Based upon these considerations, the volume of chipped and ground greenwaste and woodwaste that would need to be taken to an offsite compost facility is likely to be minimal and less than significant.

Construction waste from the installation of air pollution control equipment and operational waste from the early retirement of equipment were identified as having potentially significant impacts. Therefore, the Final Program EIR for the 2022 AQMP concluded that solid and hazardous waste impacts are potentially significant and mitigation measures SHW-1 to SHW-3 were crafted and adopted with the intent of minimizing the significant solid and hazardous waste impacts. However, the overall solid and hazardous waste would remain significant after mitigation is applied.

Analysis in the Final Program EIR for the 2016 AQMP

The Final Program EIR for the 2016 AQMP determined that the 2016 AQMP control measures listed in Table VIII-10 have potential solid and hazardous waste impacts due to use of air pollution technologies and retirement of equipment.

Implementation of control measures BCM-01, BCM-03, BCM-04, BCM-06, and BCM-07 of the 2016 AQMP could require the collection and disposal of additional particulate matter. While it is speculative to identify the number of facilities and the quantity of equipment that would utilize filters, particulate traps, and precipitators, the quantity of particulate matter collected on filters and from electrostatic precipitators is expected to be small. In some cases, waste generated will be hazardous (e.g., the collection of toxic emissions). The increase in the amount of waste generated from the use of filters and the collection of additional particulate matter are expected to be small, because filtration control equipment is already used in practice or required by existing rules, especially for stationary sources. Control measures that may include filtration control equipment will generally require increased control efficiencies and/or better housekeeping and maintenance requirements for the filtration devices. As a result, the incremental amount of material collected by filters is expected to be small. Further, the larger filters used in baghouses are cleaned and reused so minimal additional waste would be expected from filters themselves. Non-hazardous waste can be disposed of at a number of landfills in southern California. At the time of writing the Final Program EIR for the 2016 AQMP, the permitted capacity of the landfills in Los Angeles, Orange, Riverside, and San Bernardino counties was about 112,592 tons per day and have sufficient capacity to handle the small increase in waste. There are no hazardous waste landfills within the Southern California area. Hazardous waste would be transported to permitted facilities both within and outside of California. Hazardous waste was expected to be transported to Clean Harbors in Buttonwillow, California. The permitted capacity at the Buttonwillow landfill was in excess of 10 million cubic yards so it would have sufficient capacity to handle any small amounts of hazardous waste that could be collected by the filters, baghouses, or ESPs (Clean Harbors, 2015). The nearest out-of-state hazardous waste landfills are U.S. Ecology, Inc., located in Beatty, Nevada and Clean Harbors in Grassy Mountain, Utah. U.S. Ecology, Inc. was receiving waste and in the process of extending the operational capacity for an additional 35 years (U.S. Ecology, 2015). Clean Harbors was receiving waste and expected to continue to receive waste for an additional 70 years (Clean Harbors, 2015).

Implementation of control measure BCM-05 of the 2016 AQMP could result in the use of SCR units to control emissions. SCRs require periodic regeneration or replacement of the catalyst bed. Regeneration of catalyst is preferred, due to the high cost to purchase new catalyst; however, if the catalyst cannot be regenerated, precious metals contained in the catalyst can be recovered. These metals could then be recycled and the remaining material would most likely need to be disposed of at a landfill. The use of SCRs was expected to be limited to stationary sources such as refineries and electric generation facilities, or other heavy industrial uses (e.g., ports) so that SCR use was not expected to be widespread. Due to the regeneration of catalysts used in SCRs and the fact that this technology was not expected to be widely used because of cost, the Final Program EIR concluded that no significant impacts relative to waste disposal activities would be expected.

Implementation of control measures BCM-01, BCM-02, and BCM-09 of the 2016 AQMP could result in solid waste impacts from older equipment being taken out of service in the Basin and scrapped and disposed of in landfills. During the scrapping process, recoverable materials (e.g. metal components) are removed and then sent for recovery of metal content. The amount of solid waste landfilled as a result of the proposed control measures would be relatively small since most of the parts being replaced have commercial value as scrap metal. Any small increase that may occur from miscellaneous parts is expected to be within the permitted landfill capacity so that no significant impacts would be expected.

Based on the preceding discussion, the Final Program EIR for the 2016 AQMP concluded that solid and hazardous waste impacts were less than significant. Since no significant solid and hazardous waste impacts were identified, no mitigation measures were necessary or required.

Mitigation Measures

Only the Final Program EIR for the 2022 AQMP developed targeted mitigation measures based on project-specific impacts related to solid and hazardous waste which were adopted in the Mitigation, Monitoring, and Reporting Plan which can be found in Attachment 1 to the Governing Board Resolution for the Final Program EIR for the 2022 AQMP and in the Mitigation, Monitoring, and Reporting Plan which can be found in Attachment 2 to the Governing Board Resolution for the Final Program EIR for the 2016 AQMP, respectively, and are applicable to the proposed PM2.5 Plan control measures. The following mitigation measures for the 2022 AQMP are applicable to the PM2.5 Plan control measures.

Solid and Hazardous Waste Mitigation Measures in the Final Program EIR for the 2022 AQMP

SHW-1 During the planning, design, and project-level CEQA review process for individual development projects, lead agencies shall coordinate with waste management agencies and the appropriate local and regional jurisdictions to facilitate the development of measures and to encourage diversion of solid waste such as recycling and composting programs, as needed. This includes discouraging siting of new landfills unless all other waste reduction and prevention actions have been fully explored to minimize impacts to neighborhoods.

SHW-2 The lead agency should coordinate with waste management agencies, and the appropriate local and regional jurisdictions, to develop measures to facilitate and encourage diversion of solid waste such as recycling and composting programs.

SHW-3 In accordance with CEQA Guidelines Sections 15091(a)(2) and 15126.4(a)(1)(B), a Lead Agency for a project should consider mitigation measures to reduce the generation of solid waste, as applicable and feasible. These may include the integration of green building measures consistent with CALGreen (California Building Code Title 24) into project design including, but not limited to the following:

1) Reuse and minimization of construction and demolition (C&D) debris and diversion of C&D waste from landfills to recycling facilities.

2) Include a waste management plan that promotes maximum C&D diversion.

3) Pursue source reduction through: a) the use of materials that are more durable and easier to repair and maintain; b) design to generate less scrap material through dimensional planning; c) increased recycled content; d) the use of reclaimed materials; and e) the use of structural materials in a dual role as finish material (e.g., stained concrete flooring, unfinished ceilings, etc.).

4) Reuse existing structure and shell in renovation projects.

5) Develop indoor recycling program and space.

6) Discourage the siting of new landfills unless all other waste reduction and prevention actions have been fully explored. If landfill siting or expansion is necessary, site landfills with an adequate landfill-owned, undeveloped land buffer to minimize the potential adverse impacts of the landfill in neighboring communities.

7) Discourage exporting locally generated waste outside of the southern California region during the construction and implementation of a project. Encourage disposal within the county where the waste originates as much as possible. Promote green technologies for long-distance transport of waste (e.g., clean engines and clean locomotives or electric rail for waste-by-rail disposal systems) and consistency with South Coast AQMD and Connect SoCal policies can and should be required.

8) Encourage waste reduction goals and practices and look for opportunities for voluntary actions to exceed the 80 percent waste diversion target.

9) Encourage the development of local markets for waste prevention, reduction, and recycling practices by supporting recycled content and green procurement policies, as well as other waste prevention, reduction and recycling practices.

10) Develop ordinances that promote waste prevention and recycling activities such as requiring waste prevention and recycling efforts at all large events and venues, implementing recycled content procurement programs, and developing opportunities to divert food waste away from landfills and toward food banks and composting facilities;

11) Develop and site composting, recycling, and conversion technology facilities that have minimum environmental and health impacts

12) Integrate reuse and recycling into residential industrial, institutional and commercial projects.

13) Provide education and publicity about reducing waste and available recycling services.

14) Implement or expand city or county-wide recycling and composting programs for residents and businesses. This could include extending the types of recycling services offered (e.g., to include food and green waste recycling) and providing public education and publicity about recycling services.

Cumulative Impacts

Analysis in the Final Program EIR for the 2022 AQMP

The Final Program EIR for the 2022 AQMP concluded that implementation of the 2022 AQMP could result in significant adverse solid and hazardous waste impacts because of potential increases in waste produced during construction and operation activities. When combined with the Connect SoCal Plan, the SIP strategies, state policies, and other past, present, and reasonably foreseeable activities, the 2022 AQMP would result in a significant increase in solid and hazardous waste, and would contribute to cumulatively considerable impacts. No additional mitigation measures to reduce the significant cumulative impacts to solid and hazardous waste have been identified. Cumulative impacts to solid and hazardous waste for past, present, and reasonably foreseeable future projects would remain significant and unavoidable for solid and hazardous waste.

Analysis in the Final Program EIR for the 2016 AQMP

The Final Program EIR for 2016 AQMP concluded that implementation of the 2016 AQMP control measures would result in less than significant impacts to solid and hazardous waste. However, when combined with past, present, and reasonably foreseeable activities, and in particular with transportation projects projected in the 2016 RTP/SCS, the 2016 AQMP would contribute to cumulatively considerable impacts to solid and hazardous waste identified in the 2016 RTP/SCS, therefore resulting in a significant cumulative impact. No additional mitigation measures to reduce the significant cumulative impacts to solid and hazardous waste were identified. Cumulative impacts to solid and hazardous waste from implementation of the 2016 AQMP would remain significant and unavoidable.

Transportation

This section summarizes the potentially significant transportation impacts from implementing the proposed PM2.5 Plan control measures which rely on previously adopted control measures in the 2022 AQMP and 2016 AQMP. The transportation impacts for the 2022 AQMP and 2016 AQMP control measures were previously analyzed in the Final Program EIRs for the 2022 AQMP and the 2016 AQMP.

Significance Criteria

Transportation impacts are significant if any of the following criteria apply:

- A major roadway is closed to all through traffic, and no alternate route is available.
- The project conflicts with applicable policies, plans or programs establishing measures of effectiveness, thereby decreasing the performance or safety of any mode of transportation or contributes to changes in overall vehicle miles traveled.
- There is an increase in vehicle miles traveled that is substantial in relation to the existing travel activity.

- Water borne, rail car or air traffic is substantially altered.
- Traffic hazards to motor vehicles, bicyclists or pedestrians are substantially increased.
- The need for more than 350 employees.
- An increase in heavy-duty transport truck traffic to and/or from the facility by more than 350 truck round trips per day.
- Increase customer traffic by more than 700 visits per day.

It is important to note that the significance criteria for transportation impacts was revised in 2019, after the 2016 AQMP was adopted. The revisions were made in accordance with the 2019 update to the CEQA Guidelines which migrated the focus of the transportation analysis from relying on a congestion-based metric referred to as Level of Service (LOS) to instead rely on a distance-based metric referred to Vehicle Miles Traveled (VMT). Prior to 2019, the following significance criteria were applied to transportation analyses, including the transportation analysis conducted in the Final Program EIR for the 2016 AQMP.

- Peak period levels on major arterials are disrupted to a point where level of service (LOS) is reduced to D, E, or F for more than one month.
- An intersection's volume to capacity ratio increase by 0.02 (two percent) or more when the LOS is already D, E or F.

Potential Impacts

The Notice of Preparation of a Draft Program EIR and Initial Study for the 2022 AQMP concluded that significant transportation impacts during construction or operation were not expected to occur due to implementation of the 2022 AQMP because the control measures were not expected to result in an increase in VMT. Because none of the 2022 AQMP control measures would cause a potentially significant impact to transportation, the discussion on transportation impacts only focuses on the effects of the 2016 AQMP control measures. Table VIII-11 lists the 2016 AQMP control measures with potential adverse impacts to transportation, control methodology, and potential impacts. The control measures are presented and organized in the same manner as in Table VIII-2.

TABLE VIII-11

AQMP CONTROL MEASURES WITH POTENTIAL TRANSPORTATION IMPACTS

Control Measure Number	Control Methodology	Potential Transportation Impact
BCM-04 in 2016 AQMP	Acidifier application, manure removal, manure slurry injection, manure thermal gasification, and dietary manipulation/feed additives.	Potential temporary changes in traffic pattern/volume due to operational impacts due to deliveries of sodium bisulfate and increased waste disposal.
BCM-05 in 2016 AQMP	Installation and use of advanced catalyst technology for the conversion of ammonia.	Potential temporary changes in traffic pattern/volume due to construction activities and operational impacts due to deliveries of catalyst and increased waste disposal.

TABLE VIII-11 (concluded)

AQMP CONTROL MEASURES WITH POTENTIAL TRANSPORTATION IMPACTS

Control Measure Number	Control Methodology	Potential Transportation Impact
BCM-03 in 2016 AQMP	Reduction of track out from stationary sources by specifying street sweeping methods and frequency.	Potential changes in traffic due to change in frequency of street sweeping activities.
BCM-06 in 2016 AQMP	Exhaust ventilation to a fabric filter for permanent in-building abrasive blasting activities, and use of additional portable control equipment, such as negative air machines, portable fume extractors and portable dust collectors with HEPA filters.	Potential temporary changes in traffic pattern/volume due to construction activities and operational impacts due to increased waste disposal.
BCM-07 in 2016 AQMP	Dry and wet dust control options to control PM including silica particles.	Potential temporary changes in traffic pattern/volume due to construction activities and operational impacts due to increased waste disposal.
BCM-09 in 2016 AQMP	Construction/upgrading of wood burning hearths to cleaner hearth as well as an increase in the stringency of the curtailment program and education.	Potential temporary changes in traffic pattern/volume due to construction activities and operational impacts due to increased waste disposal.

Analysis in the Final Program EIR for the 2016 AQMP

The Final Program EIR for the 2016 AQMP determined that the above 2016 AQMP control measures will cause potential temporary changes in traffic due to construction activities, and operational impacts due to deliveries of sodium bisulfate and catalyst, and increased waste disposal. There are also potential changes in traffic due to change in frequency of street sweeping activities.

Construction activities would generate traffic associated with construction worker vehicles and trucks delivering equipment, and materials and supplies to the project site during the duration of the construction activities. Additional traffic will be generated by the 2016 AQMP due to the need to transport increased waste for disposal (e.g., construction debris). Heavy construction equipment such as backhoes, cranes, cherry pickers, front end loaders, and other types of equipment would be used to carry out the construction activities. Construction activities would be expected to occur within or adjacent to existing roadways which could require lane closures to protect construction workers and avoid traffic conflicts. Therefore, the Final Program EIR for the 2022 AQMP concluded that traffic and transportation impacts due to construction, though temporary in nature, were potentially significant, mitigation measure TR-1 should be implemented to minimize significant traffic and transportation impacts, but overall traffic and transportation impacts due to construction after mitigation is applied would remain significant.

Additional traffic will be generated by the 2016 AQMP due to the need to transport increased waste for disposal (e.g., waste from air pollution control equipment, such as filters), and increased waste material for recycling (e.g., catalysts), increased use of products (e.g., ammonia, catalysts, sodium bisulfate). At the time of writing the Final Program EIR for the 2016 AQMP, it was not known what control strategies may be applied, which facilities may require additional trips, or how often these trips may be necessary. Therefore, no traffic estimates could be prepared. The impacts of the proposed project on traffic and transportation were expected to be significant prior to mitigation. While mitigation measures could help minimize some of the impacts, the South Coast AQMD cannot predict how a future lead agency might choose to mitigate a particular significant traffic and transportation impact. Thus, the future traffic and transportation impacts were considered to be significant due to implementation of the 2016 AQMP control measures.

Mitigation Measure

The Final Program EIR for the 2016 AQMP developed a targeted mitigation measure based on project-specific impacts related to transportation.

Transportation Mitigation Measure in the Final Program EIR for the 2016 AQMP

TR-1 Develop a construction management plan that includes at least the following items and requirements, if determined to be feasible by the Lead Agency:

- A set of comprehensive traffic control measures, including scheduling of major truck trips and deliveries to avoid peak traffic hours, detour signs if required, lane closure procedures, signs, cones for drivers, and designated construction access routes;
- Notification procedures for adjacent property owners and public safety personnel regarding when major deliveries, detours, and lane closures will occur;
- Location of construction staging areas for materials, equipment, and vehicles at an approved location;
- A process for responding to and tracking complaints pertaining to construction activity, including identification of an onsite complaint manager. The manager shall determine the cause of the complaints and shall take prompt action to correct the problem. The Lead Agency shall be informed who the Manager is prior to the issuance of the first permit;
- Provision for accommodation of pedestrian flow;
- As necessary, provision for parking management and spaces for all construction workers to ensure that construction workers do not park in street spaces;
- Any damage to the street caused by heavy equipment, or as a result of this construction, shall be repaired, at the project sponsor's expense, within one week of the occurrence of the damage (or excessive wear), unless further damage/excessive wear may continue; in such case, repair shall occur prior to issuance of a final inspection of the building permit. All damage that is a threat to public health or safety shall be repaired immediately. The street shall be restored to its condition prior to the new construction as established by the Lead Agency (or other appropriate government agency) and/or photo

documentation, at the sponsor's expense, before the issuance of a Certificate of Occupancy;

- Any heavy equipment brought to the construction site shall be transported by truck, where feasible;
- No materials or equipment shall be stored on the traveled roadway at any time;
- Prior to construction, a portable toilet facility and a debris box shall be installed on the site, and properly maintained through project completion;
- All equipment shall be equipped with mufflers;
- Prior to the end of each work-day during construction, the contractor or contractors shall pick up and properly dispose of all litter resulting from or related to the project, whether located on the property, within the public rights-of-way, or properties of adjacent or nearby neighbors; and
- Promote “least polluting” ways to connect people and goods to their destinations.

Cumulative Impacts

Analysis in the Final Program EIR for the 2016 AQMP

The Final Program EIR for 2016 AQMP concluded that implementation of the 2016 AQMP control measures would result in significant adverse transportation impacts due to construction activities and operational impacts due to deliveries of sodium bisulfate and catalyst, and increased waste disposal. Mitigation measure TR-1 was crafted and adopted with the intention of reducing the transportation impacts during construction. However, the transportation impacts during construction would remain significant after mitigation is applied. No mitigation measures were identified for operational transportation impacts. The 2016 AQMP control measures would result in significant adverse transportation impacts and when combined with past, present, and reasonably foreseeable activities, and in particular with transportation projects projected in the SCAG 2016 RTP/SCS, would contribute to cumulatively considerable impacts to air quality identified in the 2016 RTP/SCS. No additional mitigation measures to reduce the significant cumulative impacts to transportation were identified. Cumulative impacts to transportation from implementation of the 2016 AQMP would remain significant and unavoidable.

Other Environmental Topic Areas

The Final Program EIR for the 2022 AQMP concluded that implementation of the 2022 AQMP control measures would either have no impacts or less than significant impacts for the following environmental topic areas: aesthetics, agriculture and forestry resources, biological resources, cultural and tribal cultural resources, geology and soils, land use and planning, mineral resources, population and housing, public services, recreation, transportation, and wildfire. Implementation of the PM2.5 Plan control measures whose proposed methods of control are the same as the corresponding 2022 AQMP control measures they rely on, will similarly have no impacts or less than significant impacts on the aforementioned environmental topic areas.

The Final Program EIR for the 2016 AQMP concluded that implementation of the 2016 AQMP control measures would either have no impacts or less than significant impacts for the following environmental topic areas: agriculture and forestry resources, biological resources, cultural resources; energy; geology and soils; land use and planning; mineral resources; population and housing; public services and recreation. Implementation of the PM2.5 Plan control measures whose proposed methods of control are the same as the corresponding 2016 AQMP control measures they rely on, will similarly have no impacts or less than significant impacts on the aforementioned environmental topic areas.

The Final Program EIR for the 2016 AQMP analyzed potential impacts to aesthetics from 2016 AQMP control measures that the PM2.5 Plan is not relying on. Aesthetics impacts during construction and operation were concluded to be potentially significant and mitigation measures were adopted. While mitigation was intended to minimize significant aesthetics impacts during construction and operation, the analysis concluded that the overall aesthetics impacts would remain significant after mitigation is applied.

Environmental Impact Analysis of Additional Physical Changes from Control Measure BCM-12 of the PM2.5 Plan

Proposed control measure BCM-12 in the PM2.5 Plan proposes a future amendment to South Coast AQMD Rule 1138 – Control of Emissions From Restaurant Operations to make the exemption criteria applicable to chain-driven charbroilers in paragraph (e)(1), more stringent by providing an option for the owner or operator to either accept a permit condition limiting the amount of meat cooked per week from 875 pounds to 400 pounds or install integrated catalytic oxidizer technology. By comparison, control measure BCM-01 of the 2016 AQMP contemplated reliance on add-on air pollution control equipment and devices such as such as ESPs, filters, centrifugal separators, and misters for under-fired charbroilers in order to achieve reductions in PM.

The potential for increased deployment of PM control equipment for under-fired charbroilers and the potential environmental impacts associated with the installation and operation of the aforementioned PM control equipment were analyzed in the Final Program EIR for the 2016 AQMP.

Implementation of BCM-12 of the PM2.5 Plan is expected to result in the potential installation and operation of catalytic oxidizers for certain chain-driven charbroilers that were either not originally manufactured with a catalytic oxidizer or equivalent or more stringent PM control equipment or device. Therefore, the potential retrofit of chain-driven charbroilers with catalytic oxidizers is the only new physical change anticipated from implementing control measure BCM-12 of the PM2.5 Plan that was not previously contemplated or analyzed in the Final Program EIR for the 2016 AQMP.

Rule 1138 requires that no person shall operate an existing or new chain-driven charbroiler unless it is equipped and operated with a catalytic oxidizer control device or other control device or method if found to be as or more effective than the catalytic oxidizer in reducing PM and VOC emissions. South Coast AQMD therefore certifies charbroilers with integrated catalytic oxidizers.[11] The two most common catalysts available are the BASF CHARCat™ and Nieco Incendalyst™.

The BASF CHARCat™ 900 and 910 catalyst beds sit atop the charbroiler unit, and are no more than 25 inches long by 25 inches wide by four inches high. The catalyst is encased in a food grade stainless steel frame with heavy duty stainless steel protective screens on both faces. No utility hookup is required as the broiler exhaust heat directs the PM emissions through the catalytic oxidizer. Cleaning and maintenance involves soaking the catalyst in warm water to remove built-up residue, but other manufacturer-specified cleaning materials may be used as well.[12] Because the catalytic oxidizer is small in size and connected to the charbroiler unit itself, and catalyst bed is removed regularly for maintenance, installation of the catalytic oxidizer is not expected to require construction equipment other than hand tools.

The Nieco Incendalyst™ catalyst bed also sits directly on top of the charbroiler unit. The catalyst is encased in a stainless steel frame. No utility hookup is required as the broiler exhaust heat directs the PM emissions through the catalytic oxidizer. Maintenance is minimal and includes daily rinsing with hot water and no chemicals. No special tools are required for detaching the catalyst bed from the charbroiler; when cool to the touch, it can be manually lifted and removed.[13,14] Similar to the BASF CHARCat™, installation of Nieco Incendalyst™ catalyst is minimal and not expected to require construction equipment other than hand tools.

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[11] South Coast AQMD, South Coast AQMD Certified Charbroilers with Integrated Catalysts, May 2023. https://www.aqmd.gov/docs/default-source/permitting/product-certification/charbroilerscatalysts.pdf

[12] BASF, Technical data sheets for catalyst technology, 2007. www.icac.com/resource/resmgr/greenhouse_gas_controls/basf_products_overview_07270.pdf

[13] Nieco, The IncendalystTM, Accessed on March 18, 2024. https://nieco.com/wp-content/uploads/2015/12/Incendalyst2019.pdf

[14] Nieco, Simple Tips on How to Maintain Your Nieco Broiler's Incendalyst™, February 2018. https://nieco.com/blog/your-broilers-incendalyst-maintenance/

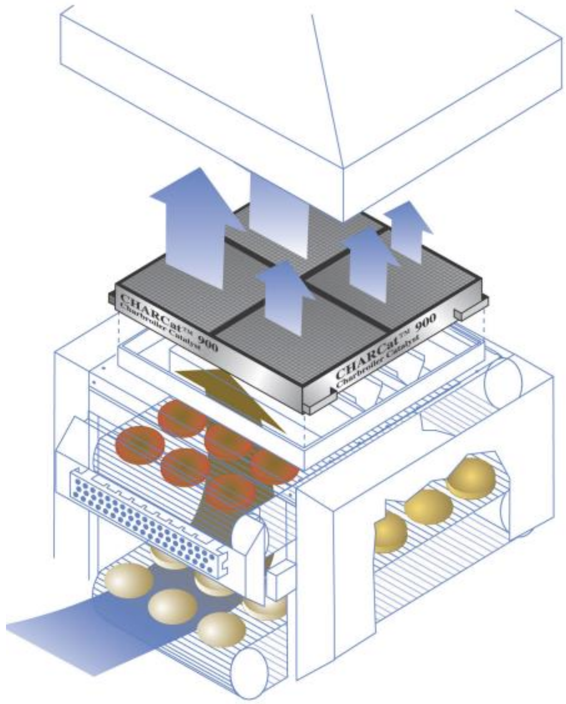

Figure VIII-1
BASF CHARCat^{TM} 900

Figure VIII-2
Nieco Incendalyst™

Other chain-driven charbroiler catalytic oxidizers are expected to be installed and operated in a similar manner as the BASF CHARCat™ and Nieco Incendalyst™, resulting in similar physical changes and minimal environmental impacts.

The following sections examine the potential environmental impacts from installing and operating catalytic oxidizers on chain-driven charbroilers, and identify whether any changes are necessary to the prior analysis and conclusion of the impacts relating to control measure BCM-01 of the 2016 AQMP upon which the PM2.5 Plan relies for control measure BCM-12.

Air Quality and Greenhouse Gas Emissions

Summary of Construction Air Quality Impacts

Catalytic oxidizers can be installed primarily with hand tools so little to no construction emissions are expected. In addition, the installation is expected to be accomplished by existing restaurant staff such that no additional worker trips are generated. Therefore, implementation of control measure BCM-12 of the PM2.5 Plan will have no air quality impacts during construction. For this reason, the conclusion in the Final Program EIR for the 2016 AQMP that construction air quality impacts are potentially significant, will remain unchanged if control measure BCM-12 is implemented.

Summary of Operational Air Quality Impacts

Catalytic oxidizers sit on top of charbroiler units such that exhaust heat from the charbroilers will direct PM through the catalyst bed. Since the functionality of the catalytic oxidizers solely rely on the natural air draft instead of blowers, for example, no electrical connections would be needed. Since no electricity would be utilized, no air emissions associated with electricity generation would be expected. Maintenance of the catalyst beds requires manually rinsing or soaking with water so no impacts to air quality would be expected. For these reasons, no adverse operational air quality impacts are expected. Further, because the catalytic oxidizers will reduce PM and VOC emissions from chain-driven charbroiler units (though the PM2.5 Plan is only claiming credits for PM reductions for this control measure), an air quality benefit will be expected if control measure BCM-12 of the PM2.5 Plan is implemented. Thus, the overall conclusion in the Final Program EIR for the 2016 AQMP that operational air quality impacts are less than significant would not be adversely affected if control measure BCM-12 of the PM2.5 Plan is implemented.

Summary of Greenhouse Gas Emissions Impacts

As explained in the preceding summary of construction air quality impacts, catalytic oxidizers can be installed primarily with hand tools so little to no construction emissions, including GHG emissions, are expected. Since a catalytic oxidizer is sited atop of the charbroiler, its functionality solely relies on the natural air draft instead of blowers, for example; thus, no electrical connections would be needed. Since no electricity would be utilized, no emissions of air pollutants, including GHGs, emissions, that would ordinarily be associated with electricity generation would be expected if control measure BCM-12 of the

PM2.5 Plan is implemented. Further, while catalytic oxidizers are capable of reducing PM and VOC emissions, this technology is not capable of controlling or reducing GHG emissions. Therefore, no benefit of reducing GHG emissions would be expected. Thus, the overall conclusion in the Final Program EIR for the 2016 AQMP that GHG impacts are less than significant would not be adversely affected by the implementation of control measure BCM-12.

The overall conclusion in the Final Program EIR for the 2016 AQMP that air quality impacts during construction would be significant and unavoidable would not be adversely affected by the implementation of control measure BCM-12. Because installation and operation of catalytic oxidizers will not contribute to any new air quality and GHG impacts, or make existing air quality and GHG impacts more severe, no additional mitigation measures will be required. Nonetheless, the overall conclusion of significant air quality and GHG impacts in Final Program EIR for the 2016 AQMP will remain unchanged if BCM-12 is implemented.

Relative to cumulative impacts, the Final Program EIR for the 2016 AQMP concluded that implementation of the 2016 AQMP, when combined with past, present, and reasonably foreseeable activities, and in particular with transportation projects projected in the 2016 RTP/SCS, would contribute to air quality during construction, but would not contribute to cumulatively considerable impacts to air quality during operation or GHG emissions.

However, since implementation of control measure BCM-12 of the PM2.5 Plan is expected to have no air quality impacts during construction and GHG emissions, and a net benefit to air quality during operation, there are no new impacts which would change the previous conclusions of the Final Program EIR for the 2016 AQMP regarding cumulatively considerable impacts to air quality. Further, no new mitigation measures would be required. Therefore, the cumulative impacts to air quality would remain significant and unavoidable.

Energy

As explained in the preceding section which discussed air quality and GHG impacts, a catalytic oxidizer sits atop of the charbroiler such that the natural draft caused by the heat of the exhaust will direct PM generated from charbroiling meat through the catalyst bed without the use of electricity. Therefore, implementation of control measure BCM-12 of the PM2.5 Plan will not cause any adverse energy impacts.

Thus, the overall conclusion in the Final Program EIR for the 2016 AQMP that energy impacts would be potentially significant would not be adversely affected by the implementation of control measure BCM-12. Because installation and operation of catalytic oxidizers will not contribute to any new energy impacts or make existing energy impacts more severe, no additional mitigation measures will be required. Nonetheless, the overall conclusion of significant energy impacts in Final Program EIR for the 2016 AQMP will remain unchanged if BCM-12 is implemented.

Relative to cumulative impacts, the Final Program EIR for the 2016 AQMP concluded that implementation of the 2016 AQMP, when combined with past, present, and reasonably foreseeable activities, and in particular with transportation projects projected in the 2016 RTP/SCS, would contribute to cumulatively considerable impacts to energy demand.

However, since implementation of control measure BCM-12 of the PM2.5 Plan is expected to have no impact to energy demand, there are no new impacts which would change the previous conclusions of the Final Program EIR for the 2016 AQMP regarding cumulatively considerable impacts to energy. Further, no new mitigation measures would be required. Therefore, the cumulative impacts to energy remain significant and unavoidable.

Hazards and Hazardous Materials

Catalytic oxidizers are designed for use in the restaurant setting; their operation and use are not expected to cause non-compliance with any safety standard nor expose people to hazardous chemicals. The catalyst is encased in a stainless-steel frame and is not intended to be removed from its casing. Maintenance is minimal and includes daily rinsing with water. No special tools are required for detaching the catalyst bed from the charbroiler; when cool to the touch, it can be manually lifted and removed. Therefore, implementation of control measure BCM-12 of the PM2.5 Plan will have no impact to hazards and hazardous materials.

Thus, the overall conclusion in the Final Program EIR for the 2016 AQMP that hazards and hazardous materials impacts would be potentially significant would not be adversely affected by the implementation of control measure BCM-12. Because installation and operation of catalytic oxidizers will not contribute to any new hazards and hazardous materials impacts, additional mitigation measures will not be required. Nonetheless, the overall conclusion of significant hazards and hazardous materials impacts in the in Final Program EIR for the 2016 AQMP will remain unchanged if BCM-12 is implemented.

Relative to cumulative impacts, the Final Program EIR for the 2016 AQMP concluded that implementation of the 2016 AQMP, when combined with past, present, and reasonably foreseeable activities, and in particular with transportation projects projected in the 2016 RTP/SCS, would contribute to cumulatively considerable impacts to hazards and hazardous materials due to fire hazards, use of liquified natural gas and ammonia, and use of hazardous materials near sensitive receptors.

However, since implementation of control measure BCM-12 of the PM2.5 Plan is expected to have no impacts to hazards and hazardous materials, there are no new impacts which would change the previous conclusions of the Final Program EIR for the 2016 AQMP regarding cumulatively considerable impacts to hazards and hazardous materials. Further, no new mitigation measures would be required. Therefore, the cumulative impacts to hazards and hazardous materials remain significant and unavoidable.

Hydrology and Water Quality

Similar to the end-of-day cleaning of the charbroiler unit itself, maintenance of the catalytic oxidizer unit requires soaking or daily rinsing of the catalyst with warm water. For context, the size of the catalyst is relatively small at approximately 25 inches long by 25 inches wide by four inches high, which is equivalent to 1.4 cubic feet and is capable of fitting inside a 10-gallon capacity wash bucket. If the catalyst is soaked in the bucket, approximately 10 gallons of additional water per day per restaurant would be needed for cleaning purposes. It is more likely that the catalyst bed will be rinsed in the same manner that dishes are rinsed, and this method uses less water. For these reasons, the quantity of additional wastewater generated from cleaning the catalyst is expected to be minimal with little impact on the capacity of existing wastewater treatment facilities. The composition of the wastewater from cleaning the catalyst is also expected to contain fats and oils from the cooked meats which will be the same or similar composition as the wastewater from cleaning the charbroiler itself, which is typical from existing restaurants operating charbroilers. Since the wastewater from cleaning the catalyst is expected to be similar to other wastewater already generated at charbroiler restaurants as part of their daily hygienic cleaning routines, no modification to industrial wastewater permits would be expected. Future rule development and amendments to Rule 1138 will provide more details regarding the number of catalytic oxidizers that would be installed and operated, and corresponding impact to hydrology and water quality. Nonetheless, operation of catalytic oxidizers is expected to have less than significant impact to hydrology and water quality. Hence, implementation of control measure BCM-12 of the PM2.5 Plan is not expected to cause any adverse hydrology and water quality impacts.

Thus, the overall conclusion in the Final Program EIR for the 2016 AQMP that hydrology and water quality impacts would be potentially significant would not be adversely affected by the implementation of control measure BCM-12. Because installation and operation of catalytic oxidizers will not make hydrology and water quality impacts significantly worse, no additional mitigation measures will be required. Nonetheless, the overall conclusion of significant hydrology and water quality impacts in Final Program EIR for the 2016 AQMP will remain unchanged if BCM-12 is implemented.

Relative to cumulative impacts, the Final Program EIR for the 2016 AQMP concluded that implementation of the 2016 AQMP, when combined with past, present, and reasonably foreseeable activities, and in particular with transportation projects projected in the 2016 RTP/SCS, would contribute to cumulatively considerable impacts to water demand.

However, since implementation of control measure BCM-12 of the PM2.5 Plan is expected to have minimal to no impact to water demand, there are no new impacts which would change the previous conclusions of the Final Program EIR for the 2016 AQMP regarding cumulatively considerable impacts to hydrology and water quality. Further, no new mitigation measures would be required. Therefore, the cumulative impacts to hydrology and water quality remain significant and unavoidable.

Noise

Installation of catalytic oxidizers is expected to be accomplished with hand tools which could generate additional minimal, temporary noise inside the restaurant; however, any such noise is not expected to be noticeable outside of the restaurant and will likely be indistinguishable from the background noise levels. Since catalytic oxidizers operate passively by only relying on the natural draft of the exhaust from the charbroiler, no noise is expected from the catalytic oxidizer after it is installed and operational. Therefore, implementation of control measure BCM-12 of the PM2.5 Plan will have minimal to no impact on noise.

Thus, the overall conclusion in the Final Program EIR for the 2016 AQMP that noise impacts would be potentially significant would not be adversely affected by the implementation of control measure BCM-12. Because installation and operation of catalytic oxidizers will not contribute to any new noise impacts or make existing noise impacts more severe, no additional mitigation measures will be required. Nonetheless, the overall conclusion of significant noise impacts in Final Program EIR for the 2016 AQMP will remain unchanged if BCM-12 is implemented.

Relative to cumulative impacts, the Final Program EIR for the 2016 AQMP concluded that implementation of the 2016 AQMP, when combined with past, present, and reasonably foreseeable activities, and in particular with transportation projects projected in the 2016 RTP/SCS, would contribute to cumulatively considerable impacts to noise and vibration during construction and noise during operation.

However, since implementation of control measure BCM-12 of the PM2.5 Plan is expected to have no impact to noise, there are no new impacts which would change the previous conclusions of the Final Program EIR for the 2016 AQMP regarding cumulatively considerable impacts to noise. Further, no new mitigation measures would be required. Therefore, the cumulative impacts to noise remain significant and unavoidable.

Solid and Hazardous Waste

Maintenance of the catalyst requires rinsing or soaking with water; no additional solid or hazardous waste is expected to be generated with operation of the catalytic oxidizers. At the end of useful life, catalytic oxidizer parts are expected to be sold and repurposed: the stainless-steel metal housing of the catalyst bed will likely be sold as recycled scrap metal, and the catalyst recycled due to containing precious metals. Minimal to no waste is expected to be sent do a landfill. Therefore, implementation of control measure BCM-12 of the PM2.5 Plan will have no impact to solid and hazardous waste.

Thus, the overall conclusion in the Final Program EIR for the 2016 AQMP that solid and hazardous waste impacts would be potentially significant would not be adversely affected by the implementation of control measure BCM-12. Because installation and operation of catalytic oxidizers will not contribute to any new solid and hazardous waste impacts or make existing solid and hazardous waste impacts more severe, no additional mitigation measures will be required. Nonetheless, the overall conclusion of significant solid and hazardous waste impacts in Final Program EIR for the 2016 AQMP will remain unchanged if BCM-12 is implemented.

Relative to cumulative impacts, the Final Program EIR for the 2016 AQMP concluded that implementation of the 2016 AQMP, when combined with past, present, and reasonably foreseeable activities, and in particular with transportation projects projected in the 2016 RTP/SCS, would contribute to cumulatively considerable impacts to solid and hazardous waste from construction and vehicle scrapping.

However, since implementation of control measure BCM-12 of the PM2.5 Plan is expected to generate minimal to no waste that will be sent to landfills, there are no new impacts which would change the previous conclusions of the Final Program EIR for the 2016 AQMP regarding cumulatively considerable impacts to solid and hazardous waste. Further, no new mitigation measures would be required. Therefore, the cumulative impacts to solid and hazardous waste remain significant and unavoidable.

Transportation

As explained the in preceding section about the air quality impacts during construction, aside from the initial, one-time delivery of the catalytic oxidizer to the restaurant, the installation of the catalytic oxidizer is expected to be accomplished by existing restaurant staff onsite such that no additional worker trips are expected. Further, once installed and operational, no additional trips associated with maintenance will be expected. Therefore, implementation of control measure BCM-12 of the PM2.5 Plan will have minimal to no impact on transportation.

Thus, the overall conclusion in the Final Program EIR for the 2016 AQMP that transportation impacts would be potentially significant would not be adversely affected by the implementation of control measure BCM-12. Because installation and operation of catalytic oxidizers will not contribute to transportation impacts, no additional mitigation measures will be required. Nonetheless, the overall conclusion of significant transportation impacts in Final Program EIR for the 2016 AQMP will remain unchanged if BCM-12 is implemented.

Relative to cumulative impacts, the Final Program EIR for the 2016 AQMP concluded that implementation of the 2016 AQMP, when combined with past, present, and reasonably foreseeable activities, and in particular with transportation projects projected in the 2016 RTP/SCS, would contribute to cumulatively considerable impacts to transportation.

However, since implementation of control measure BCM-12 of the PM2.5 Plan is expected to have minimal to no impact to transportation, there are no new impacts which would change the previous conclusions of the Final Program EIR for the 2016 AQMP regarding cumulatively considerable impacts to transportation. Further, no new mitigation measures would be required. Therefore, the cumulative impacts to transportation remain significant and unavoidable.

Other Environmental Topic Areas

Catalytic oxidizers sit atop of the charbroiler units within restaurants, and no major physical changes are expected to the restaurants nor the land the restaurants are located on. Therefore, implementation of control measure BCM-12 of the PM2.5 Plan will have no impact to aesthetics, agriculture and forestry resources, biological resources, cultural and tribal cultural resources, geology and soils, land use and planning, mineral resources or wildfires. Use of catalytic oxidizers at restaurants is designed to reduce air pollutants and as such is not expected to adversely affect the population nor the resources impacting quality of life. Therefore, implementation of control measure BCM-12 of the PM2.5 Plan will have no impact to population and housing, public services, and recreation.

Thus, the overall conclusions in the Final Program EIR for the 2016 AQMP that aesthetics impacts would be potentially significant and impacts to all other environmental topic areas listed above, excepting tribal cultural resources and wildfire because they were added to CEQA Guidelines in 2019, would be less than significant, would not be adversely affected by the implementation of control measure BCM-12. Because installation and operation of catalytic oxidizers would not contribute to any new impacts in these environmental topic areas or make existing impacts more severe, no additional mitigation measures are required. The overall conclusions of significance for these environmental topic areas in Final Program EIR for the 2016 AQMP will remain unchanged if BCM-12 is implemented.

Relative to cumulative impacts, the Final Program EIR for the 2016 AQMP concluded that implementation of the 2016 AQMP, when combined with past, present, and reasonably foreseeable activities, and in particular with transportation projects projected in the 2016 RTP/SCS, would contribute to cumulatively considerable impacts to aesthetics, but would not contribute to cumulative considerable impacts to the other environmental topic areas.

Since implementation of control measure BCM-12 of the PM2.5 Plan is expected to have no impact on any of the above environmental topic areas, there are no new impacts which would change the previous conclusions of the Final Program EIR for the 2016 AQMP regarding cumulatively considerable impacts. Further, no new mitigation measures would be required. Therefore, the cumulative impacts to aesthetics remain significant and unavoidable, and there are no cumulative impacts to the environmental topic areas of agriculture and forestry resources, biological resources, cultural and tribal cultural resources, geology and soils, land use and planning, mineral resources, population and housing, public services, recreation, or wildfire.

Conclusion

The majority of the PM2.5 Plan relies on control measures that were previously adopted in the 2022 AQMP and the 2016 AQMP, and proposes to expand the methods of control and effects of implementation for only one control measure, BCM-12, when compared to the previous 2016 AQMP control measure on which it relies, BCM-01 of the 2016 AQMP. In addition, the PM2.5 Plan proposes one new control measure, BCM-19, which does not rely on any previously adopted control measure in either the 2022 AQMP or 2016 AQMP.

New control measure BCM-19 proposes to develop an inventory of unpaved roads and parking lots within urban areas in the Basin, and assess the suitability for paving. Implementation of control measure BCM-19 of the PM2.5 Plan is an administrative exercise that will not result in physical changes. Therefore, no potential adverse environmental impacts are expected from implementation of control measure BCM-19.

Proposed control measure BCM-12 in the PM2.5 Plan proposes a future amendment to South Coast AQMD Rule 1138 – Control of Emissions From Restaurant Operations to make the exemption criteria applicable to chain-driven charbroilers in paragraph (e)(1), more stringent by providing an option for the owner or operator to either accept a permit condition limiting the amount of meat cooked per week from 875 pounds to 400 pounds or install integrated catalytic oxidizer technology. By comparison, control measure BCM-01 of the 2016 AQMP contemplated the reliance on add-on air pollution control equipment and devices such as such as ESPs, filters, centrifugal separators, and misters for under-fired charbroilers in order to achieve reductions in PM. The potential for increased deployment of PM control equipment for under-fired charbroilers and the potential environmental impacts associated with the installation and operation of the aforementioned PM control equipment were analyzed in the Final Program EIR for the 2016 AQMP. Implementation of BCM-12 of the PM2.5 Plan is expected to result in the potential installation and operation of catalytic oxidizers for certain chain-driven charbroilers that were either not originally manufactured with a catalytic oxidizer or equivalent or more stringent PM control equipment or device. Therefore, the potential retrofit of chain-driven charbroilers with catalytic oxidizers is the only new physical change anticipated from implementing control measure BCM-12 of the PM2.5 Plan that was not previously contemplated or analyzed in the Final Program EIR for the 2016 AQMP.

All other control measures proposed in the PM2.5 Plan are similar to their equivalent applicable adopted control measure in the 2022 AQMP and 2016 AQMP, as applicable, such that implementation of these PM2.5 Plan control measures is not expected to result in physical changes not previously analyzed in the Final Program EIRs for the 2022 AQMP and the 2016 AQMP. The Final Program EIR for the 2022 AQMP concluded potentially significant impacts to the environmental topic areas of air quality and greenhouse gas emissions, energy, hazards and hazardous materials, hydrology and water quality, noise, and solid and hazardous waste. As discussed in the "Summary of Environmental Impact Analysis from the Final Program EIRs for the 2022 AQMP and the 2016 AQMP," mitigation measures were adopted for certain environmental topic areas which had conclusions of potentially significant impacts. Nonetheless, no environmental topic area identified as having a potentially significant impact in Final Program EIRs for the 2022 AQMP and the 2016 AQMP was capable of being mitigated to less than significant levels. When combined with the Connect SoCal Plan, the SIP strategies, state policies, and other past, present, and reasonably foreseeable activities, implementation of the 2022 AQMP would result in significant environmental impacts. No additional mitigation measures to reduce the significant cumulative impacts were identified, and cumulative impacts to the environmental topic areas of air quality and greenhouse gas emissions, energy, hazards and hazardous materials, hydrology and water quality, noise, and solid and hazardous waste remained significant and unavoidable.

The Final Program EIR for 2016 AQMP concluded potential significant impacts to the environmental topic areas of aesthetics, air quality and greenhouse gas emissions, energy, hazards and hazardous materials, hydrology and water quality, noise, solid and hazardous waste, and transportation and traffic. As explained in the "Summary of Environmental Impact Analysis from the Final Program EIRs for the 2022 AQMP and the 2016 AQMP," mitigation measures were adopted for certain environmental topic areas which had conclusions of potentially significant impacts. Nonetheless, no environmental topic area identified as having a potentially significant impact was capable of being mitigated to less than significant levels. When combined with the other past, present, and reasonably foreseeable activities, in particular the transportation projects projected in the 2016 RTP/SCS, implementation of the 2016 AQMP would result in significant environmental impacts. No additional mitigation measures to reduce the significant cumulative impacts were identified, and cumulative impacts to the environmental topic areas of air quality and greenhouse gas emissions, energy, hazards and hazardous materials, hydrology and water quality, noise, solid and hazardous waste, and transportation and traffic remained significant and unavoidable.

The installation and operation of catalytic oxidizers was determined to have no impact to air quality due to construction, a net air quality benefit due to operation, and no impact on greenhouse gas emissions. Because maintenance and cleaning the catalytic oxidizer requires soaking or rinsing the catalyst bed, operation of the catalytic oxidizer is expected to have a less than significant impact to hydrology and water quality. Because the Final Program EIR for the 2016 AQMP analyzed much greater wastewater generation, water quality impacts, and water demand impacts from PM control for under-fired charbroilers such as ESPs, centrifugal separators, and misters, maintenance and cleaning of the catalytic oxidizers is not expected to make the previous significance determinations, more severe. Lastly, installation and operation of catalytic oxidizers was determined to have no impact on all other environmental topic areas.

Therefore, the environmental impacts associated with installing catalytic oxidizers on chain-driven charbroilers in control measure BCM-12 of the PM2.5 Plan are not substantially different from what was previously analyzed in the Final Program EIR for the 2016 AQMP for BCM-01. Thus, no new Initial Study would need to be prepared leading to either an EIR or a Negative Declaration pursuant to CEQA Guidelines Section 15168(c)(1). No substantial changes are proposed to the previously adopted control measures in the 2022 AQMP and the 2016 AQMP which are being relied upon in the PM2.5 Plan. Further, there is no new information of substantial importance to control measures that were previously adopted in the 2022 AQMP and 2016 AQMP, and the new information is not comprised of new significant effects or substantially worsened or more severe significant effects that were not previously analyzed in the Final Program EIRs for the 2022 AQMP and 2016 AQMP. There is no change to the mitigation measures or alternatives previously considered in the Final Program EIRs for the 2022 AQMP and the 2016 AQMP. Thus, in accordance with CEQA Guidelines Section 15168(c)(2), a subsequent EIR would not be required pursuant to CEQA Guidelines Section 15162.

Based on the preceding analysis, pursuant to CEQA Guidelines Section 15168(c)(2), the PM2.5 Plan is considered a later activity within the scope of the 2022 AQMP and 2016 AQMP projects covered by the Final Program EIRs for the 2022 AQMP and the 2016 AQMP. The mitigation measures developed in the Final Program EIRs for the 2022 AQMP and the 2016 AQMP for the previously adopted control measures in the 2022 AQMP and the 2016 AQMP upon which the proposed control measures in the PM2.5 Plan rely are also applicable to the implementation of the PM2.5 Plan and will remain in effect. [CEQA Guidelines Section 15168(c)(3)].

Therefore, the South Coast Air Basin Attainment Plan for the 2012 Annual PM2.5 Standard (PM2.5 Plan) is considered a later activity within the scope of the Final Program EIRs for the 2022 AQMP and the 2016

AQMP and the Final Program EIRs for the 2022 AQMP and the 2016 AQMP adequately describe the later activity for the purposes of CEQA such that no new environmental document will be required.

References

The 2022 AQMP, along with the December 2022 Final Program EIR for the 2022 AQMP (State Clearinghouse No. 2022050287) and its corresponding Findings, Statement of Overriding Considerations, and Mitigation, Monitoring, and Reporting Plan, and the 2016 AQMP along with the March 2017 Final Program EIR for the 2016 AQMP (State Clearinghouse No. 2016071006) and its corresponding with Findings, Statement of Overriding Considerations, and Mitigation, Monitoring, and Reporting Plan, upon which the analysis of the PM2.5 Plan relies, are incorporated by reference pursuant to CEQA Guidelines Section 15150 and are available from the South Coast AQMD's website at:

December 2022 Final Program EIR for the 2022 AQMP
Master webpage: https://www.aqmd.gov/home/research/documents-reports/lead-agency-scaqmd-projects/south-coast-aqmd-projects---year-2022

December 2022 Final Program EIR for the 2022 AQMP (including Appendices)
https://www.aqmd.gov/docs/default-source/ceqa/documents/aqmd-projects/2022/2022-aqmp-final-peir.pdf

Findings, Statement of Overriding Considerations, and Mitigation Monitoring and Reporting Plan: https://www.aqmd.gov/docs/default-source/ceqa/documents/aqmd-projects/2022/2022-aqmp-attachment1toresolution.pdf

2022 AQMP: https://www.aqmd.gov/home/air-quality/air-quality-management-plans/air-quality-mgt-plan

March 2017 Final Program EIR for the 2016 AQMP
Master webpage: http://www.aqmd.gov/home/research/documents-reports/lead-agency-scaqmdprojects/scaqmd-projects---year-2017

March 2017 Final Program EIR for the 2016 AQMP (without Appendices)
https://www.aqmd.gov/docs/default-source/ceqa/documents/aqmd-projects/2016/2016aqmpfpeir.pdf

Appendices A through C: https://www.aqmd.gov/docs/default-source/ceqa/documents/aqmd-projects/2016/2016aqmpfpeir_appendicesac.pdf

Appendices D through E: https://www.aqmd.gov/docs/default-source/ceqa/documents/aqmd-projects/2016/2016aqmpfpeir_appendicesde.pdf

Findings, Statement of Overriding Considerations, and Mitigation Monitoring and Reporting Plan: https://www.aqmd.gov/docs/default-source/ceqa/documents/aqmd-projects/2017/att2toresolutionfor-2016aqmp.pdf

2016 AQMP: https://www.aqmd.gov/home/air-quality/air-quality-management-plans/final-2016-aqmp

Introduction

1. South Coast AQMD, 2022 Air Quality Management Plan, December 2022. https://www.aqmd.gov/home/air-quality/air-quality-management-plans/air-quality-mgt-plan
2. South Coast AQMD, 2016 Air Quality Management Plan, March 2017. https://www.aqmd.gov/home/air-quality/air-quality-management-plans/final-2016-aqmp
3. South Coast AQMD, Final Program Environmental Impact Report for the 2022 Air Quality Management Plan, December 2022. https://www.aqmd.gov/docs/default-source/ceqa/documents/aqmd-projects/2022/2022-aqmp-final-peir.pdf
4. South Coast AQMD, Final Program Environmental Impact Report for the 2016 Air Quality Management Plan, March 2017. https://www.aqmd.gov/docs/default-source/ceqa/documents/aqmd-projects/2016/2016aqmpfpeir.pdf

Summary of Environmental Impact Analysis from the Final Program EIRs for the 2022 AQMP and the 2016 AQMP

5. South Coast AQMD, Attachment 1 to the Governing Board Resolution for the Final Program Environmental Impact Report for the 2022 Air Quality Management Plan, December 2022. https://www.aqmd.gov/docs/default-source/ceqa/documents/aqmd-projects/2022/2022-aqmp-attachment1toresolution.pdf
6. South Coast AQMD, Attachment 2 to the Governing Board Resolution for the Final Program Environmental Impact Report for the 2016 Air Quality Management Plan, March 2017. https://www.aqmd.gov/docs/default-source/ceqa/documents/aqmd-projects/2017/att2toresolutionfor-2016aqmp.pdf
7. South Coast AQMD, Final Environmental Assessment for Proposed Rule 2305 – Warehouse Indirect Source Rule – Warehouse Actions and Investments To Reduce Emissions (WAIRE) Program and Proposed Rule 316 – Fees for Rule 2305, May 2021. https://www.aqmd.gov/docs/default-source/ceqa/documents/aqmd-projects/2021/attachment_j_pr2305_finalea.pdf
8. Southern California Association of Governments, Connect SoCal (2020–2045 Regional Transportation Plan/Sustainable Communities Strategy), May 2020. https://scag.ca.gov/read-plan-adopted-final-connect-socal-2020
9. California Air Resources Board, 2022 State Strategy for the State Implementation Plan (2022 State SIP Strategy), September 2022. https://ww2.arb.ca.gov/resources/documents/2022-state-strategy-state-implementation-plan-2022-state-sip-strategy
10. Southern California Association of Governments, Connect SoCal (2016–2040 Regional Transportation Plan/Sustainable Communities Strategy), April 2016. https://scag.ca.gov/sites/main/files/file-attachments/f2016rtpscs.pdf

Environmental Impact Analysis of Additional Physical Changes from Control Measure BCM-12 of the PM2.5 Plan

11. South Coast AQMD, South Coast AQMD Certified Charbroilers with Integrated Catalysts, May 2023. https://www.aqmd.gov/docs/default-source/permitting/product-certification/charbroilerscatalysts.pdf
12. BASF, Technical data sheets for catalyst technology, 2007. www.icac.com/resource/resmgr/greenhouse_gas_controls/basf_products_overview_07270.pdf
13. Nieco, The IncendalystTM, Accessed on March 18, 2024. https://nieco.com/wp-content/uploads/2015/12/Incendalyst2019.pdf
14. Nieco, Simple Tips on How to Maintain Your Nieco Broiler's Incendalyst™, February 2018. https://nieco.com/blog/your-broilers-incendalyst-maintenance/