SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Preliminary Draft Staff Report

Proposed Rule 1159.1 – Control of NOx Emissions from Nitric Acid Tanks

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SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

GOVERNING BOARD

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EXECUTIVE SUMMARY

The Regional Clean Air Incentives Market (RECLAIM) program was adopted in October 1993 under South Coast AQMD Regulation XX. RECLAIM is a market-based emissions trading program designed to reduce NOx and SOx emissions and includes facilities with historical NOx or SOx emissions greater than four tons per year. The 2016 Final Air Quality Management Plan (2016 AQMP) included Control Measure CMB-05: Further NOx Reductions from RECLAIM Assessment (CMB-05) to ensure the NOx RECLAIM program was achieving equivalency with command-and-control rules that are implementing Best Available Retrofit Control Technology (BARCT) and to generate further NOx emission reductions at RECLAIM facilities. The adoption resolution for the 2016 AQMP directed staff to achieve five tons per day of NOx emission reductions as soon as feasible but no later than 2025, and to transition the RECLAIM program to a command-and-control regulatory structure requiring BARCT as soon as practicable. On July 26, 2017 the Governor approved California State Assembly Bill 617, which required air districts to develop, by January 1, 2019, an expedited schedule for the implementation of BARCT no later than December 31, 2023 for industrial facilities that are in the California greenhouse gas cap-and-trade program with priority given to older, higher polluting sources that need to install BARCT. As facilities transition out of the NOx RECLAIM program, a command-and-control rule that includes NOx emission standards reflecting BARCT is needed for all equipment categories. Although development of Proposed Rule 1159.1 – Control of NOx Emissions from Nitric Acid Tanks (PR 1159.1) initiated in 2021, the schedule was postponed to evaluate the impacts from the updated cost-effectiveness threshold adopted in the 2022 AQMP.

PR 1159.1 is a command-and-control rule for facilities that operate one or more Nitric Acid Units where nitric acid either reacts with a metal or decomposes at high temperatures forming NOx. PR 1159.1 proposes a NOx Emissions limit for nitric acid units that was developed through a BARCT assessment process. PR 1159.1 requires facilities to control NOx Emissions through the BARCT emission limit of 0.30 pound per hour (lb/hr) or a control efficiency of 99%. Alternatively, facilities with low emissions or low use of nitric acid may elect to comply with the requirements in this rule with either source testing or through documentation of low nitric acid usage. PR 1159.1 establishes implementation schedules to control emissions or demonstrate low emissions, as well as requirements for parametric monitoring, recordkeeping, and source testing. A total of 928 Nitric Acid Units is estimated to be subject to this rule. PR 1159.1 is estimated to impact 255 facilities, with 11 RECLAIM facilities and 244 facilities non-RECLAIM facilities. PR 1159.1 is estimated to result in seven facilities installing NOx controls; 14 facilities complying through source testing of uncontrolled units; and 234 facilities complying through recordkeeping to demonstrate low nitric acid usage. Reduction of NOx Emissions are estimated to be 0.15 ton per day.

PR 1159.1 has been developed through a public process. South Coast AQMD held seven working group meetings, a Public Workshop (in 2022), nine site visits, and multiple individual meetings with stakeholders. Another Public Workshop will be held on September 25, 2024, to present PR 1159.1 and receive public comment.

CHAPTER 1: BACKGROUND

INTRODUCTION

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PUBLIC PROCESS

CHAPTER 1: BACKGROUND

Introduction

The Regional Clean Air Incentives Market (RECLAIM) program was adopted in October 1993 under South Coast AQMD Regulation XX. RECLAIM is a market-based emissions trading program designed to reduce NOx and SOx emissions and includes facilities with NOx or SOx emissions greater than four tons per year.

The 2016 Air Quality Management Plan (AQMP) included Control Measure CMB-05: Further NOx Reductions from RECLAIM Assessment (CMB-05) to ensure the NOx RECLAIM program was achieving equivalency with command-and-control rules that are implementing Best Available Retrofit Control Technology (BARCT) and to generate further NOx emission reductions at RECLAIM facilities. CMB-05 included a requirement for five tons per day of NOx emission reductions as soon as feasible but no later than 2025, and to transition the RECLAIM program to a command-and-control regulatory structure requiring BARCT as soon as practicable.

In 2015, staff conducted a programmatic analysis of equipment at each RECLAIM facility to determine if there are appropriate and up to date BARCT NOx limits within existing command-and-control rules. It was determined that existing command-and-control rules would need to be adopted and/or amended to update emission limits to reflect current BARCT and provide implementation timeframes to meet BARCT emission limits. As facilities transition out of the NOx RECLAIM program under the direction of the 2016 AQMP, a command-and-control rule that includes NOx emission standards reflecting BARCT will be needed for all equipment categories. Most NOx sources under RECLAIM are combustion sources. Proposed Rule 1159.1 (PR 1159.1) would address NOx emissions from the chemical reaction or decomposition of nitric acid (i.e. non combustion sources).

On July 26, 2017, California State Assembly Bill (AB) 617 was approved by the Governor, which addresses non-vehicular air pollution (criteria pollutants and toxic air contaminants). It is a companion legislation to AB 398, which was also approved, and extends California's cap-and-trade program for reducing greenhouse gas emissions from stationary sources. RECLAIM facilities that are in the cap-and-trade program are subject to the requirements of AB 617. Among the requirements of this bill is an expedited schedule for implementing BARCT for cap-and-trade facilities. Air Districts were to develop by January 1, 2019, an expedited schedule for the implementation of BARCT no later than December 31, 2023, with emphasis on the largest emission sources first. In December 2022, the 2022 AQMP was adopted with the cost-effectiveness threshold changing from $50,000 to $325,000 per ton of NOx reduced. As such, the schedule to consider Proposed Rule 1159.1 was postponed to further evaluate the approach and impact to facilities based on the updated cost-effectiveness threshold.

PR 1159.1 will establish the requirements for Nitric Acid Units based on the BARCT emission limits for this source category. These requirements will apply to RECLAIM facilities, former RECLAIM facilities that have exited the RECLAIM program, and non-RECLAIM facilities. PR 1159.1 will regulate NOx emissions formed from the chemical reaction of nitric acid with metals or its decomposition at high temperatures in Nitric Acid Units. These types of operations are typically found in metal finishing, precious metal reclamation, or expanded graphite foil production facilities.

Metal finishing is the surface treatment of a metal substrate to give it a desired characteristic. This can include anti-corrosion, durability, and adhesion. Due to the beneficial properties that can be imparted to products, metal finishing supports many industries including fixtures (home, kitchen, and bath), machinery and industrial equipment, and commercial and military aerospace. In South Coast AQMD, metal finishing facilities span over 90 different classifications under the North American Industry Classification System (NAICS) standard. The amount of NOx emissions from metal finishing is dependent on the intended function of the individual tanks used in the process; surface treatment tanks such as Cleaning Tanks would have process times measured in minutes with minimal to no reaction of nitric acid with the metal part compared with the other extreme such as chemical milling tanks where a prescribed depth of metal is removed from the metal part with process times that can span hours or even days.

Precious metal reclamation involves the recovery of precious metals such as gold, platinum, or other metals from unwanted jewelry, used catalytic converters, or other metal scraps. Nitric acid is used in reactors or vessels along with hydrochloric acid to dissolve precious metal(s) into solution for later recovery and refining of theses metals. NOx emissions are formed during the chemical digestion of the metals with nitric acid.

Expanded graphite foil production involves the production of graphite foil (sheets) from raw graphite flakes. Nitric acid is used to soak raw graphite flakes before being sent to a furnace where the nitric acid thermally decomposes into gases typically at temperature above 1700 degrees Fahrenheit, including NOx emissions, that separate the layers of the graphite flakes which later are compressed to form graphite foil or sheets. The graphite foil is used to manufacture various products such as high temperature gaskets. All excess nitric acid must be driven off from the expanded graphite before finally forming the graphite foil.

Regulatory History

There are no regulations at the state or federal level controlling NOx emissions from the use of nitric acid in metal finishing, precious metal reclamation, or expanded graphite foil production operations. In South Coast AQMD, some RECLAIM facilities have requirements for mass emission rates, concentration limits, or control efficiency for NOx. Throughput limits, such as number of workpieces or pounds of metal per day, are indirect ways to limit NOx emissions found on some permits. South Coast AQMD's Regulation XIII – New Source Review requires applicants to use Best Available Control Technology (BACT) for new sources, relocated sources, and modifications to existing sources that may result in an emission increase of any nonattainment air contaminant. Under Health and Safety Code Section 40405, BACT is defined as:

> "… an emission limitation that will achieve the lowest achievable emission rate for the source to which it is applied."

In South Coast AQMD's BACT Guidelines Part D: BACT Guidelines for Non-Major Polluting Facilities, there are several BACT requirements listed for control of NOx. For chemical milling/open process tanks, the use of pack chemical scrubbers is specified. For precious metal reclamation, the use of a 3-Stage NOx reduction scrubber is listed as BACT.

Affected Industries/Facilities

PR 1159.1 affects facilities that use nitric acid in tanks where nitric acid either reacts with a metal or decomposes at high temperatures. These types of operations are typically found in metal finishing, precious metal reclamation, or expanded graphite foil production operations. PR 1159.1 affects approximately 255 facilities in the NOx RECLAIM program as well as facilities outside of the RECLAIM program. Out of the 236 facilities in the NOx RECLAIM program as of 2021, 11 facilities would be affected by PR 1159.1. There are 244 non-RECLAIM facilities that are affected by PR 1159.1. The number of facilities and type of operation are shown in Table 1.

Table 1 – Number of Facilities by Operation Type

	# of RECLAIM Facilities	# of Non-RECLAIM Facilities
Precious Metal Reclamation	1	1
Metal Finishing	9	243
Expanded Graphite Foil Production	1	0
Total	**11**	**244**

Public Process

The development of PR 1159.1 is being conducted through a public process. A PR 1159.1 Working Group was formed to provide the public and stakeholders an opportunity to discuss the proposed rule and provide staff with input during the rule development process. The Working Group is composed of representatives from businesses, environmental groups, public agencies, consultants, and other interested parties. South Coast AQMD held five working group meetings on August 4, 2021, May 25, 2022, July 7, 2022, August 17, 2022, and August 31, 2022. Initial preliminary draft rule language was released on August 26, 2022 and revisions to rule language were made to incorporate comments received from stakeholders as part of the Preliminary Draft Proposed Rule 1159.1 released September 16, 2022. In addition, a Public Workshop was held on September 29, 2022, to present PR 1159.1 to receive public input. In December 2022, the 2022 AQMP was adopted with the cost-effectiveness threshold changing from $50,000 to $325,000 per ton of NOx reduced. As such, the schedule to consider PR 1159.1 was postponed to further evaluate the approach and impact to facilities based on the updated cost-effectiveness threshold. South Coast AQMD held two additional working group meetings on April 25, 2024, and August 14, 2024, to discuss these updates. A second initial preliminary draft rule language was released on August 9, 2024, and revisions to rule language were made to incorporate comments received from stakeholder as part of second preliminary draft rule language. A Public Workshop is scheduled for September 25, 2024, to present PR 1159.1 to receive public input.

As part of the rule development process, two surveys were sent (one in January 2022 and the other in January 2023) to affected facilities to collect information about operations, equipment and controls, nitric acid usage and other information. Staff also conducted site visits to better understand facilities operations and equipment and obtain industry input at nine facilities. In addition, individual stakeholder meetings were held throughout the rule development process.

CHAPTER 2: BARCT ASSESSMENT

- **INTRODUCTION**
- **BARCT ANALYSIS**

CHAPTER 2: BARCT ASSESSMENT

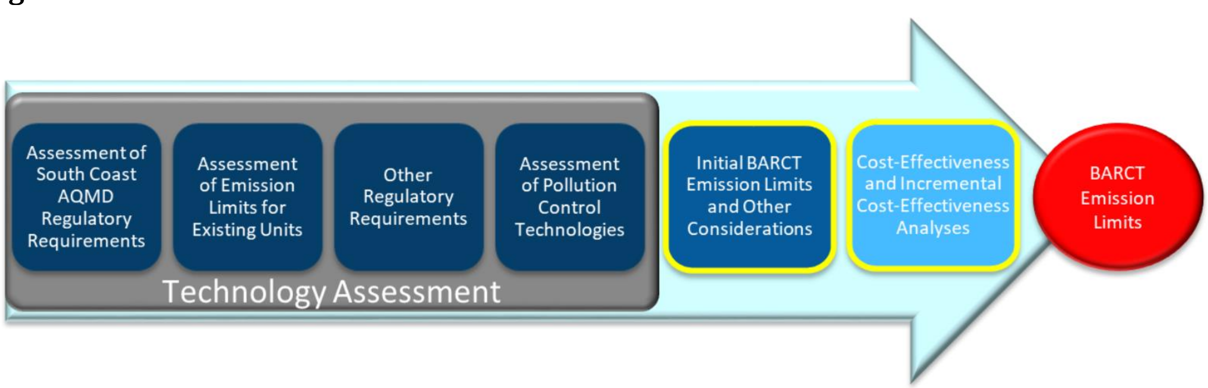
Introduction

As part of the rule development process, staff conducted a BARCT assessment of equipment subject to PR 1159.1. The purpose of a BARCT assessment is to identify any potential emission reductions from specific equipment or industries and to establish an emission limit that is consistent with state law. Under Health and Safety Code Section 40406, BARCT is defined 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."

BARCT assessments are performed periodically for equipment categories to determine if current emission limits are representative of current technologies and maximum achievable NOx reductions. The BARCT assessment is a stepwise process that includes a robust technology assessment that seeks maximum achievable cost-effective emission reductions. The BARCT assessment begins with a technology assessment to establish initial BARCT emission limits. A technology assessment identifies current regulatory requirements for specific equipment categories, established by either South Coast AQMD or other regulatory agencies. Permits and source test data are analyzed to identify the emission levels being achieved with existing technology. Current and emerging technologies are evaluated to determine the feasibility of achieving lower concentration limits relative to existing requirements. Based on the technology assessment, an initial BARCT limit is identified and a cost-effectiveness analysis and, if necessary, an incremental cost-effectiveness analysis, are conducted. A cost-effectiveness calculation, expressed in dollars per ton of pollutant reduced, is made that considers the cost to meet the initial proposed NOx limit and the reductions that would occur from implementing technology that could meet the proposed limit. The cost-effectiveness analysis considers the cost to implement one or more technologies that can meet the initial BARCT limit. An incremental cost-effectiveness analysis is conducted if multiple initial BARCT limits are identified that vary in stringency and are each cost-effective. A final BARCT limit is established that is both technologically feasible, achievable within the implementation schedule allowed in the proposed rule, cost-effective, and incrementally cost-effective. The BARCT Assessment Process is illustrated in Figure 2-1.

Figure 2-1 – BARCT Assessment Process



A BARCT assessment was conducted for PR 1159.1 in order to establish a BARCT emission limit for which Nitric Acid Units would be required to meet in order to reduce NOx emissions where it would be cost-effective.

BARCT Analysis

In identifying the initial universe that would be subject to PR 1159.1, staff used South Coast AQMD's permit database. Staff identified a universe of 255 facilities, with estimated 928 Nitric Acid Units, which included 11 RECLAIM facilities and 244 non-RECLAIM facilities. As part of the rule development process, data was obtained from multiple sources which included: online articles, industry publications, scientific and vendor literature, permits, source tests, annual emission reports, inspection reports, surveys, site visits, stakeholder meetings, Working Group meetings, and South Coast AQMD inter-departmental meetings. An overview of each step in the BARCT assessment is provided in the following sections.

Assessment of South Coast AQMD Regulatory Requirements

Staff reviewed existing requirements in South Coast AQMD source specific rules as well as BACT guidelines under Regulation XIII – New Source Review to identify for similar operations or equipment that may serve as potential BARCT NOx emission limits. There are no existing source specific rules limiting NOx emissions from the use of nitric acid in metal finishing, precious metal reclamation, or expanded graphite foil production operations.

BACT guidelines for non-major polluting facilities specified scrubber technology as BACT for NOx control for certain chemical milling tanks and precious metal reclamation operations. A packed chemical scrubber is BACT for chemical milling tanks that mill nickel alloys, stainless steel, and titanium, while 3-stage NOx reduction scrubber is BACT for precious metal reclamation conducted with chemical recovery or chemical reaction. There is no BACT guideline for major sources for metal finishing, precious metal reclamation or expanded graphite foil production operations.

Assessment of Emission Limits for Existing Units

Since no existing source specific rule regulates NOx emissions from Nitric Acid Units, NOx emission limits in permitted Nitric Acid Units were reviewed. Most Nitric Acid Units subject to PR 1159.1 are located at metal finishing facilities. The chemical reaction of metal parts with nitric acid is expected to be limited (i.e., surface treatment tanks), except for chemical milling processes. Only a fraction of Nitric Acid Units is equipped with air pollution control devices (APCDs). For Nitric Acid Units with APCDs, most APCDs were installed to control acid fumes. The permit for the APCD often did not specify the pollutant being controlled and the permit conditions did not list emission limits for a particular pollutant.

Recent permits, such as those issued after 2010, or facilities with large operations using Nitric Acid Units were likely to have APCDs installed for NOx reduction. NOx emission limits for Nitric Acid Units equipped with APCD's varied in stringency and metrics. A few Nitric Acid Units were permitted with direct NOx limits, such as requirements for a minimum control efficiency or a concentration limit, or NOx related limits based on indirect metrics such as number of work pieces processed per month, amount of metal removed, and pounds or gallons of nitric acid added per day or month. Table 2-1 –provides examples of existing NOx related emissions limits.

Table 2-1 – Examples of NOx Related Permit Limits

	Facility Operation	NOx Related Permit Limit
Facility A	Metal Finishing - Surface Treatment	• 50 gallons of nitric acid (70%)/month
Facility B	Metal Finishing - Surface Treatment	• 20 lbs of nitric acid per day
Facility C	Metal Finishing - Chemical Milling	• 200,000 pieces per month • 5 ppmv NOx
Facility D	Precious Metal Reclamation	• 99% control efficiency
Facility E	Expanded Graphite Foil Production	• 330 lbs of nitric acid (98%)/hr

Source test reports were also reviewed to evaluate the performance of NOx control equipment. Source testing of control equipment measures the amount of emissions that exit out of a stack into the ambient air. If an inlet measurement is also taken, control efficiency can be determined and represented as the percent of NOx controlled. Based on a search of the South Coast AQMD database, nine source tests for Nitric Acid Units were identified. All nine reports were for facilities using scrubber technology for an APCD. Source tests used to determine compliance with a rule or permit condition may not be suitable to use for quantification of emissions due to the more rigorous source testing requirements; Among the nine source tests, only four were deemed acceptable by South Coast AQMD to assess control efficiency and/or outlet mass emission rates. There was at least one source test for each type of operation subject to PR 1159.1. Table 2-2 summarizes the source test results for the four different types of facility operations.

Table 2-2 – Summary of Source Test Results

Facility	Facility Operation	Number of Nitric Acid Units Controlled	Control Efficiency	Single or Multi-stage Scrubber	Source Test Result (Outlet NOx)
1	Precious metal reclamation	15	98.4 %[(1)]	Multi-stage	0.26 lb/hr
2	Expanded graphite foil production	2	N/A[(2)]	Multi-stage	0.26 lb/hr
3	Surface treatment	1	43.8%	Single stage	0.29 lb/hr
4	Chemical milling	1	97.7%	Multi-stage	0.23 lb/hr

(1) Average test results meet the 99% permit condition with acceptable error
(2) Control efficiency could not be calculated

Other Regulatory Requirements

Rules and regulations at the local, state, and national levels including U.S. EPA regulations were reviewed. Staff did not identify any regulatory requirements at the local, state or federal level that regulate NOx emissions for similar operations and equipment for metal finishing, precious metal reclamation, or expanded graphite foil production that use nitric acid.

Assessment of Pollution Control Technologies

Multiple sources of information were reviewed to understand available and applicable control technologies to Nitric Acid Units. Sources included scientific literature, the South Coast AQMD database, vendors and consultants, and facility representatives. Information obtained was analyzed with the objective of identifying relevant control technologies and understanding the capabilities and limitations of each technology.

Four technologies used to control emissions of NOx were identified: (1) hydrogen peroxide dosing; (2) selective catalytic reduction, (3) non-selective catalytic reduction, and (4) NOx scrubbers. A discussion of each of these technologies is provided the following subsections.

Hydrogen Peroxide Dosing

Hydrogen peroxide (H_2O_2) additions to tank solutions may be used to control NOx formation and reduce nitric acid usage. According to the submitted information, H_2O_2 would return dissolved NOx in the tank solution back into nitric acid. As the H_2O_2 reacts with NOx in the tank solution, it would have the following results:1) Reduced NOx Emissions as some NOx is converted back to nitric acid and 2) reduced additions of nitric acid to the tank as less nitric acid is lost as NOx Emissions.

Due to limited information on this technology's use and restrictions which could potentially affect quality or the ability for a part to meet client specification(s), PR 1159.1 neither deems this a suitable technology nor prohibits the use of H_2O_2 dosing for control of NOx Emissions from Nitric Acid Units.

Selective catalytic reduction (SCR)

A post-combustion control technology, SCR involves the injection of ammonia (NH3) or urea (which is vaporized into ammonia) into the flue gas stream to reduce NOx to N2 and H2O via the use of catalysts. The optimal range of flue gas temperatures corresponding to the highest NOx reductions and maximum catalyst life is 500-1,000 °F. A molar ratio of 0.9:1 to 1:1 NH3:NOx provides the maximum NOx reductions while minimizing "ammonia slip". Ammonia slip occurs when ammonia from the ammonia injection passes through the catalyst bed without reacting with NOx and continues outside the flue stack to the ambient air. NOx reduction efficiencies can range from 80% to more than 85%. Catalysts are often installed in modular beds, with the first bed in the flue stream contributing to the most NOx reductions relative to the beds subsequent in the flue gas stream. Accordingly, catalyst beds can either be rotated or replaced on a regular basis in intervals in line with their usage. Catalysts can also be regenerated instead of replaced, which can be approximately 40% less expensive that catalyst replacement.[1]

[1] South Coast AQMD, April Board Agenda No 26 - Proposed Rule 1147.2 Appendix B (2022). Diamond Bar, CA.

Due to the high temperature requirements inherent to SCR systems, they are not suited for control of NOx from Nitric Acid Units for PR 1159.1 and none were used to control NOx from Nitric Acid Units in PR 1159.1.

Selective non-catalytic reduction systems (SNCR)

A post-combustion control technology, SNCR involves the injection of ammonia or urea into the flue gas stream to reduce NOx to N2 and H2O without the use of catalysts. The optimal range of flue gas temperatures corresponding to highest NOx reductions and maximum catalyst life is comparatively higher than that for SCR, as the catalyst integrity and efficiency is no longer a concern. This temperature range is 1,500-2,200 °F. Relative to SCR, many processes may not need to install a dilution air fan nor additional duct work due to the elevated optimal temperature range capability. A molar ratio of 2:1-4:1 NH3:NOx with a residence time of longer than one second provides the maximum NOx reductions. A higher molar ratio is necessary due to the absence of a catalyst facilitating the reaction between NH3 and NOx. Due to this, ammonia slip is more of a concern with SNCR than it is for SCR. The lack of a catalyst leads to a lower NOx reduction potential. SNCR have been demonstrated to achieve 60% NOx reduction efficiencies in the boiler industry. Due to the lack of catalyst, operating costs and maintenance costs are also lower than those for SCR by approximately 20%.[1]

Due to the high temperature requirements inherent to SNCR systems, they are not suited for control of NOx from Nitric Acid Units for PR 1159.1 and none were used to control NOx from Nitric Acid Units in PR 1159.1.

NOx Scrubber Technology

Scrubbers are common add-on controls used to control many pollutants, both particulates and gases. In order for the scrubber to be effective in achieving its targeted emission limit, it must be designed accordingly. The typical wet scrubber consists of a cylindrical tower filled with media designed to increase the available surface area for chemical reactions needed to reduce the target pollutant. Located above the packed bed of media are spray nozzles that distribute the scrubbing solution/liquid to the large surface areas on the media where the chemical reaction occurs. The scrubbing solution accumulates at the bottom and a recirculation pump will once again send the solution back up to the spray nozzles. There are also sensors and controllers (not illustrated in figure) that add back the chemicals spent during the chemical reaction. The contaminated gas stream with the pollutant typically enters from the bottom and flows up through the packed bed before passing through a mist eliminator that minimizes the loss of the scrubbing solution before exiting out to another tower or the stack. Figure 2-2 illustrates the parts of a typical packed bed scrubber. Control systems with multiple scrubbers (towers) connected in series, multi-stage scrubbers, can be used to target the specific species of NOx such as nitric oxide (NO) and nitrogen dioxide (NO_2) that primarily make up NOx. Multiple scrubbers in series increases the overall control of NOx, both control efficiency and emission rate. Typically, the first tower will oxidize the NO portion of the gas stream into NO_2 then a second tower will target NO_2 reducing it to N_2. Single tower NOx scrubbers often target only NO_2 which has a brownish visible plume and is more toxic than NO which is a colorless gas. Single tower NOx scrubber using H_2O_2 are able to control both NO and NO_2 but have limitations such as scrubber construction and available space for placement of the APCD. A Nitric Acid Unit's operation, target NOx emission limit, and available physical space at the facility are important factors in the proper design of the APCD to be considered.

While scrubbers were found to control emissions from Nitric Acid Units, only a few of the scrubbers were NOx scrubbers, with the majority being installed for the control of acid fumes. While not originally designed to control NOx emissions, acid fume scrubbers can still reduce NOx emissions due to the scrubbing solution. Comparatively, NOx scrubbers require longer residency times and are typically larger in size than acid fume scrubbers.

NOx scrubber technology is the most appropriate technology to reduce NOx emissions from Nitric Acid Units, achieving control efficiency as high as 99% and emission rates 0.30 lb/hr or lower as shown above in Table 2-2 – Summary of Source Test Results. However, based on conversations with vendors, a control efficiency performance standard could not be guaranteed due to variation in inlet concentration and each configuration being unique.

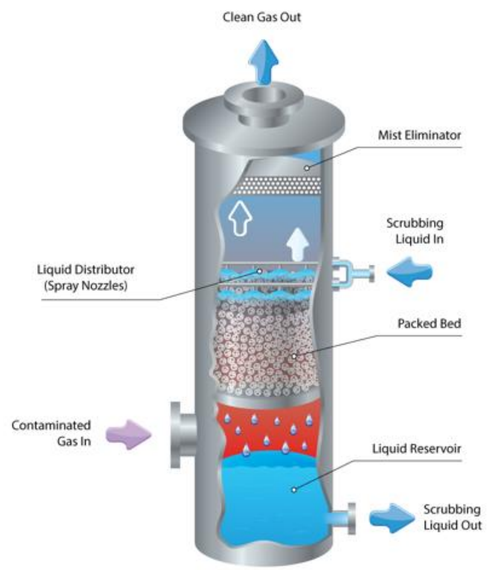


Figure 2-2 – Typical Packed Bed Scrubber

Findings of Air Pollution Technology Assessment

While there are multiple technologies available to control NOx emissions, most are designed or suitable for controlling NOx emissions from combustion sources. Whereas SCR and SNCR systems are not suitable for use with the operating conditions of Nitric Acid Units, scrubber technology was the only control technology found to be used to control NOx emissions from Nitric Acid Units used in metal finishing, precious metal reclamation, and expanded graphite foil production operations.

Upon completion of technology assessment, staff recommends an initial BARCT NOx Emissions limit established using information gathered from the technology assessment.

Initial BARCT Emission Limit

Based on the source tests results for the four different facility operations, an initial BARCT emission limit of **0.30 lb/hr** is proposed as it was demonstrated to be technologically feasible for each type of operation.

Cost-Effectiveness and Incremental Cost-Effectiveness

A cost-effectiveness analysis was conducted pursuant to Health and Safety Code Section 40920.6. A summary of the costs, emission reductions, and cost-effectiveness for Nitric Acid Units will be discussed in this chapter. A detailed analysis of the cost-effectiveness for this equipment category is found in Chapter 4 – Impact Assessment.

For Nitric Acid Units, only scrubbers were determined feasible to implement. The cost-effectiveness threshold from the 2022 Air Quality Management Plan is $325,000 per ton of NOx reduced. When adjusted by consumer price index (CPI), the 2023 cost-effectiveness threshold is $362,600 per ton of NOx reduced. The PR 1159.1 cost-effectiveness analysis used the cost-effectiveness threshold of $362,600 per ton of NOx reduced.

Over a 25-year period, the total cost of scrubber control technology was determined to be $5,313,000 and the estimated NOx Emission reductions to be 195 tons. As the potential NOx Emissions reductions vary between facilities based on the amount of uncontrolled NOx Emissions generated from Nitric Acid Unit, an evaluation of the cost-effectiveness of the control technology was not performed. Instead, the amount of uncontrolled NOx Emissions where there would be sufficient emission reductions for it to be cost-effective to implement scrubber control technology was calculated to be 0.59 tons per year of NOx. Assuming a 12-hour operational day, based on the average from the survey data, the typical facility would operate 4,380 hours per year. As such, it would be cost-effective to require controls if there is at least a reduction of 0.3 pound per hour (lb/hr) of NOx.

Health and Safety Code Section 40920.6(a)(3) states that an incremental cost-effectiveness assessment should be performed on identified potential control options that meet air quality objectives. As only scrubber control technology was identified as the only control option considered, no incremental cost-effectiveness assessment was performed.

BARCT Emission Limit Recommendation and Cost-effectiveness Threshold for Installation of Controls

According to Health and Safety Code Sections 40920.6(a)(1) and 40920.6(a)(2), potential controls to meet an air quality objective, which is to assess the BARCT emission limits, must be identified and the cost-effectiveness assessment should be conducted thereafter. The final proposed BARCT emission limit is the emission limit that achieves the maximum degree of emission reductions and is determined to be cost-effective. The cost-effectiveness for the most stringent initial BARCT emission limit would be evaluated. If the most stringent initial BARCT limit is not cost-effective, the next less stringent limit was assessed.

PR 1159.1 proposes an initial BARCT emission limit of 0.30 lb/hr that was demonstrated to be technologically feasible for all categories of Nitric Acid Units. When NOx Emissions exceed 0.60 lb/hr, it would be cost-effective to require controls to achieve the technology driven emission limit. As such, facilities with emissions exceeding 0.60 lb/hr is required to install controls. NOx Emissions can be quantified using either direct measurements (e.g., source testing) or indirect measurements (e.g., nitric acid usage).

CHAPTER 3: PROPOSED RULE 1159.1

CHAPTER 3: PROPOSED RULE 1159.1

Introduction

The objective of PR 1159.1 is to reduce emissions of nitrogen oxides from the chemical reaction of nitric acid with metals or decomposition of nitric acid at high temperatures. The following information describes the structure of PR 1159.1 and explains the provisions of the rule. The structure follows those of recently adopted or amended rules by South Coast AQMD for consistency.

Proposed Rule Structure

PR 1159.1 includes the following subdivisions:

(a) Purpose
(b) Applicability
(c) Definitions
(d) Nitric Acid Unit Requirements
(e) Facilities Exceeding 500-gallon Individual or 1650-gallon for all Nitric Units Threshold
(f) Inspection and Maintenance of Air Pollution Control Device
(g) Monitoring and Recordkeeping Requirements
(h) Source Testing Requirements and Test Methods
(i) Exemptions
Appendices

Proposed Rule 1159.1

Subdivision (a) – Purpose

The purpose of the rule is to reduce nitrogen oxides emissions from Nitric Acid Units.

Subdivision (b) – Applicability

This rule applies to an owner or operator of a facility with a Nitric Acid Unit(s). Examples of these type of facilities would include metal finishing, precious metal reclamation, or expanded graphite foil production. Facilities subject to this rule may not be subject to all the provisions of this rule.

Subdivision (c) – Definitions

PR 1159.1 includes definitions for specific terms and are capitalized in the proposed rule. Some of the definitions are based on definitions from existing South Coast AQMD rules with slight modifications, while other definitions are unique to PR 1159.1. For certain definitions, additional clarification is provided in this chapter where the definition is used within a specific provision.

- *AIR POLLUTION CONTROL DEVICE (APCD)*

As discussed in Chapter 2, NOx emissions can be controlled with an APCD, specifically a scrubber, which can be designed in either a single stage or multiple-stage configuration. An APCD may be comprised of one or more pieces of equipment, such as the columns or towers of a multistage NOx scrubber system. An APCD would begin at the point where emissions are collected from a Nitric Acid Unit to the point where emissions are discharged into the air from an exhaust stack. An APCD could consist of multiple control devices connected in series discharging to a common exhaust stack.

- *CLEANING TANK*

As discussed in Chapter 1, metal finishing can involve multiple tanks that contain nitric acid that interacts with a part or product to either clean, oxidize, or remove material. NOx emissions form when the nitric acid reacts with the metal. However, the purpose of a Cleaning Tank is to remove dirt or other non-metal contaminants. Therefore, a reaction between nitric acid and metal is not expected. As such, a Cleaning Tank is considered a Nitric Acid Unit, but it could be exempt from control requirements. Additional discussion on exemption pathway is discussed later in this chapter.

ASTM A380 identifies treatment specifications for cleaning that removes residual particles and cleaning/passivation that can remove free iron and other metallic contamination. Cleaning is conducted at nitric acid concentrations ranging from 6-25% volume and for a minimal amount of time, typically 1-2 minutes. Cleaning/passivation is conducted at concentrations up to 60% by volume for a longer period ranging from 10-60 minutes. A tank used for cleaning/passivation would be considered a Nitric Acid Unit but would not be considered a Cleaning Tank as there is the potential for nitric acid to react with the metal.

- *EXCEEDANCE YEAR*

An Exceedance Year corresponds to a calendar year, but it can be a partial calendar year, such as January 1 to July 31.

- *NITRIC ACID UNIT*

This definition was added to specify which tanks and other containers at facilities this rule applies to. Examples include cleaning and chemical milling tanks that use nitric acid in the tank solution found at metal finishing facilities. A Nitric Acid Unit does not include a container used exclusively to store nitric acid or a Rinse Tank. Wastewater system equipment is not considered Nitric Acid Units.

- *NOx EMISSIONS*

This definition was included to clarify how to determine NOx Emissions during a source test.

- *RINSE TANK*

This definition is added to clarify that this type of tank is not considered a Nitric Acid Unit due to the low concentrations, minimal time a part or product resides in the tank, and its intended purpose.

Subdivision (d) – Nitric Acid Unit Requirement

This subdivision contains requirements to control NOx Emissions from a Nitric Acid Unit, demonstrate NOx Emissions are less than the applicable threshold, and labeling requirements for specific tanks.

Compliance Pathways for Nitric Acid Units

As discussed in Chapter 2, NOx Emissions from Nitric Acid Units can be reduced to 0.30 lb/hr with an APCD. Additionally, there would be sufficient emission reductions to be cost-effective if the APCD is reducing NOx Emissions by at least 0.27 lb/hr (rounded to 0.3 lb/hr). PR 1159.1 requires controls for Nitric Acid Units that exceed the sum of the emission rate achieved with controls (0.30 lb/hr) and the emission rate required for it to be cost effective (0.3 lb/hr), which is rounded to 0.60 lb/hr. PR 1159.1 proposes three different compliance pathways for a Nitric Acid Unit at a facility to comply. The owner or operator may select more than one compliance pathway if more than one Nitric Acid Unit is applicable at the facility.

- Pathway A: Install and operate an APCD that meets the 0.30 lb/hr (0.90 lb/hr facility-wide) or 99% control efficiency
- Pathway B: Source test to demonstrate combined uncontrolled emissions from Nitric Acid Units would be less or equal to 0.60 lb/hr
- Pathway C: Nitric acid additions are less than the equivalent of 0.60 lb/hr

Pathway A – Nitric Acid Units Vented to an APCD - Paragraph (d)(1) and Facilities with Multiple APCDs Complying with Clause (d)(1)(A)(i) - Paragraph (d)(3)

Paragraph (d)(1) establishes the performance standards and permit submittal requirements for Nitric Acid Units electing to comply through operation of APCDs. While the BARCT emission limit was determined to be 0.30 lb/hr, during the rule development process, there was a request to have 99% control efficiency be an alternative performance standard to 0.30 lb/hr. The alternative performance standard of 99% control efficiency was determined to be the highest control efficiency demonstrated by a source test. However, as the performance standard was demonstrated at only one facility and no vendor could confirm the technological feasibility of 99% control efficiency, the 99% control efficiency standard is an alternate performance standard to the BARCT emission limit of 0.30 lb/hr.

Paragraph (d)(3) establishes a facility-wide emission limit for multiple APCDs that meet the emission rate of 0.30 lb/hr. The requirement is intended to prevent the use of multiple APCD's each controlling a single Nitric Acid Unit that results in minimal NOx Emission reductions. The facility-wide emission limit was based on an assessment of a complex facility with multiple Nitric Acid Units being controlled by three APCDs. It was also observed at other facilities that multiple Nitric Acid Units can be controlled by a single APCD. Therefore, the facility-limit was based on three times the BARCT emission limit of 0.30 lb/hr. Emission rate from an APCD meeting the 99% control efficiency performance standard would not be counted, as an APCD that meets the 99% control efficiency achieves maximum NOx Emissions reductions for facilities with higher inlet loadings.

Nitric Acid Units–Alternative Compliance Pathways – Paragraph (d)(2)

Paragraph (d)(2) allows two alternative compliance pathways to demonstrate the NOx Emissions are less than the cost-effective threshold of 0.60 lb/hr instead of controlling emissions with an APCD.

Pathway B – Source Testing - Subparagraph (d)(2)(A)

The first alternate compliance pathway utilizes direct measurements through source testing of uncontrolled emissions from all Nitric Acid Units electing to comply with this pathway. If the sum of the NOx Emission rates from the Nitric Acid Units do not exceed 0.60 lb/hr, then the Nitric Acid Units would not be required to be controlled.

Subparagraph (d)(2)(A) specifies the requirements for Nitric Acid Units complying through the source testing pathway to ensure that operating conditions would not generate a NOx Emissions rate that would exceed the NOx Emissions rate measured during the source test. This is achieved by restricting operating parameters that may generate more NOx, such as number of parts processed, type of metals, metal percentage, nitric acid concentration, and temperature. PR 1159.1 requires a metal in a metal alloy with a percentage greater than 10.5% to be evaluated during a source test. The 10.5% threshold is consistent with other thresholds for metals in a metal alloy that are being developed in other South Coast AQMD rules. Additional operating restrictions may be specified in the source test protocol if deemed appropriate by the Executive Officer and specified in the source test report. The facility would be required to incorporate these maximum parameters documented in the source test report(s) into the applicable permit by submitting a permit application.

Compliance with emission rate limit of 0.60 lb/hr specified in clause (d)(2)(A)(i) is determined by adding the highest emission rate calculated via source test for each Nitric Acid Unit and per the maximum operating conditions as included in the permit application(s) to be submitted pursuant to clause (d)(2)(A)(iii).

If the owner or operator wants to modify the operating conditions that were specified in a permit condition (e.g., concentration, maximum metal %, temperature), prior to operating with modified conditions, except during source testing:

- An additional source test would be required to demonstrate that the facility can still comply with 0.60 lb/hr for all Nitric Acid Units electing to comply with subparagraph (d)(2)(A)
- Permit conditions specifying operating conditions would need to be revised

Table 3-1 provides an example of how compliance would be determined based on multiple source tests for different alloys. In the example, the facility conducts source tests the three units using two different alloys. The higher emission rate of the two alloys tested would be the corresponding emission rate to be evaluated for compliance with the facility-wide emission rate of 0.60 lb/hr. Each Nitric Acid Unit would be allowed to process alloys that contain up to the maximum percent contained in Alloy A or Alloy B.

The next year, the facility wants to expand the process and use Alloy C in all three Nitric Acid Units. Prior to processing Alloy C for production, the facility would conduct a source test to verify the emission rate from Alloy C doesn't result in the facility-wide emission rate to exceed 0.60 lb/hr. Based on the results that facility-wide emissions are still below 0.60 lb/hr. Therefore, the facility would be allowed to process alloys up to the maximum percent contained in either Alloy A, Alloy B, or Alloy C (i.e., 98% Iron, 80% Nickel, 20% Chromium, and 98% Titanium) after permit conditions are revised to allow processing of parts containing up to 98% Titanium.

Table 3-1 Example of Facility-wide Emission Rate from Multiple Units Complying with Subparagraph (d)(2)(A)

Alloy Type	Composition	Unit 1	Unit 2	Unit 3	Facility-Wide Emission Rate
Alloy A (2025 Test)	98% Iron	*0.15 lb/hr*	*0.25 lb/hr*	*0.01 lb/hr*	
Alloy B (2025 Test)	80% nickel and 20% chromium	*0.25 lb/hr*	*0.20 lb/hr*	*0.01 lb/hr*	
Emission Rate for Nitric Acid Units at Facility (2025)		**0.25 lb/hr**	**0.25 lb/hr**	**0.01 lb/hr**	**0.52 lb/hr**
Alloy Type	Composition	Unit 1	Unit 2	Unit 3	Facility-Wide Emission Rate
Alloy C (Subsequent 2026 Test)	98% Titanium	*0.15 lb/hr*	*0.15 lb/hr*	*0.05 lb/hr*	
Emission Rate for Nitric Acid Units at Facility (2026)		**0.25 lb/hr**	**0.25 lb/hr**	**0.05 lb/hr**	**0.55 lb/hr**

Uncontrolled Nitric Acid Units and Nitric Acid Units vented to an APCD may utilize this compliance pathway provided NOx Emissions are measured prior to NOx Emission reduction. The purpose of this source test is to determine the NOx Emissions from the Nitric Acid Unit, not the performance of the APCD. As such, only an initial source test is required.

Pathway C – Recordkeeping of Nitric Acid Added - Subparagraph (d)(2)(B)

The second alternative compliance pathway, only available to Nitric Acid Units issued an initial permit on or before date of rule adoption, utilizes indirect measurements to demonstrate that the potential NOx Emissions from a Nitric Acid Unit is less than the 0.60 lb/hr threshold. If the initial permit to operate for the Nitric Acid Unit is reissued for an administrative change or change of operator, the Nitric Acid Unit will still be allowed to comply with this pathway. The following assumptions were made to determine the amount NOx Emissions formed from one gallon of nitric acid at 68% by weight (WT %):

- 1 mol of NOx is formed per mol of HNO_3
- NOx is 50% NO and 50% NO_2
- Density of the nitric acid added (68% by weight HNO_3, 11.79 lb/gal)

After performing the calculation using the assumptions, it was determined that one gallon would generate approximately 4.79 pounds of NOx Emissions.

Nitric acid additions thresholds in PR 1159.1 are developed for concentration at 68 WT%, which is the most common nitric acid concentration used from survey responses. Based on an emission rate of 0.60 lb/hr and 4,380 hours of operation a year (12-hr operational day), the annual NOx Emissions would 2,628 pounds. This would be equivalent to 549 gallons of nitric acid (rounded to 550 gallons).

Subparagraph (d)(2)(B) requires nitric acid additions not to exceed 550 gallons (at 68 WT%) per calendar year per Nitric Acid Unit, that is electing this compliance pathway, demonstrated through recordkeeping. Facility-wide the Nitric Acid Units complying with this pathway must not exceed 1,650 gallons of nitric acid additions at 68 WT% per year. The facility-wide limit is based on three times the limit of an individual unit. While the thresholds are annual limits, PR 1159.1 allows for one Exceedance Year per five calendar years (additional requirements triggered when exceedance occurs for two years in a five-year period). This is to allow for temporary increases in production which might not represent a permanent increase in production. Provisions for adjustments for nitric acid removal from Nitric Acid Units are included in PR 1159.1 to account for nitric acid that does not react to produce NOx Emission.

<u>Implementation Schedule and Modification of Existing Compliance Pathway</u>

Table 1 – Implementation Schedules specifies the compliance deadlines for each compliance pathway for a Nitric Acid Unit. For a Nitric Acid Unit electing to comply with Pathway A (paragraph (d)(1)), the facility would be required to demonstrate compliance with the applicable performance standard by either:

1) 12 calendar months after a permit to construct for an APCD is issued unless an extension is granted; or
2) January 1, 2029, whichever is earlier

The two deadlines are intended to ensure that the facility controls NOx Emissions as quickly as possible after the issuance of the permit to construct and consistent with South Coast AQMD permitting practices. However, January 1, 2029 remains the permanent compliance deadline for Nitric Acid Units initially complying with this compliance pathway. For example, if a permit to construct is issued in July 2027, the compliance deadline would be July 2028. If an extension is granted on June 2028 for an additional year, PR 1159.1 would still require compliance with paragraph (d)(1) by January 1, 2029.

For a Nitric Acid Unit already equipped with an existing APCD prior to the date of rule adoption, the compliance deadline to demonstrate compliance with the performance standard would be January 1, 2029 as 12 months after a permit to construct for an APCD may have passed.

An owner or operator may modify the compliance pathway from subparagraph (d)(2)(B) to either paragraph (d)(1) or subparagraph (d)(2)(A), however, the Nitric Acid Unit would be subject to the addition thresholds until demonstrating compliance with either subparagraph (d)(1)(B) or (d)(2)(A). Table 3-2 provides an example of how a facility with multiple Nitric Acid Units may comply with the rule. As discussed earlier, multiple compliance pathways may be met to satisfy the requirements of PR 1159.1.

Table 3-2 – Compliance Pathway Example

Key Dates	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Jan 2025	No APCD	No APCD	No APCD	No APCD	No APCD
Compliance Pathway	Pathway A (d)(1)	Pathway B (d)(2)(A)	Pathway B (d)(2)(A)	Pathway C (d)(2)(B)	Pathway C (d)(2)(B)
July 2025	-	-	-	Begin recordkeeping	
Jan 2026	Submit APCD application	Submit source test report and permit application	Submit source test report and permit application	**450 gal (2025)**	**500 gal (2025)**
Source Test Result	-	0.25 lb/hr	0.20 lb/hr	-	-
Category Evaluation	-	**0.45 lb/hr** (less than the combined emission rate of 0.60 lb/hr)		**950 gal (2025)** (less than the individual and facility wide additions of 550 and 1650 gallons)	

In the event the facility fails to demonstrate compliance by either Pathway A, Pathway B, or Pathway C by the applicable due date, the default compliance pathway for the Nitric Acid Unit would be Pathway A. The Nitric Acid Unit would be in violation of the subparagraph (d)(1)(B) until either: 1) Submitting a permit application for an APCD to control NOx Emissions from the Nitric Acid Unit (Pathway A); 2) Submitting a source test report and a permit application to specify maximum operations (Pathway B); or 3) Maintaining records (Pathway C).

If electing to modify the compliance pathway from either Pathway B or Pathway C to Pathway A (e.g., due to anticipated increased production or contracts), the facility would have to demonstrate that the APCD controlling the Nitric Acid Unit meets the requirements in subparagraph (d)(1)(A) beginning:

1) 12 calendar months after a permit to construct for an APCD is issued unless an extension is granted for the permit to construct; or

2) 36 months from date of submitting a complete permit application to meet the performance standards, whichever is earlier

This is the same timeline proposed in Table 1 for a Nitric Acid Unit initially complying with Pathway A to allow for sufficient time for construction and testing, while requiring the facility to meet the performance standards after the APCD is in operation.

In the event a facility may need to modify operations to increase nitric acid additions or NOx Emissions, an owner or operator may elect to modify the compliance pathway for a Nitric Acid Unit or multiple Nitric Acid Units to exclude either the emission rate or nitric acid added for the respective Nitric Acid Unit. Table 3-3 provides an example of a facility that exceeded the nitric acid threshold for multiple individual tanks for one calendar year, but conducts source tests on Unit 1, Unit 2, and Unit 3 to modify the previously selected compliance pathway. Since the facility has not exceeded the thresholds for the second calendar year, the facility may continue to have some units comply with the recordkeeping pathway unlike a facility required to comply with subdivision (e) after a second Exceedance Year .

Table 3-3 – Modifying Compliance Pathway

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Jan 2025	No APCD	No APCD	No APCD	No APCD	No APCD
Compliance Pathway	Pathway C (d)(2)(B)	Pathway C (d)(2)(B)	Pathway C (d)(2)(B)	Pathway C (d)(2)(B)	Pathway C (d)(2)(B)
July 2025	Begin recordkeeping				
Jan 2026	**500 gal (2025)**	**500 gal (2025)**	**700 gal (2025)**	**450 gal (2025)**	**500 gal (2025)**
Category Evaluation	**Facility-wide 2,650 gal (2025)** (exceed both individual and facility wide additions thresholds for one calendar year)				
Modified Compliance Pathway	Pathway B (d)(2)(A) (NEW)	Pathway B (d)(2)(A) (NEW)	Pathway B (d)(2)(A) (NEW)	Pathway C (d)(2)(B)	Pathway C (d)(2)(B)
Source Test Results	Submit source test report (0.15 lb/hr)	Submit source test report (0.15 lb/hr)	Submit source test report (0.28 lb/hr)	-	-
Nitric Acid Additions	[No longer required]	[No longer required]	[No longer required]	**525 gal (2026)**	**525 gal (2026)**
Category Evaluation	**0.58 lb/hr** (less than the combined emission rate of 0.60 lb/hr)			**1,050 gal (2026)** (less than the individual and facility-wide additions thresholds for the second calendar year)	

Labeling Requirements – Paragraphs (d)(4)

Paragraph (d)(4) requires labeling of Nitric Acid Unit identifier (e.g., tank number or name) and specific operating conditions, unless required by either Rule 1426 – Emissions from or Rule 1469 – Hexavalent Chromium Emissions from Chromium Electroplating and Chromic Acid Anodizing Operations. Rule 1426 and Rule 1469 currently require owner or operators to label tanks with the same identification information required by PR 1159.1.

Cleaning Tanks would still need to be labeled as Rule 1426 and Rule 1469 do not require them.

Facilities Exceeding 550-gallon Individual or 1650-gallon for all Nitric Acid Units Threshold – Subdivision (e)

Subdivision (e) specifies the requirements for Nitric Acid Units electing to comply with subparagraph (d)(2)(B) that exceeded the threshold in clauses (d)(2)(B)(i) or (d)(2)(B)(ii) in two or more calendar years in a five-calendar year period, including the current year. All Nitric Acid Units that elected to comply with subparagraph (d)(2)(B) would no longer be eligible to comply through subparagraph (d)(2)(B) but would be required to comply with either paragraph (d)(1) or subparagraph (d)(2)(A); the facility loses the ability to use Pathway C permanently. The determination if a threshold was exceeded will be based addition records required to be maintained. A facility that triggers the requirements of subdivision (e) would be subject to the requirements even if the current five calendar year period does not include the first Exceedance Year. For example, if a facility has an Exceedance Year in 2025 and in 2029, the facility remains subject to the requirements until meeting of either paragraph (d)(1) or subparagraph (d)(2)(A).

Until the Nitric Acid Units can meet the requirements of subparagraph (d)(1)(B), submitting a permit application for an APCD that will control NOx Emissions from the Nitric Acid Unit, or clauses (d)(2)(A)(i) and (d)(2)(A)(iii), submitting a permit application specifying operations and a source test report to the Executive Officer that demonstrates compliance with the emission limit, the Nitric Acid Unit would be subject to the threshold limits on an annual basis. After submitting a complete application that meets the requirements of subparagraph (d)(1)(B), the applicable Nitric Acid Unit(s) would not be subject to the threshold limits or recordkeeping requirements previously required. The Nitric Acid Unit(s) would face the similar restrictions as a Nitric Acid Unit initially complying with Pathway A. After triggering the requirements of subdivision (e), the compliance pathway specified in subparagraph (d)(2)(B) would not be available for the entire facility.

Inspection and Maintenance of Air Pollution Control Device – Subdivision (f)

Subdivision (f) contains requirements for inspection and maintenance for APCDs. Periodic visual inspections for leaks or malfunctions required per the manufacturer's recommended frequency or quarterly, whichever is more frequent. The APCD is required to be maintained and operated per the manufacturer's recommendation. Inspection and maintenance requirements of APCDs, which are included in many recent rules, ensures the equipment is kept in good operating conditions, operating as designed within permitted parameters, and as source tested to ensure NOx Emissions are meeting emission limit(s) after or between source tests.

Monitoring and Recordkeeping Requirements - Subdivision (g)

Requirements for APCDs – Paragraph (g)(1)

Paragraph (g)(1) requires the monitoring and recording the Operational Parameter Values listed on permit of the APCD to ensure proper operation, at least once a week if the APCD for the weeks the APCD is in operation. Parameters include the flowrate, or pH, of the scrubber solution to ensure the scrubbing solution is effective in reducing NOx Emissions. Readings of the pressure drop across different stages of the scrubber system can indicate when there is a blockage or problem with the blower motor. Older permits may specify the operating parameters but may not have requirements to record the readings weekly or at all.

Requirements for Nitric Acid Units Complying with Subparagraph (d)(2)(A) – Paragraph (g)(2)

Paragraph (g)(2) specifies the records to be maintained to demonstrate that the Nitric Acid Unit subject to subparagraph (d)(2)(A) does not exceed the parameters measured during the source test to demonstrate the NOx Emission rate of the Nitric Acid Units.

Recordkeeping Requirements for Facilities Complying with Subparagraph (d)(2)(B) or Paragraph (e)(2) – Paragraph (g)(3)

Paragraph (g)(3) specifies the records to account for additions of nitric acid and the optional adjustments to account for nitric acid disposed. As the concentration of nitric acid can vary, PR 1159.1 requires that the reported concentration be supported by either a manufacturer’s safety data sheet or through a chemical analysis. A chemical analysis is appropriate if the concentration is custom or made on site. The chemical analysis may be performed at a facility’s in-house laboratory or third-party laboratory. If using a pre-made or standard solution, the facility can elect to use a SDS or manufacturer sheet.

Record Retention Requirements – Paragraph (g)(4)

Records required to be kept for five years with the most recent five years kept on site and made available to the Executive Officer upon request. This includes applicable records to demonstrate compliance with PR 1159.1, such as source test reports, nitric acid additions, and metal content percentage.

Subdivision (h) – Source Testing Requirements and Test Methods

Submittal of Source Test Protocol Prior to Source Testing – Paragraph (h)(1)

Prior to conducting the first source test to demonstrate compliance with the performance standard, the facility is required to submit a source test protocol to the Executive Officer for approval. A source test protocol outlines the conditions, parameters to be measured, and additional details to ensure that the results are accurate. Facilities who were previously controlling NOx Emissions and had a prior source test protocol would still be required to submit a source test protocol as prior source test may not include all the required information required in PR 1159.1.

Only Nitric Acid Units electing to comply with paragraph (d)(1) would be required to conduct subsequent source tests to ensure the control equipment is operating correctly and meeting the performance standards. Nitric Acid Units electing to comply with subparagraph (d)(2)(A) are source tested to measure NOx Emissions that would be generated during maximum operations and would only be required to be source tested once, unless the owner or operator chooses to modify maximum operations, which would require another source test and potential modification to permit conditions.

Subsequent source tests would require a new source test protocol be submitted if there is a modification in the operating conditions or testing parameters or if the Executive Officer requests a source test protocol be submitted.

Source Test Protocol – Paragraphs (h)(2) and (h)(3)

Paragraphs (h)(2) and (3) specify the information to be included in the source test protocol. Paragraph (h)(2) specifies the requirements for a source test protocol evaluating the performance of the APCD, therefore the source test protocol would include typical conditions. The testing conditions specified in the source test protocol can be at or below the operating conditions specified in the permit. For example, if a permit condition restricts operating above 170 degrees F, the source test protocol cannot specify testing above 170 degrees F.

Paragraph (h)(3) specifies the requirements for a source test protocol evaluating the potential emissions of the Nitric Acid Unit, therefore the source test protocol would include maximum conditions or conditions that are less than the maximum if approved by the Executive Officer. The test conditions include metals or metal alloys to be tested, temperature, nitric acid concentration, and number of parts processed. Multiple metals or alloys can be proposed to be evaluated if the owner or operator intends to process those metals or alloys in the Nitric Acid Unit. A metal with a maximum percentage that has been evaluated to less than the threshold would be acceptable to process in a Nitric Acid Unit complying with subparagraph (d)(2)(A). For example, an alloy containing nickel at 65% was evaluated to have an emission rate of 0.10 lb/hr of NOx. As such, alloys that contain less than 65% nickel would be acceptable to use for operations.

PR 11591.1 requires metals greater than 10.5% in composition to be source tested at a percentage that is at least equivalent. For example, for stainless steel with a safety data sheet specifying four metals with maximum percentage above 10.5% (iron, nickel, chromium and manganese), a single source test run could be conducted to evaluate the NOx Emissions for stainless steel. Alternatively, the four source test runs for four metals could be conducted at a percentage that is at least equivalent to the maximum percentage stated in the safety data sheet in either a pure metal or a different alloy.

Conducting of Source Tests – Paragraph (h)(4)

A source test would be conducted pursuant to source test protocol most recently required by paragraph (h)(1) after its approval by the Executive Officer. If evaluating the performance of an APCD, the source test would also be required to be conducted pursuant to subparagraph (h)(4)(B). If evaluating the emissions of an uncontrolled Nitric Acid Unit, the source test would also be required to be conducted pursuant to subparagraph (h)(4)(C).

While this describes most source test situations, in the event there is an evaluation of the emissions from a Nitric Acid Unit with an APCD to meet the requirements of subparagraph (d)(2)(A), the measurement location would need to be located prior to the emission reduction component of the APCD (e.g., scrubber, filter). This would need to be specified and included in the source test protocol.

Periodic Source Testing for APCDs – Paragraph (h)(5)

Paragraph (h)(5) requires subsequent source tests every five years to evaluate the performance of an APCD meeting the requirements of subparagraph (d)(1)(A).

Submittal of Final Source Test Report – Paragraph (h)(6)

Paragraph (h)(6) specifies that the final source test report is due 120 days after the date the source test was conducted. Compliance with a performance standard due date, such as the dates specified in Table 1, would need to be demonstrate on or before the date regardless of the reporting deadline. A final source test report received after the due date would be considered late in demonstrating compliance with a performance standard due date.

Subdivision (i) – Exemptions

Specifies Cleaning Tanks are exempt from certain requirements, provided the Cleaning Tank is described as a Cleaning Tank in the description of a South Coast AQMD permit. To qualify for this exemption, an owner or operator may need to modify the permit description/conditions and include supplement documentation. Nitric Acid Units that are listed in a “Cleaning Line” in a permit may not be eligible for this exemption as the exemption is tank specific. Additionally, a Nitric Acid Unit that is described to perform cleaning and other functions, such as deoxidation or passivation, would not be eligible for this exemption.

Appendix A – Nitric Acid Additions and Adjustments

This appendix specifies the methodology for calculating additions for Nitric Acid Units electing to comply with subparagraph (d)(2)(B) or are subject to subdivision (e).

Appendix B – Recordkeeping

This appendix provides a recordkeeping form to maintain records of additions for each Nitric Acid Unit and for the entire facility.

CHAPTER 4: IMPACT ASSESSMENT

- **INTRODUCTION**
- **NOX EMISSIONS**
- **EMISSION REDUCTIONS**
- **COSTS AND COST-EFFECTIVENESS**
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CHAPTER 4: IMPACT ASSESSMENT

Introduction

Two facility surveys were sent out to collect additional information on impacted facilities and equipment. In 2023, a facility survey was sent out to collect additional information from facilities which including follow up calls to clarify data submitted and to gather additional information not included in the survey that helped with identifying impacts to the facilities that had responded to this survey. Data from the 70 responding facilities were analyzed to determine how each facility would comply with PR 1159.1. PR 1159.1 is expected to impact an estimated 928 Nitric Acid Units located at 255 facilities. Estimates for the number of Nitric Acid Units was extrapolated from the average number of Nitric Acid Units of facilities that responded to the 2023 facility survey due to challenges of identifying affected equipment from permits.

Based on 2023 facility survey data extrapolated to the PR 1159.1 universe of facilities, seven facilities would be required to install an APCD and 14 facilities are expected to source test uncontrolled tanks to demonstrate a combined emission rate 0.60 lb/hr or less under one of the alternative compliance pathways. 234 facilities are expected to comply through recordkeeping to demonstrate using less than the threshold amount of nitric acid. Impact assessments were conducted during the rule development to assess the environmental and socioeconomic implications of PR 1159.1. These impact assessments include emission reduction calculations, cost-effectiveness analyses, a socioeconomic impact assessment, and a California Environmental Quality Act (CEQA) analysis. Draft findings and a comparative analysis were prepared pursuant to Health and Safety Code Sections 40727 and 40727.2, respectively.

NOx Emissions

Baseline NOx Emissions from Nitric Acid Units

Baseline emission represent the total emissions from Nitric Acid Units in the PR 1159.1 universe. Because there is limited information to account for NOx emissions or calculate NOx emissions from an emission rate, NOx Emissions were estimated using the reported amount of nitric acid used and the chemical reaction equation presented in Chapter 3 of this staff report. The conversion factor used is a conservative estimation that assumes that all nitric acid reacts to form NOx Emissions. The nitric acid usage data of 70 facilities from the 2023 facility survey was used to determine the average nitric acid usage per facility. The average nitric acid usage per facility was assumed for the entire PR 1159.1 universe. Based on this conservative approach, approximately 846,600 lbs/year (or 1.16 tons per day) of NOx Emissions are estimated from the operation of Nitric Acid Units from a total of 255 facilities. as shown in Table 4-1 – *PR 1159.1 Baseline NOx Emissions*.

Emission Reductions

PR 1159.1 affects 255 facilities operating one of more Nitric Acid Units. Based on an evaluation of best available information for these facilities, 248 facilities are low emissions or low usage facilities expected to comply through source testing and/or recordkeeping, and thus would not result in emission reductions. The remaining seven facilities would be required to meet the BARCT emission limit through the control of NOx Emissions using an APCD. As such, baseline emissions for the purposes of determining emission reductions and expected emission reductions were assessed for only the seven facilities that are forecasted to reduce emissions. The average nitric acid addition was calculated from the facilities determined to be required to install an APCD as reported from the facility survey. The average nitric acid addition, 3,547 gallons, was used to calculate the average facility NOx Emissions of 16,990 lbs/year. The total baseline NOx Emission for the seven facilities which were determined to be 118,951 lbs/year of NOx based on average facility NOx Emissions by multiplying by the number of facilities.

Facility NOx Emissions are required to be controlled by the installation of an APCD meeting 0.30 lb/hr. The total amount of NOx Emissions post controls, 9,198 lbs/year, was calculated using the BARCT emission rate, operating schedule of 12 hours/day (consistent with the cost-effectiveness analysis) and multiplying by the number of facilities

The emission reductions from PR 1159.1 were calculated based on the difference of the uncontrolled NOx Emissions and NOx Emissions after installation of an APCD. PR 1159.1 is expected to reduce NOx Emission by approximately 110,000 lbs/year (0.15 ton per day).

Costs and Cost-Effectiveness

Overview

Health and Safety Code Section 40920.6 requires a cost-effectiveness analysis when establishing BARCT requirements. The cost-effectiveness of a control technology is measured in terms of the control cost in dollars per ton of air pollutant reduced. The costs for control technology includes purchasing, installation, operation and maintenance.

The 2022 AQMP established a cost-effectiveness threshold of $325,000 per ton of NOx reduced; Adjusted for CPI, the cost-effective screening threshold for 2023 is $362,600 per ton of NOx reduced used for the cost-effectiveness analysis. Cost-effectiveness that is greater than $362,600 per ton of NOx reduced requires additional analysis and a hearing before the Board on costs. The BARCT analysis establishes an emission limit of 0.30 lb/hr based on demonstration that it was technologically feasible for all types of operations. As there was only one initial BARCT emission limit proposed, no incremental cost-effectiveness was conducted.

Discounted Cash Flow (DCF)

The DCF method is used to calculate cost-effectiveness. The DCF method converts all costs, including initial capital investments and costs expected to be incurred in the present and all future years of equipment life, to present value. Conceptually, it is as if calculating the number of funds that would be needed at the beginning of the initial year to finance the initial capital investments and to be set aside to pay off the annual recurring costs as they occur in the future. The fund that is set aside is assumed to be invested and generates a rate of return at the discount rate chosen. The final cost-effective measure is derived by dividing the present value of total costs by the total emissions reduced over the equipment life. The following equation is used for calculating cost-effectiveness with DCF.

$$Cost\ effectiveness = \frac{Present\ Value}{Emissions\ Reduced\ Over\ Equipment\ Lifetime}$$

Where: Present Value = Initial Capital Costs + (Annual Recurring Costs * Present Worth Factor)

$$Cost\ effectiveness = \frac{Initial\ Capital\ Cost + (Annual\ Recurring\ Costs\ x\ PWF)}{Annual\ Emission\ Reductions\ x\ Years\ of\ Equipment\ Life}$$

Where: $PWF = \frac{(1-1/(1-\mathrm{r})^{N})}{\mathrm{r}}$

Where:

r = real interest rate (discount rate)
N = years of equipment life

Cost-Effectiveness Screening Threshold

Cost-effectiveness is the cost to benefit analysis comparing the relative cost to the outcomes (i.e., reduction of NOx Emissions in tons). The cost-effectiveness threshold from the 2022 Air Quality Management Plan is $325,000 per ton of NOx reduced. When adjusted by consumer price index (CPI), the 2023 cost-effectiveness threshold is $362,600 per ton of NOx reduced. The PR 1159.1 cost-effectiveness analysis used the cost-effectiveness threshold of $362,600 per ton of NOx reduced.

Summary of Cost for NOx Control Equipment

The cost for installation of NOx control equipment to comply with a rule includes both the initial capital costs to install the equipment as well as recurring annual costs to maintain and operate the equipment. Initial capital costs include the cost of the control equipment itself as well as the direct and indirect installation costs. Annual recurring costs include the labor, services, utilities, and material costs to operate the control equipment.

There was limited cost information available. Cost information from permit evaluations, vendor provided cost estimates, and information from facilities during site visits were used. Staff obtained costs for NOx scrubbers from a permit application and four supplier quotes during rulemaking. Two of the vendors provided costs that reflected the costs for a NOx scrubber installed prior to COVID-19. COVID-19 has impacted the cost of materials and staff determined that the costs from the two suppliers were not representative of costs that facilities would incur if they were to install a NOx scrubber in 2024 or the near future.

In 2024, additional cost information for NOx scrubbers was gathered. Based on a vendor quote and a prior cost-effectiveness evaluation in an engineering evaluation for a NOx scrubber, capital and recurring costs for a multistage scrubber was developed using the following assumptions:

- Multistage NOx scrubber cost $920,000 (base cost)
- Sales tax and delivery was assumed to be 18% of the base cost
- Direct installation cost (e.g., foundation, electrical) was assumed to be 27% of the base cost
- Indirect installation cost (e.g., engineering, construction, start-up, source testing, etc.) was to be assumed 31% of the base cost.

- Recurring annual cost (e.g., operational labor, operation materials, wastewater disposal, electricity) was assumed to be 25% to the base cost

The total initial capital cost (equipment + direct installation + indirect installation) is $1,720,000 for a multistage NOx scrubber with costs attributed per category are presented in Table 4-1.

Table 4-1 – Capital and Recurring Costs for Multistage NOx Scrubber

Item	Basis of Cost	Cost	
NOx Scrubber Base Cost	Vendor Quote	$920,000	Purchased Equipment Cost (PEC) = $1,085,600
Tax and delivery	18% of Base*	$165,600	
Direct Installation Cost	27% of PEC*	$293,112	
Indirect Installation Cost	31% of PEC*	$336,536	
Initial Capital Cost		~$1,720,000	For use to calculate Present Value
Recurring Annual Cost	25% of Base	$230,000	

* *Based on NOx scrubber quote used in cost-effectiveness evaluation in engineering application*

For the cost-effectiveness analysis, capital costs were annualized over a 25-year lifespan for the equipment with an interest rate of 4%. Present Value was determined to be $5,313,000 based on the formulas presented above in Discounted Cash Flow section.

Where:

Initial Capital Cost = $1,720,000
Recurring Annual Cost = $230,000
PWF = 15.62 (based on r = 4% and N = 25 years)

$$\$5{,}312{,}600 = \$1{,}720{,}000 + (\$230{,}000 * 15.62)$$

PR 1159.1 Cost-Effectiveness

Based on the calculated present value of $5,313,000 and the cost-effectiveness screening threshold of $362,600 per ton of NOx reduced, it would be cost-effective to require installation of NOx controls if there is a reduction of 0.59 ton of NOx per calendar year (equivalent to 1,180 lbs/year of NOx reductions).

$$0.59\ ton\ per\ year = \frac{\$5{,}313{,}000}{25\ years} * \frac{ton}{\$362{,}600}$$

Assuming a 12-hour operational day, based on the average from the survey data, the typical facility would operate 4,380 hours per year. As such, it would be cost-effective to require controls if there is at least a reduction of 0.3 lb/hr of NOx.

Incremental Cost-Effectiveness Assessment

An incremental cost-effectiveness analysis is conducted if multiple initial BARCT concentration limits are identified that vary in stringency and are each cost-effective. A final BARCT concentration limit is established that is both technologically feasible, achievable within the implementation schedule allowed in the proposed rule, cost-effective, and incrementally cost-effective.

PR 1159.1's initial BARCT emission limit of 0.30 lb/hr is the only emission limit proposed as scrubber technology is the only technology identified to be technologically feasible for reducing NOx Emissions for this universe; therefore, an incremental cost-effectiveness analysis was not conducted.

California Environmental Quality Act Assessment

Pursuant to the California Environmental Quality Act (CEQA) and South Coast AQMD's certified regulatory program (Public Resources Code Section 21080.5 and CEQA Guidelines Section 15251(l) ; codified in South Coast AQMD Rule 110), the South Coast AQMD, as lead agency, is currently reviewing the proposed project (PR 1159.1) to determine if it will result in any potential adverse environmental impacts. Appropriate CEQA documentation will be prepared based on the analysis.

Socioeconomic Impact Assessment

A socioeconomic impact assessment will be prepared and released for public review and comment at least 30 days prior to the South Coast AQMD Governing Board Hearing for PR 1159.1, which is scheduled for December 6, 2024 (subject to change).

Draft Findings under Health and Safety Code Section 40727

Requirements to Make Draft Findings
Health and Safety Code Section 40727 requires that prior to adopting, amending or repealing a rule or regulation, the South Coast AQMD Governing Board shall make findings of necessity, authority, clarity, consistency, non-duplication, and reference based on relevant information presented at the public hearing, and in the staff report. In order to determine compliance with Health and Safety Code Section 40727, Health and Safety Code Section 40727.2 requires a written analysis comparing the proposed rule with existing regulations, if the rule meets certain requirements. The following provides the draft findings.

Necessity
PR 1159.1 is needed to establish BARCT requirements for facilities that will be transitioning from RECLAIM to a command-and-control regulatory structure and to provide NOx Emission limits for Nitric Acid Units used at RECLAIM and Non-RECLAIM facilities to reflect current BARCT emission limits.

Authority
The South Coast AQMD obtains its authority to adopt, amend, or repeal rules and regulations from Health and Safety Code Sections 39002, 40000, 40001, 40440, 40506, 40702, 40725 through 40728, 41508, and 42300 et seq.

Clarity
PR 1159.1 is written or displayed so that its meaning can be easily understood by the persons directly affected by it.

Consistency
PR 1159.1 is in harmony with and not in conflict with or contradictory to, existing statutes, court decisions, or state or federal regulations.

Non-Duplication
PR 1159.1 will not impose the same requirements as or in conflict with any existing state or federal regulations. The proposed rule is necessary and proper to execute the powers and duties granted to, and imposed upon, the South Coast AQMD.

Reference
In adopting this rule, the following statutes which the South Coast AQMD hereby implements, interprets or makes specific are referenced: Health and Code Sections 39002, 40000, 40001, 40405, 40406, 40440(a), 40506, 40702, 40725 through 40728.5, 40920.6, and 42300 et seq.

Comparative Analysis

Health and Safety Code Section 40727.2 requires a comparative analysis of the proposed rule with any Federal or District rules and regulations applicable to the same source. A comparative analysis is presented in Table 4-2.

Table 4-2 – Comparative Analysis

Rule Element	Proposed Rule 1159.1	RECLAIM	Equivalent Federal Regulation
Applicability	Facility with one or more Nitric Acid Units	Facilities regulated under NOx or SOx RECLAIM program (South Coast AQMD Regulation XX)	None
Requirements	Compliance pathways for groups of Nitric Acid Units: 1) APCD venting unit(s) meets: • ≤ 0.30 lb/hr of NOx ○ ≤ 0.90 lb/hr facility-wide or; • ≥ 99% control efficiency 2) Source test uncontrol units • Combined emission ≤ 0.60 lb/hr 3) Recordkeeping of nitric acid additions and removals • ≤ 550 gal/year individual unit limit • ≤ 1650 gal/year facility-wide limit • Two-calendar year exceedances of last five, results in loss of this pathway for facility Parametric monitoring • Flowrate • pH • Pressure drop Labeling of tanks	Vent equipment to [APCD] whenever this equipment is in operation. Emission limit related permit conditions • 50 gallons of nitric acid (70%)/month • 20 lbs of nitric acid per day • 200,000 pieces per month • 5 ppmv NOx • 99% control efficiency • 330 lbs of nitric acid (98%)/hr Parametric monitoring • Flowrate • pH • Oxidation reduction potential • Pressure drop	None
Reporting	None	Quarterly Certification of Emissions Report and Annual Permit Emissions Program report	None
Monitoring	• Source testing every 5 years for APCDs • Analysis of tank solutions for optional nitric acid addition adjustments • Visual inspections on control equipment per manufacturers recommendations or at least every quarter	Source testing every: • 5.5 years; or • 5-year period	None
Recordkeeping	•Ongoing monthly and annual nitric acid addition records for units complying with recordkeeping pathway • Weekly recording of control device operating parameters •All records kept onsite for minimum of 5 years	Maintain records to demonstrate compliance with [conditions]	None

APPENDIX A – LIST OF AFFECTED FACILITIES

APPENDIX A: LIST OF FACILITIES

Table A-1: Facilities Affected by PR 1159.1

Facility ID	Facility Name
10010	3M UNITEK CORPORATION
102270	A & G ELECTROPOLISH
176446	A 2 Z PLATING CO
149179	A V PLATING, ANGEL SEDANO DBA
152173	A&A PLATING COMPANY
25087	AAA PLATING & INSPECTION, INC
45489	ABBOTT CARDIOVASCULAR SYSTEMS, INC
62266	ACCURATE ANODIZING, INC
114536	ACCURATE PLATING COMPANY
71553	ACE CLEAR WATER ENTERPRISES
17325	ACE CLEARWATER ENTERPRISES
58416	ACTIVE MAGNETIC INSPECTION
107011	ACTIVE PLATING INC
136197	ADVANCE TECH PLATING
154448	ADVANCED BIONICS LLC
173518	ADVANCED BIONICS, LLC
70220	AERO CHROME PLATING
111944	AERO ELECTRIC CONNECTOR, INC.
173558	AEROFIT, LLC
175126	AEROJET ROCKETDYNE OF DE, INC.
145232	AIR INDUSTRIES COMPANY, LLC
6815	AIR INDUSTRIES CORP
21321	AIRCRAFT X-RAY LABS INC
4346	ALCO CAD-NICKEL PLATING C
102730	ALERT PLATING COMPANY
47835	ALL METALS PROCESSING OF ORANGE CO., LLC
178908	ALLFAST FASTENING SYSTEMS, LLC
117435	ALLOY PROCESSING
7437	ALLOYS CLEANING INC
94719	ALUMINUM PRECISION PROD INC,ALU FORGE CO
36522	ALUMINUM PRECISION PRODUCTS INC
37801	AMERICAN ETCHING & MFG CO
8015	ANADITE INC
16951	ANAPLEX CORP
144438	ANDRES TECHNICAL PLATING
184767	ANOCHEM COATINGS
160399	ANODIZING INDUSTRIES, INC
142479	ANODIZING INDUSTRIES, INC.

7011	ANODYNE INC
189684	APCT ANAHEIM
189170	APCT OC
115329	ARTCRAFT PLATING & FINISHING CO., INC.
55661	ARTISTIC SILVER PLATING INC
121756	ASSOCIATED PLATING CO INC
133243	ASTECH ENGINEERED PRODUCTS INC.
93049	ATK SPACE SYSTEMS INC
17060	AUTOMATION PLATING CORP
127901	AUTOMATION PLATING CORP.
147364	AVIATION REPAIR SOLUTIONS INC.
117912	AVIBANK MANUFACTURING INC
144106	AVK INDUSTRIAL PRODUCTS
189752	AVNEX SURFACE FINISHING INC.
130292	B G DETECTION SERVICES
121215	BARKEN'S HARDCHROME, INC
13618	BARRY AVE PLATING CO INC
146448	BEO-MAG PLATING INC
18814	BLACK OXIDE IND INC
137801	BODYCOTE THERMAL PROCESSING
17489	BRISTOL INDUSTRIES
42645	BRITE PLATING CO INC
13911	BROWN-PACIFIC WIRE INC
70778	BURBANK PLATING SERVICE CORP
171832	C & R PLATING, INC.
76490	CADILLAC PLATING INC
15216	CAL AURUM IND
9120	CAL ELECTROPLATING INC
147653	CALIFORNIA FAUCETS
1953	CAL-TRON PLATING INC
14944	CENTRAL WIRE
148925	CHERRY AEROSPACE
18460	CHRISTENSEN PLATING WKS INC
180575	CHROMADORA, INC
145401	CIRCUIT SERVICES LLC
18031	CLA-VAL CO, GRISWOLD INDUSTRIES DIV
112968	COAST PLATING INC
175222	COASTLINE METAL FINISHING INC
63111	CONNELL PROCESSING INC, CONNELL PROC CORP
20600	CONTINENTAL FORGE CO
192593	CPI SATCOM & ANTENNA TECHNOLOGIES INC.
24756	CRANE CO, HYDRO-AIRE DIV

175218	DANCO EN
21392	DANCO METAL SURFACING
53481	DANCO METAL SURFACING
10955	DANCO METAL SURFACING, ANOMIL ENT., INC.
145507	DENTIUM USA
144198	DESIGNED METAL CONNECTIONS
141966	DICKSON TESTING CO. INC.
46563	DIP BRAZE INC
5723	DUCOMMUN AEROSTRUCTURES, INC
125051	DUCOMMUN AEROSTRUCTURES, INC
140811	DUCOMMUN AEROSTRUCTURES, INC
6763	DUNHAM METAL PROCESSING, CHUCK DUNHAM
45938	E.M.E. INC/ELECTRO MACHINE & ENGINEERING
136148	E/M COATING SERVICES
126964	EDWARDS LIFESCIENCES LLC
82621	ELECTRO ADAPTER INC
143630	ELECTRODE TECH INC, REID METAL FINISHING
9823	ELECTROLURGY INC.
117799	ELECTROMATIC, INC.
94035	ELECTRON PLATING III
23349	ELECTRONIC PRECISION SPECIALTIES INC
129444	ELEMENT MATERIALS TECHNOLOGY
186519	EMBEE PROCESSING
47329	FINE QUALITY METAL FINISHING CO
105966	FINELINE CIRCUITS & TECHNOLOGY INC
164581	FLARE GROUP DBA AVIATION EQUIPMENT PROCE
186898	FMH AEROSPACE CORP
148373	FULLERTON CUSTOM WORKS INC
13488	GCG CORP
116004	GOLDEN STATE MAGNETIC & PENETRANT LAB IN
11998	GOODRICH CORPORATION
76262	GRAPHIC DIES INC
158699	GSP ACQUISITION CORP/GARDENA SPECIALIZED
12841	HARTWELL CORP
40829	HAWKER PACIFIC AEROSPACE
123774	HERAEUS PRECIOUS METALS NO. AMERICA, LLC
158146	HERMETIC SEAL CORP/AMETEK
103703	HIGHTOWER PLATING & MANUFACTURING CO
11192	HI-SHEAR CORPORATION
11818	HIXSON METAL FINISHING
800003	HONEYWELL INTERNATIONAL INC
134931	HOWMET GLOBAL FASTENENING SYSTEMS INC.

134943	HOWMET GLOBAL FASTENING SYSTEMS INC
134944	HOWMET GLOBAL FASTENINGS SYSTEMS INC
1216	HRL LABORATORIES, LLC
153546	HUCK INTERNATIONAL INC
133930	HYDROFORM USA
103286	IDEAL ANODIZING INC
91548	II-VI AEROSPACE & DEFENSE
171275	IMPRESA AEROSPACE, LLC
58876	INDUSTRIAL MFG CO LLC DBA AROOWHEAD PROD
15703	INDUSTRIAL TECTONICS INC
180672	INFINEON TECHNOLOGIES AMERICAS CORP.
139666	ISU PETASYS INC
186454	JD PROCESSING, INC
62852	JENCO PLATING & ANODIZING INC
236	K & L ANODIZING CORP
93702	KCA ELECTRONICS INC
112911	KVR INVESTMNT GRP, PACIFIC PLATING, DBA
71455	L.N.L. ANODIZING
144010	L-3 ELECTRON DEVICES
155797	LA GAUGE COMPANY
140017	LA HABRA PLATING COMPANY
22467	LEFIELL MFG CO
132333	LM CHROME CORP
12748	LMDD ENTER. INC., DIXON HARD CHROME,DBA
41229	LUBECO INC
167413	M & R PLATING CORPORATION
108315	M J B CHROME PLATING & POLISHING
10132	MAGNESIUM ALLOY PROD. CO
14700	MAGPARTS INC
56547	MARCEL ELECTRONICS
107149	MARKLAND MANUFACTURING INC
17473	MECHANICAL METAL FINISHING CO
192123	MEGGITT (ORANGE COUNTY), INC.
109573	METAL CHEM
122365	METAL FINISHING MARKETERS INC
20280	METAL SURFACES INTERNATIONAL, LLC
73339	MID VALLEY ANODIZING
167001	MISTRAS GROUP, INC.
6663	MITCHELL LAB INC
139550	MONITOR POLISHING & PLATING, INC.
133358	MONOGRAM AEROSPACE FASTENERS
102334	MOOG, INC

136913	MORRELL'S ELECTRO PLATING, INC
140513	MS AEROSPACE INC
129249	MULTICHROME / MICROPLATE CO., INC
135284	MURRIETTA CIRCUITS INC
2047	NATIONAL TECHNICAL SYSTEM
42712	NEUTRON PLATING INC
800328	NMB TECHNOLOGIES CORPORATION
18294	NORTHROP GRUMMAN SYSTEMS CORP
800408	NORTHROP GUMMAN SYSTEMS
800409	NORTHROP GRUMMAN SYSTEMS CORPORATION
8408	OMNI METAL FINISHING INC
186803	ORCHID ORTHOPEDIC SOLUTIONS
140871	PAC RANCHO, INC.
153092	PACIFIC AERODYNAMIC INC
173247	PACIFIC CHROME SERVICES
22991	PACIFIC MAGNETIC & PENETRANT CO INC
80799	PALM SPRINGS PLATING
9151	PICO RIVERA PLATING INC
5076	PIONEER CIRCUITS INC
14802	PLATERONICS PROCESSING, INC
177440	PLATINUM SURFACE COATING, INC.
588	PRECIOUS METALS PLATING C
69454	PRECISION AEROSPACE CORP
24570	PRECISION ANODIZING & PLATING INC
130017	PRECISION CONTROL FINISHING, INC.
171391	PRECISION HERMETIC TECHNOLOGY, INC.
195746	PRECISION METAL PROCESSING, INC.
48300	PRECISION TUBE BENDING
150186	PRIME PLATING
182848	QAP METAL FINISHING
52525	QUAKER CITY PLATING & SILVERSMITH LTD
144835	QUALITY ALUMINUM FORGE A DIV OF GEL IND
76769	QUALITY CONTROL PLATING
148912	QUINSTAR TECHNOLOGY, INC.
114009	R.L. ANDODIZING, RAYMOND LANE, DBA
166352	RAH INDUSTRIES
172044	RANTEC MICROWAVE SYSTEMS
95189	RBC TRANSPORT DYNAMICS CORP
94272	RGF ENTERPRISES INC
100806	ROBINSON HELICOPTER CO INC
800113	ROHR, INC
128230	S. LETVIN & SONS

24244	S.T. & I. INC.
39965	SAFE PLATING INC
177461	SAFRAN ELECTRONICS&DEFENSE,AVIONICS USA
10444	SANDERS SERVICE INC
125806	SANTEC, INC
89731	SANTOSHI CORP, ALUM-A-COA
159128	SEMICOA CORPORATION
105598	SENIOR AEROSPACE SSP
192413	SERFLEX L.L.C.
37603	SGL TECHNICAL
115662	SONIC INDUSTRIES INC
1808	SONIC PLATING CO, INC
36738	SORENSON ENGINEERING INC, FRANK SORENSON
194740	SOUTH COAST CIRCUITS INC
183467	SPACE EXPLORATION TECHNOLOGIES
142710	SPECTRUM PLATING CO
151453	SPS TECHNOLOGIES, LLC
169990	SPS TECHNOLOGIES, LLC
5743	STABILE PLATING CO INC
195628	STELLANT SYSTEMS INC
18845	STUTZMAN PLATING CO
181234	SUNVAIR
165015	SUPERFORM USA
154669	SUPERIOR CONNECTOR PLATING, INC.
128150	SUPERIOR PROCESSING
122432	SUPREME PLATING & COATING, L DE LA ROSA
114016	TA MFG CO TA AEROSPACE
131749	TECT
173517	TELEDYNE REYNOLDS INC. DBA TELEDYNE RELA
800067	THE BOEING COMPANY
131232	THE BOEING COMPANY-C13 FACILITY
173544	THE BUYERS, INC.
12282	THE PRECISION COIL SPRING
137438	THERMAL VAC TECHNOLOGY
24718	TIODIZE CO INC
125265	TRIDENT PLATING INC
62986	TTM TECHNOLOGIES INC
170894	TTM TECHNOLOGIES NORTH AMERICA, LLC. (VIASYSTEMS TECHNOLOGIES CORP, LLC.)
12170	VACCO INDUSTRIES
109562	VALLEY PLATING WORKS INC
25304	VALLEY PLATING WORKS, INC
106838	VALLEY-TODECO, INC

24209	VALMONT GEORGE INDUSTRIES
14495	VISTA METALS CORPORATION
177089	WATERSTONE FAUCETS
10966	WEBER METALS INC
113268	WEST COAST AEROSPACE
166762	WEST VALLEY PLATING, INC
158848	WESTERN FILTER - A DIV. OF DONALDSON CO.