Comment Letter #84

Comments on SCAQMD 2022 draft AQMP_Appendix 1

Major comments:

1. As mentioned in the Introduction, this is "a report on the health impacts of particulate matter in the South Coast Air Basin (SCAB)". The purpose of this document is to provide "a brief summary of the conclusions of scientific reviews conducted by U.S. EPA and other scientific agencies, with some additional information from more recently published studies". One would expect this Appendix to focus on studies within SCAB, especially including publications from recent years (e.g., the 2019 USEPA PM Integrated Science Assessment (ISA) included literature up to the end of 2017 or before 2018, and the 2020 Ozone ISA included literature before April 2018). However, very few recent publications were included, especially in the ozone and PM sections. The individual studies that are mentioned are mostly older studies before the latest ISAs were released and didn't necessarily focus on Southern California.

I suggest the authors put more weight on studies conducted in Southern California or other areas with similar ranges of air pollution levels, climate patterns, and population demographics. Local climate, e.g., temperature, relative humidity, and geography, may also interact with health impacts of air pollution, especially ozone. Demographic characteristics, such as racial/ethnicity and socioeconomic status, should also be considered.

Furthermore, recent literature suggests that dose-response relationships changed over time (Bi et al. 2020 https://www.sciencedirect.com/science/article/abs/pii/S0013935120308628; Chen et al. 2021 https://www.thelancet.com/pdfs/journals/lanplh/PIIS2542-5196(21)00168-6.pdf), as air pollution, population demographic distributions, health service/technology all change over time, studies conducted more recently are more relevant.

There are many new articles on health effects of criteria air pollutants that have been published since 2018. Here are some papers most relevant to Southern California identified from a brief search of Scopus:

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1) Hao, H., Eckel, S.P., Hosseini, A., Van Vliet, E.D.S., Dzubur, E., Dunton, G., Chang, S.Y., Craig, K., Rocchio, R., Bastain, T., Gilliland, F., Okelo, S., Ross, M.K., Sarrafzadeh, M., Bui, A.A.T., Habre, R.
Daily Associations of Air Pollution and Pediatric Asthma Risk Using the Biomedical REAI-Time Health Evaluation (BREATHE) Kit
(2022) *International Journal of Environmental Research and Public Health*, 19 (6), art. no. 3578, . Sidell, M.A., Chen, Z.,

2) Ademu, L.O., Gao, J., Thompson, O.P., Ademu, L.A.
Impact of Short-Term Air Pollution on Respiratory Infections: A Time-Series Analysis of COVID-19 Cases in California during the 2020 Wildfire Season
(2022) *International Journal of Environmental Research and Public Health*, 19 (9), art. no.

3) Huang, B.Z., Chow, T., Eckel, S.P., Martinez, M.P., Lurmann, F., Thomas, D.C., Gilliland, F.D., Xiang, A.H.
Ambient air pollution and COVID-19 incidence during four 2020–2021 case surges
(2022) *Environmental Research*, 208, art. no. 112758, . Cited 1 time.

4) Sun, Y., Li, X., Benmarhnia, T., Chen, J.-C., Avila, C., Sacks, D.A., Chiu, V., Slezak, J., Molitor, J., Getahun, D., Wu, J.
Exposure to air pollutant mixture and gestational diabetes mellitus in Southern California: Results from electronic health record data of a large pregnancy cohort
(2022) *Environment International*, 158, art. no. 106888, . Cited 3 times.

5) 5057Petkus, A.J., Resnick, S.M., Wang, X., Beavers, D.P., Espeland, M.A., Gatz, M., Gruenewald, T., Millstein, J., Chui, H.C., Kaufman, J.D., Manson, J.E., Wellenius, G.A., Whitsel, E.A., Widaman, K., Younan, D., Chen, J.-C.
Ambient air pollution exposure and increasing depressive symptoms in older women: The mediating role of the prefrontal cortex and insula
(2022) *Science of the Total Environment*, 823, art. no. 153642, . Cited 2 times.

6) Younan, D., Wang, X., Millstein, J., Petkus, A.J., Beavers, D.P., Espeland, M.A., Chui, H.C., Resnick, S.M., Gatz, M., Kaufman, J.D., Wellenius, G.A., Whitsel, E.A., Manson, J.E., Rapp, S.R., Chen, J.-C.
Air quality improvement and cognitive decline in community-dwelling older women in the United States: A longitudinal cohort study
(2022) *PLoS Medicine*, 19 (2), art. no. e1003893, .

7) Ailshire, J., Walsemann, K.M.
Education Differences in the Adverse Impact of PM2.5 on Incident Cognitive Impairment Among U.S. Older Adults
(2021) *Journal of Alzheimer's disease : JAD*, 79 (2), pp. 615-625. Cited 4 times.

8) Chen, C., Hayden, K.M., Kaufman, J.D., Espeland, M.A., Whitsel, E.A., Serre, M.L., Vizuete, W., Orchard, T.S., Wang, X., Chui, H.C., DAlton, M.E., Chen, J.-C., Kahe, K.
Adherence to a MIND-Like Dietary Pattern, Long-Term Exposure to Fine Particulate Matter Air Pollution, and MRI-Based Measures of Brain Volume: The Women's Health Initiative Memory Study-MRI
(2021) *Environmental Health Perspectives*, 129 (12), art. no. 127008, . Cited 2 times

9) Ilango, S.D., Gonzalez, K., Gallo, L., Allison, M.A., Cai, J., Isasi, C.R., Hosgood, D.H., Vasquez, P.M., Zeng, D., Mortamais, M., Gonzalez, H., Benmarhnia, T.
Long-Term Exposure to Ambient Air Pollution and Cognitive Function among Hispanic/Latino Adults in San Diego, California
(2021) *Journal of Alzheimer's Disease*, 79 (4), pp. 1489-1496. Cited 2 times

10) Petkus, A.J., Younan, D., Wang, X., Beavers, D.P., Espeland, M.A., Gatz, M., Gruenewald, T., Kaufman, J.D., Chui, H.C., Millstein, J., Rapp, S.R., Manson, J.E., Resnick, S.M., Wellenius, G.A., Whitsel, E.A., Widaman, K., Chen, J.-C., Zammit, A.
Associations between Air Pollution Exposure and Empirically Derived Profiles of Cognitive Performance in Older Women
(2021) *Journal of Alzheimer's Disease*, 84 (4), pp. 1691-1707.

11) Ouidir, M., Seyve, E., Rivière, E., Bernard, J., Cheminat, M., Cortinovis, J., Ducroz, F., Dugay, F., Hulin, A., Kloog, I., Laborie, A., Launay, L., Malherbe, L., Robic, P.-Y., Schwartz, J., Siroux, V., Virga, J., Zaros, C., Charles, M.-A., Slama, R., Lepeule, J.
Maternal ambient exposure to atmospheric pollutants during pregnancy and offspring term birth weight in the nationwide ELFE cohort
(2021) *International Journal of Environmental Research and Public Health*, 18 (11), art. no. 5806, .

12) Mann, J.K., Lutzker, L., Holm, S.M., Margolis, H.G., Neophytou, A.M., Eisen, E.A., Costello, S., Tyner, T., Holland, N., Tindula, G., Prunicki, M., Nadeau, K., Noth, E.M., Lurmann, F., Hammond, S.K., Balmes, J.R.
Traffic-related air pollution is associated with glucose dysregulation, blood pressure, and oxidative stress in children
(2021) *Environmental Research*, 195, art. no. 110870, . Cited 9 times.

13) Toledo-Corral, C.M., Alderete, T.L., Herting, M.M., Habre, R., Peterson, A.K., Lurmann, F., Goran, M.I., Weigensberg, M.J., Gilliland, F.D.
Ambient air pollutants are associated with morning serum cortisol in overweight and obese Latino youth in Los Angeles
(2021) *Environmental Health: A Global Access Science Source*, 20 (1), art. no. 39, . Cited 1 time.

14) Burnor, E., Cserbik, D., Cotter, D.L., Palmer, C.E., Ahmadi, H., Eckel, S.P., Berhane, K., McConnell, R., Chen, J.-C., Schwartz, J., Jackson, R., Herting, M.M.
Association of Outdoor Ambient Fine Particulate Matter with Intracellular White Matter

Microstructural Properties among Children
(2021) *JAMA Network Open*, 4 (12), art. no. e2138300, . Cited 3 times.

15) Davis, E., Malig, B., Broadwin, R., Ebisu, K., Basu, R., Gold, E.B., Qi, L., Derby, C.A., Park, S.K., Wu, X.M.
Association between coarse particulate matter and inflammatory and hemostatic markers in a cohort of midlife women
(2020) *Environmental Health: A Global Access Science Source*, 19 (1), art. no. 111, . Cited 1 time.

16) Su, P.-F., Sie, F.-C., Yang, C.-T., Mau, Y.-L., Kuo, S., Ou, H.-T.
Association of ambient air pollution with cardiovascular disease risks in people with type 2 diabetes: a Bayesian spatial survival analysis
(2020) *Environmental Health: A Global Access Science Source*, 19 (1), art. no. 110, . Cited 1 time.

17) Tavallali, P., Gharibi, H., Singhal, M., Schweizer, D., Cisneros, R.
A multi-pollutant model: a method suitable for studying complex relationships in environmental epidemiology
(2020) *Air Quality, Atmosphere and Health*, 13 (6), pp. 645-657. Cited 4 times.

18) Pope, C.A., III, Coleman, N., Pond, Z.A., Burnett, R.T.
Fine particulate air pollution and human mortality: 25+ years of cohort studies
(2020) *Environmental Research*, 183, art. no. 108924, . Cited 112 times.

19) Chau, K., Franklin, M., Gauderman, W.J.
Satellite-derived PM2.5 composition and its differential effect on children's lung function
(2020) *Remote Sensing*, 12 (6), art. no. 1028, . Cited 10 times.

20) Starling, A.P., Moore, B.F., Thomas, D.S.K., Peel, J.L., Zhang, W., Adgate, J.L., Magzamen, S., Martenies, S.E., Allshouse, W.B., Dabelea, D.
Prenatal exposure to traffic and ambient air pollution and infant weight and adiposity: The Healthy Start study
(2020) *Environmental Research*, 182, art. no. 109130, . Cited 19 times.

21) Wyatt, L.H., Peterson, G.C.L., Wade, T.J., Neas, L.M., Rappold, A.G.
The contribution of improved air quality to reduced cardiovascular mortality: Declines in socioeconomic differences over time
(2020) *Environment International*, 136, art. no. 105430, . Cited 3 times.

22) Petkus, A.J., Younan, D., Widaman, K., Gatz, M., Manson, J.E., Wang, X., Serre, M., Vizuete, W., Chui, H., Espeland, M.A., Resnick, S., Chen, J.-C.
Exposure to fine particulate matter and temporal dynamics of episodic memory and depressive symptoms in older women
(2020) *Environment International*, 135, art. no. 105196, . Cited 17 times.

23) Younan, D., Petkus, A.J., Widaman, K.F., Wang, X., Casanova, R., Espeland, M.A., Gatz, M., Henderson, V.W., Manson, J.E., Rapp, S.R., Sachs, B.C., Serre, M.L., Gaussoin, S.A., Barnard, R., Saldana, S., Vizuete, W., Beavers, D.P., Salinas, J.A., Chui, H.C., Resnick, S.M., Shumaker, S.A., Chen, J.-C.
Particulate matter and episodic memory decline mediated by early neuroanatomic biomarkers of Alzheimer's disease
(2020) *Brain*, 143 (1), pp. 289-302. Cited 73 times.

24) Ebisu, K., Malig, B., Hasheminassab, S., Sioutas, C.
Age-specific seasonal associations between acute exposure to PM2.5 sources and cardiorespiratory hospital admissions in California
(2019) *Atmospheric Environment*, 218, art. no. 117029, . Cited 7 times.

25) Jo, H., Eckel, S.P., Chen, J.-C., Cockburn, M., Martinez, M.P., Chow, T., Lurmann, F.W., Funk, W.E., Xiang, A.H., McConnell, R.
Gestational diabetes mellitus, prenatal air pollution exposure, and autism spectrum disorder
(2019) *Environment International*, 133, art. no. 105110, . Cited 16 times.

26) Jo, H., Eckel, S.P., Wang, X., Chen, J.-C., Cockburn, M., Martinez, M.P., Chow, T., Molshatzki, N., Lurmann, F.W., Funk, W.E., Xiang, A.H., McConnell, R.
Sex-specific associations of autism spectrum disorder with residential air pollution exposure in a large Southern California pregnancy cohort
(2019) *Environmental Pollution*, 254, art. no. 113010, . Cited 24 times.

27) Jo, H., Eckel, S.P., Chen, J.-C., Cockburn, M., Martinez, M.P., Chow, T., Lurmann, F., Funk, W.E., McConnell, R., Xiang, A.H.

Associations of gestational diabetes mellitus with residential air pollution exposure in a large Southern California pregnancy cohort
(2019) *Environment International*, 130, art. no. 104933, . Cited 30 times.

28) Schwarz, L., Bruckner, T., Ilango, S.D., Sheridan, P., Basu, R., Benmarhnia, T.
A quantile regression approach to examine fine particles, term low birth weight, and racial/ethnic disparities
(2019) *Environmental Epidemiology*, 3 (4), art. no. e060, . Cited 8 times.

29) Hajat, A., Diezroux, A.V., Castro-Diehl, C., Cosselman, K., Golden, S.H., Hazlehurst, M.F., Szpiro, A., Vedal, S., Kaufman, J.D.
The association between long-term air pollution and urinary catecholamines: Evidence from the multi-ethnic study of atherosclerosis
(2019) *Environmental Health Perspectives*, 127 (5), art. no. 057007, . Cited 16 times.

30) Enders, C., Pearson, D., Harley, K., Ebisu, K.
Exposure to coarse particulate matter during gestation and term low birthweight in California: Variation in exposure and risk across region and socioeconomic subgroup
(2019) *Science of the Total Environment*, 653, pp. 1435-1444. Cited 13 times.

31) Huang, H., Woodruff, T.J., Baer, R.J., Bangia, K., August, L.M., Jellife-Palowski, L.L., Padula, A.M., Sirota, M.
Investigation of association between environmental and socioeconomic factors and preterm birth in California
(2018) *Environment International*, 121, pp. 1066-1078. Cited 17 times.

32) Ebisu, K., Malig, B., Hasheminassab, S., Sioutas, C., Basu, R.
Cause-specific stillbirth and exposure to chemical constituents and sources of fine particulate matter
(2018) *Environmental Research*, 160, pp. 358-364. Cited 26 times.

33) Toledo-Corral, C.M., Alderete, T.L., Habre, R., Berhane, K., Lurmann, F.W., Weigensberg, M.J., Goran, M.I., Gilliland, F.D.
Effects of air pollution exposure on glucose metabolism in Los Angeles minority children
(2018) *Pediatric Obesity*, 13 (1), pp. 54-62. Cited 54 times.

These are recent review articles published since 2018:

1) Yu, X., Rahman, M.M., Wang, Z., Carter, S.A., Schwartz, J., Chen, Z., Eckel, S.P., Hackman, D., Chen, J.-C., Xiang, A.H., McConnell, R. Evidence of susceptibility to autism risks associated with early life ambient air pollution: A systematic review (2022) Environmental Research, 208

2) Gong, C., Wang, J., Bai, Z., Rich, D.Q., Zhang, Y. Maternal exposure to ambient PM2.5 and term birth weight: A systematic review and meta-analysis of effect estimates (2022) Science of the Total Environment, 807

3) Xie, G., Sun, L., Yang, W., Wang, R., Shang, L., Yang, L., Qi, C., Xin, J., Yue, J., Chung, M.C. Maternal exposure to PM2.5 was linked to elevated risk of stillbirth (2021) Chemosphere, 283

4) Bevan, G.H., Al-Kindi, S.G., Brook, R., Rajagopalan, S. Ambient Air Pollution and Atherosclerosis: Recent Updates (2021) Current Atherosclerosis Reports, 23 (10)

5) Lee, Y.-G., Lee, P.-H., Choi, S.-M., An, M.-H., Jang, A.-S. Effects of air pollutants on airway diseases (2021) International Journal of Environmental Research and Public Health, 18 (18)

6) Chun, H., Leung, C., Wen, S.W., McDonald, J., Shin, H.H.
Maternal exposure to air pollution and risk of autism in children: A systematic review and meta-analysis. (2020) *Environmental Pollution*, 256

7) Gruzieva, O., Xu, C.-J., Yousefi, P., Relton, C., Merid, S.K., Breton, C.V., Gao, L., Volk, H.E., Feinberg, J.I., Ladd-Acosta, C., Bakulski, K., Auffray, C., Lemonnier, N., Plusquin, M., Ghantous, A., Herceg, Z., Nawrot, T.S., Pizzi, C., Richiardi, L., Rusconi, F., Vineis, P., Kogevinas, M., Felix, J.F., Duijts, L., Den Dekker, H.T., Jaddoe, V.W.V., Ruiz, J.L., Bustamante, M., Antó, J.M., Sunyer, J., Vrijheid, M., Gutzkow, K.B., Grazuleviciene, R., Hernandez-Ferrer, C., Annesi-Maesano, I., Lepeule, J., Bousquet, J., Bergström, A., Kull, I., Söderhäll, C., Kere, J., Gehring, U., Brunekreef, B., Just, A.C., Wright, R.J., Peng, C., Gold, D.R., Kloog, I., Demeo, D.L., Pershagen, G., Koppelman, G.H., London, S.J., Baccarelli, A.A., Melén, E. Prenatal particulate air pollution and DNA methylation in newborns: An epigenome-wide meta-analysis. (2019) Environmental Health Perspectives, 127 (5)

8) Ritz, B., Hoffmann, B., Peters, A. The effects of fine dust, ozone, and nitrogen dioxide on health (2019) Deutsches Arzteblatt International, 116 (51-52), pp. 881-886.

9) Papadogeorgou, G., Kioumourtzoglou, M.-A., Braun, D., Zanobetti, A. Low Levels of Air Pollution and Health: Effect Estimates, Methodological Challenges, and Future Directions (2019) Current environmental health reports, 6 (3), pp. 105-115.

10) Liu, Q., Gu, X., Deng, F., Mu, L., Baccarelli, A.A., Guo, X., Wu, S. Ambient particulate air pollution and circulating C-reactive protein level: A systematic review and meta-analysis (2019) International Journal of Hygiene and Environmental Health, 222 (5), pp. 756-764

Wildfire studies:

1) Fann, N., Alman, B., Broome, R.A., Morgan, G.G., Johnston, F.H., Pouliot, G., Rappold, A.G. The health impacts and economic value of wildland fire episodes in the U.S.: 2008–2012 (2018) Science of the Total Environment, 610-611, pp. 802-809.

2) Meo, S.A., Abukhalaf, A.A., Alomar, A.A., Alessa, O.M., Sami, W., Klonoff, D.C. Effect of environmental pollutants PM-2.5, carbon monoxide, and ozone on the incidence and mortality of SARS-COV-2 infection in ten wildfire affected counties in California (2021) Science of the Total Environment, 757, art. no. 143948.

3) Aguilera, R., Corringham, T., Gershunov, A., Benmarhnia, T.
Wildfire smoke impacts respiratory health more than fine particles from other sources: observational evidence from Southern California. (2021) *Nature Communications*, 12 (1)

4) Heaney, A., Stowell, J.D., Liu, J.C., Basu, R., Marlier, M., Kinney, P.
Impacts of Fine Particulate Matter From Wildfire Smoke on Respiratory and Cardiovascular Health in California. (2022) *GeoHealth*, 6 (6)

5) Naqvi, H.R., Mutreja, G., Shakeel, A., Singh, K., Abbas, K., Naqvi, D.F., Chaudhary, A.A., Siddiqui, M.A., Gautam, A.S., Gautam, S., Naqvi, A.R. Wildfire-induced pollution and its short-term impact on COVID-19 cases and mortality in California (2022) Gondwana Research.

6) Sharma, A., Valdes, A.C.F., Lee, Y. Impact of Wildfires on Meteorology and Air Quality (PM2.5 and O3) over Western United States during September 2017 (2022) Atmosphere, 13 (2), art. no. 262.

For each pollutant, table or figure summaries of the literature would be more straightforward and much appreciated.

2. For the AQMP, it may be helpful to have an overview of the health effects of cumulative exposures to multiple pollutants by air district, since people are subject to the stress of multiple air pollutants at the same time. In Table I-7, excess cases of similar outcomes are summarized, e.g., outcomes related to asthma, associated with different pollutants. It would be helpful if these estimates are extrapolated to other pollutants.

Minor comments:

1. Page I-2, American Heart Association (AHA) also periodically published scientific statements based on expert review on cardiovascular effects from air pollution.

2004 review: https://www.ahajournals.org/doi/10.1161/01.cir.0000128587.30041.c8

2010 review: https://www.ahajournals.org/doi/10.1161/cir.0b013e3181dbece1

2020 review: https://www.ahajournals.org/doi/10.1161/CIR.0000000000000931

Since the mortality associated with PM mainly related to cardiovascular outcomes, AHA publications should be referenced.

2. On page I-36, the sentence about blood pressure in the middle of metabolic effects section is out of place.

3. or PM2.5, short-term cardiovascular effects did not include subclinical effects. Studies on adverse birth outcomes were not included in the short-term health effect section, but mixed with long-term health effects. Usually, trimester and full pregnancy exposures would be considered long-term exposures, while exposures within a few day(s) or one week prior to delivery would be considered short-term exposures.

4. For the sensitive population sections under ozone and PM, I suggest adding the population size and percentage of the SCAQMD territory in the table or text, if available (unless that will be covered in the economic report?). The younger and higher percentage of non-White populations in this region may exacerbate health risks from ambient air pollution.

5. For the health burden analysis of ozone and PM in the South Coast Air Basin, more explanation is needed about the analysis in the 2016 AQMP. Were the 1,400 and 2,700 premature deaths for 2023 and 2031, respectively, reported annually? How was "an average of about 1,500 avoided premature deaths per year" calculated? Was it based on the projected air concentrations without control?

Table I-8, why wasn't short-term PM2.5 exposure included in the mortality-related benefits?

There are new resources/tools available to estimate the health burden associated with air pollution exposure, e.g., CalEnviroScreen, California Healthy Places Index, ATSDR/CDC Social Vulnerability Index, etc. SCAQMD should consider redoing the risk estimate using newer data.

6. For NO2, subtitles by short/long-term outcomes would be appreciated, at least for the major categories: respiratory, cardiovascular, other outcomes, etc.

7. Th "Toxic Air Contaminants" section does not include any health effects associated with TACs.

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Sent: Friday, August 12, 2022 8:44 AM