APPENDIX XV

MATES V

FINAL REPORT

Response to Comments on MATES V Report

Appendix XV

Response to Comments on MATES V Report

Responses to Comment Letter A from Delbert Eatough

Response to Comment A-1:
Staff appreciate the commenter providing the information derived from the source apportionment studies.

Response to Comment A-2:
While it is true that the MATES studies have consistently showed that diesel PM is a major contributor to air toxics cancer risk, neither South Coast AQMD nor CARB specifically attributes this risk to the black carbon (BC) present in the diesel PM emissions. CARB has determined that total diesel exhaust, including both gaseous and particulate emissions, was carcinogenic while diesel PM was designated as a surrogate to total diesel exhaust.

Staff disagree with the assertion that off-road and stationary sources have negligible contributions to the overall BC emissions in the South Coast Air Basin. The studies cited by the commenter were unable to identify a contribution from ships near the Ports of Long Beach and Los Angeles at a sampling site near I-710 and Long Beach Blvd. The inability of those studies to identify contribution of ship emissions to measured PM2.5 or BC concentration at a site downwind of the ports does not in itself indicate those emissions from ships do not travel on land.

While BC measurements were performed during MATES studies, these measurements were not factored in our risk analyses because the OEHHA risk assessment guidance does not have health risk assessment values for BC. In our analyses, we tracked PM emissions from diesel engines for each source category without regard to the speciation of the emissions. Emissions were inventoried from the top-down approach based on reported or estimated activity, vehicle/equipment population, or fuel consumption data, and established emission factors. For example, the diesel PM emissions from point sources were reported by facilities based on the hours of operations and engine size or diesel fuel consumption; the emission factors for this equipment were then applied to calculate the pollutant emissions. As the regulatory agency with primary authority over mobile sources, CARB has developed various tools to calculate mobile source emissions, based on their wealth of data on mobile source engines in California. The emissions inventory employed in MATES V is consistent with a regulatory inventory included in an AQMP/SIP which were developed via public process by multiple agencies, including CARB. While new data and methodology will likely continue to improve the accuracy of emissions inventories, any changes in the inventory and the underlying assumptions would need to go through an appropriate public process.

Response to Comment A-3:

We note that all BTEX compounds (benzene, toluene, ethylbenzene, o-xylene, m+p-xylenes) were measured in MATES V and previous MATES. During MATES V, benzene and toluene were generally well-correlated at all MATES sites (r^2 = 0.62-0.94), with linear regression slopes (toluene/benzene) ranging from 1.7-3.9. The toluene/benzene ratio has been used to differentiate between key BTEX sources such as vehicle exhaust and refinery emissions in some regions (e.g., Halliday et al., 2016), but assessing the refinery signal in the MATES V BTEX data is very difficult due to the location of refineries within a major urban area with other large sources of these compounds, including gasoline-powered mobile sources. However, the MATES V Advanced Monitoring report expected to be released within the next year will include results from targeted studies of toxic emissions from refineries. Furthermore, South Coast AQMD currently has several monitoring programs focused on characterizing refinery emissions and impacts, including the Rule 1180 (continuous fenceline monitoring) and AB 617 (community monitoring) programs. These higher spatial and temporal resolution datasets will be used in conjunction with baseline MATES V BTEX data to understand the impact of refineries on community and regional scales.

Reference:

Halliday, H. S., A. M. Thompson, A. Wisthaler, D. R. Blake, R. S. Hornbrook, T. Mikoviny, M. Müller, P. Eichler, E. C. Apel, and A. J. Hills. "Atmospheric benzene observations from oil and gas production in the Denver-Julesburg Basin in July and August 2014." *J. Geophys. Res. Atmos.* 121 (2016): 11,055-11,074.

Responses to Comment Letter B from Scott Fruin

Response to Comment B-1:
The executive summary states that "The carcinogenic risk from air toxics in the Basin, based on the average concentrations at the 10 monitoring sites, is approximately 38% lower than the monitored average in MATES IV and 82% lower than the average in MATES II." and describes the changes in chronic HI from IV to V. In order to keep the executive summary at a reasonable length, staff believe that this level of detail is sufficient to highlight the large reductions in cancer risk.

Response to Comment B-2:
In Chapter 1, staff have added a description of the links between PM2.5 exposures and risk of premature mortality. In future work, staff may consider adding information to the Data Visualization Tool to highlight the impact of PM2.5 on premature mortality.

Response to Comment B-3:
Staff have added text in the chapters to provide additional interpretation of the hazard indices.

Response to Comment B-4:
The air toxics cancer risk associated with diesel PM was calculated using both the modeling results as well as the monitoring results. Uncertainties in the risk estimates stemming from the uncertainties in the cancer potency factor are noted in the Executive Summary and Chapter 1.

Uncertainties in Modeled Air Toxics Cancer Risk Associated with Diesel PM

The modeling-based cancer-risk used CAMx-predicted diesel PM to calculate cancer risk. The air toxics cancer risks presented in the MATES III and IV reports also used model-based predictions that did not rely on a conversion factor. However, the EC-to-diesel PM ratio was used in the measurement-based risk calculations in MATES V as well as earlier iterations. While there is uncertainty in the monitoring-based calculation of cancer risks from diesel PM, arising from the conversion factor, these risk estimates also showed similar significant reductions in diesel PM risk. This indicates that, despite the uncertainties in estimating this risk, the model-derived EC-to-diesel PM conversion factor served the risk calculation reasonably well.

The uncertainties in modeled EC concentrations were from the individual model components, I.e., emissions inputs and air quality and meteorological models. The CAMx model used for the MATES analysis is a state-of-the-art, comprehensive 3-dimensional model that utilizes 3-dimensional meteorological models, complex chemical mechanisms that accurately simulate ambient reactions of pollutants, and sophisticated numerical methods to solve complex mathematical equations that lead to the prediction of ambient air quality concentrations. While air quality models progressively became more sophisticated in employing improved chemical reaction modules that more accurately simulate the complex ambient chemical reaction mechanisms of the various pollutants, such improved modules are still based on limited experimental data that carry associated uncertainties. In order to predict ambient air quality concentrations, air quality models rely on the application of sophisticated numerical methods to solve complex mathematical equations that govern the highly complex physical and chemical processes that also have associated uncertainties. Layer averaging of model output reduces the sensitivity of the model to changing patterns in the vertical structure.

While significant improvements have been realized in mobile source emissions models, uncertainties continue to exist in the mobile source emissions inventory estimates. EMFAC2017 on-road mobile source emission estimates have improved with each new EMFAC release. On-road mobile source emissions have inherent uncertainties with the current methodologies used to estimate vehicle miles traveled and the impacts of fuel additives such as ethanol. Stationary (or point) source emission estimates generally have less associated uncertainty compared to area source emission estimates. Major stationary point sources report emissions annually whereas minor stationary and area source emissions are, in general, estimated based on a top down approach that relies on state-total to county-total production, usage or activity information. Area source emissions including paved road dust and fugitive dust have significant uncertainties in the estimation of particulate (PM2.5) emissions due to the methodologies used for estimation, temporal loading and weather impacts. In addition to uncertainties in PM emissions, EC emissions relied on speciation profiles and large uncertainties in those profiles were expected. Nevertheless, the modeled EC concentrations compared reasonably well with the measured EC concentrations throughout MATES II to MATES V. The model performance for EC provides reasonable confidence for both the EC emissions inventory and the modeling system.

Since diesel PM behaves similarly to EC in the atmosphere and diesel PM comes from fewer sources than EC and its modeling inventory does not need to be speciated, it is expected that the uncertainties in the modeled diesel PM concentrations are less than the modeled EC concentrations.

Uncertainties in Air Toxics Cancer Risk Associated with Diesel PM Calculated with Measured EC

Uncertainties in estimating diesel PM risk from the measured EC concentrations are related to uncertainties in measured EC concentrations and uncertainties in the ratio of modeled EC and diesel PM. Additional text has been added in Chapter 2 to better describe these uncertainties. In addition, staff added error bars to the monitor-based calculation of diesel risk, which were based on uncertainties inherent in deriving the ratio of modeled diesel PM and EC along with uncertainties in the EC measurements. Although there are uncertainties in converting ambient EC concentrations into ambient diesel PM concentrations, it is worth noting that converted diesel PM concentrations compared reasonably well with modeled diesel PM concentrations.

Staff also added a figure showing the EC2.5 trend to Chapter 2; EC2.5 shows a steady decrease in concentrations from MATES III through MATES V.

Response to Comment B-5:
Staff reduced the density of basin boundaries in risk maps throughout the report to avoid misinterpretation of risk in the port area.

Response to Comment B-6:
(part 1) Staff have added text in this paragraph to clarify that air toxics are those pollutants that do not have ambient regulatory standards. However, federal, state, and local agencies do have regulatory standards that do control emissions of air toxics.

(part 2) Chapter 1 includes an explanation of the exposure pathways. Staff have added text to describe that the estimated multi-pathway cancer risk is ~8% higher than the inhalation-only estimate. The multi-pathway non-cancer chronic HI is approximately twice the inhalation-only estimate. Staff added text in Chapter 1 to describe the uncertainties in estimating health impacts from non-inhalation exposure pathways.

(part 3) Staff added "Results" to the "Fixed Monitoring" and "Modeling" headings.

(part 4) The risk results included in this section have been moved toward the beginning of the paragraph, along with a brief description of the basis of these calculations and the interpretation. Chapter 1 includes a more detailed description of how these cancer risks were calculated. A definition of secondary formation has been added.

(part 5) Staff have added text to the Executive Summary as well as Chapter 2 to provide more explanation and interpretation of the chronic HI.

(part 6) Staff fixed the font size in Figure ES-4.

(part 7) Staff have added clarifying text to the Executive Summary.

(part 8) Staff reduced the density of basin boundaries in risk maps throughout the report.

(part 9) Because previous MATES iterations utilized inhalation-only exposure pathways to calculate risk, and because a reader may be looking for the same information in the MATES V report, staff believe it is important to keep this information in the Executive Summary. Staff also concur that there is uncertainty in the calculation of cancer risks and discuss these uncertainties in the Executive Summary and Chapter 1.

(part 10) Although staff agree that presenting risk reduction by percentage may be useful, there is also value in consistently showing the change in absolute cancer risk across MATES iterations. However, the percentage reductions are described within the text of the report. Error bars have been added to the plot for diesel PM for MATES IV and V.

(part 11) Staff added text to the Caveats section of the Executive Summary to note that the conversion of BC to diesel PM is a source of uncertainty. This section also includes comments about the analysis not being designed to reflect near-source exposures. The analysis of the EC2.5 concentrations is included in Chapter 2. See also Response to Comment B-4.

(part 12) In an effort to keep the Executive Summary as short as possible, staff prefer to keep the conclusions at the end of the Executive Summary. However, staff will highlight such conclusions in infographics and outreach presentations.

Response to Comment B-7:
Uncertainties in the estimation of diesel PM health risks are addressed in the Executive Summary and Chapter 1. See Response to Comment B-4. Error bars have been added to the figure for diesel PM for MATES IV and V to help convey some uncertainties in these estimates.

Response to Comment B-8:
MATES IV and V diesel PM estimates were calculated with station-specific EC to diesel PM ratio calculated from modeled concentrations. As discussed above, uncertainties in the station-specific conversion factors were calculated for MATES IV and V and were combined with the EC measurement uncertainty to capture the diesel PM estimation uncertainty. MATES II and III diesel PM estimates were calculated with a basin-wide conversion factor calculated from modeled emissions. While it is not possible to calculate the uncertainty of these emission-based conversion factors, staff derived them for MATES IV and V to ensure that the methodology did not contribute to the large apparent decrease in diesel PM. Using these emission-based conversion factors led to a very similar trend in diesel PM throughout each MATES study. A paragraph was added to Chapter 2 to address this point.

Response to Comment B-9:
We have added horizontal lines showing the MATES IV average risk in the basin and Coachella Valley to figures 4-18 through 4-21. Appendix titles are shown on the cover pages of the appendices and in the List of Appendices.

<u>Responses to Comment Letter C from Ken Davidson</u>

Response to Comment C-1:

Staff added text to the Executive Summary detailing the change in population-weighted cancer risk within the SB535 designated communities compared to the rest of the Basin in MATES IV and MATES V.

Response to Comment C-2:
Staff added a couple of sentences acknowledging that unmeasured air toxics could contribute to health risks, but that the MATES studies have included the known air toxics that primarily drive health risks from air pollution.

Response to Comment C-3:
Staff added "ambient concentrations" for clarification.

Response to Comment C-4:
Staff revised the report so that the term "EJ Community" is first defined as "communities experiencing environmental injustices". The term "EJ Community" is subsequently used for the remainder of the chapter or appendix.

Response to Comment C-5:
Per OEHHA guidelines, residential health risks are calculated assuming that 100% of the time is spent at home. This is a conservative estimate of the impacts in a single location.

Responses to Comment Letter D from John Budroe

Response to Comment D-1:
Staff have incorporated additional language in the Executive Summary, Chapter 1 and Chapter 2 to clarify the terminology and interpretation of chronic non-cancer health impacts.

Response to Comment D-2:
Staff have made the suggested revisions.

Response to Comment D-3:
Staff have made the suggested revision.

Response to Comment D-4:
Page 2-14: Staff have made the suggested revisions.

Page 2-16: Staff have made the suggested revision.

Page 2-18: Staff have deleted the redundant graph and fixed the figure numbering.

Page 2-30: Staff have added text explaining that the two bromomethane figures show the same data with different vertical axes. Staff have added similar clarification for similar figure pairings throughout Chapter 2.

Responses to Comment Letter E from Janet Whittick

Response to Comment E-1:

Staff appreciate the comments about using MATES data to enhance our understanding of air toxics risk drivers, especially in environmental justice communities. The MATES data have already been used to inform AB 617 community efforts. For example, the MATES IV data was one of the main technical data sources that was used to inform community identification and prioritization efforts for AB 617. Additionally, the emissions inventory is a key part of the Source Attribution analysis portion of the AB 617 Community Emissions Reduction Plans (CERPs). These data, along with community knowledge and other information (e.g. near-source monitoring studies, other data sources), help to inform the priorities and actions of the CERPs. Staff intend to use MATES V data for similar purposes once the data are finalized.

Response to Comment E-2:
In order to keep the Executive Summary at a reasonable length and minimize redundancy, staff prefer not to include a discussion of the perspectives on risk that is currently described in Chapter 1. However, staff added text in the Executive Summary explicitly defining cancer risk and chronic non-cancer health impacts to improve clarity.

Response to Comment E-3:
Staff agree that it is reasonable to expect future trends of decreasing air toxics emissions, since criteria pollutants such as NOx, VOC and combustion-related PM emissions are also expected to decrease due to various regulations by the District, State and Federal agencies. These planning projections can already be found in other South Coast AQMD publications, such as the Air Quality Management Plans. For example, 2016 AQMP includes projected diesel PM emissions in the future year (2016 AQMP Appendix III). The Source Attribution analyses completed for the designated AB 617 communities also show significant decreases in air toxics emissions (including diesel emissions) from the 2017 baseline year to the target years 2024 and 2029 (source-attribution-methodology.pdf). Given that the MATES analysis has always been anchored on measurement data and serves as a platform to measure the progress in air toxics and associated health risks, staff do not believe that an analysis of projected future emissions and associated health risks would be a good fit. Staff have added text to the Executive Summary and Chapters 2, 3, and 4 to cite the existing data from the 2016 AQMP and the AB 617 source attribution analysis.

Staff have added text to clarify when information shown in figures is based on population-weighted data.