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Bay Area Air Quality Management District
Submitted electronically to methodfeedback@baaqmd.gov

Dear David,

Thank you for the opportunity to provide comments on the document entitled *Modeling Local Sources of Fine Particulate Matter (PM2.5) for Risk Management* ("proposed methodology")[1]. CCEEB is a nonpartisan, nonprofit coalition of business, labor, and public leaders that advances strategies for a healthy environment and sound economy. CCEEB represents many of the entities that operate in the Bay Area Air Quality Management District ("BAAQMD" or "District").

Our comments are summarized as follows:

- **The proposed methodology relies on unclear authorities, and seems to contradict existing policies and procedures required by federal and state law.**
- **Staff should define objectives and process for the proposed methodology.**
- **Staff must contextualize what a "maximum risk" framework means in the real world, and consider the applications for which such a framework is appropriate.**

More detail on each of these comments can be found below.

Background

Development of the Proposed Methodology

Over the course of 2022, District staff have provided several presentations to the Advisory Council that seek to address staff's objective of "reduc[ing] PM exposure where it matters the most."[2] Staff identified several proposed pathways related to understanding and addressing PM exposure, including rulemaking analyses identifying health and equity impacts, proposals for rule prioritization, and the proposed methodology. Specifically, staff identifies the objective of the proposed methodology as the following: "To set local PM significance levels; to inform

[1] BAAQMD. 2022a. *Modeling Local Sources of Fine Particulate Matter (PM2.5) for Risk Management*. October 2022.
[2] BAAQMD. 2022b. Presentation to Advisory Council: PM MODELING: CONTEXT, PRODUCTS, & PROGRESS. July 11, 2022. https://www.baaqmd.gov/%7E/media/files/board-of-directors/advisory-council/2022/acr_presentations_071122_op-pdf.pdf?la=en&rev=6f8f6c267583494eb546d8dd50636460

permitting, prioritization of rulemaking, and CEQA analyses."[3] While it is clear that staff intends the proposed methodology's application to be broad, its impact on each of these processes remains unclear.

Establishing local PM significance levels – something that, to our knowledge, no other agency in the world has done – would have the potential to impact every sector in the Bay Area, from construction and development, to manufacturing, to waste, recycling, and composting, to operation of essential facilities like hospitals, grocery stores, and treatment plants, to goods movement, to infrastructure necessary for decarbonization, to electricity generation and fuel production. Furthermore, permitting, setting CEQA thresholds, and rulemaking lie at the heart of the District's core statutory responsibilities as an agency. The District's implementation of these programs are required for both the District's and regulated industries' compliance with federal, state, and local laws.

Current Regulatory Framework for PM2.5

Currently, PM2.5 is regulated as a "criteria pollutant" under the Clean Air Act (CAA).[4] The CAA requires the U.S. Environmental Protection Agency (USEPA) to set National Ambient Air Quality Standards (NAAQS) for criteria pollutants, including PM2.5. The NAAQS are set at a level intended to protect public health with an adequate margin of safety.[5]

The San Francisco Bay Area Air Basin is unclassifiable/attainment for the federal annual PM2.5 ambient air quality standard. The District has also received a clean data finding on the federal daily PM2.5 ambient air quality standard but retains the status of non-attainment until it submits a maintenance plant to the USEPA. In the 10 years since the clean data finding on 2012 data, the District has failed to submit a maintenance plan. Therefore, with the exception of the District not filing their maintenance plan in a timely manner, it would be in attainment of all federal PM2.5 ambient air quality standards. Data from the District's long-term monitoring network demonstrates that PM2.5 emissions have remained relatively steady over the last decade, with the exception of emissions from exceptional events like wildfires, and remain below the federal standards (which do not consider emissions from exceptional events).[6]

The California Ambient Air Quality Standards establish a not-to-exceed annual standard for PM2.5. The San Francisco Bay Area Air Basin does not currently meet the California annual PM2.5 ambient air quality standard.[7] Unlike the NAAQS, the CAAQS do not need to be met by specified dates, but require incremental progress toward attainment.

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[3] Ibid

[4] As opposed to a "toxic air contaminant"

[5] 40 CFR Part 50

[6] BAAQMD. 2022c. "Air Quality Overview." Board of Directors Special Meeting/Retreat. January 19, 2022. https://www.baaqmd.gov/~/media/files/board-of-directors/2022/bods_presentations_011922_rv_op-pdf.pdf?la=en&rev=c7b665e014114327868ba7cc9dc04397

[7] California Air Resources Board (CARB). 2020. Area Designations for State Ambient Air Quality Standards PM2.5. https://www.arb.ca.gov/desig/adm/2020/state_pm25.pdf?_ga=2.226897821.140466884.1669741197-522976691.1669663294

In summary, the District's statutory obligations to control PM2.5 emissions are structured through the lens of attaining health-based federal and state standards within the region. One exception is Diesel Particulate Matter (DPM), a subset of PM2.5, which is already treated and regulated as a toxic air contaminant.

The District's most recent inventory for PM2.5, from 2016, shows that over 75% of PM2.5 emissions in the Bay Area come from mobile and area sources. Significant reductions in PM2.5 are anticipated over the next decade as CARB ratchets down on NOx and PM2.5 emissions from on- and off-road mobile sources to enable non-attainment districts to attain ozone and PM2.5 NAAQS.

The proposed methodology relies on unclear authorities, and seems to contradict existing policies and procedures required by federal and state law.

Staff has developed a methodology that, in essence, treats all undifferentiated PM2.5 as a toxic air contaminant. The proposed methodology's framework and its assumptions are modeled on the Office of Environmental Health Hazard Assessment's (OEHHA's) Air Toxics Hot Spots Program Risk Assessment Guidelines ("HRA Guidelines").[8,9] Staff's presentations have occasionally referred to 'screening levels' or 'thresholds' set by the methodology, which would functionally establish a health value for undifferentiated PM2.5. However, HSC 39660 clearly identifies the roles and responsibilities related to establishing toxic air contaminants as follows:

> "Upon the request of the ***state board***, the ***office [of environmental health hazard assessment]***, in consultation with and with the participation of the ***state board***, shall evaluate the health effects of and prepare recommendations regarding substances, other than pesticides in their pesticidal use, which may be or are emitted into the ambient air of California and that may be determined to be toxic air contaminants." (emphasis added)[10]

As stated, OEHHA has the statutory authority to evaluate and prepare recommendations on substances that may be determined to be toxic air contaminants, upon the request of, and in consultation with, the California Air Resources Board (CARB). It is OEHHA's technical expertise and review of scientific literature that allows OEHHA to determine health values for potential toxic air contaminants. It is the District's responsibility, then, to take established standards and toxicity data and implement strategies that ensure sources meet those already defined standards.

The District appears to recognize this chain of authority, given that it sent a May 17, 2017 letter to OEHHA and CARB formally requesting that OEHHA and CARB "develop health values and, if necessary, additional modeling guidance for undifferentiated fine particulate matter."[11] Yet

[8] The proposed methodology references on page 6 OEHHA's Air Toxics Hot Spots Program Risk Assessment Guidelines (OEHHA 2015) and BAAQMD's HRA Guidelines (BAAQMD 2021)

[9] OEHHA. 2015. *Air Toxics Hot Spots Program Risk Assessment Guidelines: Guidance Manual for Preparation of Health Risk Assessments*. February 2015. https://oehha.ca.gov/media/downloads/crnr/2015guidancemanual.pdf

[10] HSC 39660(a)

[11] BAAQMD. 2017. "RE: Request to Develop Health Values for Fine Particulate Matter." May 17, 2017. Letter from BAAQMD APCO Jack Broadbent to OEHHA Director Dr. Lauren Zeise and CARB Executive Officer Richard Corey.

OEHHA has not developed health values for undifferentiated PM2.5. OEHHA's consultation on the proposed methodology, if any, has not been made public.

While these questions of authority and engagement of the relevant experts are fundamental, in the interest of keeping open dialogue as staff continues to explore different avenues, we provide the following comments pertaining to the proposed methodology.

Staff should define objectives and process for the proposed methodology.

The proposed methodology puts forward a tentative framework by which to determine specified health outcomes resulting from exposure to increments of PM2.5 within a certain range.[12] However, the proposed methodology does not identify how this framework would be used to set local PM significance levels, inform permitting, prioritize rulemaking, or conduct CEQA analyses. Staff has not described how either the existing NAAQS or the existing TAC regulatory frameworks inform the District's board-adopted CEQA thresholds of significance. To our knowledge, it has not been discussed how the proposed methodology would conflict with implementation of the Clean Air Act in the District, including any future actions that may be necessary to comply if the USEPA lowers the PM2.5 NAAQS.

It is unclear to CCEEB what the process will be for reviewing and approving the proposed methodology. We understand, and appreciate, that staff plans to engage in a robust public workshop process to identify how the proposed methodology should be applied. However, given that understanding the proposed methodology is dependent upon understanding its application, and vice versa, we would recommend that staff conduct one public process to review both the methodology and the potential applications, with several public workshops.

This would allow staff to assess the potential environmental, socioeconomic, and health impacts – and how those impacts occur across different groups for the purposes of achieving equity – of the different approaches they have identified to address undifferentiated PM2.5. We have heard staff discuss using existing tools with new parameters for analysis (such as the health and equity analysis staff has presented to the Advisory Council and the Board), prioritization of rulemaking, district-wide source apportionment, and the proposed methodology. In addition, there may be other, previously vetted methods other agencies have undertaken to reduce PM2.5 emissions, and staff could explore how those methods may benefit the Bay Area.[13] These could all be complementary or contradictory tools – the degree to which they are remains unclear until staff conducts and presents a holistic assessment.

[12] Assumed, but not demonstrated, to be policy relevant.

[13] For example, USEPA is considering what new information could be incorporated to advance past the typical 12 kilometer modeling of PM2.5 and ozone to better capture neighborhood-scale impacts.

Staff must contextualize what a "maximum risk" framework means in the real world, and consider the applications for which such a framework is appropriate.

Staff categorizes the proposed methodology as "oriented toward "worst case" potential risks."[14] Table 13 of the proposed methodology summarizes the elements of the proposed methodology that use conservative assumptions to end up at a worst-case risk scenario:

Table 13: Protective approaches applied to key dimensions of the methodology.

Component	Protective Aspect(s)
Baseline risk	The selected exposure windows are associated with higher-than-average baseline rates.
Concentration	For each class of receptor (resident, worker, etc.), the maximally impacted potential location is selected.
Exposure intensity	For workers and children, near-100% overlaps in intra-week schedules (source vs receptor) are assumed. Seniors aged 65+ are assumed to reside at home 100% of the time.
Exposure duration	For residential receptors, the length of the exposure window (30 years) is based on the 90th percentile of residency times.
Dose	For breathing rates, 95th percentiles are used. For workers and children, moderate exertion levels are assumed.
Effect size	The starting points are central estimates of population-average effect size. These are scaled by factors of 3 to account for individual variation.

Source: BAAQMD 2022a

These factors introduce a number of technical considerations that need to be fully vetted, given that each factor compounds on the other to arrive at the final screening thresholds presented in the proposed methodology. Consideration of susceptible populations has already been accounted for in underlying assumptions for health risk-based limits elsewhere and should be leveraged here as well. For example, instead of accounting for the highly improbable scenario in which people, beginning at age 65, are homebound 365 days/year, 24 hr/day and 7 days a week, the proposed methodology could instead consider reasonable parameterization of the Exposure Frequency (EF), fraction of time at home (FAH) (which are not the current values used in the draft Excel file *MortalityResident* sheet).

As another example, the Excel spreadsheet uses an unsubstantiated breathing rate value adjusted and expected to be sustained every 8-hour workday all day for workers (see *MortalityWorkers* tab, column P) "adjusted" for a "sensitive individual" of working age (in this Excel sheet, ages

[14] BAAQMD 2022a, page 14

40-64) all have unreasonable 690 L/kg per 8-hour day.[15] Not all workers would default to the 95th percentile, and some portion of the workforce would not be above the light intensity breathing rate. This should be addressed directly in instructions to users of the draft spreadsheet tool, as OEHHA gave the following options:

Table 5.8. Eight-Hour Breathing Rate (L/kg per 8 Hrs) Point Estimates for Males and Females Combined[a,b]

	0<2 years	2<9 years	2<16 years	16<30 years	16-70 years
	Sedentary & Passive Activities (METS ≤ 1.5)				
Mean	200	100	80	30	30
95th Percentile	250	140	120	40	40
	Light Intensity Activities (1.5 < METs ≤ 3.0)				
Mean	490	250	200	80	80
95th Percentile	600	340	270	100	100
	Moderate Intensity Activities (3.0 < METs ≤ 6.0)				
Mean	890	470	380	170	170
95th Percentile	1200	640	520	240	230

[a] For pregnant women, OEHHA recommends using the mean and 95th percentile 8-hour breathing rates based on moderate intensity activity of 16<30 year-olds for 3rd trimester.
[b] Breathing rates in the table may be used for worker, school, or residential exposures

Source: OEHHA 2015

Perhaps more importantly, though, is that the 8-hour breathing rate cannot exceed any of the USEPA EFH total volumes of air breathed by a human in 24 hours. The conundrum in the mathematical use of 690 L/kg in an 8-hour workday is that none of the USEPA EFH daily inhalation rates surveyed based on time-activity observations suggest (such as in the excerpted table below) are sustained/sustainable for 8-hour workdays. Moderate intensity breathing rates are more likely to be relevant only for 1-2 hours per day.[16] Further, using "L/kg" metric instead of the USEPA EFH standard (assuming an underlying body weight default for age, reducing the needed units to m^3/day) unnecessarily complicates the calculations, by forcing the weight of the receptor to be included somewhere in the draft method's calculations, which introduces an entirely different set of variables. Similar questions regarding breathing rate arise for the calculations underlying asthma incidence.

Another way of categorizing the approach taken by the proposed methodology is that it is designed to calculate the maximum risk to the most vulnerable individual. What this means in the real world is that, statistically, it is unlikely that there is such a person who fits this characterization, in terms of his/her/their individual vulnerability, combined with his/her/their location and activity. That doesn't mean it isn't important to understand what the maximum risk is – these tools are helpful for individuals to make decisions to reduce their exposure, to the extent that they are able, and for governmental and non-governmental entities to identify the

[15] The spreadsheet mechanics and underlying formula(s) should be checked to ensure it's really only using the 8-hour (work shift) breathing rate 95th percentile below (e.g. 230 L/kg for a shift) if it's supposed to be used to represent workday exposure.
[16] USEPA. 2011. "Table 6-48: Daily Inhalation Rates Based on Time-Activity Survey." *Exposure Factors Handbook*. October 2011. https://www.epa.gov/sites/default/files/2015-09/documents/efh-chapter06.pdf

need for exposure reductions. But it is inappropriate to use a framework focused on the least likely scenario to set bright-line thresholds for compliance. As one example, how will the District determine a threshold that is appropriate for use in CEQA determinations that does not automatically trigger an Environmental Impact Report for every project?

Other Comments

Underlying Assumptions

- BAAQMD is using as its baseline incidence rates for pediatric asthma onset on a study conducted in 2006-2008 timeframe. This study is over 10 years old and significant changes to PM2.5 and more specifically the composition of PM2.5 has substantially changed during this time frame. For instance, the aggressive diesel particulate matter regulations have substantially reduced PM2.5 that comes from diesel engines which are known to contain multiple chemicals that are known to cause cancer and other chronic health impacts. In addition, there have been substantial decreases in smoking especially indoors which will likely affect baseline incidence rates.

- The proposed methodology fails to note the serious methodological limitations in the long-term studies of the association of fine PM with mortality. In particular, these studies associate mortality with contemporaneous levels of air pollution. If indeed air pollution is associated with mortality, then long-term exposure, including exposure in the past when concentrations were much higher, is surely important. The consequence of considering only contemporaneous exposure is to inflate the estimate of risk associated with a unit concentration of exposure.

- The proposed methodology fails to account for changes in baseline conditions (y_o) over time when combining multi-year exposures. It would be expected that y_o would decrease in future years due to roll out and implementation of existing and future regulations such as those impacting mobile sources. Anchoring a PM2.5 rule in a 2022 demographic profile is unlikely to be relevant in 5 years. How will the methodology be updated over time to address these types of concerns?

- The 30-year multi-year exposure duration seems to have been arbitrarily selected based on the parallel use of 30 years developed for cancer-based health risk assessments. This exposure window is not based on linking the identified PM2.5 response function with the time periods involved in development of the Beta term. It should be noted that longer term studies of the same cohort used by the District to develop their basis for a Beta value does not show a correlation with PM2.5 and any of the endpoints including mortality and pediatric asthma incidence. Studies that have extended the age range of cohorts have shown that long-term studies do not show a PM2.5 relationship with the health outcomes.

Methodological Clarifications

- Please provide justification for the health endpoints selected.

- Please provide justification for using a factor of three adjustment to effect sizes to account for vulnerable populations.

- How do the exposure windows align with projects that may be short term in nature?

- Clarify how the *AsthmaResident* FAH is representative of any community at large, in sufficient numbers for it to become the standard in this spreadsheet tool and procedure.
- The exposure should account for the facility's actual hours of operation (rather than default to 24/7 operation), as the District would have access to that information for most sources of emissions affected by this methodology.

- The calculations and work hour adjustments in the excel spreadsheet for worker risk need to be double checked. Specifically, based on the fact the WAF variable (in Excel sheet *MortalityWorker* in column E) is set to 4.2 regardless of any other column (calculated as "=(24/8)*(7/5)") and yet the column next to it (*MortalityWorker* column F) uses at least one of the same factors to adjust the delta X/delta C ratio ("=(C4/365)*(D4/24)*E4").

- What is a "screening level risk score," as referenced on page 24 of the proposed methodology?

- The proposed methodology and accompanying draft spreadsheet use several terms that are inconsistent with previous guidance in health risk assessment widely used by practitioners across California and under USEPA guidance. Specifically, for example: calculations for a "statistically average individual" appear in the spreadsheet. This should align with other California and USEPA risk assessment policy and guidance documents. For example, if the proposed methodology is meant to be representative of Central Tendency Exposure (CTE) parameters, common in USEPA's Exposure Factors Handbook (EFH) and Risk Assessment Guidance for Superfund (RAGS) parlance, then it should use that term. Similarly, for "adjustments for a sensitive individual", this must be clearly, transparently defined. Please explain if this is meant to refer to something other than the USEPA Reasonable Maximum Exposure (RME) definitions and guidance in EFH and RAGS documentation.

- The proposed methodology assumes that a steady-state dispersion model will adequately estimate a source's contribution to near-field ambient concentrations of PM2.5. What model is staff proposing to use for implementation of the proposed methodology? How will it account for the limitations and uncertainties in dispersion model's capabilities to accurately model building downwash and complex terrain at a localized scale in the Bay Area?

Source Attribution

- Given that PM2.5 can travel hundreds of miles, the white paper and intentions for the draft calculations need to be clearly crafted so as not to "double count" where areas of study overlap. In particular, saying that (as alleged in the white paper) patterns are stable over decades doesn't mean it has been the same source or sources over decades, but rather is a reflection that something burns within a 30-mile radius at all times, giving an ambient background of PM2.5. How will the proposed methodology parse local sources

from regional sources when assessing individual resident or neighborhood risks due to PM2.5?

Compounding Uncertainties

- The proposed methodology should acknowledge the cumulative nature of the uncertainties in these estimates. Every step in the process used to estimate the health risks associated with fine PM, from estimation of emissions, to converting these using regression equations into estimates of diesel particulate concentrations, to the choice of health coefficients and concentration-response functions from epidemiological studies, has a large uncertainty associated with it. These uncertainties are propagated and accumulate during the estimation of the impact of fine PM on health.

Contextualizing Results

- How does the District plan to communicate that *risk scores* (as determined by this methodology) are different than *actual occurrences*?

- The proposed methodology does not address the wide variety of confounding factors involved with using PM2.5 response relationships, such as indoor source of pollution, change in demographics, change in baseline health across areas and time, age, prevalence of heart and lung disease, education, income/poverty, access to health care, etc. These confounding factors and changes to these confounding factors over time can substantially influence the conclusions drawn regarding PM2.5 response relationships on health outcomes.

Conclusion

From CCEEB's perspective, the District's most important objective in developing emissions reduction frameworks should be reducing significant emissions of PM2.5 in the most effective, efficient way possible. CCEEB previously provided the following recommendations for prioritizing efforts to reduce PM2.5:[17]

- Identify measures with greatest ground-level concentration reductions;
- Identify measures with greatest impact;
- Identify measures available near-term versus future reductions; and
- Identify most cost-effective measures.

It is unclear whether the proposed methodology would support any of these objectives without understanding the proposed applications.

We suggest that, in the holistic review we recommend above, staff explore alternative approaches to reducing PM2.5 emissions that are not already able to be addressed through the District's core programs. This could include identifying specific emission sources and potential solutions based on emissions monitoring data developed for AB 617 community emission

[17] CCEEB. 2020. PRESENTATION TO BAAQMD ADVISORY COMMITTEE: Proposed Guiding Principles for Consideration in Forwarding Recommendations to the BAAQMD on PM2.5 Regulation. July 31, 2020.

reduction plans and community air monitoring plans. For example, to address dust, District staff has recently identified it will draft a Dust White Paper that identifies best management practices to reduce localized exposures. While the details have yet to be described, that approach seems like a more concrete, more quickly implementable solution to at least one source of localized PM2.5 emissions than the proposed methodology.

Specific to the proposed methodology, we suggest that staff conduct a third-party independent validation of all equations by working a "test case" or "case study" to show how the tool should be used, with long-hand confirmation that the intended units work out for a health risk assessment. This could also provide helpful information as to whether a key or "indicator" receptor could be representative of maximal risk in cases where it is the regulatory intent to address the maximum risk.

Lastly, it is important to note that, if the District were to use the proposed methodology, the Bay Area would regulate undifferentiated PM2.5 differently than the rest of the state. The screening-level risk scores identified in Table 13 of the proposed methodology would suggest an extremely stringent approach that would further discourage development of new or modernized facilities, homes, or infrastructure in the Bay Area. Given our region may soon be in a very different economic condition than it has been during the tech boom of the last decade, we wish to further emphasize the need to ensure that the District's programs are implementable, cost-effective, and minimize unintentional impacts to the resources our region relies on.

Thank you for considering our comments and for your continued engagement with us on these matters. Please feel free to contact me should you wish to discuss our comments in further detail, at 415-940-0501 or christinew@cceeb.org.

Sincerely,

Christine Wolfe
Policy and Communications Director
CCEEB

cc:
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