UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 9
75 Hawthorne Street
San Francisco, CA 94105-3901

December 22, 2014

Karla Petty
Arizona Division Administrator
Federal Highway Administration
4000 North Central Avenue, Suite 1500
Phoenix, AZ 85012

Subject: Final Environmental Impact Statement for the South Mountain Freeway Project, Maricopa County, Arizona [CEQ#20140275]

Dear Ms. Petty:

The U.S. Environmental Protection Agency has reviewed the Final Environmental Impact Statement (EIS) for the South Mountain Freeway Project. Our review and comments are provided pursuant to the National Environmental Policy Act, the Council on Environmental Quality Regulations (40 CFR Parts 1500-1508), and our NEPA review authority under Section 309 of the Clean Air Act.

As described in the Final EIS, the South Mountain Freeway Project is a proposal to build a new 8-lane freeway extending approximately 22 to 24 miles from the Interstate 10 and Santan Freeway interchange westward through the community of Ahwatukee, paralleling the Gila River Indian Community (GRIC) border, and turning north to reconnect with Interstate 10 west of downtown Phoenix. The Final EIS has identified a preferred alternative which runs primarily along the existing Pecos Road alignment on the eastern end and connecting to 59th Avenue on the western end.

On July 23, 2013, EPA provided comments to FHWA on the Draft EIS for this project and rated the document as "3 – Inadequate Information." Our rating was based upon a lack of information important to analyzing the project's potentially significant impacts on air quality, including assessment and disclosure of potential PM10 hotspot impacts and confirmation of whether the project meets the Clean Air Act's Transportation Conformity requirements. We appreciate the new information which has been incorporated into the Final EIS and would like to thank FHWA for working closely with EPA over the past year to develop the analysis of PM10 and the determination of Transportation Conformity. We understand that, based upon lessons learned during the South Mountain Freeway NEPA process, FHWA and ADOT are working on improving their approach to the interagency consultation process to initiate earlier consultation on technical issues, such as modeling inputs, receptors, meteorological data and background concentrations, along with making determinations as to whether proposed projects are projects of air quality concern. We look forward to coordinating with FHWA and ADOT following this new approach for future projects.

Based upon our review of the Final EIS, EPA has a few remaining comments regarding the Transportation Conformity analysis and assessment of PM10 hotspot impacts. We have continuing

concerns regarding the analysis and discussion provided in the Final EIS regarding possible near-roadway health impacts along the proposed new freeway corridor, including impacts to children and sensitive receptors. Additionally, we have continuing concerns with the analysis of the No Action Alternative, as well as impacts to both aquatic resources and wildlife connectivity. These issues and recommendations for the Record of Decision, are addressed in the enclosed detailed comments.

We appreciate the opportunity to review this Final EIS and look forward to working with FHWA and ADOT to address our concerns on this, and future, roadway projects in Arizona. If you have any questions, please contact me, or your staff may continue to coordinate with Clifton Meek at (415) 972-3370 or meek.clifton@epa.gov. Please send a copy of the Record of Decision and associated response to comments on the Final EIS to the address above (mail code ENF 4-2).

Sincerely,

/s/

Lisa B. Hanf, Assistant Director
Enforcement Division

Enclosures:
(1) EPA Detailed Comments on the South Mountain Freeway Final EIS
(2) EPA's Additional Information on Assessing Near-Roadway Health Effects

cc via email: Alan Hansen, Federal Highway Administration
Rebecca Yedlin, Federal Highway Administration
John Halikowski, Arizona Department of Transportation
Ralph Ellis, Arizona Department of Transportation
Chaun Hill, Arizona Department of Transportation
Kathleen Tucker, U.S. Army Corps of Engineers
Kelly Wolff-Krauter, Arizona Game and Fish Department
Steve Spangle, U.S. Fish and Wildlife Service
Gregory Mendoza, Gila River Indian Community
Dennis Smith, Maricopa Association of Governments

U.S. EPA DETAILED COMMENTS ON THE FINAL ENVIRONMENTAL IMPACT STATEMENT FOR THE SOUTH MOUNTAIN FREEWAY PROJECT, MARICOPA COUNTY, ARIZONA, DECEMBER 22, 2014

Air Quality

Transportation Conformity

Since completing our review of the Draft EIS for the South Mountain Freeway project in July 2013, EPA has been working closely with FHWA to address project-level Transportation Conformity requirements, including the need to analyze the "worst-case intersection" with the highest total PM10 concentrations. Both Chapter 4 of the Final EIS and the Air Quality Technical report describe the worst-case intersection, where the new roadway would connect to I-10 west of Phoenix, as being analyzed for the purposes of conformity requirements, while both the 40th Street and Broadway Road intersections are characterized as being analyzed for NEPA purposes only. However, the results of the Transportation Conformity analysis demonstrate that the 40th Street Interchange is the location with the highest total PM10 concentrations. EPA's PM10 hot-spot guidance states, "it may be appropriate in some cases to focus… on the locations of highest air quality concentrations," and thus it is important that the 40th Street interchange also be characterized as being analyzed for conformity purposes. EPA recommends that this be clarified in the Record of Decision (ROD).

Mobile Source Air Toxics

While we appreciate the expanded discussion of Mobile Source Air Toxics (MSATs) in the Final EIS, we have continuing concerns about the characterization of near-roadway emissions directly adjacent to the new freeway corridor. On page 4-79, the Final EIS states that total MSAT emissions are estimated to decline by as much as 91 percent in the study area; however, this is the case only because the document presents an estimated value of MSAT emissions that combines the impact of the new freeway alignment with emissions from the adjacent, and existing, I-10 freeway, as well as other roadways in the area. This methodology does not provide the information needed to characterize the MSAT emissions anticipated solely along the new freeway corridor.

The carbon monoxide and PM10 analyses indicate that concentrations of criteria pollutants along the new freeway corridor will increase relative to current levels, which suggests that MSAT emissions along the corridor would increase as well. The potential increase indicated by these analyses would occur despite the fact that per-vehicle emissions are declining substantially over time as a result of EPA regulations. Therefore, the conclusion that MSAT emissions will decrease by as much as 91 percent pertains only to the overall study area, and does not apply to the potential impacts that may be experienced directly adjacent to the project corridor. A refinement to the existing discussion, by limiting the scope of analysis to the near-roadway corridor, would allow for conclusions to be made about possible site-specific increases in emissions. Specifically, what impacts will receptors experience directly adjacent to the new roadway and how does this compare with impacts they may experience currently, in the absence of an adjacent high-volume freeway? This analysis is relevant given the historical interest in potential impacts from the proposed freeway, and will aid in more meaningful disclosure, even when considering the context provided in the Final EIS that previous risk assessments suggest these increases are not likely to pose a significant health risk to populations along the corridor.

In addition to recommending an updated discussion of near-roadway health effects in the ROD, EPA is also providing the attached additional information for FHWA and ADOT to consider when discussing

and analyzing uncertainty, risk comparison, and literature sources associated with the health effects of MSATs.

Analysis of the No Action Alternative

In our comment letter on the Draft EIS, EPA noted the need to analyze the No Action Alternative using updated socioeconomic projections that do not assume completion of the South Mountain Freeway. In the Final EIS, there continues to be a lack of analysis regarding the projected differences in land use and emissions if no freeway were to be built. While we understand that FHWA and ADOT used the information available to them from General Plan documents, we continue to recommend that the likely differences in land use, emissions, and congestion impacts between the Action and No Action alternatives be fully disclosed. Methods exist to complete these types of projections and "scenario planning", and such analyses can help the public and decision-makers better understand the timing and location of induced growth and traffic impacts that may occur as a result of the action alternatives.

As stated in the Final EIS, the traffic analyses for South Mountain Freeway were completed by distributing the Arizona Department of Administration population and employment projections for Maricopa County to smaller geographic areas,

> "using the latest available data, including general plans for local jurisdictions, and a state-of-the-art land use model system called AZ-SMART. The nationally-recognized UrbanSim microsimulation model was integrated into AZ-SMART and used to allocate county projections of population and employment to regional market areas based upon the pre-existing location of these activities, land consumption, and transportation system accessibility."

These socioeconomic projections were then aggregated to Traffic Analysis Zones using AZ-SMART.

As noted in EPA's comments on the Draft EIS, the underlying general plans used in these analyses assume that the South Mountain Freeway is complete. For example, the Estrella Village Core Plan (Adopted by Phoenix City Council Feb. 4, 2009) states: "Bisecting the core is the proposed Loop 202 that will connect the existing loop 202 in the southeast valley to I-10. This plan is based upon the assumption that the freeway will be an integral part of development within the core." These assumptions are reflected on Page 4-7 of the Final EIS, which states: "Versions of the proposed action most closely aligned with the W59 and E1 Alternatives have been accounted for in long-range planning by municipalities (most notably, the City of Phoenix)." Additionally, the Final EIS states on page 4-14 that the "Phoenix *General Plan* for Laveen Village has designated areas for commercial development that cannot support the projected densities without implementation of the proposed action;" and further, on page 4-19, that the "land use plan designations associated with [the Laveen and Estrella village] cores are predicated, in part, on proximity to the freeway corridor." These statements contradict other conclusions in the document that suggest land-use and development trends in the project area would be maintained regardless of whether the South Mountain Freeway is built. On the contrary, these general plans suggest that future land-use and development trends in areas surrounding the freeway are dependent on the freeway being built and, as such, have explicitly assumed completion of the proposed action.

As a result, in the Final EIS, there continues to be inconsistency in the modeling inputs that result in an inability to make comparisons of the traffic operations and emission changes between the No Action Alternative and Preferred Alternative. The "No Action" scenario includes population and employment projections that assume the "Preferred Alternative" is built, with the build and no-build scenarios both using the same forecast of future population and employment. To model traffic volumes, speed, and

emissions by removing the road segments representing the South Mountain Freeway corridor, while leaving the socioeconomic inputs constant does not provide an accurate comparison of these alternatives, as is required under NEPA.

Since the AZ-SMART model itself includes statistical sub-models of population and employment which include "transportation system accessibility," to conclude that a project as large as the South Mountain Freeway will do nothing to change where people and jobs are located in the future is not supported by an understanding of land-use transportation linkages. Both the text of the general plans and the statistical models in AZ-SMART point to the conclusion that future population and employment projections in the traffic analysis zones are based on whether or not the South Mountain Freeway is built. While the zoning regulations within general plans may not change as a result of highway accessibility, the development of land parcels within each General Plan area depend on forecast travel time (or other AZ-SMART accessibility factors).

We understand that General Plans are voter-approved documents, and as such it is not feasible to modify them for an analysis of the No Action alternative. However, it is possible to use AZ-SMART/UrbanSim to develop alternative socioeconomic forecasts at the Traffic Analysis Zone level that represent transportation infrastructure present in the No Action alternative. In this way, future population and employment forecasts can be estimated, given current General Plans, but in the absence of the new freeway. These projections would then be suitable for modeling the environmental impacts of the No Action alternative, including traffic patterns, congestion, and near roadway health impacts. This analytical concern does not affect the transportation conformity hot-spot analyses for CO and PM10, as they are both based on "Build" scenarios only.

Children's Environmental Health and Safety

We appreciate the additional information and analysis provided in the Final EIS regarding noise impacts to schools adjacent to the proposed freeway. However, the Final EIS does not address other issues specific to children's environmental health and safety. Further, the conclusion in the Final EIS that children are inherently accounted for in the analyses conducted for the population as a whole does not meet the intent of Executive Order 13045 on Children's Health and Safety. The order directs that each federal agency shall make it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children, and shall ensure that its policies, programs, activities, and standards address these risks. It applies to all significant decisions made by federal agencies and is not specific to actions which are regulatory in nature, as suggested on Page B20 of the response to comments in the Final EIS. Additionally, based on current EPA policy and guidance, an analysis of impacts to children's health should be included in a NEPA analysis if there is a possibility of disproportionate impacts on children related to the proposed action. [1,2]

Many studies have now shown that people who live, work, or attend school near major roads have an increased incidence and severity of health problems that may be related to air pollution from roadway

1 U.S. EPA. April 4, 1996. Memorandum: Interim OFA Program Guidance on Implementing the EPA Policy on Evaluating Health Risks to Children. Available at: http://www.epa.gov/compliance/resources/policies/nepa/children-health-risks-pg.pdf.

2 U.S. EPA. August 28, 2012. Memorandum: Addressing Children's Health through Reviews Conducted Pursuant to the National Environmental Policy Act and Section 309 of the Clean Air Act. Available at http://www.epa.gov/compliance/resources/policies/nepa/NEPA-Children's-Health-Memo-August-2012.pdf.

traffic.[3] Further, reviews of the literature have concluded that near-roadway traffic emissions may not only trigger and exacerbate asthma symptoms, but also contribute to the development of asthma in children.[4,5] As such, the construction of a new 8-lane freeway with diesel truck volumes of up to 17,000 per day in an area with a large population of children constitutes a need to analyze, disclose, and mitigate impacts to children.

Given the connection between roadways and childhood asthma, the data on existing asthma rates and asthma severity among children living, playing, and attending school and daycare near the proposed project should be considered to determine if targeted mitigation measures, such as improved heating, ventilating, and air conditioning (HVAC) systems, may be appropriate to avoid exacerbating asthma symptoms or instigating the onset of new symptoms. Include any determination of targeted mitigation in the ROD.

Impacts to Aquatic Resources

EPA acknowledges that much additional field work has been completed between the Draft EIS and Final EIS to determine the extent of jurisdictional waters in the project area, and the Final EIS identifies that projected impacts to Waters of the U.S. have been reduced substantially from the 26 acres of impacts reported in the Draft EIS to under 3 acres in the Final EIS. The preferred alternative involves placing a roadway bridge over the Salt River and the construction of piers in the channel, as well as potential filling of 51 ephemeral washes that originate in the Phoenix South Mountain Park and drain to the south or west, with a potential hydrological connection to the Gila River. As discussed in our comments on the Draft EIS, ephemeral washes perform a diversity of hydrologic and biogeochemical functions that directly affect the integrity and functional condition of higher-order waters downstream.[6] A commitment to maintain these natural washes, in their present location and natural form, and including adequate natural buffers to the maximum extent practicable, should be included in the ROD. Further, we encourage FHWA and ADOT to continue working with the Army Corps of Engineers throughout project design to further avoid and minimize impacts to Waters of the U.S.

Clean Water Act Compliance

We understand that potential disturbances of greater than 0.5 acres may be necessary where the project crosses large individual washes, thus requiring an Individual Permit (IP) under Section 404 of the Clean Water Act. When applying for the Section 404 permit, FHWA and ADOT must demonstrate that the proposed action is the least environmentally damaging practicable alternative (LEDPA), while also

3 HEI Panel on the Health Effects of Traffic-Related Air Pollution. 2010. Traffic-Related Air Pollution: A Critical Review of the Literature on Emissions, Exposure, and Health Effects. HEI Special Report 17. Health Effects Institute, Boston, MA.

4 Anderson H, Favarato G, Atkinson R. 2011a. Long-term exposure to air pollution and the incidence of asthma: meta-analysis of cohort studies. Air Qual Atmos Health. doi:10.1007/s11869-011-0144-5.

5 Anderson H, Favarato G, Atkinson R. 2011b. Long-term exposure to outdoor air pollution and the prevalence of asthma: meta-analysis of multi-community prevalence studies. Air Qual Atmos Health. doi:10.1007/s11869-011-0145-4.

6 See Levick, L., J. Fonseca, D. Goodrich, M. Hernandez, D. Semmens, J. Stromberg, R. Leidy,M. Scianni, D. P. Guertin, M. Tluczek, and W. Kepner. 2008. *The Ecological and Hydrological Significance of Ephemeral and Intermittent Streams in the Arid and Semi-arid American Southwest*. U.S. EPA and USDA/ARS Southwest Watershed Research Center, EPA/600/R-08/134, ARS/233046, 116 pp.

not causing or contributing to significant degradation of the aquatic ecosystem. If the project is to be permitted and delivered as a single design-build project, this LEDPA demonstration would apply to the project as a whole, rather than a specific crossing or segment of the project.

The Final EIS suggests that the project will likely be permitted using a combination of Nationwide Permits (NWPs) and an IP. However, NWPs issued in advance of the IP or a grouping of NWPs and IPs can be issued only if single and complete/independent utility portions of the project can be determined, with the intent being to avoid piecemealing and/or prejudicing the decision on an individual permit. 33 C.F.R. section 330.6(d) states:

> "…portions of a larger project may proceed under the authority of the NWPs while the district engineer evaluates an individual permit application for other portions of the same project, but only if the portions of the project qualifying for NWP authorization would have independent utility and are able to function or meet their purpose independent of the total project. When the functioning or usefulness of a portion of the total project qualifying for an NWP is dependent on the remainder of the project, such that its construction and use would not be fully justified even if the Corps were to deny the individual permit, the NWP does not apply and all portions of the project must be evaluated as part of the individual permit process."

If the South Mountain Freeway project is to be delivered as a single design-build project, EPA recommends pursuing an Individual Permit for the project as a whole, as it would be difficult to justify that multiple smaller segments of the project would meet their purpose independent of the total project.

Wildlife Connectivity

The project proposes to construct a new 8-lane freeway through multiple ridgelines of South Mountain Park in an area known to be the last remaining connection for wildlife to move between South Mountain and the Sierra Estrella mountains. We note that ADOT has demonstrated national leadership in prioritizing wildlife on other major freeway projects throughout the state. However, despite the anticipated impacts of the project to wildlife movement, little has been proposed in the Final EIS to address and mitigate for the construction of this significant new barrier to wildlife connectivity, with the exception of a few multiuse crossings and culverts. In response to comments on the Draft EIS, FHWA and ADOT suggest that the corridor will only become more degraded as the surrounding area develops, and that it is not the responsibility of ADOT to mitigate for impacts caused by these future unrelated actions. However, as is made clear in local general plans, the future development of the surrounding area is not an unrelated action and is very much dependent on the construction of the proposed project to facilitate access into these core development areas. As such, EPA continues to recommend that FHWA and ADOT identify measures in the ROD beyond standard freeway mitigation to protect and restore this important wildlife linkage.

The South Mountain Project is an important opportunity for ADOT to shift their focus from preservation of wildlife movement corridors to the even more challenging and equally important work of restoring a degraded corridor. Currently, we understand that ADOT is partnering with other state and local stakeholders on the State Route 77 wildlife corridor project outside of Tucson to secure connectivity on state and private lands between the Tortolita and Santa Catalina Mountains. A similar approach could be effective on the South Mountain Freeway project, working with local leaders, developers, and the Gila River Indian Community to purchase mitigation lands and/or obtain

conservation easements in a defined corridor between South Mountain and the Sierra Estrella Mountains. Additional mitigation could be achieved through the provision of overcrossings, or enhancements to 51st Avenue in order to reduce barrier effects. If such a project were executed to protect these resources, construction of the South Mountain Freeway could provide an opportunity to enhance and restore wildlife connectivity rather than threaten it.

U.S. EPA ADDITIONAL INFORMATION TO CONSIDER FOR ASSESSING NEAR-ROADWAY HEALTH EFFECTS - FINAL ENVIRONMENTAL IMPACT STATEMENT, SOUTH MOUNTAIN FREEWAY PROJECT, MARICOPA COUNTY, ARIZONA, DECEMBER 22, 2014

EPA's July 23, 2013 comments on the Draft EIS included recommendations regarding the assessment of potential near-roadway health effects of the proposed South Mountain Freeway project. While we appreciate that the Final EIS and Response to Comments for the project included an expanded discussion about health risk from highway projects, we believe the following additional information should also be considered in order to understand possible health effects from this project. Further, we recommend the following information be considered when conducting analyses of future roadway projects.

Sources of Uncertainty

The discussion under "Health Risk Contributions from Highway Projects" (pp. 4-79 to 4-81) and "The Role of Health Risk Assessment in a National Environmental Policy Act Context" (p. 4-82) are welcome additions to MSAT discussions found in environmental documents for highway projects. However, this discussion describes only those sources of uncertainty that have the potential to lead to a "false positive" statement about health risk (i.e., an overestimation of the risk). Lacking from this discussion is a description of sources of uncertainty that lead to a higher chance of "false negative" statements about health risk. To be balanced, this section should address several notable sources of uncertainty, which create a potential for "false negative" statements of risk.

First, exposure to mutagenic carcinogens during early life is associated with elevated risk of lifetime cancer. In EPA's *Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens* (http://www.epa.gov/cancerguidelines/guidelines-carcinogen-supplement.htm), exposures occurring during early childhood are assigned "age-dependent adjustment factors" which adjust the "potency" of the chemical for lifetime cancer risk as such:

- For exposures before 2 years of age (i.e., spanning a 2-year time interval from the first day of birth up until a child's second birthday), a 10-fold adjustment.
- For exposures between 2 and <16 years of age (i.e., spanning a 14-year time interval from a child's second birthday up until their sixteenth birthday), a 3-fold adjustment.
- For exposures after turning 16 years of age, no adjustment.

Second, the discussion here focuses primarily on uncertainty associated with the parameters included in various models along the chain of models between emissions and risk, which is sometimes called "parametric uncertainty." However, other sources of uncertainty include "model uncertainty" or "epistemic uncertainty" which results from the limitations in available information about the world contained in one or more models. One major source of epistemic uncertainty here is the assumption that risk assessment procedures adequately represent information about public health. Earlier in 2014, the U.S. authors at the U.S. Centers for Disease Control and Prevention (CDC) published a quantitative meta-analysis of studies of the risks of childhood leukemia associated with living near a major roadway, and found positive risks associated with residence after birth, but not before birth (Boothe et al., 2014). At the U.S. incidence rate of childhood leukemia (for age 0-14 years, 8.8 per 100,000 between 2001-2007 in NCI's SEER database), the CDC's relative risk of 1.53 suggests a risk enhancement of (8.8 * 0.53 =) 4.7 per 100,000 associated with childhood residence near major roadways), or 0.0047 percent. While the etiologic agents responsible for the enhanced leukemia risks in children are unknown, three MSATs included in this FEIS are leukemogens in adults (i.e., benzene,

formaldehyde, 1,3-butadiene). In that the majority of pediatric leukemia cases take place within the first 5 years of life, this suggests that a focus on 70-year lifetime cancer risk and the attendant uncertainties described in the text box on Page 4-82 has the potential to understate risk.

As such, this section should include a discussion of sources of uncertainty that are more likely to result in a "false negative" statement of health risk (or an underestimate) than a "false positive" (or an overestimate) associated with health risks. In particular:

- In keeping with EPA's supplemental risk guidelines for early-life exposure to carcinogens, this section should note that early-life exposures to certain MSATs may result in higher risk than those studies reviewed here.
- CDC's study should be discussed to illustrate that risk assessment focused exclusively on adults may underestimate cancer risks in children.

Overall, the qualitative description of uncertainties on p. 4-82 reach the conclusion that the results of,

> "health risk assessment would be more influenced by the uncertainty introduced into the process through assumptions and speculation rather than by genuine insight into the actual health impacts directly attributable to MSAT exposure associated with a project. Therefore, outcomes of such a health risk assessment do not provide useful information for decision makers."

Given that epidemiology studies of actual cases of childhood cancer have reported statistically significant associations between disease risk and concentrations of MSATs and other pollutants predicted by similar models (see comments below), this statement seems unjustified. If such information is of sufficient quality for use in cancer epidemiology studies, it seems reasonable that such information would also be relevant to NEPA review and of interest to decision makers.

Risk Comparison

The Final EIS states that, "...the incremental risk of cancer from breathing air near a major roadway is several hundred times lower than the risk of fatal accident from using a major roadway" (p. 4-81). However, given CDC's estimate for childhood leukemia risk (Relative Risk of 1.53, corresponding to excess risk of 4.7 per 100,000 children), this statement should be reworded to reflect risks of a more comparable magnitude. Comparing traffic fatalities to cancer deaths is not a strictly apples-to-apples comparison. The air pollution risks from MSATs are part of the larger impacts of air pollution on public health, which includes deaths from cardiovascular disease and other causes. Recent studies estimate the annual premature mortality attributable to air pollution in the U.S. to be approximately 200,000. As such, we recommend that MSAT risks be compared to this larger quantified air pollution risk, rather than to traffic fatalities in general.

Literature on MSATs

The publications described on pages 4-81 to 4-85 represent a small percentage of total articles and publications about MSAT exposures and risks. As such, these publications seem to have been selectively chosen to support FHWA's conclusion that risk assessment for MSATs is too uncertain to support decision making. In addition to the description of CDC's meta-analysis, above, which links childhood leukemia rates with living near a major road, where known or likely leukemogens for adults are emitted (e.g., benzene, formaldehyde, and 1,3-butadiene), there are several other studies that discuss how exposure to MSATs affect health including:

- A study by EPA authors comparing the performance of multiple dispersion models (RLINE, AERMOD with volume sources, AERMOD with area sources, ADMS, CALINE3, and CALINE4) used measurements from tracer studies in two locations to quantify the performance of each of these models.[7] For CALINE3/4, RLINE, ADMS, and AERMOD, metrics of performance (fractional bias – FB, normalized mean square error – NMSE, correlation – R, and fraction of estimates within a factor of measured values – FAC2) were all published. These metrics suggest good performance of RLINE, AERMOD, and ADMS.
- An air quality modeling study using AERMOD's dispersion of benzene, 1,3-butadiene, and toluene compared the outcomes to measurements near a major highway in Raleigh, North Carolina. "The results presented in the paper demonstrate the suitability of the formulation in AERMOD for estimating concentrations associated with mobile source emissions near roadways."[8]
- In an Italian case-control study, benzene concentrations at children's residences modeled with the European emissions model (COPERT IV) and CALINE4 dispersion model were associated with the risk of childhood leukemia among 83 cases of leukemia in the years 1998-2009, particularly among myeloid leukemia before age 5 years.[9] This study was not included in the CDC meta-analysis, which focused only on "traffic," not specific air pollutants. While benzene could be correlated with other toxics, concentrations of air toxics modeled in the way that this document describes "would not necessarily have a strong nexus to the requirements for high-quality information and accurate scientific analysis" (p. 4-82). Yet such models did provide enough quality-based information to address children's exposure in an epidemiology study. Such a study is not "risk assessment," but epidemiology based on actual pediatric cancer cases. If such modeling produces enough information that epidemiology models have sufficient power to statistically associate it with the likelihood of real-world pediatric leukemia, it is hard to understand how such information is described as poor quality.
- A case-control study in California used CALINE4 for quantifying Carbon Monoxide (CO) at pregnant women's residential addresses and found statistically significant associations with their children's risk of acute pediatric lymphoblasic leukemia (ALL), germ cell tumors, and retinoblastoma.[10] Notably, the study found negative associations between the mothers' exposure to CO and the risks of acute myeloid leukemia (AML). This study was published after CDC's publication cutoff, and notably found pediatric cancer risks associated with *in utero* exposures– risks which CDC's meta-analysis found nonsignificant. The study also found that average PM2.5 concentrations during pregnancy also created risks for retinoblastoma in children's residences with much traffic near their home.
- A cohort study in Toronto, Canada used "land-use regression (LUR) surfaces" based on Volatile Organic Compound (VOC) measurements in 2002 and 2005 to quantify the exposure for Toronto residents.[11] These VOCs included total hydrocarbons and the MSATs benzene

7 Heist, D.; Isakov, V.; Perry, S.; et al. (2013) Estimating near-road pollutant dispersion: a model inter-comparison. Transportation Research Part D: Transport and Environment 25: 93-105.
8 Venkatram, A.; Isakov, V.; Seila, R.; Baldauf, R. (2009) Modeling the impacts of traffic emissions on air toxics concentrations near roadways. Atmospheric Environment 43: 3191-3199.
9 Vincenti, M.; Rothman, K.J.; Crespi, C.M.; et al. (2012) Leukemia risk in children exposed to benzene and PM10 from vehicular traffic: a case-control study in an Italian population. Europe J Epidemiology 27: 781-790.
10 Heck, J.E.; Wu, J.; Lombardi, C.; et al. (2013) Childhood cancer and traffic-related air pollution exposure in early life. Environmental Health Perspectives 121: 1385-1391.
11 Villeneuve, P.J.; Jerrett, M.; Su, J.; et al. (2013) A cohort study of intra-urban variations in volatile organic compounds and mortality, Toronto, Canada. Environmental Pollution 183: 30-39.

and n-hexane. The exposures (for benzene) were based on a LUR that included distance to expressways and major roads and nearby commercial and industrial land area. The article concluded, "Our exploratory multi-pollutant modeling implicated benzene rather than nitrogen dioxide as the pollutant that may be responsible for the increase in cancer-related mortality, whereas the opposite held true for cardiovascular disease mortality."

- Formaldehyde exposure has been linked with leukemia in a number of occupational studies, with a particular focus on myeloid leukemia.[12]

These studies do not represent all the publications available, but provide sufficient evidence that the references provided in the Final EIS are not representative of the range of publications that are available.

With respect to the publications by HEI discussed on pages 4-83 to 4-84, saying that "*In general, the authors … were unable to find that highways were the only source of these pollutants*" does not describe the hypotheses for which these studies were designed. In fact, Lioy et al. (HEI Report 160) was intentionally selected to reflect emissions of multiple sources of toxics, including one with "industrial sites serviced by heavy truck traffic" that was hypothesized to be a hot-spot and a comparison site with no industrial sites chosen as a comparison site. While the authors did find that the hypothesized "hot spot" had higher concentrations of PM2.5, toluene, xylenes, and PAHs than the comparison site, the comparison site had concentrations of benzene, MTBE, chloroform, carbon tetrachloride, hexane, and acetaldehyde that were as high or higher. HEI's Research Committee "concurred with the investigators' conclusion that, by their alternative definition of a hot spot (i.e., having elevated concentrations compared with those of other, more distant areas in New Jersey and across the United States), both neighborhoods could be considered hot spots for PM2.5, benzene, toluene, MTBE, and aldehydes." In a saturation-sampling substudy, HEI states that "results showed that, even within a possible hot spot, spatial variability in ambient concentrations can be found, suggesting that people in some locations within a neighborhood are likely to be exposed to much higher concentrations than those recorded at a fixed monitoring site in the same neighborhood."

Similarly, in the statement on Research Report 158 (Spengler et al.), the Research Committee noted, "Although the levels of MSATs in the area near the Peace Bridge in Buffalo may not be high relative to those in other locations in the United States, these data contribute to our understanding of how traffic emissions may result in elevated levels of air toxics in a local area."

Likewise, in HEI report 156, the HEI statement reads:

"The study's main conclusions are that (1) on-road concentrations of all pollutants measured, including several MSATs, were higher than those measured at fixed sites away from the roads, (2) gasoline-powered vehicles are the main sources of VOCs (including BTEX) at the near-road sites, and (3) diesel- and gasoline-powered vehicles contribute about 50% to 60% of TC associated with PM."

Across the studies, the Review Committee noted that the design of studies, such as the selection of a high-traffic comparison site in the Lioy et al. study, the lack of control of ventilation inside vehicles (Fujita et al., Study 156), and the lack of "appropriately selected background sites" in the Smith et al. (truck terminals) study creates problems in defining a particular location as a "hot spot," but nevertheless underscores the potential for emissions from traffic infrastructure to increase the concentrations of numerous toxics and other pollutants in nearby locations.

12 Zhang, L.; Steinmaus, C.; Eastmond, D.A.; et al. (2009) Formaldehyde exposure and leukemia: a new meta-analysis and potential mechanisms. Mutation Research 681: 150-168.

Overall, the HEI Review Committee made numerous comments about the difficulty of defining a "hot spot." Within local areas, the studies found generally significant gradients within local areas between source locations and backgrounds (one exception is Smith et al.'s trucking terminal study, where the committee noted a lack of appropriate background monitoring and control of wind conditions). However, the HEI Review Committee introduced the notion of comparing study results to concentrations reported in other studies reporting measurements of air toxics in urban areas, which includes locations with numerous other air pollution sources, as an alternative way of defining "hot spot." To conclude that the studies found that, "*no true hot spots were identified*" is to overlook nearly all of the written discussion of the studies by the investigators and the HEI Review Committee.