Air Quality Community of Practice
Mobile Source Air Toxics
State-of-the-Practice

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Disclaimer

This State-of-the-Practice Report summarizes the discussions of Air Quality Community of Practice members who spoke as individual members of the community and did not necessarily represent their agency's views or positions. In addition, the contents of the report do not necessarily represent the views or positions of AASHTO or the Center for Environmental Excellence.

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INTRODUCTION

The Center for Environmental Excellence recently established an Air Quality Community of Practice (COP). The purpose of the Air Quality COP is to assemble a group of State DOT practitioners to have a focused discussion on the state of the practice, emerging issues, and research data needs on particular issues. This effort has essentially two goals, the first of which is to extend the State DOT's networks and contacts, enabling them to share experiences and learn from each other. In this regard, this effort expands and supplements a November 2008 Air Quality Practitioner's Conference that was held in Albany, New York.[1] The second goal is to develop a State-of-the-Practice Report on a selected focus area. The Air Quality COP consists of representatives from ten State DOTs, FHWA, FTA, and an independent consultant. The Air Quality COP members considered a range of possible topic areas but generally agreed that Mobile Source Air Toxics (MSATs) should be the top priority for the first phase of this effort. This topic was chosen because a number of State DOTs are being challenged for not including MSAT analyses in NEPA documents or for allegedly a lack of adequate MSAT analyses, and such challenges have the potential to significantly delay important transportation projects.

Addressing MSATs emissions from mobile sources emerged as a major area of concern for transportation agencies around 2000 as a result of EPA regulations that were issued to address the health effects of MSATs, and emerging studies that reported that proximity to highways is related to adverse health effects. One notable study was the Multiple Air Toxic Exposure Study-II (MATES-II) released by the South Coast Air Quality Management District in 2000.[2] This study assigns 90% of the total cancer risk related to toxic air contaminants to mobile sources in the California South Coast region. It also states that 70% of this total risk is associated with diesel particulate matter. The MATES-III study was released in September 2008 and updates the MATES-II study. It indicates that the overall cancer risk from air toxics has declined since the MATES-II study was completed but that the risks are still unacceptable and are higher near emission sources such as transportation corridors and ports. The MATES-III study also concludes that 94% of the cancer risk is attributable to mobile sources, and that diesel exhaust accounts for about 84% of the total risk.[3] Further, EPA indicates that MSATs, some of which are designated as hazardous air pollutants, include a range of compounds that are known to cause or suspected of causing cancer or other serious health effects. As a result of these activities and concerns, EPA and environmental groups now raise questions about the health impacts of toxics emissions associated with highway projects during the NEPA process. FHWA and State DOTs were also sued regarding MSAT issues in NEPA documents for several major projects.

To address these concerns, FHWA issued interim guidance to assist State DOTs with addressing MSATs in their environmental documents and committed to a long-term research project to monitor and characterize MSATs near roadways. This State-of-the-Practice Report will therefore discuss EPA actions to reduce MSAT emissions, current

FHWA guidance for analyzing MSAT emissions, the current state-of-the practice of the State DOTs in this COP, and possible research needs for better understanding MSAT emissions, impacts, health effects, and mitigation strategies.

EPA REGULATIONS

To address concerns about the potentially serious impacts of hazardous air pollutants on public health and the environment, the Clean Air Act Amendments of 1990 include a number of provisions that have led EPA to characterize, prioritize, and control these emissions. The Clean Air Act (CAA) identifies 188 air toxic (hazardous air pollutant) compounds. The EPA is the lead Federal agency for administering the CAA, and on March 29, 2001, issued a Final Rule entitled, "Control of Emissions of Hazardous Air Pollutants from Mobile Sources" which identified 21 of these air toxic compounds as MSATs.[4] EPA refined the list further, compiling a subset of six priority MSATs identified as having the greatest influence on health. These included:

- benzene,
- 1,3-butadiene,
- formaldehyde,
- acrolein,
- acetaldehyde, and
- diesel exhaust organic matter (DEOM) and diesel particulate matter (DPM).

Of these six priority MSATs, the first five are also listed by EPA under the Clean Air Act as hazardous air pollutants. Diesel exhaust itself (DEOM+DPM) is not at this time listed by EPA as hazardous air pollutants but DPM is considered a probable human carcinogen.

The 2001 Final Rule also analyzed the mobile source contribution of toxics emissions to national emissions inventories and the impacts of existing and newly promulgated mobile source control programs. Mobile source control programs include EPA's reformulated gasoline program, national low emission vehicle standards, Tier two motor vehicle emissions standards and gasoline sulfur control requirements, proposed heavy-duty engine and vehicle standards, and on-highway diesel fuel sulfur control requirements. Between 1990 and 2020, EPA estimated that these programs will reduce on-highway mobile source emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde by 67 to 76%, and will reduce on-highway diesel PM emissions by 90%.

In an independent analysis FHWA also projected that these toxic emissions will drop substantially between 2000 and 2020 despite a 64% increase in VMT during this time period. According to the FHWA analysis on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde will be reduced by 57 to 65% during this time frame while on-highway diesel PM emissions will be reduced by 87%.

On February 26, 2007 EPA issued a new Final Rule entitled, "Control of Hazardous Air Pollutants from Mobile Sources" in order to finalize standards for: 1) exhaust hydrocarbon emissions from passenger vehicles during cold temperature operation; 2) evaporative

hydrocarbon emissions from passenger vehicles; and 3) the benzene content of gasoline.[5] EPA estimates these standards will also contribute to significant reductions in benzene, 1,3-butadiene, formaldehyde, acetaldehyde, acrolein, and naphthalene emissions. The rule also discusses the MSATs which pose the greatest risk at current levels based on updated information. The discussion includes polycyclic organic matter (POM) and naphthalene and excludes acetaldehyde. EPA reports in this Final Rule that a substantial number of modeling assessments and air quality monitoring studies show elevated concentrations of multiple MSATs in close proximity to major roadways. They further point to exposure study findings, which indicate that populations spending time near major roadways likely experience elevated personal exposures to differing physical and chemical compositions of certain motor vehicle-related air toxic pollutants depending on the amount of time spent in close proximity to motor vehicle emissions.

Unlike criteria pollutants such as ozone, particulate matter, and carbon monoxide, however, air toxics do not have National Ambient Air Quality Standards (NAAQS) associated with them. In addition, EPA has not issued any direct requirements on mobile sources for use in the project development process, nor have they developed risk factors for DPM, which is expected to be the major contributor to carcinogenic risk, or for acrolein and naphthalene. EPA has also concluded (71 FR 12498) that its MOBILE6.2 model includes significant limitations that make it unsatisfactory for use in project scale analysis of PM emissions as necessary for quantitative hot-spot analysis.[6] Consequently, it is very difficult to assess the health effects of mobile source air toxics as part of the NEPA process due to the lack of these standards, the lack of scientific linkages between toxic concentration levels and specific health effects, and the uncertainties in the existing modeling tools.

FHWA GUIDANCE

Background

Because of the growing concern for toxic emissions and a lack of guidance on how to address this issue in NEPA documents, FHWA issued “Interim Guidance on Air Toxics in NEPA Documents” on February 3, 2006.[7] This guidance was coordinated with EPA before it was released; however, there are still some differences between FHWA and EPA on the level of toxics analysis that is needed, particularly on large projects. In general, EPA would like to see the analysis on major projects, especially those with high volumes of traffic with heavy duty diesel engines that are close to sensitive receptors, to include an evaluation of concentration levels and health assessments for the various toxics pollutants.

Although work is ongoing to assess the overall health risk of air toxics, FHWA indicates that the tools and techniques for assessing project-specific health impacts from MSATs are still limited. FHWA further indicates that trying to determine the appropriate level of toxics analyses is an evolving situation which will continue for some time. State DOTs have expressed concern about the adequacy of existing dispersion models for use in air toxics analyses, and the lack of science to determine the health effects of various concentration levels, particularly since there are no NAAQS for toxics.

Nevertheless, as a result of new studies, FHWA recently indicated that it is reviewing its toxics guidance and that FHWA has made some project specific progress in reaching agreement with EPA on how to handle toxics in environmental impact statements. However, until such time as FHWA issues new guidance, their February 3, 2006 guidance remains the main document that State DOTs use to prepare their toxics assessments.

FHWA's Interim Guidance on Analysis of MSATs in NEPA Documents

The FHWA interim guidance suggests a three tiered approach for addressing toxics in NEPA documents since there are no criteria for determining the significance of MSAT emissions in the NEPA context. The following summarizes the level of analysis suggested in the guidance for the various tiers:

- **Exempt Projects or Projects with No Meaningful Potential MSAT Effects.** These first tier projects which include projects that qualify as categorical exclusions under FHWA's NEPA regulations (23 CFR 771.11(c)), or are exempt under the EPA Transportation Conformity Regulation (40 CFR 93.126), or other types of projects with no meaningful impacts on traffic volumes or vehicle mix do not require any analysis of MSATs in the NEPA documents. The guidance provides prototype language for these exempt projects.

- **Projects with Low Potential MSAT Effects.** These second tier projects which include minor widening projects, new interchanges or where the traffic volumes for the design year are expected to be less than 140,000 to 150,000 AADT should include a qualitative MSAT assessment. The guidance includes examples of prototype language for these projects.

- **Projects with Higher Potential MSAT Effects.** This third tier includes projects which: 1) create or significantly alter a major intermodal freight facility with the potential to concentrate high levels of DPM in a single location; or 2) create new or add significant capacity to urban highways, or collector-distributor routes, with projected AADTs of 140,000 to 150,000 or greater; and 3) are proposed to be in close proximity to populated areas or in rural areas in close proximity to sensitive receptors such as schools, nursing homes, and hospitals. These types of projects should include a quantitative analysis to differentiate the emissions for the six priority MSATs for each alternative. If a quantitative emissions analysis shows meaningful differences in MSAT emissions among project alternatives, mitigation should be considered.

The Council on Environmental Quality's (CEQ) regulations for implementing NEPA requires agencies to include a discussion of incomplete and unavailable information when evaluating reasonably foreseeable significant impacts on the human environment as part of their environmental impact statements.[8] To address this requirement, the FHWA guidance includes prototype language to assist State DOTs in complying with this CEQ provision.

This prototype language explains the limitations of current models to predict MSAT emissions as well as concentration levels. It also indicates that the shortcomings in current approaches for exposure assessment and risk analysis preclude making meaningful conclusions about project-specific health impacts.

OVERVIEW OF THE STATE-OF-THE-PRACTICE FOR MSAT ANALYSES

Since the Clean Air Act does not specify NAAQS for MSATs and EPA has not issued any implementing requirements for MSATs analysis, most States follow the interim FHWA guidance without any additional State requirements. Some States are beginning to incorporate MSATs into State policies and air quality guidance documents. Also, several States have made modifications to the FHWA guidance to make it more consistent with State policies and practices. This section contains an overview of State practices for selected States involved in this COP.

California DOT

California uses the FHWA interim MSAT guidance but with some modifications because of California State Law and the fact they use a different emissions model than the rest of the country. California uses the EMFAC model, rather than the EPA MOBILE6 model, to predict mobile source emissions. The EMFAC model does not directly output MSAT emissions factors. Because of this, and because California has a heavy focus on DPM, the California Air Resources Board (CARB) provides speciation factors for total organic compounds for addressing five of the six priority MSATs. Diesel vehicle classes are added together to develop DPM factors. To simplify the analysis process, CALTRANS has developed a CT-EMFAC interface model that makes it easier to come up with the composite emissions factors.[9]

California has a separate system of regulation for air toxics, based on a State initiative ("Proposition 65") and other State law. The California equivalents of EPA's "hazardous air pollutants" are called "toxic air contaminants" (TACs). All of EPA's hazardous air pollutants are also listed as TACs, with numerous additions. Unlike EPA, California has listed diesel particulate matter (DPM) as a TAC, and has set cancer potency and unit risk factors for it. CARB has also issued a "Land Use Handbook" defining areas near freeways and other heavily used roads where certain sensitive land uses should not be located, and several State codes related to school siting have incorporated the ARB impact areas into law.[10]

Another difference is that the language in the FHWA guidance for addressing the CEQ requirement for incomplete and unavailable information is a problem under the California Environmental Quality Act (CEQA) because CARB has found DPM to be a State TAC. Accordingly, CARB can say there is no uncertainty in the status of DPM in the process. Also on larger projects local Air Pollution Control Districts want quantitative Health Risk Analyses which CALTRANS indicates can cost up to $500,000 for major projects. The

CARB and California State law define all freeways and urban roads greater than 100K AADT, and rural roads greater than 50K AADT as producing significant health impacts related mainly to DPM thus requiring higher levels of analysis than would be required under the FHWA guidance, unless there are no sensitive receptors within one-forth (¼) mile of the proposed project.

California is developing MSAT guidance based on a mixture of the FHWA, National Cooperative Highway Research Program (NCHRP), and State-level approaches, but is currently using the FHWA guidance with ad-hoc adjustments noted above. CALTRANS reports that since there are no national air quality standards for MSAT concentrations, doing MSAT analyses that go beyond emissions is a very big step. CALTRANS has not yet done dispersion modeling to predict MSAT concentration levels, or Health Risk Assessments (HRA), on State projects.

Colorado DOT

The Colorado DOT uses the FHWA interim guidance for their NEPA documents, but has started developing a programmatic agreement through an interagency consultation process to deal with issues such as MSAT emissions which do not have specific air quality standards or regulatory requirements. This programmatic agreement was initiated because CDOT is receiving comments on toxics as part of the NEPA process, but there have been disagreements on the best course of action for dealing with these emissions. These disagreements have delayed projects. Consequently, CDOT thought a better approach would be to develop a Memorandum of Agreement (MOA) and to identify a number of proactive mitigation measures that will reduce these unregulated emissions on a statewide basis, rather than to negotiate mitigation measures for them on a project-by-project basis. The agreement will be between CDOT, the Regional Air Quality Council, the Regional Transportation District, EPA, FHWA, FTA, and the Colorado Department of Health and Environment. As part of this process CDOT identified 11 strategies for possible implementation, some of which they are already doing. CDOT indicates they took this step because many of the resource agencies and the general public do not understand the proactive actions CDOT is already undertaking and the benefits these strategies provide for reducing MSAT emissions. While this effort was originally envisioned as an MOA it was decided that the most appropriate course of action would be to revise their existing Policy Directive on Air Quality to incorporate these commitments. The Policy Directive is expected to be completed by spring of 2009. The 11 strategies identified in the Policy Directive include:

1. Technical assessments and studies, field work, and other initiatives related to achieving the goal and objectives of the Policy Directive. Examples include sharing and refining relevant air quality information on emissions, modeling, and monitoring in Colorado.

2. Evaluating the effects of statutory, regulatory, and other legal requirements on air quality.

3. Developing materials to better educate the public on actions they can take to reduce personal impacts on air quality.

4. Evaluating how long range visions of transportation in Colorado may affect overall air quality within the state.

5. Researching traffic control options for limiting exposure of sensitive receptors to impacts from vehicles.

6. Researching technologies to extend the service life of transportation infrastructure including concrete and asphalt.

7. Work collaboratively with local agencies to integrate transportation and community development decisions.

8. Continuing efforts to reduce air quality impacts from agency vehicles and from vehicles of agency contractors.

9. Promote best practices that reduce impacts to air quality from personal and commercial vehicles.

10. Research additional ways to improve efficiency of the statewide system with regards to freight movement.

11. Identify opportunities to reduce impacts to air quality from non-transportation features of the system such as landscaping and Department facilities.

CDOT recently completed a cost-benefit analysis on the following strategies:

1. researching truck route restrictions to avoid sensitive receptor populations,

2. continuing research on pavement durability to reduce the frequency of repaving,

3. using additives to concrete to reduce demand for cement,

4. exploring transportation demand management strategies on a statewide basis to better utilize the existing mobility network, and

5. using ultra-low sulfur diesel in non-road equipment statewide by 2010.[11]

The cost-benefit analysis includes a discussion of implementation costs, obstacles to implementation, and potential emissions reductions per year for various pollutants. For purposes of this study, diesel particulate emissions were used as a surrogate for MSATs.[12]

Maryland DOT

Maryland DOT also utilizes the FHWA interim guidance. For minor widening projects such as the US 40 at Edgewood Drive Intersection Improvements project, MDOT indicates such projects will not result in any meaningful changes in traffic volumes, vehicles mix, location of the existing facility, or any other factors that would cause an increase in emissions. MDOT classifies these types of projects as categorical exclusions under the NEPA regulations.[13] In addition, they are exempt from the conformity provisions. Consequently, no MSAT analyses are done for these projects. For projects that meet FHWA's definition of a "Project with Low Potential for MSAT Effects," such as the I-70: Mt Phillip Road to MD 144 Phase 2D project that includes some outside widening, MDOT uses a qualitative assessment approach consistent with the FHWA guidance.[14] Such qualitative approach typically results in a three page discussion which draws from the FHWA prototype language.

MDOT has only had one project that required the full quantitative approach and that was for the Intercounty Connector (ICC) project. The ICC is an 18-mile controlled access, toll facility in Montgomery and Prince George's Counties, Maryland and links two major interstate routes, I-270 to the west and the I-95/US 1 corridors to the east. Although this quantitative analysis was completed prior to the issuance of the FHWA interim guidance, MDOT and the State Highway Administration (SHA) worked closely with FHWA to develop the methodology used in the analysis. The quantitative analysis for this project compared the total emissions burden (tons) of the six priority MSATs within the study area for each build alternative to the emissions burden for the no-build alternative for the design year (2030) and to the emissions in 2000. Traffic data came from the ICC Travel Analysis Technical Report; MOBILE6.2.03 was used to develop emissions factors; and Microsoft Access© was used to sum emissions on roadway links.[15] They found that all the build alternatives and the no-build alternative resulted in substantial reductions in MSAT emissions between 2000 and 2030, in the range of 67 to 92.5%.[16] Both build alternatives reduced MSAT emissions slightly less than the no-build option in 2030, ranging from 0 and 1.3%. The analyses indicate these small differences in emissions are within the error range of EPA's MOBILE6.2 emissions model due to its inherent uncertainties. While the Final EIS summarizes some of the potential health effects of the six priority MSATs, it does not include a risk or health impacts assessment, consistent with the FHWA guidance.[17]

The project does not include mitigation measures exclusively for MSAT emissions, but a commitment was made to implement a Diesel Emissions Reduction Program to minimize air pollution which will help to reduce MSAT emissions during construction of the ICC. The Record of Decision for this project states this program will require:

- Diesel powered construction equipment to meet minimum emissions reduction requirements by engine manufacturer, or by being properly retrofitted with emissions control devices, or that clean fuels be used if necessary to meet the emissions reduction requirements; and

- All pertinent Federal and State regulations relative to exhaust emission controls and safety to be complied with; and
- Retrofit equipment that is used to be on the EPA Verified Retrofit Technology List; and
- Delivery vehicles to reduce their idling times when unloading construction material.

These requirements were included in the Request for Proposals for all ICC construction contracts. To satisfy these requirements, the contractor is required to submit and adhere to a Diesel Emissions Reduction Plan to demonstrate his compliance with the contract requirements.

Minnesota DOT

The MNDOT uses the FHWA interim guidance and follows the analyses recommendations contained in the guidance. For example, MNDOT and FHWA determined that a quantitative emissions analysis was required in an Environmental Assessment (EA)/ Environmental Assessment Worksheet (EAW) for a congestion relief project funded under a Federal Urban Partnership Agreement. The project is for the addition of priced dynamic shoulder lanes on I-35W northbound from 46th Street to TH65 Split with I-35W. [18] The EA/EAW includes a general discussion of air toxics and some of the actions EPA has undertaken to help control MSAT emissions; and incorporates the FHWA's prototype language for addressing the CEQ requirements for unavailable or incomplete information.

The EA/EAW also includes a quantitative analysis to estimate the emissions levels for the six primary MSATs for the existing year 2008 and for years 2010 and 2030 for both the no-build and build alternatives. MNDOT uses FHWA's Easy Mobile Inventory Tool (EMIT), which incorporates a graphical interface with the EPA MOBILE6.2 emissions model, to complete their analyses. The EMIT model simplifies the development of mobile source emissions factors and emissions inventories for project level analyses. The analysis shows that total MSAT emissions rates will be 11% (no-build) to 18% (build) lower in 2010 compared to base year 2008 emissions. The emissions rates will be 40% lower for both the build and no-build alternatives in 2030 compared to 2008 emissions. Diesel particulate emissions will decrease by 88% for both the build and no-build alternatives in 2030 compared to the base 2008 emissions. The analysis also indicates that the emission differences between the build and no-build alternatives are small compared to the long term MSAT emission trends. Since MSAT levels are projected to decrease substantially, and since MSAT criteria have not been defined by EPA, this project does not propose any mitigation measures. The EA/EAW includes a general discussion of possible construction related mitigation measures, such as particulate matter traps, oxidation catalysts, ultra-low sulfur diesel fuels, diesel retrofits, etc., but no specific mitigation measures are proposed because of the short construction period for this project.

New York State DOT

Using the FHWA Interim Guidance, NYSDOT reviews projects on a case-by-case basis to determine the appropriate level of MSAT analyses for NEPA documents. Important considerations include proximity to sensitive land uses, public concerns, and changes in diesel truck traffic. NYSDOT is currently developing MSAT guidance that is based on the FHWA Interim Guidance, but addresses issues specific to New York State and provides more detailed analysis procedures.

NYSDOT is conducting a quantitative MSAT analysis for the Proposed Long Island Truck-Rail Intermodal Facility project. This project is in the Draft Environmental Impact Statement (DEIS) phase. In addition, NYSDOT anticipates performing a quantitative MSAT analysis for the upcoming Tappan Zee Bridge/I-287 DEIS. The Department has also conducted numerous qualitative MSAT analyses.

To comply with the New York State Diesel Emissions Reduction Act (DERA), NYSDOT is installing retrofit equipment on the Department's fleet of pre-2007 model year on-road diesel vehicles (model year 2007+ vehicles are already equipped with the emission-reducing technology). NYSDOT is also currently pursuing the implementation of "green construction practices." Under these practices, all new construction contracts will:

- Require the use of ultra-low sulfur diesel fuel in construction equipment
- Include provisions banning the idling of diesel equipment for longer than three minutes, with certain exceptions
- Include provisions to protect air intakes for buildings and/or facilities from the impacts of diesel exhaust fumes
- Include additional requirements for dust control

It is anticipated that these measures will decrease diesel particulate matter emissions throughout New York State.

Texas DOT

Texas typically uses the FHWA interim MSAT guidance but with some modifications. TxDOT determines the type of MSAT analyses based on the project specifics rather than on the type of NEPA document. For example, they conduct qualitative analyses for CE projects which add capacity greater than 10,000 AADT by the design year if a sensitive receptor exists, rather than not doing any analyses. They also added two qualifiers to FHWA's thresholds for doing quantitative analyses. First, TxDOT guidance indicates that if MSATs are raised as an issue during the NEPA process, or if there is a threat of litigation, a quantitative analysis should be done for the project even if the AADTs are less than 140,000. And secondly, if there is any doubt on the appropriate level of analysis they will make a determination on other projects with AADTs less than 140,000 on a case-by-case basis in consultation with FHWA and the MPOs.[19]

TxDOT has completed 30 quantitative MSAT analyses and has 30 others underway. The 60 projects are for corridors above FHWA's 140,000 AADT threshold by design year, except for a new loop around Houston. Each segment of independent utility for this project is under 100,000 AADT by the design year. The cost of these analyses runs between $75K and $100K per analysis. To try to reduce the cost and time involved to prepare these analyses the North Central Texas Council of Government (NCTCOG) has developed a protocol that will reduce these costs to $10K and reduce the analysis period from three months to two weeks. The protocol has automated the analysis process by developing a module called Emilink on the back end of the transportation demand model.[20] Since NCTCOG has already calculated the emissions on the various links within the Dallas Fort Worth Region, TxDOT does not need to redo this analysis. Also this process provides for procedural and data assumption consistency between projects.

TxDOT points out the need for emissions trend data that goes to 2035 or 2040 so it can be incorporated in the guidance, since the next round of transportation plans will extend to these dates. Also TxDOT indicates a need for information that provides more detailed analytical procedures for quantitative MSAT analysis and possibly regional analysis with some type of hotspot analysis at certain distances from the project.

Virginia DOT

The Virginia Department of Transportation (VDOT) uses the FHWA interim guidance for their MSAT analyses and does not add any state-specific MSAT analysis requirements. One recent study is the "Air Quality Analysis (for the) I-95/I-395 HOV/Bus/HOT Lanes Project," dated December 5, 2008.[21] From the report: "*Under provisions of Virginia's Public-Private Transportation Act of 1995, [VDOT] in partnership with Fluor Virginia, Inc., and TransUrban USA, Inc., (Fluor-Transurban), proposes to construct a system of High Occupancy Toll (HOT) lanes on I-95 and I-395 in Northern Virginia. The total length of the project is approximately 36 miles, including transition areas between the southern terminus of the proposed HOT lanes and the I-95 general purpose lanes at Route 610, Garrisonville Road.*"

The MSAT analysis includes background material on MSATs, and a discussion of unavailable and incomplete information that is largely from the FHWA guidance. The analysis includes projections for both the build and no-build alternatives for analysis years 2006 (existing), 2010, 2015, and 2030 for all six priority MSATs. The analysis area includes a traffic shed that includes links in the regional network that will have a 5% increase or decrease or more in daily traffic volumes between the build and no-build scenarios. Emission rates are from FHWA's EMIT model. The appropriate MSAT emissions for each link are then multiplied by the daily VMT per link to calculate the emissions for each of the six priority MSATs.

The analysis shows substantial reductions in emissions relative to existing conditions for all six primary MSATs ranging from 12.6 to 36.4% in 2010, from 34.9 to 79.0% in 2015, and from 32.5 to 91.4% in 2030. In each year, the build emissions are slightly higher than the no-build emissions, with the differences ranging from 0.6% or less in 2010 to 1.6% or

less in 2030. Because of the substantial reductions in overall MSAT emissions from the base or existing year, the small differences between the build and no-build emissions, the uncertainties inherent in the models, and the difficulty assessing exposure at the project level, the document concludes that there does not appear to be significant adverse impacts on the human environment from mobile source air toxics.

Washington DOT

WSDOT uses the FHWA interim guidance, including the sample language and thresholds for quantitative analysis for their environmental documents. So far, WSDOT has conducted two quantitative MSAT analyses. They have some upcoming projects that will add capacity to existing facilities with AADTs over 140,000 that will also need quantitative MSAT analyses in the near future. The two projects for which quantitative analyses have been completed are the Salmon Creek Interchange, located north of Vancouver where Interstates I-205 and I-5 split[22], and for the Tacoma/Pierce County HOV Program.[23] The documents for these two projects contain some general background information on MSAT emissions; and summarize the potential hazards and toxicology of the six primary MSATs from the EPA Integrated Risk Information System, the MSAT study limitations, and the information that is unavailable or incomplete. The discussion on unavailable and incomplete information draws heavily from the FHWA guidance.

Both projects also contain emission analyses for all six priority MSATs for both the build and no-build scenarios for various analysis years. WSDOT uses the FHWA's EMIT model. The study area for the analyses includes roadway links that will experience more than a 10% change in AADT as a result of the project. The analyses for both projects show very significant reductions (approx. 43%) in total MSAT emissions in future years from both the build and no-build scenarios, with the build emissions in the design years being slightly higher than the no-build emissions. No mitigation measures were proposed because of the large reductions in MSAT emissions, the small difference in emissions between the build and no-build scenarios, and because of the inherent uncertainties in the model predictions.

RESEARCH ON AIR TOXICS

EPA

Both EPA and FHWA have committed to continuing research on MSATs to improve the science and understanding of air toxics and their health effects, to identify data gaps, and to better evaluate cost-effective control strategies. For example, in the 2001 rule making, EPA committed to implementing a Technical Analysis Plan to improve understanding of the impacts of air toxics on public health and welfare. The plan is primarily intended to help develop better air toxics emission factors; improve estimation of air toxics exposures in micro-environments; improve consideration of the range of total public exposures to air toxics; and to increase understanding of the effectiveness and costs of vehicle, fuels, and non-road controls for air toxics. In 2006, EPA released an update to its 1999 National-Scale Air Toxics Assessment (NATA) to identify and prioritize air toxics, emission source

types and locations which are of greatest potential concern in terms of contributing to population risk.[24] In 2008, EPA updated its Integrated Risk Information System (IRIS) that contains information on human health effects that may result from exposure to various substances in the environment.[25] More recently, EPA announced a new initiative to further measure levels of toxic air pollution near many schools across the country, especially those located near large industries and in urban areas. EPA has an extensive web site which presents information on MSATs including, among other things, modeling and analysis tools, health effects, and strategies for reducing risk to the public. [26]

FHWA

FHWA released a Strategic Work Plan for Air Toxics Research in June 2004, which is intended to serve as a road map for research on MSATs that is undertaken by or for the transportation community.[27] The plan focuses on four research areas, including: (1) vehicle emissions characterization, (2) ambient monitoring, (3) analysis, and (4) control strategies/measures. FHWA, in conjunction with EPA and a consortium of State DOTs, is also studying the concentration and physical behavior of MSATs and mobile source PM 2.5 emissions at several near roadway sites around the country.[28] The National Near Road Study was initiated in response to a lawsuit by, and settlement agreement with, the Sierra Club on improvements proposed for US 95 in Nevada.[29] This study will gather additional information on the potential sources and behavior of MSAT emissions. In addition, FHWA has MSAT research included in its FY 2009 Surface Transportation Environment and Planning Cooperative Research Program (STEP).[30] This research includes outreach and communication efforts to inform and provide technical assistance on a wide range of air quality issues, including MSATs and the health implications of transportation services. This effort will also include synthesis and compilation of research results and other information. FHWA has and continues to use STEP to fund independent research and scientific review studies by the Health Effects Institute (HEI) counting a planned, multi-year grant to understand the health effects of key pollutants of direct interest and relevance to the needs of the agency, including a range of toxic air pollutants and current and emerging fuels and transportation technologies.

Recently, FHWA issued a Broad Agency Announcement soliciting proposals for research and development projects that could lead to better understanding and advances for tools and methodologies in conducting emissions analysis for transportation projects.[31] The four research focus areas identified include: 1) Testing, Evaluation and Validation of New Emission Models and Methodologies, 2) Research on Conducting Project Level Analysis, 3) Air Quality and Transportation Conformity Outreach and Communication, and 4) Fleet Data for On-road Mobile Sources Emissions Inventory.

NCHRP

In March 2007, NCHRP released a report entitled, “Analyzing, Documenting, and Communicating the Impacts of Mobile Source Air Toxic Emissions [MSATs] in the NEPA Process.”[32] This report was requested by AASHTO and provides insight on how to

determine concentration levels and conduct health assessments for certain categories of projects.

Health Effects Institute

New studies are coming out on the health effects of air toxics, and the science is still evolving. One such study, which was funded in part by both EPA and FHWA, is HEI's research report entitled, "Mobile-Source Air Toxics: A Critical Review of the Literature on Exposure and Health Effects, Special Report 16" which was released in 2007.[33] The report discusses the health effects of exposure to 21 MSATs; critically analyzes the literature for a subset of seven MSATs (acetaldehyde, acrolein, benzene, 1,3-butadiene, formaldehyde, naphthalene, and polycyclic organic matter); and assesses and summarizes research gaps and unresolved questions. The report focuses on the MSATs for which mobile sources are an important contributor and for which health effects may be observed at levels found in the ambient air. Of the MSATs discussed, benzene seems to be the pollutant of biggest concern because of studies showing increased cancer risk at lower exposures, and because evidence of benzene having a health risk is strengthening. For many of the other MSATs there is less evidence that they are causing health effects at the levels found in the ambient air. The report should be useful for anyone that is doing toxics analysis as part of a NEPA document.

Future Research Needs

To improve understanding and use of MSAT analyses, the HEI report indicates: 1) that MSATs need better source apportionments because they originate from many different sources, 2) there is a need to better characterize concentrations in micro-environments, such as homes and workplaces, and contributions of outdoor concentrations to indoor concentrations and personal exposures, 3) that improved analytical chemistry methodologies are needed to better understand exposure measurements, 4) there is a need to compile better trend and spatial data, 5) that the EPA NATA modeling process needs to continue to improve, and 6) that there is a need to assess MSAT emissions from alternative fuels.

At the November 2008 AASHTO Air Quality Practitioner's Conference, air quality practitioners suggested that State DOTs support research to: 1) improve the science and understanding between transportations impacts on air quality and health effects such as asthma and cancer risk; 2) evaluate models as they are implemented to see if forecasts of future events correlate with follow-up measurements, and 3) develop a bibliography of major research efforts on MSATs which includes a synopsis on whether the research helps fill in the gaps of unavailable or incomplete information and data that is needed to make a MSATs evaluation.

The Air Quality COP recommends the following additional research measures to help advance the state-of-the-practice for MSATs:

- Evaluate air toxics emissions models and research the implications of the new EPA MOVES emissions model on MSAT analyses.

- Gather information on project-level mitigation measures for MSAT emissions for construction, operations and maintenance activities.

SUMMARY

Concern about the potential health effects of MSATs emissions emerged as a major issue for transportation agencies around 2000. This was a result of EPA regulations that were issued to address the health effects of MSATs, emerging studies that reported that proximity to highways is related to adverse health effects, and lawsuits challenging environmental documents for key projects. To address these concerns, FHWA issued interim guidance to assist State DOTs with addressing MSATs in their environmental documents and committed to a research project to monitor and characterize MSATs near major highways.

Since the Clean Air Act does not specify NAAQS for MSATs and EPA has not issued any implementing requirements for MSATs in the NEPA process, most States follow the interim FHWA guidance without any additional State requirements. Some States are beginning to incorporate MSATs into State policies and air quality guidance documents. Several States have made modifications to the FHWA guidance to make it more consistent with State policies and practices. For example, several States have established lower thresholds for completing quantitative MSAT analysis than are contained in the FHWA interim guidance. Also, several States are exploring ways to reduce the time and costs for completing a MSAT analysis.

Both EPA and FHWA have committed to continuing research on MSATs to improve the science and understanding of air toxics and their health effects, to identify data gaps, and to better evaluate cost-effective control strategies. If this research provides such linkages, State DOTs can expect continuing pressure to predict concentration levels and to complete risk assessments for MSATs especially on larger projects with high volumes of heavy duty diesel engines that are in close proximity to sensitive receptors. This would also require substantial improvements in current models to accurately predict concentration levels for MSAT emissions.

Considerable uncertainty remains associated with MSAT analyses, modeling techniques, linkages to health risks, etc. The Air Quality COP identified the following needs for advancing the state-of-the-practice for MSATs:

- Need to incorporate POM and naphthalene in any future updates/revisions to MSAT guidance since the February 26, 2007 EPA Final MSAT Rule expanded the priority MSATs to include these compounds. However, since the current version of the EPA MOVES emissions model (Draft MOVES 2009) does not estimate emissions for the POMs named in the EPA Final Rule, any MSAT guidance that

includes POM emissions needs to determine how to conduct quantitative analyses for these pollutants.

- Need to include emissions trend data that goes to at least 2040 in any future updates/revisions to MSAT guidance, since the next round of transportation plans will extend to these dates and design years are already approaching 2040 for large projects. Any such MSAT guidance also needs to consider providing detailed analytical procedures for quantitative MSAT analysis and possibly a regional/subregional analysis with some type of hotspot analysis at certain distances from the project.

- Need for State DOT input to FHWA's revised toxics guidance and coordination with FHWA during its development.

- Need to conduct and synthesize research to improve the science and understanding of transportation MSAT emissions and impacts on air quality and health effects such as asthma and cancer risk.

- Need risk assessment protocols to facilitate project level HRAs for air toxics, if HRAs are required at some point. This needs to include, among other things, information on how to do a "simplified" analysis.

- Need additional training and technical assistance on MSATs, particularly in States with little experience in doing MSAT analyses. Also, need to maximize the use of electronic means such as live satellite/web teleconferences and training sessions, webinars, including/archiving video presentations on the web, etc. to get the information and technical assistance out more quickly.

- Request FHWA to present a webinar/conference call to go over the current FHWA MSAT guidance again, provide additional information on current MSAT research activities, and to give some indication of where the updated FHWA MSAT guidance will come out.

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