Air Quality Community of Practice

Project-Level Quantitative Hot-spot Analyses for $PM_{2.5}$ and PM_{10}

State-of-the-Practice

Requested by:

American Association of State Highway and Transportation Officials (AASHTO)

Center for Environmental Excellence

Prepared by:

James M. Shrouds
AASHTO Consultant

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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. Use of trade names for commercial products is for example purposes only, and does not constitute approval or recommendation by the Air Quality Community of Practice members or AASHTO.

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INTRODUCTION

The Center for Environmental Excellence by AASHTO (Center) established an Air Quality Community of Practice (COP) in 2008. 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, as well as on other air quality issues of interest. This effort has essentially two goals, the first of which is to extend the State DOTs' 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 State-of-the-Practice Reports on selected focus areas. To date, the Air Quality COP effort has produced the following reports:

- State-of-the-Practice Report on *Mobile Source Air Toxics* in May 2009;[2]
- State-of-the-Practice Report on *Short Term Impacts from Construction Equipment and Operations* in March 2010;[3]
- State-of-the-Practice Report on *Air Quality Interagency Consultation* in June 2010;[4]
- State-of-the-Practice Report on *Establishing Air Quality Background Concentration Levels for Projects* in December 2010;[5]
- State-of-the-Practice Report on *Use of Transportation Control Measures and Reasonably Available Control Measures in Approved or Submitted State Implementation Plans* in April 2011;[6]
- State-of-the-Practice Report on *Public Education Programs* in January 2012;[7] and
- State-of-the-Practice Report on *Establishing and Coordinating Motor Vehicle Emissions Budgets* in June 2012.[8]

The Air Quality COP consists of representatives from thirteen State DOTs, FHWA, FTA, and AASHTO. The Air Quality COP members considered a range of possible topic areas and agreed on *Project-Level Quantitative Hot-spot Analyses for $PM_{2.5}$ and PM_{10}* for this report. The US Environmental Protection Agency's (EPA's) Transportation Conformity regulations required $PM_{2.5}$ and PM_{10} qualitative hot-spot analyses for projects of air quality concern in PM nonattainment and maintenance areas until such time as EPA released modeling guidance for making quantitative analyses. On December 20, 2010, EPA released final guidance for *Quantitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas*. Also on this date, EPA announced in the Federal

Register its approval of the use of EPA's Motor Vehicle Emissions Simulator model (MOVES 2010a), and the Emission Factor model (EMFAC2007) in California, for quantitative PM hot-spot analyses. The Federal Register indicates that EPA's approval started a two year grace period before the models are required to be used for conformity purposes. This grace period ended on December 20, 2012. Beginning on that date, States are required to use the new models to complete new quantitative hot-spot analyses for projects of air quality concern. The one exception is that a qualitative PM hot-spot analysis begun before the end of the grace period can be completed. Also since EPA proposed to strengthen the annual PM National Ambient Air Quality Standard (NAAQS) and to require some near-road monitors in urban areas which may result in more PM nonattainment areas in the future, the State DOTs elected to look at current and planned State procedures for conducting quantitative project-level PM hot-spot analyses with the new MOVES2010a, MOVES2010b, and EMFAC2007 emissions models. States are also interested in determining what**,** if any, additional research or technical assistance States DOT's may need to help them more efficiently address these analyses procedures now and in the future.

This report area will therefore summarize: EPA and FHWA/FTA requirements and guidance documents for conducting $PM_{2.5}$ and PM_{10} quantitative hot-spot analyses; current and planned practices of selected State DOTs for conducting these analyses; technical details such as which models States are using or plan to use, including utility software that will help streamline and facilitate the modeling process; and current and completed research, as well as additional research or technical assistance States DOT's may need to more efficiently conduct these analyses.

[Note: When this report was started, EPA was in the process of proposing changes to the annual PM $_{2.5}$ standards and near-road monitoring requirements. EPA announced the final annual PM $_{2.5}$ standards and near-road monitoring requirements on December 14, 2012. See the EPA Regulation/Guidance Section below.]

EPA REGULATIONS/GUIDANCE

EPA has established a number of regulatory and guidance documents that relate to project-level hot-spot analyses for $PM_{2.5}$ and PM_{10}. The following is a summary of several of these documents and websites.

Transportation Conformity Rule:[9] EPA's Transportation Conformity Regulations contain several sections that are applicable to project-level PM hot-spot analyses. The most relevant sections for purposes of this report are:

> ***Section 93.101, Definitions, Hot-spot Analysis:*** This section defines a hot-spot analysis as an estimation of likely future localized Carbon Monoxide (CO), $PM_{2.5}$ and/or PM_{10} pollutant concentrations and a comparison of those concentrations to the national ambient air quality standards. It indicates that hot-spot analysis assesses impacts on a smaller scale than the entire nonattainment or maintenance area. Hot-spot analyses typically include congested roadway intersections and

highways or transit terminals, and use an air quality dispersion model to determine the effects of emissions on air quality.

Section 93.102(d), Grace period for new nonattainment areas: This section indicates that the transportation conformity provisions will not apply with respect to a NAAQS for 12 months following the effective date of a final nonattainment designation for areas or portions of areas which have been continuously designated attainment or not designated for any NAAQS for ozone, CO, PM_{10}, $PM_{2.5}$ or NO_2 since 1990 and are subsequently redesignated to nonattainment or designated nonattainment for any NAAQS for any of these pollutants.

Section 93.105, Consultation: This section requires States to provide detailed consultation procedures whereby representatives of the metropolitan planning organizations (MPOs), and State and local transportation and air quality planning agencies, and other organizations with responsibilities for developing, submitting, or implementing provisions of a State implementation plan (SIP) must consult with each other and with EPA, FHWA, and FTA on the development of the SIP, the transportation plan, the transportation improvement program (TIP), and associated conformity determinations. The rule lists specific topics that the consultation procedures must address such as a process involving the MPO, State and local air quality planning agencies, State and local transportation agencies, EPA, and DOT for evaluating and choosing a model (or models) and associated methods and assumptions to be used in hot-spot analyses.

Section 93.111, Criteria and procedures: Latest emissions model: This section indicates that conformity determinations must be based on the latest available emission model approved by EPA. If a new model is established, EPA will consult with DOT to establish a grace period before the new model must be used for transportation conformity purposes. The grace period will be published in the Federal Register.

Section 93.116, Criteria and procedures: Localized CO, PM_{10}, and $PM_{2.5}$ violations (hot-spots): This section indicates that FHWA/FTA projects must not: 1) cause or contribute to any new localized CO, PM_{10}, and/or $PM_{2.5}$ violations; 2) increase the frequency or severity of any existing violations; or 3) delay timely attainment of any NAAQS, interim emission reductions, or other milestones in CO, PM_{10}, and $PM_{2.5}$ nonattainment and maintenance areas. These criteria are satisfied without a hot-spot analysis in PM_{10} and $PM_{2.5}$ nonattainment and maintenance areas for FHWA/FTA projects that are not specifically identified in the regulation. For all other FHWA/FTA projects in CO, PM_{10} and $PM_{2.5}$ nonattainment and maintenance areas the criteria are satisfied if it is demonstrated that during the time frame of the transportation plan no new local violations will be created and the severity or number of existing violations will not be increased as a result of the project, and the project has been included in a regional emissions analysis.

Section 93.117, Criteria and procedures: Compliance with PM_{10} ***and*** $PM_{2.5}$ ***control measures:*** This section indicates that a FHWA/FTA project must comply with any PM_{10} and $PM_{2.5}$ control measures in the applicable SIP. It further indicates that this criterion is satisfied if the project-level conformity determination contains a written commitment from the project sponsor to include the SIP's PM control measures in the final plans, specifications, and estimates for the project.

Section 93.123 Procedures for determining localized CO, PM_{10}***, and*** $PM_{2.5}$ ***concentrations (hot-spot analysis):*** This section indicates that hot-spot demonstrations must be based on quantitative analysis methods for certain types of projects, after EPA releases modeling guidance on this subject and announces in the *Federal Register* that these requirements are in effect. Examples of projects that will require a quantitative analysis once the requirement is effective include: new and expanded highway projects with a significant number of diesel vehicles; projects affecting intersections that are, or will be, at Level-of-Service (LOS) D, E, or F with a significant number of diesel vehicles; new or expanded bus and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location; and projects in or affecting locations, areas, or categories of sites which are identified in the PM_{10} or $PM_{2.5}$ SIPs as sites of violation or possible violation.

This section allows the use of qualitative PM analysis based on local factors if quantitative methods are not yet available. It also allows DOT, in consultation with EPA, to make categorical hot-spot findings for CO, $PM_{2.5}$ and PM_{10} nonattainment and maintenance areas based on appropriate modeling for applicable projects without further hot-spot analysis. Finally this section includes some general requirements that must be included in the hot-spot analysis.

Final Rule: National Ambient Air Quality Standards for Particulate:[10] On December 14, 2012, EPA signed a notice to establish final revisions to the suite of PM standards to provide requisite protection of public health and welfare. Among other things this rule: 1) revises the annual $PM_{2.5}$ standard by lowering the level from 15.0 micrograms per cubic meter (μg/m3) to 12.0 μg/m3; 2) retains the current 24-hour $PM_{2.5}$ and 24-hour PM_{10} standards; and 3) requires one near-road $PM_{2.5}$ monitor in PM nonattainment and maintenance areas with a population of 1 million or more. While EPA originally proposed to create a separate 24-hour $PM_{2.5}$ secondary standard for visibility impairment, that provision was not finalized.

Draft Guidance: Particulate Matter (PM) Advance:[11] EPA recently requested comments on its proposed PM Advance program which is a collaborative effort by EPA, States, tribes, and local governments to encourage emission reductions in $PM_{2.5}$ attainment areas to help them maintain the 2012 annual $PM_{2.5}$ NAAQS, the 2006 24-hour $PM_{2.5}$ NAAQS, and any future revised $PM_{2.5}$ NAAQS. The goals of the program are to (1) help attainment areas ensure continued health protection for their citizens, (2) better position areas to remain in attainment, and (3) efficiently direct available resources toward actions to address PM problems quickly. PM Advance is similar to the Ozone Advance program,

which EPA announced on April 4, 2012. The guidance encourages areas that choose to participate in both the Ozone and PM Advance programs to combine their efforts into one multi-pollutant strategy that addresses both PM and ozone.

Tool to generate EMISFACT portion of an AERMOD input file:[12] EPA recently issued a tool, called MOVES2AERMOD, that will simplify the incorporation of MOVES emission rates into the AERMOD dispersion model. The tool automates the process of generating the EMISFACT portion of an AERMOD input file using MOVES output. MOVES2AERMOD is run directly through the MOVES interface and can be used for any type of project requiring a quantitative PM hot-spot analysis.

Proposed Rule: Revisions to the National Ambient Air Quality Standards (NAAQS) for Particulate Matter (PM) as contained in the June 29, 2012 Federal Register:[13] On June 29, 2012, EPA promulgated a proposal to make revisions to the primary and secondary NAAQS for PM to provide requisite protection of public health and welfare, respectively. Among other things this rule proposed to: 1) revise the annual $PM_{2.5}$ standard by lowering the level to within a range of 12.0 to 13.0 micrograms per cubic meter (μg/m3), with an alternative level of 11.0 μg/m3; 2) retain the current 24-hour $PM_{2.5}$ and 24-hour PM_{10} standards; 3) create a separate 24-hour secondary standard for visibility impairment; and 4) require one near-road $PM_{2.5}$ monitor in PM nonattainment and maintenance areas with a population of 1 million or more.

Policy Guidance on the Use of MOVES2010 and Subsequent Minor Revisions for State Implementation Plan Development, Transportation Conformity, and Other Purposes:[14] This guidance describes how and when to use the MOVES2010 emissions model (and subsequent minor revisions like MOVES2010b) for SIP development, transportation conformity determinations, including PM_{10} and $PM_{2.5}$ quantitative hot-spot analyses, and other purposes. The guidance indicates that project sponsors can continue to use PM_{10} and $PM_{2.5}$ qualitative hot-spot analyses if such analyses are started during the grace period. It also indicates that quantitative PM_{10} and $PM_{2.5}$ hot-spot analyses can be completed during the grace period, but cautions that any such analyses must use MOVES2010a or MOVES2010b, since MOBILE6.2 does not have the capabilities to conduct project-level PM emissions analyses. The guidance suggests that the interagency consultation process be used if it is unclear if a previous analysis was begun before the end of the grace period, and to contact the EPA Regional Office if there is a question about which model should be used for project-level conformity determinations during the grace period. Any quantitative analysis begun after the grace period must use MOVES2010a or MOVES2010b (except in California). The guidance indicates that EPA encourages the States and local agencies to use the latest version of the MOVES model when starting the analysis, which at the current time is MOVES2010b.

Notice of Availability: Official Release of the MOVES2010a and EMFAC2007 Motor Vehicle Emissions Models for Transportation Conformity Hot-Spot Analyses and Availability of Modeling Guidance:[15] On December 20, 2010, EPA announced the availability of two new EPA guidance documents for completing quantitative PM hot-spot analyses. This notice also announced a two-year grace period before the MOVES2010a

model is required to be used in quantitative CO and PM hot-spot analyses for project-level conformity determinations outside California. EPA also approved the latest version of the EMFAC2007 model for quantitative PM hot-spot analyses for transportation conformity purposes in California.

Transportation Conformity Guidance for Quantitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas:[16] This guidance describes conformity requirements for quantitative PM hot-spot analyses; provides technical guidance on how to complete quantitative hot-spot analyses for certain highway and transit projects in $PM_{2.5}$ and PM_{10} nonattainment and maintenance areas using EPA's MOVES model, California's EMFAC model, and other methods; outlines how to apply air quality dispersion models for quantitative PM hot-spot analyses; and includes other resources and examples to assist in conducting quantitative PM hot-spot modeling analyses. It indicates that PM hot-spot analyses are required for projects of local air quality concern, which include certain highway and transit projects that involve significant levels of diesel vehicle traffic and any other project identified in the PM SIP as a project of localized air quality concern.

The guidance indicates that: 1) re-entrained road dust must be considered in $PM_{2.5}$ hot-spot analyses only if EPA or the state air agency has made a finding that such emissions are a significant contributor to the $PM_{2.5}$ air quality problem in a given nonattainment or maintenance area; 2) re-entrained road dust must be included in all PM_{10} hot-spot analyses; and 3) emissions from construction-related activities are not required to be included in PM hot-spot analyses if such emissions are considered temporary as defined in the transportation conformity rule (i.e., emissions only occur during the construction phase and last five years or less at any individual site).

The guidance also describes mitigation and control measures that can be considered, if necessary.

AP-42, *Compilation of Air Pollutant Emission Factors:*[17] EPA's quantitative hot-spot guidance indicates that road or construction dust can be quantified using its AP-42 method or alternative local methods. AP-42 is EPA's compilation of data and methods for estimating average emission rates from a variety of activities and sources from various sectors. The sections of AP-42 that address emissions of re-entrained road dust from paved and unpaved roads and emissions of construction dust are found in AP-42, Chapter 13, "Miscellaneous Sources."

EPA indicates that AP-42 users should consult its website to ensure they are using the latest approved version, as the methodology and procedures may change over time. In addition to the latest version of AP-42, EPA's guidance indicates that alternative local methods can be used for estimating road or construction dust; in some areas, these methods may already exist and can be considered for use in quantitative PM hot-spot analyses.

Particulate Matter Website: This web site contains basic information on PM and its health effects; air quality standards; nonattainment areas; programs and requirements for reducing PM pollution; links to proposed and final rules, fact sheets, and other rulemaking

documents; links to PM research; etc. The website can be found at http://www.epa.gov/pm/.

Policy and Technical Guidance Website: This EPA website contains policy guidance issued by EPA and/or U.S. DOT to assist State and local transportation and air quality agencies to implement the transportation conformity program. Policy guidance can be found on a range of topics including quantitative and qualitative project-level hot-spot conformity analyses for both PM and CO. It also includes information on the use of the MOVES2010 and the EMFAC2007 emissions models. The website can be found at http://www.epa.gov/otaq/stateresources/transconf/policy.htm.

FHWA/FTA REGULATIONS/GUIDANCE

Congestion Mitigation and Air Quality Improvement (CMAQ) Program:

Legislation: In 1991, Congress adopted the Intermodal Surface Transportation Efficiency Act (ISTEA) and authorized the CMAQ program to help fund transportation programs and projects that contribute to attainment of a NAAQS. The CMAQ program is jointly administered by FHWA and FTA and was reauthorized in 2005 under the Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). SAFETEA-LU expanded CMAQ eligibility to include non-road diesel retrofit projects including construction vehicles and equipment deployed in Title 23 projects. More recently the program was continued under the Moving Ahead for Progress in the 21st Century Act (MAP–21) in 2012.[18] Among other things, MAP-21 indicates that in $PM_{2.5}$ nonattainment or maintenance areas States and MPOs must give CMAQ funding priority to projects that are proven to reduce $PM_{2.5}$ emissions, including diesel retrofits. In addition MAP-21 indicates that a State or MPO may elect to obligate funds to install diesel emission control technology on non-road diesel equipment or on-road diesel equipment that is operated on a highway construction project within a $PM_{2.5}$ nonattainment or maintenance area.

Guidance: FHWA released revised CMAQ guidance on November 17, 2008 to incorporate the SAFETEA-LU provisions.[19] The guidance indicates that CMAQ funds are eligible for "diesel engine replacement; full engine rebuilding and reconditioning; and purchase and installation of after-treatment hardware, including particulate matter traps and oxidation catalysts, and other technologies; and support for heavy-duty vehicle retirement programs", assuming that other CMAQ criteria are met.[20] The guidance further states that refueling is not a stand-alone CMAQ eligible project, but it is eligible if "required to support the installation of emissions control equipment, repowering, rebuilding, or other retrofits of non-road engines".[21]

FHWA recently released a Fact Sheet[22] that summarizes the CMAQ provisions as contained in MAP-21, and interim guidance[23] to implement the MAP-21 CMAQ provisions. The interim guidance was effective on October 1, 2012, and indicates that projects eligible under the CMAQ program prior to enactment of MAP-21 generally remain eligible with the new authorization. It indicates there is some modification with new language placing considerable emphasis on select project types including electric and natural gas vehicle infrastructure and diesel retrofits. The guidance also recognizes the MAP-21 CMAQ funding priority for projects located in $PM_{2.5}$ nonattainment and maintenance areas. The guidance indicates that further information on this section will be provided in the future. The FHWA has also released a list of Questions and Answers on the CMAQ program under MAP-21.[24]

CO, $PM_{2.5}$ and PM_{10} Categorical Findings: The transportation conformity rule allows DOT, in consultation with EPA, to make CO and PM hot-spot categorical findings without further hot-spot analyses for any project of air quality concern as described in the regulation based on appropriate modeling. The rule also allows DOT, in consultation with EPA, to consider the current air quality circumstances of a given CO, $PM_{2.5}$ or PM_{10} nonattainment or maintenance area in categorical hot-spot findings for applicable FHWA or FTA projects. DOT, in consultation with EPA, is currently in the process of developing a categorical finding for CO to assist States to more efficiently meet the CO hot-spot requirements. This categorical finding is expected to be completed in early 2013. DOT, in consultation with EPA, is also working on an approach for a PM categorical finding.

Transportation Conformity Website: This website has a wide range of information on the conformity process, including the transportation conformity rule; the EPA MOVES model; guidance for PM hot-spot quantitative analyses; and information on selected transportation conformity practices for a number of areas around the country, including examples of $PM_{2.5}$ and PM_{10} qualitative project-level hot-spot analyses completed after March 10, 2006. This site also contains $PM_{2.5}$ nonattainment area maps. The website can be found at http://www.fhwa.dot.gov/environment/air_quality/conformity/.

Transportation Conformity: A Basic Guide for State and Local Officials:[25] This Guide was prepared to help State and local officials understand the basic provisions of the transportation conformity process and how conformity requirements relate to transportation investments in their communities. The guide provides an overview of the major elements of the conformity process, and discusses the implications of conformity on metropolitan transportation plans, TIPs, and transportation projects. The guide also includes a discussion of project-level conformity and hot-spot analyses, including a flow chart that gives an overview of the transportation conformity process for projects.

OVERVIEW OF THE STATE-OF-THE-PRACTICE ON QUANTITATIVE PROJECT-LEVEL HOT-SPOT ANALYSES FOR $PM_{2.5}$ AND PM_{10}

As noted above, the transportation conformity regulations currently require qualitative hot-spot analyses for projects of air quality concern in PM nonattainment and maintenance areas. However, since EPA released quantitative hot-spot guidance; announced its approval of the use of the MOVES2010a and EMFAC2007 (in California) emissions models; and started a two year grace period on December 20, 2010, the new models must be used to complete PM quantitative hot-spot analyses that are started on or after December 20, 2012.

To determine current and planned State procedures for conducting PM quantitative hot-spot analyses, the AQ COP members decided to send out an AASHTO survey to both the States that are members of this COP, as well as those States that are represented on AASHTO's Air Quality, Energy and Climate Change Subcommittee. In addition, COP member States were requested to send in more detailed information on their planned or current practices.

This section contains a summary of the survey results and an overview of selected State DOT's current and planned practices. It also includes a discussion of technical details such as which models States are using or plan to use in such analyses, including any software that States are using that will help streamline and facilitate the analysis process.

Survey Results:

Twelve States responded to the AASHTO survey. Two of the States that responded to the survey also submitted more detailed information on their practices. In addition, two other States that did not respond to the survey submitted more detailed information. A total of 14 States provided information for this report. Below is a summary of the information received:

- Eleven of the States reported that they have PM nonattainment areas. One State reported it has no PM nonattainment areas, but does have some PM maintenance areas. Five of the States reported they may have new PM nonattainment areas under EPA's revised standards, but the designation depends on the final PM standards.

- Most States indicated they plan to closely follow EPA's *Transportation Conformity Guidance for Quantitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas* and not issue any additional guidance. Several States indicated they will update existing guidance to make it consistent with the EPA guidance. Several other States reported they are developing new guidance documents that will supplement the EPA guidance to make it more specific to their State.

- Most States reported that they have not completed, nor do they have underway, any PM quantitative hot-spot analyses. However, one State has completed an analysis under the new EPA guidance, and three other States are in the early stages of completing an analysis. One of these States reported that it is in the process of completing a pilot study $PM_{2.5}$ quantitative hot-spot analysis for a project that does not require a hot-spot analysis per EPA's guidance. This pilot study is being conducted for the sole purpose of State agency staff gaining experience working with EPA's new MOVES emissions model. Another State indicated it anticipates running a test case $PM_{2.5}$ quantitative analysis prior to the end of EPA's grace period in order to familiarize itself with possible problems and needs of the analysis.

- Three States indicated they do not anticipate any problems with future quantitative hot-spot analyses, or being ready by the end of the grace period for completing such analyses. However, seven States indicated they do anticipate problems. The potential problems mentioned include:
    1) lack of resources;
    2) limited modeling capabilities both in terms of technical capacity (computers, models) and staff knowledge;
    3) obtaining input data including meteorological, population, and vehicle data for the various years and seasons required for the analyses;
    4) obtaining background concentration levels;
    5) educating project sponsors so that they can identify projects of air quality concern and take the proper steps to address hot spot issues in their NEPA work; and
    6) developing staff comfort using the EPA MOVES emissions model and the AERMOD and/or CAL3QHCR dispersion models.

- Most States reported that they will use existing interagency consultation procedures for making quantitative PM hot-spot analyses. The States indicated that the issues that will be determined through the interagency consultation process will include such items as: 1) the correct meteorological data to use, 2) which dispersion model to use, 3) receptor locations and areas that should be modeled along the project, 4) planning assumptions, 5) identifying projects of air quality concern, 6) calendar years to include in the analyses, 7) significant changes in design concept and scope that could trigger a new PM hot-spot analysis, and 8) data adequacy, among other issues.

- One State indicated that it wanted to enhance its interagency coordination procedures for PM quantitative hot-spot analyses by working with other agencies to develop a quality controlled centralized data warehouse or other repository to include area-based meteorological and vehicle attribute data. This data would be made available to assure consistent applications of model inputs for project-level and NEPA air quality related analyses by the agency and its consultants.

- All States (except California) reported they will be using the EPA MOVES emissions model and the CAL3QHCR and/or AERMOD dispersion models in accordance with the EPA PM hot-spot guidance. California indicated it will use the EMFAC2007 emissions model but will be transitioning to the EMFAC2011 emissions model by early 2013. Four States indicated they will use the AERMOD dispersion model in most cases to provide consistency between projects, even those without a transit component. Several States reported that when they need to use the AERMOD model they will rely on the State Air Quality Agency or consultants to run the model. Several other States reported that they have experience with the CAL3QHC model and are very familiar with its requirements, but have not yet used the CAL3QHCR model.

- While most States indicated that they have not used commercial software to help streamline and facilitate the modeling process, others reported using or investigating one of the two major commercial user interface systems:
    1) Two states have used or are beginning the acquisition process for CALRoads View (CALINE4, CAL3QHC, and CAL3QHCR dispersion models in one integrated interface) and/or AERMOD View (AERMOD and related programs in one integrated user interface) software.
    2) One State indicated that it previously used the BREEZE integrated family of air dispersion models for modeling continuous releases from industrial, highway, and other source types. The State reported its future use will depend on whether they are preparing the analysis in-house or by consultants.
    3) One State conducted a preliminary review of vendor software currently available that may facilitate quantitative analyses for transportation projects, but has not made a selection to date pending the completion this fall by one vendor of planned upgrades to its software.

- As noted above, only one State reported that it had completed a PM hot-spot analysis under the new EPA guidance. Since the analysis showed the project will not exceed the annual $PM_{2.5}$ NAAQS, the project was found to conform and no PM hot-spot mitigation measures were required. Also, since the other States have not completed any PM quantitative hot-spot analyses pursuant to the new EPA guidance, it is not yet known if mitigation will be needed to establish conformity under the guidelines.

- Most States indicated they do not have a specific process in place for determining whether or not a significant change in design concept and scope of a project has occurred as it relates to PM hot-spot analyses. As noted above, most States will continue to coordinate on this issue through existing interagency consultation processes. One State indicated that all changes in design concept and scope are coordinated through the interagency consultation process to determine if they are significant. Another State indicated that some of the features they would investigate to determine if a significant change in design concept and scope occurred include: 1) adding lanes or extending existing lanes; 2) a significant

increase in traffic volumes, vehicle miles traveled (VMT), or vehicle mix; 3) the length of time since the previous analyses; and 4) adding or removing an interchange, ramps, etc. Another State indicated that once a project of air quality concern has been identified, it would be up to the project sponsor to report any change in scope or cost of the project.

Overview of Selected State DOTs:

California

California DOT (Caltrans) uses the EPA/FHWA hot-spot analyses guidance in $PM_{2.5}$ and PM_{10} nonattainment and maintenance areas. Interagency Consultation managed by the MPOs (or by Caltrans in a couple of isolated rural PM_{10} areas) is used to determine whether or not a project is a project of air quality concern. The consultation process uses regularly scheduled meeting of pre-existing consultation groups in the major MPOs, and email in more rural areas. All of the major metropolitan areas in the state, except San Diego and a few remote or coastal small MPOs, are nonattainment for the 2006 annual $PM_{2.5}$ standard.

Projects of air quality concern have been analyzed to date using the 2006 EPA/FHWA guidance, with qualitative emission modeling analyses. Caltrans is just starting to do PM quantitative hot-spot analyses on a few projects for which the environmental process will extend well beyond the December 2012 deadline for using the newer 2010 quantitative analysis guidance. Caltrans is considering revising some of the details in its Standard Environmental Reference document and related materials, but plans in general to closely follow EPA's December 2010 guidance.

Caltrans will use the EPA recommended dispersion models and the EMFAC emissions model (instead of EPA's MOVES emissions model) for detailed PM hot-spot analyses. The EMFAC2007 emissions model is the current model (as of Fall 2012) in California for conformity use. However, the fleet and other planning assumptions are hard-coded into EMFAC, so a new version of the model must be released by California Air Resources Board (CARB) at least every five years to meet FHWA's "latest planning assumptions" requirements. The EMFAC2011 model was released by CARB in October 2011, and is currently being reviewed by EPA and CARB to ensure that it is usable for project-level analysis purposes before EPA officially "makes it available" for conformity use. In the meantime, Caltrans will continue to use EMFAC2007 pending agreement between CARB and EPA about how to use EMFAC2011 for PM hot-spot analyses. EPA is expected to make EMFAC2011 available for conformity use in early 2013.

Caltrans reports that its modeling capabilities remain limited, both in terms of technical capacity (computers, models) and staff knowledge. Caltrans staff is currently learning the AERMOD and CAL3QHCR models and expects to use the AERMOD dispersion model in most cases. Most previous dispersion modeling (for CO) used CALINE4. Caltrans work so far has revealed significant data availability issues for both meteorology and

background concentrations, and reports that the use of local (project site) monitoring is both time and cost prohibitive in most cases. Use of AERMOD for projects of substantial scope is also proving to be challenging due to excessive runtimes (on the order of weeks to a month or more per run) and model setup complexity.

Pre-existing interagency consultation processes are used to review projects and concur in the analysis process for projects of air quality concern, or in a determination that a project is not a project of air quality concern, consistent with the EPA guidance. The interagency consultation procedures are also used to verify background concentration levels, sensitive receptors/locations, models to be used, etc. An example is the Southern California Association of Governments' (SCAG) procedure for determining whether $PM_{2.5}$ or PM_{10} hot-spot analyses are required for a project. See FHWA's conformity practices website located at http://www.fhwa.dot.gov/environment/air_quality/conformity/practices/. This website provides a PM Conformity Hot-Spot Analysis Summary Form for Interagency Consultation.[26] The purpose of this form is to provide sufficient information to allow the transportation conformity working group to determine if a project requires a project-level PM hot-spot analysis pursuant to the EPA conformity regulations.

Agencies involved in the interagency consultation process include EPA, FHWA, FTA on occasion, Caltrans, MPO(s), CARB, air pollution control/air quality management district(s), local transit agencies or public works departments as applicable. In isolated rural areas for PM_{10}, there is no MPO, but the state-based Regional Transportation Planning Agency and the air pollution control district also participate. The consultation process is jointly run by Caltrans and the air pollution control district on a per-project basis.

Colorado

Colorado DOT (CDOT) does not currently have any $PM_{2.5}$ or PM_{10} nonattainment areas, but has seven PM_{10} maintenance areas which include Adams, Arapahoe, Archuleta, Boulder, Broomfield, Denver, Fremont, Jefferson, Pitkin, Prowers, Routt, and San Miguel Counties.

CDOT is planning to follow EPA's *Transportation Conformity Guidance for Quantitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas.* CDOT reports that it does not anticipate any problems with future quantitative hot-spot analyses, or being ready by the end of the grace period.

CDOT indicates that the current interagency scoping consultations that include: FHWA (Resource Center and Colorado Division Staff), EPA, CDOT, state air agency (Colorado Department of Public Health and the Environment, Air Pollution Control Division) and MPOs, effectively assure that the analytical guidance will be properly applied on projects as directed by EPA. As such, they have not yet been compelled to generate any supplemental policies or procedures for the new guidance.

CDOT would like to enhance its interagency coordination procedures for PM quantitative hot-spot analyses by working with the interagency consultation agencies identified above to develop, validate and otherwise provide a quality assurance/quality control centralized data warehouse or other repository. This would include area-based meteorological and vehicle attribute data, which will be made available to assure consistent applications of model inputs for project-level and NEPA air quality related analyses by the agency and its consultants.

In addition to MOVES2010b (or most current software version), CDOT anticipates using AERMOD and CAL3QHCR, but has not purchased any additional vendor or utility software for these models. CDOT has staff experienced with use of the MOVES and AERMOD models and does not anticipate any problems gaining appropriate knowledge of CAL3QHCR.

CDOT has not completed any PM quantitative conformity or hot-spot analyses pursuant to the new guidance. As such, it has not attempted to incorporate any mitigation measures into a project-level conformity analyses. CDOT does have several projects of various statures whose environmental planning and review process is expected to move forward in the near-term. It anticipates using MOVES2010b to perform any necessary quantitative analyses although specifics are not available at this time.

Illinois

Project Description

The Illinois Department of Transportation (IDOT) utilized EPA's quantitative hot-spot guidance to estimate annual $PM_{2.5}$ concentrations in the Tier Two Draft Environmental Impact Statement (DEIS) and Final EIS (FEIS) for the Elgin O'Hare – West Bypass (EO-WB) project.[27] The project includes roadway, transit, and bicycle/pedestrian improvements and is intended to relieve local congestion, improve efficiency, improve access to existing and planned land uses, and enhance planned O'Hare Airport improvements. EPA's guidance did not require a quantitative analysis during the grace period which ended on December 20, 2012. However, it was determined during an interagency consultation meeting, consisting of FHWA, FTA, EPA, Illinois Environmental Protection Agency (IEPA), and the Chicago Metropolitan Agency for Planning, that the proposed project is one of air quality concern because it is located in a $PM_{2.5}$ nonattainment area and is considered a new highway project that has a significant number of diesel vehicles. Consequently, in anticipation of the release of EPA's final hot-spot guidance, it was decided to complete a quantitative $PM_{2.5}$ hot-spot analysis. In this case, only the annual $PM_{2.5}$ standard was evaluated because the project is located in the DuPage County and Cook County annual $PM_{2.5}$ nonattainment areas. The FHWA, FAA, IDOT, and Illinois State Toll Highway Authority (Illinois Tollway) are joint lead agencies for the project.

Overview of PM hot-spot Analyses

IDOT used EPA's MOVES2010a emissions model and CAL3QHCR dispersion model for the PM hot-spot analyses. The MOVES inputs incorporated local registration mix and fuel data provided by IEPA that are consistent with the regional emissions analyses for conformity determinations. The CAL3QHCR model inputs included local meteorological data and traffic data specific to each roadway section.

While hot-spot analyses typically include the entire project, the DEIS indicates that since this project is so expansive, the PM hot-spot analysis focuses on the locations with the highest likelihood of new or worsened violations of the PM standard. Accordingly, the EO-WB interagency workgroup selected four major interchanges that have a large number of vehicles concentrated in one general location. These locations were selected based on the greatest increase in traffic volumes, greatest overall traffic volumes, proximity to residential areas, and proximity to other potential sources of PM emissions. The interchanges represent the locations expected to have the highest air quality concentrations. Consequently, if conformity was demonstrated at these locations, it was assumed that conformity was met in the entire project area. This approach is consistent with EPA's quantitative hot-spot modeling guidance.

$PM_{2.5}$ concentrations for both the Build Alternative and the No-Build Alternative were evaluated at all four interchange locations. Since this project is being constructed in two phases, analyses were conducted for 2030 (i.e., after the initial construction phase would be completed), and 2040 (i.e., after construction of the entire project would be completed) consistent with EPA guidance.

The PM hot-spot analyses included directly emitted $PM_{2.5}$ emissions which consist of exhaust, brake wear, and tire wear emissions. Only running exhaust emissions were considered because cold start exhaust emissions are unlikely to occur on the roadways included in the model domain. Re-entrained road dust was not included because the SIP does not identify that such emissions are a significant contributor to the $PM_{2.5}$ nonattainment problem. Emissions from construction-related activities were not included because they are considered temporary, as defined in EPA's conformity rule. In addition, no other sources of $PM_{2.5}$ emissions were included since it was assumed that $PM_{2.5}$ concentrations due to any nearby emissions sources are included in the ambient monitor values that are used as background concentrations.

IDOT coordinated with the interagency consultation group on the meteorology data. For surface meteorology, IDOT used five years worth of data from O'Hare Airport. For the Upper Air data, IDOT used 5 years of data from the Peoria Upper Air Station. The surface data met EPA criteria, and IEPA advised that the Peoria Upper air data was appropriate to use for this project. IDOT indicates that it met with the consultation group three different times and that the group provided them with good guidance and direction on such things as the correct meteorology data to use, which dispersion model to use, receptor placement, and areas that should be modeled along the project.

The DEIS indicates that the model output was used to determine a design value, which describes a future air quality concentration level that can be compared to an air quality standard, for each modeled scenario. The IEPA provided a background concentration of 13.0 μg/m3 from a monitor that represents the highest monitored concentration level in the project area for use in the hot-spot analyses. As the DEIS notes this value is likely conservative because it is expected that ambient $PM_{2.5}$ concentrations will be lower in future years. The design value for each scenario was determined by combining modeled $PM_{2.5}$ concentrations from the project with the 13.0 μg/m3 monitored background $PM_{2.5}$ concentration provided by IEPA. The total concentration was then compared to the annual $PM_{2.5}$ NAAQS of 15 μg/m3.

Results

EPA hot-spot guidance indicates that the annual $PM_{2.5}$ design value is defined as the average of three consecutive years' annual averages, each estimated using equally-weighted quarterly averages. The 1997 annual $PM_{2.5}$ standard is met when the three-year average concentration is less than or equal to 15.0 μg/m³. Using the EPA guidance procedures and the receptor with maximum annual average $PM_{2.5}$ concentration for each model run for each year of meteorological data, the associated design value was determined for comparison to the NAAQS. The annual $PM_{2.5}$ design value for the receptor with the maximum concentration for each scenario ranged from 13.2 μg/m3 to 13.8 μg/m3 for the 2040 No-Build Alternative and 13.4 μg/m3 to 14.0 μg/m3 for the 2040 Build Alternative. The annual concentrations of $PM_{2.5}$ for the 2030 interim year ranged from 13.4 μg/m³ to 13.8 μg/m³. The results of the analyses show that the modeled hot-spot $PM_{2.5}$ concentrations do not exceed the annual $PM_{2.5}$ NAAQS for the Build Alternative, No-Build Alternative, or 2030 interim year of the Build Alternative. As a result the project was found to conform and no PM hot-spot mitigation measures were required.

The DEIS indicates that the Illinois Interagency Workgroup agreed on the $PM_{2.5}$ hot-spot analyses. They also indicated that EPA is on the consultation team for the above project and provided input and guidance on the analyses. The technical details of the PM hot-spot analyses for the project are included in Appendix I of the DEIS.[28]

IDOT indicates that the above was the first project in Illinois where they have completed a quantitative PM hot-spot analyses. IDOT reports that no other quantitative PM hot-spot analyses are currently being worked on but they may have some more in the future.

Maryland

Maryland has three non-attainment areas for the 1997 $PM_{2.5}$ 24-Hour and Annual NAAQS, including the Baltimore, MD; Washington, DC-MD-VA; and Hagerstown-Martinsburg, MD-WV areas. Maryland has no non-attainment areas for the 2006 24-hour $PM_{2.5}$ or PM_{10} standards. Maryland notes that the current designations include all areas of significant populations and industry, and does not anticipate additional nonattainment area designations based on the revised $PM_{2.5}$ annual standard being proposed by EPA.

Maryland plans to update its previous project level conformity process guidelines to be consistent with the current EPA guidance on quantitative PM hot-spot analyses. The revision will rely heavily on the EPA guidance with modifications specific to Maryland concerning analysis requirements and computer model input values. Maryland reports that no quantitative analyses have been completed using MOVES by the Maryland State Highway Administration to date, although MPOs and air agencies are using it on a regional level in SIP development and for conformity purposes. Maryland ran a test case of a project level $PM_{2.5}$ quantitative analysis for a Park and Ride facility prior to December 20, 2012 in order to familiarize itself with possible problems and needs of the analysis. It anticipates running a more detailed test case for a multi-lane highway in early 2013.

Maryland anticipates the biggest issue with future quantitative $PM_{2.5}$ hot-spot analyses will be obtaining input data for the required MOVES analyses for the various years and seasons. These would include meteorological, population, and vehicle data. The Maryland Department of Transportation (MDOT) hopes much of this data will be available from the Maryland Department of the Environment (MDE), MPOs and through internal sources.

Agencies involved in the interagency consultation process for PM hot-spot analyses will include EPA, FHWA, MDOT, MDE, and the MPOs. Prior to the analyses, interagency consultation will be required to determine: 1) the exempt status of the project; 2) the status of the project in the constrained long range plan and TIP; 3) if any change in scope/scale of a previously approved project has occurred; 4) whether the project is a project of air quality concern; and 5) to coordinate with MPO's regional analyses, models and inputs. In addition, the final analyses and report will be sent to all interagency consultation members for review, comment and acceptance.

Maryland anticipates using the MOVES2010b emissions model (or most current version) with the CAL3QHCR dispersion model. Maryland reports that they have personnel and consultants who have been trained in running MOVES, but have not yet used it on a PM quantitative hot-spot project analyses. Maryland has not used CAL3QHCR, but has used CAL3QHC for many years and is very familiar with its requirements. To date, Maryland has not used any vendors or utility software to help streamline and facilitate the modeling process.

Maryland indicates that in order to determine whether or not a significant change in design concept and scope of a project has occurred, they will investigate features such as: 1) additional lanes or extension of existing lanes; 2) significant increases in traffic volumes, VMT, and/or vehicle mix; 3) length of time since previous analyses; 4) addition, modification or removal of interchanges, ramps, vehicular movements, etc.

Pennsylvania

Project-Level Air Quality Handbook

Pennsylvania has not completed any PM quantitative analyses to date. However, they have developed a Project-Level Air Quality Handbook[29] that will assist the Pennsylvania Department of Transportation (PennDOT), its consultants, and other potential users in the completion of project-level CO, PM, and mobile source air toxics analyses to satisfy current state and federal air quality requirements. With regard to PM analyses the Handbook provides: 1) a process to analyze and report air quality impacts of transportation improvement projects; 2) background information and citations to relevant state and federal rules, regulations, and guidance documents; 3) a screening process to identify projects that may be of air quality concern and a process to determine the need and level of air quality modeling during the NEPA process; and 4) technical guidance and procedures for assessing $PM_{2.5}$ and PM_{10} at the project-level.

The Handbook references EPA's transportation conformity rule requirements regarding the criteria and procedures for determining which transportation projects must be analyzed for $PM_{2.5}$ and PM_{10} hot-spots in nonattainment and maintenance areas. It also indicates that EPA's December 2010 quantitative PM hot-spot guidance must be used to conduct quantitative hot-spot analyses for new or expanded highway or transit projects with significant increases in diesel traffic in PM nonattainment or maintenance areas. It points out, however, that while the available EPA and FHWA rulemaking and guidance documents provide examples of projects of air quality concern, they do not provide specific thresholds for such determinations.

Screening Process

To assist in the decision-making process, PennDOT, through the interagency consultation process with EPA, FHWA, FTA, Pennsylvania Department of Environmental Protection (PaDEP), MPOs, and applicable transit agencies, established a screening procedure to determine projects of air quality concern. The Handbook points out that the screening process has three distinct screening levels.

The Level 1 screening process is used to initially determine whether a project is exempt from a $PM_{2.5}$ or PM_{10} hot-spot analysis or whether a hot-spot analysis is required. Projects that cannot be clearly defined as exempt under Level 1 are advanced to Level 2.

The Level 2 screening process quickly identifies projects which are not exempt and are located within a $PM_{2.5}$ or PM_{10} nonattainment or maintenance area but clearly do not create new PM hot-spots or worsen existing air quality conditions. The interagency consultation group (ICG), which includes the agencies noted above, has agreed on criteria and assumptions to screen out projects that clearly do not contribute to or worsen air quality conditions within the project area, including: 1) total traffic and diesel truck volume totals or increases that clearly do not cause a potential $PM_{2.5}$ or PM_{10} hot-spot concern; and 2) vehicle classes that should be considered to represent diesel trucks. The Handbook

includes a Figure that includes specific thresholds for various types of projects such as for highway capacity expansions, new highways and intermodal or transit facilities, etc. PennDOT will review project information, including traffic/truck volumes and LOS. If the project is identified as being "not of air quality concern," this determination is documented in the project record.

Projects that cannot be determined to be a project "not of air quality concern" using the Level 2 thresholds are to be submitted to the ICG to make the decision on whether the project is of air quality concern, requiring a quantitative hot-spot analysis. Level 3 screening may use the same or more detailed information as the Level 2 screening but is performed and decided by the ICG rather than a single person or agency.

A project does not have to go through each screening level. For example, if a project is determined to be exempt in Level 1 screening, then additional traffic data and interagency consultation review are not required. Likewise, if the project can be screened out using the Level 2 thresholds, than the ICG review is not needed.

The Handbook indicates that it does not change or revise any recommendations provided in EPA guidance for conducting a PM quantitative hot-spot analysis and that all analyses are to follow EPA's regulatory requirements for PM hot-spot analyses from Section 93.123(c) of the Conformity Rule. It also points out that the interagency consultation process is an important component in completing project-level conformity determinations and hot-spot analyses, and that the interagency consultation process must be used to determine: 1) the geographic area covered by the analysis; 2) the emissions models used in the analysis; 3) whether and how to estimate road and construction dust emissions; 4) the nearby sources considered, background data used, and the air quality model chosen, including the background monitors/concentrations selected and any interpolation methods used; and 5) the appropriateness of receptors to be compared to the $PM_{2.5}$ NAAQS.

The Handbook also includes several example write-ups that should be included in the NEPA document for conditions where a $PM_{2.5}$ or PM_{10} hot-spot quantitative analysis is not required.

Texas

Background

Texas Department of Transportation (TxDOT) is in the process of developing guidance for quantitative PM hot-spot analyses and for determining projects of air quality concern. The guidance should be complete before the end of fiscal year 2013 when it can be used for any planned projects in El Paso, which is a PM_{10} nonattainment area. TxDOT has requested EPA guidance on what constitutes a project of air quality concern for existing roadways that add lanes; but the additional lanes don't result in a change in diesel truck percentage; since EPA's example was for a new location freeway. The protocol may also be useful for the Houston area if it is designated $PM_{2.5}$ nonattainment area under the pending revised

EPA standards. TxDOT is developing an El Paso worst-case analysis option for consideration by the El Paso transportation conformity consultation partners. It is anticipated that the worst case analysis will provide a set of threshold criteria, similar to what FHWA is developing for the CO categorical findings, only this analysis will be specific to El Paso (including but not limited to unique terrain and meteorology). For any project with all criteria at or below the threshold, the goal would be to use the worst case analysis instead of conducting separate project level hot-spot analyses.

TxDOT has two El Paso PM qualitative hot-spot analyses underway prior to December 20, 2012, for which it anticipates being able to demonstrate conformity after excluding dust storm events as defined by the National Oceanic and Atmospheric Administration (NOAA). While TxDOT anticipates that up to two projects every four years in El Paso may require PM_{10} hot-spot analyses, none are planned for FY2013-2014. TxDOT also estimates approximately five hot-spot analyses per year in the greater Houston area if it is designated a $PM_{2.5}$ nonattainment area.

Limited experience with PM quantitative hot-spot analyses within the state of Texas will pose challenges. For example TxDOT reports that one issue is how to deal with high wind events that the Texas Commission on Environmental Quality (TCEQ) does not flag as an exceptional event because the NAAQS has not been exceeded, even when NOAA criteria indicate it is a dust storm. This could skew the background concentration levels. TxDOT indicates it will use the MOVES2010b and AERMOD models but notes it has a limited knowledge base with the AERMOD dispersion model since it was initially designed for point sources.

All aspects of TxDOT's analyses and selected methodologies will be determined through interagency consultation, however, TxDOT has been asked to propose what they believe fulfills requirements of the hot-spot guidance and regulations. The agencies that will be involved in the interagency consultation process include MPOs, the TCEQ, EPA, FHWA, TxDOT, local air quality agencies, and in the El Paso area the New Mexico DOT, and New Mexico Environmental Protection Agency. The El Paso nonattainment area traverses portions of Texas and New Mexico and is influenced by bi-national pollutant transport (primarily from Juarez, Mexico).

Template for Meteorological Data Analysis for Days with High PM_{10} Records[30]

TxDOT developed and submitted a protocol to consultation partners for their consideration on excluding high wind events that resulted in dust storms with higher than "background" level concentrations of PM_{10}. The consultation partners (including but not limited to FHWA and EPA) deemed this protocol acceptable for use in determining background PM_{10} concentrations.

This protocol was developed and provides criteria on what ambient monitoring data may be excluded from determining background concentrations that are associated with dust-storm related high wind events in El Paso. The protocol references EPA's Exceptional Events rule which states that at the request of a responsible state agency, EPA shall

exclude data from use in determinations of exceedance or violation of a NAAQS that are directly due to an exceptional event (e.g. a significant dust event).[31] Exceptional event decisions for Texas require extensive data collection and may take 2-4 years or more of negotiations between TCEQ and EPA before a decision is rendered. This is important for project development because Section 93.123(c)(1) of the EPA conformity rule states that, "estimated pollutant concentrations must be based on the total emissions burden which may result from the implementation of the project, summed together with future background concentrations…". In addition, the protocol points out that EPA's guidance on quantitative PM hot spot analyses states that background concentrations do not include the emissions from the project itself; but instead, the background concentrations for PM hot-spot analyses include nearby sources and other sources. Consequently, identifying and excluding these exceptional natural events is important in establishing a representative PM_{10} background level.

This protocol notes that the procedure for excluding exception events has been regularly used in regional conformity determinations in Texas; but now needs to be implemented for project level conformity requirements since estimated pollutant concentrations from a project must be added to representative background concentrations before comparing the total concentration levels to the air quality standards. As a result, TxDOT and Texas Transportation Institute have developed a template to help identify high wind related dust storms for the El Paso area. The protocol notes that a published study by NOAA staff (Novlan et al. 2007[32]) that analyzed 73 years of dust storms in El Paso was used to establish criteria to identify high PM_{10} causing events.

This protocol provides an overview of hourly meteorological and PM_{10} data for the days with high 24-hour PM_{10} concentration readings from regulatory monitors. The main methodology used in this protocol is a qualitative comparison of these hourly observations. These time-aligned data are then used to isolate potential dust events based on the reported visibility values of less than six miles. The protocol indicates that the meteorology data are taken from the closest Meteorological Aviation Report (METAR) station located in the study area; usually this is the closest airport or permanent weather station.

The goal of this protocol is to provide sufficient information to make a determination on whether a natural event (i.e. dust storm or wild fire) was the main contributing factor to the high PM_{10} readings that are below the NAAQS and have not been flagged as a potential exceptional event, as well as those above the NAAQS that the state flags as potential exceptional events. A recommendation is made for each day regarding the applicability of the readings for establishing the appropriate background concentration level for the proposed area or project.

Washington

The State of Washington has one partial county that is in a nonattainment area (Tacoma) for the 2006 $PM_{2.5}$ standard, and five PM_{10} maintenance areas that are subject to transportation conformity. PM quantitative hot-spot analyses will be required for projects

of air quality concern in these areas after December 20, 2012, the end of EPA's MOVES grace period. Washington DOT (WSDOT) reports that it anticipates doing the first quantitative hot-spot analysis in early calendar year 2013.

WSDOT indicates that the PM hot-spot analysis will use EPA guidance and recommended models. While the EPA guidance allows the use of the CAL3QHCR or AERMOD dispersion models for highway and intersection projects, WSDOT is currently planning to use the AERMOD dispersion model to promote consistency between projects, even those without a transit component. AERMOD is EPA's recommended model for transit, freight, and other terminal projects; and for projects that involve both highway/intersections and nearby terminals and/or nearby sources.

WSDOT indicates that its staff has some experience using the BREEZE interface model for the AERMOD model on multi-modal projects, including bus and ferry terminals. WSDOT has reviewed the documentation for using the AERMOD and CAL3QHCR models, however, it reports that it will be a challenge to develop staff comfort using EPA MOVES and AERMOD and/or CAL3QHCR models, and WSDOT plans to use consultant expertise for initial quantitative analyses. While WSDOT has previously used the BREEZE software, its future use will depend on whether WSDOT prepares the analyses in-house or contracts them out to consultants.

WSDOT plans to use interagency consultation to determine project types and parameters to evaluate and then identify individual projects of air quality concern on an annual (or less) timeframe. To date, discussions with consultation partners have focused on the definition for "projects of air quality concern." Consultation partners include the Washington State Department of Ecology, WSDOT, Regional Clean Air Agency(s), MPO, Regional Transportation Planning Organization, FHWA, FTA, and EPA. WSDOT will co-lead this process with local MPOs. WSDOT further states that past consultation efforts have resulted in programmatic approaches to quantitative air quality analyses for projects. For example, once the evaluation criteria are agreed to by the consultation partners, the project sponsors determine if/how those criteria apply to a specific project without additional consultation with interagency partners, unless there are questions. WSDOT is expecting that the models and receptor locations will continue to be evaluated and determined by the project sponsor as long as they are consistent with EPA guidance. However, one new element that may need to be addressed through consultation is the determination of a significant change in design concept and scope that triggers a new PM hot-spot analysis.

Wisconsin

In 2009, the EPA designated Milwaukee, Racine, and Waukesha counties in Wisconsin to be in nonattainment for the 24-hour $PM_{2.5}$ NAAQS. EPA is now considering a request from the Wisconsin Department of Natural Resources (WDNR) to redesignate these counties to attainment based on 2008-2010 monitoring data. Wisconsin does not anticipate any new violations. A review of 2009-2011 monitoring data reveals that all counties in the

State will be in attainment of the annual $PM_{2.5}$ NAAQS if EPA sets the standard at $12\mu/m^3$ or higher.

Wisconsin DOT (WisDOT) does not plan to develop any policies and/or procedures to supplement EPA's quantitative PM hot-spot guidance. However, Wisconsin is in the process of completing a pilot study $PM_{2.5}$ quantitative hot-spot analysis for a project that does not require a hot-spot analysis per EPA's guidance. This pilot study is being conducted for the sole purpose of State agency staff gaining experience working with EPA's new MOVES emissions model. It is anticipated that the pilot study will be completed after the end of EPA's grace period.

WisDOT reports that its staff together with staff from WDNR participated in EPA's and FHWA's Project Level Training for Quantitative PM Hot-Spot Analyses. WisDOT states that limited experience with MOVES in its pilot study indicates that there will likely be significant data gaps which must be filled in order for them to confidently and successfully run the MOVES model. The data requirements for MOVES are beyond what WisDOT typically collects. Decisions will need to be made about how to collect the additional data and how to address this issue in its budget.

Agencies involved in the interagency consultation process will include EPA, FHWA, FTA, WDNR, WisDOT, and MPOs if a conformity issue is specific to an area/county served by the MPO, and Wisconsin Local Public Transit Agencies. Wisconsin has an interagency consultation Memorandum of Agreement with all affected agencies that provides the guidance for making technical and policy recommendations regarding transportation conformity issues. All decisions are jointly made by an interagency consultation workgroup. In the past, the workgroup has discussed and reached consensus on planning assumptions, projects of air quality concern, sensitive receptors, calendar years to include in the analyses, safety margins, and data adequacy, among other issues.

WisDOT and the WDNR will be using the current version of the MOVES emissions model per EPA's guidance. WDNR uses the AERMOD dispersion model and has extensive experience with the model as applied to stationary sources. WisDOT indicates that obtaining appropriate spatial data for transportation projects which can be converted to the AERMOD input format, especially for the no-build scenario, is currently a major issue. Wisconsin does not plan to use any vendors or utility software, but for the pilot study, they have employed a contractor to provide data from their travel demand model to be used as inputs for the MOVES emissions model.

RESEARCH, REPORTS, AND WEBSITES

The following is a summary of selected research documents, reports, and websites that are relevant to project-level hot-spot analyses for $PM_{2.5}$ and PM_{10}.

EPA – *Website on Transportation Related Documents:* This website includes specific guidance documents that provide guidance for crediting emission reductions from programs such as commuter programs, heavy duty diesel retrofits, alternative fuels, anti-idling programs, transportation control measures, etc. All these strategies can be used to help reduce PM emissions. The website can be found at *http://www.epa.gov/otaq/stateresources/policy/pag_transp.htm*.

EPA - *Diesel Retrofits: Quantifying and Using Their Benefits in SIPs and Conformity - Guidance for State and Local Air and Transportation Agencies:*[33] This document provides guidance on quantifying and using emission reductions from highway and non-road diesel vehicles, engines, and equipment that have been retrofitted with emission reduction technology in 8-hour ozone, $PM_{2.5}$, PM_{10}, and CO nonattainment and maintenance areas. The guidance indicates that, among other things, the emission reductions resulting from implementing a retrofit project can be used in transportation conformity determinations. The guidance further states that retrofit projects provide a unique and cost-effective opportunity for state and local governments to reduce pollution from highway and non-road diesel vehicle and equipment fleets.

EPA - *Diesel Retrofit Technology - An Analysis of the Cost-Effectiveness of Reducing Particulate Matter and Nitrogen Oxides Emissions from Heavy-Duty Non-road Diesel Engines Through Retrofits:*[34] The purpose of this technical analysis was to evaluate the cost effectiveness of retrofitting existing heavy-duty diesel non-road engines to reduce PM and nitrogen oxide (NOx) emissions. The report includes an evaluation of the costs and emissions benefits of retrofitting non-road equipment such as tractors/loaders/backhoes, excavators, cranes, generator sets, agricultural tractors, crawler tractors/dozers and off-highway trucks with diesel oxidation catalysts and catalyzed diesel particulate filters. The study indicates that retrofits can be a cost effective way to reduce air pollution and health impacts associated with diesel emissions.

EPA - *Website on the MOVES (Motor Vehicle Emission Simulator) Model:* This website contains information on the use of the MOVES model for SIP and conformity purposes, technical details on the design and inputs for MOVES, and information on previous versions of the MOVES model. More specifically this website includes documents such as the MOVES2010a User Guide, policy guidance on the use of MOVES2010 for transportation conformity purposes; and general information and user documents for MOVES2010b. The new MOVES emission modeling system estimates emissions for mobile sources covering a broad range of pollutants and allows multiple scale analyses. The MOVES model currently estimates emissions from cars, trucks, and motorcycles. EPA plans to add the capability to model non-highway mobile sources in future releases. The website can be found at http://www.epa.gov/otaq/models/moves/index.htm.

FHWA – *Transportation Conformity Research Website:* This website notes that a variety of research has been conducted by FHWA, EPA, and others related to all aspects of transportation conformity. Among other things, this website includes information on *Advances in Project Level Analyses*; *Multi-Pollutant Emissions Benefits of Transportation*

Strategies, which is intended to help transportation practitioners determine the emissions effects of various transportation demand and system management strategies, technology strategies such as idle reduction programs, non-road strategies, and dust reduction strategies; *Implications of the Implementation of the MOBILE6 Emissions Factor Model on Project-Level Impact Analyses Using the CAL3QHC Dispersion Model*; *A Compendium of Practice for Off-Model Air Quality Analysis*; etc. The website can be found at *http://www.fhwa.dot.gov/environment/air_quality/conformity/research/index. m*.

NCHRP 25-25/Task 78 [Pending] - *Programmatic Agreements for Project-Level Air Quality Analyses Using MOVES, CAL3QHC/R and AERMOD:*[35] This proposal recognizes the challenges that State DOTs, and other agencies responsible for project implementation, face with implementation of EPA's project-level hot-spot modeling requirements using the new MOVES emissions model and the CAL3QHC/R and/or AERMOD dispersion models. The proposal indicates that these challenges may be partly addressed through programmatic agreements and categorical findings for project-level analyses based on the new models and guidance. This project is therefore aimed at developing standard approaches to streamline air quality analyses relating to CO and PM. The proposal recognizes that FHWA has recently initiated a process to develop, in consultation with EPA, regional or multi-state categorical findings for both CO and PM. Since FHWA/FTA plan to develop categorical findings, this project has been postponed until completion of the FHWA/FTA findings.

NCHRP 25-25, Task 42 [Completed] – *Alternative Methods For Determining Emissions For Re-Entrained Road Dust On Transportation Projects:*[36] The purpose of this research effort was to identify alternative approaches to the AP-42 methodology for determining more reliable emission factors for re-entrained road dust for application to transportation projects. The report indicates that the traditional AP-42 methodology, which has been in place for more than 30 years, relies on difficult and costly road surface sampling to gather critical information for input into the AP-42 emission factor equations. This research began with an analysis of the current practice of applying the AP-42 methodology and its deficiencies. This included not only the requirement of road surface sampling, which the report indicates limits the feasibility of full method application, but also the use and limitations of default dust ("silt") loading tables that can be used in place of road surface sampling. The research then shifted to an evaluation of the mobile monitoring and the specific configurations that have been tested. Finally, a new set of hybrid combinations of mobile monitoring and the AP-42 methodology were developed, with accuracies equal to or greater than the AP-42 methodology alone, but with significantly lower costs of implementation.

NCHRP 25-25, Task 59 [Completed] - *Evaluate the Interactions between Transportation-Related Particulate Matter, Ozone, Air Toxics, Climate Change, and Other Air-Pollutant Control Strategies:*[37] The objective of this study was to provide transportation officials with information on the effects of different transportation control strategies on a full range of pollutants, and to identify methods for evaluating tradeoffs among different pollutants when selecting control strategies. The study assessed the effectiveness and cost-effectiveness of a variety of transportation emission control

strategies at reducing emissions of various pollutants, including ozone precursors, PM, air toxics, and greenhouse gases; and identifies which strategies may reduce some pollutants while increasing others. A total of 34 control strategies were reviewed in three categories – transportation demand management, transportation systems management, and vehicle and fuel technology.

NCHRP 25-25/Task 71 [Completed] - *Templates for Project-Level Analyses Using MOVES and AERMOD:*[38] The purpose of this project was to develop a project-level analysis air quality technical report template for use by State DOTs in the preparation of project-level analyses for PM and other pollutants to address transportation conformity and NEPA requirements. The template is intended to reduce the time and cost necessary to complete air quality studies, to improve the consistency and quality of these studies, and to assist transportation agencies in meeting new modeling and documentation requirements. The report indicates that the focus of the template was on: 1) PM hot-spot analyses with MOVES2010 and AERMOD or CAL3QHCR and 2) CO hot-spot analyses with MOVES2010 and CAL3QHC or CAL3QHCR. The report further indicates that the template was also designed to briefly address the topics of road dust and construction air quality impacts, mobile source air toxics and indirect effects and cumulative impacts to air quality. The preliminary project-level analyses template provides suggested language, guidelines and organization for air quality technical reports prepared to comply with the transportation conformity rules and guidance, and as well as NEPA. EPA indicates they will be finalizing the template before the grace period ends in December.

NCHRP 25-38, [Active] - *Input Guidelines for Motor Vehicle Emissions Simulator Model*:[39] The purpose of this research is to produce guidelines for transportation practitioners on methods, procedures, and datasets needed to develop and obtain transportation-related regional and project-level inputs for using MOVES2010a to estimate emissions of criteria pollutants, air toxics, and greenhouse gases. The guidelines are intended for all practitioners at State DOT and MPO agencies that are addressing transportation air quality analyses at the regional or project level. This effort will include two phases. Phase I will include: 1) the creation of a detailed plan to review current practices and data sources for MOVES2010a, 2) the collection and/assembling of the information in a structured manner; 3) the preparation of a technical memorandum summarizing the state of practice for developing inputs for MOVES2010a, and after NCHRP approval 4) the submission of an interim report. Phase II will include the development of guidelines on methods, procedures, and datasets to obtain transportation-related regional and project-level inputs for using MOVES2010a for criteria pollutants, air toxics, and greenhouse gases along with illustrative real-world examples.

NCHRP 25-18 [Final] - *Particulate-Matter ($PM_{2.5}$ and PM_{10}) Apportionment for On-Road Mobile Sources:*[40] This research suggested that improved methodologies were needed to estimate $PM_{2.5}$ and PM_{10} emissions and that research was needed to determine emission factors from transportation-related sources. Since large variations in particulate emissions occur because of various factors such as vehicle type and condition, roadway type, and climate, the research indicated these factors needed to be quantified. Consequently, the objectives of this research were to: (1) apportion, from among major

sources, the contribution of on-road mobile sources of direct and indirect emissions that contribute to ambient $PM_{2.5}$ and PM_{10} concentrations near roadways and (2) determine appropriate $PM_{2.5}$ and PM_{10} emission factors for use in estimating emission rates with micro-scale dispersion models.

Hao Chen, Song Bai, Douglas Eisinger, and Deb Niemeier, University of California, Davis; and Michael Claggett, FHWA - *Predicting Near-Road $PM_{2.5}$ Concentrations: Comparative Assessment of CALINE4, CAL3QHC, and AERMOD:*[41] This TRB Journal Article indicates that accurately predicting near-road $PM_{2.5}$ concentrations is important for project-level transportation conformity and health risk analyses. This study assessed the capability and performance of the CALINE4, CAL3QHC, and AERMOD dispersion models in predicting near-road $PM_{2.5}$ concentrations. According to the report, the comparative assessment included identifying differences among the three models in relation to methodology and data requirements. An intersection in Sacramento, California, and a busy road in London were used as sampling sites to evaluate how model predictions differed from observed $PM_{2.5}$ concentrations. The report states that screen plots and statistical tests indicated that, at the Sacramento site, CALINE4 and CAL3QHC performed moderately well, while AERMOD under predicted $PM_{2.5}$ concentrations. For the London site, both CALINE4 and CAL3QHC resulted in over predictions when incremental concentrations due to on-road emission sources were low, while under predictions occurred when incremental concentrations were high. The report states that the street canyon effect and receptor location likely contributed to the relatively poor performance of the models at the London site.

Cornell University - *Development of Advanced Modeling Tools for Hotspot Analysis of Transportation Emissions:*[42] This report indicates that Gaussian plume dispersion models of line sources have been widely used in quantitative hot-spot analyses of CO from transportation sources and have proven successful in modeling inert gaseous pollutants such as CO. However, the Gaussian dispersion models do not account for any chemical reactions or other physical dynamics such as condensation, coagulation and deposition; which have been shown critical for quantitative modeling of PM on hot-spot spatial scales. The report indicates that quantitative hot-spot modeling tools are scarce to adequately characterize gradients in concentrations of PM, PM components (such as black carbon), and PM precursors near roadways. This report presents the development of two advanced modeling tools that can be applied to hot-spot analysis of transportation emissions. One is a multi-link dispersion model based on EPA's AERMOD model. The other is a computation fluid dynamics model that incorporates vehicle-induced turbulence and road-induced turbulence. The study implies that roadway designs can significantly influence the near-road air pollution. Thus the study recommends that mitigating near-road air pollution through roadway design be considered in the air quality and transportation management.

Future Research Needs

The AASHTO Transportation Environmental Research Ideas (TERI) database, which is a central storehouse for tracking and sharing new transportation and environmental research ideas, recommends the following additional research measures be developed and

implemented to advance the state-of-the-practice for conducting PM project-level hot-spot analyses:

- ***Establishing Representative Background Concentrations for Quantitative Hot-spot Analyses for Particulate Matter:***[43] This research proposal was posted on the AASHTO TERI database on May 7, 2012. The proposal states that background concentrations representative of a project area are the most critical information needed for transportation projects subject to the new EPA guidance for quantitative PM hot-spot analyses. The proposal indicates that State DOTs need methodologies for establishing representative background concentrations based on existing ambient air quality monitoring and associated data or on forecasts using air quality models. While the EPA hot-spot guidance discusses a few factors to consider in establishing PM background concentrations, research is needed to identify and evaluate other methodologies not yet specified. Among other things, this research is intended to provide procedures and methodologies that transportation consultation partners can use to determine future forecasted background concentrations for PM_{10} and $PM_{2.5}$. The proposal further indicates that the research needs to also provide methodologies and associated rationale to identify and account for exceptional events and pollutant transport when establishing background concentrations. *[Note: This proposal was selected for funding in FY2013 as a NCHRP 25-25 project (Task 89). Work should begin by August 2013.]*

- ***On-road Traffic Operation Data Aligned with Model Validation Need for Project-Level $PM_{2.5}$ Conformity Analysis:*** This research proposal was posted on the AASHTO TERI database on April 25, 2011. The proposal indicates that it is challenging to acquire accurate fleet composition and relevant traffic operation data at the local level. Therefore the goals of this proposed research are to explore the suitability of traffic data sources and data collection techniques to the local traffic data needs for project-level $PM_{2.5}$ conformity analyses; and to provide a proof-of-concept study on model validation for conformity analysis to MOVES and microscopic traffic simulation models in an integrated way. The research will: 1) investigate traffic data sources and collection techniques applied in numerous states in the US for various categories of roadways, 2) develop a model validation procedure in applying MOVES along with microscopic traffic simulation for project-level conformity analyses using local link-based on-road data to improve the accuracy of local scale air quality modeling assessments, and 3) evaluate regional-level and project-level MOVES input variables for conformity analyses to recommend possible changes that should be made to regional MOVES input criteria for use in the development of project-level MOVES analyses; identify new inputs for project level MOVES analyses that are currently not used; and identify traffic activity and/or operation related criteria for requiring hot-spot analyses.

- ***Integration of Air Quality Models Used in Highway Air Quality Analysis:*** This research proposal was posted on the AASHTO TERI database on April 19, 2011. The proposal indicates that each traffic operations, transportation demand, emission

factor, and dispersion model has certain assumptions built into its design and those assumptions need to be explored especially as it relates to the output they generate and how that output is then used as inputs in other models. This study, therefore, proposes to examine the transportation demand and traffic models commonly used when initiating air quality analyses. The emission factor models would generally focus on MOVES and EMFAC and include an examination of the models' assumptions made in the traffic and transportation model outputs which are used with the emission factor models to yield inventories for regional analysis or as inputs themselves to dispersion models. In addition, dispersion model discussions would evaluate the AERMOD and CAL3QHCR models, and possibly other dispersion models that may be considered useful. The study would include an assessment of the accuracies and limitations of such models; and increase the validity in using the models and the confidence in the results obtained from the models.

Survey Responses

In the AASHTO survey, States were asked what additional research and technical assistance, if any, they needed to more efficiently conduct quantitative project-level PM hot-spot analyses. Responses included the following needs:

Guidance:

- Develop guidance for the determination of appropriate current and future background concentration levels for use in PM project-level analyses. This should also include an acceptable approach for addressing locations that are relatively remote from existing meteorological and air quality monitoring sites, perhaps involving some kind of regional modeling done on a large-project or other basis, since local monitoring is not feasible in most cases due to cost and schedule. This effort could be combined with the TERI database project *Establishing Representative Background Concentrations for Quantitative Hot-spot Analyses for Particulate Matter* noted above.

- Develop initial categorical findings that: 1) focus on the highest priority projects; and 2) that the development of categorical findings be an ongoing process so the categorical findings are updated periodically as needed to adjust to changes in models and guidance (and the level and form of the applicable NAAQS), to add or expand the types and scopes of projects covered, etc. This could be coordinated with the NCHRP 25-25/Task 78 project for *Programmatic Agreements for Project-Level Air Quality Analyses Using MOVES, CAL3QHC/R and AERMOD* noted above.

- Develop, as appropriate, associated programmatic agreements for PM, such that PM analyses are not required for NEPA purposes if they are not required for conformity purposes under the new categorical findings.

- Develop worst case protocols that an area could use for different types of projects. Need general acceptance that a "worst-case-scenario" analysis means that no future analyses are needed for lesser cases and that meeting de minimis criteria means that an analysis is not required at all.

Database Development/Access:

- Develop a national resource guide that lists appropriate background emissions and meteorology information for each nonattainment area so this information would not need to be re-estimated for every project requiring a hot-spot analysis. This concept would be similar to listing applicable sensitive sources in an area for the State for other issues such as for endangered species, wildlife, waterways, etc.

- Develop utilities to aid in establishing and entering MOVES input data. This could include items such as on-line databases of input data such as meteorological, population and vehicle data; approved sample runs from other States that are put on-line and available for review; examples of completed studies and effective mitigation measures; and on-line "chat-rooms" and/or a MOVES help desk developed and run by EPA or others where specific questions can be asked and answered in real-time.

- Develop data needs and model validation for specific circumstances in States with smaller projects where traffic volumes and the number of diesel vehicles barely meet the threshold numbers in EPA's guidance.

- Provide examples of specific data inputs needed from air agencies and consultation requirements for a PM hot-spot analyses as a reference that can be provided to air agencies. One State indicated this is needed because while interagency consultation processes are very specific in terms of regional conformity they are more general for project level hot-spots analyses and air agencies were not required to be involved and provide data for project level analyses in the past.

Research:

- Conduct a Survey and Assessment, or National research effort, of Commercial Software for Project-Level Analyses, to include: 1) a survey of State DOTs for software in use and experience to date; 2) a comparative assessment of commercial and other software available for use in CO and PM analyses; and 3) the identification of feature upgrades or enhancements of interest to State DOTs, for reference by model developers.

- Continue research on best practices for project-level analyses, addressing all aspects including modeling (construction, traffic, emissions and dispersion), monitoring and the determination of appropriate background concentrations, mitigation, consultation, documentation, etc.

- Develop an expert system to help guide the analyst through the analysis process and with data input.

SUMMARY

The topic of *Project-Level Quantitative Hot-spot Analyses for $PM_{2.5}$ and PM_{10}* was selected because starting on December 20, 2012, States, except California, are required to use the EPA MOVES emissions models to complete quantitative PM hot-spot analyses for projects of air quality concern. California will need to use the EMFAC emissions model. Also since EPA proposed to strengthen the annual PM air quality standard and require some near-road monitors in urban areas, which may result in more PM nonattainment areas in the future, the State DOTs elected to look at both current and planned State procedures for conducting PM quantitative hot-spot analyses.

Since most States have not yet completed a PM quantitative hot-spot analysis, the AQ COP members decided to send out an AASHTO survey to both the States that are members of this COP, as well as those States that are represented on AASHTO's Air Quality, Energy and Climate Change Subcommittee to get a broader representation of current and planned State procedures.

The resulting report highlights EPA and FHWA/FTA requirements and guidance documents for conducting $PM_{2.5}$ and PM_{10} quantitative hot-spot analyses; and a summary of the AASHTO survey and an overview of current and planned practices of selected State DOTs for conducting these analyses. In addition, it includes a summary of the technical details such as which models States are using or plan to use, including utility software that will help streamline and facilitate the modeling process; and current and completed research, as well as additional research or technical assistance States DOTs may need to more efficiently conduct these analyses.

As noted in the report, EPA's Transportation Conformity regulations require $PM_{2.5}$ and PM_{10} qualitative hot-spot analyses for projects of air quality concern in PM nonattainment and maintenance areas until EPA releases modeling guidance for making quantitative analyses. On December 20, 2010, EPA released final guidance for *Quantitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas*. Also on this date, EPA announced in the Federal Register its approval of the use of EPA's MOVES 2010a, and the EMFAC2007 (for California) emissions models, for quantitative PM hot-spot analyses. The Federal Register indicates that EPA's approval started a two year grace period before the models are required to be used for conformity purposes. This grace period ended on December 20, 2012. Beginning on that date, States are required to use the new models to complete new quantitative hot-spot analyses for projects of air quality concern. The one exception is that a qualitative PM hot-spot analysis begun before the end of the grace period can be completed.

The transportation conformity rule allows DOT, in consultation with EPA, to make CO and PM hot-spot categorical findings without further hot-spot analyses. The DOT, in consultation with EPA, is currently in the process of developing categorical findings for CO to assist States to more efficiently meet the CO hot-spot requirements. The process is expected to be completed in early 2013. The DOT, in consultation with EPA, is also working on an approach for a PM categorical finding.

In 1991 ISTEA authorized the CMAQ program to help fund transportation programs and projects that contribute to attainment of a NAAQS. The CMAQ program was reauthorized in 2005 under SAFETEA-LU, and in 2012 the program was continued under MAP–21. MAP-21 indicates that States and MPOs must give CMAQ funding priority to projects that are proven to reduce $PM_{2.5}$ emissions, including diesel retrofits in $PM_{2.5}$ nonattainment or maintenance areas. In addition MAP-21 indicates that a State or MPO may elect to obligate funds to install diesel emission control technology on non-road diesel equipment or on-road diesel equipment that is operated on a highway construction project within a $PM_{2.5}$ nonattainment or maintenance area. This program can therefore help to fund the types of strategies that will assist State and local agencies to reduce PM emissions and to meet the EPA hot-spot requirements.

Most States reported that they have not completed, nor do they have underway, any PM quantitative hot-spot analyses. However, Illinois has completed an analysis under the new EPA guidance, and three other States reported they are in the early stages of completing analyses. The Illinois project was for a complex multi-model project that included roadway, transit, and bicycle/pedestrian improvements and the analysis is documented in the draft and final EIS. The DEIS indicates that the Illinois Interagency Workgroup agreed on the $PM_{2.5}$ hot-spot analysis and that EPA is on the consultation team and provided input and guidance on the analyses. Consequently, other States may want to consider the Illinois PM hot-spot analyses process as they gear up to develop their analyses.

The Illinois analyses indicated that it used the highest monitored PM concentration level in the project area for PM background concentration levels, even for future analysis years. As a result the projected PM concentration levels are likely conservative because it is expected that ambient $PM_{2.5}$ concentrations will be lower in future years. Nevertheless, the analyses show that PM background concentration levels will likely be a major portion of predicted PM concentration levels since the concentration levels from the project itself were very small. Consequently, it will be critical for States to be able to accurately estimate future PM background concentration levels.

Most States indicated they plan to closely follow EPA's hot-spot guidance and not issue any additional guidance. Several States indicated they will update existing guidance to make it consistent with the EPA guidance, or develop new guidance documents that will supplement the EPA guidance to make it more specific to their State.

While several States indicated they do not anticipate any problems with future quantitative hot-spot analyses, or being ready by the end of the grace period for completing such analyses, most States indicated they do anticipate some problems. These problems include

items such as a lack of resources, limited modeling capabilities, obtaining input data, obtaining background concentration levels, educating project sponsors on identifying projects of air quality concern, and developing staff comfort using the EPA MOVES emissions model and the AERMOD and/or CAL3QHCR dispersion models.

Most States reported that they will use exiting interagency procedures for making quantitative PM hot-spot analyses and coordinate through the interagency process on issues such as meteorological data, dispersion models, receptor locations, planning assumptions, projects of air quality concern, analysis years, changes in design concept and scope, and data adequacy, among others. One State indicated that it wanted to enhance its interagency coordination procedures for PM quantitative hot-spot analysis by working with other agencies to develop a quality controlled centralized data warehouse or other repository which includes area-based meteorological and vehicle attribute data. This data would help assure consistent applications of model inputs for project-level and NEPA air quality related analyses by the agency and its consultants.

All States (except California) reported they will be using the EPA MOVES emissions model and the CAL3QHCR and/or AERMOD dispersion models in accordance with the EPA PM hot-spot guidance. California indicated it will use the EMFAC2007 emissions model but will be transitioning to the EMFAC2011 emissions model by early 2013. Four States indicated they will use the AERMOD dispersion model in most cases to provide consistency between projects, even those without a transit component.

Most States indicated that they have not used commercial software to help streamline and facilitate the modeling process. A few indicated that they have used or are considering CALRoads View (which combines CALINE4, CAL3QHC, and CAL3QHCR dispersion models into one integrated interface), AERMOD View (which combines AERMOD and several support programs with an integrated user interface), or BREEZE air dispersion modeling software (which also provides a user interface for the standard models).

This report also includes a summary of applicable research ideas included in the AASHTO TERI database that would help advance the state-of-the-practice for developing more effective and streamlined procedures for conducting PM quantitative hot-spot analyses. These include research to: 1) establish representative PM background concentration levels for quantitative analyses, 2) explore the suitability of traffic data sources and data collection techniques to the local traffic data needs for project-level $PM_{2.5}$ conformity analyses; and to provide a proof-of-concept study on model validation for conformity analysis to MOVES and microscopic traffic simulation models in an integrated way, and 3) integrate the air quality models used in highway air quality analysis. In addition, the report summarizes a number of other research ideas that States recommended through the AASHTO survey.

ACRONYMS AND ABBREVIATIONS

The following acronyms and abbreviations are used in this report:

AASHTO - American Association of State Highway and Transportation Officials
AERMOD – Air Quality Dispersion Model
AERMOD View - An air dispersion model that integrates several dispersion models into one integrated interface.
AP-42 – EPA document that includes a compilation of air pollutant emission factors
BREEZE – An air dispersion model for modeling continuous releases from industrial, highway, and other source types.
CAL3QHC/ CAL3QHCR – Air Quality Dispersion Models
CALINE4 - California Line Source Dispersion Model
CALRoads View - An air dispersion modeling package which combines CALINE4, CAL3QHC, and CAL3QHCR into one seamless integrated graphical interface.
Caltrans – California Department of Transportation
CARB - California Air Resources Board
CDOT – Colorado Department of Transportation
CMAQ - Congestion Mitigation and Air Quality Improvement Program
CO - Carbon Monoxide
COP – Community of Practice
DEIS – Draft Environmental Impact Statement
DOT – Department of Transportation
EIS - Environmental Impact Statement
EMFAC – A California's emission factor model that can estimate emission rates for on-road mobile sources and is used for SIP and transportation conformity purposes.
EO-WB – Illinois Elgin O'Hare – West Bypass project
EPA – US Environmental Protection Agency
FEIS – Final Environmental Impact Statement
FHWA – Federal Highway Administration
FTA – Federal Transit Administration
ICG - Interagency Consultation Group
IDOT – Illinois Department of Transportation
IEPA – Illinois Environmental Protection Agency
ISTEA - Intermodal Surface Transportation Efficiency Act
LOS – Level of Service
MAP-21 - Moving Ahead for Progress in the 21st Century Act
MDE - Maryland Department of the Environment
MDOT - Maryland Department of Transportation
METAR - Meteorological Aviation Report
MOBILE – EPA's Emission Factor Model
MOVES – EPA's Motor Vehicle Emission Simulator Model
MPO – Metropolitan Planning Organization
NAAQS – National Ambient Air Quality Standards
NCHRP - National Cooperative Highway Research Program
NEPA - National Environmental Policy Act

NOAA - National Oceanic and Atmospheric Administration
NO_2 – Nitrogen Dioxide
NO_x – Nitrogen Oxides
PaDEP - Pennsylvania Department of Environmental Protection
PennDOT – Pennsylvania Department of Transportation
$PM_{2.5}$ - Particle matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers
PM_{10} - Particle matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers
SAFETEA-LU - Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SCAG – Southern California Association of Governments'
SIP – State Implementation Plan
TCEQ - Texas Commission on Environmental Quality
TERI - Transportation Environmental Research Ideas
TIP – Transportation Improvement Program
TxDOT – Texas Department of Transportation
µg/m3 - Micrograms per Cubic Meter
VMT - Vehicle Miles Traveled
WDNR - Wisconsin Department of Natural Resources
WisDOT – Wisconsin Department of Transportation
WSDOT – Washington State Department of Transportation

APENDIX A - AASHTO Survey on State Practices on Project-Level Quantitative Hot-spot Analyses for $PM_{2.5}$ and PM_{10}

Background:

The AASHTO Air Quality Community of Practice (COP), which consists of representatives from thirteen State DOTs, are researching current and planned State practices on *Project-Level Quantitative Hot-spot Analyses for $PM_{2.5}$ and PM_{10}.* This research effort is intended to identify: 1) EPA and FHWA/FTA requirements and guidance documents for conducting $PM_{2.5}$ and PM_{10} quantitative hot-spot analyses; 2) current and planned practices of selected State DOTs for conducting these analyses; 3) technical details such as which models States are using or plan to use, including utility software that will help streamline and facilitate the modeling process; and 4) current and completed research, as well as additional research or technical assistance States DOT's may need to more efficiently conduct the analyses.

The AQ COP is sending out this survey to a wider range of State DOTs in order to assist in this research effort, and to solicit your ideas for future research and technical assistance needs to help meet the new EPA quantitative PM hot-spot requirements.

If you have any comments or questions on this survey, please contact Jen Brickett (JBrickett@aashto.org; 202-624-8815); Tim Sexton (sextont@wsdot.wa.gov; 206-440-4549); or James Shrouds (j.shrouds@verizon.net; 703-455-7413).

Survey Questions for PM Quantitative Hot-spot Analyses:

1) Do you have any PM2.5 and/or PM10 nonattainment and maintenance areas in your State? Do you anticipate any new PM2.5 nonattainment areas under EPA's proposed revisions to the PM standard? If so, identify the areas and the PM standard for which they are nonattainment or maintenance.

2) Have you developed, or plan to develop, any policies and/or procedures for quantitative PM hot-spot analyses to supplement EPA's *Transportation Conformity Guidance for Quantitative Hot-spot Analyses in PM2.5 and PM10 Nonattainment and Maintenance Areas*?

3) Have you completed, or are you in the process of completing, any PM quantitative hot-spot analyses? If so, how many have you completed and/or have underway? Have you been able to demonstrate conformity in all cases? Please send in a copy of, or provide a link to, the analysis.

4) If you have not completed, or are not in the process of completing, any PM quantitative hot-spot analyses, when do you anticipate doing the first such analysis (before or after the grace period which ends 12/20/12)?

5) Does the State anticipate any problems with future quantitative hot-spot analysis, or being ready by the end of the grace period? If so, what issues do you anticipate?

6) What issues will be determined thru interagency consultation (i.e. background levels, sensitive receptors/locations, projects of air quality concern, models, etc.)?

7) What agencies will be involved in the interagency consultation process for PM hot-spots?

8) What interagency coordination procedures will be used in your PM nonattainment area(s) for PM quantitative hot-spot analysis?

9) What models are you planning to use (i.e. MOVES2010a, MOVES2010b, EMFAC (in California), CAL3QHCR, AERMOD, etc.)? Is your State experienced with the use of these models? Do you anticipate any problems using these models?

10) Have you used, or plan to use, any vendors or utility software, that will help streamline and facilitate the modeling process? If so, please list the vendors, and give a brief description of the software and its intended use.

11) Have you incorporated any mitigation measures into the analyses in order to demonstrate conformity? If so, what kinds of mitigation measures have been incorporated?

12) How do you determine whether or not a significant change in design concept and scope of a project has occurred, especially as it relates to PM hot-spot analysis?

13) What additional research, if any, do State DOTs need to more efficiently conduct quantitative project-level PM hot-spot analyses?

14) What additional technical assistance do State DOTs need to more efficiently conduct quantitative project-level PM hot-spot analyses?

Contact Information:

Please provide your contact information: name, State DOT, title, phone number, and e-mail address.

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