ITEM 11 - Information
February 17, 2010

Briefing on the Transportation Planning Implications of the Environmental Protection Agency's (EPA) New Nitrogen Dioxide Standard, Proposed Changes in the Eight-hour Standard for Ozone, and New Motor Vehicle Emissions Simulation Model (MOVES)

Staff Recommendation: Receive briefing on the timing and transportation planning implications of three recent EPA actions as described in the enclosed materials.

Issues: None

Background: EPA has recently issued a new Nitrogen Dioxide standard, proposed stricter health standards for ground level ozone measured over eight hours, and released guidance on the use of MOVES for regional air quality planning and transportation conformity analysis.

National Capital Region Transportation Planning Board

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MEMORANDUM

February 17, 2010

To: Transportation Planning Board

From: Ronald F. Kirby
Director, Department of
Transportation Planning

Subject: Upcoming EPA State Implementation Plan (SIP) and Mobile Source Emissions Modeling Requirements: Implications for TPB Planning Activities

Introduction

This memo provides an overview of some upcoming EPA planning requirements and discusses how the TPB's air quality planning process may subsequently be affected. EPA is required under the Clean Air Act to establish and monitor health standards for pollutants considered harmful to public health and to the environment. To date, EPA has set standards for six 'criteria' pollutants: nitrogen dioxide, ozone, fine particulate matter, carbon monoxide, sulfur dioxide and lead; they must also review the standards through time to ensure they are adequately protective.

Under these requirements EPA is updating the standards for several of these pollutants, including nitrogen dioxide which may, and ozone which definitely will, affect transportation planning activities. Similarly, EPA has responsibility for the development and maintenance of modeling tools for the estimation of mobile source emissions. At this time, EPA is also updating its longstanding 'Mobile' model to the new 'MOVES' (Motor Vehicle Emissions Simulator) model.

Upcoming Changes

Each year the TPB's transportation conformity assessment of its plan and program involves regular updates of planning information such as transportation projects, land activity forecasts, and transit service changes. At present, in addition to these typical planning assumption updates there are at least three upcoming changes resulting from EPA actions which will affect the larger context of air quality analyses. These include: (1) release of new nitrogen dioxide health standards, (2) proposed changes to the 8-

hour ozone standard, and (3) release of the production version of the MOVES model.

Each of these is discussed below. While none is likely to affect the transportation conformity process in the near future (next year or two), each change could ultimately have significant impacts on both SIP development and transportation conformity.

Nitrogen Dioxide

Attachment 1 contains an EPA Fact Sheet on this subject. On January 22nd of this year EPA set stricter health standards for NO_2 by establishing a new 1-hour standard at a level of 100 parts per billion (ppb). This is in addition to the existing annual average of 53 ppb, which remains unchanged. The action also contains a requirement to establish a 'roadside monitoring network' to ascertain any specific impacts from mobile sources. Under this rule, initial nonattainment designations are expected to be finalized by January 2012. The additional roadside monitoring network must begin operation by January 1, 2013, and could have implications regarding additional nonattainment designations once sufficient data are collected, i.e., in a 2016 or 2017 time frame.

In the past, when areas were designated nonattainment they had one year in which to demonstrate that transportation plans and programs conformed to criteria and procedures associated with the new pollutant. So, if the Washington area is designated nonattainment for NO_2, and transportation is felt to be a significant contributor to that status, it is possible that by January 2013 the TPB would have to show conformity to NO_2 requirements. EPA would also have to issue interim criteria and procedures for such conformity assessments in conjunction with the nonattainment designation.

Ozone

Attachment 2 contains a fact sheet for EPA's proposal to revise the national health standards for ozone. On January 6th of this year EPA proposed to strengthen the 8-hour primary ozone standard by lowering it from the standard of 75 ppb set in 2008 to somewhere in the range between 60 and 70 ppb. EPA is currently taking public comment on the proposal and has an overall schedule of finalizing the standards by August 31, 2010 and subsequent nonattainment designations by August 2011. The Washington region will continue to be designated as nonattainment for ozone, and, as in the past, it is likely that transportation conformity will have to be demonstrated for plans and programs with respect to the tighter standard within one year of the nonattainment designation.

MOVES Model

Attachment 3 contains, in a 'Question and Answer' format, summary information on EPA's new mobile source emissions model. EPA released the official version of this model on December 23, 2009. However, its formal release will be its publication in the Federal Register, which should occur any day now. TPB and MWAQC staff and

technical committees have developed a joint Task Force to examine the model and are in the midst of joint work efforts to develop new inputs and test its operation. MOVES will ultimately be required to be used for all SIP planning and transportation conformity assessments in the region.

This model is believed to be more accurate than its predecessor. In testing to date, it has produced much higher emissions than were previously estimated with the Mobile model. EPA points out that this may not adversely affect existing SIPs as emissions reductions through time may also be greater than previously estimated. There is a two year grace period before the use of MOVES is required for conformity assessments.

Implications Regarding Transportation Planning Activities

While specific implications of these new requirements cannot be determined until nonattainment designations are decided and the new MOVES model is brought into production use, it is useful to at least identify a time line for these future events with respect to upcoming TPB air quality conformity assessments. Exhibit 1 presents such a timeline.

The chart shows that, for NO_2, January 2012 would be the earliest that these new standards could affect transportation planning, by requiring a conformity assessment within a year, i.e., January 2013. For ozone, following an expected nonattainment designation in August 2011, air quality conformity would have to be demonstrated within one year, i.e., by August 2012.

The transition to MOVES poses much more uncertainty. The two year grace period before its use is required suggests that the conformity assessment of the 2012 CLRP, starting in January 2012, could be undertaken with either Mobile or MOVES (which could also involve tests for NO_2 and the new ozone standard, per discussion above.)

By February 2011, the work program to test the MOVES model should enable staff and the Task Force to assess whether MOVES emissions inventories would adhere to previously developed mobile source emissions budgets. If budgets could not be met, and mobile source emissions reductions through time are still maintained for $PM_{2.5}$ and ozone attainment demonstrations, then a separate work effort to develop new MOVES-based emissions budgets could be warranted and undertaken in conjunction with MWAQC and the state air agencies. If this could be accomplished expeditiously, conformity assessments for the 2012 and beyond CLRPs would then be undertaken using MOVES, and would have to adhere to these new emissions budgets.

Next Steps

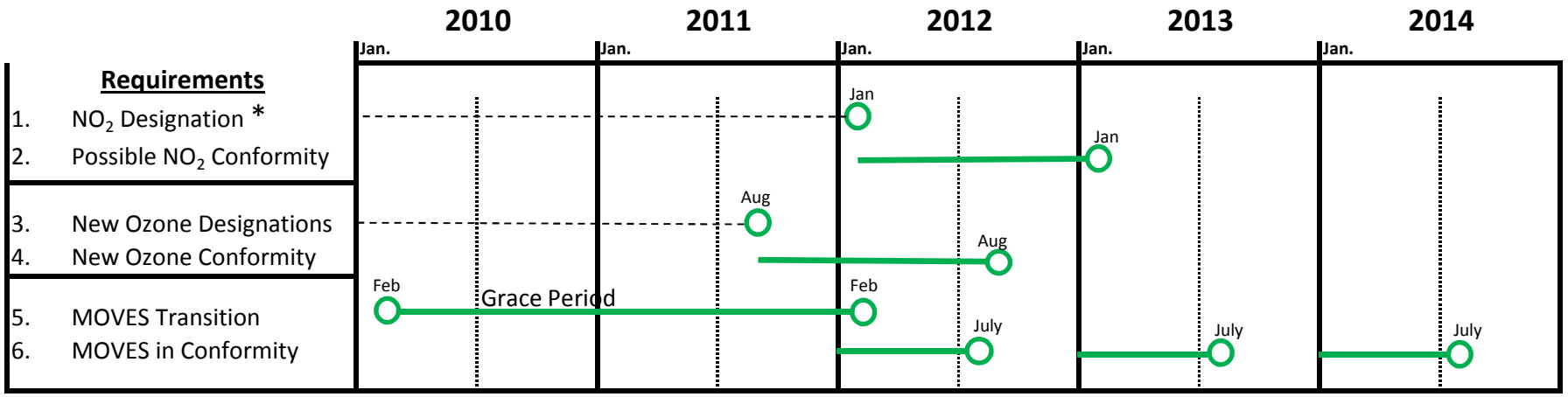
While there is some uncertainty in predicting exact future steps, at this point it appears clear that the conformity assessments for the next two years (2010 and 2011 CLRPs) will be undertaken addressing currently specified pollutants using existing emissions

estimation methods. However, transition to the MOVES model is critical for efforts beyond then, which places a great deal of emphasis upon current testing efforts to develop the new inputs and test the operation of the new model.

EXHIBIT 1

February 17, 2010

Considerations in Upcoming Air Quality Planning Activities



* NO_2 Roadside Monitoring Network and results in 2016 or 2017

FACT SHEET
FINAL REVISIONS TO THE NATIONAL AMBIENT AIR QUALITY STANDARDS FOR NITROGEN DIOXIDE

SUMMARY OF ACTION

- On January 22, 2010, EPA strengthened the health-based National Ambient Air Quality Standard (NAAQS) for nitrogen dioxide (NO_2). The new standard will protect public health, including the health of sensitive populations – people with asthma, children and the elderly.

- EPA is setting a new 1-hour NO_2 standard at the level of 100 parts per billion (ppb). This level defines the maximum allowable concentration anywhere in an area. It will protect against adverse health effects associated with short-term exposure to NO_2, including respiratory effects that can result in admission to a hospital.

- In addition to establishing an averaging time and level, EPA also is setting a new "form" for the standard. The form is the air quality statistic used to determine if an area meets the standard. The form for the 1-hour NO_2 standard, is the 3-year average of the 98^{th} percentile of the annual distribution of daily maximum 1-hour average concentrations.

- EPA also is retaining, with no change, the current annual average NO_2 standard of 53 ppb.

- This suite of standards will protect public health by limiting people's exposures to short-term peak concentrations of NO_2 – which primarily occur near major roads – and by limiting community-wide NO_2 concentrations to levels below those that have been linked to respiratory-related emergency department visits and hospital admissions in the United States.

- To determine compliance with the new standard, EPA is establishing new ambient air monitoring and reporting requirements for NO_2.
    - In urban areas, monitors are required near major roads as well as in other locations where maximum concentrations are expected.
    - Additional monitors are required in large urban areas to measure the highest concentrations of NO_2 that occur more broadly across communities.
    - Working with the states, EPA will site a subset of monitors in locations to help protect communities that are susceptible and vulnerable to NO_2-related health effects.

- The addition of a new 1-hour NO_2 standard and changes to the NO_2 monitoring network are consistent with the recommendations of the majority of the Clean Air Scientific Advisory Committee (CASAC). CASAC provides independent advice to the EPA Administrator on the relevant scientific and technical information and on the standards.

- These changes will not affect the secondary NO_2 standard, set to protect public welfare. EPA is considering the need for changes to the secondary standard under a separate review.

NO_2 AND PUBLIC HEALTH

- Current scientific evidence links short-term NO_2 exposures, ranging from 30 minutes to 24 hours, with an array of adverse respiratory effects including increased asthma symptoms, more difficulty controlling asthma, and an increase in respiratory illnesses and symptoms.

- Studies also show a connection between short-term exposure and increased visits to emergency departments and hospital admissions for respiratory illnesses, particularly in at-risk populations including children, the elderly, and asthmatics.

- NO_2 concentrations near major roads are appreciably higher than those measured at monitors in the current network. Concentrations in heavy traffic or on freeways can be twice as high as levels measured in residential areas or near smaller roads. Monitoring studies indicate that near-road (within about 50 meters) concentrations of NO_2 can be 30 to 100 percent higher than concentrations away from major roads.

- EPA's NAAQS for NO_2 is designed to protect against exposure to the entire group of nitrogen oxides (NO_x). NO_2 is the component of greatest concern and is used as the indicator for the larger group of NO_x. The sum of nitric oxide (NO) and NO_2 is commonly called NO_x. Other nitrogen oxides include nitrous acid and nitric acid.

- Emissions that lead to the formation of NO_2 generally also lead to the formation of other NO_x. Control measures that reduce NO_2 can generally be expected to reduce population exposures to all gaseous NO_x. This may have the co-benefit of reducing the formation of ozone and fine particles both of which pose significant public health threats.
    - NO_x react with ammonia, moisture, and other compounds to form small particles. These small particles penetrate deeply into sensitive parts of the lungs and can cause or worsen respiratory disease, such as emphysema and bronchitis, and can aggravate existing heart disease, leading to increased hospital admissions and premature death. EPA's NAAQS for particulate matter (PM) are designed to provide protection against these health effects.
    - NO_x react with volatile organic compounds to form ozone. Children, the elderly, people with lung diseases such as asthma, and people who work or exercise outside are at risk for adverse health effects from ozone. These effects include reduced lung function and increased respiratory symptoms, more respiratory-related emergency department visits and hospital admissions, and increased risk of premature death from heart or lung disease. EPA's NAAQS for ozone are designed to provide protection against these health effects.

REVISING THE NO_2 MONITORING NETWORK

- EPA is setting new requirements for the placement of new NO_2 monitors in urban areas. These include:

    Near Road Monitoring

    - At least one monitor must be located near a major road in any urban area with a population greater than or equal to 500,000 people. A second monitor is required

near another major road in areas with either:

(1) population greater than or equal to 2.5 million people, or

(2) one or more road segment with an annual average daily traffic (AADT) count greater than or equal to 250,000 vehicles.

These NO_2 monitors must be placed near those road segments ranked with the highest traffic levels by AADT, with consideration given to fleet mix, congestion patterns, terrain, geographic location, and meteorology in identifying locations where the peak concentrations of NO_2 are expected to occur. Monitors must be placed no more than 50 meters (about 164 feet) away from the edge of the nearest traffic lane.

- EPA estimates that the new NO_2 monitoring requirements will result in a network of approximately 126 NO_2 monitoring sites near major roads in 102 urban areas.

Community Wide Monitoring

- A minimum of one monitor must be placed in any urban area with a population greater than or equal to 1 million people to assess community-wide concentrations.
- An additional 53 monitoring sites will be required to assess community-wide levels in urban areas.
- Some NO_2 monitors already in operation may meet the community-wide monitor siting requirements.

Monitoring to Protect Susceptible and Vulnerable Populations

- Working with the states, EPA Regional Administrators will site at least 40 additional NO_2 monitors to help protect communities that are susceptible and vulnerable to NO_2 -related health effects.

- All new NO_2 monitors must begin operating no later than January 1, 2013.

- EPA Regional Administrators have the authority to require additional monitoring in certain circumstances, such as in areas impacted by major industrial point sources or a combination of sources where there is an indication that the standards may be exceeded. The Regional Administrators also have the authority to require additional near-road monitoring in urban areas where multiple peak concentration areas may be caused by a variety mobile source factors including fleet mix, traffic congestion patterns, or terrain.

IMPLEMENTING THE NEW NO_2 STANDARD

- In this final rule, EPA is outlining the Clean Air Act requirements that states must address to implement the new NO_2 air quality standard.

- The new standard must be taken into account when permitting new or modified major sources of NOx emissions such as fossil-fuel fired power plants, boilers, and a variety of other manufacturing operations.

- EPA expects to identify or "designate" areas as attaining or not attaining the new standard by January 2012, within two years of establishing the new NO_2 standard. These designations

will be based on the existing community-wide monitoring network. Areas with monitors recording violations of the new standards will be designated "nonattainment." EPA anticipates designating all other areas of the country "unclassifiable" to reflect the fact that there is insufficient data available to determine if those areas are meeting the revised NAAQS.

- Once the expanded network of NO_2 monitors is fully deployed and three years of air quality data have been collected, EPA intends to redesignate areas in 2016 or 2017, as appropriate, based on the air quality data from the new monitoring network.

BACKGROUND

- The Clean Air Act requires EPA to set national ambient air quality standards for pollutants considered harmful to public health and the environment. National standards exist for six pollutants: nitrogen dioxide, ozone, particulate matter, carbon monoxide, sulfur dioxide, and lead.

- For each of these pollutants, the Clean Air Act requires EPA to set the health-based or "primary" standards at a level judged to be "requisite to protect the public health with an adequate margin of safety" and establish secondary standards that are "requisite" to protect public welfare from "any known or anticipated adverse effects associated with the pollutant in the ambient air" including effects on vegetation, soils, water, wildlife, buildings and national monuments, and visibility. EPA is considering the need for changes to the secondary NO_2 standard under a separate review.

- The law also requires EPA to review the standards and their scientific basis every five years to determine whether revisions are appropriate.

- Nitrogen dioxide is one of a group of highly reactive gasses known as "oxides of nitrogen." NO_2 forms quickly from emissions from cars, trucks and buses, power plants, and off-road equipment. In addition to contributing to the formation of ground-level ozone and fine particle pollution, NO_2 is linked with a number of adverse effects on the respiratory system.

- EPA first established standards for NO_2 in 1971, setting both a primary standard (to protect health) and a secondary standard (to protect the public welfare) at 53 ppb, averaged annually. Prior to the current review, the Agency reviewed the standards twice since 1971, but chose not to revise the standards at the conclusion of each review.

- All areas presently meet the 1971 NO_2 NAAQS, with annual NO_2 concentrations measured at community-wide monitors well below the level of the standard (53 ppb). Annual average ambient NO_2 concentrations, as measured at community-wide monitors, have decreased by more than 40 percent since 1980. Currently, the annual average NO_2 concentrations range from approximately 10-20 ppb.

- EPA expects NO_2 concentrations to continue decreasing as a number of mobile source regulations take effect. Tier 2 standards for light-duty vehicles began phasing in during 2004, and new NO_x standards for heavy-duty engines are phasing in between 2007 and 2010

model years. Current air quality monitoring data reflect only a few years of vehicles entering the fleet that meet these stricter NO_x tailpipe standards.

FOR MORE INFORMATION

- To download a copy of the final rule, go to EPA's Web site at: http://www.epa.gov/air/nitrogenoxides.

- This final rule and other background information are also available either electronically at http://www.regulations.gov, EPA's electronic public docket and comment system, or in hardcopy at the EPA Docket Center's Public Reading Room.

- The Public Reading Room is located in the EPA Headquarters, Room Number 3334 in the EPA West Building, located at 1301 Constitution Avenue, NW, Washington, DC. Hours of operation are 8:30 a.m. to 4:30 p.m. eastern standard time, Monday through Friday, excluding Federal holidays.

- Visitors are required to show photographic identification, pass through a metal detector, and sign the EPA visitor log. All visitor materials will be processed through an X-ray machine as well. Visitors will be provided a badge that must be visible at all times.

- Materials for this action can be accessed using Docket ID No. EPA-HQ-OAR-2006-0922.

FACT SHEET
PROPOSAL TO REVISE THE NATIONAL AMBIENT AIR QUALITY STANDARDS FOR OZONE

SUMMARY OF ACTION

Proposed ozone standards

- On January 6, 2010, EPA proposed to strengthen the national ambient air quality standards (NAAQS) for ground-level ozone, the main component of smog. The proposed revisions are based on scientific evidence about ozone and its effects on people and the environment.

- EPA is proposing to strengthen the 8-hour "primary" ozone standard, designed to protect public health, to a level within the range of 0.060-0.070 parts per million (ppm).

- EPA is also proposing to establish a distinct cumulative, seasonal "secondary" standard, designed to protect sensitive vegetation and ecosystems, including forests, parks, wildlife refuges and wilderness areas. EPA is proposing to set the level of the secondary standard within the range of 7-15 ppm-hours.

- The proposed revisions result from a reconsideration of the identical primary and secondary ozone standards set at 0.075 ppm in 2008.

- EPA is reconsidering the ozone standards to ensure that two of the nation's most important air quality standards are clearly grounded in science, protect public health with an adequate margin of safety, and protect the environment. The ozone standards set in 2008 were not as protective as recommended by EPA's panel of science advisors, the Clean Air Scientific Advisory Committee (CASAC). The proposed standards are consistent with CASAC's recommendations.

- The proposal to strengthen the primary standard places more weight on key scientific and technical information, including epidemiological studies, human clinical studies showing effects in healthy adults at 0.060 ppm, and results of EPA's exposure and risk assessment.

- The proposal to set a distinct secondary standard places more weight on the importance of a biologically relevant standard by recognizing that cumulative, seasonal exposure to ozone harms sensitive vegetation.

- EPA will take public comment for 60 days following publication of the proposal in the Federal Register. The agency also will hold public hearings on the proposal in the following three locations:

    - February 2, 2010
        - Arlington, Va.
        - Houston, Texas
    - February 4, 2010
        - Sacramento, Calif.

- EPA will issue final standards by August 31, 2010.

Review of Science: Public Health

- Scientific evidence indicates that adverse public health effects occur following exposure to ozone, particularly in children and adults with lung disease.

- Breathing air containing ozone can reduce lung function and inflame airways, which can increase respiratory symptoms and aggravate asthma or other lung diseases. Ozone exposure also has been associated with increased susceptibility to respiratory infections, medication use, doctor visits, and emergency department visits and hospital admissions for individuals with lung disease.

- Ozone exposure also increases the risk of premature death from heart or lung disease.

- Children are at increased risk from exposure to ozone because their lungs are still developing and they are more likely to be active outdoors, which increases their exposure.

Review of Science: Public Welfare

- Scientific evidence shows that repeated exposure to ozone during the growing season damages sensitive vegetation. Cumulative ozone exposure can lead to reduced tree growth; visibly injured leaves; and increased susceptibility to disease, damage from insects and harsh weather.

- Sensitive plant species that are potentially at increased risk from ozone exposure include trees such as black cherry, quaking aspen, ponderosa pine and cottonwood. These trees are found across the United States, including in protected parks and wilderness areas.

Review of Science: Technical Record

- The reconsideration is based on the scientific and technical record used in the March 2008 review, which included more than 1,700 scientific studies.

- In this reconsideration, EPA is not relying on studies about the health and ecological effects of ozone that have been published since the science assessment to support the 2008 review was completed. However, EPA conducted a provisional assessment of these newer studies and found they do not materially change the conclusions of the Agency's earlier science assessment. More information on the provisional assessment is available at: http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=214003

DETERMINING COMPLIANCE: THE FORM OF THE STANDARDS

- When EPA sets air quality standards, it also must specify the measurement unit, or "form" of each standard, which is used to determine whether an area is meeting the standards.

- For the primary standard, ozone concentrations are averaged over 8-hour periods. The fourth-highest 8-hour value at a particular monitor in the most recent year is averaged with the fourth-highest 8-hour values from the previous two years. This produces a three-year average. To meet the standard, the three-year average must be less than or equal to the level of the standard. EPA did not reconsider the form of the primary standard.

- The proposed secondary standard is designed to protect sensitive vegetation from adverse effects associated with cumulative ozone exposures during the three months when daytime ozone concentrations are the highest. Specifically, the form of this new proposed secondary standard is a "cumulative peak-weighted index," called W126. The W126 index is calculated by:
    - "Weighting" each hourly ozone measurement occurring during the 12 daylight hours (8:00 am to 8:00 pm) each day, with more weight given to higher concentrations. This "peak weighting" emphasizes higher concentrations more than lower concentrations, because higher concentrations are disproportionately more damaging to sensitive trees and plants;
    - Adding these 12 weighted hourly ozone measurements for each day, to get a cumulative daily value;
    - Summing the daily values for each month, to get a cumulative monthly value;
    - Identifying the three consecutive months during the ozone season with the highest index value, to get the cumulative seasonal index value, and;
    - Averaging these maximum seasonal index values over three years.
- An area would meet the proposed secondary standard if the three-year average of the cumulative seasonal index values is less than or equal to the level of the standard (i.e., 7-15 ppm-hours).

ESTIMATED TIMELINE FOR IMPLEMENTING THE PROPOSED STANDARDS

- EPA, states and tribes will work together to implement the ozone standards that result from the reconsideration.
- EPA is proposing an accelerated schedule for designating areas for the primary ozone standard. Also, EPA is taking comment on whether to designate areas for a seasonal secondary standard on an accelerated schedule or a 2-year schedule.
- The accelerated schedule would be:
    - **By January 2011:** States make recommendations for areas to be designated attainment, nonattainment or unclassifiable.
    - **By July 2011:** EPA makes final area designations.
    - **August 2011** Designations become effective.
    - **December 2013:** State Implementation Plans, outlining how states will reduce pollution to meet the standards, are due to EPA.
    - **2014 to 2031:** States are required to meet the primary standard, with deadlines depending on the severity of the problem.

MONITORING FOR OZONE

- In a separate rule, EPA proposed in July 2009 to modify the ozone air quality monitoring network design requirements. The proposed modifications would better support alternative ozone standards, including the 2008 ozone standards and the ozone standards proposed in this reconsideration.

- EPA is not proposing in this reconsideration to further modify the minimum monitoring requirements for ozone.

- The already proposed monitoring revisions would change minimum monitoring requirements in urban areas, add new minimum monitoring requirements in non-urban areas, and extend the length of the required ozone monitoring season in many states.

    - EPA proposed that urban areas with populations between 50,000 and 350,000 people operate at least one ozone monitor.

    - EPA proposed that states be required to operate at least three ozone monitors in non-urban areas.

- There are approximately 1,200 ozone monitors operating in the United States, with about 1,000 sited to represent urban areas and 200 to represent non-urban areas.

    - EPA estimates that about 270 new ozone monitors could be required to satisfy the proposed monitoring requirement. We expect the number of new monitors to be considerably less because of the flexibility including in the proposal.

- EPA is considering comments received on the proposed monitoring requirements and plans to issue a final rule in coordination with the final ozone standards in August 2010.

BACKGROUND

What is Ozone?

- Ozone is found in two regions of the Earth's atmosphere – at ground level and in the upper regions of the atmosphere. Both types of ozone have the same chemical composition (O_3). While upper atmospheric ozone forms a protective layer from the sun's harmful rays, ground level ozone is the main component of smog.

- Ground-level ozone is not emitted directly into the air, but forms through a reaction of nitrogen oxides (NOx), volatile organic compounds (VOCs), carbon monoxide (CO) and methane (CH_4) in the presence of sunlight.

- Emissions from industrial facilities and electric utilities, motor vehicle exhaust, gasoline vapors, and chemical solvents are the major man-made sources of NOx and VOCs.

- Because sunlight and hot weather accelerate its formation, ozone is mainly a summertime air pollutant. Both urban and rural areas can have high ozone levels, often due to transport of ozone or its precursors from hundreds of miles away.

Ozone and Public Health

- Exposures to ozone can:
    - Reduce lung function, making it more difficult for people to breathe as deeply and vigorously as normal,
    - Irritate the airways, causing coughing, sore or scratchy throat, pain when taking a deep breath and shortness of breath,
    - Inflame and damage the airways,
    - Increase frequency of asthma attacks,
    - Increase susceptibility to respiratory infection, and
    - Aggravate chronic lung diseases such as asthma, emphysema and bronchitis.

- In some people, these effects can lead to:
    - Increased medication use among asthmatics,
    - More frequent doctors visits,
    - School absences,
    - Increased emergency room visits and hospital admissions, and
    - Increased risk of premature death in people with heart and lung disease.

- Groups that are at greater risk from ozone include:
    - People with lung disease, especially children with asthma.
    - Children and older adults.
    - People who are active outside, especially children and people who work outdoors.

Ozone and the Environment

- Ground-level ozone can have harmful effects on sensitive vegetation and ecosystems. When sufficient ozone enters the leaves of a plant, it can:
    - Interfere with the ability of sensitive plants to produce and store food, leading to reduced growth, making them more susceptible to certain diseases, insects, other pollutants, competition and harsh weather.
    - Visibly damage the leaves of trees and other plants, harming the appearance of vegetation in urban areas, national parks, and recreation areas.

- These effects can have adverse impacts on ecosystems, including loss of species and changes to habitat quality, and water and nutrient cycles.

About the NAAQS Process

- The Clean Air Act requires EPA to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. National standards exist for six pollutants: ozone, particulate matter, nitrogen oxides, carbon monoxide, sulfur dioxide, and lead.

- For each of these pollutants, the Clean Air Act requires EPA to set the health-based or "primary" standards at a level judged to be "requisite to protect the public health with an adequate margin of safety" and establish secondary standards that are "requisite" to protect

public welfare from "any known or anticipated adverse effects associated with the pollutant in the ambient air" including effects on vegetation, soils, water, wildlife, buildings and national monuments, and visibility.

- The law also requires EPA to review the standards and their scientific basis every five years to determine whether revisions are appropriate.

- The Clean Air Scientific Advisory Committee (CASAC) provides independent advice to the EPA Administrator on the relevant scientific and technical information and on the standards.

HOW TO COMMENT

- EPA will accept public comments for 60 days after the proposed revisions to the ozone standards are published in the Federal Register.

- Comments should be identified by Docket ID No. EPA-HQ-OAR-2005 -0172 and submitted by one of the following methods:

    - Federal eRulemaking Portal (http://www.regulations.gov),
    - e-mail (a-and-r-docket@epa.gov),
    - Mail (EPA Docket Center, Environmental Protection Agency, Mail code 6102T, 1200 Pennsylvania Avenue, NW, Washington, DC 20460), or
    - Hand delivery (EPA Docket Center, Environmental Protection Agency, Room 3334, 1301 Constitution Avenue, NW, Washington, DC).

FOR MORE INFORMATION

- To download the Federal Register notice about the proposed revisions to the ozone standards, visit www.epa.gov/ozonepollution.

- Today's proposal and other background information are also available either electronically at http://www.regulations.gov, EPA's electronic public docket and comment system, or in hardcopy at the EPA Docket Center's Public Reading Room.

    - The Public Reading Room is located in the EPA Headquarters Library, Room Number 3334 in the EPA West Building, located at 1301 Constitution Ave., NW, Washington, DC. Hours of operation are 8:30 a.m. to 4:30 p.m. eastern standard time, Monday through Friday, excluding federal holidays.

    - Visitors are required to show photographic identification, pass through a metal detector, and sign the EPA visitor log. All visitor materials will be processed through an X-ray machine as well. Visitors will be provided a badge that must be visible at all times.

    - Materials for this action can be accessed using Docket ID No. EPA-HQ-OAR- 2005-0172.

Questions and Answers

EPA Releases MOVES2010 Mobile Source Emissions Model: Questions and Answers

Q1. What is MOVES2010?

A1. MOVES2010 is the state-of-the-art upgrade to EPA's modeling tools for estimating emissions from highway vehicles, based on analysis of millions of emission test results and considerable advances in the Agency's understanding of vehicle emissions. MOVES2010 replaces the previous model for estimating on-road mobile source emissions, MOBILE6.2.

Q2. Why is EPA replacing MOBILE6.2 with MOVES2010?

A2. The Clean Air Act (CAA) requires EPA to regularly update its mobile source emission models. EPA continuously collects data and measures vehicle emissions to make sure the Agency has the best possible understanding of mobile source emissions. This assessment, in turn, informs the development of EPA's mobile source emission models. MOVES2010 represents the Agency's most up-to-date assessment of on-road mobile source emissions. MOVES2010 also incorporates several changes to the EPA's approach to mobile source emission modeling based upon recommendations made to the Agency by the National Academy of Sciences.

Q3. Can MOVES2010 be used for state implementation plans and transportation conformity?

A3. MOVES2010 can be used to estimate air pollution emissions from cars, trucks, motorcycles, and buses. It will be approved for use in official state implementation plan (SIP) submissions to EPA and for transportation conformity analyses outside of California. It can also be used to estimate the benefits from a range

EPA United States Environmental Protection Agency

Office of Transportation and Air Quality
EPA-420-F-09-073
December 2009

of mobile source control strategies, for more general analyses of national or local emissions trends, and for policy evaluation. MOVES2010 is EPA's best available tool for quantifying criteria pollutant and precursor emissions, as well as for other emissions analyses of the transportation sector.

Prior to this official release of MOVES2010, the MOBILE6.2 motor vehicle emission factor model was the only model approved for performing SIP and transportation conformity analyses outside of California (where the approved model for these analyses is currently the EMFAC2007 model). EPA will be publishing a Federal Register notice of availability in the near future to approve MOVES2010 for official purposes. Upon publication of the Federal Register notice, MOVES2010 will become EPA's approved motor vehicle emission factor model for estimating volatile organic compounds (VOCs), nitrogen oxides (NOx), carbon monoxide (CO), direct particulate matter (PM10 and PM2.5) and other pollutants and precursors from cars, trucks, motorcycles, and buses by state and local agencies outside of California. EPA intends to include in the notice a two-year grace period for using MOVES2010 for transportation conformity purposes.

Q4. When should MOVES2010 be used for SIP and transportation conformity analyses?

A4. In general, EPA believes that MOVES2010 should be used in ozone, CO, PM, and nitrogen dioxide SIP development outside of California as expeditiously as possible. The CAA requires that SIP inventories and control measures be based on the most current information and applicable models that are available when a SIP is developed.

Regarding transportation conformity, EPA and DOT intend to establish a two-year grace period before MOVES2010 is required for new transportation conformity analyses outside of California. EPA will publish a Federal Register notice of availability in the near future to approve MOVES2010 for official purposes.

For more information on the requirements regarding the use of MOVES2010 for SIP and transportation conformity analyses, including implementation of the MOVES2010 conformity grace period, see EPA's "Policy Guidance on the Use of MOVES2010 for State Implementation Plan Development, Transportation Conformity, and Other Purposes," available at www.epa.gov/otaq/stateresources/transconf/policy.htm#models.

Q5. Can MOVES2010 be used to estimate greenhouse gas emissions?

A5. MOVES2010 is currently the best tool EPA has for estimating greenhouse gas (GHG) emissions from the transportation sector. It is a significant improvement over MOBILE6.2 and previous versions of MOVES for GHG estimation. State and local agencies estimating GHG emissions in the transportation planning process should consider using MOVES2010 for GHG emissions analyses in the future.

Q6. Can MOVES2010 be used to estimate mobile source air toxics?

A6. MOVES2010 estimates emissions for the following mobile source air toxics (MSATs): benzene, 1,3-butadiene, formaldehyde, acetaldehyde, acrolein, naphthalene, ethanol, and MTBE. MOVES2010 is EPA's best available tool for quantifying emissions of these MSATs. State and local agencies, academic institutions, and other interested parties who are interested in analyzing MSAT emissions from transportation projects are encouraged to use MOVES2010. EPA is working to integrate additional MSATs into the MOVES modeling framework in the near future.

EPA notes that there are no SIP and transportation conformity requirements for air toxics. Regarding the analysis of MSAT emissions in the National Environmental Policy Act (NEPA) process, DOT has responsibility for implementing NEPA for federally-funded or approved transportation projects.

Q7. Why has EPA changed the name of its mobile source model from "MOBILE" to "MOVES"?

A7. The name "MOVES" is an acronym for "Motor Vehicle Emission Simulator." The name change signals the new approach to projecting mobile source emissions being taken in the new model. The MOVES generation of models is not merely an upgrade of the previous MOBILE model using more recent emissions data; it is brand-new software, designed from the ground up to estimate emissions at a more detailed level.

The more detailed approach to modeling allows EPA to easily incorporate large amounts of in-use data from a wide variety of sources, such as data from vehicle inspection and maintenance (I/M) programs, remote sensing device (RSD) testing, certification testing, portable emission measurement systems (PEMS), etc. This approach also allows users to incorporate a variety of activity data to better estimate emission differences such as those resulting from changes to vehicle speed and acceleration patterns. For example, the improvements in MOVES2010 will allow project-level PM2.5 and PM10 emissions to be estimated.

The current version of the model – MOVES2010 – is so named to indicate the first year in which the model may be used in SIPs and conformity determinations, and to clearly distinguish the model from its precursor, Draft MOVES2009.

Q8. What has EPA done to prepare users for the release of MOVES2010?

A8. In April 2009, EPA released "Draft MOVES2009" as a work-in-progress to solicit user comments that were then used to improve the official final version: MOVES2010. In addition to aiding EPA as it worked toward finalizing MOVES2010, the draft model allowed potential users to gain valuable experience with the new input formats for the

MOVES generation of models.

Between the release of Draft MOVES2009 and MOVES2010, EPA and the Federal Highway Administration (FHWA) conducted a total of 20 training sessions across the country for state and local users of the MOVES model. EPA also made training materials available on its website at http://www.epa.gov/otaq/models/moves/index.htm.

In addition to the above training, EPA has developed several documents to assist in implementing MOVES2010, including the following:

"MOVES2010 User Guide": This guide provides detailed instructions for setting up and running MOVES2010. Available at www.epa.gov/otaq/models/moves/index.htm.

"Policy Guidance on the Use of MOVES2010 for State Implementation Plan Development, Transportation Conformity, and Other Purposes": This document describes how and when to use the MOVES2010 emissions model for SIP development, transportation conformity determinations, and other purposes. Available at www.epa.gov/otaq/stateresources/transconf/policy.htm#models.

"Technical Guidance on the Use of MOVES2010 for Emission Inventory Preparation in State Implementation Plans and Transportation Conformity": This document provides guidance on appropriate input assumptions and sources of data for the use of MOVES2010 in SIP submissions and regional emissions analyses for transportation conformity purposes. Available at www.epa.gov/otaq/models/moves/index.htm.

"Transportation Conformity Guidance for Quantitative Hot-spot Analyses in PM2.5 and PM10 Nonattainment and Maintenance Areas": This document explains how to use MOVES2010 to complete hot-spot analyses required for projects of local air quality concern in PM2.5 and PM10 nonattainment and maintenance areas. This guidance is presently under development. When it is available, it will be posted on the EPA's transportation conformity policy guidance website (www.epa.gov/otaq/stateresources/transconf/policy.htm). EPA will be making a draft available for public comment prior to finalizing this guidance.

Q9. How do MOVES2010's inputs and outputs compare to EPA's previous mobile source emission models?

A9. Unlike EPA's previous mobile source emission models, MOVES2010 has a graphical user interface (GUI) which allows users to more easily set up and run the model. More fundamentally, it has been designed to do calculations with information in databases, using the open source database management software known as MySQL.

The database-centered design provides users much greater flexibility regarding output choices. Unlike earlier models which provided emission factors in grams-per-mile in fixed output formats, MOVES2010 output can be expressed as total mass (in tons, pounds, kilograms, or grams) or as emission factors (grams-per-mile and in some cases grams-per-vehicle). Output can be easily aggregated or disaggregated to examine emissions in a range of scales, from national emissions impacts down to the emissions impacts of individual transportation projects.

The database-centered design also allows EPA to update emissions data incorporated in MOVES2010 more easily and will allow users to incorporate a much wider array of activity data to improve estimation of local emissions. For example, the improvements in MOVES2010 will allow project-level PM2.5 and PM10 emissions to be estimated.

Q10. How does MOVES2010 compare to previously released drafts of MOVES?

A10. The first draft release in the MOVES generation of mobile source emission models – MOVES2004 – was a proof-of-concept model that only looked at two aspects of mobile source activity: energy consumption and GHG impacts. MOVES2004 was followed by the MOVES Demo model, which was released in May 2007. MOVES Demo allowed potential users to gain familiarity with what would be the basic structure for subsequent iterations of the model but included only placeholder values for emission rates. MOVES Demo was released to get comments from likely users on the user interface and other model functions. With the release of Draft MOVES2009 in April 2009, EPA provided a more refined version of the model for likely users to test and comment upon.

In response to the comments received regarding Draft MOVES2009, EPA has made many improvements to the model. For example, MOVES2010 runs faster. It includes an improved emission rate calculator that provides "lookup table" results for starts and evaporative emissions as well as exhaust emissions. It eases entry of local fuels, heavy-duty reflash parameters, and other user inputs. MOVES2010 includes the ability to model new pollutants and precursors (sulfur dioxide, ammonia, nitrogen dioxide, and nitric oxide) and includes estimates of emissions from motorcycles. EPA has also expanded the capabilities of MOVES2010 for project-level analyses by including a graphical user interface for such analyses.

EPA also made emission rate improvements based upon newly available data and the comparisons of Draft MOVES2009 results to real-world emission measurements. These changes include improved estimates of emissions from heavy-duty trucks and older light-duty vehicles, as well as improved estimates of emissions at high speeds and accelerations. Because of these changes, inventories and emission rates generated by MOVES2010 will differ from those generated using Draft MOVES2009.

Q11. How do MOVES2010 emission estimates compare to those of MOBILE6.2?

A11. As part of its own internal testing, EPA performed a preliminary comparison of MOVES2010 to MOBILE6.2 using approximate local data for several different urban

counties, each with its own fleet age distribution, fraction of light- and heavy-duty vehicle miles travelled (VMT), local fuel specifications, meteorology, and other input factors. The differences between MOVES2010 and MOBILE6.2 found in this analysis are described below, by criteria pollutant. Actual results will vary based on local inputs in a given area, with local variations in the fleet age distribution and composition having a significant influence on the final results.

For volatile organic compounds (VOCs): For all the urban counties modeled, mobile source VOC emissions were lower using MOVES2010 than previously estimated using MOBILE6.2. This difference is most noticeable for Tier 1 and newer vehicles, especially for evaporative emissions.

For oxides of nitrogen (NOx): Emissions from both light- and heavy-duty trucks are higher than previously estimated. Using MOVES2010 and assuming no change in extended idle activity as a fraction of total activity, EPA projects that uncontrolled extended idle emissions from heavy-duty vehicles will become a significant share of the on-road mobile source NOx inventory in the future. In some urban areas of the country, in fact, extended idle emissions could comprise approximately one quarter of total heavy-duty NOx emissions by 2020. This increase in the fraction of overall emissions represented by idling emissions is due to the fact that new heavy-duty vehicle standards are driving down regular exhaust emissions, making the idle fraction bigger by comparison.

For PM2.5: EPA's estimate of mobile source PM2.5 emissions using MOVES2010 is significantly higher compared to MOBILE6.2 for both light- and heavy-duty vehicles and for all of the urban areas modeled. For passenger cars and light trucks, these increases are based on data developed as part of EPA's Kansas City study, which showed much higher PM2.5 emissions at low ambient temperatures than previously known. For heavy-duty trucks, MOVES2010 incorporates new data from a large study of trucks conducted by the Coordinating Research Council (known as the CRC E-55 study) which includes deterioration effects on in-use emissions. MOVES2010 also models the impact of vehicle speed and load on PM emissions, showing very high rates of PM generation in stop-and-go traffic conditions. This high emission rate consists of the emissions produced while the engine is under increased load while accelerating (i.e., the "go" phase of stop-and-go driving) as well as the emissions produced while the vehicle is stopped and therefore not accumulating any mileage, thus resulting in higher overall emissions per total mile driven.

Q12. What sort of data did EPA use to improve its estimates of vehicle emissions?

A12. Over the last ten years, EPA's in-use data about technologies such as Tier 2, second-generation onboard diagnostics (OBD II), and enhanced evaporative emission control systems have dramatically improved. For MOVES2010, EPA has been able to carefully study these newer technologies, examining millions of results for light-duty vehicles. A detailed analysis of 70,000 vehicles in Arizona's I/M program provided information on how vehicles from the late-1990's and early 2000's age. Other I/M and remote sensing data and special purpose studies helped EPA to better understand trends in VOC, CO,

and NOx emissions for light-duty cars and trucks. In reviewing these data, EPA found little change in CO from our original MOBILE6.2 projections, lower VOC emissions, and a noticeable increase in NOx emissions.

Also in support of MOVES2010 development, the Agency conducted a landmark study of PM emissions, testing nearly 500 gasoline-fueled light-duty cars and trucks in Kansas City, Missouri. Due to the technical difficulties associated with measuring PM emissions, the Kansas City study – a collaborative effort including EPA, DOT, the Department of Energy (DOE), and the automotive and petroleum industries – is currently the largest such study ever conducted. The Kansas City study confirmed that PM emissions from light-duty gasoline-fueled vehicles are higher than earlier predicted, and clearly showed that cold ambient temperatures can dramatically increase PM start emissions. The MOVES2010 model includes these increases in PM start emissions at low temperatures.

EPA's understanding of emissions from heavy-duty vehicles has continued to improve since MOBILE6.2 was issued. Most earlier heavy-duty emission rates were based on certification tests of then-new, mid-1990's engines. For MOVES2010, EPA has been able to analyze data on more than 400 in-use trucks, some in the laboratory and some with on-road measurement equipment. This allowed the Agency to understand how real trucks pollute at a range of speeds and driving conditions. EPA also has been able to better incorporate emissions from heavy-duty diesel crankcase ventilation and from extended idling (also known as "hotelling") – two emission processes that were relatively unstudied at the time MOBILE6.2 was developed. The incorporation of this additional data accounts for the increases in heavy-duty NOx and PM emissions reflected in MOVES2010. Emission differences in MOVES2010 are especially large for heavy-duty PM emissions because they reflect updated data on the effects of both speed and vehicle deterioration not previously available.

Q13. How are the changes in MOVES2010 expected to affect I/M program credit?

A13. In moving from MOBILE6.2 to MOVES2010 users will notice that the emission reductions estimated for individual I/M programs have gone down significantly between the two models. The magnitude of the difference depends upon the criteria pollutant and evaluation year being considered, the design of the I/M program, and local variables, such as fuel composition, average temperature, and the age distribution of the in-use fleet. The main reason for this reduced credit is the continuation of a previously observed trend toward improved, in-use vehicle durability first seen in MOBILE6.2 which is continued for MOVES2010. This is a "good news" story for the environment because it means that in-use, light-duty vehicles are continuing to stay cleaner longer than was previously thought to be the case. One side-effect of the continuation of this trend is that I/M programs (which reduce emissions by identifying cars in need of repair and getting them fixed) will continue to achieve less SIP credit than previously projected because there are fewer and fewer vehicles in need of repair than originally projected.

As part of its testing of MOVES2010, EPA modeled a typical I/M program including onboard diagnostic (OBD) testing on model year (MY) 1996 and newer vehicles and a

loaded-mode tailpipe test on MY1995 and older vehicles; this program was modeled for a 2008 evaluation year using both MOBILE6.2 and MOVES2010. For VOC and NOx, MOBILE6.2 estimated emission reductions from this I/M program of roughly 12% and 17% respectively compared to the no I/M case while MOVES2010 estimated reductions of approximately 5% and 10% from the same I/M program compared to the no I/M case. In other words, for a typical I/M program in 2008, MOVES2010 estimated approximately 40-60% fewer reductions than originally projected by MOBILE6.2. The difference between the two models only grows as a user models later evaluation years because while MOBILE6.2 projects a steady increase in percent I/M reductions for both VOC and NOx, MOVES2010 estimates a relatively constant 5% reduction in VOCs from I/M from 2008 through 2020, while it projects that NOx reductions from I/M drop from approximately 10% in 2008 to 6% in 2020. It should be noted, however, that this comparison is for illustration purposes only. As indicated above, the results for individual I/M program areas will vary significantly due to local variables, such as the design of the I/M program, local fuel composition, average temperature, and the age distribution of the in-use fleet.

Q14. How are the changes in emission rates in MOVES2010 expected to affect attainment demonstrations?

A14. The answer to this question depends upon the unique circumstances of each nonattainment or maintenance area. The emission comparisons depend very heavily on the pollutants of concern, the dates of concern, and on existing local control measures, traffic patterns, fleet age, and the mix of cars and trucks. In some cases, a change from MOBILE6.2 to MOVES2010 may result in increased emissions estimates, while in other cases it may result in decreased emissions estimates for various time periods.

Moreover, because of the complex chemistry and meteorology involved in air pollution, the implications of changes in highway vehicle emissions may not be clear until multiple years are examined and the new emissions levels are applied in an air quality model. Relative differences in emissions over time from MOBILE6.2 to MOVES2010 may be as important as, or more important than, differences between the two models in any one year. Therefore, MOVES2010 users should not immediately assume that increases or decreases in emissions in any single year imply the need for more or fewer SIP control measures until those changes in emissions have been put in the complete SIP context.

When considering how the transition from MOBILE6.2 to MOVES2010 may affect attainment demonstrations, the relative reduction in emissions between a base year and an attainment year is often more important than absolute increases or decreases in emissions. To give users an illustration of how transitioning to MOVES2010 could potentially affect such demonstrations, EPA has performed a comparison of MOVES2010 to MOBILE6.2 using local data for several different urban counties, varying the local data used by fleet age distribution, fraction of light- and heavy-duty VMT, local fuel specifications, meteorology, and other input factors. This preliminary comparison indicates significantly larger relative reductions in PM2.5 using MOVES2010 compared to MOBILE6.2 for all of the urban areas modeled and lower relative reductions of NOx. For VOCs, the results are

mixed, with MOVES2010 projecting higher relative reductions of VOCs in two out of three urban areas modeled, but lower relative reductions in at least one area. As the results for VOCs highlight, results will vary based on local inputs in a given nonattainment area, with local variations in fleet age distribution and composition having a significant influence on the final results.

An increase in emissions due to the use of MOVES2010 may affect an area's ability to demonstrate conformity for their transportation plan and/or transportation improvement program. Areas are encouraged, through the interagency consultation process, to consider if and how MOVES2010 may impact their future conformity determinations and discuss any concerns with the appropriate EPA Regional Office.

Q15. What do users need to know to run MOVES2010?

A15. Users who have participated in the MOVES training offered jointly by EPA and FHWA or who have practical experience with running the model in the form of Draft MOVES2009 will find that, although some new features have been added, their experience will apply well to using the official MOVES2010. In addition, EPA plans to work with FHWA to offer another round of training in support of the release of MOVES2010, including both on-site and webinar-based training. Information concerning these additional training opportunities will be posted on EPA's mobile source model web page at www.epa.gov/otaq/models/moves/index.htm as they are scheduled.

Concerning other recommended training, knowledge of the MySQL database query language is not necessary for simple runs, but it will give users greater flexibility to customize MOVES2010 outputs to meet their needs. For more advanced analyses such as official SIP and/or conformity submissions, it is highly recommended that modelers develop in-house MySQL skills as soon as possible. MySQL training is commercially available from a variety of vendors.

Q16. What are the minimum system requirements for running MOVES2010?

A16. EPA recommends the following minimum system specifications for running MOVES2010: processor – dual-core; memory – 1 GB RAM; storage – 40 GB; operating system: Windows XP or higher. As is often the case when running resource-intensive applications, a faster processor and more memory will allow MOVES2010 to perform user runs more quickly. See the "MOVES2010 User Guide" posted at http://www.epa.gov/otaq/models/moves/index.htm for more details on MOVES system requirements.