MARICOPA ASSOCIATION of GOVERNMENTS

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June 17, 2010

TO: Members of the MAG Air Quality Technical Advisory Committee

FROM: Doug Kukino, Glendale, Chair

SUBJECT: MEETING NOTIFICATION AND TRANSMITTAL OF TENTATIVE AGENDA

Thursday, June 24, 2010 - 1:30 p.m.
MAG Office, Suite 200 - Saguaro Room
302 North 1st Avenue, Phoenix

A meeting of the MAG Air Quality Technical Advisory Committee has been scheduled for the time and place noted above. Members of the Air Quality Technical Advisory Committee may attend the meeting either in person, by videoconference or by telephone conference call. Those attending by videoconference must notify the MAG site three business days prior to the meeting. If you have any questions regarding the meeting, please contact Chair Kukino or Lindy Bauer at 602-254-6300.

Please park in the garage underneath the building, bring your ticket, and parking will be validated. For those using transit, Valley Metro/Regional Public Transportation Authority will provide transit tickets for your trip. For those using bicycles, please lock your bicycle in the bike rack in the garage.

In 1996, the Regional Council approved a simple majority quorum for all MAG advisory committees. If the MAG Air Quality Technical Advisory Committee does not meet the quorum requirement, members who arrived at the meeting will be instructed a legal meeting cannot occur and subsequently be dismissed. Your attendance at the meeting is strongly encouraged. If you are unable to attend the meeting, please make arrangements for a proxy from your entity to represent you.

Pursuant to Title II of the Americans with Disabilities Act (ADA), MAG does not discriminate on the basis of disability in admissions to or participation in its public meetings. Persons with a disability may request a reasonable accommodation, such as a sign language interpreter, by contacting Jason Stephens at the MAG office. Requests should be made as early as possible to allow time to arrange the accommodation.

TENTATIVE AGENDA

	COMMITTEE ACTION REQUESTED
1. Call to Order	
2. Call to the Audience An opportunity will be provided to members of the public to address the Air Quality Technical Advisory Committee on items not scheduled on the agenda that fall under the jurisdiction of MAG, or on items on the agenda for discussion but not for action. Members of the public will be requested not to exceed a three minute time period for their comments. A total of 15 minutes will be provided for the Call to the Audience agenda item, unless the Air Quality Technical Advisory Committee requests an exception to this limit. Please note that those wishing to comment on action agenda items will be given an opportunity at the time the item is heard.	2. For information.
3. Approval of the May 25, 2010 Meeting Minutes	3. Review and approve the May 25, 2010 meeting minutes.
4. Draft 2010 MAG Conformity Analysis for the Draft FY 2011-2015 MAG Transportation Improvement Program and Draft Regional Transportation Plan 2010 Update The Draft 2010 MAG Conformity Analysis concludes that the FY 2011-2015 MAG Transportation Improvement Program (TIP) and Draft Regional Transportation Plan 2010 Update meet all applicable federal conformity requirements and are in conformance with the applicable air quality plans. Following a 30-day public review and comment period, a public hearing will be conducted on June 21, 2010 on the Draft TIP, Regional Transportation Plan 2010 Update, and Conformity Analysis. At the meeting, the comments received and the response to the public comments will be	4. Recommend approval of the Draft 2010 MAG Conformity Analysis for the Draft FY 2011-2015 MAG Transportation Improvement Program and Draft Regional Transportation Plan 2010 Update.

discussed. Please refer to the enclosed material.

5. <u>Update on Exceptional Events and MAG Five Percent Plan for PM-10</u>

On May 25, 2010, the Environmental Protection Agency (EPA) announced that it would not concur with the Arizona Department of Environmental Quality (ADEQ) documentation regarding four high wind exceptional events at the West 43rd Avenue monitor in 2008. The region will not have its first year of clean data and will not be in attainment by 2010. EPA has decided to disapprove the MAG Five Percent Plan for PM-10 for reducing dust pollution in the Valley. The decision, if made final, will have significant implications for the region, including a potential conformity freeze on the MAG $7 billion Transportation Improvement Program and the loss of federal highway funding.

Compelling information was found that the conditions in the riverbed and high winds were major contributors to the exceptional events. MAG and ADEQ staff worked vigorously to provide information and documentation to the EPA supporting the exceptional events. In addition, at the May 25th meeting, the EPA Region IX Administrator acknowledged that the EPA Exceptional Events Rule was flawed. Instead of accepting the ADEQ exceptional events documentation and MAG's technical analysis that the monitor readings were caused by high wind exceptional events, the EPA Region IX Administrator noted that he had to enforce the flawed rule.

At the EPA meeting, MAG was prepared to discuss a project involving Phoenix, Maricopa County and the U.S. Army Corps of Engineers to restore the riverbed near the West 43rd Avenue monitor to its native habitat. This project is viewed as a permanent, long-term solution to stabilize the riverbed. No

5. For information and discussion.

opportunity was given to discuss this option. The EPA issued its decision with no warning and no opportunity for our experts to review and provide comment on the EPA final technical support document regarding the EPA review of the exceptional events.

On May 26, 2010, the MAG Regional Council directed staff to bring recommendations to the MAG Regional Council Executive Committee on obtaining legal advice and suggested that staff work with the Governor and the Arizona Congressional Delegation to stay the action of EPA until EPA corrects its flawed policy. Please refer to the enclosed material.

6. CMAQ Methodologies

The purpose of the Congestion Mitigation and Air Quality Improvement (CMAQ) Program is to provide federal funding for projects designed to assist nonattainment and maintenance areas in complying with the National Ambient Air Quality Standards. The Maricopa Association of Governments has developed methodologies for quantifying emissions benefits and disbenefits and calculating the cost-effectiveness of proposed CMAQ projects. MAG has updated the CMAQ methodologies periodically since 1999 to address changes in federal guidance, new project types, and improved technical methods and assumptions.

At the last meeting, the MAG Air Quality Technical Advisory Committee requested a presentation on the CMAQ methodologies. The CMAQ methodologies are attached and a presentation will be given by MAG staff. Please refer to the enclosed material.

6. For information and discussion.

7. Lawsuit Filed Against the State for the Repeal of the Lottery Funds for the Transit

On June 14, 2010, the Arizona Center for Law in the Public Interest filed a lawsuit against

7. For information and discussion.

the State of Arizona for the repeal of the deposit of lottery funds into the Local Transportation Assistance Fund (LTAF). The lawsuit was filed in the U.S. District Court for the District of Arizona. The Center contends that the repeal constitutes a violation of an emissions standard or limitation under the Clean Air Act. The Arizona Center for Law in the Public Interest is requesting that the Court order the State to fully implement its commitment to deposit lottery funds into the LTAF as required by the carbon monoxide and PM-10 air quality plans. Please refer to the enclosed material.

8. Call for Future Agenda Items

The next meeting of the Committee has been tentatively scheduled for Thursday, July 29, 2010 at 1:30 p.m. The Chairman will invite the Committee members to suggest future agenda items.

8. For information and discussion.

MINUTES OF THE
MARICOPA ASSOCIATION OF GOVERNMENTS
AIR QUALITY TECHNICAL ADVISORY COMMITTEE MEETING

Tuesday May 25, 2010
MAG Office
Phoenix, Arizona

MEMBERS ATTENDING

Doug Kukino, Glendale, Chairman
Joe Gibbs for Gaye Knight, Phoenix, Vice Chair
Paul Lopez for Sue McDermott, Avondale
Elizabeth Biggins-Ramer, Buckeye
#Jim Weiss, Chandler
#Jamie McCullough, El Mirage
Kurt Sharp for Tami Ryall, Gilbert
Cato Esquivel, Goodyear
#Greg Edwards for Scott Bouchie, Mesa
#Maher Hazine for William Mattingly, City of Peoria
Larry Person, Scottsdale
#Antonio DeLaCruz, Surprise
Oddvar Tveit, Tempe
#Mark Hannah, Youngtown
Ramona Simpson, Queen Creek
*Walter Bouchard, Citizen Representative
*Corey Woods, American Lung Association of Arizona
Grant Smedley, Salt River Project
Brian O'Donnell, Southwest Gas Corporation
Mark Hajduk, Arizona Public Service Company
*Gina Grey, Western States Petroleum Association
*Randi Alcott, Valley Metro/RPTA
*Dave Berry, Arizona Motor Transport Association
*Jeannette Fish, Maricopa County Farm Bureau
*Russell Bowers, Arizona Rock Products Association
*Greater Phoenix Chamber of Commerce
Amanda McGennis, Associated General Contractors
*Spencer Kamps, Homebuilders Association of Central Arizona
#Mannie Carpenter, Valley Forward
Erin Taylor, University of Arizona Cooperative Extension
Beverly Chenausky, Arizona Department of Transportation
Leonard Montenegro for Diane Arnst, Arizona Department of Environmental Quality
*Wienke Tax, Environmental Protection Agency
Bob Downing for Jo Crumbaker, Maricopa County Air Quality Department
Duane Yantorno, Arizona Department of Weights and Measures
*Ed Stillings, Federal Highway Administration
*Judi Nelson, Arizona State University
Christopher Horan, Salt River Pima-Maricopa Indian Community

*Members neither present nor represented by proxy.
#Participated via telephone conference call.
+Participated via video conference call.

OTHERS PRESENT

Lindy Bauer, Maricopa Association of Governments
Julie Hoffman, Maricopa Association of Governments
Randy Sedlacek, Maricopa Association of Governments
Ranjith Dandanayakula, Maricopa Association of Governments
Dean Giles, Maricopa Association of Governments
Patrisia Magallon, Maricopa Association of Governments
Adam Xia, Maricopa Association of Governments
Matt Poppen, Maricopa Association of Governments
Feng Liu, Maricopa Association of Governments
Amy St. Peter, Maricopa Association of Governments
Stan Belone, Salt River Pima-Maricopa Indian Community
Greg Little, Salt River Pima-Maricopa Indian Community
Michele Mellott, Arizona Department of Weights and Measures
Joonwon Joo, Arizona Department of Transportation
Russell Van Leuven, Arizona Department of Agriculture
Mitch Wagner, Maricopa County Department of Transportation
Michael Milovanoviz, Soilworks
Scott DiBiase, Pinal County Air Quality
Shane Kiesow, City of Apache Junction
Steven Peplau, Arizona Department of Environmental Quality

1. Call to Order

A meeting of the MAG Air Quality Technical Advisory Committee was conducted on May 25, 2010. Doug Kukino, City of Glendale, Chair, called the meeting to order at approximately 1:30 p.m. Mark Hannah, Town of Youngtown; Mannie Carpenter, Valley Forward; Antonio DeLaCruz, City of Surprise; Maher Hazine, City of Peoria; Jim Weiss, City of Chandler; Jamie McCullough, City of El Mirage; and Greg Edwards, City of Mesa, attended the meeting via telephone conference call.

2. Call to the Audience

Mr. Kukino stated that according to the MAG public comment process, members of the audience who wish to speak are requested to fill out comment cards, which are available on the tables adjacent to the doorways inside the meeting room. Citizens are asked not to exceed a three minute time period for their comments. Public comment is provided at the beginning of the meeting for nonagenda items and nonaction agenda items. He noted that no public comment cards had been received.

3. Approval of the April 29, 2010 Meeting Minutes

The Committee reviewed the minutes from the April 29, 2010 meeting. Larry Person, City of Scottsdale, moved and Oddvar Tveit, City of Tempe, seconded and the motion to approve the April 29, 2010 meeting minutes carried unanimously.

4. Evaluation of Proposed CMAQ Projects for the Federal Fiscal Year 2010 Interim Year End Closeout

Dean Giles, MAG, presented the evaluation of proposed Congestion Mitigation and Air Quality Improvement (CMAQ) projects for the Federal Fiscal Year 2010 Interim Year End Closeout. He stated that MAG staff, in accordance with Federal CMAQ Program Guidance, has completed an evaluation of the proposed projects. Mr. Giles noted that the results for the project evaluation have been included in the packet that was provided to the Committee. He added that the projects are ranked in order of cost-effectiveness based on the total CMAQ funds requested for the project. Mr. Giles mentioned that the deadline for submitting project requests to MAG was April 19, 2010. He indicated that 27 projects requesting approximately $25.2 million were evaluated.

Mr. Giles stated that in the closeout process, projects primarily consist of requests to advance funds from a later year in the Transportation Improvement Program (TIP). He indicated that the closeout process also provides an opportunity to request additional funds and new projects. Mr. Giles referred to the attachment and noted that the Surprise project, SUR08-612, should be listed as a new project. He stated that potential projects need to be ready to go to bid by the end of the federal fiscal year. Therefore, the projects should be at a stage where they could quickly be advanced through the Arizona Department of Transportation (ADOT) project development process.

Mr. Giles stated that the recommendation by the Committee will be forwarded to the MAG Transportation Review Committee (TRC) for consideration in prioritizing the projects. He added that this process is consistent with the MAG Federal Fund Programming Principles. Mr. Giles mentioned that MAG is currently working with ADOT and the Federal Highway Administration to determine the available federal funds for the closeout. He mentioned recent rescissions and noted that the amount of funds for closeout is expected to be smaller than normal. Approximately $1 to $5 million may be available for closeout. Mr. Giles indicated that if $5 million became available, the proposed projects listed in the table through the Glendale project, GLN09-609 could be funded. He added that these

numbers are estimates and MAG is continuing to work on the amount of federal funds available. Mr. Giles stated that this item is for information, discussion and possible recommendation to forward the CMAQ evaluation to the May 27, 2010 MAG TRC meeting for use in prioritizing projects.

Brian O'Donnell, Southwest Gas Corporation, commented on the second Glendale project which is to upgrade traffic signal controllers. He inquired about the traffic benefit of the project. Mr. Giles responded that the controllers may have the capability to communicate with the Traffic Management Center. He added that the upgrades assist traffic by reducing vehicle delay at the intersection. Mr. O'Donnell inquired if there will be a change to the timing of the signals. Mr. Giles replied that the Traffic Management Center could potentially control the timing of the lights. Mr. O'Donnell inquired about the Glendale project for closed circuit television cameras. Mr. Giles responded that this project may involve relaying video images from the intersection back to the Traffic Control Center. He added that this project could reduce vehicle delay if there is an incident at the intersection.

Mr. O'Donnell commented on the Avondale project for construction of an Interim Traffic Operation Center. He asked why the project would be interim. Paul Lopez, City of Avondale, responded that the center is listed as interim since Avondale would be using an existing facility and bringing in the electrical equipment to operate the Traffic Operation Center. He added that ultimately, the Traffic Division would like to have its own facility on that land. Mr. Lopez stated that the City is trying to save on construction costs for an actual building by using the current facility to manage traffic operations. Mr. Lopez indicated that the City would most likely have to construct another building as they expand; however, the same electrical equipment would be used.

Mr. O'Donnell inquired about the Mesa project for video detection cameras. Mr. Giles responded that video detection is used in the same sense as closed circuit television. Greg Edwards, City of Mesa, agreed with Mr. Giles and added that the funds will be used for intersection monitoring.

Mr. Kukino inquired about the process for evaluating the project applications. Mr. Giles responded that it is an extensive process. He added that the evaluation of CMAQ projects begins at the time the cities submit the project applications. Mr. Giles indicated that MAG typically requests additional information which is an addendum sheet. This information is used to evaluate the proposed projects for estimated emission reductions. He mentioned that the modeling staff is currently using MOBILE6.2 to obtain the emission factors for the different years. Mr. Giles commented that MAG staff conducts an extensive process to evaluate projects and determine whether the emission reductions are reasonable for the type of project. He noted that the process takes several weeks.

Mr. Person asked when the table used to evaluate and identify the cost-effectiveness for projects was last updated. He discussed the column for emissions reduction weighted nitrogen oxides (NOx). Mr. Person added that the NOx numbers seem to skew the cost-effectiveness of the various projects when added with the total organic gases and particulate matter. He inquired about eliminating that column from the analysis. Mr. Person mentioned that this would not change the cost-effectiveness per metric ton immensely. He noted that only $1 to $5 million would be available for projects. Mr. Person added that the current table has the PM-10 measures on the bottom of the list; however, removing NOx may bring a few of those PM-10 measures to the top of the list. Mr. Giles responded that the total organic gases and NOx are evaluated since they are precursors for ozone. He noted that the region is a nonattainment area for ozone. Mr. Giles indicated that the CMAQ methodologies were last reviewed in April 2009. He stated that the methodologies were made available for public review and many comments were received. Mr. Giles mentioned that the methodologies set procedures for weighting

total organic gases, NOx and PM-10 equally. He added that the emission rates for these pollutants are not equal, but are weighted equally in the table.

Mr. Kukino inquired if Mr. Person would like to revisit the methodologies. Mr. Person stated that MAG does a good job of continually evaluating the information. He inquired about the next time the methodologies will be evaluated. Mr. Giles responded that EPA has released the new MOVES 2010 emissions model. Therefore, MAG anticipates evaluating the CMAQ methodologies for that model and potentially hold a workshop to receive comments at some point in the future. Mr. Person stated that the recommendation from the Air Quality Technical Advisory Committee should not necessarily follow cost-effectiveness. He noted that he was reviewing the air quality gains of the projects versus the cost-effectiveness. Mr. Person commented that the Avondale project has 1.29 kilograms per day of PM-10 emission reductions and will not be funded since it ranks low in terms of cost-effectiveness. He indicated that is a good reduction in PM-10 and wishes the project would be funded.

Cato Esquivel, City of Goodyear, commented on the ranking in the table. He stated that based on the overall emission reductions, there are several projects including Avondale with a much higher ranking than the Glendale project GLN09-609. Mr. Giles responded that the projects were ranked in order of cost-effectiveness, which is the third column from the right. He added that as the dollar amounts increase in the column, the projects are becoming less cost-effective. Mr. Esquivel stated that the total reductions in emissions for the Avondale project appears to be higher than the Glendale project; however, the cost-effectiveness for the Avondale project is also higher. Mr. Giles responded that for the cost-effectiveness, MAG staff evaluates the total CMAQ dollars that have been requested for the project. He indicated that the amount of funding requested for the Avondale project is $300,000 with a possibility of additional funding being requested. Mr. Giles mentioned that he would need to report back on this particular project. Mr. Esquivel commented that the request is for the design of a transit facility. He added that the $630,000 of CMAQ funds requested seems reasonable. Grant Smedley, SRP, inquired if the pollutants are multiplied by a factor to account for relative importance. Mr. Giles responded that is correct.

Mr. Kukino stated that the Committee has struggled with the ranking of CMAQ projects by cost-effectiveness versus total emission reductions. He added that if the Committee were to rank the projects by total emission reductions, less projects would be funded, and the projects could also result in a smaller impact. Mr. Kukino indicated that the purpose for ranking in the order of cost-effectiveness is to determine the most efficient and effective way for spending the funds. Lindy Bauer, MAG, stated that MAG is required to look at cost-effectiveness. She indicated that at a future meeting, MAG staff could review with the Committee the CMAQ methodologies and how the pollutants are weighted.

Joe Gibbs, City of Phoenix, moved to forward the CMAQ evaluation to the May 27, 2010 MAG Transportation Review Committee meeting for use in prioritizing projects. Mr. O'Donnell seconded the motion.

Mr. Smedley stated that he would like MAG staff to provide the Committee with a review of the CMAQ methodologies. He noted that he is a new member of the Air Quality Technical Advisory Committee and is not familiar with the process.

Amanda McGennis, Associated General Contractors, commented on the sequence of committee actions. She inquired why the Transportation Review Committee was listed twice. Mr. Giles

responded that with regard to CMAQ projects for the TIP, the role of the Air Quality Technical Advisory Committee is to forward the evaluation of the proposed CMAQ projects to the TRC and to rank the air quality projects to forward to the TRC. He indicated that there are typically two attachments provided to the Committee. Mr. Giles indicated that currently the requested action for the agenda item is just to forward the evaluation of proposed CMAQ projects to the TRC. Ms. McGennis stated that the sequence of committee actions are listed as follows: Air Quality Technical Advisory Committee, TRC and Modal Technical Advisory Committees, Management Committee, TRC, and Regional Council. She inquired if the projects are presented to the TRC twice. Mr. Giles responded that the TRC was inadvertently listed twice. The Transportation Policy Committee should be listed between the Management Committee and the Regional Council in the sequence of committee actions.

Mr. Kukino called for a vote on the motion to forward the CMAQ evaluation to the May 27, 2010 MAG Transportation Review Committee meeting for use in prioritizing projects. The motion carried unanimously.

5. Salt River Pima-Maricopa Indian Community Environmental Protection and Natural Resources Air Quality Program

Chris Horan, Salt River Pima-Maricopa Indian Community (SRPMIC), provided a presentation on their Air Quality Program. He noted that the program was originally established in 1998 and is one of the most mature programs in the Environmental Protection and Natural Resources Department. The activities of the program include controlling the air quality on the Community, especially local sources. Mr. Horan commented that regulations have been developed for addressing local sources. In addition, the program asserts tribal sovereignty and self determination.

Mr. Horan discussed the importance of the SRPMIC Air Quality Program and indicated that air has no artificial boundary. He added that the Salt River Pima-Maricopa Indian Community is subject to air flow through the Community where there is a sensitive population of children, elderly, and those with respiratory issues. Mr. Horan presented a map of the Community. He noted the locations of the Salt River-Pima Maricopa Indian Community, Fort McDowell Yavapai Nation and the Gila River Indian Community.

Mr. Horan commented that in 1998, SRPMIC began work to develop baseline data in order to track changes and identify sources and levels of local air pollution in the Community. He added that Stan Belone, Salt River Pima-Maricopa Indian Community, was instrumental in developing the baseline.

Mr. Horan presented the locations of the four monitoring sites that are within the Community. He added that the Senior Center site monitors PM-10, PM-2.5 and ozone; Red Mountain measures ozone; Salt River High School monitors ozone and PM-10; and the Lehi site measures ozone and PM-10. In addition to those four sites, the SRPMIC has a Differential Optical Absorption Spectrum (DOAS) site, which is located at the intersection of Loops 101 and 202, that measures air toxics. The air toxics monitored by the DOAS site, in cooperation with the Arizona Department of Environmental Quality (ADEQ), include mercury, xylene, benzene, ethyl benzene, formaldehyde, nitrogen dioxide, and toluene. Mr. Horan presented a visual of an air monitoring site which showed the filters for particulate matter, air intake, and meteorological data collection.

Mr. Horan discussed the Joint Air Toxics Assessment Project. He stated that this project was developed in cooperation with ADEQ, the Gila River Indian Community, and other partners. Mr.

Horan added that the DOAS site has measured air toxics for a full year. He noted that the project is now at the point were a risk assessment analysis is being performed. The goal is to create an early action risk reduction program. Mr. Horan commented that some of the sources of air pollution on the Community include mining and material processing, track out, agricultural land use, open burning and traffic on Loop 101 and Loop 202. He discussed the size of particulate matter relative to a human hair and fine beach sand.

Mr. Belone discussed the air quality trends on the Community. He presented a chart with the PM-10 annual means from 2002 to 2008 for three monitoring sites. He noted that the Senior Center is listed twice since one is a co-located site. Mr. Belone indicated that the High School site has monitored higher PM-10 levels since it moved in 2006 which could be attributed to the landscape in surrounding areas. Mr. Belone noted that the monitor moved approximately one-half mile. He also discussed the trends for the PM-2.5 annual means from 2003 to 2008. Mr. Belone presented the visibility impacts of a hazy day on Red Mountain.

Mr. Belone gave an overview of the annual fourth highest daily maximum eight-hour average ozone concentrations from 2003 to 2008 for the Senior Center, Red Mountain, Lehi, and High School sites. He also presented the last three-year average of the fourth highest daily maximum.

Greg Little, Salt River Pima-Maricopa Indian Community, discussed the Community outreach by the Air Quality Program. He added that the current methods of outreach include: Air Quality Index Communication Flagpoles, Air Quality website, and the Air Quality Advisory on the SRPMIC Intranet/email, which informs staff of the Community's air quality. Mr. Little described the Air Quality Index including the meaning of the colors and the level of health concerns. He showed a picture of the Air Quality Index flagpoles which are located in areas with sensitive populations. Mr. Little noted that there are five locations on the Salt River Pima-Maricopa Indian Community. He mentioned that a green flag indicates good air quality while a yellow flag indicates moderate air quality. Mr. Little added that signs are located near the flagpoles that explain the meaning of the different color flags. He commented on the Air Quality website and provided a link to the Committee. Mr. Little stated that the website features a webcam that provides live images of the air at the Red Mountain monitor. He also mentioned the School Bus Idling Program and added that the purpose of this program is to reduce children's exposure to diesel particulates.

Mr. Horan discussed the accomplishments of the Air Quality Program. He stated that one accomplishment for the Salt River Pima-Maricopa Indian Community was receiving the Treatment as a State Certification in 2008. He added that the Community is currently working on the Tribal Implementation Plan which entails developing ordinances that fit the needs of the Community. Mr. Horan discussed the different ordinances that the Community is currently preparing. He commented that the SRPMIC is also developing an enforcement and compliance section to the department. Mr. Horan mentioned that Mr. Little will be assisting in this section once the ordinances are in place. He showed a picture of the Treatment as a State formal recognition ceremony. Mr. Horan stated that the Air Quality Program staff will continue public education and awareness activities through district meetings, Tribal Council meetings, and door-to-door visits. He added that the elderly appreciate the door-to-door visits. Mr. Horan commented that the Salt River Pima-Maricopa Indian Community will also perform multimedia compliance inspections. He mentioned the staff who work in the Air Quality Program. Mr. Horan indicated that a copy of the presentation could be provided to those interested by email or through the MAG website.

Mr. O'Donnell expressed his appreciation for the steps SRPMIC is taking to improve air quality. He commented on the agriculture along Loop 101 and inquired about the enforcement for dust control in those areas. Mr. Horan responded that enforcement will come from the agriculture fugitive dust ordinance. He added that they are currently relying on good communication and the good will of Community members to help reduce the dust. Mr. Horan noted that Mr. Little visits with the individuals that are creating the dust problem and discusses the options. He indicated that the ordinance will not immediately solve the problem; however, it will be used as a comparing tool. Mr. Horan added that the ordinance will include all the different land uses. Mr. O'Donnell indicated that the problem is getting better and he appreciates the improvement.

Mr. Kukino inquired about the funding for the Air Quality Program. Mr. Horan responded that EPA has been providing tribal allocated funds to the Community since 1998. He added that the Community started receiving funds under the 103 grants, which are developing grants. Once the Community received the Treatment as a State determination, the Community began to receive funding through the 105 grants. He added that the SRPMIC receives approximately $250,000 to $260,000 for the program.

Mr. Kukino asked about the ordinances and when they will be completed. Mr. Horan responded that the Community is addressing agriculture, mining, and unpaved roads. He added that the right-of-way issues can make unpaved roads on the Community difficult to address. Mr. Horan noted that the Community is trying to integrate the issues into the ordinances. He mentioned open burning and the health issue to the people doing the burning. Mr. Horan commented on the Salt River Pima-Maricopa Indian Community Solid Waste Program which provides options other than burning.

Erin Taylor, University of Arizona Cooperative Extension, asked if the Community utilized the Best Management Practices to help with dust control for agriculture. Mr. Horan responded that the ordinances were based on the Best Management Practices to keep it consistent with what was being done outside the Community.

Mr. Kukino inquired if the Community used the rules of Maricopa County as a model when writing their rules. Mr. Horan responded that the Maricopa County Rules are a big advantage. He added that Maricopa County staff reviewed the Community's ordinances and provided comments and suggestions. Mr. Horan noted that the County's regulations are constantly changing. The Salt River Pima-Maricopa Indian Community works to keep up with the County in a way that fits the Community. Mr. Kukino inquired on the wind patterns and its effect on the SRPMIC. Mr. Horan responded that most of the particulate matter is from localized sources. He added that the ozone tends to flow from the downtown Phoenix area through the Community and up toward Fountain Hills along Highway 87. Mr. Horan referred back to the comment made by Mr. Belone were he indicated that the highest ozone concentrations are seen at the Red Mountain monitor, which is along Highway 87.

6. <u>Information Requested on Existing or Imminent Sustainability Efforts for Possible Sustainable Communities Planning Grant Program Application</u>

Amy St. Peter, MAG, provided an overview of the information requested on existing or imminent sustainability efforts for possible Sustainable Communities Planning Grant Program application. She stated that the purpose of her presentation is to inform the Committee about activities undertaken and to solicit feedback to determine the viability of a regional application to possibly be submitted through MAG for the Sustainable Communities Planning Grant Program. The U.S. Department of Housing and Urban Development (HUD) is partnering with the U.S. Department of Transportation (DOT) and

the Environmental Protection Agency (EPA) to offer the Program. She mentioned that the funding supports the creation of regional plans for sustainable development. Ms. St. Peter noted that MAG may be eligible to receive the funding. She indicated that this funding may position MAG well in the future if such plans become a requirement with the re-authorization of federal transportation funding.

Ms. St. Peter stated that an approximate $100 million is available nationally, with up to $5 million potentially available for large metropolitan areas. She added that a 20 percent match is required. Ms. St. Peter noted that it is anticipated that this grant process will be extremely competitive. She mentioned that many entities have expressed interest in the grant. Ms. St. Peter commented that the advance notice published by HUD in March did not define an eligible applicant. She added that MAG is working to determine who is the most appropriate applicant for the region. Ms. St. Peter commented that the advance notice also did not define a region which is part of the reason why the eligible applicant will be critical. She noted that the Pima Association of Governments (PAG) along with the Central Arizona Association of Governments (CAAG) are also considering this opportunity. Ms. St. Peter mentioned the possibility of applying as the Sun Corridor and added that there may be some synergies that could be maximized when applying together. She added that there may be benefits for applying independently as well.

Ms. St. Peter stated that in April, the MAG Regional Council Executive Committee requested that MAG staff collect information about this opportunity and weigh the pros and cons of applying independently or through a consolidated effort such as the Sun Corridor. She added that since then, MAG staff has convened meetings with community partners, member agencies, and the officers of the MAG technical Committees. The purpose of these meetings has been to collect information about current activities that are relevant to this grant. Ms. St. Peter added that the feedback received to date has indicated support for the submission of a consolidated effort through the Sun Corridor. She commented on addressing the impacts that the region would like to achieve through this plan. Ms. St. Peter indicated that one topic being discussed is the development of green jobs and housing along high capacity transit lines such as commuter rail, light rail, and the proposed intercity rail from Phoenix to Tucson. She mentioned that the feedback received at the meeting held with the technical Committee officers included: the importance of focusing on the entire region, to consider infill development, to specifically identify the impacts desired by the plan, and to leverage existing efforts proposed in the MAG FY 2011 Unified Planning Work Program.

Ms. St. Peter stated that there are many projects in the region which may impact the planning process for sustainability. She indicated that the Committee officers want to make sure that all the plans are being integrated together into one cohesive plan. Ms. St. Peter added that HUD also wants the region to build on existing housing plans, transportation plans, and environmental plans and bringing everything into one cohesive package. She indicated that HUD has also advised that they are focusing on partnerships. Ms. St. Peter mentioned that HUD is concerned with social equity and making sure that a variety of stakeholders are included in the planning process. She added that HUD also wants to ensure that the plan offers tangible results. In addition, HUD is also hoping that this process will be an ongoing funding source and will show early success from the first round of awards to maintain that funding source.

Ms. St. Peter mentioned the possibility of submitting a consolidated effort with PAG and CAAG. She added that MAG is seeking feedback on a consolidated effort and any activities that the Committee may be addressing or may want to address in the future may help to support this planning process. Ms. St. Peter noted that there will also be a presentation at the May 26, 2010 MAG Regional Council

meeting. The Notice of Funding Availability (NOFA) was scheduled to be released in mid April; however, many comments were received on the advance notice and it has been delayed until mid June. Ms. St. Peter commented that once the NOFA is released, the deadline for the grant is anticipated to be 60 to 90 days. She added that MAG is hoping to gather as much information as possible to be able to move quickly once the NOFA is released and potentially submit a competitive application on behalf of the region.

Mr. O'Donnell inquired about the other cities that are not included in the Sun Corridor. Ms. St. Peter responded that one of their priorities is to include the entire region including parts of the region that would not have high capacity transit. She added that there is a lot of different activities that can support the application. Ms. St. Peter indicated that the HUD application encompasses housing, transportation, air quality, water quality and a number of other efforts. She mentioned that MAG staff is gathering information from community partners and technical committees. Ms. St. Peter indicated that not every community will have high capacity transit; however, every community will be able to address sustainability in some way. She noted that MAG wants to make sure that the plan is reflective of all those different efforts.

Mr. O'Donnell referred to the SRPMIC and inquired about the Loop 101 corridor. Ms. St. Peter responded that MAG is looking at the possibility of increasing transit access to the tribes. She added that the recommendation came from one of the community partners, American Indian Policy Institute for ASU. She commented that the goal is an inclusive process and application.

Ramona Simpson, Town of Queen Creek, inquired about the input process for the HUD application. Ms. St. Peter responded that a planning inventory form has been provided to the Chair and Vice Chair of the MAG technical committees. She added that assistance is requested to inform MAG of the activities around the region that may be helpful in supporting the regional application. Ms. St. Peter indicated that the Committee members can provide activities from their city, town, or committee via phone or email by June 4, 2010 if possible.

Mr. Kukino stated that the planning inventory form is available in the agenda packet that was provided to the Committee. He added that the application has six basic sustainability principles. He noted that Gaye Knight, City of Phoenix, attended the Committee officers meeting. Mr. Kukino noted that the input includes keeping air quality consistent with housing, transportation, and economic development so they can occur without impacting the environment. If the Committee would like to make other statements please contact Ms. St. Peter.

Ms. Simpson commented on the CMAQ evaluation just discussed and added that many projects that did not get funded contribute to pollution reductions. She inquired if there would be any funding for these regional projects. Ms. St. Peter responded that the current opportunity being offered through HUD is for a planning process. She added that in the future, additional funding will be available to support the implementation of other projects that are proposed within the plans. Mr. Kukino inquired if the Sun Corridor included Tucson, Casa Grande area, and Phoenix. Ms. St. Peter responded yes. Mr. Kukino asked if this approach would be seeking cooperation from PAG and CAAG. Ms. St. Peter responded yes.

7. Call for Future Agenda Items

Mr. Person discussed the CMAQ process. Mr. Person mentioned that there may be opportunity for the air quality input to be more meaningful as it moves through the committee process. He requested

a discussion on the CMAQ process in a future meeting. Mr. Person indicated that he would like to see that any air quality concerns from this Committee be carried forward to the MAG Management Committee and Regional Council. Ms. Bauer mentioned that there is an established process outlined in the MAG Federal Fund Programming Principles. She added that a presentation on this report could be provided at a future meeting.

Mr. Kukino referred to a request from Beverly Chenausky, Arizona Department of Transportation, at a previous meeting. Ms. Chenausky mentioned an update on the diesel retrofit program and the congestion mitigation scores. Mr. O'Donnell requested an update on fuel efficiency standards. He added that models were based on old standards. Mr. O'Donnell inquired about the type of impacts that this would have on the ozone. Ms. Bauer responded that Mr. O'Donnell was referring to the tailpipe standards for greenhouse gas emission reductions that were released by EPA on April 1, 2010. She added that the administration has also ordered tighter standards for the medium and heavy duty vehicles. Ms. Bauer indicated that the new MOVES model has the capability to calculate greenhouse gas emission reductions from transportation. She indicated that EPA may be building the benefits of the new standards into the model. Ms. Bauer stated that MAG could provide a presentation on this issue.

Mr. Kukino indicated that another future agenda item may be electric vehicles and the related public charging stations that would be located along the Sun Corridor. He suggested a presentation from the consultant with the federal grant to provide an update. Ms. Bauer responded that MAG and PAG are partnering with ECOtality and Nissan on this project. She added that an update could be provided at a future meeting.

Mr. Kukino announced that the next meeting of the Committee has been tentatively scheduled for Thursday, June 24, 2010 at 1:30 p.m. With no further comments, the meeting was adjourned at 2:38 p.m.

Agenda Item #4

ON THE MOVE
PARTNERS IN PROGRESS

DRAFT
2010

CONFORMITY ANALYSIS

FOR THE FY 2011-2015 TRANSPORTATION IMPROVEMENT PROGRAM AND THE REGIONAL TRANSPORTATION PLAN 2010 UPDATE

REGIONAL TRANSPORTATION PLAN

EXECUTIVE SUMMARY

MAY 2010

MARICOPA ASSOCIATION of GOVERNMENTS

EXECUTIVE SUMMARY

This report presents the 2010 MAG Conformity Analysis for the FY 2011-2015 MAG Transportation Improvement Program (TIP) and the MAG Regional Transportation Plan 2010 Update (RTP). The Maricopa Association of Governments (MAG) is the designated Metropolitan Planning Organization (MPO) in Maricopa County, Arizona, and is responsible for regional transportation and air quality planning. The analysis demonstrates that the criteria specified in the federal transportation conformity rule for a conformity determination are satisfied by the TIP and RTP. A finding of conformity for the FY 2011-2015 MAG Transportation Improvement Program and MAG Regional Transportation Plan 2010 Update is therefore supported.

The 2010 MAG Conformity Analysis for the FY 2011-2015 MAG Transportation Improvement Program and the MAG Regional Transportation Plan 2010 Update includes results of the regional emissions analysis for carbon monoxide, eight-hour ozone, and PM-10. Summarized below are the applicable federal criteria or requirements for conformity determinations, the conformity tests applied, regional emissions analysis results, and an overview of the organization of this report. Figures presenting the conformity test results and transportation control measure funding in the FY 2011-2015 MAG Transportation Improvement Program are provided at the end of the Executive Summary.

CONFORMITY REQUIREMENTS

The federal transportation conformity rule (40 Code of Federal Regulations Parts 51 and 93) specifies criteria and procedures for conformity determinations for transportation plans, programs, and projects and their respective amendments. The federal transportation conformity rule was first promulgated in 1993 by EPA, following the passage of amendments to the federal Clean Air Act in 1990. The federal transportation conformity rule has been revised several times since its initial release to reflect both EPA rule changes and court opinions. The transportation conformity rule and court opinions are summarized in Chapter 1.

The conformity rule applies nationwide to "all nonattainment and maintenance areas for transportation-related criteria pollutants for which the area is designated nonattainment or has a maintenance plan" (40 CFR 93.102). At this time, portions of Maricopa County are designated as a nonattainment or maintenance area with respect to federal air quality standards for three criteria pollutants, carbon monoxide (CO), eight-hour ozone, and particulate matter less than or equal to ten microns in diameter (PM-10). Transportation plans and programs for the nonattainment or maintenance areas in the Maricopa County

area must satisfy the requirements of the federal transportation conformity rule. Under the federal transportation conformity rule, the principal criteria for a determination of conformity for transportation plans and programs are:

(1) the TIP and Regional Transportation Plan must pass an emissions budget test with a budget that has been found to be adequate or approved by EPA for transportation conformity purposes, or interim emissions tests;

(2) the latest planning assumptions and emission models in force at the time the conformity analysis begins must be employed;

(3) the TIP and RTP must provide for the timely implementation of transportation control measures (TCMs) specified in the applicable air quality implementation plans; and,

(4) consultation.

Consultation generally occurs at the beginning of the conformity analysis process, on the proposed models, associated methods, and assumptions for the upcoming analysis and the projects to be assessed, and at the end of the process, on the draft conformity analysis report. The final determination of conformity for the TIP and RTP is the responsibility of the Federal Highway Administration and the Federal Transit Administration.

CONFORMITY TESTS

The conformity tests specified in the federal transportation conformity rule are: (1) the emissions budget test, and (2) interim emissions tests. For the emissions budget test, predicted emissions for the TIP and RTP must be less than or equal to the motor vehicle emissions budget specified in the approved air quality implementation plan or the emissions budget found by EPA to be adequate for transportation conformity purposes. If there is no approved air quality plan for a pollutant for which the region is in nonattainment or no emissions budget found to be adequate for transportation conformity purposes, interim emissions tests apply.

On March 9, 2005, EPA published the final rule in the *Federal Register* approving the Carbon Monoxide Maintenance Plan, including the conformity budgets, effective April 8, 2005. On October 25, 2007, EPA published a notice in the *Federal Register* finding the VOC and NOx emissions budgets in the MAG Eight-Hour Ozone Plan adequate, effective November 9, 2007. In addition, on June 16, 2008, EPA published a notice in the *Federal Register* finding the PM-10 emission budget in the MAG 2007 Five Percent Plan for PM-10 adequate, effective July 1, 2008.

Chapter 1 summarizes the applicable air quality implementation plans and conformity tests for carbon monoxide, eight-hour ozone, and PM-10. For the 2010 MAG Conformity Analysis for the FY 2011-2015 MAG TIP and RTP, the emissions budget test was applied using the approved conformity budgets from the Carbon Monoxide Maintenance Plan. For

eight-hour ozone, the emissions budget tests were performed for volatile organic compounds (VOC) and nitrogen oxides (NOx) using the adequate conformity budget from the MAG Eight-Hour Ozone Plan. For PM-10, the emissions budget test was applied using the adequate conformity budget from the MAG 2007 Five Percent Plan for PM-10.

RESULTS OF THE CONFORMITY ANALYSIS

For the 2010 MAG Conformity Analysis, a regional emissions analysis was conducted for carbon monoxide, for the eight-hour ozone precursors (volatile organic compounds and nitrogen oxides), and PM-10 for the years: 2010, 2015, 2025, and 2031. All analyses were conducted using the latest planning assumptions and emissions models in force at the time the conformity analysis started on April 26, 2010. The major conclusions of the 2010 MAG Conformity Analysis are:

- For carbon monoxide, the total vehicle-related emissions associated with implementation of the TIP and Regional Transportation Plan for the analysis year 2010 are projected to be less than the approved 2006 emissions budget, and the emissions associated with implementation of the TIP and Regional Transportation Plan for the analysis years 2015, 2025, and 2031 are projected to be less than the approved budget for 2015. The applicable conformity test for carbon monoxide is therefore satisfied. The results of the regional emissions analysis for carbon monoxide are presented in Figure ES-1.

- For eight-hour ozone, the total vehicle-related volatile organic compound and nitrogen oxide emissions associated with implementation of the TIP and Regional Transportation Plan for the analysis years of 2010, 2015, 2025, and 2031 are projected to be less than the adequate 2008 emissions budgets. The applicable conformity tests for eight-hour ozone are therefore satisfied. The results of the regional emissions analysis for eight-hour ozone are presented in Figures ES-2 and ES-3.

- For PM-10, the total vehicle-related emissions associated with implementation of the TIP and Regional Transportation Plan for the analysis years of 2010, 2015, 2025, and 2031 are projected to be less than the adequate 2010 emissions budget. The conformity test for PM-10 is therefore satisfied. The results of the regional emissions analysis for PM-10 are presented in Figure ES-4.

- A review of the implementation status of TCMs in applicable air quality plans has indicated that the TIP and Regional Transportation Plan will provide for the timely implementation of the TCMs and there are no obstacles to the implementation of any TCM. The current status of TCMs identified in applicable air quality implementation plans is documented in Chapter 5 of this report. Figure ES-5 presents the total funding programmed in the TIP for transportation projects and programs that implement transportation control measures and other air quality measures.

- Consultation has been conducted in accordance with federal requirements.

REPORT ORGANIZATION

The report is organized into six chapters. Chapter 1 provides an overview of the applicable federal and state conformity rules and requirements, air quality implementation plans, and conformity test requirements. Chapter 2 contains a discussion of the latest planning assumptions. Chapter 3 includes a summary of the transportation model characteristics, key socioeconomic data, and other data related to the land use and transportation system forecasts, and Chapter 4 describes the air quality modeling used to estimate emission factors and mobile source emissions. Chapter 5 contains the documentation required under the federal transportation conformity rule for transportation control measures. The results of the conformity analysis for the TIP and Regional Transportation Plan are provided in Chapter 6.

Excerpts from the applicable air quality plans, consultation documentation, and other related information are contained in the Appendices. The appendices include copies of memoranda previously circulated for consultation. The appendices of the final version of this report will also include a transcript of the public hearing to be conducted on the draft report. Any comments received and responses made as part of the final 30-day consultation period on this draft report will also be included in the appendices.

Figure ES-1: Carbon Monoxide Results for Conformity Budget Test

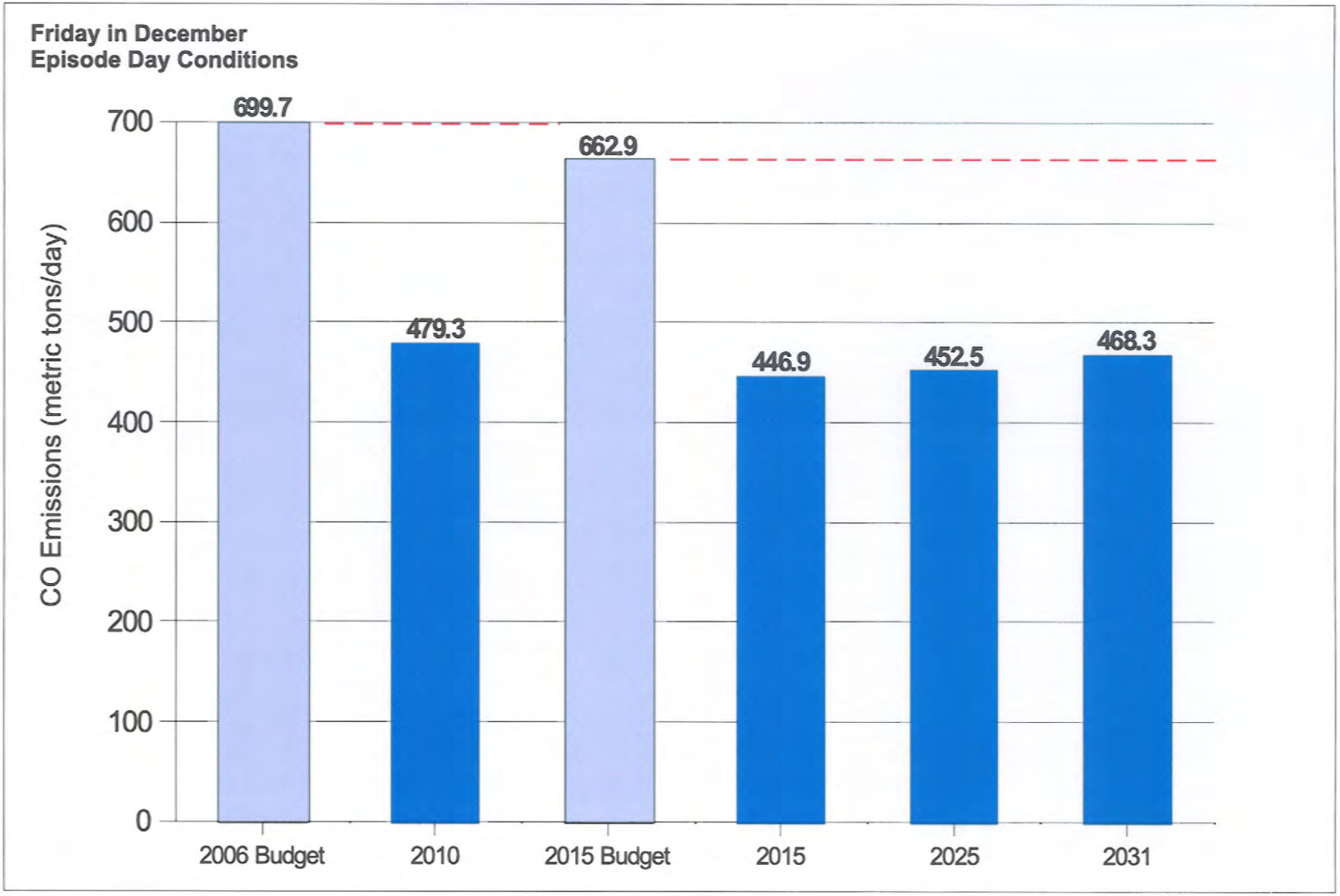


Figure ES-2: Eight-Hour Ozone: Volatile Organic Compounds (VOC) Results for Conformity Budget Test

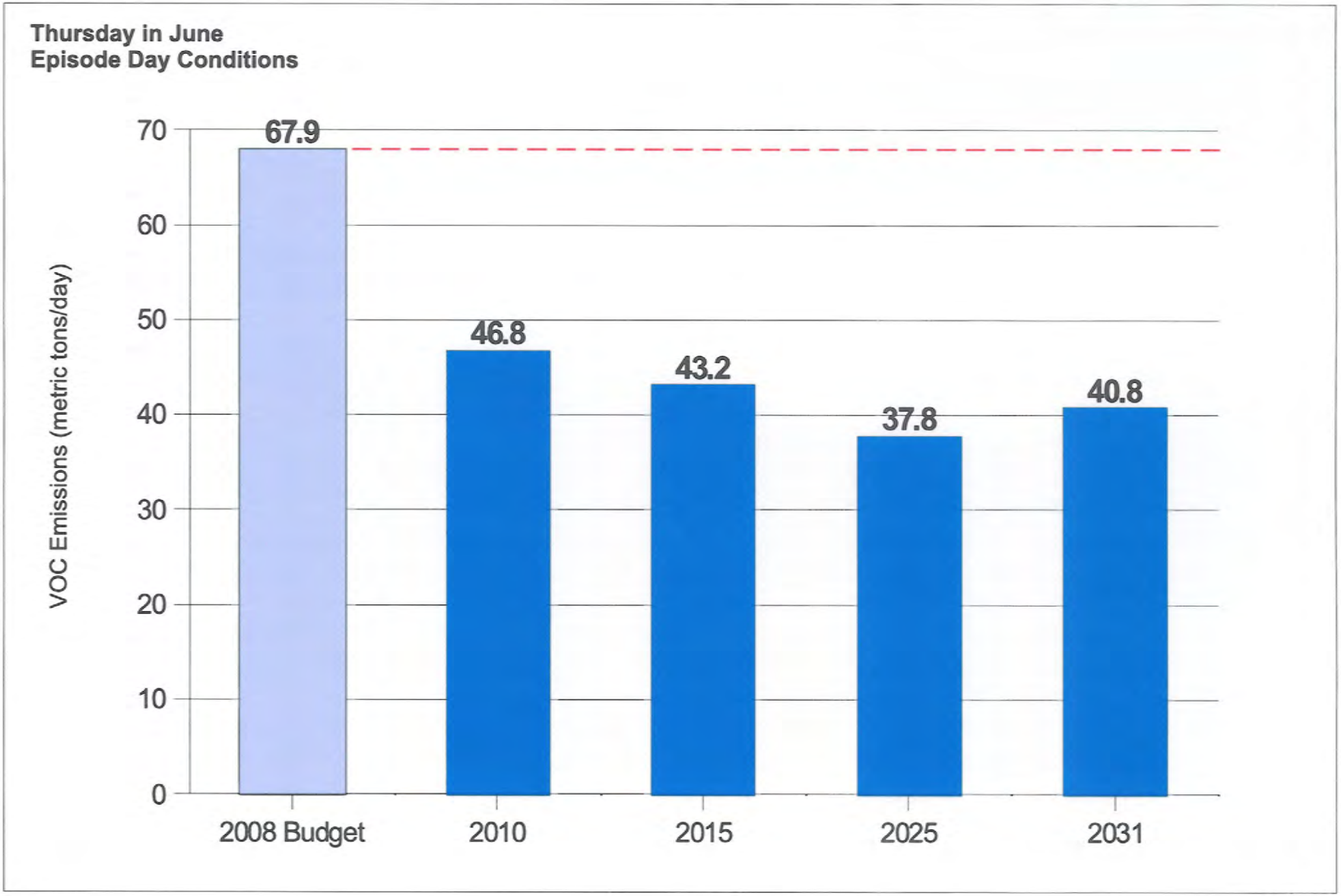


Figure ES-3: Eight-Hour Ozone: Nitrogen Oxides (NOx) Results for Conformity Budget Test

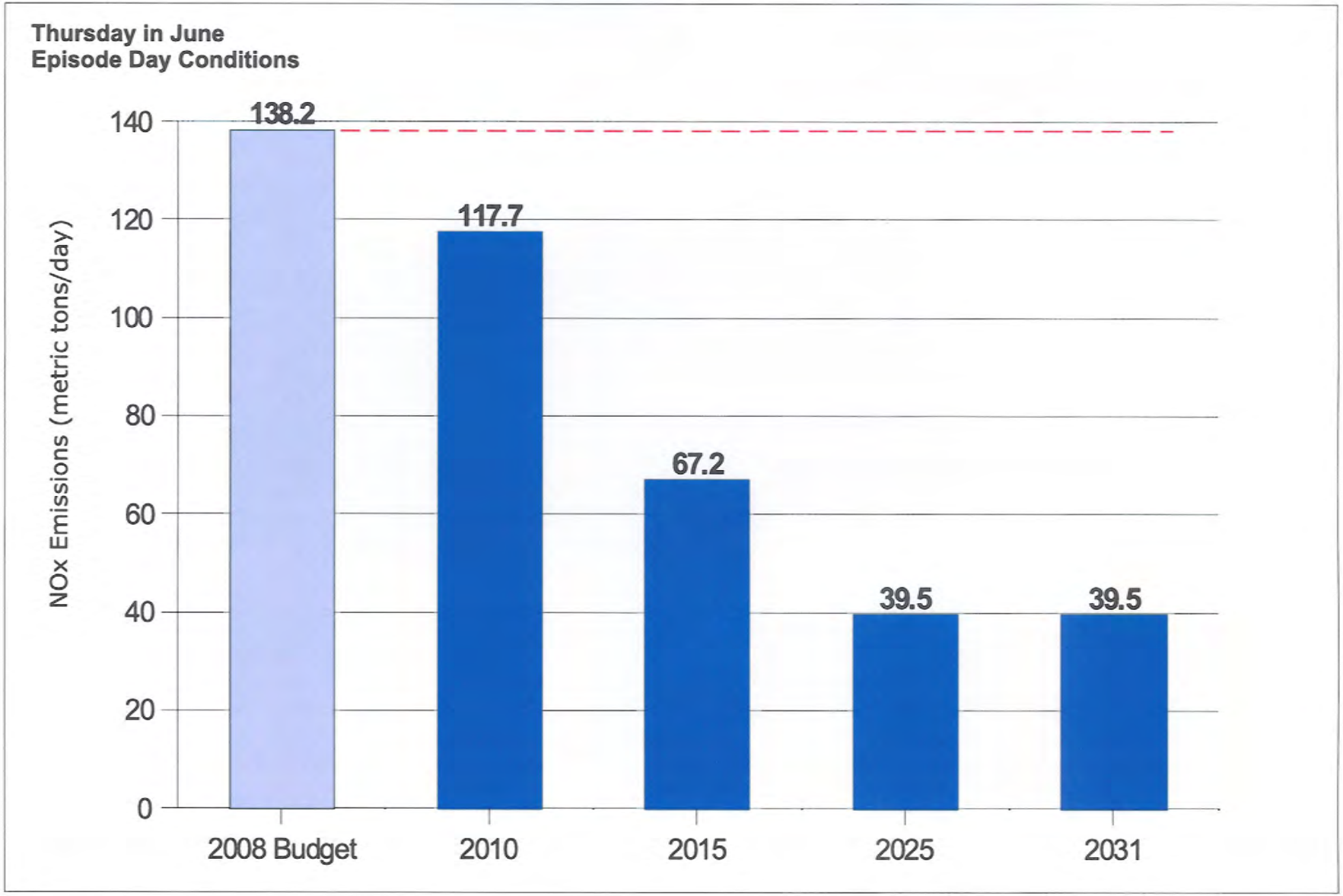


Figure ES-4: PM-10 Results for Conformity Budget Test

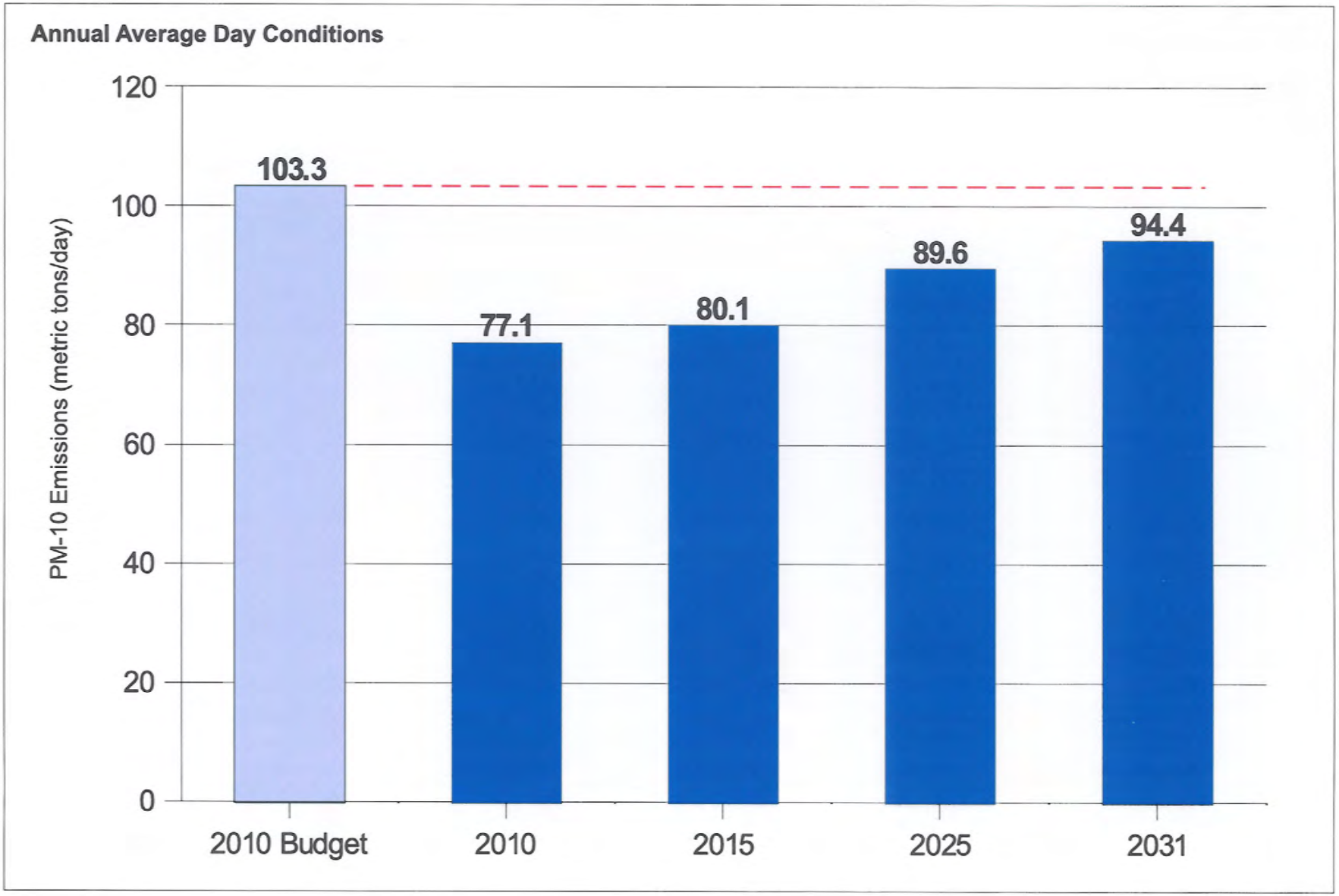
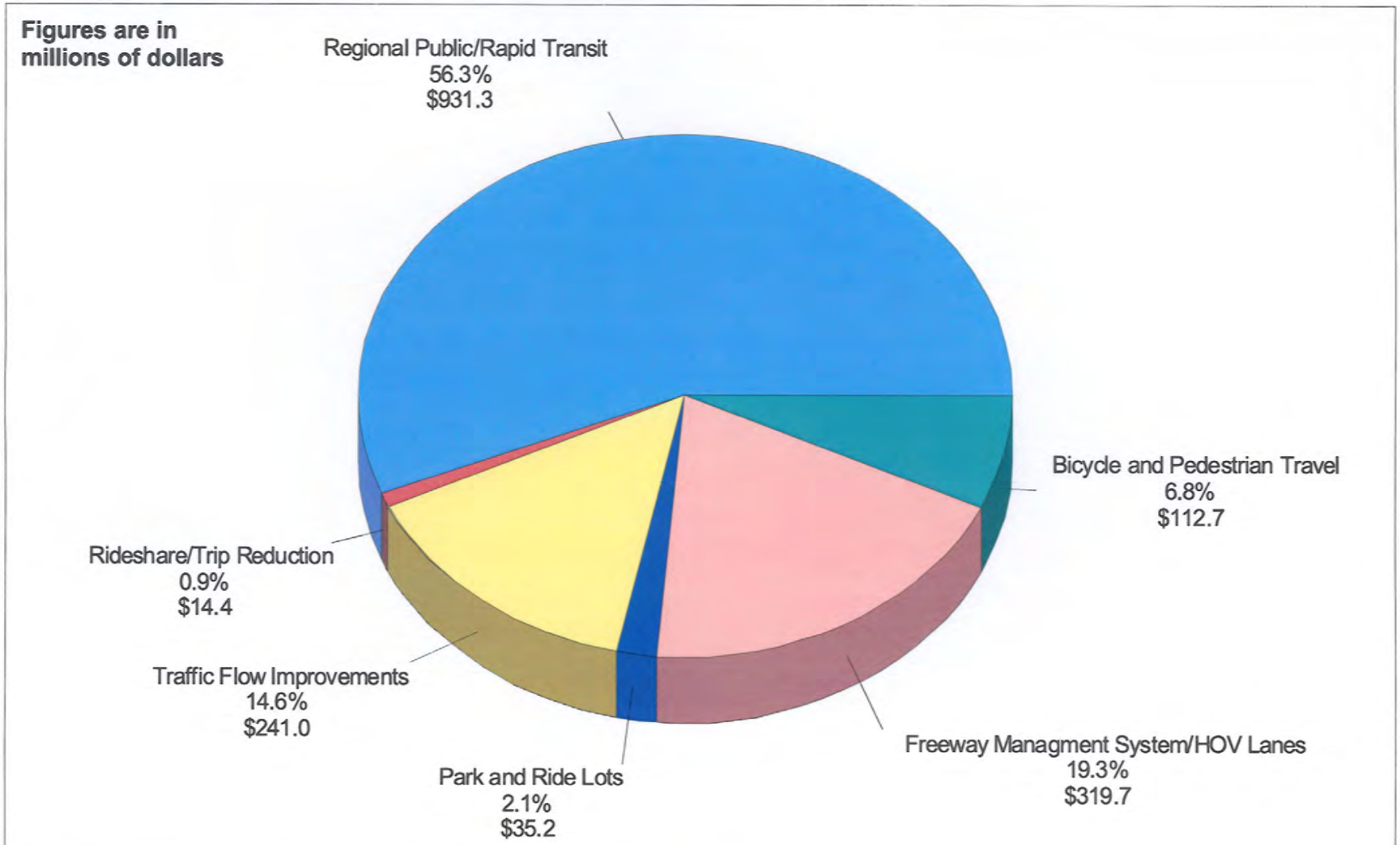


Figure ES-5: Transportation Control Measure Funding in the FY 2011-2015 MAG Transportation Improvement Program



Total Transportation Control Measure Funding in the TIP=$1,654 million
An additional $31 million is programmed for paving dirt streets and street sweepers.

Agenda Item #5

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

OFFICE OF THE
REGIONAL ADMINISTRATOR

May 21, 2010

Benjamin H. Grumbles, Director
Arizona Department of Environmental Quality
1110 W. Washington St.
Phoenix, AZ 85007

RE: PM_{10} National Ambient Air Quality Standard in Phoenix
Request for Concurrence for Treatment as "Exceptional Events"

Dear Mr. Grumbles:

This letter responds to the Arizona Department of Environmental Quality (ADEQ) submittals regarding exceedances of the PM_{10} National Ambient Air Quality Standard (NAAQS) at the W. 43rd Ave. monitor in Phoenix on the following days in 2008: March 14, April 30, May 21, and June 4. ADEQ has requested that EPA exclude these exceedances from consideration when determining whether the Phoenix area is on track to comply with the PM10 NAAQS by the end of 2010.

Our response to ADEQ's request is governed by the "Treatment of Data Influenced by Exceptional Events" rule (72 FR 13560, March 22, 2007). After careful consideration of the information provided, we have decided to disapprove ADEQ's request to treat these exceedances as due to exceptional events. The basis for our decision is set forth in the enclosed technical support document.

If you have any questions or wish to discuss this matter further, please have your staff contact Deborah Jordan, Director of the Air Division at (415) 947-8715.

Sincerely,

Jared Blumenfeld
Regional Administrator

Enclosures

cc: Dennis Smith, Executive Director, Maricopa Association of Governments
Max Porter, Acting Director, Air Quality, Department, Maricopa County
Philip McNeely, Environmental Programs Manager, City of Phoenix
Ira Domsky, Acting Air Quality Division Director, ADEQ

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Agenda Item #5

Review of Exceptional Event Request

Maricopa County, AZ

24-Hour PM_{10}

- March 14, 2008
- April 30, 2008
- May 21, 2008
- June 4, 2008

U.S. Environmental Protection Agency
Region 9

May 12, 2010

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1.0 Introduction

On March 22, 2007, EPA adopted the *Treatment of Data Influenced by Exceptional Events,*[1] also known as the Exceptional Events Rule (EER), to govern the review and handling of certain air quality monitoring data for which the normal planning and regulatory processes are not appropriate. Under the terms of the EER, a state may request EPA to exclude data showing exceedances or violations of the National Ambient Air Quality Standard (NAAQS) that are directly due to an exceptional event from use in determinations by demonstrating to EPA's satisfaction that such event caused a specific air pollution concentration at a particular air quality monitoring location.[2] Before EPA will exclude data from these regulatory determinations, the state must flag the data in EPA's AQS database and, after notice and an opportunity for public comment, submit a demonstration to justify the exclusion. After considering the weight of evidence provided, EPA will determine if the demonstration satisfies all the requirements of the EER and either concur or nonconcur with the state's request.

On June 30, 2009, the Arizona Department of Environmental Quality (ADEQ) submitted to EPA a preliminary demonstration for exceedances that occurred at various monitoring locations throughout Arizona on 27 separate days in 2008, including five at the West 43rd monitoring site located in southwestern Phoenix. On November 17, 2009 ADEQ submitted final demonstrations for twelve of these exceedances, including five at the West 43rd site.[3]

This document sets forth the legal and factual basis for EPA's decision regarding four exceedances of the 24-hour PM_{10} NAAQS in 2008 at the West 43rd monitoring site on March 14, April 30, May 21, and June 4, 2008 that ADEQ has flagged as "high wind" exceptional events.[4] EPA has not yet completed its analysis of the remaining dates and is not making a concurrence or non-concurrence determination for them at this time.

The documentation submitted by ADEQ and considered by EPA in support of the exceptional events claims includes the following:

- Assessment of Qualification for Treatment under the Arizona Natural and Exceptional Events Policy for the High Particulate (PM_{10}) Concentration Events in the Phoenix Area on March 14, 2008 (March 14 Assessment);
- Assessment of Qualification for Treatment under the Arizona Natural and Exceptional Events Policy for the High Particulate (PM_{10}) Concentration Events in the Phoenix Area on April 30, 2008 (April 30 Assessment);

[1] 72 FR 13560-13581, March 22, 2007.
[2] 40 CFR §50.14 (a).
[3] On March 17, 2010 EPA received a draft-supplemental report titled "Assessment of Qualification for Treatment Under the Federal Exceptional Events Rule: High Particulate (PM_{10}) Concentration Events in the Phoenix and Yuma Areas on June 4th, 2008." Information presented in this document will be considered in EPA's concurrence/non-concurrence decision for the claimed event that occurred on June 4, 2008. EPA has not received additional information concerning the other three events we are reviewing in this document.
[4] The West 43rd monitor also measured a fifth exceedance on November 9, 2008; EPA is not reviewing this event at this time.

- Assessment of Qualification for Treatment under the Arizona Natural and Exceptional Events Policy for the High Particulate (PM_{10}) Concentration Events in the Phoenix Area on May 21, 2008 (May 21 Assessment);
- Assessment of Qualification for Treatment under the Arizona Natural and Exceptional Events Policy for the High Particulate (PM_{10}) Concentration Events in the Phoenix Area on June 4, 2008 (June 4 Assessment);
- The Impact of Exceptional Events "Unusual Winds" on PM_{10} Concentrations in Arizona (Unusual Winds White Paper);
- High Wind Exceptional Events and Control Measures for PM_{10} Areas (Controls White Paper); and
- DRAFT – Supplemental Report: Assessment of Qualification for Treatment under the Federal Exceptional Events Rule: High Particulate (PM_{10}) Concentration Events in the Phoenix and Yuma Areas on June 4, 2008 (June 4 DSR).

2.0 Summary of the Events

In 2008, there were seventeen PM_{10} monitoring sites operating in Maricopa County, ten of which use continuous PM_{10} analyzers that produce hourly data. During 2008, the West 43rd monitoring site, which measures PM_{10} with a continuous analyzer,[5] measured five exceedances of the 24-hour PM_{10} NAAQS, four of which are reviewed in this document.[6] ADEQ has claimed that the exceedances at the West 43rd site resulted from the transport of dust from soils by high winds, the high wind event was a regional phenomenon that affected the entire Phoenix area, and the events were the result of the transport of dust and soils from high winds that suspended natural soils and soils from areas where BACM was in place.[7]

Table 1: West 43rd 2008 PM_{10} Exceedances

Date	PM_{10} (ug/m^3)	Weather Condition	Wind Direction
March 14	251	Low Pressure Trough	W
April 30	173	Frontal System Passage	WSW
May 21	279	Frontal System Passage	W
June 4	194	Frontal System Passage	WSW

3.0 Requirements of the Exceptional Events Rule

Pursuant to 40 CFR §50.14(c)(3)(iii) a request for EPA's concurrence on an exceptional event flag must be accompanied by a demonstration that:

(A) The event satisfies the criteria set forth in 40 CFR §50.1(j) that it:
1. affects air quality;
2. is not reasonably controllable or preventable;

[5] All of the continuous analyzers in Maricopa County, including the analyzer at West 43rd, are Thermo Scientific TEOM 1400AB analyzers with EPA FEM designation number EQPM-1090-079.
[6] EPA is not analyzing the exceedance on November 9, 2008 at this time.
[7] March 14, April 30, May 21, and June 4 Assessments at p.4.

3. is caused by human activity that is unlikely to recur at a particular location, or is a natural event;
4. does not include stagnation of air masses or meteorological inversions, a meteorological event involving high temperatures or lack of precipitation, or pollution relating to source noncompliance;

(B) There is a clear causal relationship between the measurement under consideration and the event that is claimed to have affected the air quality in the area;

(C) The event is associated with a measured concentration in excess of normal historical fluctuations, including background; and

(D) There would have been no exceedance or violation but for the event.

The demonstrations must fully meet all the above criteria to EPA's satisfaction; failure to meet any one of the criteria will result in the non-concurrence of the event in question.. In addition to the technical criteria, the EER also has procedural requirements. 40 CFR §50.14(c)(2)(iii) requires that data claimed to be due to an exceptional event must be flagged in the AQS database, and that an initial description of the event be provided to EPA; both must occur by July 1 of the year following the event. In addition, 40 CFR §50.14(c)(3)(i) requires that the State:

- submit a demonstration to EPA within three years of the calendar quarter of the event or 12 months prior to an EPA regulatory decision;
- provide notice and opportunity for public comment; and
- submit any public comments along with the demonstration.

EPA's concurrence or non-concurrence with a State's flag constitutes its agreement or disagreement with the State on whether the data should be excluded from regulatory decisions involving a State's compliance with the NAAQS. EPA's determination regarding a State's attainment status or action on a state SIP submission will be issued in a rulemaking which is a final agency action that is judicially reviewable under CAA section 307(b)(1).

The following sections evaluate ADEQ's assessments of March 14, April 30, May 21, and June 4, 2008 with respect to these requirements.

4.0 Criteria Set Forth in 40 CFR §50.1(j)

4.1 Affect Air Quality

As stated in the preamble to the EER, the event in question shall be considered to have affected air quality if it can be shown that there is a clear causal relationship between the monitored exceedance and the event (section 5.0), and that the event is associated with a measured concentration in excess of normal historical fluctuations (section 6.0).[8]

[8] 72 FR 13569, 72 FR 49051, and 73 FR 14702.

4.2 Reasonably Controllable or Preventable

A determination of whether a particular event was "not reasonably controllable or preventable" depends on the specific facts and circumstances surrounding the event. Therefore, EPA addresses this and the other criteria of the EER on a case by case basis.

This factor of the analysis should consider whether anthropogenic sources contributing to the exceedance caused by the event were reasonably controlled.[9] ADEQ's supporting documentation, however, did not specifically identify the type or location of the possible contributing sources in the area, other than the Salt and Gila River channels, located upwind of the West 43rd monitoring site.. Although the June 4 DSR identifies that the alluvial channels located upwind of the West 43rd monitor most likely significantly contributed to the exceedance at West 43rd site, ADEQ did not evaluate whether emissions from those sources were reasonably controllable or preventable.

The June 4 DSR included a table titled, "Rules Regulating Particulate Matter Emissions in Maricopa County," which includes the rule number, title, and a brief description of the general sources that the rule is designed to control. Without addressing the types, and locations of sources in the area, however, it is not possible to evaluate whether sources in the area were reasonably controlled.

4.3 Human Activity/Natural Event

The term "natural event" is defined at 40 CFR §50.1(k) as "an event in which human activity plays little or no direct causal role." As described in the preamble to the EER, high wind events may qualify as exceptional events if the following conditions are met: the wind speed associated with the event is "unusual for the affected area during the time of year that the event occurred," and, in instances where wind produces emissions from anthropogenic sources, all reasonable and appropriate measures must be in place for all contributing sources.[10] An event that was caused by human activity, but is unlikely to recur at a given location may be considered an exceptional event assuming all other requirements of the rule are met.

ADEQ's Assessments briefly discussed the various source categories in the area, including industrial sources, construction, area sources (unpaved parking lots and shoulders), roads, track out, and windblown dust. According to ADEQ, the windblown dust category includes significant contribution from the following sources: agriculture, alluvial channels, vacant lots, construction, industrial, disturbed areas, and stockpiles. In addition, EPA has identified, through satellite images and visits to the area, numerous anthropogenic sources in the area that could contribute to elevated PM_{10} concentrations. The commercial nature associated with many of these activities indicates that some portion of them can be reasonably expected to recur.

To establish that the exceedances at the West 43rd site may properly be classified as "natural events," the data must support a finding that "human activity plays little or no direct causal

[9] EER Preamble, 72 FR 13566, n. 11.
[10] EER Preamble, 72 FR 13566.

role."[11] ADEQ's Assessments of the four exceedances did not analyze potential contribution from anthropogenic sources. The Controls White Paper states that because of "the relative complexity of the emitting source mix, parsing out a specific source or source category along with the applicable control measures for a determination of relative effectiveness can be difficult and may even be counter-productive." ADEQ's Assessments also stated that "no specific emission allocation is possible based on the data for analysis" and that "the primary source appears to be wind-blown dust over central Arizona for which there is not an effective or efficient method to estimate the relative contributions from specific sources."[12]

The lack of analysis regarding anthropogenic contribution upwind of the West 43rd site makes it difficult to determine the contributing role of human activity to the exceedances at the West 43rd site, particularly where it is known that commercial activities such as agriculture, sand and gravel mining and construction are known to take place.

EPA notes that the EER did not set a specific threshold to define a "high wind event,"[13] but suggested the use of a comparison of wind speeds measured on the event day to be compared to historical wind speed levels "for the season of the year that the event occurred."[14] The analysis that supports ADEQ's definition of "unusual" wind was based on data from 2005 through 2009 for the entire year period and was only analyzed for four monitoring sites (Buckeye, West 43rd, Durango Complex, and Higley). The use of a complete year of data in this situation rather than the season during which the events occurred likely biases the statistical analysis low. The Phoenix area experiences more consistent elevated wind speed levels associated with frontal passages during the months of March through June.

Conclusions drawn from this analysis suggest that wind speeds that occur less than 5% of the time should be considered "unusual" for exceptional events purposes. For the West 43rd monitoring station, this standard would correspond to sustained hourly wind speeds greater than 10 mph and wind gusts[15] greater than 20 mph. ADEQ's documentation did not provide any specific analysis pertaining to certain hours of the day and there is no discussion of the wind speeds that are associated with the event and their relationship to the 95th percentile. While wind speeds above the 95th percentile may seem unusual, the frequency of occurrence of hourly wind speeds over 10 mph at this site is approximately 100 days per year.[16]

The Unusual Winds White Paper further stated that "unusual winds can be defined as any wind that has the ability to create windblown dust." ADEQ's definition could be interpreted to treat all windblown PM_{10} as exceptional as long as the wind speeds are about the threshold friction velocity for that area. Threshold wind speeds provide a minimum baseline for wind speeds that are capable of producing windblown dust and are based on particle interaction on the ground surface, while "high" and "unusual" wind speed definitions should be based on a separate analysis. Thus, although this evidence may contribute to the exceptional analysis, it should not

[11] 40 CFR §50.1(k)
[12] March 14, April 30, May 21, and June 4 Assessments at p.4.
[13] EER Preamble 72 FR 13577.
[14] Id. at 13566.
[15] Wind gusts from Maricopa County stations are 1-sec maximum wind speed value for the hour.
[16] Based on data from 2007-2009.

be a major deciding factor when determining whether wind speed associated with an exceptional event is "unusual."

In summary, considering the limited analysis on the elevated wind speeds associated with the event combined with little analysis of possible contributing sources located directly upwind of the West 43rd site, EPA has determined that ADEQ's documentation did not provide sufficient evidence to support that the events in question should be considered "natural events" as required under the EER.

4.4 Stagnation of Air Masses/Inversions/High Temperature/Lack of Precipitation/Source Noncompliance

ADEQ did not provide any evidence suggesting that the exceedances at the West 43rd monitoring site were the direct result of stagnation of air masses, inversions, high temperature, or lack of precipitation. Regarding source noncompliance, ADEQ states that, "no local sources were reported as significantly contributing to the air quality episode" for all days except June 4. This statement assumes that because there were no observations made (i.e. there were no reported civilian complaints or enforcement actions), that all sources in the area were in compliance with all applicable fugitive dust control measures.

The June 4 assessment explained that there were two Notice of Violations (NOV) issued on June 4 and June 5 for noncompliance with Maricopa County's (MCAQD) fugitive dust rules. The June 4 DSR also states that "one complaint based inspection of a dust control permit on June 4... resulted in a Notice of Violation (NOV) for track-out under Rule 310" and on June 5 "an inspection of a Rule 316 source resulted in the issuance of a notice of violation for failure to install a wheel washer." Both of the NOVs were issued to sources that are located within a two mile radius of the West 43rd monitoring site, but the specific locations of these facilities were not identified in the June 4 assessment or DSR. The NOVs provide some evidence that nearby sources may not have been reasonably controlled during the time of the event.

5.0 Clear Causal Relationship

In order for EPA to concur with an exceptional event request, the EER requires the State to demonstrate that there is a clear causal relationship between the measurement under consideration and the event that is claimed to have affected air quality in the area. 40 CFR §50.14(a)(2); 40 CFR §50.14(c)(3)(iii). To address this element for "high wind events," such as those flagged by Arizona, the state should reasonably consider the relationship between an event, the PM_{10} emissions caused by unusually high winds, and a measured exceedance at a monitoring site. Arizona's Assessments included various data points relevant to this analysis. EPA's technical review also considered additional data regarding wind speed and direction, PM_{10} concentration, and visibility.[17]

As a preliminary matter relevant to this issue, EPA notes that ADEQ's limited analysis of the potential sources that might have contributed to the exceedances at the West 43rd site (sections

[17] Appendix A contains pollution roses based on % total PM_{10} mass for all four of the events in question.

4.2 and 4.3) makes it difficult to comprehensively evaluate the causal relationship between the event and the exceedance. Another general point concerns the data provided by Arizona for each event. EPA notes that, for each of the four events reviewed in this document, Arizona provided different sets of PM_{10} data drawn from among the ten monitoring stations using continuous analyzers. EPA also notes that Arizona provided a different set of meteorological data for each event. Considering the four events discussed in this document are very similar in nature, it is unclear why ADEQ did not provide the same data for each event. In some instances the most relevant meteorological data, (those data from the closest or upwind locations) are not included in the supporting documentation.[18]

5.1 March 14, 2008

5.1.1 Correlation between Wind Speed and PM_{10}

The March 14 Assessment included tabular hourly and maximum wind speed and PM_{10} data for five monitoring sites in the Phoenix area: West 43rd, Durango Complex, West Phoenix, Coyote Lakes, and Central Phoenix. ADEQ also included meteorological data from three National Weather Service (NWS) stations: Goodyear Airport, Glendale Airport, and Phoenix Sky Harbor.[19] EPA notes that ADEQ did not provide hourly PM_{10} data from the other four continuous PM_{10} analyzers in the Phoenix area and did not include wind speed and direction data from numerous other meteorological stations in the Phoenix area.

ADEQ also provided four graphs that show the potential correlation between maximum wind speeds and PM_{10} concentrations at the West 43rd, Durango Complex, Greenwood, and South Phoenix monitoring sites. [20] The graphs show that hourly PM_{10} concentrations increase with an increase in maximum recorded wind speed at the West 43rd site, but not at the other three monitoring sites. In fact, the graphs show that the maximum wind speeds at the Durango Complex site were higher than those measured at the West 43rd site, but the Durango Complex site experienced significantly lower PM_{10} values during periods of elevated wind speed. These data suggest that the elevated PM_{10} concentrations at the West 43rd site may have been caused by local upwind sources and were not due to a high wind event that was regional in nature.

5.1.2 Visibility

The March 14, Assessment included photographs from numerous locations throughout the Phoenix area. Unfortunately, there is not a significant discernable difference between the conditions preceding and during the event. Therefore, the photographs do not significantly

[18] Table 1 in Appendix A identifies the PM_{10} and meteorological stations ADEQ used in their analysis of the 2008 exceptional events in question.

[19] ADEQ also included meteorological data from two AZMET stations. These data are collected at 3 meters, while NWS and Maricopa County data are collected at 10 meters. There does not seem to be any correction or adjustment for the difference in the heights of these stations.

[20] The max wind speed values used in this comparison are the instantaneous max wind speed values recorded by onsite data loggers, which have the capability of recording these instantaneous values in a fraction of a second. ADEQ does not explain why the use of the maximum 1-sec value for an hour is the appropriate measure for comparison to hourly average PM_{10} values.

contribute to establishing a causal relationship between wind speed, potential contributing sources, and PM_{10} concentrations at the West 43rd site.

The March 14 Assessement also stated that reduced visibility during the event throughout portions of the Phoenix provides further evidence of a clear causal relationship between the high wind event and the measured exceedance at the West 43rd site. The visibility at Goodyear Airport before the event ranged from 60 to 20 statute miles, while during the time of the elevated PM_{10} concentrations at West 43rd the visibility ranged from 15 to 10 miles. Other NWS stations in the area did not record any decrease in visibility throughout the entire day: visibility at Glendale Airport remained at 20 miles, Sky Harbor remained at 10 miles, and Luke Air Force Base remained at 10 miles. Visibility throughout the day in the Phoenix area was never significantly reduced; thus, this information does not significantly contribute to establishing a clear causal relationship.[21]

5.1.3 Review of 24-Hour PM_{10} Data

The 24-hour PM_{10} concentrations measured on March 14 at the West 43rd and surrounding sites are listed in Table 2 and shown in Figure 1. On this day, the West 43rd site was the only site in the Phoenix area to exceed the 24-hour PM_{10} standard. Furthermore, PM_{10} concentrations at the West 43rd site were 2-3 times higher than those measured at other sites, which is generally inconsistent with the notion that a regional high wind event caused the exceedance.[22]

Table 2: March 14, 2008 24-Hour PM_{10}

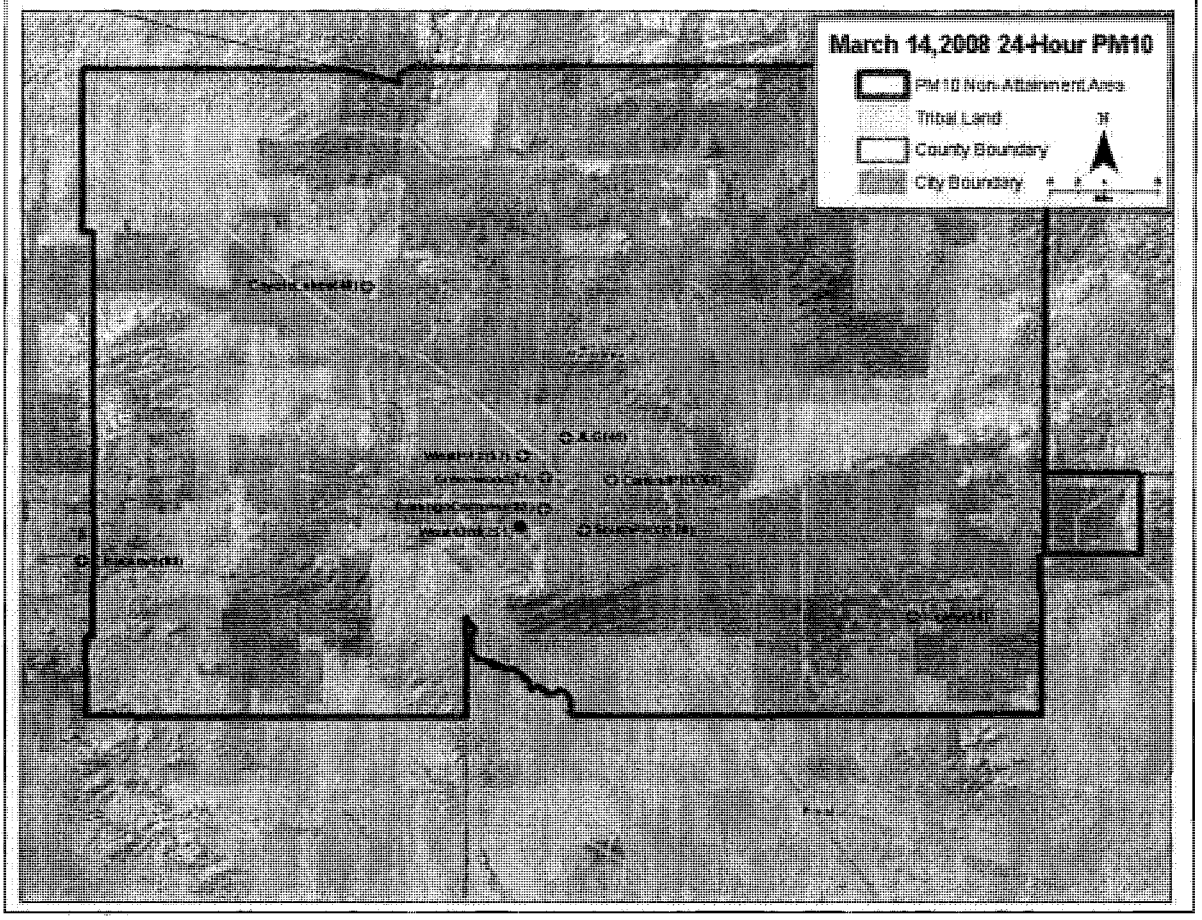
Site Name	PM_{10} (ug/m3)	Site Name	PM_{10} (ug/m3)
Buckeye[23]	80	West PHX	57
West 43rd	251	Central PHX	69
Durango Complex	92	JLG Supersite	41
South PHX	120	Higley	54
Greenwood	71	Coyote Lakes	48

[21] Appendix B contains information pertaining to reduced visibility and dust storms in Arizona.

[22] The only other exceedance recorded in Arizona on March 14, 2008, was the Cowtown monitoring site in Pinal County, which was not flagged as an exceptional event.

[23] 24-hour PM_{10} data for this site was not included in Arizona's Assessment.

Figure 1: March 14, 2008 24-Hour PM_{10}



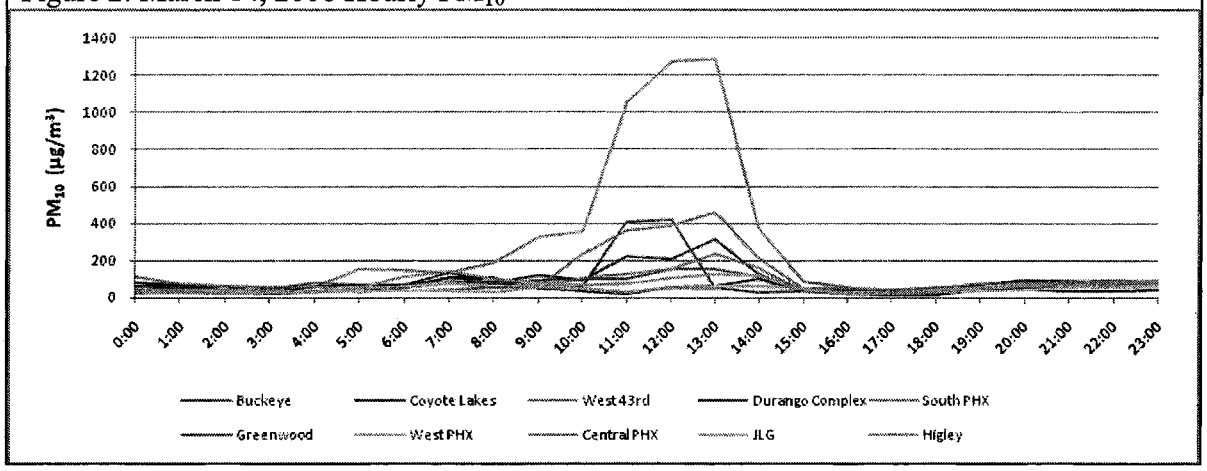
5.1.4 Review of Hourly PM_{10} and Meteorological Data

The hourly PM_{10} data are shown in Figure 2. As early at 0500 hrs, the West 43rd site began to experience an increase in PM_{10} concentration that was not characteristic of the other nine monitoring sites in the Phoenix area. From 0500 to 1000 hrs, the hourly PM_{10} values increased from 150 $\mu g/m^3$ to 360 $\mu g/m^3$. During these hours the hourly wind speeds throughout the Phoenix area remained below 9 mph, which suggests these elevated concentrations were not driven by high wind, but by some other mechanism. Thus, the elevated PM_{10} during these hours do not appear to have been caused by elevated wind conditions.

The first sign of any elevated winds occurred at the majority of the stations around 1100 hrs. NWS data for Goodyear Airport showed an increase in wind speed from 6 to 14 mph (accompanied by a 29 mph gust); while an increase in hourly wind speed from 12 to 15.9 mph was recorded at the West 43rd site. At 1100 hrs, the PM_{10} concentration at the West 43rd site also rose from 355 to 1051 $\mu g/m^3$ and continued to increase over the next two hours to a maximum hourly concentration of 1286 $\mu g/m^3$. While the values at some of the other sites in the area increased over the same time period, the values at the West 43rd site ranged from 3-20 times higher than other sites in the Phoenix area. Given that the Durango Complex, South Phoenix,

Greenwood, and West Phoenix sites are located within approximately five miles of the West 43rd site, one would expect to see greater consistency in the PM_{10} concentrations if a regional high wind event was occurring. It is also worth noting that the West 43rd site came close to reaching the peak concentration seen by other nearby sites well before the arrival of elevated wind speeds. The closest site, Durango Complex, reached a maximum concentration of 310 $\mu g/m^3$ at 1300 hrs, while West 43rd exceeded this level at 0900 hrs. The inconsistency in the PM_{10} concentrations during the period from 1100 to 1400 hrs and the relatively low wind speeds in the morning hours suggest that the West 43rd site was most likely significantly influenced by local upwind sources and the claimed exceptional event was not regional in nature.

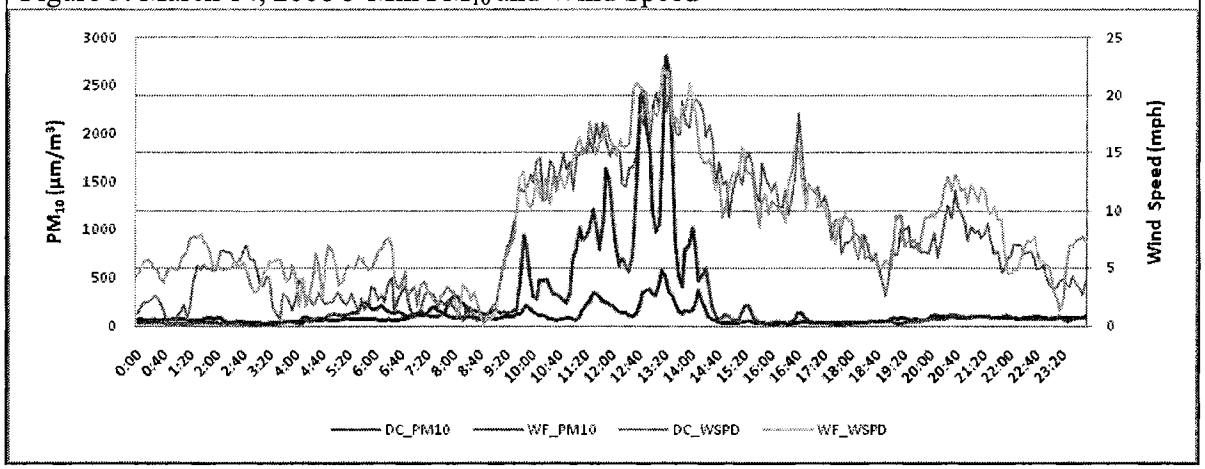
Figure 2: March 14, 2008 Hourly PM_{10}



5.1.5 Review of 5-Min PM_{10} and Wind Speed Data

The 5-min data reinforce the fact that even though elevated wind speeds were measured at other nearby locations, the West 43rd monitor consistently measured much higher PM_{10} concentrations than other locations. Figure 3 shows the 5- min PM_{10} and wind speed data from West 43rd and Durango Complex monitoring sites. These monitors are located only 2 miles apart, yet there seems to be a considerable difference in the relationship between PM_{10} and wind speed on March 14. Both sites experience similar wind speed levels, but during some periods of the day the 5-min PM_{10} concentrations at the West 43rd site were more than five times those measured at Durango Complex. These data provide further evidence that the claimed regional high wind event only affected PM_{10} concentrations at the West 43rd site and the elevated PM_{10} concentrations measured at this site were most likely significantly influenced by local sources and the claimed exceptional event was not regional in nature.

Figure 3: March 14, 2008 5-Min PM_{10} and Wind Speed



5.1.6 Days with Similar Meteorological Conditions

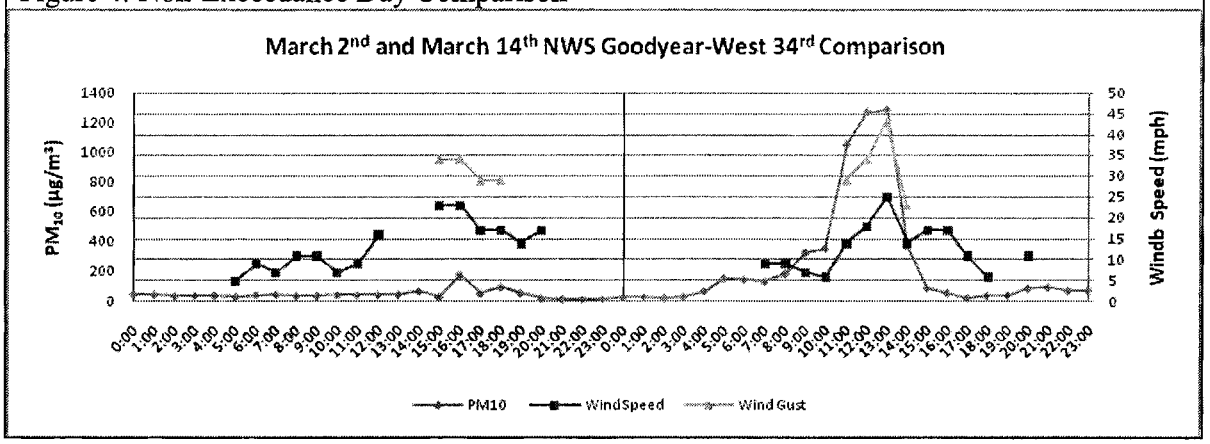
The following discussion emphasizes that meteorological conditions in upwind locations do not always affect on PM_{10} concentrations at the West 43rd site. The NWS station at Goodyear Airport is located approximately 13 miles to the west of the West 43rd monitoring site and serves as the closest location with readily available meteorological data for the area directly to the west of the West 43rd monitoring site.[24]

Wind speeds at Goodyear Airport exceeded 15 mph on ten days in March 2008. On six of those days, wind gusts exceeded 25 mph. Despite these facts, March 14 was the only day in the month of March that measured an exceedance of the 24-hour PM_{10} NAAQS. The following analysis compares hourly PM_{10} data, wind speed, and wind gusts recorded at Goodyear Airport on March 14 with the same data for three days in March with similar meteorological conditions.

On March 14, the West 43rd monitor measured elevated PM_{10} concentrations of 1051 $\mu g/m^3$ and 1270 $\mu g/m^3$ at 1100 and 1200 hrs, respectively. Wind speeds at Goodyear Airport during this period were from the west (260°) at 14 and 18 mph with gusts of 29 and 34 mph. On March 2, the Goodyear station measured wind speeds and gusts of equal or higher magnitude: 23 mph with 34 mph gusts from the NW (310°-320°) for two consecutive hours. Elevated wind speeds on March 2 corresponded to an increase in PM_{10} from 29 $\mu g/m^3$ to 177 $\mu g/m^3$ at the West 43rd monitoring site. This increase in PM_{10} is relatively minor compared to PM_{10} concentrations on measured on March 14, which reached at maximum of 1270 $\mu g/m^3$.

[24] NWS stations report meteorological data differently than meteorological stations operated by Maricopa County. NWS service stations report wind speeds as a 2-min average and wind gusts are defined as "a rapid fluctuation of wind speed with variations of 10 knots or more between peaks and lulls," which are reported as a 5-sec average. Maricopa County meteorological stations have the capability of reporting wind speeds as a 5-min average, an hourly average, or a maximum wind speed, which is recorded as an instantaneous reading that can be less than one second in duration.

Figure 4: Non-Exceedance Day Comparison



Similarly, on March 29, wind speeds of 16 to 17 mph with wind gusts of 29 to 32 mph from the SSW (200°) and the WSW (240°) were recorded at Goodyear Airport for a period of three hours. The corresponding PM_{10} concentrations at West 43rd remained below 130 $\mu g/m^3$ for the entire day. On the following day, March 30, wind speeds of 25 to 29 mph from the SW (230°-240°) were recorded at Goodyear, which corresponded to a spike in PM_{10} concentration at the West 43rd site. There are, however, significant differences between the spike measured on March 30 and the one measured on March 14 and flagged as an exceptional event. First, the spike on March 30 clearly follows a period of elevated wind speed while the spike measured on March 14 was coincident with or even precedes the elevated wind. In addition, the PM_{10} spike on March 30 was shorter in duration and much smaller in magnitude.

Figure 5: Non-Exceedance Day Comparison

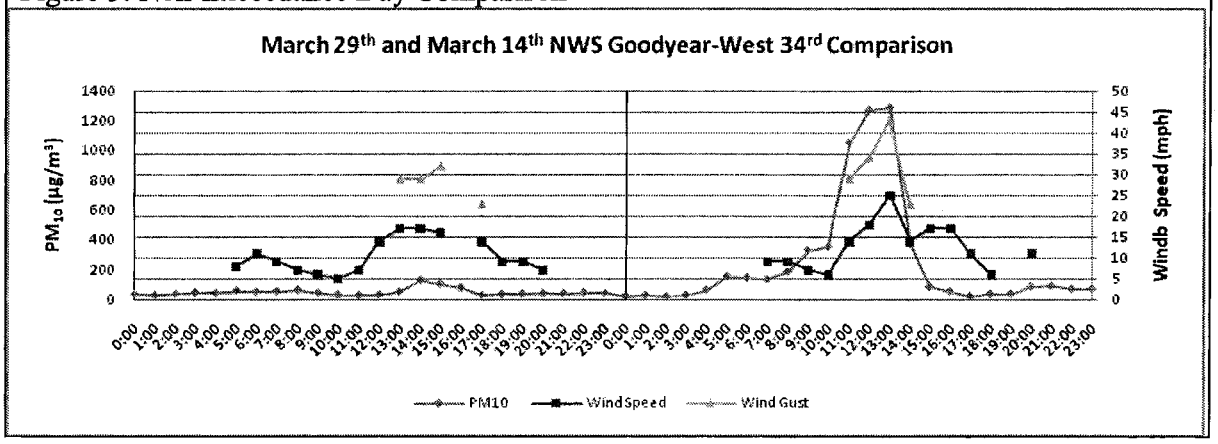
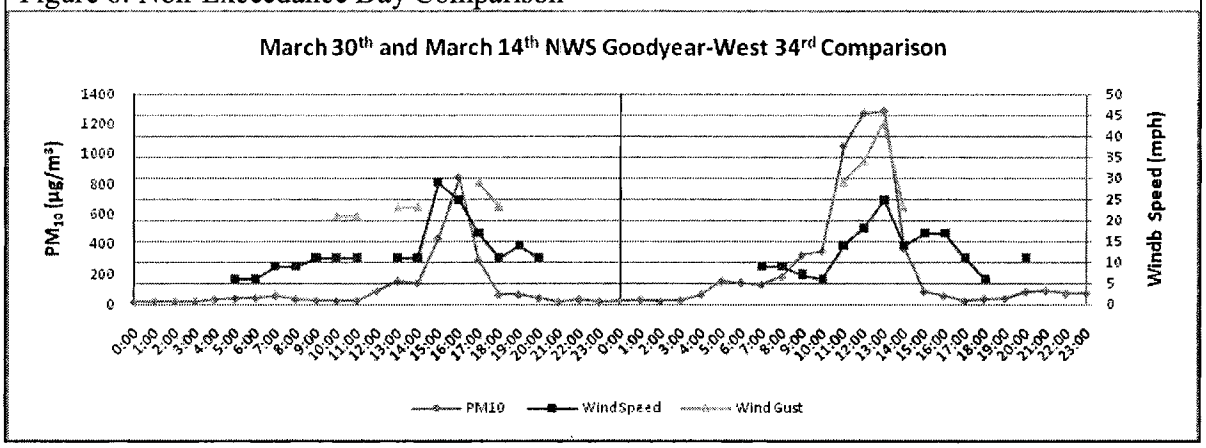


Figure 6: Non-Exceedance Day Comparison



These examples illustrate how elevated wind speeds in upwind areas are related to elevated PM_{10} concentrations on occasion, but the magnitude of PM_{10} concentrations measured at the West 43rd site seem to be associated with factors in addition to wind speed. Also, March 2, March 29, and March 30 were weekend days, which also indicates that elevated wind speeds are not necessarily the primary factor in creating elevated PM_{10} concentrations at the West 43rd site.

5.1.7 Summary of Clear Causal Relationship for March 14, 2008

ADEQ's conclusions that the recorded exceedance was caused by a regional high wind event are not substantiated by relevant monitoring and meteorological data. The data show that the spatial extent of PM_{10} during this day was isolated and not regional in nature. The data also show differences in the measured PM_{10} concentrations at the West 43rd site and the remaining sites in the Phoenix area. In addition, as explained above, ADEQ provided only limited analysis of possible contribution from human activity, making it difficult to determine the relationship between the claimed event and the exceedance. Therefore, EPA has determined that the weight of evidence presented in the March 14 Assessment does not demonstrate a clear causal relationship as required by the EER.

5.2 April 30, 2008

5.2.1 Correlation between Wind Speed and PM_{10}

The April 30 Assessment included hourly and maximum wind speed and PM_{10} data for five sites in the Phoenix area: West 43rd, Durango Complex, South Phoenix, Central Phoenix, and Higley. ADEQ also included meteorological data from the NWS Sky Harbor and Deer Valley stations.[25] ADEQ did not provide tabular hourly PM_{10} data from the other four continuous PM_{10} analyzers in the Phoenix area and did not include wind speed and direction data from numerous other meteorological stations in the Phoenix area. The assessment also did not include any information discussing the 7 filter-based monitoring sites that collected samples on this day.

[25] ADEQ also includes meteorological data from two AZMET stations. These data are collected at 3 m while NWS and Maricopa County data are collected at 10 m. There does not seem to be any correction or adjustment for the collection heights of these stations, and therefore should not be used in the exceptional events analysis.

Refer to Appendix A for more information on the PM_{10} and meteorological data used in the April 30 assessment.

ADEQ also provided four graphs that show the potential correlation between maximum wind speeds and PM_{10} concentrations. The four graphs display data from the West 43rd, Durango Complex, Greenwood, and South Phoenix monitoring sites. While the hourly PM_{10} concentrations increase with an increase in maximum recorded wind speeds at the West 43rd site, there is not a similar correlation between PM_{10} and maximum wind speed at the other monitoring sites in the area. These facts suggest that the elevated PM_{10} concentrations at West 43rd may have been caused by local upwind sources and were not regional in nature.

5.2.2 Visibility

The April 30 assessment included photographs from numerous locations throughout the Phoenix area. Unfortunately, there is not a significant discernable difference between the conditions preceding and during the event. Therefore, the photographs do not significantly contribute to establishing a clear causal relationship between wind speed, potential contributing sources, and PM_{10} concentrations at the West 43rd monitoring site.

ADEQ also stated that reduced visibility during the event at Goodyear Airport provides further evidence of a causal relationship between the high wind event and the measured exceedance at the West 43rd site. The visibility at Goodyear Airport before and during the event ranged from 20 to 7 statute miles. Other NWS stations in the area did not record any decrease in visibility throughout the entire day: visibility at Glendale Airport remained at 20 miles and Sky Harbor remained at 10 miles. At the Goodyear Airport, the minimum recorded visibility was 7 statute miles. The visibility throughout the day in the Phoenix area was never significantly reduced, and thus this information does not significantly contribute to establishing a clear causal relationship.[26]

5.2.3 Review of 24-hour PM_{10} Data

The 24-hour PM_{10} concentrations measured on April 30 at the West 43rd and surrounding sites are listed in Table 3 and shown in Figure 7. On this day, the West 43rd monitor was the only site in the entire Phoenix area to violate the 24-hour PM_{10} standard.[27] Furthermore, PM_{10} concentrations at the West 43rd site were more than double those recorded at other local sites, which is generally inconsistent with the notion that a regional high wind event caused the exceedance.

[26] See Appendix B for information regarding reduced visibility and dust storms in Arizona.

[27] Similar to the data for March 14, 2008, the only other exceedance recorded in Arizona on this day was the Cowtown monitoring site in Pinal County, which was not flagged as an exceptional event.

Figure 7: April 30, 2008 24-Hour PM_{10}

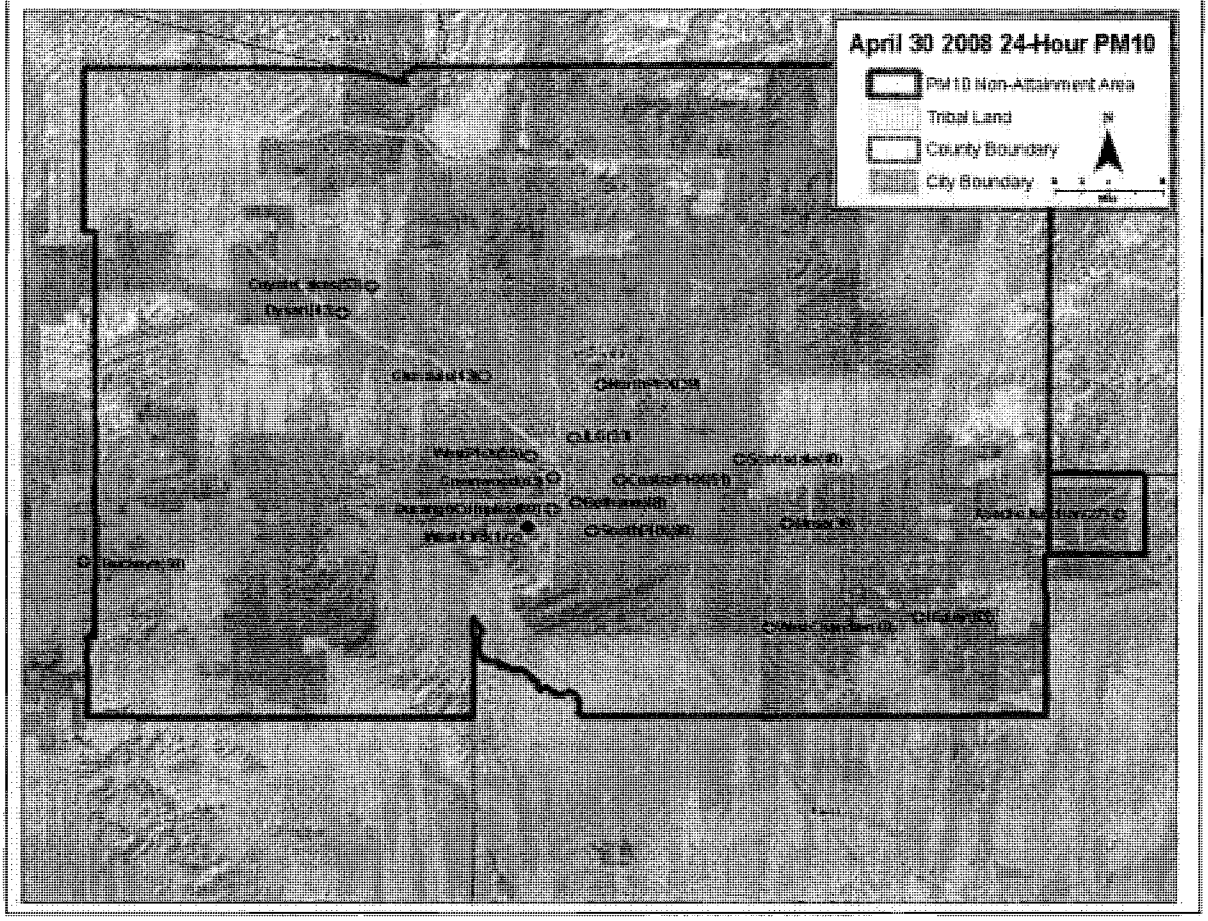


Table 3: April 30, 2008 24-Hour PM_{10}			
Site Name	**PM_{10} (ug/m^3)**	**Site Name**	**PM_{10} (ug/m^3)**
Buckeye*[28]	68	Glendale(FRM) [29]*	43
West 43rd	172	Mesa (FRM)*	38
Durango Complex	69	North PHX (FRM)*	39
South PHX	88	South Scottsdale (FRM)*	40
Greenwood	63	West Chandler (FRM)*	49
West PHX	55	Bethune Elementary (FRM)*	48
Central PHX	51	Dysart (FRM)*	43
JLG Supersite	46	Coyote Lakes	53
Higley	63		

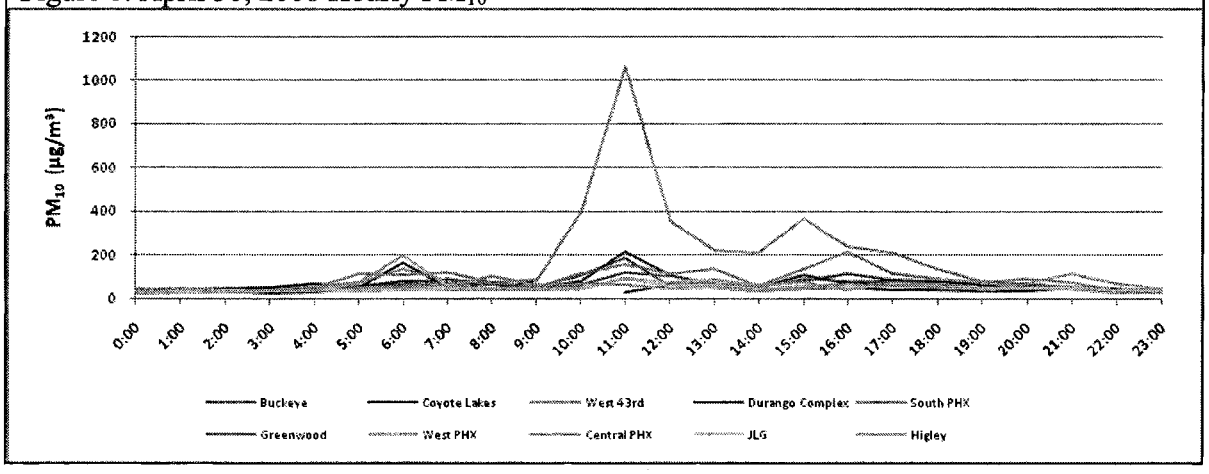
[28] 24-hour PM_{10} data for these sites were not included in the Assessment.
[29] PM_{10} FRM samplers operate on a 1 in 6 day schedule.

5.2.4 Review of Hourly PM_{10} and Meteorological Data

The hourly PM_{10} data are shown in Figure 8. As early as 1000 hrs, the West 43rd site began to experience an increase in PM_{10} concentration that was not characteristic of the other nine monitors in the Phoenix area. From 0900 to 1000 hrs the hourly PM_{10} values at the West 43rd site increased from 85 $\mu g/m^3$ to 404 $\mu g/m^3$, while PM_{10} values at surrounding sites remained below 120 $\mu g/m^3$. The first sign of any elevated winds occurred at the majority of the stations around 1100 hrs. NWS data for Goodyear Airport showed an increase in wind speed from 16 to 17 mph (accompanied by a 29 mph gust); while an increase in hourly wind speed from 12.7 to the day's maximum value of 16 mph was recorded at the West 43rd site. At 1100 hrs, the PM_{10} concentration at the West 43rd site also rose from 404 $\mu g/m^3$ to the day's maximum value of 1065 $\mu g/m^3$.

While values at other sites in the area increased over the same time period, the values at the West 43rd site ranged from 5 to 10 times higher than other sites in the Phoenix area. For example, the majority of the sites measured maximum PM_{10} concentrations that were coincident with the maximum PM_{10} concentrations at the West 43rd site, but all sites in Maricopa County measured maximum PM_{10} concentrations less than 220 $\mu g/m^3$. Given that the Durango Complex, South Phoenix, Greenwood, and West Phoenix sites are located within approximately five miles of the West 43rd site, one would expect to see greater consistency in the concentrations if a regional high wind event was occurring. The data suggest that the West 43rd site was most likely significantly influenced by local upwind sources and the claimed exceptional event was not regional in nature.

Figure 8: April 30, 2008 Hourly PM_{10}

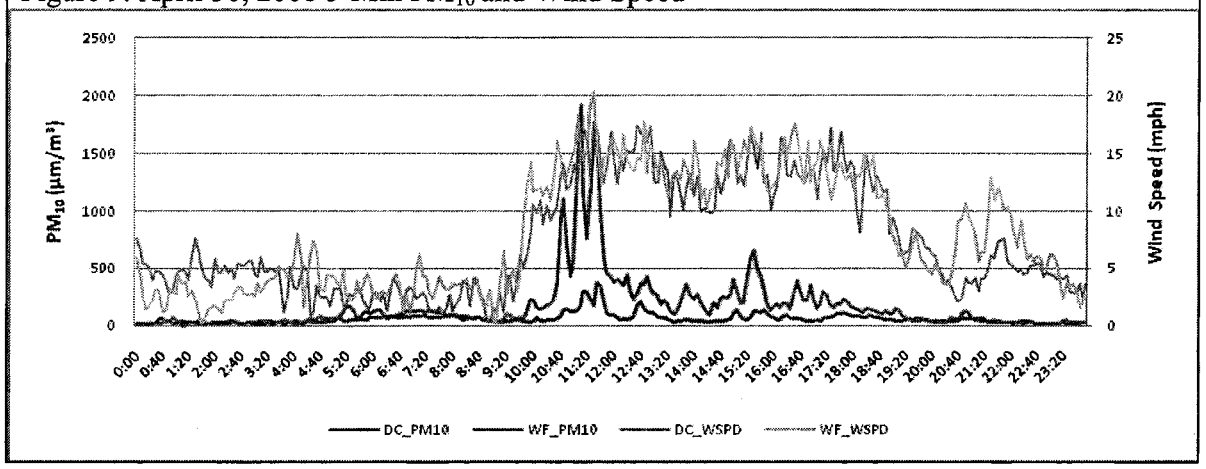


5.2.5 Review of 5-Min PM_{10} and Wind Speed Data

The 5-min data reinforce the fact that even though elevated wind speeds were measured at other nearby locations, the West 43rd monitor consistently measured much higher PM_{10} concentrations than other locations. Figure 9 shows the 5- min PM_{10} and wind speed data from West 43rd and Durango Complex. These monitors are located only 2 miles apart, yet there seems to be a considerable difference in the relationship between PM_{10} and wind speed on April 30. Both sites experience similar wind speed levels, but during some periods of the day the 5-min PM_{10}

concentrations at West 43rd site were more than 9 times those measured at Durango Complex. The two highest 5-min PM_{10} averages measured at the West 43rd site were approximately 1920 and 1624 $\mu g/m^3$, while PM_{10} concentrations at Durango Complex during the same time period were 178 and 373 $\mu g/m^3$, respectively. These data provide further evidence that the claimed regional high wind event only affected PM_{10} concentrations at the West 43rd site and the elevated PM_{10} concentrations measured at this site were most likely significantly influenced by local sources and the claimed exceptional event was not regional in nature.

Figure 9: April 30, 2008 5-Min PM_{10} and Wind Speed

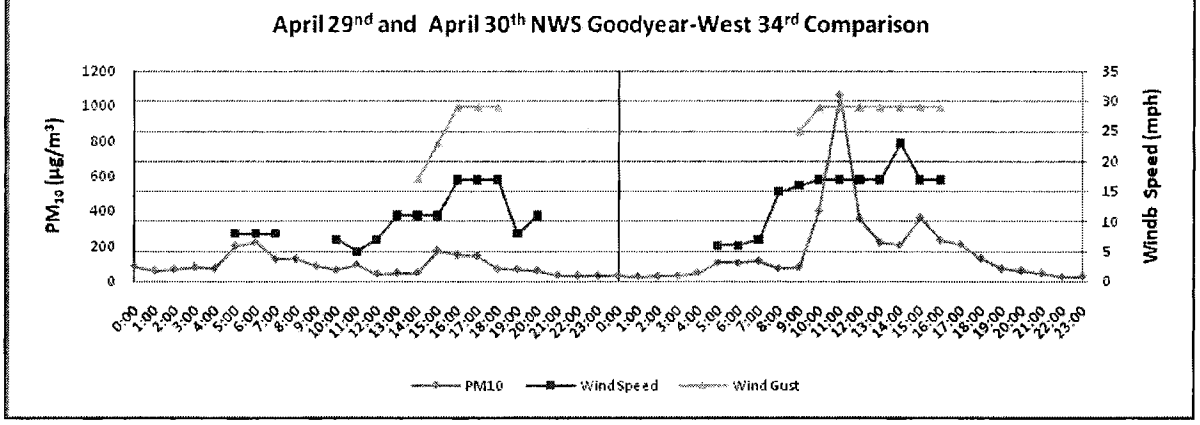


5.2.6 Review of Days with Similar Meteorological Conditions

On twenty days in April 2008, the wind speeds at Goodyear Airport exceeded 15 mph. On six of those days, wind gusts exceeded 25 mph. The following analysis compares the hourly PM_{10} data, wind speed, and wind gusts recorded at Goodyear Airport on April 30 with the same data from a similar day in April.

On April 30, the West 43rd monitor experienced elevated PM_{10} concentrations of 404 $\mu g/m^3$ and 1065 $\mu g/m^3$ at 1000 and 1100 hrs, respectively. Wind speeds at Goodyear Airport during this period were from the WSW (240°-260°) at 17 mph with gusts of 29 mph. On April 29, the Goodyear station measured wind speeds and gusts of equal magnitude; 17 mph winds and 29 mph gusts from the SW (230°) for three consecutive hours. A maximum concentration of 177 $\mu g/m^3$ was observed during this period, but it is considerably lower than the PM_{10} concentrations measured on the day the exceptional event is claimed to have occurred. This example illustrates how elevated wind speeds in upwind areas are related to elevated PM_{10} concentrations on occasion, but the magnitude of PM_{10} concentrations measured at the West 43rd site seem to be dependent on a number of different factors.

Figure 10: Non-Exceedance Day Comparison



5.2.7 Summary of Clear Causal Relationship for April 30, 2008

ADEQ's conclusions that the recorded exceedance was caused by a regional high wind event are not substantiated by relevant monitoring and meteorological data. The data show that the spatial extent of PM_{10} during this day was isolated and not regional in nature. The data also show differences in the measured PM_{10} concentrations at the West 43rd site and the remaining sites in the Phoenix area. In addition, ADEQ provided only limited analysis of possible contribution from human activity, making it difficult to comprehensively evaluate the relationship between the claimed event and the exceedance. Therefore, EPA has determined that the weight of evidence presented in the April 30 Assessment does not demonstrate a clear causal relationship as required by the EER.

5.3 May 21, 2008

5.3.1 Correlation between Wind Speed and PM_{10}

The May 21 Assessment included tabular hourly and maximum wind speed and PM_{10} data for five sites in the Phoenix area: West 43rd, Durango Complex, South Phoenix, and Buckeye.[30] ADEQ also included meteorological data from the NWS Luke Air Force Base station. ADEQ did not provide hourly PM_{10} and meteorological data from the remaining five continuous PM_{10} analyzers in the Phoenix area and did not include wind speed and direction data from numerous other meteorological stations in the Phoenix area. Appendix A contains more information on the PM_{10} and meteorological data used in the May 21assessment.

ADEQ also provided three graphs that show the potential correlation between maximum wind speeds and PM_{10} concentrations. The three graphs display data from the West 43rd, Durango Complex, and South Phoenix monitoring sites. While the hourly PM_{10} concentrations significantly increase with an increase in maximum recorded wind speeds at the West 43rd site,

[30] ADEQ's supporting documentation for this event also contained information pertaining to measured exceedances at monitoring sites in Yuma County (Yuma Courthouse site). The Yuma monitor is more than 150 miles from the West 43rd site. We expect the circumstances that caused the exceedance at the Yuma MCAS site to be different that those affecting the Phoenix area; therefore we are giving this data relatively little weight in our evaluation.

there is not a similar correlation between PM_{10} and maximum wind speed at the other monitoring sites in the area. These facts suggest that the elevated PM_{10} concentrations at West 43rd may have been caused by local upwind sources and were not regional in nature.

5.3.2 Visibility

The assessment included photographs from numerous locations throughout the Phoenix area. Photographs taken at 1330 hrs show evidence of reduced visibility and a potential regional event; however, PM_{10} concentrations at the West 43rd site began to increase at 0800 hrs. Photographs were provided for 0930, 1330, 1430, and 1530 hrs. Photographs were not submitted for the hours preceding the elevated PM_{10} concentrations measured at the West 43rd site. Therefore, the photographs do not significantly contribute to establishing a causal relationship between wind speed, potential contributing sources, and PM_{10} concentrations at the West 43rd monitoring site during the morning hours.

ADEQ also stated that reduced visibility during the event throughout portions of Phoenix provides further evidence of a clear causal relationship. The visibility at Goodyear Airport before the event ranged from 20 to 7 statute miles; visibilities of 7 miles were recorded at 1047, 1647, and 1747 hrs. Chandler Airport recorded observations of blowing dust (BLDU) at 1347 hrs, which was followed by a recorded visibility of 7 miles at 1447 hrs. Visibility at other NWS stations in the area remained above 10 miles for the entire day: Glendale Airport ranged from 10 to 20 miles, Sky Harbor remained at 10 miles, and Luke Air Force Base remained at 10 miles. The visibility throughout the day in the Phoenix area was never significantly reduced, and thus this information does not significantly contribute to establishing a clear causal relationship.[31]

5.3.3 Review of 24-Hour PM_{10} Data

The 24-hour PM_{10} concentrations measured on May 21 at the West 43rd and surrounding sites are listed in Table 4 and shown geographically in Figure 11. On this day, the West 43rd monitor was the only site in the entire Phoenix area to violate the 24-hour PM_{10} standard. Furthermore, PM_{10} concentrations at West 43rd were more than double those recorded at other local sites, which is generally inconsistent with the notion that a regional high wind event caused the exceedance.

[31] See Appendix B for information regarding reduced visibility and dust storms in Arizona.

Figure 11: May 21, 2008 24-Hour PM_{10}

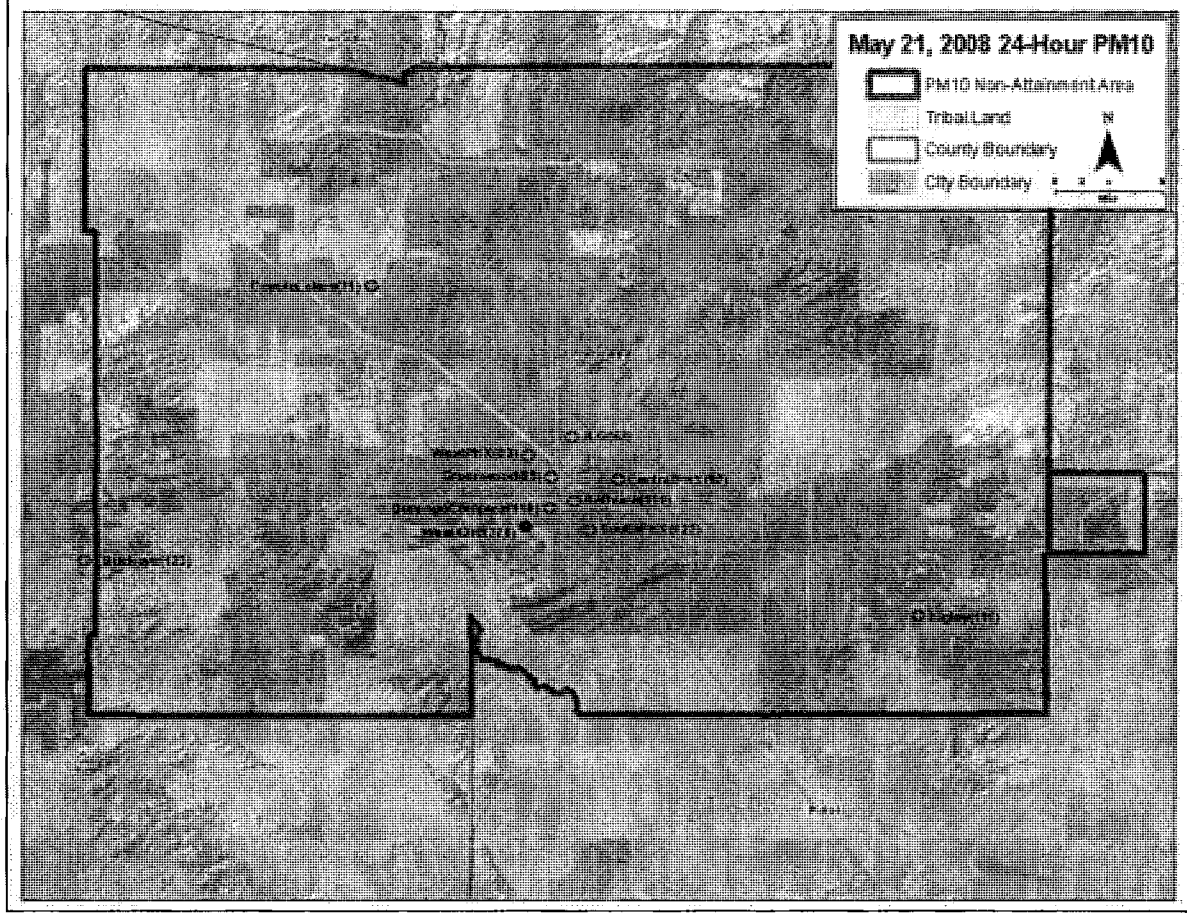


Table 4: May 21, 2008 24-Hour PM_{10}			
Site Name	**PM_{10} (ug/m3)**	**Site Name**	**PM_{10} (ug/m3)**
Buckeye*[32]	123	West PHX*	83
West 43rd	278	Central PHX*	92
Durango Complex	110	JLG Supersite*	62
South PHX	122	Higley*	111
Greenwood	89	Coyote Lakes*	71
Bethune (FRM)*	111		

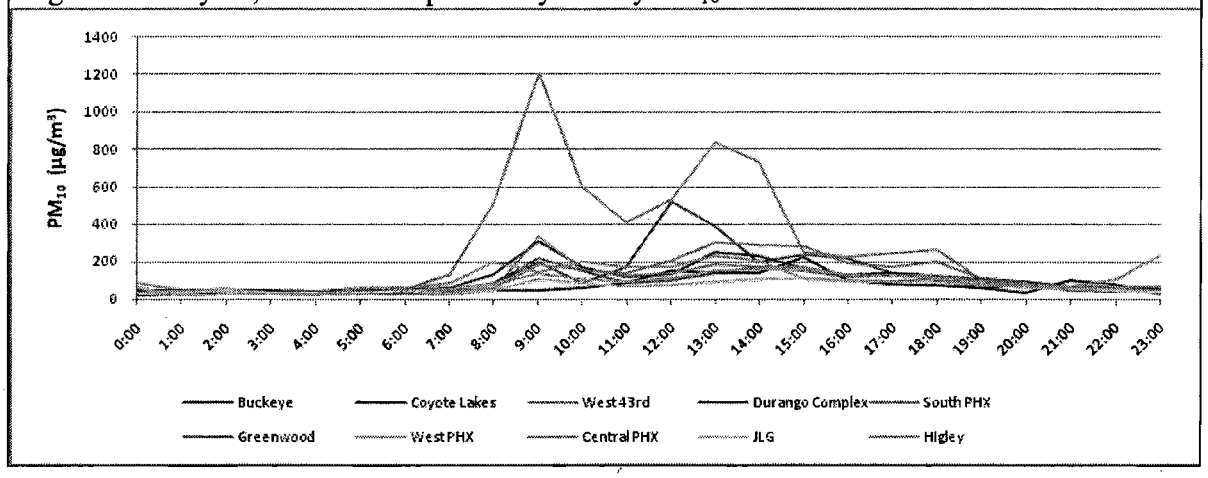
5.3.4 Review of Hourly PM_{10} and Meteorological Data

The hourly PM_{10} data for Maricopa County are shown in Figure 12. The peak PM_{10} concentration of 1207 $\mu g/m^3$ at 0900 hrs measured at the West 43rd site coincides with an increase in wind speed from 11 to 22 mph, and a recorded wind gust of 28 mph at the Goodyear

[32] 24-hour PM_{10} data from these sites were not included in the Assessment.

station and an increase in hourly wind speed from 15.3 to 18.1 mph at the West 43rd monitoring site. Similar to previously discussed events, the measured PM_{10} concentrations at West 43rd were more than 3.9 times the PM_{10} values measured at the Durango Complex station just 2 miles to the northeast and 3.6 times the values measured at the South Phoenix station 4 miles to the east. The inconsistencies in PM_{10} concentrations suggest that the West 43rd site most likely was influenced by local upwind sources and the claimed exceptional event was not regional in nature.

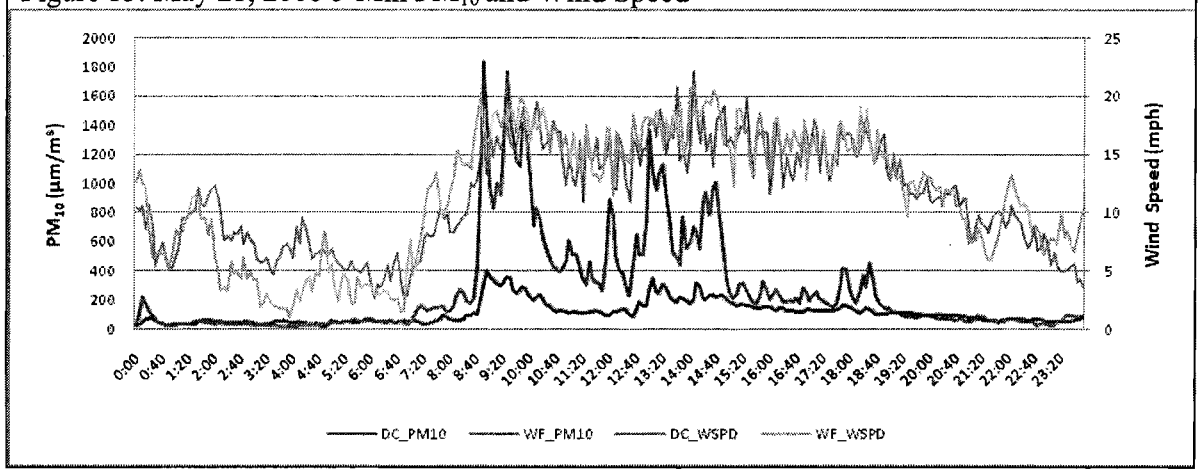
Figure 12: May 21, 2008 Maricopa County Hourly PM_{10}



5.2.5 Review of 5-Min PM_{10} and Wind Speed Data

The 5-min data reinforce the fact that even though elevated wind speeds were measured at other nearby locations, the West 43rd monitor consistently measured much higher PM_{10} concentrations than other locations. Figure 13 shows the 5- min PM_{10} and wind speed data from the West 43rd and Durango Complex sites. These monitors are located only 2 miles apart, yet there seems to be a considerable difference in the relationship between PM_{10} and wind speed on May 21. Both sites experience similar wind speed levels, but during some periods of the day the 5-min PM_{10} concentrations at West 43rd site ranged from 3-6 times higher than those measured at Durango Complex. The two highest 5-min PM_{10} averages measured at the West 43rd site were approximately 1837 and 1769 $\mu g/m^3$, while PM_{10} concentrations at Durango Complex during the same time period were 290 and 362 $\mu g/m^3$, respectively. These data provide further evidence that the claimed regional high wind event only affected PM_{10} concentrations at West 43rd and the elevated PM_{10} concentrations measured at this site were most likely significantly influenced by local sources and the claimed exceptional event was not regional in nature.

Figure 13: May 21, 2008 5-Min PM_{10} and Wind Speed

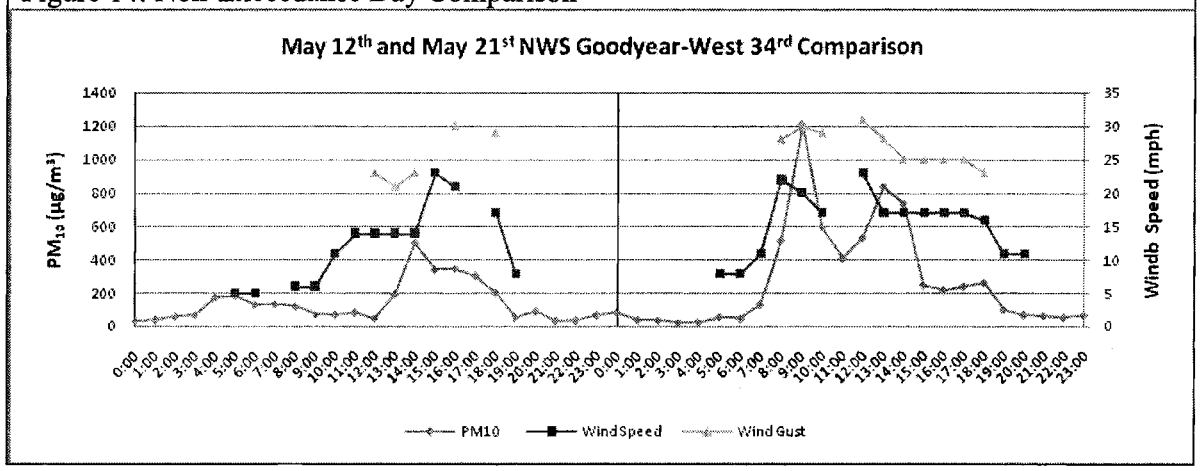


5.3.6 EPA Review of Days with Similar Meteorological Conditions

On fourteen days in May 2008, the wind speed at Goodyear Airport exceeded 15 mph. On three of those days, wind gusts exceeded 25 mph. The following analysis compares the hourly PM_{10} data, wind speed, and wind gusts on May 21 with the same data from a similar day in May.

On May 21, the West 43rd monitor experienced elevated PM_{10} concentrations of 518 $\mu g/m^3$ and 1207 $\mu g/m^3$ at 0800 and 0900 hrs, respectively. Wind speeds at Goodyear Airport during this period were from the WSW (240°) at 22 and 21 mph with gusts of 28 and 30 mph. Similarly, on May 12, the Goodyear station measured wind speeds and gusts of equal magnitude; 21 mph wind speeds and 30 mph gusts from the SW (230°). These elevated wind speeds, however, only correspond to moderate hourly PM_{10} values at the West 43rd site. Hourly PM_{10} concentrations on May 12 were considerably lower than the PM_{10} concentrations measured on the day the exceptional event is claimed to have occurred; maximum PM_{10} values on May 12 only reached 500 $\mu g/m^3$. This example illustrates how elevated wind speeds in upwind areas are related to elevated PM_{10} concentrations on occasion, but the magnitude of PM_{10} concentrations measured at the West 43rd site seem to be dependent on a number of different factors.

Figure 14: Non-Exceedance Day Comparison



5.3.7 Summary of Clear Causal Relationship for May 21, 2008

ADEQ's conclusions that the recorded exceedance was caused by a regional high wind event are not substantiated by relevant monitoring and meteorological data. The data show that the spatial extent of PM_{10} during this day was isolated and not regional in nature. The data also show differences in the measured PM_{10} concentrations at the West 43rd site and the remaining sites in the Phoenix area. In addition, as explained above, ADEQ provided only limited analysis of possible contribution from human activity (sections 4.2 and 4.3 above), making it difficult to comprehensively evaluate the relationship between the claimed event and the exceedance. Therefore, EPA has determined that the weight of evidence presented in the May 21 Assessment does not demonstrate a clear causal relationship as required by the EER.

5.4 June 4, 2008 Event

The June 4 assessment contained information pertaining to measured exceedances at monitoring sites in both the Phoenix area (Buckeye, Coyote Lakes, and West 43rd site) and Yuma County (Yuma MCAS site). These two locations are over 150 miles apart and the data concerning the Yuma area has limited value in determining whether or not exceptional events occurred in the Phoenix area. It is also important to note that EPA is not evaluating the exceedances measured at the Buckeye and Coyote Lakes monitoring sites in this document. As discussed in the next section, it is clear that the PM_{10} concentrations at these sites are not correlated to those measured at the West 43rd site for the majority of the day on June 4 and were most likely influenced by a different set of sources and meteorological conditions (Figure 16).

5.4.1 Correlation between Wind Speed and PM_{10}

The assessment included tabular wind speed and PM_{10} data for five sites in the Phoenix area: West 43rd, Durango Complex, Central Phoenix, Coyote Lakes, and Buckeye. ADEQ also included meteorological data from the NWS Luke Air Force Base station. ADEQ did not provide tabular hourly PM_{10} data from the remaining five continuous PM_{10} analyzers in the Phoenix area and did not include wind speed and direction data from numerous other meteorological stations in the Phoenix area. Appendix A contains more information on the meteorological data used in the June 4 supporting documentation.

ADEQ also provided seven graphs that show the potential correlation between maximum wind speeds and PM_{10} concentrations. The graphs show that, at the West 43rd site, the hourly PM_{10} concentrations increase with an increase in maximum recorded wind speeds at the West 43rd site; however, there does not seem to be a similar correlation between PM_{10} and maximum wind speed for the other monitoring sites in the area until later in the evening. These data suggest that the elevated PM_{10} concentrations in the morning and early afternoon hours at the West 43rd site were most likely caused by local upwind sources and are not regional in nature.

5.4.2 High Winds

While Section 4.3 contains a general discussion of ADEQ's high wind analysis, ADEQ's DSR provided a more detailed discussion of the meteorological conditions that were associated with

the claimed exceptional event occurring on June 4. Unlike the previously discussed events, the DSR contained copies of NWS advisories concerning the meteorological conditions in the Phoenix area. These reports provide additional evidence of the nature of the wind speeds associated with the claimed exceptional event. Specifically, NWS issued a wind advisory at 0356 hrs on June 4 that was set to be in effect from 1500 to 2100 hrs. The advisory states that "wind speeds of 25 to 30 mph with gusts up to 40 mph can be expected" and warned that "strong winds over desert areas could result in briefly lowered visibilities to well under a mile at times in blowing dust or blowing sand...especially near empty farm fields and construction areas."

While these advisories continued to be in effect during the afternoon hours of June 4, the average hourly wind speeds observed at the West 43rd monitoring site never exceeded 17.1 mph for the entire day, while wind gusts reached a maximum of 36 mph at 1600 hrs. ADEQ's DSR states that during the afternoon hours the Phoenix area experienced "unusually high gusts of 35-40 mph which would likely overwhelm BACM in place for PM in the Phoenix" area, but as discussed in section 4.2.2, ADEQ has not determined at which wind speeds this may be occurring. As discussed below, the West 43rd monitoring site began measuring elevated PM_{10} concentrations at 1200 hrs, well before the NWS advisories were put into effect.

5.4.3 Visibility

The assessment included photographs from numerous locations throughout the Phoenix area. Photographs taken at 1830 hrs show evidence of reduced visibility and a potential regional event,[33] but it is important to note that PM_{10} concentrations at the West 43rd monitoring site began to increase at 1200 hrs. No photographs were submitted for this time period or for hours preceding the elevated PM_{10} concentrations. Therefore, the photographs do not significantly contribute to establishing a causal relationship between observed wind speeds, potential contributing sources, and PM_{10} concentrations at the West 43rd monitoring site during the late morning, early afternoon hours.

ADEQ also stated that reduced visibility during the event at Goodyear Airport provides further evidence of a clear causal relationship. The visibility at Goodyear Airport during the morning and early afternoon hours ranged from 20 to 10 statute miles. While the reduced visibility observed at numerous NWS after 1800 hrs suggests a regional event may have occurred, it is important to note that PM_{10} concentrations at the West 43rd site began to increase at 1200 hrs: a time when visibility was between 10 to 20 miles.

5.4.4 Review of 24-Hour PM_{10} Data

The 24-hour PM_{10} concentrations measured on June 4 at the West 43rd and surrounding sites are shown in Figure 15. On this day, the West 43rd monitor measured PM_{10} concentrations that were more than double those measured at other monitoring sites in the area, except for the Buckeye and Coyote Lakes sites, which recorded similar concentrations.

[33] See Appendix B regarding visibility and dust storms in Arizona.

Figure 15: June 4, 2008 24-Hour PM_{10}

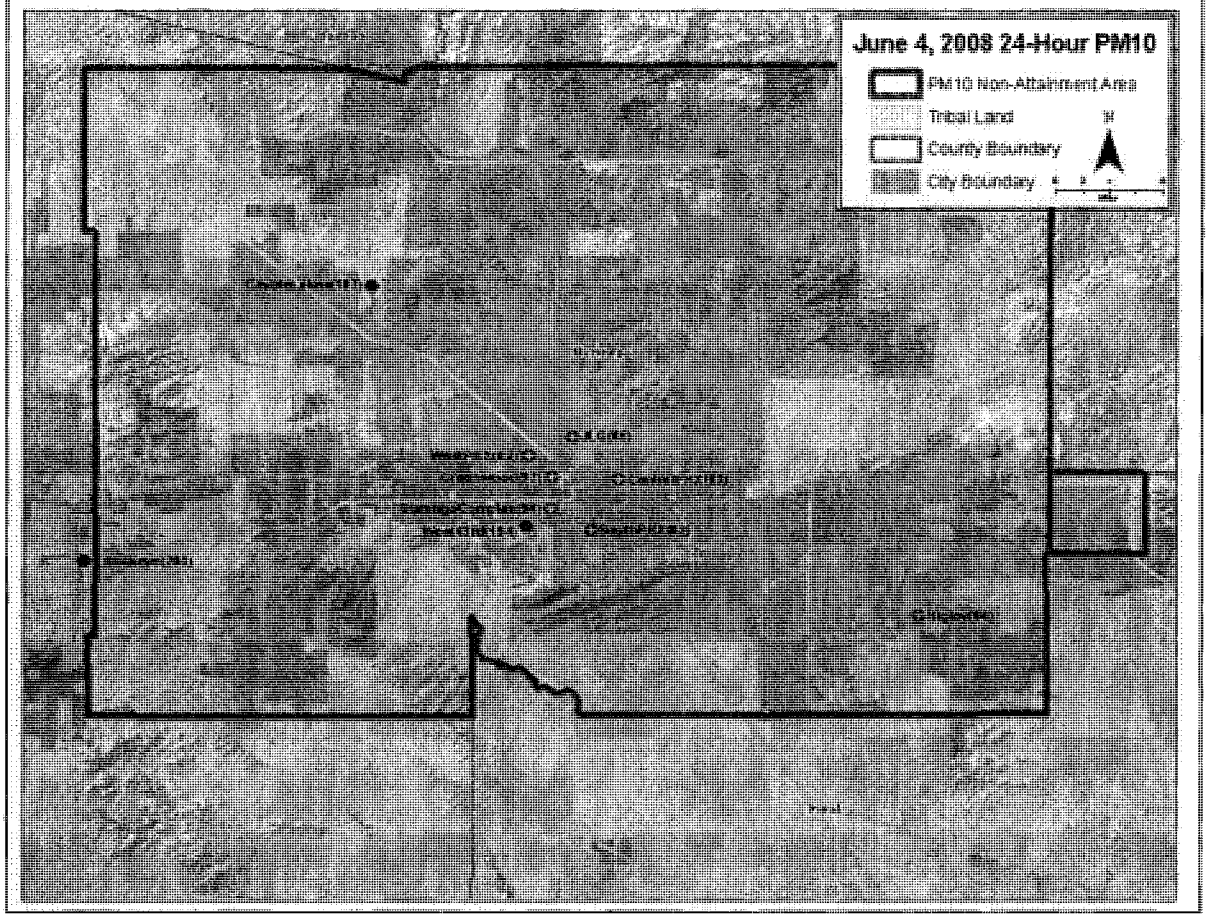


Table 5: June 4, 2008 24-Hour PM_{10}			
Site Name	**PM_{10} (ug/m3)**	**Site Name**	**PM_{10} (ug/m3)**
Buckeye	204	Greenwood*	97
West 43rd	194	West PHX*	83
Coyote Lakes	187	Central PHX*	93
Durango Complex*[34]	94	JLG Supersite*	65
South PHX*	82	*Higley*	84

5.4.5 Review of Hourly PM_{10} and Meteorological Data

The patterns observed through the morning hours and mid-day on June 4 are similar to the claimed exceptional event days discussed in previous sections and the data from this time period does not indicate an influence from a regional high wind event. Also, similar to the previously

[34] 24-hour PM_{10} data for this station was not included in the Assessment.

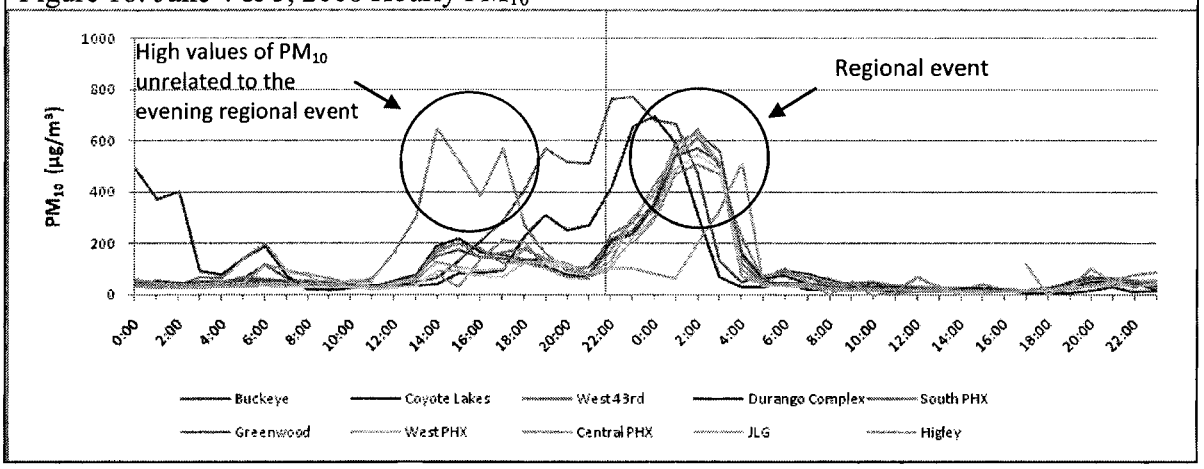
discussed events, the West 43rd site measured elevated PM_{10} concentrations earlier and of a higher magnitude than other monitoring sites located nearby. For example, on the early afternoon of June 4, the West 43rd monitor began measuring PM_{10} concentrations ranging from 165 $\mu g/m^3$ to 645 $\mu g/m^3$ between 1200 and 1400 hrs, while all other monitors in the Phoenix area remained below 200 $\mu g/m^3$ for the same time period. The inconsistencies in these concentrations suggest that the West 43rd site was most likely significantly influenced by local upwind sources and the claimed exceptional event was not regional in nature. ADEQ acknowledged that the concurrent timing of elevated wind speeds "may indicate that PM sources in close proximity to the monitor contributed significantly to the dust event" and "it is likely that the loose particulates deposited in the dry river bed to the west and south-west of the monitor were transported the short distance to the West 43rd monitor by the high winds."[35]

It appears that a regional weather event began on the evening of June 4 and lasted into the morning of June 5. Figure 16 shows that the Buckeye site begins to measure significantly elevated PM_{10} concentrations at 1600 hrs, followed by an increase in PM_{10} at the Coyote Lakes site a few hours later. The West 43rd site lagged behind Buckeye and Coyote Lakes and did not show elevated PM_{10} from the regional event until 2200 hrs on June 4. While the West 43rd, Buckeye, and Coyote Lakes sites all exceeded on June 4, the cause of the exceedances seems to be different. The exceedances at Buckeye and Coyote Lakes were most likely due to a regional event that began in the evening and did not reach West 43rd until 2200 hrs, while the exceedance at West 43rd was most likely caused by a different set of circumstances (Figure 16). Also, beginning around 2200 hrs and extending into the early morning hours of June 5, PM_{10} concentrations at all sites in the Phoenix area were elevated and uniformly consistent, illustrating a potential regional event. In the DSR, ADEQ acknowledged that "a more homogeneous dust plume affected the area just after midnight on the following day."

While there was some contribution to the 24-hour PM_{10} concentration that can be attributed to this evening event, the West 43rd monitor began measuring high PM_{10} concentrations well before the arrival of the "dust plume" described in the June 4 DSR. Furthermore, the arrival of the dust plume began at around 2100 hrs and only contributed to approximately 11.3 percent of the total PM_{10} mass concentration for June 4. With such a small total contribution, if all PM_{10} concentrations measured after 2100 hrs were completely removed from the data set, the PM_{10} 24-hour average for June 4 would still be above the PM_{10} 24-hour NAAQS. The majority of the PM_{10} mass was measured well before the arrival of the evening event described above and the high PM_{10} concentrations measured in the late morning and early afternoon hours have been determined to be independent from the regional event that took place on the evening of June 4.

[35] June 4 DSR at p. 24.

Figure 16: June 4 & 5, 2008 Hourly PM_{10}

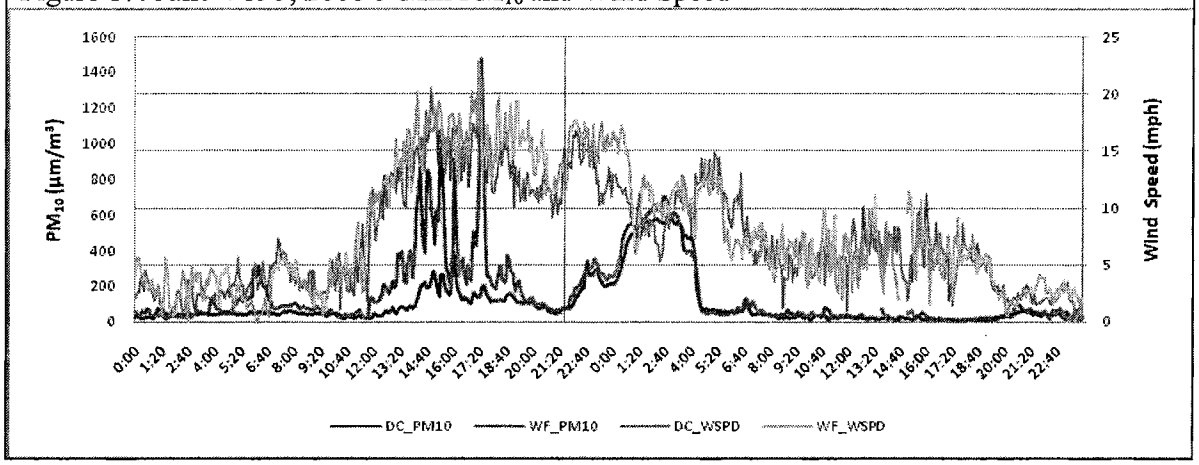


5.4.6 Review of 5-Min PM_{10} and Wind Speed Data

The 5-min data also show that even though elevated wind speeds were measured at other nearby locations, the West 43rd monitor consistently measured much higher PM_{10} concentrations than other locations. Figure 18 shows the 5- min PM_{10} and wind speed data from West 43rd and Durango Complex:. these monitors are located only 2 miles apart, yet there seems to be a considerable difference in the relationship between PM_{10} and wind speed on June 4 during the late morning and early afternoon hours. Both sites experience similar wind speed levels, but during some periods of the day the 5-min PM_{10} concentrations at West 43rd site ranged from four to nine times higher than those measured at Durango Complex. The two highest 5-min PM_{10} averages measured at the West 43rd site were approximately 1475 and 975 $\mu g/m^3$, while PM_{10} concentrations at Durango Complex during the same time period were 153 and 264 $\mu g/m^3$, respectively.

These data provide further evidence that the claimed regional high wind event only affected PM_{10} concentrations at West 43rd and the elevated PM_{10} concentrations measured at this site in the morning and early afternoon hours were most likely significantly influenced by local sources and the claimed exceptional event was not regional in nature.

Figure 17: June 4 & 5, 2008 5-Min PM_{10} and Wind Speed

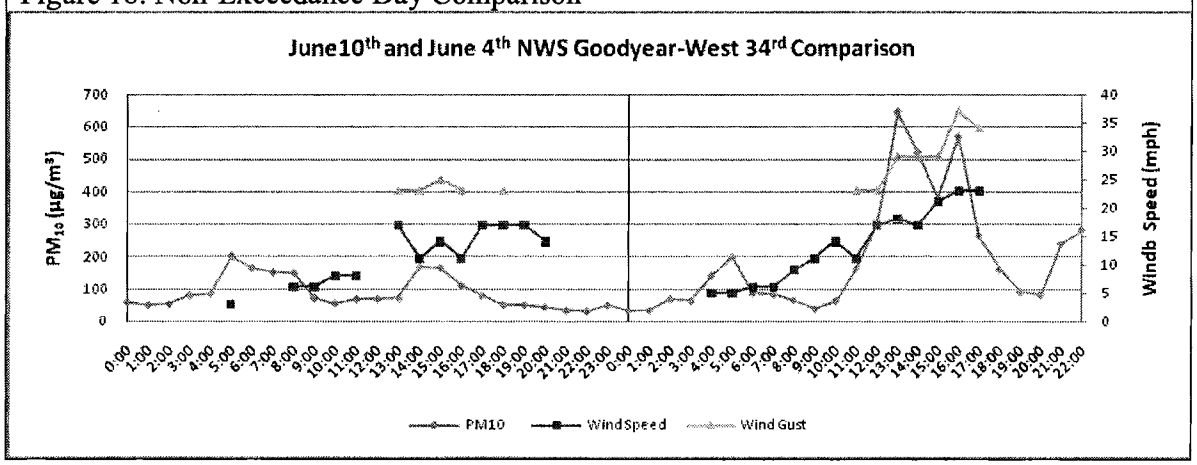


5.4.7 Review of Days with Similar Meteorological Conditions

On twelve days in June 2008, the wind speed at Goodyear Airport exceeded 15 mph. On two of those days, wind gusts exceeded 25 mph. The following analysis compares the hourly PM_{10} data, wind speed, and wind gusts on June 4 with the same data from a similar day in May.

On June 4, the West 43rd monitor experienced elevated PM_{10} concentrations of 307 $\mu g/m^3$ and 644.9 $\mu g/m^3$ at 1300 and 1400 hrs, respectively. Wind speeds at Goodyear Airport during this period were from the WSW (242°) at 17 and 18 mph with gusts of 23 and 29 mph. Similarly, on June 10, the Goodyear station measured wind speeds and gusts of similar magnitude; 17 mph wind speeds and 23 mph gusts from the WSW (240°). These elevated wind speeds, however, only correspond to a slight increase in hourly PM_{10} values at the West 43rd site. This example illustrates how elevated wind speeds in upwind areas are related to elevated PM_{10} concentrations on occasion, but the magnitude of PM_{10} concentrations measured at the West 43rd site seem to be dependent on a number of different factors.

Figure 18: Non-Exceedance Day Comparison



5.4.8 Summary of Clear Causal Relationship for June 4, 2008

The data show that the spatial extent of PM_{10} during the early portion of the day was isolated and not regional in nature. In addition, ADEQ did not adequately address the possible contributing sources in the area directly upwind of the West 43rd monitor, which makes a causal relationship difficult to evaluate. ADEQ has also failed to adequately explain the differences in the measured PM_{10} concentrations at the West 43rd site and the remaining sites in the Phoenix area experiencing similar wind conditions.

ADEQ asserted that while elevated wind speeds occurred throughout the Phoenix area, "the blowing dust that was generated from these high winds occurred at sporadic locations;" the "high concentrations of blowing dust only occurred where dust sources were located;" and "these dust sources are typically located in depositional areas where fine and coarse particles are deposited during times of precipitation." ADEQ further concluded that "cause of the exceedances for the Maricopa County monitors was alluvial dust generated by high winds in the river channels, coupled with the generally elevated dust from the region-wide dust storm." Even more explicitly, ADEQ explained that the exceedance at West 43rd "was due to generally elevated PM_{10} from the dust storm coupled with contributions from dust generated in the alluvial plain of the Salt and Gila Rivers due to high, gusty winds." While ADEQ has concluded that the exceedance at West 43rd was caused by emissions originating in the Salt and Gila River channels, there little technical justification supporting this conclusion and there is no discussion explaining how emissions from these sources are not reasonably controllable or preventable.

While there appears to be some component of the PM_{10} that could be attributed to a regional dust storm event, the time series (Figures 16 and 17) indicate that the regional event did not influence the measured PM_{10} at the West 43rd site until very late on June 4 and the principal cause of the exceedance were emissions from local sources. Therefore, the weight of evidence does not demonstrate a clear causal relationship as required by the EER.

6.0 Concentration in Excess of Normal Historical Fluctuations

Pursuant to 40 CFR 50.14(c)(3)(iii)(C), the demonstration must show that "the event is associated with a measured concentration in excess of normal historical fluctuations." ADEQ provided tables for each event that ranked the PM_{10} exceedances using data from the past five years (2003-2008). A comparison was made to five years of data from the "spring season" and the complete five year data set. Table 6 summarizes these data.

Table 6: ADEQ Historical Distribution

Exceedance Date	PM_{10} Concentration	Seasonal Percentile	Yearly Percentile
3.14.08	251 $\mu g/m^3$	< 99.5	< 99.5
4.30.08	172 $\mu g/m^3$	< 97.5	< 99.7
5.21.08	279 $\mu g/m^3$	< 99.5	< 99.5
6.4.08	194 $\mu g/m^3$	< 97.5	< 99.0

There is no specific threshold test for this requirement, but concentrations in the high percentiles can provide supporting evidence and informs EPA's weight of evidence analysis of the exceptional events in question. As stated in the EER preamble, "For extremely high concentrations relative to historical values, a lesser amount of documentation or evidence may be required." [36] While the relative comparison to the historical fluctuations informs the amount of evidence required, for an event to be considered an exceptional event, all criteria listed under section 3.0 must be met.

7.0 No Exceedances But For the Event

Pursuant to 40 CFR §50.14(c)(3)(iii)(D), the demonstration must show that "there would have been no exceedance or violation but for the event." The weight of evidence in a demonstration does not require a precise estimate of the air quality impact from the event,[37] though such information could be useful.

Assessments for all events include an "event contribution analysis" to support the notion that there would have been no exceedance but for the event. This analysis consists of a table that calculates the 24-hour PM_{10} concentration excluding the hours of the day that the event was assumed to have occurred. There is no explanation of how to interpret this analysis, and it is unclear how these hours are chosen for exclusion. Also, from the documentation alone, it is unclear how this calculation is performed. After conversations with staff members of ADEQ, it was determined that the hours that have been chosen for exclusion are replaced by the average PM_{10} concentration calculated with remaining hours of the day. This is equivalent to assuming there is no normal increase during those hours. If there is a typical rise during that period, then the average used may not be representative of typical conditions. Considering the weight of evidence, the assessments for all four events do not provide sufficient evidence to establish that there would not have been an exceedance but for the event.

8.0 Procedural Requirements

The EER at 40 CFR §50.14(c)(2)(iii) requires that data claimed to be due to an exceptional event must be flagged in the AQS database, and that an initial description of the event be provided to EPA by July 1 of the year following the event.

Pursuant to 40 CFR §50.14(c)(3)(i) the State must submit a demonstration to EPA within three years of the event. EPA received the final demonstrations for the 2008 events in question on November 17, 2009, which satisfies the three year submission requirement.

40 CFR §50.14(c)(3)(i) also requires notice and opportunity for public comment. ADEQ's documentation was available on the ADEQ web-site and the ADEQ Library in Phoenix beginning on October 15, 2009. No comments were received from the public during the comment period.[38] Information included in the draft supplemental report, received by EPA on March 17, 2010, has not yet gone through the public comment process.

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[36] EER Preamble, 72 FR 13569.
[37] Id. at 13570.
[38] Letter from Nancy Wrona, ADEQ, to Deborah Jordan, USEPA Region 9 received on November 17, 2009.

9.0 Conclusion

ADEQ stated that the measured exceedances at the West 43rd monitoring site, during these days, were a result of the transport of dust from soils by high winds that were associated with approaching low pressure systems. For all of the events, there appears to be elevated wind speeds in various locations throughout the Phoenix area, but as discussed in section 4.3, ADEQ's approach to defining "unusual" winds relies on complete yearly data, rather than the season during which the events occurred. In addition, ADEQ's approach would find that "unusual" winds occur on approximately 100 days a year. Also, there is little discussion or explanation concerning the meteorological conditions that were occurring on the days in question and how those conditions affected the elevated PM_{10} concentrations at the West 43rd monitoring site. The majority of the data concerning these relationships are presented in tables and a small number of graphs with no explanation of the interpretation of the information that has been presented.

Moreover, the Assessments did not adequately address the sources that may have been contributing to the event. Without this information, it is difficult to determine whether the elevated PM_{10} concentrations resulted from controllable anthropogenic sources or natural desert sources. Since there are numerous anthropogenic sources located in upwind areas, this information is critical to assessing whether an exceedance is the result of an exceptional event or uncontrolled anthropogenic sources. With little discussion of the meteorological conditions on the event days combined with a very limited discussion on possible sources, the Assessments did not adequately establish a clear source-receptor relationship or make a convincing demonstration that the events in question should be considered natural events under the EER.

Furthermore, the information in the Assessments did not support the broad conclusion that the elevated PM_{10} concentrations were caused by transport of dust from soils by high winds. Again, without acknowledging the sources that may be contributing to the event, it is difficult to determine where the dust originated from and how it was transported to West 43rd. Also, the monitoring data is inconsistent with the notion of transport. If transport was occurring on these days, one would expect to see similar concentrations at nearby monitoring locations. One of the most interesting aspects of these events is that on March 14 and April 30 the West 43rd monitor is the only monitor to violate the 24-hour standard, not only in the Phoenix area, but the entire state of Arizona except for the Cowtown monitor in Pinal County, which consistently measures the highest levels of PM_{10} within Region 9 due to its proximity to a large cattle feedlot. Also, the differences between the hourly PM_{10} concentrations at West 43rd and other sites that are located just a few miles away are striking. Although it is very clear that there is something unique about the measured exceedances at the West 43rdsite, the assessments did not explain these differences in PM_{10} concentrations and how they are inconsistent with a regional high wind event.

The June 4 DSR included a more detailed discussion of the meteorological conditions during the event and provided some discussion on the sources that may be influencing the elevated PM_{10} concentrations at the West 43rd monitoring site. The additional documentation asserted that the exceedance measured at the West 43rd monitoring site can be attributed to emissions from the dry Gila and Salt River channels that were coupled with contributions from a regional dust storm. As previously discussed, the documentation Assessments did not provide sufficient technical

justification of this conclusion and did not explain how emissions from these sources were not reasonably controllable or preventable. Furthermore, the data show that the contribution from the regional dust storm during the late night hours of June 4 was not significant and the exceedance was most likely driven by the elevated PM_{10} concentrations measured in the late morning and early afternoon hours.

The June 4 DSR provided some new information regarding the significant differences in the hourly PM_{10} values seen at the Durango Complex and South Phoenix monitoring sites. The documentation stated that "it is also entirely possible that the urbanized core of the Phoenix metro area acted to reduce the amount of blowing dust compared to the western periphery due to increased surface roughness." While this might be relevant, it does not account for the nearly identical PM_{10} concentrations measured throughout the entire Phoenix area in the evening hours of June 4 and the morning hours of June 5. The June 4 DSR did not provide sufficient technical analysis to support a clear source receptor relationship or provide new evidence to support the notion that the June 4 event should be considered a natural event under the EER. Considering the weight of available evidence, EPA does not concur that the March 14, April 30, May 21 and June 4, 2008 exceedances at the West 43rd monitoring site should be treated as exceptional events.

Appendix A

Table 1: Meteorological Data Used in ADEQ's Assessments[39]						
Available Met Data	**Distance to West 43rd**	**Direction**	**3.14.08**	**4.30.08**	**5.21.08**	**6.4.08**
WEST PHOENIX	5	N	x		x	
MESA	16	E		x		
NORTH PHOENIX	12	NNE				
GLENDALE	12	N				
PINNACLE PEAK	27	NE				
CENTRAL PHOENIX	7	ENE	x	x		x
SOUTH SCOTTSDALE	14	ENE		x		
GREENWOOD	4	NNE				
SOUTH PHOENIX	4	E		x	x	
COYOTE LAKES*	21	NNW	x			x
WEST CHANDLER	17	ESE		x		
TEMPE	12	E				
HIGLEY	25	ESE		x		
WEST 43RD	n/a	n/a	x	x	x	x
DYSART	20	NNE				
BUCKEYE	28	W			x	x
DURANGO COMPLEX	2	NE	x	x	x	x
JLG SUPERSITE	7	NNE				
WEST INDIAN ROAD	6	N				
FALCON FIELD	24	E				
CAVE CREEK	29	NNE				
BLUE POINT	32	ENE				
FOUNTAIN HILLS	28	ENE				
GOODYEAR	13	W	x	x		
LUKE AFB	16	NW				x
GLENDALE	13	NW	x			
SKY HARBOR	9	ENE	x		x	
DEER VALLEY	20	N			x	
SCOTTSDALE	20	NE				
FALCON FIELD	24	E				
CHANDLER	21	ESE				
WILLIAMS GATEWAY	29	ESE				

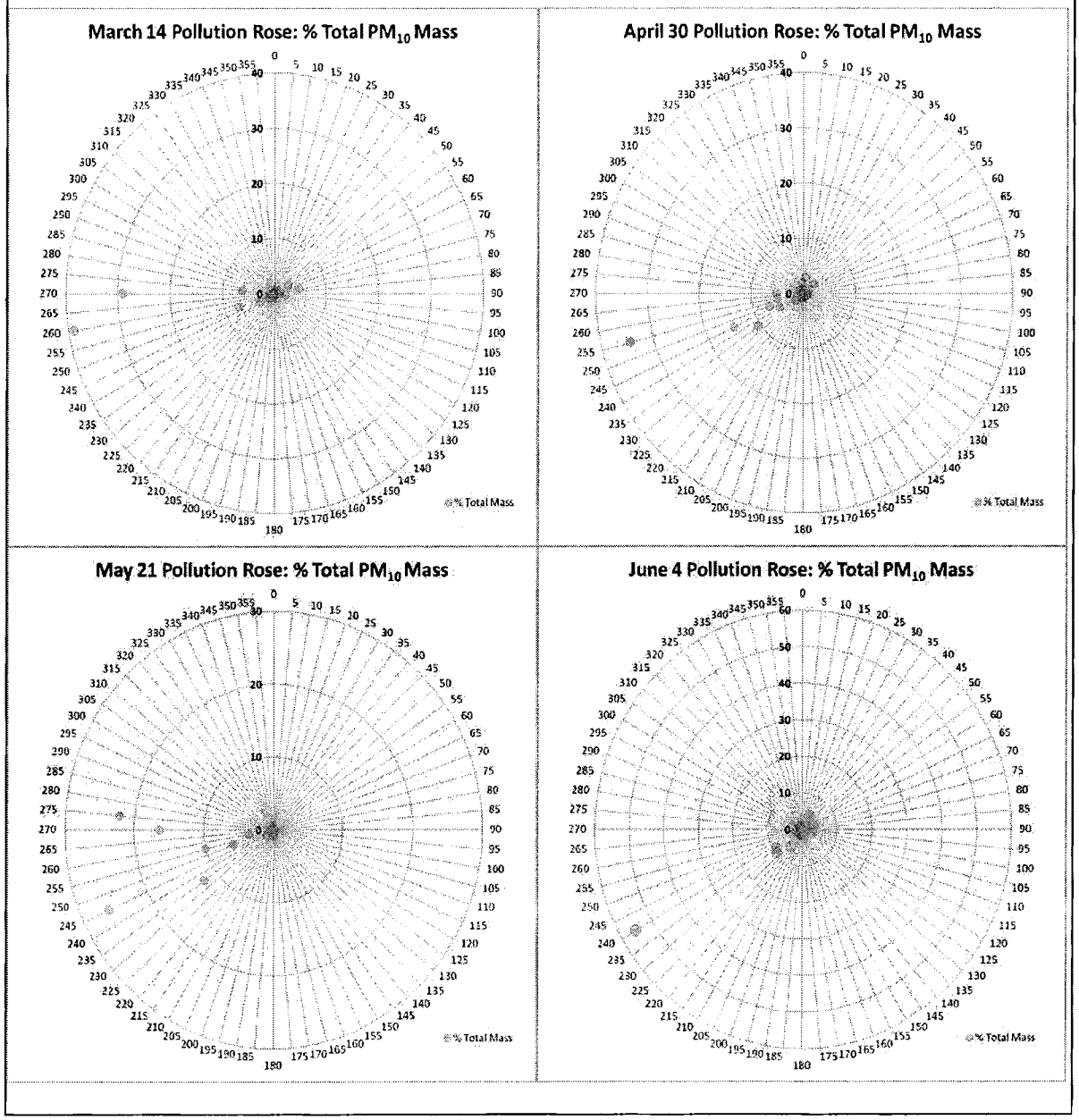
[39] The highlighted areas in Table 1 correspond to either the closest meteorological station or stations upwind of the West 43rd monitoring site.

Table 2: PM_{10} Data Used in ADEQ's Assessments[40]				
Site Name	**Distance to West 43rd**	**Direction**	**24 Hour PM_{10} Data**	**Hourly PM_{10} Data**
		3.14.08		
WEST PHOENIX	5	N	x	x
CENTRAL PHOENIX	7	ENE	x	x
GREENWOOD	4	NNE	x	x
SOUTH PHOENIX	4	E	x	
COYOTE LAKES	21	NNW	x	x
HIGLEY	25	ESE	x	
WEST 43RD	n/a	n/a	x	x
BUCKEYE	28	W		
DURANGO COMPLEX	2	NE	x	x
JLG SUPERSITE	7	NNE	x	
		4.30.08		
WEST PHOENIX	5	N	x	
MESA	16	E		**n/a**
NORTH PHOENIX	12	NNE		**n/a**
GLENDALE	12	N		**n/a**
CENTRAL PHOENIX	7	ENE	x	x
SOUTH SCOTTSDALE	14	ENE		**n/a**
GREENWOOD	4	NNE	x	x
SOUTH PHOENIX	4	E	x	x
COYOTE LAKES	21	NNW	x	
WEST CHANDLER	17	ESE		**n/a**
HIGLEY	25	ESE	x	x
WEST 43RD	n/a	n/a	x	x
DYSART	20	NNE		**n/a**
BUCKEYE	28	W		
BETHUNE	4	NE		**n/a**
DURANGO COMPLEX	2	NE	x	x
JLG SUPERSITE	7	NNE	x	
		5.21.08		
WEST PHOENIX	5	N		x
CENTRAL PHOENIX	7	ENE		
GREENWOOD	4	NNE	x	
SOUTH PHOENIX	4	E	x	x
COYOTE LAKES	21	NNW		
HIGLEY	25	ESE		
WEST 43RD	n/a	n/a	x	x
BUCKEYE	28	W		x
BETHUNE	4	NE		**n/a**
DURANGO COMPLEX	2	NE	x	x
JLG SUPERSITE	7	NNE		

[40] The highlighted areas in Table 1 correspond to either the closest meteorological station or stations upwind of the West 43rd monitoring site.

6.4.08				
WEST PHOENIX	5	N		x
CENTRAL PHOENIX	7	ENE		x
GREENWOOD	8	NNE		x
SOUTH PHOENIX	4	E		
COYOTE LAKES	21	NNW	x	x
HIGLEY	25	ESE		
WEST 43RD	n/a	n/a	x	x
BUCKEYE	28	W	x	x
BETHUNE	4	NE		
DURANGO COMPLEX	2	NE		x
JLG SUPERSITE	7	NNE		

Figure 1: West 43rd Pollution Roses % Total PM_{10} Mass



Appendix B

EPA acknowledges that massive dust storms do occur in the Southwestern United States and that these events could quality as exceptional events if all requirements of the EER were satisfied. The following information could be used as evidence in an exceptional events demonstration if the conditions of the event were consistent with those observed during a dust storm.

The relationship between weather types, wind speed, and dust storm generation has been researched and examined for many years. Generally, there are generally four different weather types that are capable of producing dust storms. These conditions were examined in further detail by Brazel and Nickling in two separate research papers during the 1980's. Both studies conclude that the frequency of dust storms can be directly linked to specific weather conditions which are accompanied by elevated wind speeds, but also note that dust events are "strongly affected by antecedent conditions (i.e. surface moisture, vegetation cover, surface crusting, and anthropogenic disturbances)". For the years 1965 -1980, 80% of all intense dust storms[41] in the Phoenix area were related to thunderstorm activity in the region. The mean wind speed for dust storms during this time period in the Phoenix area were 12.4 m/s or 27.7 mph, while the mean peak gusts were 17.8 m/s or 39.8 mph (Nickling W.G., Brazel A.J., 1984). Some of these intense dust storms that occur in the Phoenix area could potentially be classified as "haboobs": events that are caused by powerful downdrafts from thunderstorms and have the potential to create solid walls of advancing dust (Idso, 1972).

There are a number of different definitions of "dust storms" based on different levels of reduced visibility. The National Weather Service issues a dust storm advisory when visibility drops below 1 mile and a dust storm warning when visibility is less than ¼ mile. NWS further states that "typically, Blowing Dust Advisories are issued for widespread winds that may produce localized areas of blowing dust" and "dust storms can occur with widespread winds, or may be associated with thunderstorm outflow." Table 2 lists all days in 2008 that had reports of blowing dust or dust storms at Phoenix NWS stations.

Similarly, Nickling and Brazel (1984) also use a reduced visibility of 1 mile as a cut-off point for dust storm classification. This criterion was chosen to be the most representative of the conditions that can be attributed to dust storms in Arizona. Earlier research suggests that reduced visibility less than 7 miles constitutes dust storm classification (Orgill, Sehmel, 1976). Table 1 shows the visibility recorded at Goodyear Airport during the event days in question compared to the various dust storm definitions discussed above.

In 2008, the Phoenix area experienced numerous occurrences of thunderstorm activity and elevated winds. A detailed account of these events is displayed in table 3 and is available in the NWS report "Storm Data and Unusual Weather Phenomena". Four of the events are described as dust storms.[42] For example, an event occurring on September 11 was described as "a

[41] Intense dust storms (IDS) correspond with visibility $\leq$ 1 mile, while moderate-to-weak dust storms (MWDS) correspond to visibility >1 mile but $\leq$ 7 miles.

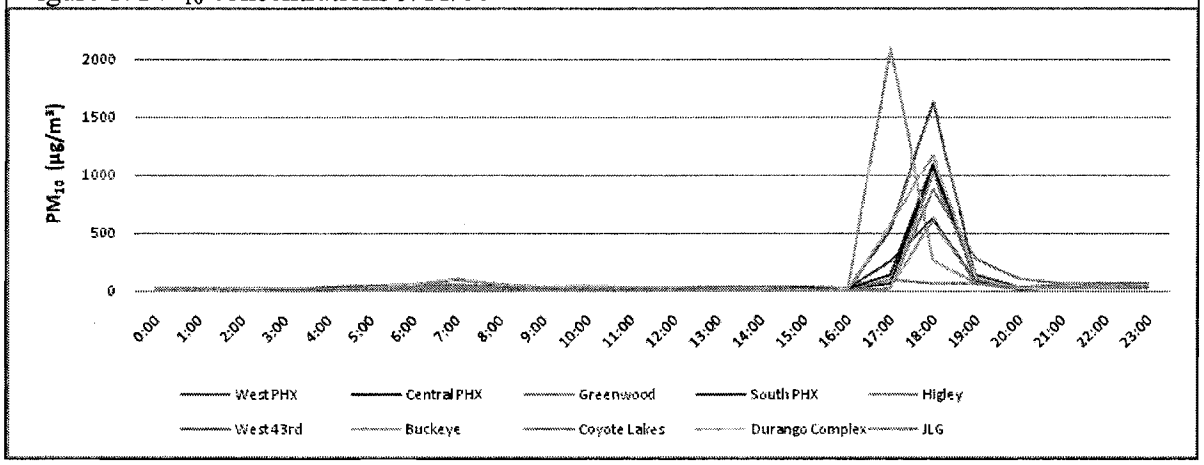
[42] The events described by the NWS as dust storms occurred on May 15, July 1, July 10, and September 9. The meteorological events that occurred on the days of concern for the present analysis (March 14, April 30, May 21, and June 4) were not characterized as such.

spectacular dust storm moved across west-central and central Maricopa County, including the Greater Phoenix area. Dust moved southwest to northeast, with winds typically 30-50 mph accompanying the blowing dust. A 3-mile stretch of power poles was blown down along old U.S. highway 80 south of Buckeye and north of Gila Bend (615 PM)".

Table 1: Dust Storm Comparison				
Event Date	**3.14.08**	**4.30.08**	**5.21.08**	**6.4.08**
Event Visibility (miles)[43]	**10**	**7**	**7**	**20**
0.25[44]	N	N	N	N
1[45]	N	N	N	N
7[46]	N	N	N	N

Figure 1 further illustrates how PM_{10} concentrations can be affected during these events. The September 9 dust storm originated in the southwest and moved through Phoenix, heading northeast. Wind speeds throughout the Phoenix area reached 30 mph, with 40 mph wind gusts reported at the NWS Luke Air Force Base station. Wind direction during the event was predominately from the west/southwest. The visibility during the event dropped below ¼ mile at one station and remained below 5 miles for other stations in the area. Figure 1 shows the west to east movement of the dust storm and its effect on the PM_{10} monitoring stations in the Phoenix area. PM_{10} concentrations spike first at the Buckeye monitor at 1700 hrs and the rest of the central Phoenix area experiences elevated PM_{10} concentrations at 1800 hrs.

Figure 1: PM_{10} concentrations 9/11/08



[43] Visibility during periods of elevated wind speed and elevated PM_{10} at West 43rd
[44] NWS Warning
[45] NWS Advisory & Nickling and Brazel
[46] Orgill and Sehmel

Table 2: National Weather Service Significant Weather Types 2008									
Date	**Goodyear**	**Luke AFB**	**Glendale**	**Sky Harbor**	**Chandler**	**Williams Gateway**	**Falcon Field**	**Scottsdale**	**Deer Valley**
3.14.08									
4.16.08	BLDU								
4.30.08									
5.15.08	BLDU	SQ			BLDU				
5.21.08					BLDU				
6.4.08	BLDU	BLDU DU							
6.5.08		HZ		BLDU HZ	BLDU	HZ		HZ	HZ
7.1.08		BLDU			BLDU				HZ SQ
7.3.08		BLDU							
7.4.08			BLDU					HZ	
7.10.08				BLDU					
7.13.08				BLDU					
7.26.08						BLDU			
8.7.08		BLDU		BLDU	BLDU				
8.14.08	BLDU	BLDU		BLDU	BLDU	BLDU			
8.25.08	BLDU	BLDU SQ	BLDU	BLDU					
8.30.08		BLDU			BLDU				
9.8.08					BLDU				
9.11.08	DS	BLDU HZ	BLDU	BLDU HZ SQ	BLDU	DS HZ	BLDU	HZ SQ	HZ
9.26.08						BLDU			
9.27.08				BLDU					
11.9.08	BLDU	HZ		BLDU	BLDU		BLDU		HZ
12.13.08	BLDU								
Notes: BLDU - Blowing Dust DS - Dust Storm DU - Dust HZ - Haze SQ – Squall[47]									

Table 3: NWS Storm Data and Unusual Weather Phenomena Reports 2008				
Date	**Location[48]**	**Event**	**Time**	**Description**
3.14.08	**NONE**			
4.16.08	**NONE**			
4.30.08	**NONE**			
5.15.08	AZZ028-Central Deserts	**Dust Storm**	1515-1640	Strong and gusty winds uprooted trees in Eastern Chandler. **Dense blowing dust** with low visibility was reported at Gateway airport
	Maricopa County	Thunderstorm Wind	1535-1610	Portions of eastern Maricopa county and Pinal county received gusty winds from a line of thunderstorms that moved rapidly toward the south.
5.21.08	NONE			

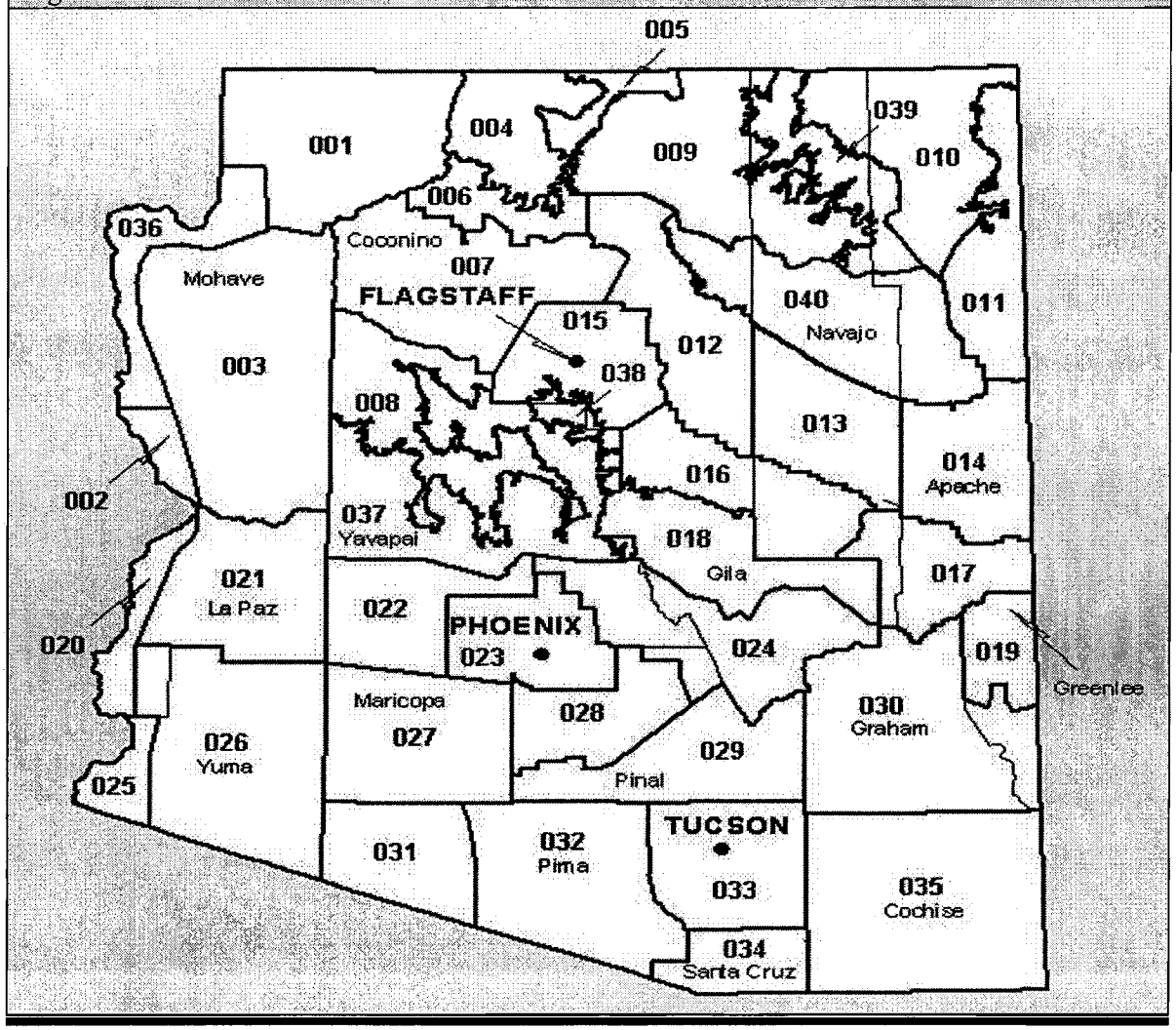
[47] NWS definition: sudden onset of a strong wind with increase of at least 16 knots and sustained at 22 knots or more for at least one minute

[48] See Figure 2 for NWS Forecast Areas

6.4.08	**NONE**			
6.5.08	NONE			
7.1.08	AZZ028-Central Deserts	**Dust Storm**	1740-1800	Low visibility due to blowing dust resulted from strong winds from nearby thunderstorms. Winds were generally in the 30 to 40 mph range with reports of **blowing dust** in the Phoenix East Valley Late in the afternoon and early afternoon.
7.3.08	Maricopa County	Funnel Cloud	2140	Pilot reported sighting a brief funnel cloud. Thunderstorms were triggered by an old outflow boundary. The associated peak wind gusts were 28 knots at Sky Harbor and 39 knots at Scottsdale airport
	Pinal County	Thunderstorm Wind	1630-1631	Several trees were uprooted at Saddlebrook
7.4.08	Maricopa County	Thunderstorm Wind	1900-2000	Scottsdale airport recorded peak winds of 53 mph during thunderstorms. Winds at Sky Harbor airport reached as high as 39 mph and some tents at the fireworks display were blown down
7.10.08	AZZ026 - Southwestern Deserts	**Dust Storm**	1540-1700	Strong winds from nearby thunderstorms resulted in **dense blowing dust**.
	Maricopa County	Thunderstorm Wind	1830-2045	Winds caused power outages and property damage due to microburst winds as high as 65 mph. Winds blew down a tree near 78th Street and McDonald which damaged a covered parking structure.
	Maricopa County	Thunderstorm Wind	1915-1925	Winds speed measured at 68 mph at Bush Highway and Usery Pass Road. According to radar, these storms were moving west at about 35 mph.
	Pinal County	Thunderstorm Wind	1927-1940	Spotters in two locations in Apache Junction had gusts to 67 and 89 mph
7.13.08	Maricopa County	Thunderstorm Wind	1600-1630	Winds from a microburst blew down about 25 trees and damaged light poles at Mesa Community College. A security officer was slightly injured when the strong winds blew him from his golf cart.
7.26.08	Maricopa County	Thunderstorm Wind	1830	Power poles and trees were reported down at Chandler Heights and Greenfield roads, as well as Ocotillo and Higley and at Ocotillo and Power roads. Brief strong winds caused isolated damage to parts of the Southeast Valley
8.7.08	Maricopa County	Thunderstorm Wind	1940-1950	Power poles and lines reported blown down. As many as 70 poles were down in the Buckeye area alone. Note: the estimated wind gust of 60 knots is equivalent to 69 mph.
	Maricopa County	Thunderstorm Wind	2017-2020	Power poles down in Central Phoenix. Note: the estimated wind gust of 60 knots is equivalent to 69 mph.
	Maricopa County	Thunderstorm Wind	2020-2025	Large branches blown from trees. Note: the estimated wind gust of 55 knots is equivalent to 63 mph.
8.14.08	Pinal County	Thunderstorm Wind	1810-1850	Strong winds reported by spotter. Note: the estimated wind gust of 52 knots is equivalent to 60 mph.

	Maricopa County	Thunderstorm Wind	1812-1852	Several crashes on the Loop 202 were blamed on strong winds and rain. Power outages were reported after winds and rain moved through the East Valley. SRP reported about 3,000 customers were left without electricity…and APS reported 2,000 customers without power. Note: the estimated wind gust of 52 knots is equivalent to 60 mph.
	Maricopa County	Thunderstorm Wind	1838	Strong winds reported at Brown and Mesa. Trees were damaged. Note: the estimated wind gust of 50 knots is equivalent to 58 mph.
	Maricopa County	Thunderstorm Wind	1905	Winds at Chandler Airport reached 50 knots as severe thunderstorms moved toward the west. The southern and central portions of Arizona were very moist and unstable. Storms developed and moved toward the southwest and strong winds kicked up widespread areas of **blowing dust**. A Severe Thunderstorm Watch was in effect for much of the evening. Note: the measured wind gust of 50 knots is equivalent to 58 mph.
8.25.08	Maricopa County	Thunderstorm Wind	1510-1526	Microburst winds hit Chandler airport and flipped at least two planes. Winds also damaged a fence and other property. Northeast winds peaked at 67 mph at 3:25 pm. Thunderstorm winds over 80 mph damaged planes at Chandler Municipal Airport. Strong winds also blew down tress and damaged some homes in the Chandler area. **Dense blowing dust** was also reported. Note: the measured wind gust of 58 knots is equivalent to 67 mph.
8.30.08	NONE			
9.8.08	NONE			
9.11.08	Maricopa County	Thunderstorm Wind	1710-1720	Shingles were blown off homes, and a few trees were uprooted.
	Maricopa County	Thunderstorm Wind	1734-1742	Winds estimated to reach as high as 60 mph along with visibility to less than a 1/4 mile in **blowing dust**.
	Maricopa County	Thunderstorm Wind	1740	Flood control district sensor measured a gust to 60 mph.
	AZZ023-Greater Phoenix Area	**Dust Storm**	1745-1815	Thunderstorms moved steadily toward the northeast during afternoon hours. As a result, locally heavy rain, strong winds and very low visibility due to **dust and sand moved across the deserts**
	Maricopa County	Thunderstorm Wind	1815-1840	According to Arizona Public Service, 48 power poles across a distance of three miles were blown down along Old Highway 80 between Buckeye and Gila Bend. Winds were measured up to 56 mph on the Palo Verde Nuclear Generating Station tower.
9.26.08	NONE			
9.27.08	NONE			
11.9.08	NONE			
12.13.08	NONE			

Figure 2: NWS Forecast Areas



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Phoenix PM_{10} Plan: Transportation Conformity Implications and Timelines

Issue:

Due to continuing violations of the standard and other issues, the EPA intends to propose disapproval of the submitted PM_{10} 5% plan for Phoenix. Any path forward will have implications for transportation conformity.

Background:

EPA found the Motor Vehicle Emissions Budget (MVEB) in the 5% plan to be adequate in May 2008. The MVEB for PM_{10} under the previous approved plan was 59.7 metric tons per day (mtpd); the new budget is 103.3 mtpd. The most recent Transportation Improvement Plan shows 101.8 mtpd of PM_{10} emissions from on-road sources in 2028. The Metropolitan Planning Organization, Maricopa Association of Governments (MAG) would not be able to show conformity to the old 59.7 mtpd budget.

On Dec. 2, 2009, EPA was sued for failing to act on the plan within the timelines specified in the Clean Air Act. We are currently in settlement negotiations with the litigant. The negotiations will result in a consent decree that sets the latest date by which EPA can act on the plan.

Plan Disapproval Implications:

Timeframe	Milestone
Date set in consent decree	Regional Administrator (RA) signs final disapproval of plan
30-90 days after final disapproval in Federal Register[1]	Disapproval action becomes final, conformity process freezes[2]
18 months after disapproval in the Federal Register	Emission offset sanctions: The state must ensure that each ton of emissions created by a new stationary source of PM-10 in the nonattainment area is offset by a two ton reduction in existing stationary sources in the area.
24 months after final disapproval in Federal Register	Highway funding sanctions; conformity lapse; FIP imposed

A conformity freeze means that only projects in the first four years of the most recent conforming Regional Transportation Plan (RTP) and Transportation Improvement Program (TIP) can proceed[3]. During a freeze, no new RTPs, TIPs or RTP/TIP amendments can be found to conform until a new 5% plan is submitted, and EPA finds the budget in that SIP adequate for conformity purposes. If adequate budgets are not in place in time, the freeze will turn into a lapse in conjunction with the imposition of highway sanctions which normally occurs two years after the SIP disapproval without a protective finding, or by the next required conformity determination as required by the frequency requirements of 40 CFR §93.104, whichever occurs first.

If the EPA were disapproving the plan for administrative reasons unrelated to the attainment demonstration, the 5% requirement and reasonable further progress (RFP) demonstration, then EPA could issue the disapproval with a protective finding. This would avoid the conformity freeze. This is not the case and therefore EPA does not believe that a protective finding is applicable to the current situation with the Phoenix PM_{10} plan.

---

[1] EPA has the administrative flexibility to set an effective date as much as 90 days after publication of the final disapproval of the plan (See 68 FR 38974, at 38986 June 30, 2003).

[2] See 40 CFR §93.120(a)

[3] This does not include exempt projects such as transportation control measures, safety projects and non-regionally significant state and locally funded projects.

The MVEB submitted in the new 5% plan should be consistent with both the RFP and the attainment demonstrations. Note that EPA can act on the RFP budgets separately from the attainment budgets if the attainment target set in the plan is deemed adequate. If the State can develop an RFP plan that meets EPA requirements, this approach allows for transportation planning to continue while EPA and the State work to resolve concerns about the attainment demonstration.

In the unlikely event of a conformity lapse, DOT can only make approvals or grants for: projects that are exempt from the conformity process and transportation control measures (TCMs) that are included in approved SIPs. Therefore only the following six types of transportation projects may proceed for purposes of funding and implementation:

1. TCMs in Approved SIPs;
2. Non-Regionally Significant Non-federal Projects;
3. Regionally Significant Non-federal Projects - only if the project was approved by all necessary non-federal entities before the lapse[4]
4. Project phases that received funding commitments or an equivalent approval or authorization prior to the conformity lapse.
5. Exempt Projects - identified under 40 CFR §93.126 and 40 CFR §93.127; and,
6. Traffic Synchronization Projects

Note that the conformity lapse would be imposed at the same time as federal highway funding sanctions.

Plan Withdrawal Implications:
If Arizona were to withdraw the current Phoenix PM_{10} 5% plan, they would have to also withdraw the MVEB. This means that the area would revert to its previous approved MVEB of 59.7 mtpd. Since the current transportation plans show emissions exceeding that level, MAG would in effect be in a conformity freeze since no new conformity determinations could be made.

Also, upon withdrawal of the plan, EPA would immediately issue a finding of failure to submit, which would start the clock on highway sanctions and conformity lapse[5].

Timeframe	Milestone
Date determined by ADEQ	Current plan withdrawn: Approved MVEB drops to 59.7 mtpd, conformity freezes; RA signs finding of failure to submit starts clock on lapse and highway sanctions;
18 months after Finding of Failure to Submit is published in the Federal Register	Emission offset sanctions: The state must ensure that each ton of emissions created by a new stationary source of PM-10 in the nonattainment area is offset by a two ton reduction in existing stationary sources in the area.
24 months after Finding of Failure to Submit is published in published in the Federal Register	Highway funding sanctions; conformity lapse; FIP imposed

[4] See Transportation Conformity Reference Guide, Section C:, Chapter 4 (http://www.fhwa.dot.gov/environment/conformity/ref_guid/chap4.htm#nonfed) for more details.
[5] see 40 CFR 93.120(b)

Agenda Item #5

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Clean Air Report - 06/10/2010

EPA Veto Of Arizona 'Exceptional' Event Claim Bolsters Call For Guidance

EPA has rejected Arizona's bid to rely on an EPA "exceptional" events rule to exempt dust storms that contributed to air pollution spikes from counting towards its attainment of air standards, highlighting problems states face in using the rule to win the exemptions, and bolstering calls for EPA guidance to ease the rule's implementation, sources say.

The agency is working on guidance designed to address some of the states' concerns, which include criticisms that the rule sets unclear definitions for what events qualify as those that are in excess of "historical" concentrations. But some states are calling for formal notice-and-comment rule revisions, which they say are long overdue in order to address a backlog of states' exceptional events claims said to be pending at EPA.

Among the changes states are advocating are guidance on prioritizing EPA processing of more-complicated exceptional events, and rule changes to amend the agency's definition of "exceptional" events.

California Air Resources Board (CARB) head Mary Nichols is crafting a "stern" letter to EPA urging it to quickly issue guidance to make the rule easier to implement and apply in a nationally consistent manner, according to a California air official who also describes the denial of Arizona's claim as "troubling."

EPA appears to be sticking with plans to develop guidance and not pursue formal changes to its rule. The agency's exceptional events rule, issued during the Bush administration, allows states to claim that exceptional events -- those defined by EPA as natural events, or events unlikely to recur that are not reasonably controllable or preventable -- caused pollution to increase in excess of normal historical concentrations.

If EPA approves a state's claim then the pollution associated with an exceptional event does not count towards the state's attainment with an agency national ambient air quality standard (NAAQS).

State officials say the backlog of exceptional events claims at EPA will only grow with the stricter ozone NAAQS EPA is expected to finalize in August. The new standard, in the range of 0.060 to 0.070 parts per million, will push many areas out of attainment for the first time. Many states, particularly in the West, will need to use the exceptional events rule to exclude pollution spikes in order to meet the NAAQS, sources say.

However, state and local air officials claim that EPA has a backlog of exceptional events claims and that it is difficult for states to prove such claims, because the agency does not apply the rule on a consistent basis and it is unclear what metric EPA uses to determine historical concentrations under the rule.

EPA's decision to reject Arizona's claim of an exceptional event that should be exempted from counting towards NAAQS attainment highlights the difficulties states face in using the rule, sources say.

EPA Region IX Administrator Jared Blumenfeld in a May 25 statement said he was rejecting Arizona's claim of an exceptional event because, "After thoroughly reviewing the State's data, EPA air-quality scientists determined that a legally significant number of pollution spikes were not the result of regional dust storms." According to Blumenfeld's statement, the exceptional events claimed by Arizona "were not supported by the science."

Arizona had claimed that 10 out of 11 exceedances of EPA's coarse particulate matter (PM10) NAAQS were caused by naturally occurring dust storms, which are common across the arid West. But EPA's decision means that the agency could now disapprove Arizona's PM10 state implementation plan (SIP) -- an air quality blueprint for attaining the standard -- which in turn could result in the loss of federal highway funds.

Ben Grumbles, former Bush EPA water chief and now director of Arizona's environment department, said he is "disappointed" with the decision but will work with "local and regional agency partners to improve air quality."

The California air official says that the Arizona decision is "troubling" and highlights the problems that states face in collecting adequate data to make the case for an exceptional events exemption under EPA's rule.

The source says that a separate dispute with EPA over an exceptional events claim in California's Imperial County remains unresolved. EPA in December rejected the county's exceptional events claim for high-wind events that the county says caused PM10 NAAQS exceedances in the area in 2006 and 2007 -- a decision California opposes.

The source says that no progress has been made in talks with EPA over the decision, and that the CARB has not made any decision yet to approve the county's PM10 SIP, as the exceptional events determination forms an important part of that document. However, CARB's Nichols will soon send a letter to EPA, asking for changes to the implementation of the exceptional events rule to ease its use by states across the country, the source says.

Nichols will ask EPA to provide guidance that will enable state air districts and EPA regional offices to implement the rule in a uniform fashion, which they are presently unable to do, the source says.

EPA air chief Regina McCarthy told state air officials at a May meeting in Sacramento, CA, that EPA is aware of states' concerns with the rule, the California source says. McCarthy vowed that EPA would issue guidance this year, in line with an earlier promise to take steps to ease the rule's implementation, the source adds.

The Western States Air Resources Council (WESTAR), representing state and local air officials in the region, has previously argued that the definition of "exceptional event" needs to be clarified through a formal notice-and-comment rule revision to ease a state's demonstration that their NAAQS exceedances stem from such events.

EPA has said it will complete its consideration of possible changes to ease implementation by September, but has not so far indicated a willingness to actually revise the rule itself. However, states say that revisions may be necessary given the importance the rule will play in helping states meet stricter NAAQS.

Possible improvements EPA could make to the rule in its upcoming guidance include prioritizing EPA processing of difficult exceptional events requests from states, WESTAR has suggested. Another option is to establish standardized metrics to determine data requirements (*Clean Air Report*, March 4).

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Agenda Item #5

WESTERN STATES AIR RESOURCES COUNCIL

WESTAR

September 11, 2009

Gina McCarthy, Assistant Administrator
Office of Air and Radiation
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue
Washington, D.C. 20004

Subject: Recommendations to improve implementation of the Exceptional Events Rule

Dear Ms. McCarthy:

The Western States Air Resources (WESTAR) Council, an association of fifteen western state air quality management agencies, offers the enclosed recommendations related to the implementation of rules governing the treatment of data influenced by exceptional events – 40 CFR Parts 50 and 51, typically referred to as the Exceptional Events Rule. This rule is especially important in western states where we face significant air quality challenges brought on by chronic wildfires and dust storms. Improvements in the implementation of this important rule would benefit EPA, state and local agencies, and the public by focusing scarce air quality management resources on problems we can solve instead of problems over which we have little or no control.

Many of the problems that have been encountered could be resolved through simple rule revisions while others could be addressed through procedures that would differentiate those cases where expeditious concurrence is warranted from those cases where more rigorous justification is needed. In those cases where additional justification is needed, it is critical that EPA provide early feedback on the elements of an exceptional events request that are either misunderstood or that need further explanation.

Finally, states will always be limited to available data to justify their exceptional events requests. It is unlikely that the available data will be as complete and comprehensive as

would be needed to provide indisputable evidence in support of an exceptional events request. Nevertheless, decisions must be made and it is in all of our interests that those decisions are made on a timely basis.

Thank you in advance for your consideration of these recommendations. If you have any questions or comments, please contact Dan Johnson, WESTAR Executive Director, at 206-254-9145 (djohnson@westar.org).

Sincerely,

Martin Bauer

Martin Bauer, President
Western States Air Resources Council

Cc: WESTAR Council Air Directors
Bill Harnett, EPA-OAQPS
Steve Page, EPA-OAQPS
EPA Regional Administrators, Regions 6, 8, 9, 10
Bill Becker, NACAA

ATTACHMENT

Recommended Actions to Improve Implementation of 40 CFR Parts 50 and 51 Related to Treatment of Data Influenced by Exceptional Events

The Exceptional Events Rule, which became effective on May 21, 2007, provides state and local agencies with a mechanism to exclude air monitoring values associated with exceptional events from datasets used to make important regulatory determinations, including the determination of attainment and redesignation from nonattainment to attainment. The preamble to the rule characterizes exceptional events as "events for which normal planning and regulatory processes established by the [Clean Air Act] are not appropriate." State and local air quality management agencies and EPA Regional Offices have encountered problems implementing the rule. Delays in processing and approving exceptional event demonstrations add workload both for EPA as well as state and local agencies while the backlog of pending actions by EPA grows and retrieval of older documentation becomes increasingly problematic. State and local agencies are often faced with strict deadlines to make regulatory decisions (e.g., attainment/nonattainment determinations), decisions that could hinge on whether or not data affected by exceptional events are included or excluded. Accordingly, WESTAR believes that EPA should establish a goal to respond to requests within 60 days, and in no case should EPA need more than 18 months to make a final concurrence decision.

Many of the problems can be traced to the lack of clarity surrounding EPA's expectations about what a state[1] should include in its demonstration package, as well as lack of consistency between the preamble and the rule itself. States are left to guess what EPA will ultimately require. While written guidance could address this issue, strict guidelines and thresholds would ignore the reality that each exceptional event is different in its own way. *A state should always be afforded the opportunity to demonstrate that monitored data has been affected by an exceptional event and exclude the data even when the circumstances surrounding the event are unusual and do not conform to a "one size fits all" model.*

States, EPA, and ultimately the public will benefit if we can solve these implementation issues. States should not be required to solve problems over which they have little or no control. It is essential that we focus our air quality management resources on problems we can solve, especially in these times of tight budgets and limited resources.

WESTAR believes the following recommendations address many of the problems states and EPA have encountered over the past two years. EPA's expectations with regard to the scope and content of a state's exceptional events demonstration package need to be more clearly articulated. Once EPA's expectations are clear, states should be able to prepare packages

[1] All subsequent references to the state are meant to include state and local agencies responsible for submitting air quality data to the AQS.

that address those expectations or explain why an alternative analysis or explanation is appropriate.

Our recommendations address each of the showings a state is required to make, as spelled out in the Exceptional Events Rule. According to the rule, the state must show that:

1. An exceptional event occurred, as defined in the rule;
2. There is a clear causal relationship between the monitored value and the event;
3. There would have been no exceedance but for the event;
4. The event caused a measured concentration in excess of normal historical fluctuations;
5. The state has followed a public comment process; and
6. Reasonable actions are being taken to protect public health.

In general, we recommend that EPA use a screening process that differentiates exceptional event demonstrations that can and should be expedited from those that, absent significant justification, are unlikely to receive EPA concurrence. In the case of the former, neither EPA nor the state should devote additional resources to embellishing an otherwise approvable package. In the latter case, the state should know the hurdles it is likely to face in preparing an approvable demonstration so that informed decisions can be made about committing resources to the task.

The majority of the cases will fall somewhere between these two extremes – simple in many respects but more complicated in others. In these cases, it is important that EPA and the state are clear on both the showings that need more work as well as those showings that are sufficient and approvable. In short, both EPA and the state should be clear on expectations.

Recommendations

1. Show that an exceptional event occurred, as defined in the rule.

In the preamble to the Exceptional Events Rule, EPA describes exceptional events as "events for which the normal planning and regulatory process established by the CAA is not appropriate." This characterization addresses the fundamental issue that the Exceptional Events Rule is meant to address - that regulatory decisions under the CAA should not be biased by monitored air quality data over which the state has little or no control.

The rule provides a broad definition of an exceptional event as an event that affects air quality, is not reasonably controllable or preventable, and is either a natural event or an event that is unlikely to recur [50.1(j)]. The rule later restricts an exceptional event to exceedances or violations of a NAAQS [50.14(a)(1)] and further requires the state to justify its request for exclusion of data by showing that the exceedance would not have occurred but for the event [50.14(c)(3)(iii)(D)].

Unfortunately, these restrictions could result in inflated design values, driving Clean Air Act planning and regulatory processes that are not appropriate. For example, inflated design values could impact nonattainment area classifications, control program target reductions in attainment SIPs, monitoring network design obligations, and eligibility for the limited maintenance plan option.

WESTAR recommends either of two paths for EPA to address this issue. The preferred alternative would be for EPA to revise the Exceptional Events Rule to allow its use any time monitored values are affected by an exceptional event that is not reasonably controllable or preventable. If EPA chooses not to revise the rule, WESTAR recommends that EPA allow for data that does not otherwise meet the definition of an exceptional event to be excluded under the Part 50 NAAQS rule appendices that govern data handling and allow the Regional Administrator to exclude data on a case-by-case basis.

2. Show that there is a clear causal relationship between the monitored value and the event.

The relationship between the event and the impacted monitoring site should be clearly established by the state in its exceptional event demonstration package. Once that relationship has been clearly established, no further work to address this part of the Exceptional Events Rule should be required. In some cases, the circumstances of the event will be such that the demonstration by the state is simple, while in other cases more detailed analysis will be needed. Our recommendation centers on how EPA could differentiate between the simple and the more difficult demonstrations so that, in the simple case, expeditious concurrence can be expected, and in the more difficult case, EPA can quickly alert the state as to the specific information needed for approval.

The clear causal relationship should be established through a description of four critical elements: meteorology, area impacted by the event, contributing emission sources, and air quality impacts.

a. Narrative: Describe the event in narrative terms, including the chronology, and summarize how the following elements interacted to impact the monitoring site. The narrative and the associated analyses below should establish that: 1) there was an event, 2) the meteorological conditions were sufficient to provide for transport of the emissions generated by the event to the monitor, and 3) the chronology of concentrations (either daily or hourly) at the affected monitors are consistent with the expected arrival of the emissions.

b. Meteorology:
    i. Expedited review for *dust* if:

1. 20 mph or greater wind speed for minimum of 2 hours or wind speed above an established dust suspension threshold for the region, and;
2. Synoptic scale meteorology which could be coupled with back trajectories as appropriate showing source-receptor relationship.

ii. Expedited review for *fire impact on PM or ozone* if:

1. Synoptic scale meteorology which could be coupled with back trajectories as appropriate showing source-receptor relationship, or;
2. Satellite and/or photographic evidence showing plume impact coupled with vertical dispersion evidence showing ground level impact.

c. Area impacted by the event: Expedited review if all of the monitors expected to be impacted by the event were impacted.

d. Contributing emission sources: Expedited review if the state shows emissions in the area were consistent before, during, and after the event, aside from emissions from the event itself.

e. Air Quality Impacts: Expedited review if there is physical evidence of a plume impacting the monitor. For PM, this might include photographs or smoke markers on filter. For ozone, this might include a showing that the diurnal pattern differs significantly from the typical diurnal pattern for that monitoring site with respect to either the timing of peaks and valleys in the diurnal profile, or the rapidity of the buildup of concentrations.

3. Show that there would have been no exceedance but for the event

This is a special case of the clear causal discussion above, requiring a state to show not only that there was an impact from an event on a monitored value, but that the impact was significant enough to have caused the exceedance.

This demonstration requires a state to calculate the incremental impact caused by an event at a monitoring site over the relevant averaging time. In the preamble to the Exceptional Events Rule, however, EPA acknowledges that there are no precise and universally applicable techniques for calculating incremental impacts. Despite this acknowledgement, the state must do such a calculation to make the showing that there would have been no exceedance but for the event.

In large part, this dilemma is an outgrowth of EPA's choice to limit the definition of an exceptional event to an event that caused an exceedance of a NAAQS. EPA established a bright line test while acknowledging the absence of acceptable methods to meet the test.

Reiterating our comments above regarding EPA's choice to limit exceptional events to those that caused an exceedance, WESTAR believes that EPA should either revise the Rule to allow its use any time monitored values are affected by an exceptional event that is not reasonably controllable or preventable, or allow for data that does not otherwise meet the definition of an exceptional event to be excluded under the Part 50 NAAQS rule appendices that govern data handling and allow the Regional Administrator to exclude data on a case-by-case basis. If EPA chooses not to address this issue through either path, we offer the following recommendations on the requirement to show that there would not have been an exceedance but for the event.

WESTAR recommends expedited review when the incremental increase attributed to an exceptional event, as calculated using the methods described below, was sufficient to cause an exceedance of the relevant NAAQS:

a. Estimating event impacts on *24 hour PM*: Calculate the difference between the monitored value and the average PM concentration based on all of the hourly measurements at the site excluding the hours during which the event impacted the site. The difference is assumed to be the impact from the event. Hourly PM data must be available using this approach, or;

b. Calculate the 98th percentile average daily PM value for similar time periods (typically seasonal but more precise, area specific metrics could be used). The incremental impact from the event is assumed to be the difference between the actual value for that day and the 98th percentile expected value for similar days.

c. Estimating *fire impact on ozone*:

    i. In areas that use predictive modeling to estimate ozone values for AQI purposes, the increase in monitored ozone resulting from the event is assumed to be the difference between the monitored value and a predicted value, or;

    ii. The incremental impact from the event is assumed to be the difference between the actual value for that day and the 98th percentile expected value for similar days, calculated by determining the 98th percentile average 8-hour ozone value for similar time periods (typically seasonal but more precise, area specific metrics could be used).

4. Show that the event caused a measured concentration in excess of normal historical fluctuations

WESTAR stands by its May 25, 2006 comments to the Exceptional Events Rule docket as follows:

> "WESTAR's view is that statistical analysis may be used to qualify an event as an exceptional event, but statistical analysis should not be used to exclude an event from qualification as an exceptional event. Accordingly, WESTAR recommends that the rule allow States to seek a flag for any and all data impacted by an exceptional event. Concentrations above the 75th percentile of typical concentrations qualify as exceptional events and require only basic documentation. States may justify concentrations below the 75th percentile level on a case-by-case basis."

Notwithstanding WESTAR's comments, EPA chose in the final rule to require a state to show that the event resulted in a monitored value in excess of normal historical fluctuations. By limiting exceptional events in this manner, EPA has effectively excluded chronic dust and wildfire events that are common in the western states. That is, as chronic events, they are a part of our historical record against which we are required to show that a particular event caused an abnormal concentration. In short, during these chronic events, abnormal is normal, and under these circumstances it would be senseless to try to show that the event is abnormal.

WESTAR recommends that EPA either revise the rule to exclude this provision, or issue guidance consistent with our May 25, 2006 comments quoted above. The suggested 75th percentile should be considered sufficient for expedited review.

5. Show that the state has followed a public comment process

This provision of the Exceptional Events Rule has not proven to be a problem, and we therefore offer no recommendations for improvement.

6. Show that reasonable actions are being taken to protect public health.

While an exceptional event is defined as an event that is not reasonably controllable or preventable, reasonable steps can and should be taken to mitigate the impacts of an event on public health. This is consistent with the guiding principle in the preamble to the Exceptional Events Rule that protection of public health is the highest priority.

WESTAR recommends that states that have developed Natural Events Action Plans under the Natural Events Policy (superseded by the Exceptional Events Rule) continue to use these or

similar plans to guide the steps to be taken to alert and inform the public and to address actions the state may take to reduce emissions, especially from temporary and intermittent sources. States that have not developed such plans may consider doing so, or document other ongoing public education and alert programs if there is a likelihood of dust or fire events in the future.

As part of this showing, EPA must also determine whether the state is implementing an emission control program that, in effect, represents "reasonable actions" to protect public health. Section 110 of the Clean Air Act requires just this sort of showing in each state's SIP, a plan that provides for implementation, maintenance, and enforcement of primary and secondary air quality standards. The SIP must contain, among other things, enforceable emission limitations and other control measures, means, or techniques as may be necessary or appropriate to prohibit any source from contributing significantly to nonattainment or interfere with maintenance of national ambient air quality standards.

WESTAR believes that, with regard to exceptional events, EPA's assessment of whether a state is taking reasonable actions to protect public health should merely be an assessment of whether the state has met its obligations under Section 110 of the Clean Air Act. This would include emission control programs and regulations that are being implemented by the state, that have been submitted to EPA for inclusion in their SIP, but that have not yet been acted upon by EPA.

If the 110 SIP is deficient, EPA should call for a SIP revision as set forth in the Act. Under these circumstances the state would need to show that the deficiency had little impact on the monitored value for which the state has requested exclusion under the Exceptional Events Rule. Otherwise, WESTAR believes that the absence of a SIP call represents *defacto* evidence that the state is taking reasonable steps to protect public health.

In either case, EPA's review should focus on whether, in fact, the applicable provisions of the SIP were being implemented when the event occurred, including intermittent control measures—for example, suspending burn permits.

7. Additional recommendations

In addition to the recommendations above related to specific showings a state must make in support of an exceptional events request, WESTAR has several suggestions regarding basic program administration that, if implemented, will ensure that the state and EPA are clear on all issues related to the approvability of exceptional events requests. The common theme is: keep in touch and keep informed.

a. Learn from previous successes (and failures). The content and format of an approvable exceptional event demonstration will become clear over time as EPA responds to more and more demonstrations. A successful demonstration

should guide future demonstrations, including, for example, consistent definition of key terms and consistent application of analytical methods.

b. EPA should provide periodic reports on the status of their review of exceptional event demonstrations.

c. When an exceptional event demonstration, for one reason or another, does not qualify for expedited review, the state should be informed within 60 days of their submittal and given the opportunity to consult with EPA on the specific areas that are deficient. This is especially important when, in EPA's view, one or more of the areas represent a fatal flaw to approval.

In closing, streamlining the implementation of the exceptional events rule would benefit EPA, the states, and ultimately the public. Simple, yet critical, changes to the rule would resolve many issues, while other issues could be addressed by implementing procedures that differentiate exceptional events based on the complexity of the circumstances surrounding the event. States will always be limited to the data they have on hand to document an event. Knowing what data are most important and how those data are best used to document an exceptional event will contribute significantly to improving the implementation of the exceptional events rule.

Agenda Item #5

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAR 08 2010

OFFICE OF
AIR AND RADIATION

Mr. Martin Bauer
President
Western States Air Resources Council (WESTAR)
1218 3rd Avenue
Seattle, Washington 98101

Dear Mr. Bauer:

Thank you for your letter of September 11, 2009, providing recommendations of the Western States Air Resources Council (WESTAR) related to the implementation of rules governing the treatment of data influenced by exceptional events—40 CFR Parts 50 and 51, typically referred to as the "Exceptional Events Rule."

In your letter, you discuss how important the Exceptional Events Rule is to western states in light of the air quality challenges brought on by the frequent occurrence of chronic wildfires and dust storms in your area. Additionally, you have provided suggested recommendations for improvements in the implementation of this important rule, recognizing the budget pressures that we are all experiencing at this time for air quality management resources.

I appreciate the time and effort WESTAR and your member states put into these recommendations, the discussions we have had with WESTAR representatives previously, and the work of your WESTAR Exceptional Events Workgroup.

We are exploring how implementation of the exceptional events rule can be improved to provide clarity and efficiency within the Agency and for all of our stakeholders. This includes consideration of chronic natural events in the exceptional events context, and other events for which developing technical demonstrations proves to be difficult. I have asked my staff to identify areas where guidance or other rule considerations would be appropriate to achieve this goal and to work over the next six months to develop solutions that will improve rule implementation. During this process, we want to continue our dialog with WESTAR on implementation issues, and the U.S. Environmental Protection Agency (EPA) Regional staff will continue to work with you to develop technical demonstrations to support consideration of exceptional events.

As you mention in your letter, the effectiveness of this rule is important for the state and local agencies, and the general public, and we must all do our best to make sure that we spend our resources wisely to protect public health.

Again, thank you for your letter. I look forward to further discussions with you on ways to implement clean air programs in the western U.S.

Sincerely,

Gina McCarthy
Assistant Administrator

Agenda Item #6

Methodologies for Evaluating Congestion Mitigation and Air Quality Improvement Projects

Maricopa Association of Governments

April 16, 2009

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INTRODUCTION

The purpose of the Congestion Mitigation and Air Quality Improvement (CMAQ) Program is to provide federal funding for projects designed to assist nonattainment and maintenance areas in complying with the National Ambient Air Quality Standards. The most recent federal guidance for the CMAQ program, effective October 20, 2008, indicates that the emissions benefits and disbenefits for CMAQ project proposals should be quantified, if possible, for all pollutants for which the area is in nonattainment or maintenance status, including appropriate precursor emissions. The Maricopa Association of Governments (MAG) has developed methodologies for quantifying emissions benefits and disbenefits and calculating the cost-effectiveness of proposed CMAQ projects. MAG has updated the CMAQ methodologies periodically since 1999 to address changes in federal guidance, new project types, and improved technical methods and assumptions.

Reviews of the CMAQ Methodologies

In 2002, MAG contracted with Sierra Research to review CMAQ methodologies and identify the most promising project evaluation techniques used by MPOs in the western U.S. On April 29, 2002, MAG conducted a half-day workshop describing the CMAQ methodologies in use by the western MPOs and the findings and recommendations of the Sierra Research study. In general, Sierra concluded that "the methods established by MAG for computing the cost-effectiveness of proposed CMAQ projects are easily the most sophisticated encountered in the review of western communities." The Sierra Research recommendations and input from the 2002 workshop were incorporated into the 2004 MAG CMAQ methodologies (MAG, 2004b).

On June 28, 2005, MAG conducted a second workshop to discuss additional revisions to the CMAQ methodologies. The input from this workshop was incorporated into the MAG CMAQ methodologies that have been applied since August 2005 (MAG, 2005).

In 2008, MAG contracted with Sierra Research to review CMAQ approaches used elsewhere and recommend improvements to the 2005 MAG methodologies (MAG, 2008). The major findings of this study are summarized below.

(1) MAG's CMAQ methodologies adequately address the key issues in the latest federal transportation legislation (SAFETEA-LU, 2005). As recommended by SAFETEA-LU, MAG's CMAQ process includes an evaluation and prioritization of diesel retrofit projects, prioritizes projects based on cost-effectiveness, and allows funding of transportation systems management and operations projects that mitigate congestion and improve air quality.

(2) Like MAG, the California Air Resources Board (CARB) has eliminated carbon monoxide (CO) emissions from their calculations of cost-effectiveness for CMAQ projects.

(3) The level of detail used by the Texas Department of Transportation in evaluating CMAQ projects (TTI, 2007) is higher than currently required by the MAG methodologies. For

example, the TTI methodology for ITS projects quantifies the emission reductions attributable to alleviating peak and off-peak recurrent and non-recurrent congestion. The TTI methodologies require extensive data collection on the part of entities requesting CMAQ funds. Sierra points out that the TTI methods are also used to quantify control measures for Texas SIPs.[1]

(4) California communities can download automated database programs to quantify twelve types of CMAQ projects. Several other communities have established spreadsheets that automate the calculation of benefits and cost-effectiveness for project sponsors. Colorado has automated the procedures used to prepare the annual CMAQ reports. Sierra recommends that MAG consider automating its CMAQ methodologies.

(5) The MAG CMAQ methodologies should be updated to be consistent with assumptions in the Eight-Hour Ozone Plan (MAG, 2007a) and Five Percent Plan for PM-10 (MAG, 2007b).

(6) Sierra recommends that the local sources from which activity rates have been derived (e.g. On Board Bus and Household Travel Surveys, MAG Congestion Studies, Travel Demand Management Surveys, Maricopa County Trip Reduction Program Reports) be reviewed and updated where appropriate.[2]

(7) The 2008 Sierra Research report concludes that: "Overall, the methods established by MAG for computing the cost-effectiveness of proposed CMAQ projects are still the most sophisticated of the states and communities surveyed, particularly for fugitive dust emission calculations."

Since Sierra Research has concluded that MAG continues to have the most sophisticated methods, major changes to the methodologies are not required. However, the TOG, NOx and PM-10 emission factors have been updated in this document to be consistent with assumptions in the 2007 MAG Ozone and PM-10 Plans, as recommended by Sierra.

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[1]It is important to note that it would be difficult for MAG member agencies to collect this type of detailed data, especially given the typically tight time constraints for submission and evaluation of CMAQ projects. Accurate emission reduction estimates are necessary for legally-binding control measures in a State Implementation Plan (SIP); in CMAQ evaluations, the emission reductions are quantified in order to compare the relative cost-effectiveness of potential CMAQ projects (for new TIP projects or year-end closeout) and estimate the benefits of completed projects (in the annual CMAQ report). Neither of these CMAQ purposes warrants the same level of precision in the estimation of emission reductions that would be required for a SIP.

[2]The 2004 MAG CMAQ methodologies updated the activity rates based on the latest local studies; however, it was found that these rates do not vary significantly over time.

On March 31, 2009, MAG conducted a workshop to discuss the findings of the latest Sierra Research review and proposed changes to the CMAQ methodologies. Input from workshop participants has been incorporated into the 2009 CMAQ methodologies.

In the 2009 methodologies, the priority weights in the example equations have been revised for ozone precursor emissions. This change was precipitated by EPA's lowering of the eight-hour ozone standard (from 0.08 to 0.075 ppm) in March 2008. Based on 2006-2008 monitoring data, Maricopa County is likely to be designated a nonattainment area for the new eight-hour ozone standard. Because CMAQ projects that reduce total organic gases (TOG) and nitrogen oxides (NOx) will contribute to attainment of the new, more stringent ozone standard, the weights used in calculating cost-effectiveness have been increased for these ozone precursors. To calculate the new weights, the 2008 light duty vehicle emission rates for TOG and NOx have been set equal to the emission rate for PM-10, a pollutant for which the area is also in nonattainment.[3] The table below shows the new priority weights of 0.89 for TOG and 1.03 for NOx that result in the PM-10 emission rate of 0.68 grams per vehicle mile of travel (vmt).

Pollutant	2008 Light Duty Vehicle Emission Rates[4]	Priority Weight	Weighted Emission Rates
CO	8.47 grams/vmt	0.00	0.00 grams/vmt
TOG	0.76 grams/vmt	0.89	0.68 grams/vmt
NOx	0.66 grams/vmt	1.03	0.68 grams/vmt
PM-10	0.68 grams/vmt	1.00	0.68 grams/vmt

Participants in the 2005 MAG CMAQ workshop suggested that MAG assign a weight of zero to carbon monoxide (CO) emissions when calculating cost-effectiveness and this suggestion was implemented in the 2005 methodologies. As indicated in the 2008 Sierra Research study, CARB also assigns a weight of zero to CO emissions when evaluating CMAQ projects. Since the Maricopa County area has not violated the CO standard since 1996 and monitored CO concentrations continue to decline, zeroing out the CO emissions in the CMAQ cost-effectiveness calculation remains appropriate. However, CO emission reductions must still be calculated for funded projects in the

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[3]In the 2005 CMAQ methodologies, the priority weights were derived by setting the 2005 light duty vehicle emission rates for TOG and NOx equal to one-half of the PM-10 emission rate. The 2005 light duty vehicle emission rates were derived from MOBILE6.2 and PART5.

[4]The 2008 light duty vehicle exhaust emission rates for CO, TOG, and NOx were derived from MOBILE6.2. The 2008 PM-10 rate of 0.03 g/vmt for exhaust, tire wear and brake wear emissions was also derived from MOBILE6.2. The 2008 PM-10 emission rate of 0.65 g/vmt for reentrained dust created by vehicles traveling on paved roads was derived from EPA AP-42 equations and is consistent with assumptions in the Five Percent Plan for PM-10 (MAG, 2007b).

annual CMAQ report required by FHWA. If EPA were to lower the CO standard in the future, the priority weight could change. For these reasons, CO emissions are included in the equations and examples shown in this document, even though the priority weight is zero. PM-2.5 emissions are not included in the MAG CMAQ methodologies, because the Phoenix-Mesa Metropolitan Statistical Area was designated an attainment area for PM-2.5 in September 2004.

The priority weights shown above will be used in calculating cost-effectiveness for projects requesting CMAQ funding. The weights are applied to the seasonally adjusted emission rates (i.e., TOG and NOx are divided by two to reflect the six-month ozone season)[5]. The cost-effectiveness calculations for the example projects in this document have been updated with the new priority weights for TOG and NOx. Their use will result in cost-effectiveness scores that differ from those calculated using previous versions of the MAG CMAQ methodologies.

CMAQ Project Review Process

Each year MAG programs available CMAQ funds. As part of the programming process, jurisdictions are requested through the MAG Management Committee, MAG Transportation Review Committee, and MAG modal committees, to submit requests for federally funded projects. After the receipt of project requests, MAG evaluates CMAQ projects for possible inclusion in the Transportation Improvement Program. The MAG modal committees are furnished with the CMAQ assessment, along with the Congestion Management System rating score, for project evaluation purposes. Recommendations from the MAG modal committees are forwarded to the Transportation Review Committee for programming consideration.

The CMAQ project assessment may be in the form of a quantitative analysis resulting from the methodologies or a qualitative evaluation. CMAQ guidance allows a qualitative evaluation to be made when a quantitative analysis is not possible, although every effort will be made to quantify the emissions reduction impact of each project. Qualitative assessments may be based on a reasonable review of how a project or program will decrease emissions. Committed transportation control measures identified in the air quality plans receive priority in CMAQ project programming.

The CMAQ methodologies provide options for local input, while striving to keep the overall data requirements from being overly complex and burdensome. In general, agencies submitting CMAQ projects may provide local data to replace default values in any of the methodologies, as long as there is supporting written documentation. The values to be substituted and the supporting documentation (i.e., traffic engineering modeling; city-specific survey data) must accompany the request for CMAQ funding.

The methodologies included in this report were developed in response to federal guidance (FHWA, 2008) requiring the quantification of emission reductions for proposed CMAQ projects,

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[5]A seasonal adjustment factor is not applied to PM-10, because violations of the PM-10 standard could occur at any time of the year.

whenever possible. Other potential project benefits such as human health, safety, land use, and congestion mitigation impacts are not addressed. It is also important to note that emission reductions and cost-effectiveness are not the only factors considered in evaluating and selecting candidates for CMAQ funding.

Overview of Key Assumptions

The methodologies for quantifying the emission reductions and cost-effectiveness of typical CMAQ projects are described below. In general, the methodologies estimate (1) emission reductions in kilograms per day, which are the sum of reductions in TOG, NOx, and PM-10; and (2) the cost-effectiveness of each project in dollars per metric ton of emissions reduced per year. Because the CMAQ methodology uses the latest EPA emissions models and regional planning assumptions, the emission reductions may not be consistent with previous CMAQ analyses or air quality plans that used earlier EPA models and assumptions. Some projects do not reduce PM-10 emissions and only CO, TOG, and NOx benefits are calculated. In other cases, only PM-10 emissions are reduced. If a proposed project combines two project types (i.e., paving a dirt road and adding a bicycle lane), the combined impact of the two portions of the project is included in the total emission reduction.

The EPA MOBILE6 emissions model will be run to estimate CO, TOG, NOx, and PM-10 emission factors for the implementation year of the project, assuming that the project is implemented in the CMAQ funding year. The MOBILE6 emission factors will be based on the latest vehicle registrations and diesel split factors. The PM-10 emissions output by MOBILE6 include tailpipe exhaust, tire wear and brake wear emissions. The average speed of area-wide traffic is assumed to be 30 miles per hour, unless specified otherwise in the methodologies.

PM-10 emission rates for unpaved and paved roads used in this document are derived from the Five Percent Plan for PM-10 (MAG, 2007b). The unpaved road emission rate used in the methodology for paving unpaved roads is 666.62 grams per vehicle mile of travel (vmt).

The PM-10 emission rates for reentrainment by vehicles traveling on paved roads are: 0.18 grams per vmt on freeways; 1.70 grams per vmt on low traffic roads (carrying less than 10,000 vehicles per day); 0.92 grams per vmt for all non-freeways; and 0.65 grams per vmt for all road types. In the Salt River Area, the paved road PM-10 emission rate is 3.44 grams per vmt for all non-freeways (MAG, 2008).[6]

Carbon monoxide emission reductions are calculated for the range of temperatures on the winter episode day in the EPA-approved carbon monoxide maintenance plan (MAG, 2003). As previously indicated, the priority weight for CO is zero and the CO emission reduction benefits are only calculated for the annual CMAQ report. No seasonal adjustment (i.e, division by four) is applied when estimating CO emissions for the annual CMAQ report.

[6]All of these paved road emissions rates assume paved shoulders and curb and gutter.

TOG and NOx emissions are calculated for the range of temperatures on the summer episode day in the Eight-Hour Ozone Plan (MAG, 2007a). In the calculation of total emissions and cost-effectiveness for projects requesting CMAQ funding, TOG and NOx reductions are divided by a seasonal factor of two to account for the six-month ozone season. No seasonal adjustment (i.e, division by two) is applied when estimating TOG and NOx emissions for the annual CMAQ report. Temperature is not used in estimating PM-10 emissions, and no seasonal factor is applied, because exceedances of the daily PM-10 standard can occur at any time of year. Because of the seasonal and priority weight assumptions discussed above, total emission reductions (i.e., sum of CO, TOG, NOx and PM-10) for CMAQ projects do not represent an average day during the year.

In the CMAQ methodologies, the cost-effectiveness of a project is calculated by dividing the annualized total project cost by the annual emission reduction. The annual emission reduction is obtained by converting the total weighted reduction in CO, TOG, NOx and PM-10 emissions in kilograms per day to metric tons per year. The total cost is amortized over the expected project life using a three percent discount rate, which represents the opportunity cost of using public dollars to fund a project, versus investing the same funds in a certificate of deposit earning three percent per year over the life of the project. The general approach for calculating cost-effectiveness and the discount rate are consistent with those used by the California Air Resources Board (CARB, 2005).

The remainder of this document describes the methodologies and assumptions used to estimate emission reductions and cost-effectiveness for typical CMAQ projects. The description of the methodology for each project type is divided into three sections. The first section describes the modeling methodology, assumptions, and defaults. The second lists the data that are requested from the entity proposing the project. If any of the required data are not provided, default assumptions are substituted. The third section provides the formulas used in the analyses. Data from the first and second sections are input to the formulas to estimate the emission reduction and cost-effectiveness of a proposed project. At least one example calculation is provided for each project type. The examples represent generic CMAQ projects, provided to demonstrate how the methodology will be applied. The emission reductions and cost-effectiveness calculated for actual CMAQ projects will be dependent upon local inputs and may vary substantially from the examples.

This document describes methodologies for the following project types, in alphabetical order: Bicycle and Pedestrian Facilities, Bus and Light Rail Projects, Diesel Retrofits and Anti-Idling Programs, Intersection Improvements (including Roundabouts), Ozone Education Program, Park and Ride Facilities, Paving Projects, PM-10 Efficient Street Sweepers, Rideshare Programs, Telework Program, Traffic Flow Improvements, Trip Reduction Program, and Vanpool Vehicles.[7]

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[7]The methodology for High Occupancy Vehicle (HOV) Facilities that was included in the 2005 CMAQ methodologies has been eliminated from the 2009 methodologies, because it is anticipated that future HOV projects will utilize funding sources other than CMAQ. The 2005 CMAQ methodology for Freight Projects focused on Truck Stop Electrification which is addressed as a Diesel Anti-Idling Program in the 2009 methodologies.

These represent the most common CMAQ project types in the MAG region. CMAQ-eligible projects that do not fall into one of these categories will also be quantified, if feasible, on a case-by-case basis. If CMAQ funding for one phase (e.g., planning or design) of an eligible project is requested, the emission reduction benefit will be calculated for the first year that the project is expected to be completed. If additional CMAQ funds have been or will be requested to complete a project (e.g., a light rail segment), the requesting entity will be asked to estimate the total CMAQ funds to be used in calculating the cost-effectiveness for the project.

Application of Methodologies

The CMAQ methodologies calculate cost-effectiveness, a measure that is used in prioritizing projects that are candidates for future CMAQ funds. The methodologies are also used to quantify daily emission reductions for annual CMAQ reports submitted to FHWA. If emission reduction credit for a CMAQ-funded project in the Transportation Improvement Program has not been taken in a State Implementation Plan (SIP), the benefits of the project may also be used in transportation conformity. Since the annual CMAQ report and conformity analyses require emission reductions by individual pollutant, the priority weights (*w1, w2, w3, w4*) and seasonality factors (e.g., dividing VOC and NOx by two) are not used in these applications.

BICYCLE AND PEDESTRIAN FACILITIES

"Encouragement of Bicycle Travel" and "Development of Bicycle Travel Facilities" are committed control measures in the Serious Area CO Plan (MAG, 2001) and Serious Area PM-10 Plan (MAG, 2000a). Bicycle facilities have the potential to reduce commute and other non-recreational trips. Bicycle paths are facilities which are physically separated from motor vehicle traffic. Bicycle lanes are striped for preferential or exclusive use of bicycles. CO, TOG, NOx, and PM-10 emission reductions occur when bicycle trips replace single occupant vehicle trips.

"Encouragement of Pedestrian Travel" is also a committed control measure in the MAG Serious Area CO and PM-10 Plans. Pedestrian facilities provide or improve pedestrian access. Emissions are reduced when vehicle trips are replaced by walking.

The CO, TOG, NOx, and PM-10 emission factors are calculated for the implementation year of the project. The project life for bicycle and pedestrian paths and bicycle lanes on roads or shoulders is twenty years; fifty years, for overpasses and underpasses. The average weekday traffic (***ADT***) estimates for the adjacent or nearest parallel arterial must be provided by the entity requesting CMAQ funding for the project.

MOBILE6 will be run assuming a speed of 30 miles per hour to estimate CO, TOG, NOx, and PM-10 emission factors for light duty vehicles. Since it is assumed that bicycle/pedestrian trips replace vehicle trips that are four miles or less, the cold start emission factor will be used for all vehicle trips replaced by bicycle/pedestrian trips (CEF_{CO}, CEF_{TOG}, CEF_{NOx}, CEF_{PM}). Evaporative

emissions from the hot engine at the end of each trip will also be estimated for TOG (HEF_{TOG}).

The number of vehicle trips replaced by bicycle or pedestrian trips will be estimated based on the average weekday traffic on the adjacent or nearest parallel arterial to the bicycle/pedestrian path. The ADT on the road will be converted to annual average daily traffic (AADT) by multiplying by 0.91. The vehicle trips reduced will be estimated using the adjustment factors from Table 1. The adjustment factors are dependent upon the length of the bicycle/pedestrian project and the AADT on the road parallel to the bicycle/pedestrian project. Given the relative importance of bridges and underpasses that connect bicycle/pedestrian paths, the adjustment factor used for bridges and underpasses will be based on the sum of the lengths of the two paths connected.

Estimates of the VMT reduced are based on the average number of vehicle trips reduced, multiplied by average trip lengths. Consistent with assumptions in MAG transportation modeling concerning pedestrian trips to transit centers, a pedestrian trip length of one-half mile will be assumed. Based on data in Bicycle Demand and Benefit Model (Alta Transportation Consulting, April 2000) an average bicycle trip length of four miles will be assumed. For multi-use paths, it will be assumed that half of the trips are bicycle and half are pedestrian. Therefore, an average trip length of 2.25 miles will be assumed for multi-use paths.

The usefulness of a bicycle/pedestrian path is also dependent upon its location. Usage estimates for bicycle/pedestrian paths will take into consideration the number of activity centers near the proposed bicycle/pedestrian path. The credit for activity centers along a bicycle/pedestrian path is shown in Table 2.

Table 1. Adjustment Factors[8]

ANNUAL AVERAGE DAILY TRAFFIC (AADT)	LENGTH OF PROJECT (one direction)	**ADJUSTMENT FACTOR (*A*)**
AADT ≤ 12,000 vehicles per day	≤ 1 mile	0.0019
	> 1 mile and ≤ 2 miles	0.0029
	> 2 miles	0.0038
12,000 < AADT ≤ 24,000 vehicles per day	≤ 1 mile	0.0014
	> 1 mile and ≤ 2 miles	0.0020
	> 2 miles	0.0027
AADT > 24,000 vehicles per day	≤ 1 mile	0.0010
	> 1 mile and ≤ 2 miles	0.0014
	> 2 miles	0.0019

[8]Data adapted from the California Air Resources Board (CARB, 2005).

Table 2. Activity Center Credits[9]

Examples of Activity Centers: bank, church, hospital or HMO, park and ride, office park, post office, public library, shopping area or grocery store, schools, university or junior college.		
Number of activity centers	**Credit (C)**	
	Within ½ mile	Within ¼ mile
at least three	0.0005	0.001
more than three but less than seven	0.001	0.002
seven or more	0.0015	0.003

The formulas below are used to calculate the annual emission reductions and cost-effectiveness of bicycle and pedestrian facilities.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Cost.***
- Average weekday traffic (***ADT***) on the nearest parallel arterial.
- Number of activity centers (i.e. bank, church, hospital, HMO, light rail station, park and ride lot, office park, post office, public library, shopping area, grocery store, university or junior college) within ¼ mile and ½ mile of the bicycle/pedestrian project.
- Length of bicycle/pedestrian path (for a bridge/underpass; the combined length of the paths connected by the bridge/underpass).

Formulas:

$$\textit{Trips Reduced } (TR) = ADT * 0.91 * (A + C)$$

where: ***A*** = the adjustment factor from Table 1
C = the activity center credit from Table 2
ADT = the average weekday traffic on the adjacent or nearest parallel arterial
0.91 = factor to convert average weekday traffic to annual average daily traffic
ADT * 0.91 = the annual average daily traffic (**AADT**) on the adjacent or nearest parallel arterial

$$\textit{VMT Reduced } (VR) = ATR * \textit{trip length}$$

[9]Ibid.

where: ***trip length*** = the length of a bicycle trip is assumed to be 4.0 miles and the length of a pedestrian trip is assumed to be 0.5 miles. For a multi-use path, it is assumed that the average trip length is 2.25 miles.

$$\textit{Daily Emissions Reduction} = [(TR * \frac{w2 * HEF_{TOG}}{2}) +$$

$$(VR * (\frac{w1 * CEF_{CO}}{4} + \frac{w2 * CEF_{TOG}}{2} + \frac{w3 * CEF_{NOx}}{2} + (w4 * (CEF_{PM} + PEF))))] * \frac{1}{1000} = \frac{kilograms}{day}$$

where: HEF_{TOG} = the hot soak light duty vehicle trip end emission factor for TOG
CEF = the cold start light duty vehicle emission factor for each pollutant
PEF = the paved road PM-10 emission factor for arterials
w1-w4= weighting factors for CO, TOG, NOx, and PM-10, respectively

$$\textit{Capital Recovery Factor (CRF)} = \frac{(1+i)^{life}\,(i)}{(1+i)^{life} - 1}$$

where: ***i*** = discount rate of 3 percent
life = effectiveness period of 20 years for bicycle and pedestrian paths; 20 years for a bicycle lane on a road or shoulder; and 50 years for an overpass or underpass.

$$\textit{Cost-Effectiveness} = \frac{CRF * CMAQ\ Cost * 1000}{\textit{Daily Emissions Reduction} * 365} = \frac{dollars}{metric\ ton}$$

where: ***CMAQ Cost*** = the CMAQ funding requested for the project.

Bicycle and Pedestrian Facilities **EXAMPLE**

A city proposes to pave an unpaved shoulder with curb and gutter and create a 1.5 mile long bike lane in 2015 at a total cost of $650,000, where $65,000 will be paid with local funds. The bike lane will be adjacent to an arterial with average weekday traffic (**ADT**) of 18,000 vehicles per day. The bike lane will be outside the Salt River Area. There are three activity centers (a grocery store, a

library, and a park and ride) less than one-quarter mile from the path. There are four additional activity centers (two office parks, a church, and a post-office) between one-quarter and one-half mile from the path for a total of seven activity centers within one-half mile.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Cost*** = $585,000.
- Project length (***miles***) = 1.5 miles.
- Average weekday traffic (***ADT***) on adjacent arterial = 18,000.
- Activity centers within ¼ mile = 3 OR activity centers within ½ mile = 7.

Calculations:

The primary Adjustment Factor (**A**) is calculated from Table 1. Since the **ADT** is 18,000, the annual average daily traffic (**AADT**) is 16,380 (0.91 x 18,000). From Table 1, the adjustment factor for a path adjacent to a roadway with between 12,000 and 24,000 AADT and between one and two miles in length is 0.0020. The Activity Center Credit (**C**) is calculated from Table 2. There are two choices of activity center credit for this project, since there are three activity centers within one-quarter mile (0.001) and seven centers within one-half mile (0.0015). The higher value, 0.0015, is chosen. Additional credit will also be given to the project for reducing PM-10 by paving an unpaved shoulder. The emission reduction credit for paving the unpaved shoulder with curb and gutter outside the Salt River Area is 0.75 grams per vehicle mile of travel (from the methodology for Paving Projects).

$$\textit{Trips Reduced } (\textit{TR}) = 18{,}000 * 0.91 * (0.0020 + 0.0015) = 57 \ \frac{\textit{trips}}{\textit{day}}$$

$$\textit{VMT Reduced } (\textit{VR}) = 57 * 4.0 = 228 \ \frac{\textit{vehicle-miles}}{\textit{day}}$$

$$\textit{Daily Emissions Reduction: for Bike Lane} = [57 * \frac{0.89*1.21}{2} +$$

$$[228 * (\frac{0.00*58.27}{4} + \frac{0.89*2.58}{2} + \frac{1.03*1.16}{2} + 1.0*(.02+0.92))] * \frac{1}{1000} = 0.64 \ \frac{\textit{kilograms}}{\textit{day}}$$

$$\textit{Daily Emissions Reduction for Paving Shoulder} = (1.0*0.75*18{,}000*0.91*1.5)*\frac{1}{1000} = 18.43 \ \frac{\textit{kilograms}}{\textit{day}}$$

$$\textit{Total Daily Emissions Reduction} = 0.64 + 18.43 = 19.07 \ \frac{\textit{kilograms}}{\textit{day}}$$

$$\textit{Capital Recovery Factor } (\textit{CRF}) = \frac{(1+0.03)^{20} * (0.03)}{(1+0.03)^{20} - 1} = 0.0672$$

$$\textit{Cost-Effectiveness} = \frac{0.0672 * 585{,}000 * 1000}{19.07 * 365} = 5{,}648 \ \frac{\textit{dollars}}{\textit{metric ton}}$$

BUS AND LIGHT RAIL PROJECTS

"Expansion of Public Transportation Programs" and "Mass Transit Alternatives" are committed control measures in the MAG Serious Area CO and PM-10 Plans. These measures reduce CO, TOG, NOx, and PM-10 emissions by reducing the vehicle miles of travel (VMT) driven in single occupant vehicles.

New Bus Service

Bus service on new routes and increased frequency on existing bus routes provide a new level of service and reduce VMT. The daily emissions reduction attributable to the new bus service will be estimated based on the difference between the emissions from the light duty vehicle trips replaced by the bus trips and the sum of the bus emissions from the new service and vehicle emissions from people driving to access the bus.

The vehicle miles of travel replaced (VMT_{REP}) by the new bus service will be estimated based on the fraction of riders on the bus who drove to their destination prior to introduction of the new bus service (F_1). This fraction will be multiplied by total bus riders and the average trip length replaced by the bus service (***trip length***$_1$). The VMT replaced by bus trips will be multiplied by light duty vehicle emission factors from MOBILE6 and fugitive dust emission factors from the Five Percent Plan for PM-10 (MAG, 2007b) for vehicles traveling on a paved road to estimate the emissions from trips replaced by transit.

The automobile VMT added (VMT_{ADD}) by people driving to reach the new transit service will be estimated based on the fraction of riders on the bus who drive to transit (F_2). This fraction will be multiplied by total bus riders and the average trip length to reach transit (***trip length***$_2$). The VMT added by automobile trips to reach transit will be multiplied by light duty vehicle emission factors from MOBILE6 and paved road emissions factors from the Five Percent Plan for PM-10 to estimate the automobile emissions added by trips to reach transit.

The emissions from the bus itself (***BUS***) are equal to the number of miles driven daily by the bus multiplied by the exhaust plus fugitive dust emission factors for the bus. Exhaust emission factors for buses are estimated using MOBILE6. In addition to the exhaust emission factors, a fugitive dust emission factor from the Five Percent Plan for PM-10 is included in the net emission factor. It will be assumed that a bus travels 100 miles per weekday (VMT_{BUS}).

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Funding***.
- Fraction of riders who previously drove to their destination (F_1). For example, if 75 of 100 bus riders drove vehicles to their destination before introduction of the new bus, F_1 would equal 0.75. Default = 0.5 (CARB, 2005).

- Fraction of riders who drive to reach transit (F_2). For example, if 10 of 100 riders of the new bus drive to reach the bus, F_2 would equal 0.10. Default = 0.03 (Valley Metro, 2001 On Board Origin and Destination Survey).
- Average length of trip from home to destination (***trip length$_1$***). Default = 10.6 miles (from 2001 Maricopa Regional Household Travel Survey and 2002 transportation model validation, February 15, 2005).
- Total daily ridership of each new bus (***R***). For example, if the new bus is expected to carry 400 people per day, *R* would equal 400. Default = 307 (Valley Metro).
- Average length of trip driving from home to transit (***trip length$_2$***). Default = 5 miles (Valley Metro, 2001 On Board Origin and Destination Survey).

Formulas:

$$\textit{VMT Replaced } (VMT_{REP}) = R * F_1 * \textit{trip length}_1$$

$$\textit{VMT added } (VMT_{ADD}) = R * F_2 * \textit{trip length}_2$$

where: ***R*** = the ridership on the bus per operating day
F$_1$ = the fraction of riders on the bus who previously drove
trip length$_1$ = the average trip length replaced for each rider who previously drove
F$_2$ = the fraction of riders who drive to transit
trip length$_2$ = the average trip length driven to transit

$$\textit{Vehicle Emissions Reduced } (VER) = (VMT_{REP} - VMT_{ADD}) * \left(\frac{w1 * LEF_{CO}}{4} + \frac{w2 * LEF_{TOG}}{2} + \frac{w3 * LEF_{NOx}}{2} + (w4 * (LEF_{PM} + PEF)) * \frac{1}{1000} * 0.91 = \frac{\textit{kilograms}}{\textit{day}}\right.$$

where: ***VMT$_{REP}$*** = the vehicle travel replaced by bus service
VMT$_{ADD}$ = the VMT added as a result of trips driven to reach transit
LEF = the light duty vehicle emission factor for each pollutant
PEF = the paved road PM-10 emission factor for all road types
0.91 = factor to convert from average weekday to annual average daily vehicle trips
w1-w4 = weighting factors for CO, TOG, NOx, and PM-10, respectively

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$$\textit{Bus Emissions } (BUS) =$$

$$\left(\frac{w1 * BEF_{CO}}{4} + \frac{w2 * BEF_{TOG}}{2} + \frac{w3 * BEF_{NOx}}{2} + (w4 * (BEF_{PM} + PEF))\right) * VMT_{BUS} * \frac{1}{1000} * 0.91 = \frac{\textit{kilograms}}{\textit{day}}$$

where: ***BEF*** = the bus exhaust emission factor for each pollutant (includes tire wear and brake wear for PM-10)
VMT_{BUS} = the daily bus VMT

$$\textit{Daily Emissions Reduction} = \textbf{VER} - \textbf{BUS} = \frac{\textit{kilograms}}{\textit{day}}$$

$$\textit{Capital Recovery Factor (CRF)} = \frac{(1+i)^{life}\,(i)}{(1+i)^{life} - 1}$$

where: ***i*** = discount rate of 3 percent
life = effectiveness period of 12 years (CARB, 2005)

$$\textit{Cost-Effectiveness} = \frac{\textit{CRF} * \textit{CMAQ Cost} * 1000}{\textit{Daily Emissions Reduction} * 365} = \frac{\textit{dollars}}{\textit{metric ton}}$$

where: ***CMAQ Cost*** = the CMAQ funding requested for the project.

New Bus Service **EXAMPLE**

A city proposes to purchase a diesel bus to start a new bus route in 2015. The cost of the bus is $320,000. The city proposes to pay $32,000 and requests $288,000 of CMAQ funding.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Cost*** = $288,000.
- Fraction of riders who previously drove to their destination (F_1) = 0.5.
- Fraction of riders who drive to reach transit (F_2) = 0.03.
- Average length of trip from home to destination (***trip length***$_1$) = 10.6 miles.
- Total daily ridership on the new bus (***R***) = 307.
- Average length of trip from home to transit (***trip length***$_2$) = 5 miles.

Calculations:

$$VMT_{REP} = 307 * 0.50 * 10.6 = 1{,}627$$

$$VMT_{ADD} = 307 * 0.03 * 5 = 46$$

$$VER = (1{,}627-46)*\left(\frac{0.00*6.38}{4}+\frac{0.89*0.45}{2}+\frac{1.03*0.34}{2}+(1.0*(0.02+0.65))*\frac{1}{1000}*0.91\right) = 1.50\ \frac{kilograms}{day}$$

$$BUS = 100 * \left(\frac{0.00*0.46}{4}+\frac{0.89*0.30}{2}+\frac{1.03*1.75}{2}+(1.0*(0.09+0.65))*\frac{1}{1000}*0.91\right) = 0.16\ \frac{kilograms}{day}$$

$$Daily\ Emissions\ Reduction = 1.50 - 0.16 = 1.34\ \frac{kilograms}{day}$$

$$Capital\ Recovery\ Factor\ (CRF) = \frac{(1+0.03)^{12} * (0.03)}{(1+0.03)^{12} - 1} = 0.1005$$

$$Cost\text{-}Effectiveness = \frac{0.1005 * 288{,}000 * 1000}{1.34 * 365} = 59{,}178\ \frac{dollars}{metric\ ton}$$

New Light Rail Service

Light rail represents a new alternative mode to single occupant vehicle travel. Light rail service will decrease emissions by reducing vehicle miles of travel. The daily emissions reduction attributable to the provision of new rail service or the improvement of existing service will be based on the estimated number of light rail passengers who previously drove in single occupant vehicles. Emissions from light rail passengers driving to access the light rail stations will be deducted from the benefit.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Funding (total for the rail segment being funded).***
- Fraction of riders who previously drove to their destination (F_1). For example, if 50 of 100 rail riders drove vehicles to their destination before introduction of the new rail service, F_1 would equal 0.5.
- Fraction of riders who drive to reach rail (F_2). For example, if 20 of 100 riders drive to reach the rail line, F_2 would equal 0.20.
- Average length of trip from home to destination (***trip length***$_1$).
- Total daily ridership on the rail line (***R***). For example, if the new line is expected to carry 30,000 passengers per day, *R* would equal 30,000.
- Average length of trip driving from home to rail (***trip length***$_2$).

Formulas:

$$VMT\ Replaced\ (VMT_{REP}) = R*F_1*trip\ length_1$$

$$VMT\ added\ (VMT_{ADD}) = R*F_2*trip\ length_2$$

where: $\boldsymbol{R}$ = the ridership on the rail segment per average weekday
$\boldsymbol{F_1}$ = the fraction of rail riders who previously drove in a single occupant vehicle
$\boldsymbol{trip\ length_1}$ = the average trip length replaced for each rider who previously drove
$\boldsymbol{F_2}$ = the fraction of riders who drive to the rail station
$\boldsymbol{trip\ length_2}$ = the average trip length driven to the rail station

$$Daily\ Emissions\ Reduction = (VMT_{REP} - VMT_{ADD})*(\frac{w1*LEF_{CO}}{4} + \frac{w2*LEF_{TOG}}{2} + \frac{w3*LEF_{NOx}}{2} +$$

$$(w4*(LEF_{PM}+PEF)) * \frac{1}{1000} * 0.91 = \frac{kilograms}{day}$$

where: $\boldsymbol{VMT_{REP}}$ = the vehicle travel replaced by the rail service
$\boldsymbol{VMT_{ADD}}$ = the VMT added as a result of trips driven to the rail station
$\boldsymbol{LEF}$ = the light duty vehicle emission factor for each pollutant
PEF = the paved road PM-10 emission factor for all road types
w1-w4 = weighting factors for CO, TOG, NOx, and PM-10, respectively
0.91 = factor to convert from average weekday to annual average daily vehicle trips

$$Capital\ Recovery\ Factor\ (CRF) = \frac{(1+i)^{life}\ (i)}{(1+i)^{life} - 1}$$

where: $\boldsymbol{i}$ = discount rate of 3 percent
life = effectiveness period of 20 years

$$Cost\text{-}Effectiveness = \frac{CRF * CMAQ\ Cost * 1000}{Daily\ Emissions\ Reduction * 365} = \frac{dollars}{metric\ ton}$$

where: ***CMAQ Cost*** = the CMAQ funding requested for the project.

In FY 2013, Valley Metro Rail (VMR) requests $4,000,000 in CMAQ funds to augment the cost of constructing an additional 20-mile segment of the light rail system. VMR estimates that a total of $20 million in supplemental CMAQ funds will be needed to complete the new light rail segment. Transit modeling indicates that 30,000 passengers will ride the new segment on an average weekday during the first full year of operation in 2015. VMR anticipates that 50 percent of the light rail passengers would have previously driven in single occupant vehicles, traveling an average of 10.6 miles from their origin to their destination. Twenty percent of the light rail riders are expected to drive to the light rail station and the average length of these trips is estimated to be 5 miles.

Inputs Required from Entity Requesting CMAQ Funds:

- ***Total CMAQ Cost for new segment*** = $20,000,000.
- Number of light rail passengers per average weekday ***(R)*** = 30,000.
- Fraction of riders who previously drove to their destination in an SOV (F_1) = 0.50.
- Average length of SOV trips diverted to rail (***trip length***$_1$) = 10.6 miles.
- Fraction of riders who drive to the rail station (F_2) = 0.20.
- Average length of trips driven to the rail station (***trip length***$_2$) = 5 miles.

Calculations:

$$\textit{VMT Replaced } (VMT_{REP}) = 30{,}000 * 0.5 * 10.6 = 159{,}000$$

$$\textit{VMT added } (VMT_{ADD}) = 30{,}000 * 0.2 * 5.0 = 30{,}000$$

$$\textit{Daily Emissions Reduction} = (159{,}000 - 30{,}000) * \left(\frac{0.00*6.38}{4} + \frac{0.89*0.45}{2} + \frac{1.03*0.34}{2} + (1.0*(0.02+0.65))\right) * \frac{1}{1000} * 0.91 = 122.71 \ \frac{kilograms}{day}$$

$$\textit{Capital Recovery Factor } (CRF) = \frac{(1+0.03)^{20} * (0.03)}{(1+0.03)^{20} - 1} = 0.0672$$

$$\textit{Cost-Effectiveness} = \frac{0.0672 * 20{,}000{,}000 * 1000}{122.71 * 365} = 30{,}007 \ \frac{dollars}{metric\ ton}$$

DIESEL RETROFITS AND ANTI-IDLING PROGRAMS

FHWA has indicated that retrofits for diesel engines and anti-idling programs for diesel trucks are eligible for CMAQ funding, if they reduce emissions primarily in a nonattainment or maintenance area (FHWA, 2008). Federal transportation legislation also authorizes use of CMAQ funds for these types of projects (SAFETEA-LU, 2005).

The term diesel retrofit includes any technology or system that achieves emission reductions beyond that required by the EPA regulations at the time of new engine certification (EPA, 2007). Diesel retrofit projects may include replacement of high-emitting vehicles/equipment with cleaner vehicles/equipment (including hybrid or alternative fuel models; repowering or engine replacement; rebuilding the engine to a cleaner standard; purchase and installation of advanced emissions control technologies (such as particulate matter traps or oxidation catalysts); or the use of a cleaner fuel. CMAQ funds may be used to retrofit onroad diesel vehicles or nonroad diesel vehicles/engines used in construction. Projects that retrofit diesel engines can significantly reduce tailpipe emissions; the pollutants reduced will vary depending upon the technology or system that is installed. For example, installation of catalyzed diesel particulate filters or diesel oxidation catalysts will reduce particulate matter (PM-10 and PM-2.5), while replacing an older engine with newer technology will reduce CO, TOG, NOx, and PM-10 emissions.

In addition, CMAQ may be used to fund the capital costs of anti-idling programs, including advanced truck stop electrification projects and installation of auxiliary power units (APUs) on heavy duty diesel trucks. Heavy duty diesel trucks typically idle 6-10 hours per day to power the sleeper cab air conditioning, heating, and appliances (FHWA, 2009). Projects that reduce idling of diesel vehicles can significantly reduce tailpipe emissions of NOx and PM-10.

Diesel Retrofits

CMAQ projects would typically involve retrofitting diesel engines manufactured between 1990 and 2007. If the retrofits are for onroad vehicles, MOBILE6 will be run to estimate exhaust emission rates at 30 mph for each model year heavy duty diesel vehicle that is being retrofitted. Since ultra low sulfur fuel has been required for onroad diesel vehicles nationwide since October 2006, the sulfur level in the diesel fuel will be set at 15 ppm in MOBILE6. If the retrofits are occurring to nonroad engines, the latest version of the EPA NONROAD model will be run to determine the emission rates for each model year engine that is being retrofitted and the diesel sulfur level will be set to 500 ppm. The emission rates for the non-retrofitted vehicles/engines will be multiplied by the average annual vehicle miles traveled by all vehicles of that model year.

For vehicles/engines being retrofitted with diesel oxidation catalysts, the PM-10 exhaust emissions will be reduced by 30 percent. If the vehicles/engines are being retrofitted with catalyzed diesel particulate filters, the PM-10 exhaust emissions will be reduced by 90 percent (EPA, 2007).

If the engines are being replaced or rebuilt, the emissions of CO, TOG, NOx and PM-10 from the older model year vehicle/engine will be compared with the emissions generated by a heavy duty diesel onroad vehicle (using MOBILE6) or nonroad engine (using the NONROAD model) manufactured in 2015. The difference will represent the emissions benefit of the diesel retrofit project. It is expected that the vehicles or engines that are retrofitted will be kept in service for at least five years.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Cost.***
- Model year(s) of the vehicles to be retrofitted.
- Average annual mileage traveled by the vehicles being retrofitted.

___Formulas:

$$\textit{Emissions Before Retrofit } (EBR_i) = VMT_i * \left(\frac{w1 * BEF_{CO}}{4} + \frac{w2 * BEF_{TOG}}{2} + \frac{w3 * BEF_{NOx}}{2} + (w4 * BEF_{PM10})\right)$$

$$\textit{Emissions After Retrofit } (EAR) = \sum VMT_i * \left(\frac{w1 * AEF_{CO}}{4} + \frac{w2 * AEF_{TOG}}{2} + \frac{w3 * AEF_{NOx}}{2} + (w4 * AEF_{PM10})\right)$$

where: VMT_i = the annual miles driven by vehicles of model year i
BEF = the heavy duty diesel emission factor for each pollutant in model year i, assuming ultra-low sulfur fuel (15 ppm) for onroad vehicles or low sulfur fuel (500 ppm) for nonroad vehicles/engines
AEF = the heavy duty diesel emission factor for each pollutant in model year 2015
$w1$-$w4$ = weighting factors for CO, TOG, NOx, and PM-10, respectively

$$\textit{Daily Emissions Reduction} = \left(\sum EBR_i - EAR\right) * \frac{1}{1000} * \frac{1}{365} = \frac{kilograms}{day}$$

where: **1/365** = factor to convert annual emissions to daily emissions

$$\textit{Capital Recovery Factor } (CRF) = \frac{(1+i)^{life}\,(i)}{(1+i)^{life} - 1}$$

where: i = discount rate of 3 percent
$life$ = effectiveness period of 5 years

$$Cost\text{-}Effectiveness = \frac{CRF * CMAQ\ Cost * 1000}{Daily\ Emissions\ Reduction * 365} = \frac{dollars}{metric\ ton}$$

___where: ***CMAQ Cost*** = the CMAQ funding requested for the project.

Diesel Retrofits **EXAMPLE**

A city requests $160,000 in FY 2015 CMAQ funds to retrofit 40 heavy duty diesel vehicles in the onroad municipal fleet with catalyzed diesel particulate filters. The city will provide a $10,000 cash match for the project. The average model year of the vehicles to be retrofitted is 1996. The average annual miles driven by each vehicle is 20,000. The city commits to use the retrofitted vehicles for at least five more years. MOBILE6.2 estimates that the PM-10 exhaust emissions for a 1996 heavy duty vehicle running on ultra-low sulfur diesel fuel is 0.70 grams per mile. Because particulate filters are being installed, the PM-10 exhaust emissions from the vehicle fleet will be reduced by 90 percent.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Cost*** = $160,000.
- Average model year = 1996.
- Average annual miles driven per vehicle = 20,000.

Calculations:

$$DailyEmissionsReduction = 20{,}000 * 40 * (1.00 * 0.70) * 0.90 * \frac{1}{1000} * \frac{1}{365} = 1.38\ \frac{kilograms}{day}$$

$$Capital\ Recovery\ Factor\ (CRF) = \frac{(1+0.03)^5 * (0.03)}{(1+0.03)^5 - 1} = 0.2184$$

$$Cost\text{-}Effectiveness = \frac{0.2184 * 160{,}000 * 1000}{1.38 * 365} = 69{,}375\ \frac{dollars}{metric\ ton}$$

Diesel Anti-Idling Programs

Projects that reduce idling emissions from heavy duty diesel vehicles in a nonattainment or maintenance area are eligible for CMAQ funding (FHWA, 2008). One example would be a public-private partnership to implement a truck stop electrification project. Emissions will be reduced because trucks will turn off their engines and receive compartment cooling/heating and other services (cable TV, high speed internet) from the electric stalls during rest stops.

Another example of an anti-idling program would be the installation of auxiliary power units (APUs) on a fleet of diesel trucks that operate primarily within a nonattainment or maintenance area. APUs are mobile idle reduction technology that provides air conditioning, heat, and power for sleeper cab appliances, as well as battery charging and start assist for the main engine. They can be diesel or battery powered or a combination of both (FHWA, 2009).

To quantify the benefit of an anti-idling project, MOBILE6 will be run to estimate idling emission rates for NOx and PM-10 for heavy duty diesel vehicles in the year of project implementation. The MOBILE6 emission rates for heavy duty diesel vehicles operating at 2.5 miles per hour will be converted to grams per hour and multiplied by the estimated daily reduction in idling hours. The resultant emissions will represent the reduction benefit of a truck stop electrification project. For a CMAQ project involving auxiliary power units, the benefit will be calculated as the difference between the idling emissions for diesel trucks before and after installation of the APUs.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Cost.***
- Diesel vehicle idling hours reduced on an annual average day (***IR***).

Formulas:

$$\textit{Daily Emissions Reduction} = \boldsymbol{IR} * \left(\frac{w3 * DIEF_{NOx}}{2} + (w4 * DIEF_{PM10})\right) * \frac{1}{1000} = \frac{kilograms}{day}$$

where: ***IR*** = diesel vehicle idling hours reduced by the project on an annual average day
DIEF = the heavy duty diesel idling emission factor (in grams per mile at 2.5 mph) for NOx and PM-10 (multiplied by 2.5 mph to convert to grams per hour)

$$\textit{Capital Recovery Factor } (\boldsymbol{CRF}) = \frac{(1+i)^{life}\,(i)}{(1+i)^{life} - 1}$$

where: i = discount rate of 3 percent
life = effectiveness period of 5 years

$$Cost\text{-}Effectiveness = \frac{CRF * CMAQ\ Cost * 1000}{Daily\ Emissions\ Reduction * 365} = \frac{dollars}{metric\ ton}$$

___where: ***CMAQ Cost*** = the CMAQ funding requested for the project.

Truck Stop Electrification **EXAMPLE**

A city located within the PM-10 nonattainment area would like to enter into a legal agreement with a private firm to build 50 electrified stalls at a truck stop along an Interstate facility in the city limits. The total cost of the project is estimated to be $1,000,000. The city will donate land appraised at $100,000 to accommodate the 50 electrified stalls. The city requests $500,000 in FY 2015 CMAQ funds. The private firm has committed to pay the remaining capital cost of the project. The city estimates that space utilization will be 90 percent and truck idling will be reduced by 8 hours per utilized space for a total of 360 hours reduced per annual average day.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Cost*** = $500,000.
- ***IR*** = 360 hours of diesel vehicle idling reduced per annual average day.

Calculations:

$$Daily\ Emissions\ Reduction = 360 * \left(\frac{1.03 * 135}{2} + (1.00 * 0.89)\right) * \frac{1}{1000} = 25.35\ \frac{kilograms}{day}$$

$$Capital\ Recovery\ Factor\ (CRF) = \frac{(1+0.03)^5 * (0.03)}{(1+0.03)^5 - 1} = 0.2184$$

$$Cost\text{-}Effectiveness = \frac{0.2184 * 500{,}000 * 1000}{25.35 * 365} = 11{,}802\ \frac{dollars}{metric\ ton}$$

Auxiliary Power Units **EXAMPLE**

A city located within the eight-hour ozone nonattainment area would like to install APUs equipped with 2003 Kubota engines on its fleet of diesel municipal buses. The city has 100 diesel buses that are all model year 2006 or older. Emissions will be reduced because the bus drivers will turn off

their engines and receive compartment cooling during rest stops. The total cost of the project is estimated to be $700,000. The city requests $500,000 in FY 2015 CMAQ funds and estimates that bus idling will be reduced by 2 hours per bus per day for a total of 200 hours per annual average day.

The idle emission factors for the diesel buses before installing the APUs are 135 grams per hour for NOx and 3.68 grams per hour for PM-10 (FHWA, 2009). The 2003 Kubota engine has EPA-certified emissions levels of 4.7 grams per brake horsepower hour for NOx and 0.24 grams per brake horsepower per hour for PM-10 (40 CFR Part 89). Multiplying by a horsepower load factor of 5 (FHWA, 2009) produces APU emission rates of 23.5 grams per hour for NOx and 1.2 grams per hour for PM-10. These emissions are subtracted from the idling emissions for the buses without the APUs to obtain the net benefit of the APUs.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Cost*** = $500,000.
- ***IR*** = 200 hours of diesel vehicle idling reduced per annual average day.

Calculations:

$$\textit{Daily Emissions Reduction} = 200 * \left(\left(\frac{1.03*135}{2} + (1.00*3.68)\right) - \left(\frac{1.03*23.5}{2} + (1.00*1.2)\right)\right) * \frac{1}{1000} = 11.98 \ \frac{\textit{kilograms}}{\textit{day}}$$

$$\textit{Capital Recovery Factor (CRF)} = \frac{(1+0.03)^5 * (0.03)}{(1+0.03)^5 - 1} = 0.2184$$

$$\textit{Cost-Effectiveness} = \frac{0.2184 * 500{,}000 * 1000}{11.98 * 365} = 24{,}973 \ \frac{\textit{dollars}}{\textit{metric ton}}$$

INTERSECTION IMPROVEMENTS

Intersection improvements include projects which add left or right turn lanes or construct roundabouts to improve traffic flow. These improvements reduce vehicle delay and idling emissions. The entity requesting CMAQ funds will provide the total reduction in vehicle hours of delay per weekday, based on traffic operations modeling of the intersection improvement. Industry standard intersection analysis tools such as Highway Capacity Manual (HCM) software, NETSIM, SYNCHRO, and TRANSYT-7F should be used to simulate the delay before and after the changes to the intersection (FHWA, 2009). MAG will apply idling emission factors to the vehicle hours of delay reduced to determine the daily emissions reduction. This methodology assumes that reductions in delay are the principal source of emissions benefits attributable to an intersection improvement.

MOBILE6 will be run to estimate the idle emission factors for CO, TOG, NOx, and PM-10 for all vehicle classes in the year of project implementation (IEF_{CO}, IEF_{TOG}, IEF_{NOx}, and IEF_{PM}). As recommended in EPA's "Technical Guidance on the Use of MOBILE6 for Inventory Preparation," the idle emission factor will be estimated by running the model at 2.5 miles per hour and converting the resulting emission factor in grams per mile to grams per hour, using 2.5 miles per hour.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Cost.***
- The total weekday vehicle hours of delay reduced due to the intersection improvement (***DR***).

Formulas:

$$\textit{Daily Emissions Reduction} =$$

$$DR * \left[\frac{w1*IEF_{CO}}{4} + \frac{w2*IEF_{TOG}}{2} \frac{w3*IEF_{NOx}}{2} + w4*IEF_{PM}\right]*0.91*\frac{1}{1000} = \frac{kilograms}{day}$$

where: ***DR*** = Reduction in total weekday vehicle hours of delay due to the improvement
IEF = the idling emission factor for all vehicle classes for each pollutant (in grams/hr)
0.91 = factor to convert from average weekday traffic to annual average daily traffic
w1-w4 = weighting factors for CO, TOG, NOx, and PM-10, respectively

$$\textit{Capital Recovery Factor (CRF)} = \frac{(1+i)^{life}\,(i)}{(1+i)^{life} - 1}$$

where: ***i*** = discount rate of 3 percent
life = effectiveness period of 20 years

$$\textit{Cost-Effectiveness} = \frac{CRF * CMAQ\ Cost * 1000}{\textit{Daily Emissions Reduction} * 365} = \frac{dollars}{metric\ ton}$$

where: ***CMAQ Cost*** = the CMAQ funding requested for the project.

Additional Turning Lanes **EXAMPLE**

A city proposes to add second left turn lanes westbound and northbound and a dedicated right turn lane eastbound at an intersection in 2015 at a cost of $2,000,000. The city proposes to pay $200,000

and requests $1,800,000 of CMAQ funding. A city consultant has simulated the traffic operations at the intersection before and after the capacity improvements using SYNCHRO and has determined that the total reduction in vehicle hours of delay will be 70 hours per average weekday in 2015.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Cost*** = $1,800,000.
- ***DR*** = 70 vehicle hours of delay reduced per weekday.

Calculations:

$$\textit{Daily Emissions Reduction} =$$

$$70*(\frac{0.00*38.54}{4}+\frac{0.89*7.13}{2}+\frac{1.03*2.53}{2}+(1.0*0.08))*0.91*\frac{1}{1000} = 0.29\ \frac{kilograms}{day}$$

$$\textit{Capital Recovery Factor (CRF)} = \frac{(1+0.03)^{20} * (0.03)}{(1+0.03)^{20} - 1} = 0.0672$$

$$\textit{Cost-Effectiveness} = \frac{0.0672 * 1{,}800{,}000 * 1000}{0.29 * 365} = 1{,}142{,}749\ \frac{dollars}{metric\ ton}$$

Roundabout **EXAMPLE**

ADOT proposes to build a roundabout in 2015 at a freeway interchange. Traffic operations modeling performed by an ADOT consultant indicates that the roundabout will reduce average vehicle delay by 120 hours per weekday. The cost of the project is $2,000,000. ADOT proposes to pay $200,000 and requests $1,800,000 of CMAQ funding.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Cost*** = $1,800,000.
- ***DR*** = 120 vehicle hours of delay reduced per weekday.

$$\textit{Daily Emissions Reduction} =$$

$$120*(\frac{0.00*38.54}{4}+\frac{0.89*7.13}{2}+\frac{1.03*2.53}{2}+(1.0*0.08))*0.91*\frac{1}{1000} = 0.50\ \frac{kilograms}{day}$$

$$\textit{Capital Recovery Factor (CRF)} = \frac{(1+0.03)^{20} * (0.03)}{(1+0.03)^{20} - 1} = 0.0672$$

$$\textit{Cost-Effectiveness} = \frac{0.0672 * 1{,}800{,}000 * 1000}{0.50 * 365} = 662{,}795\ \frac{dollars}{metric\ ton}$$

OZONE EDUCATION PROGRAM

"Areawide Public Awareness Programs" is a committed control measure in the MAG 1999 Serious Area CO and PM-10 Plans. Past Air Quality Education Programs have been conducted during the winter months for CO and PM-10 and the summer months for ozone. These educational and outreach efforts focus on encouraging the public to reduce single occupant vehicle (SOV) travel, especially during periods of high measured concentrations, called pollution "alerts." Air Quality Educational Program messages are communicated through the news media, television and radio spots, posters, and the Internet. During pollution alerts, residents are encouraged to take alternate modes, such as carpools, vanpools, buses, bicycles, or walking. Telecommuting and compressed work schedules are also encouraged. These programs reduce emissions primarily by decreasing the total vehicle miles of travel (VMT) for commute trips.

Based on TDM surveys conducted in 1999-2003 for RPTA, an average of 26 percent of commute trips by persons not employed at home were taken by an alternate mode, including telecommuting and compressed work schedules (RPTA, 2003). The average trip length of commute trips by all modes for 1999-2001 was 12.6 miles (RPTA, 2001).[10]

The MOBILE6 model will be run for the CMAQ funding year to estimate the average light duty vehicle emissions of TOG, NOx, and PM-10 (LEF_{TOG}, LEF_{NOx}, and LEF_{PM}) in grams per mile. The emission factors are multiplied by the reduction in vehicle miles of travel (***VR***) to estimate the daily emissions reduction benefit of the Ozone Education Program. The CO emission factor is not included because this program is not in operation during the winter CO season. The PM-10 factor is divided by two to reflect the six month duration of the ozone education program.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Cost.***
- Percent of alternate mode use attributable to the Ozone Education Program ***(P)***.

Formulas:

$$\textit{VMT Reduced } (VR) = \frac{.26 * W * P}{1.2} * 12.6$$

where: ***.26*** = 1999-2003 average percent of trips by employees using alternate modes including telecommuting and compressed work schedules (Table 16a, RPTA, 2003)
W = daily home-based work person trips = 1.6 * total employment in Maricopa County for CMAQ funding request year (MAG trip attraction equation)
P = percent of alternate mode use attributable to the Ozone Education Program

[10]Data on commute trip lengths are not available in TDM surveys conducted by RPTA after 2001.

1.2 = average vehicle occupancy (derived from Table 15, RPTA, 2001)
12.6 = 1999-2001 average commute trip length by all modes (Table 52, RPTA, 2001)

$$\textit{Daily Emissions Reduction} = VR * \left(\frac{w2 * LEF_{TOG}}{2} + \frac{w3 * LEF_{NOx}}{2} + \frac{w4 * (LEF_{PM} + PEF)}{2}\right) * \frac{1}{1000} * \frac{250}{365} = \frac{kilograms}{day}$$

where: ***LEF*** = the light duty vehicle emission factor for each pollutant
PEF = the paved road PM-10 emission factor for all road types
w2-w4 = weighting factors for TOG, NOx, and PM-10, respectively
250/365 = factor to convert from an average weekday to an annual average day

$$\textit{Capital Recovery Factor (CRF)} = \frac{(1+i)^{life}\,(i)}{(1+i)^{life} - 1}$$

where: ***i*** = discount rate of 3 percent
life = program period of 1 year

$$\textit{Cost-Effectiveness} = \frac{CRF * CMAQ\ Cost * 1000}{\textit{Daily Emissions Reduction} * 365} = \frac{dollars}{metric\ ton}$$

where: ***CMAQ Cost*** = the CMAQ funding requested for the project

Ozone Education Program **EXAMPLE**

RPTA requests $300,000 in FY 2015 CMAQ funds for the Ozone Education Program and estimates that the share of the annual alternative mode use attributable to the Ozone Education Program is five percent. Based on interpolations of 2010 and 2020 projections adopted by the MAG Regional Council in May 2007, the total employment for Maricopa County in 2015 is expected to be 2,473,000.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Cost*** = $300,000.
- ***P*** = 5 %.[11]

[11]In the 2005 CMAQ methodologies, the value of "P" for this example was 10%. This value has been cut in half to represent the six-month Ozone Education Program season.

Calculations:

$$VMT\ Reduced\ (VR) = \frac{.26 * (1.6 * 2{,}473{,}000) * .05}{1.2} * 12.6 = 540{,}103$$

$$Daily\ Emissions\ Reduction = 540{,}103 * \left(\frac{0.89*0.45}{2} + \frac{1.03*0.34}{2} + \frac{1.0*(0.02+0.65)}{2}\right) * \frac{1}{1000} * \frac{250}{365} = 262.78\ \frac{kilograms}{day}$$

$$Capital\ Recovery\ Factor\ (CRF) = \frac{(1+0.03)^1 * (0.03)}{(1+0.03)^1 - 1} = 1.03$$

$$Cost\text{-}Effectiveness = \frac{1.03 * 300{,}000 * 1000}{262.78 * 365} = 3{,}222\ \frac{dollars}{metric\ ton}$$

PARK AND RIDE FACILITIES

"Park and Ride Lots" is a committed control measure in the MAG 1999 Serious Area CO and PM-10 Plans. Park and ride facilities reduce vehicle trips and emissions by encouraging carpooling, vanpooling, and transit ridership. These projects reduce light duty vehicle exhaust emissions of CO, TOG, and NOx, and exhaust plus reentrained emissions of PM-10.

The methodology is based on the number of park and ride spaces to be built and the projected utilization rate in ten years when the facility is scheduled to open. It is assumed that each vehicle parked in the facility (spaces times the utilization rate) represents two commute trips. An average trip length is derived from regional commuting data collected by the Regional Public Transportation Authority and applied to the total commute trips. The average trip length driven to park and ride lots (from a MAG park-and-ride lot survey) is subtracted from the average commute trip length. The net trip length is applied to the total commute trips reduced to obtain the average weekday reduction in vehicle miles of travel (VMT).

The MOBILE6 model will be run for the year that the project is implemented to estimate the average light duty vehicle emission factors for CO, TOG, NOx, and PM-10 (LEF_{CO}, LEF_{TOG}, LEF_{NOx}, and LEF_{PM}).

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Cost.***
- Number of spaces ***(S)***.
- Estimated utilization rate ***(U)***.

Formulas:

$$VMT\ Reduced\ (VR) = S * U * 2 * (12.6 - 3.5)$$

where: ***S*** = number of parking spaces provided in the park and ride facility
U = average weekday utilization rate
2 = number of vehicle commute trips per average weekday
12.6=1999-2001 average commute trip length by all modes (Table 52, RPTA, 2001)
3.5 =average miles driven to park and ride lots (from MAG park-and-ride lot survey)

$$Daily\ Emission\ Reduction = VR * \left(\frac{w1 * LEF_{CO}}{4} + \frac{w2 * LEF_{TOG}}{2} + \frac{w3 * LEF_{NOx}}{2} + w4 * (LEF_{PM} + PEF)\right) * \frac{1}{1000} * \frac{250}{365} = \frac{kilograms}{day}$$

where: ***LEF*** = the light duty vehicle emission factor for each pollutant
PEF = the paved road PM-10 emission factor for all road types
250/365 = factor to convert from a weekday to an annual average day
w1-w4 = weighting factors for CO, TOG, NOx, and PM-10, respectively

$$Capital\ Recovery\ Factor\ (CRF) = \frac{(1+i)^{life}\ (i)}{(1+i)^{life} - 1}$$

where: ***i*** = discount rate of 3 percent
life = effectiveness period of 20 years

$$Cost\text{-}Effectiveness = \frac{CRF * CMAQ\ Cost * 1000}{Daily\ Emissions\ Reduction * 365} = \frac{dollars}{metric\ ton}$$

where: ***CMAQ Cost*** = the CMAQ funding requested for the project.

Park and Ride Lot **EXAMPLE**

A city requests $200,000 in FY 2015 CMAQ funds to construct a park and ride lot with 300 spaces. The city will use an additional $50,000 in local funds. The city estimates that 90 percent of these spaces will be utilized on a typical weekday.

Inputs Required from Entity Requesting CMAQ Funds:

•***CMAQ Cost*** = $200,000.
•**S** = 300 spaces.
•**U** = 90% utilization.

$$\textit{VMT Reduced (VR)} = 300 * 0.90 * 2 * 9.1 = 4{,}914$$

$$\textit{Emission Reduction} = 4{,}914*\left(\frac{0.00*6.38}{4}+\frac{0.89*0.45}{2}+\frac{1.03*0.34}{2}+(1.0*(0.02+0.65))\right)*\frac{1}{1000}*\frac{250}{365} = 3.52\ \frac{\textit{kilograms}}{\textit{day}}$$

$$\textit{Capital Recovery Factor (CRF)} = \frac{(1+0.03)^{20} * (0.03)}{(1+0.03)^{20} - 1} = 0.0672$$

$$\textit{Cost-Effectiveness} = \frac{0.0672 * 200{,}000 * 1000}{3.52 * 365} = 10{,}461\ \frac{\textit{dollars}}{\textit{metric ton}}$$

PAVING PROJECTS

"Pave or Stabilize Unpaved Shoulders" and "Pave or Stabilize Existing Public Dirt Roads and Alleys" are committed measures in the MAG Five Percent Plan for PM-10 (MAG 2007b). Paving projects are effective in reducing PM-10 and therefore, represent potential candidates for CMAQ funds. Typical projects requesting CMAQ funds are for paving unpaved shoulders, curbs and gutters, unpaved roads, and unpaved access points. These projects reduce PM-10, but not CO, TOG, or NOx.

The Five Percent Plan for PM-10 assumes an unpaved road emission rate of 666.62 grams per vehicle mile of travel (g/vmt) (**BEF**) and an average paved road emission rate of 3.51 g/vmt (**AEF**) on low volume roads (i.e., those carrying less than 10,000 vehicles per day) with unpaved shoulders. The difference between these paved and unpaved emission rates, 663.11 g/vmt, represents the reduction in PM-10 emissions due to paving of dirt roads outside the Salt River Area. In the Salt River Area, the average emission rate is 6.88 g/vmt for paved roads without shoulders and the emission reduction due to paving a dirt road in the Salt River Area is 659.74 g/vmt.

The benefits of paving unpaved shoulders and/or installing curbs and gutters (C&G) are also derived from the MAG Five Percent Plan. Outside the Salt River Area, the reduction factor (**RF**) for paving shoulders with C&G on both sides of the road is 1.81 g/vmt for roads with less than 10,000 vehicles per day and 1.49 g/vmt for roads with 10,000 or more vehicles per day. In the Salt River Area, the

RF for paving shoulders with C&G on both sides of a road is 3.44g/vmt.[12] As shown in the formulas below, the **RF**s vary based on the extent of shoulder and/or C&G paving.

To be consistent with the Five Percent Plan, paving unpaved access points will be assumed to reduce emissions by 343 grams per access point per day. If the number of access points to be paved is not supplied, it will be assumed that eight access points were paved per project mile.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Cost.***
- Project length (***centerline miles***).
- Average weekday traffic (***ADT)*** for paving unpaved roads or shoulders.
- The number of access points to be paved (***access points***) - if paving unpaved access points.
- Whether the project includes paving the shoulder and/or providing curb and gutter on one or both sides of the road.

Formulas:

<u>For Paving Unpaved Shoulders and/or Providing Curb and Gutter (C&G)</u>:

$$\textit{Daily Emissions Reduction} = w4 * RF * \textbf{miles} * ADT * 0.91 * \frac{1}{1000} = \frac{\textit{kilograms}}{\textit{day}}$$

where: ***RF*** = Reduction factor for:

Low volume roads (<10,000 ADT) **outside the Salt River Area** =
1.81 g/vmt, if paving shoulders and providing C&G on both sides of the road;
1.36 g/mvt, if paving shoulders on both sides of the road without C&G;
0.91 g/vmt, if paving shoulder and providing C&G on one side of the road;
0.68 g/vmt, if paving shoulder on one side of the road without C&G;
0.45 g/vmt, if providing C&G on both sides of a road with paved shoulders; or
0.23 g/vmt, if providing C&G on one side of a road with a paved shoulder.

High volume roads (≥ 10,000 ADT) **outside the Salt River Area** =
1.49 g/vmt, if paving shoulders and providing C&G on both sides of the road;
1.12 g/mvt, if paving shoulders on both sides of the road without C&G;
0.75 g/vmt, if paving shoulder and providing C&G on one side of the road;
0.56 g/vmt, if paving shoulder on one side of the road without C&G;
0.37 g/vmt, if providing C&G on both sides of a road with paved shoulders; or
0.19 g/vmt, if providing C&G on one side of a road with a paved shoulder.

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[12]Paving unpaved shoulders with C&G in the Salt River Area reduces paved road emissions by 50 percent; therefore, **RF** due to paving shoulders with C&G in the Salt River Area is 6.88 g/vmt x 0.50 = 3.44 g/vmt. (MAG, 2008).

All roads inside the Salt River Area =

3.44 g/vmt, if paving shoulders and providing C&G on both sides of the road;
2.58 g/mvt, if paving shoulders on both sides of the road without C&G;
1.72 g/vmt, if paving shoulder and providing C&G on one side of the road;
1.29 g/vmt, if paving shoulder on one side of the road without C&G;
0.86 g/vmt, if providing C&G on both sides of a road with paved shoulders; or
0.43 g/vmt, if providing C&G on one side of a road with a paved shoulder.

miles = the length of the project (in centerline miles)
ADT = the average weekday traffic on the road adjacent to the unpaved shoulders
0.91 = the factor to convert from weekday to annual average daily traffic
w4 = the PM-10 weighting factor

<u>For Paving Unpaved Roads:</u>

$$\textit{Daily Emissions Reduction} = w4 * (BEF - AEF) * miles * ADT * 0.91 * \frac{1}{1000} = \frac{kilograms}{day}$$

where: ***BEF*** = the PM-10 emission factor for vehicles traveling on unpaved roads = 666.62 g/vmt
AEF = the PM-10 emission factor for vehicles traveling on paved roads outside the Salt River Area = 3.51 g/vmt or inside the Salt River Area = 6.88 g/vmt
miles = the length of the project (in centerline miles)
ADT = the average weekday traffic on the road adjacent to the unpaved shoulders
0.91 = the factor to convert from weekday to annual average daily traffic
w4 = the PM-10 weighting factor

<u>For Paving Unpaved Access Points</u>:

$$\textit{Daily Emissions Reduction} = w4 * \frac{343\ grams}{access\ point\text{-}day} * access\ points * \frac{1}{1000} = \frac{kilograms}{day}$$

where: ***access points*** = the number of access points to be paved
w4 = the PM-10 weighting factor

For All Paving Projects:

$$\textit{Capital Recovery Factor } (\textbf{CRF}) = \frac{(1+i)^{life}\,(i)}{(1+i)^{life} - 1}$$

where: i = discount rate of 3 percent
$life$ = effectiveness period of 20 years

$$\textit{Cost-Effectiveness} = \frac{\textbf{CRF} * \textbf{CMAQ Cost} * 1000}{\textit{Daily Emissions Reduction} * 365} = \frac{\textit{dollars}}{\textit{metric ton}}$$

where: ***CMAQ Cost*** = the CMAQ funding requested for the project.

Paving Unpaved Roads Without Paved Shoulders **EXAMPLE**

A jurisdiction proposes to pave a 1.5 mile section of unpaved road in FY 2015 which has an average weekday traffic volume of 120 vehicles per day. No paved shoulders or curb and gutter will be provided. The project is located outside of the Salt River Area. The total cost of the project is $675,000. The jurisdiction proposes to pay $75,000 and requests $600,000 in CMAQ funds.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Cost*** = $600,000.
- Project length (***miles***) = 1.5 miles.
- Average weekday traffic (***ADT***) on the unpaved road = 120.

Calculations:

$$\textit{Daily Emissions Reduction} = 1.0 * (666.62 - 3.51) * 1.5 * 120 * 0.91 * \frac{1}{1000} = 108.62\ \frac{\textit{kilograms}}{\textit{day}}$$

$$\textit{Capital Recovery Factor } (\textbf{CRF}) = \frac{(1+0.03)^{20} * (0.03)}{(1+0.03)^{20} - 1} = 0.0672$$

$$\textit{Cost-Effectiveness} = \frac{0.0672 * 600{,}000 * 1000}{108.62 * 365} = 1{,}017\ \frac{\textit{dollars}}{\textit{metric ton}}$$

Paving Unpaved Roads With Paved Shoulders and Curb and Gutter EXAMPLE

A city proposes to pave one mile of an unpaved road in FY 2015 which has a traffic volume of 120 vehicles per average weekday. The project will pave the shoulders and provide curb and gutter on both sides of the road. The paving project is located outside of the Salt River Area. The total cost of the project is $675,000. The city proposes to pay $75,000 and requests $600,000 of CMAQ funding.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Cost*** = $600,000.
- Project length (***miles***) = 1 mile.
- Average weekday traffic (***ADT***) on unpaved road = 120.

Calculations:

Calculate the daily emissions reduction from paving the unpaved road:

$$\textit{Daily Emissions Reduction} = 1.0 * (666.62 - 3.51) * 1.0 * 120 * 0.91 * \frac{1}{1000} = 72.41 \frac{kilograms}{day}$$

Calculate the daily emissions reduction from paving the shoulder and providing curb and gutter on both sides of the road:

$$\textit{Daily Emissions Reduction} = 1.0 * 1.81 * 1.0 * 120 * 0.91 * \frac{1}{1000} = 0.20 \frac{kilograms}{day}$$

The total daily emissions reduction from paving the unpaved road with a shoulder and curb and gutter is:

$$\textit{Total Daily Emissions Reduction} = 72.41 + 0.20 = 72.61 \frac{kilograms}{day}$$

$$\textit{Capital Recovery Factor (CRF)} = \frac{(1+0.03)^{20} * (0.03)}{(1+0.03)^{20} - 1} = 0.0672$$

$$\textit{Cost-Effectiveness} = \frac{0.0672 * 600{,}000 * 1000}{72.61 * 365} = 1{,}521 \frac{dollars}{metric\ ton}$$

Paving Unpaved Access Points **EXAMPLE**

A city proposes to pave unpaved access points on two miles of paved road in FY 2015. The city proposes to pay $50,000 and requests $250,000 of CMAQ funding. The city indicates that there are sixteen access points that will be paved along the two miles of road.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Cost*** = $250,000.
- Project length (***miles***) = 2 miles.
- Access points to be paved (***access points***) =16.

Calculations:

$$\textit{Daily Emissions Reduction} = 1.0 * \left(\frac{343\ \textit{grams}}{\textit{access point-day}}\right) * 16 * \frac{1}{1000} = 5.49\ \frac{\textit{kilograms}}{\textit{day}}$$

$$\textit{Capital Recovery Factor (CRF)} = \frac{(1+0.03)^{20}\ (0.03)}{(1+0.03)^{20} - 1} = 0.0672$$

$$\textit{Cost-Effectiveness} = \frac{0.0672 * 250{,}000 * 1000}{5.49 * 365} = 8{,}384\ \frac{\textit{dollars}}{\textit{metric ton}}$$

PM-10 CERTIFIED STREET SWEEPERS

"PM-10 Efficient Street Sweepers" is a committed measure in the Five Percent Plan for PM-10 (MAG, 2007b). Street sweepers certified in accordance with South Coast Air Quality Management District Rule 1186 reduce PM-10 on paved roads, which reduces reentrainment of PM-10 by vehicles traveling on the road. Therefore, the purchase of PM-10 certified street sweepers is eligible for CMAQ funds. Emission reductions for this type of project will be calculated for PM-10 only.

The emission reductions are addressed as two separate components: the reduction in reentrained dust from vehicles traveling on the roadways cleaned by the sweeper and the reduction in dust from the actual sweeping process. These components will be combined to determine the total emissions reduction associated with a PM-10 certified street sweeper. Each component is described in a separate section below.

Reduced Reentrained Dust from Vehicles Traveling on Roadways. If the sweeper is being purchased to replace an existing conventional sweeper, the emission reduction will be based on a comparison of the emissions from the base silt loading on a paved road after using a conventional sweeper

versus emissions from the reduced silt loading attributable to a PM-10 certified sweeper. The reduced silt loading results in lower emissions of reentrained dust from vehicles traveling on the road. If the sweeper is being purchased to replace an older PM-10 certified sweeper, the emission reduction will be based on a comparison of the utilization rates of the new PM-10 certified sweeper versus the older certified sweeper.

If the street sweeper is being purchased to increase the frequency of sweeping, the emission reduction will be based on a comparison of emissions using a PM-10 certified sweeper with the new cycle length (***daysnew***) versus the same sweeper with the existing cycle length (***days***). If the street sweeper is being purchased to expand coverage, the emission reduction will be based on the difference between the emissions from an unswept road (using the initial emission factors in Tables 4 and 5) and the emissions after sweeping with a PM-10 certified unit for the expanded area (***milesnew***).

The emission factor for reentrained dust varies depending upon how often a street is swept. It will be assumed that requested PM-10 certified street sweepers use the same sweeping schedule as the conventional street sweepers they replace. To be consistent with the Five Percent Plan for PM-10, it will be assumed that the silt loading on a street returns to its initial level nine days after the street is swept by a PM-10 certified sweeper and six days after being swept by a conventional sweeper. The initial unswept emission factors derived from the Five Percent Plan are 0.18 grams per vehicle mile of travel for freeways and 0.92 grams per vehicle mile of travel for arterials. The latter represents a VMT-weighted average of the low ADT (1.70 g/vmt) and high ADT (0.65 g/vmt) emission factors for arterials outside the Salt River Area.

In the Salt River Area, Sierra Research recommends that a paved road PM-10 emission factor of 3.44 g/vmt for all arterials (MAG 2008). As defined in the Five Percent Plan, the Salt River Area has boundaries of: Van Buren Street on the north, 7th Street on the east, Baseline Road on the south, and 59th Avenue on the west. The higher paved road emission rate in the Salt River Area is due to the heavier weight (i.e., 4.1 tons) of vehicles traveling on paved roads in this industrial area, compared with the average vehicle weight of 3.18 tons in the rest of the region. Emission reduction credit for PM-10 street sweepers to be purchased with CMAQ funds for use in the Salt River Area will be calculated using this higher paved road emission rate.

The Five Percent Plan also indicates that the PM-10 certified sweepers reduce the initial silt loading by 86 percent (i.e. the silt loading is reduced to 14 percent of the initial level), while conventional sweepers reduce the initial silt loading by 55 percent. The schedule in the Five Percent Plan for percent of initial silt loading on days after PM-10 certified street sweeping is as follows: day of sweeping - 14 percent, 1 day after - 24 percent, 2 days after - 34 percent, 3 days after - 44 percent, 4 days after - 54 percent, 5 days after - 64 percent, 6 days after - 74 percent, 7 days after - 84 percent, 8 days after - 94 percent, and nine days or more after - 100 percent of initial silt loading. Similarly, the silt loading at varying days after sweeping with a conventional sweeper is as follows: day of sweeping - 45 percent, 1 day after - 55 percent, 2 days after - 65 percent, 3 days after - 75 percent, 4 days after - 85 percent, 5 days after - 95 percent, and 6 days or more after - 100 percent of initial silt loading.

The paved road emission factor for reentrained dust is exponentially related to the silt loading[13]. Therefore, the change in emission factors over time after sweeping does not follow the same linear relationship as percent reductions in silt loadings. The PM-10 emission factors for sweeping freeways and non-freeways with a PM-10 certified unit are listed in Table 4 for various days following street sweeping. Similar factors for a conventional sweeper are provided in Table 5. In Tables 4 and 5, the emission factors for sweeping non-freeways in the Salt River Area are based on a higher initial unswept emission rate from the Five Percent Plan, as recommended by Sierra Research (MAG, 2008).

Based on sweeping frequency, the emission factors in Tables 4 and 5 will be combined to create a weighted average emission factor as shown in the formulas below. Separate weighted emission factors will be estimated to reflect the impact of sweeping with PM-10 certified sweepers and conventional sweepers. The difference between these two emission factors is the incremental reduction in emissions achieved by replacing a conventional street sweeper with a PM-10 certified unit.

The difference between the initial unswept emission factor and the PM-10 certified sweeper emission factor when applied to the new area being swept (***milesnew***) represents the reduction in emissions achieved by expanding the area of sweeping. The difference between the PM-10 certified emission factors for the old (***days***) and new (***daysnew***) cycle lengths represents the reduction achieved by increasing the frequency of sweeping.

To calculate the benefits of a new PM-10 certified sweeper that will replace an older certified unit, the utilization rate of the new and older sweepers will be compared. The requestor will provide the percent of time that the older unit was not utilized during the previous year due to maintenance and repair downtime. The average daily benefit of the new sweeper based on the emission factors in Table 4 will be reduced by the difference between 95 percent (the assumed utilization rate for a new sweeper) and the utilization rate (1.0 - percent downtime) for the older sweeper.

Reduced Emissions During the Sweeping Process. The reduction in PM-10 from the actual sweeping process will be based upon the California Air Resources Board estimate that a PM-10 certified street sweeper entrains 0.05 pounds per mile less PM-10 than a conventional sweeper during the sweeping process (CARB, 2005). For this analysis, the emissions reduction is converted to kilograms per vehicle mile, resulting in an emission reduction factor of 0.023 kilograms per vehicle mile traveled by the PM-10 certified sweeper. This estimate will be combined with the estimate of miles traveled per day by the PM-10 certified sweeper to produce a total reduction in emissions in kilograms for an average day. This reduction will only be applied when a PM-10 certified sweeper will replace a conventional sweeper.

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[13]The AP-42 equation for paved road PM-10 emission factors is calculated by raising the silt loading to the power of 0.65.

Table 4. PM-10 Emission Factors as a Function of Days After Sweeping with a PM-10 Certified Sweeper

	Freeway	Non-freeway	Salt River Area Non-freeway
day of sweeping (k=1)	0.05 g/vmt	0.26 g/vmt	0.96 g/vmt
1 day after sweeping (k=2)	0.07 g/vmt	0.36 g/vmt	1.36 g/vmt
2 days after sweeping (k=3)	0.09 g/vmt	0.46 g/vmt	1.71 g/vmt
3 days after sweeping (k=4)	0.11 g/vmt	0.54 g/vmt	2.02 g/vmt
4 days after sweeping (k=5)	0.12 g/vmt	0.62 g/vmt	2.30 g/vmt
5 days after sweeping (k=6)	0.13 g/vmt	0.69 g/vmt	2.57 g/vmt
6 days after sweeping (k=7)	0.15 g/vmt	0.76 g/vmt	2.83 g/vmt
7 days after sweeping (k=8)	0.16 g/vmt	0.82 g/vmt	3.07 g/vmt
8 days after sweeping (k=9)	0.17 g/vmt	0.88 g/vmt	3.30 g/vmt
9 days after sweeping (k>9)	0.18 g/vmt	0.92 g/vmt	3.44 g/vmt

Table 5. PM-10 Emission Factors as a Function of Days After Sweeping with a Conventional Sweeper

	Freeway	Non-freeway	Salt River Area Non-freeway
day of sweeping (k=1)	0.11 g/vmt	0.55 g/vmt	2.05 g/vmt
1 day after sweeping (k=2)	0.12 g/vmt	0.62 g/vmt	2.33 g/vmt
2 days after sweeping (k=3)	0.14 g/vmt	0.69 g/vmt	2.60 g/vmt
3 days after sweeping (k=4)	0.15 g/vmt	0.76 g/vmt	2.85 g/vmt
4 days after sweeping (k=5)	0.16 g/vmt	0.83 g/vmt	3.10 g/vmt
5 days after sweeping (k=6)	0.17 g/vmt	0.89 g/vmt	3.33 g/vmt
6 days after sweeping (k>6)	0.18 g/vmt	0.92 g/vmt	3.44 g/vmt

Inputs Required from Entity Requesting CMAQ Funds:

PM-10 certified street sweepers are eligible for purchase with CMAQ funds if they replace an existing unit that has not been certified by South Coast Rule 1186, replace a Rule 1186 certified unit that is at least eight years old, increase the frequency of sweeping, expand the area that is swept, or a combination of these functions. Input requirements for each of these functions are described below. If the requested unit will perform more than one function, the requestor will need to provide all of the inputs described under each function. Note that the sweeping cycle (***days* or *daysnew***) referred to below represents the number of calendar days that elapse before the same lane of road is re-swept by the same sweeper.

For all sweeper requests:

- ***CMAQ Cost.***
- Average weekday traffic (***ADT***) per lane on streets to be swept by the PM-10 certified sweeper.
- Whether the requested unit will sweep freeways or non-freeways.

If the new sweeper will replace a non-certified sweeper:

- Current number of days per sweeping cycle (***days***) for the unit being replaced.
- Lane miles (***miles***) swept per cycle by the unit being replaced.

If the new sweeper will replace an older PM-10 certified sweeper:

- Percent of time the older certified sweeper was not utilized during the previous year as a result of maintenance and repair downtime.
- Current number of days per sweeping cycle (***days***) for the unit being replaced.
- Lane miles (***miles***) swept per cycle by the unit being replaced.

If the new sweeper will be used to increase the frequency of sweeping:

- Planned number of days per sweeping cycle (***daysnew***) for the lanes to be swept.
- Current number of days per sweeping cycle (***days***) for the lanes to be swept.
- Lane miles (***miles***) of roads to be swept per cycle.

If the new sweeper will be used to expand the area to be swept:

- Planned number of days per cycle (***daysnew***) on roads in the expanded area.
- Lane miles (***milesnew***) of roads to be swept per cycle in the expanded area.

Formulas:

<u>Reduced Reentrained Dust from Vehicles Traveling on Roadways</u>:

Emission factor for roads swept with PM-10 certified street sweepers:

$$PM\text{-}10\ Certified\ Sweeper\ Emission\ Factor\ (PEF) = \frac{\sum_{k=1}^{days} (PM\text{-}10\ certified\ emission\ factor)_k}{days}$$

Emission factor for roads swept with conventional street sweepers:

$$Conventional\ Sweeper\ Emission\ Factor\ (CEF) = \frac{\sum_{k=1}^{days} (conventional\ emission\ factor)_k}{days}$$

where: $(PM\text{-}10\ certified\ emission\ factor)_k$ = the emission factor on day k from Table 4
$(conventional\ emission\ factor)_k$ = the emission factor on day k from Table 5
days = current number of days per sweeping cycle

Replacing a Conventional Sweeper:

$$Daily\ Emissions\ Reduction = w4 * miles * ADT * 0.91 * (CEF - PEF) * \frac{1}{1000} = \frac{kilograms}{day}$$

Replacing an Older PM-10 Certified Sweeper:

$$Daily\ Emissions\ Reduction = w4 * miles * ADT * 0.91 * PEF * (0.95 - URATE_{old}) * \frac{1}{1000} = \frac{kilograms}{day}$$

Increasing the Frequency of Sweeping:

$$Daily\ Emissions\ Reduction = w4 * miles * ADT * 0.91 * (PEF - PEF_{new}) * \frac{1}{1000} = \frac{kilograms}{day}$$

Expanding the Coverage of Sweeping:

$$\textit{Daily Emissions Reduction} = w4 * \textbf{milesnew} * \textbf{ADT} * 0.91 * (\textit{IEF} - \textit{PEF}_{new}) * \frac{1}{1000} = \frac{\textit{kilograms}}{\textit{day}}$$

where: ***w4*** = the PM-10 weighting factor
miles = lane miles of street to be swept per cycle
ADT = average weekday traffic per through lane to be swept by the requested sweeper
0.91 = factor to convert from weekday traffic to annual average daily traffic
$\textit{URATE}_{old}$ = percent utilization of the older PM-10 certified sweeper during the past year
$\textit{PEF}_{new}$ = PM-10 certified sweeper emission factor calculated with ***days*** = ***daysnew***
IEF = the initial silt loading emission factor in Table 4 (i.e., 9 days after sweeping) or Table 5 (i.e., 6 days after sweeping)
milesnew = lane miles of streets be swept per cycle in the expanded area

<u>Reduced Emissions During the Sweeping Process</u> (This reduction is only applied if the requested sweeper replaces a non-certified unit):

$$\textit{Daily Emissions Reduction for the Sweeping Process} = w4 * (\frac{\textbf{miles}}{\textbf{days}}) * 0.023 = \frac{\textit{kilograms}}{\textit{day}}$$

where: **0.023** = kilograms per vehicle mile reduction in reentrained dust from the sweeping process itself.
w4 = the PM-10 weighting factor

$$\textit{Capital Recovery Factor (CRF)} = \frac{(1+i)^{life}\,(i)}{(1+i)^{life} - 1}$$

where: ***i*** = discount rate of 3 percent
life = effectiveness period of 8 years (MAG, 1998)

$$\textit{Cost-Effectiveness} = \frac{\textbf{CRF} * \textbf{CMAQ Cost} * 1000}{\textit{Daily Emissions Reduction} * 365} = \frac{\textit{dollars}}{\textit{metric ton}}$$

where: ***CMAQ Cost*** = the CMAQ funding requested for the project.

A city proposes to purchase a PM-10 certified street sweeper in FY 2010 to replace a non-certified sweeper. The replacement unit will not be used to increase the frequency of sweeping or the area swept. The cost of CMAQ-eligible equipment on the sweeper is $150,000. The city proposes to pay $15,000 and requests $135,000 of CMAQ funding. The certified sweeper will be used on streets (non-freeways) outside the Salt River Area with average weekday traffic per through lane of 5,000 vehicles. Each lane mile of street is currently swept once every 14 days. During this 14-day cycle, 200 lane miles are swept using the non-certified sweeper being replaced.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Cost*** = $135,000.
- Average weekday traffic per through lane swept with the conventional sweeper to be replaced (***ADT***)= 5,000 vehicles/day.
- Current number of days in the sweeping cycle using the conventional sweeper to be replaced (***days***) = 14 days.
- Lane miles of streets swept per sweeping cycle with the conventional sweeper to be replaced (***miles***) = 200 lane miles.

Calculations:

$$CEF = \frac{0.55 + 0.62 + 0.69 + 0.76 + 0.83 + 0.89 + (8 * 0.92)}{14} = 0.836$$

$$PEF = \frac{0.26 + 0.36 + 0.46 + 0.54 + 0.62 + 0.69 + 0.76 + 0.82 + 0.88 + (5 * 0.92)}{14} = 0.714$$

$$\textit{Daily Emissions Reduction for Reentrainment} = 1.0*200*5000*0.91*(0.836 - 0.714)*\frac{1}{1000} = 111.02\ \frac{kilograms}{day}$$

$$\textit{Daily Emissions Reduction for the Sweeping Process} = 1.0 * \frac{200}{14} * 0.023 = 0.33\ \frac{kilograms}{day}$$

$$CRF = \frac{(1+0.03)^8 * (0.03)}{(1+0.03)^8 - 1} = 0.1425$$

$$\textit{Cost-Effectiveness} = \frac{0.1425 * 135{,}000 * 1000}{111.35 * 365} = 473\ \frac{dollars}{metric\ ton}$$

RIDESHARE PROGRAMS

"Employer Rideshare Program Incentives" and "Preferential Parking for Carpools and Vanpools" are committed control measures in the MAG 1999 Serious Area CO and PM-10 Plans. Ridesharing in carpools and vanpools reduces emissions by decreasing the total vehicle miles of travel (VMT) for commute trips. MAG programs CMAQ funding for the Regional Rideshare Program operated by RPTA and partial funding for the Capitol Rideshare Program conducted by the Arizona Department of Administration.

Based on TDM surveys conducted in 1999-2003 for RPTA, an average of 14 percent of all work trips are made by carpools and vanpools (RPTA, 2003). The average trip length of commute trips by all modes during the period 1999-2001 was 12.6 miles and the average vehicle occupancy was 1.2 (RPTA, 2001).[14]

The MOBILE6 model will be run for the CMAQ funding year to estimate the average light duty vehicle emissions of CO, TOG, NOx, and PM-10 (**LEF_{CO}, LEF_{TOG}, LEF_{NOx}, and LEF_{PM}**) in grams per mile. The emission factors will be multiplied by the reduction in vehicle miles of travel (**VR**) to estimate the emissions benefit of ridesharing.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Cost.***
- Percent of carpooling participation attributable to the Regional Rideshare Program (**P**).

Formulas:

$$\textit{VMT Reduced (VR)} = \frac{.14 * W * P}{1.2} * 12.6$$

where: **.14** = 1999-2003 average percent of total commute trips by carpooling (Table 16a, RPTA, 2003)
W = daily home-based work person trips = 1.6 * total employment in Maricopa County for CMAQ funding request year (MAG trip attraction equation)
P = percent of carpooling attributable to the Regional Rideshare Program
1.2 = average vehicle occupancy for all modes (derived from Table 15, RPTA, 2001)
12.6 = 1999-2001 average commute trip length by all modes (Table 52, RPTA, 2001)

[14]Data on commute trip lengths and vehicle occupancy are not available in TDM surveys conducted by RPTA after 2001.

$$Daily\ Emissions\ Reduction = VR * [\frac{w1 * LEF_{CO}}{4} + \frac{w2 * LEF_{TOG}}{2} + \frac{w3 * LEF_{NOx}}{2} + w4 * (LEF_{PM} + PEF)] * \frac{1}{1000} * \frac{250}{365} = \frac{kilograms}{day}$$

where: ***LEF*** = the light duty vehicle emission factor for each pollutant
PEF = the paved road PM-10 emission factor for all road types
w1-w4 = weighting factors for CO, TOG, NOx, and PM-10, respectively
250/365 = factor to convert from an average weekday to an annual average day

$$Capital\ Recovery\ Factor\ (CRF) = \frac{(1+i)^{life}\ (i)}{(1+i)^{life} - 1}$$

where: ***i*** = discount rate of 3 percent
life = program period of 1 year

$$Cost\text{-}Effectiveness = \frac{CRF * CMAQ\ Cost * 1000}{Daily\ Emissions\ Reduction * 365} = \frac{dollars}{metric\ ton}$$

where: ***CMAQ Cost*** = the CMAQ funding requested for the project.

Regional Rideshare Program **EXAMPLE**

RPTA requests $594,000 in FY 2015 CMAQ funds for the Regional Rideshare Program and indicates that the Regional Rideshare Program is responsible for ten percent of employee participation in carpooling. Based on interpolation of 2010 and 2020 projections adopted by the MAG Regional Council in May 2007, the total employment for Maricopa County in 2015 is expected to be 2,473,000.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Cost*** = $594,000.
- ***P*** = 10%.

Calculations:

$$VMT\ Reduced\ (VR) = \frac{0.14 * (1.6 * 2{,}473{,}000) * 0.10}{1.2} * 12.6 = 581{,}650$$

$$\textit{Daily Emissions Reduction} =$$

$$581{,}650*\left(\frac{0.00*6.38}{4}+\frac{0.89*0.45}{2}+\frac{1.03*0.34}{2}+(1.0*(0.02+0.65))\right)*\frac{1}{1000}*\frac{250}{365} = 416.46\ \frac{kilograms}{day}$$

$$\textit{Capital Recovery Factor (CRF)} = \frac{(1+0.03)^1 * (0.03)}{(1+0.03)^1 - 1} = 1.03$$

$$\textit{Cost-Effectiveness} = \frac{1.03 * 594{,}000 * 1000}{416.46 * 365} = 4{,}025\ \frac{dollars}{metric\ ton}$$

TELEWORK PROGRAM

"Encouragement of Telecommuting, Teleworking and Teleconferencing" is a committed control measure in the MAG 1999 Serious Area CO and PM-10 Plans. The program encourages employers to set up and institutionalize telecommuting options for employees. The program provides consulting services to implement or expand corporate telecommuting programs, including advice on information technology and telecommunications connectivity. The current outreach effort targets CEOs of companies to obtain top-level commitment. The program also aims to increase general public awareness of telecommuting via TV programs, press releases, and advertisements in corporate publications. The Telework Program reduces emissions by decreasing the total vehicle miles of travel (VMT) for commute trips.

Based on averages for 1999-2003 from TDM surveys conducted by RPTA, 3.5 percent of daily commute trips are replaced by telecommuting (RPTA, 2003). The average trip length of commute trips by telecommuters is 19.0 miles (RPTA, 2000a). The MOBILE6 model will be run for the CMAQ funding year to estimate average light duty vehicle emissions of CO, TOG, NOx, and PM-10 ($\mathbf{LEF_{CO}}$, $\mathbf{LEF_{TOG}}$, $\mathbf{LEF_{NOx}}$, and $\mathbf{LEF_{PM}}$) in grams per mile. The emission factors will be multiplied by the reduction in vehicle miles of travel (**VR**) to estimate the emissions benefit of the Telework Program.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Cost.***
- Percent of telecommuting attributable to the Telework Program (***P***).

Formulas:

$$\textit{Commute Trips Avoided } (CTA) = \frac{.035 * W}{1.2}$$

$$\textit{VMT Reduced } (VR) = CTA * P * 19.0$$

where: **.035** = 1999-2003 average percent of commute trips replaced by telecommuting on an average weekday (Table 16a, RPTA, 2003)
W= daily home-based work person trips = 1.6 * total employment in Maricopa County in the CMAQ funding request year (from MAG trip generation equation)
1.2 = average vehicle occupancy (derived from Table 15, RPTA, 2001)
P = percent of telecommuting attributable to the Telework Program
19.0 = average one-way commute trip length in miles for telecommuters (Table 4, RPTA, 2000a)

$$\textit{Daily Emissions Reduction} = VR * \left[\frac{w1 * LEF_{CO}}{4} + \frac{w2 * LEF_{TOG}}{2} + \frac{w3 * LEF_{NOx}}{2} + w4 * (LEF_{PM} + PEF)\right] * \frac{1}{1000} * \frac{250}{365} = \frac{kilograms}{day}$$

where: ***LEF*** = the light duty vehicle emission factor for each pollutant
PEF = the paved road PM-10 emission factor for all road types
w1-w4 = weighting factors for CO, TOG, NOx, and PM-10, respectively
250/365 = factor to convert from an average weekday to an annual average day

$$\textit{Capital Recovery Factor } (CRF) = \frac{(1+i)^{life}\,(i)}{(1+i)^{life} - 1}$$

where: ***i*** = discount rate of 3 percent
life = program period of 1 year

$$\textit{Cost-Effectiveness} = \frac{CRF * CMAQ\ Cost * 1000}{\textit{Daily Emissions Reduction} * 365} = \frac{dollars}{metric\ ton}$$

where: ***CMAQ Cost*** = the CMAQ funding requested for the project.

Telework Program **EXAMPLE**

RPTA requests $300,000 in FY 2015 CMAQ funds for the Telework Program. RPTA indicates that the share of telecommuting attributable to the Telework Program is 20 percent. Based on interpolation of 2010 and 2020 projections adopted by the MAG Regional Council in May 2007, the total employment for Maricopa County in 2015 is expected to be 2,473,000.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Cost*** = $300,000.
- ***P*** = 20%.

Calculations:

$$\textit{Commute Trips Avoided (CTA)} = \frac{.035 * (1.6 * 2{,}473{,}000)}{1.2} = 115{,}407$$

$$\textit{VMT Reduced (VR)} = 115{,}407 * .20 * 19.0 = 438{,}547$$

$$\textit{Daily Emissions Reduction} =$$

$$438{,}547 * \left(\frac{0.00*6.38}{4} + \frac{0.89*0.45}{2} + \frac{1.03*0.34}{2} + (1.0*(0.02+0.65)) * \frac{1}{1000} * \frac{250}{365} = 314.00 \frac{\textit{kilograms}}{\textit{day}}\right.$$

$$\textit{Capital Recovery Factor (CRF)} = \frac{(1+0.03)^1 * (0.03)}{(1+0.03)^1 - 1} = 1.03$$

$$\textit{Cost-Effectiveness} = \frac{1.03 * 300{,}000 * 1000}{314.00 * 365} = 2{,}696 \frac{\textit{dollars}}{\textit{metric ton}}$$

TRAFFIC FLOW IMPROVEMENTS

"Coordinate Traffic Signal Systems," "Develop Intelligent Transportation Systems," and "Reduce Traffic Congestion at Major Intersections" are committed control measures in the MAG 1999 Serious Area CO and PM-10 Plans. These measures reduce emissions by increasing vehicle speeds or reducing vehicle idling.

The 2005 CMAQ methodologies (MAG, 2005) stated that MAG would run the FHWA ITS Deployment Analysis System (IDAS) software to estimate the CO, TOG, and NOx emission reductions for Traffic Signal Coordination, Freeway Management System (FMS), and other Intelligent Transportation System (ITS) projects that are proposed for CMAQ funding. Unfortunately, application of IDAS did not provide the level of sensitivity needed to evaluate the emissions benefits of the types of traffic flow improvement projects typically proposed for MAG

CMAQ funding. As a result, MAG is proposing to substitute the following methodologies for future CMAQ evaluations of traffic flow improvement projects.

Traffic Signal Coordination

The following methodology will be used to calculate the daily CO, TOG and NOx emission reductions attributable to traffic signal coordination projects. PM-10 emission reductions are not estimated, because changes in speed do not impact PM-10 emissions. The formulas and data in Table 6 were obtained from the California Air Resources Board (CARB, 2005). The length of the project, the ADT, and the category in Table 6 that best represents the proposed project will be provided by the agency requesting CMAQ funding.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Cost.***
- Length of project (***miles***).
- Current average weekday traffic (***ADT***).
- The category into which the proposed project should be classified (see Table 6)

Table 6. Traffic Signal Coordination - Post-Project Speeds

Category	Before Condition	After Condition	Increase in Speed
one	Non-interconnected, pre-timed signals with old timing plan	Advanced computer-based control	25 percent
two	Interconnected, pre-timed signals with old timing plan	Advanced computer-based control	17.5 percent
three	Non-interconnected signals with traffic-actuated controllers	Advanced computer-based control	___16 percent
four	Interconnected, pre-timed signals with actively managed timing	Advanced computer-based control	____8 percent
five	Interconnected, pre-timed signals with various forms of master control and various qualities of timing plans	Optimization of signal timing plans. No change in hardware	___12 percent
six	Non-interconnected, pre-timed signals with old timing plan	Optimization of signal timing plan	___7.5 percent

Formulas:

$$\textit{Daily Emissions Reduction} = \textbf{miles} * \textbf{ADT} * \textbf{0.91} *$$

$$[(\frac{w1*BEF_{CO}}{4} + \frac{w2*BEF_{TOG}}{2} + \frac{w3*BEF_{NOx}}{2}) - (\frac{w1*AEF_{CO}}{4} + \frac{w2*AEF_{TOG}}{2} + \frac{w3*AEF_{NOx}}{2})]*\frac{1}{1000} = \frac{kilograms}{day}$$

where: ***miles*** = the length of the project
ADT = the average weekday traffic
0.91 = the factor for converting ADT to annual average daily traffic (AADT)
BEF = the emission factor for all vehicle classes at the pre-project speed
AEF = the emission factor at the post-project speed (from Table 6)
w1-w3 = weighting factors for CO, TOG, and NOx, respectively

$$\textit{Capital Recovery Factor (CRF)} = \frac{(1+i)^{life}\,(i)}{(1+i)^{life} - 1}$$

where: ***i*** = discount rate of 3 percent
life = effectiveness period of 5 years (CARB, 2005)

$$\textit{Cost-Effectiveness} = \frac{\textbf{CRF} * \textbf{CMAQ Cost} * 1000}{\textit{Daily Emissions Reduction} * 365} = \frac{dollars}{metric\ ton}$$

where: ***CMAQ Cost*** = the CMAQ funding requested for the project.

Traffic Signal Coordination **EXAMPLE**

A city proposes to install a system in FY 2015 that synchronizes the traffic lights on three miles of street. The city will be replacing interconnected, pre-timed signals with actively managed timing with an advanced computer-based control system. The cost of the system is $150,000. The city proposes to pay $15,000 and requests $135,000 of CMAQ funding. The average speed on the three miles of street is estimated to be 25 mph. Since the project falls within category four of Table 6, the

post-improvement speed will be eight percent higher than 25 mph or 27 mph. The weekday traffic on the road is estimated to be 10,000 vehicles per day.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Cost*** = $135,000.
- Length of project (***miles***) = 3.
- Average weekday traffic (***ADT***) = 10,000.
- The pre-project speed = 25 mph.
- The category into which the proposed project is classified (from Table 6) = four

Calculations:

$$\textit{Daily Emissions Reduction} = 3 * 10{,}000 * 0.91 *$$

$$[(\frac{0.00*5.65}{4} + \frac{0.89*0.47}{2} + \frac{1.03*0.53}{2}) - (\frac{0.00*5.59}{4} + \frac{0.89*0.46}{2} + \frac{1.03*0.52}{2})] * \frac{1}{1000} = 0.26 \frac{kilograms}{day}$$

$$\textit{Capital Recovery Factor (CRF)} = \frac{(1+0.03)^5 * (0.03)}{(1+0.03)^5 - 1} = 0.2184$$

$$\textit{Cost-Effectiveness} = \frac{0.2184 * 135{,}000 * 1000}{0.26 * 365} = 310{,}685 \frac{dollars}{metric\ ton}$$

Intelligent Transportation Systems

The installation of Intelligent Transportation Systems (ITS) alerts drivers concerning congestion incidents. ITS permits more efficient re-routing of traffic and reduces vehicle idling which, in turn, reduces emissions. The requestor will provide the total hours of vehicle delay to be reduced by the project on a typical weekday. The vehicle delay reduction (in hours per weekday) will be multiplied by the CO, TOG, NOx and PM-10 idling emission factors (in grams per hour) to estimate kilograms reduced per weekday.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Cost.***
- The vehicle hours of delay reduced by the project on an average weekday ***(DR)***

Formulas:

$$Daily\ Emissions\ Reduction = DR * [\frac{w1*IEF_{CO}}{4} + \frac{w2*IEF_{TOG}}{2} \frac{w3*IEF_{NOx}}{2} + w4*IEF_{PM}]*0.91*\frac{1}{1000} = \frac{kilograms}{day}$$

where: ***DR*** = the vehicle hours of delay reduced on an average weekday due to the project
IEF= the idling emission factor in grams/hour for each pollutant
0.91 = factor to convert from an average weekday to an annual average day
w1-w4 = weighting factors for CO, TOG, NOx, and PM-10, respectively

$$Capital\ Recovery\ Factor\ (CRF) = \frac{(1+i)^{life}\ (i)}{(1+i)^{life} - 1}$$

where: ***i*** = discount rate of 3 percent
life = effectiveness period of 5 years

$$Cost\text{-}Effectiveness = \frac{CRF * CMAQ\ Cost * 1000}{Daily\ Emissions\ Reduction * 365} = \frac{dollars}{metric\ ton}$$

where: ***CMAQ Cost*** = the CMAQ funding requested for the project.

Intelligent Transportation Systems **EXAMPLE**

A city proposes to install ITS technology on several major arterials in FY 2015. The city engineer estimates that the project will reduce vehicle delay by 25 hours on an average weekday. The cost of the project is $150,000. The city proposes to pay $15,000 and is requesting $135,000 in CMAQ funding.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Funding*** = $135,000.
- ***DR*** = 25 vehicle hours of delay reduced per average weekday.

Calculations:

$$\textit{Daily Emissions Reduction} = 25*(\frac{0.00*38.54}{4}+\frac{0.89*7.13}{2}+\frac{1.03*2.53}{2}+(1.0*0.08))*0.91*\frac{1}{1000} = 0.10\ \frac{kilograms}{day}$$

$$\textit{Capital Recovery Factor (CRF)} = \frac{(1+0.03)^5 * (0.03)}{(1+0.03)^5 - 1} = 0.2184$$

$$\textit{Cost-Effectiveness} = \frac{0.2184 * 135{,}000 * 1000}{0.10 * 365} = 807{,}781\ \frac{dollars}{metric\ ton}$$

Freeway Management System

The Freeway Management System (FMS) reduces emissions by decreasing vehicle idling due to accidents or other incidents that create traffic congestion on freeways. ADOT will provide the total hours of vehicle delay to be reduced by the FMS project on a typical weekday. The vehicle delay reduction (in hours per weekday) will be multiplied by the CO, TOG, NOx, and PM-10 idling emission factors (in grams per hour) to estimate kilograms reduced per weekday.

***Inputs Required from Entity Requesting CMAQ Funds*:**

- ***CMAQ Cost.***
- The vehicle hours of delay reduced by the project on an average weekday ***(DR)***

Formulas:

$$\textit{Daily Emissions Reduction} = DR * [\frac{w1*IEF_{CO}}{4}+\frac{w2*IEF_{TOG}}{2}\frac{w3*IEF_{NOx}}{2}+w4*IEF_{PM}]*0.91*\frac{1}{1000} = \frac{kilograms}{day}$$

where: ***DR*** = vehicle hours of delay reduced on an average weekday due to the project
IEF= the idling emission factor in grams/hour for each pollutant
0.91 = factor to convert from an average weekday to an annual average day
w1-w4 = weighting factors for CO, TOG, NOx, and PM-10, respectively

$$\textit{Capital Recovery Factor (CRF)} = \frac{(1+i)^{life}\ (i)}{(1+i)^{life} - 1}$$

where: i = discount rate of 3 percent
$life$ = effectiveness period of 5 years

$$Cost\text{-}Effectiveness = \frac{CRF * CMAQ\ Cost * 1000}{Daily\ Emissions\ Reduction * 365} = \frac{dollars}{metric\ ton}$$

where: ***CMAQ Cost*** = the CMAQ funding requested for the project.

Freeway Management System **EXAMPLE**

ADOT proposes to add six variable message signs to the freeway system in FY 2015. The cost of the project is $500,000. ADOT proposes to pay $50,000 and requests $450,000 in CMAQ funding. An ADOT traffic engineer estimates that the FMS project will reduce vehicle delay on the freeways by 250 hours on an average weekday.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Cost*** = $450,000.
- ***DR*** = 250 vehicle hours of delay reduced per average weekday.

Calculations:

$$Daily\ Emissions\ Reduction = 250 * \left(\frac{0.00 * 38.54}{4} + \frac{0.89 * 7.13}{2} + \frac{1.03 * 2.53}{2} + (1.0 * 0.08)\right) * 0.91 * \frac{1}{1000} = 1.04\ \frac{kilograms}{day}$$

$$Capital\ Recovery\ Factor\ (CRF) = \frac{(1+0.03)^5 * (0.03)}{(1+0.03)^5 - 1} = 0.2184$$

$$Cost\text{-}Effectiveness = \frac{0.2184 * 450{,}000 * 1000}{1.04 * 365} = 258{,}904\ \frac{dollars}{metric\ ton}$$

TRIP REDUCTION PROGRAM

"Trip Reduction Program" is a committed control measure in the MAG 1999 Serious Area CO and PM-10 Plans. The Trip Reduction Program requires employers with 50 or more employees at a work site in Area A to achieve target reductions in single occupant vehicle (SOV) trips through use of alternate transportation modes. Alternate transportation modes include carpooling, vanpooling,

taking the bus, bicycling, and walking. Reductions in SOV trips due to telecommuting or compressed work schedules also qualify for credit in the trip reduction program. The program reduces emissions by decreasing the total vehicle miles of travel (VMT) for commute trips.

The Maricopa County Trip Reduction Program (TRP) maintains detailed information on participating organizations and their employees. For the period 1998-2002, the TRP indicates that 33 percent of employees work for TRP organizations and 26 percent of the commute trips taken by these employees are by alternate modes (or the commute trip is eliminated, in the case of telecommuting and compressed work weeks). In addition, the average one-way commute trip length for TRP employees is 11.4 miles and the average vehicle occupancy for TRP commute trips is 1.16.

The MOBILE6 model will be run for the CMAQ funding year to estimate the average light duty vehicle emissions of CO, TOG, NOx, and PM-10 (LEF_{CO}, LEF_{TOG}, LEF_{NOx}, *and* LEF_{PM}) in grams per mile. The emission factors will be multiplied by the reduction in vehicle miles of travel (*VR*) to estimate the emissions benefit of the Trip Reduction Program.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Cost.***
- Percent of alternate mode use attributable to the Trip Reduction Program (***P***).

Formulas:

$$\textit{VMT Reduced (VR)} = \frac{.26 * W * .33 * P}{1.16} * 11.4$$

where: **.26** = the percent of work trips in TRP organizations using alternate modes, including telecommuting and compressed work schedules (from 1998-2002 TRP data)
W = daily home-based work person trips = 1.6 * total employment in Area A in the CMAQ funding request year (from MAG trip generation equation)
.33 = percent of employees working for a TRP organization with at least 50 employees (from 1998-2002 TRP data)
P = percent of alternate mode use attributable to the Trip Reduction Program
1.16 = average vehicle occupancy (from 1998-2002 TRP data)
11.4 = average one-way commute trip length (from 1998-2002 TRP data)

$$\textit{Daily Emissions Reduction} =$$

$$VR * [\frac{w1 * LEF_{CO}}{4} + \frac{w2 * LEF_{TOG}}{2} + \frac{w3 * LEF_{NOx}}{2} + w4 * (LEF_{PM} + PEF)] * \frac{1}{1000} * \frac{250}{365} = \frac{kilograms}{day}$$

where: ***LEF*** = the light duty vehicle emission factor for each pollutant
PEF = the paved road PM-10 emission factor for all road types
w1-w4 = weighting factors for CO, TOG, NOx, and PM-10, respectively
250/365 = factor to convert from an average weekday to an annual average day

$$\textit{Capital Recovery Factor (CRF)} = \frac{(1+i)^{life}\,(i)}{(1+i)^{life} - 1}$$

where: ***i*** = discount rate of 3 percent
life = program period of 1 year

$$\textit{Cost-Effectiveness} = \frac{\textit{CRF} * \textit{CMAQ Cost} * 1000}{\textit{Daily Emissions Reduction} * 365} = \frac{\textit{dollars}}{\textit{metric ton}}$$

where: ***CMAQ Cost*** = the CMAQ funding requested for the project.

Trip Reduction Program **EXAMPLE**

Maricopa County requests $910,000 in FY 2015 CMAQ funds for the Trip Reduction Program. The Arizona Department of Environmental Quality contributes $948,000 to the program. The County indicates that the share of alternative mode use attributable to the Trip Reduction Program is 25 percent. Based on interpolation of 2010 and 2020 projections adopted by the MAG Regional Council in May 2007, the total employment for Maricopa County in 2015 is expected to be 2,473,000. Area A includes the most populous areas of Maricopa County, as well as the Apache Junction and Queen Creek areas of Pinal County. By 2015, it is estimated that there will be approximately 2.6 million people working in Area A.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Cost*** = $910,000.
- ***P*** = 25%.

Calculations:

$$\textit{VMT Reduced (VR)} = \frac{.26 * (1.6 * 2{,}600{,}000) * .33 * .25}{1.16} * 11.4 = 876{,}935$$

$$\textit{Daily Emissions Reduction} =$$

$$876{,}935*\left(\frac{0.00*6.38}{4}+\frac{0.89*0.45}{2}+\frac{1.03*0.34}{2}+(1.0*(0.02+0.65))\right)*\frac{1}{1000}*\frac{250}{365}=627.88\ \frac{kilograms}{day}$$

$$\textit{Capital Recovery Factor (CRF)} = \frac{(1+0.03)^1 * (0.03)}{(1+0.03)^1 - 1} = 1.03$$

$$\textit{Cost-Effectiveness} = \frac{1.03 * 910{,}000 * 1000}{627.88 * 365} = 4{,}090\ \frac{dollars}{metric\ ton}$$

VANPOOL VEHICLES

"Encouragement of Vanpooling" is a committed control measure in the MAG 1999 Serious Area CO and PM-10 Plans. Vanpools reduce emissions by decreasing the total vehicle miles of travel for commute trips.

Valley Metro indicates that a vanpool vehicle travels 66 miles (on average - round trip) per day on 255 commute days per year. This is equal to 16,830 commute miles annually per van. Valley Metro estimates that the average vanpool carries nine people, including the driver. It will be assumed that each vanpool passenger drives an average of three miles round trip to access the vanpool, which reduces the daily commute miles saved to 63 per passenger. This reduction accounts for vanpool passengers driving (park-and-ride) or being dropped off (kiss-and-ride) or the vanpool driver picking up and dropping off passengers. It will also be assumed that the average vehicle occupancy for commute trips by all modes is 1.2 (RPTA, 2001). Based on these assumptions, 16,830 miles per van (vanpool miles) will replace 121,125 commute miles per year. Therefore, each vanpool reduces automobile VMT by 104,295 miles annually and each vanpool mile replaces approximately 7.2 commute miles.

The MOBILE6 model will be run for the year that the CMAQ funds are requested to estimate the average light duty vehicle emissions of CO, TOG, NOx, and PM-10 (LEF_{CO}, LEF_{TOG}, LEF_{NOx}, and LEF_{PM}) in grams per mile. The equivalent emission factors for light-duty gas trucks, LDGT3 and LDGT4, (VEF_{CO}, VEF_{TOG}, VEF_{NOx}, and VEF_{PM}), which includes full size vans, will also be estimated using MOBILE6. The emission factors will be multiplied by the appropriate vehicle miles of travel to estimate commute and vanpool emissions. The difference between the commute and vanpool emissions represents the net emission reduction benefit of vanpools.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Cost.***

Formulas:

$$Emissions\ Reduced\ (ER) = miles_{commute} * \left(\frac{w1 * LEF_{CO}}{4} + \frac{w2 * LEF_{TOG}}{2} + \frac{w3 * LEF_{NOx}}{2} + w4 * (LEF_{PM} + PEF)\right) * \frac{1}{1000}$$

where: $miles_{commute}$ = the commute miles replaced by the vanpool each year
LEF = the light duty vehicle emission factor for each pollutant
PEF = the paved road PM-10 emission factor for all road types

$$Vanpool\ Emissions\ (VE) = miles_{vanpool} * \left(\frac{w1 * VEF_{CO}}{4} + \frac{w2 * VEF_{TOG}}{2} + \frac{w3 * VEF_{NOx}}{2} + w4 * VEF_{PM}\right) * \frac{1}{1000}$$

where: $miles_{vanpool}$ = the miles driven annually by a van used for a vanpool
VEF = the emission factors for a van (LDGT3 and LDGT4) for each pollutant

$$Daily\ Emissions\ Reduction = (ER - VE) * \frac{1}{365} = \frac{kilograms}{day}$$

where: **1/365** = factor to convert annual emissions to daily emissions

$$Capital\ Recovery\ Factor\ (CRF) = \frac{(1+i)^{life}\ (i)}{(1+i)^{life} - 1}$$

where: i = discount rate of 3 percent
$life$ = effectiveness period of 4 years

$$Cost\text{-}Effectiveness = \frac{CRF * CMAQ\ Cost * 1000}{Daily\ Emissions\ Reduction * 365} = \frac{dollars}{metric\ ton}$$

where: ***CMAQ Cost*** = the CMAQ funding requested for the project.

Vanpool Vehicles **EXAMPLE**

RPTA proposes to purchase a fifteen-passenger van to be used in a vanpool. The cost of the van is $25,000. RPTA requests $25,000 of FY 2015 CMAQ funding.

Inputs Required from Entity Requesting CMAQ Funds:

- ***CMAQ Cost*** = $25,000.

Calculations:

$$\textit{Emissions Reduced (ER)} = 121{,}125 * \left(\frac{0.00*6.38}{4}+\frac{0.89*0.45}{2}+\frac{1.03*0.34}{2}+(1.0*(0.02+0.65))*\frac{1}{1000}\right. = 126.62\ \frac{kilograms}{year}$$

$$\textit{Vanpool Emissions (VE)} = 16{,}830 * \left(\frac{0.00*6.31}{4}+\frac{0.89*0.47}{2}+\frac{1.03*0.43}{2}+(1.0*(0.02+0.65)))*\frac{1}{1000}\right. = 18.52\ \frac{kilograms}{year}$$

$$\textit{Daily Emissions Reduction} = (126.62 - 18.52) * \frac{1}{365} = 0.30\ \frac{kilograms}{day}$$

$$\textit{Capital Recovery Factor (CRF)} = \frac{(1+0.03)^4 * (0.03)}{(1+0.03)^4 - 1} = 0.2690$$

$$\textit{Cost-Effectiveness} = \frac{0.269 * 25{,}000 * 1000}{0.30 * 365} = 61{,}416\ \frac{dollars}{metric\ ton}$$

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Agenda Item #7

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IN THE UNITED STATES DISTRICT COURT

FOR THE DISTRICT OF ARIZONA

Kelly Paisley and Sandra Bahr; Plaintiffs, vs. Jan Brewer, in her capacity as Governor of Arizona; and Benjamin Grumbles, in his capacity as Director of the Arizona Department of Environmental Quality; Arizona Department of Environmental Quality; and the State of Arizona, Defendants.	Case No.: COMPLAINT

Plaintiffs, by and through their attorneys, the Arizona Center for Law in the Public Interest, for their Complaint against defendants allege as follows:

NATURE OF ACTION

1. This is a suit to enforce compliance with requirements of the Clean Air Act, 42 U.S.C. §§7401-7627 (the Act) in the metropolitan area of Phoenix, Arizona.

JURISDICATION AND VENUE

2. The court has jurisdiction over this action pursuant to 42 U.S.C. §7604 and 28 U.S.C. §1316. Venue lies in the District of Arizona, pursuant to 28 U.S.C. §§1391(b) & (e) and Rule 1, Rules of Practice for the United States District Court for the District of Arizona, because the cause of action arises in the District of Arizona.

ADMINISTRATIVE PREREQUISITE TO THE FILING OF THIS ACTION

3. On April 8, 2010, plaintiffs served notice of the violation described herein upon the United States Environmental Protection Agency and each of the defendants in the form and manner required under §7604(b) and 40 C.F.R. §§54.1-3.

PARTIES

4. Under §7604(a)(1) any person may commence a civil action on his own behalf against any person (including the United States and any other governmental instrumentality or agency) who is alleged to be in violation of an emission standard or limitation under the Act. Pursuant to §7604(f)(3), "emission standard or limitation" includes any condition or requirement under an applicable implementation plan relating to transportation control measures, air quality maintenance plans, or vehicle inspection and maintenance programs.

5. Plaintiffs are residents of Maricopa County and are adversely affected by being forced to breathe air that is less pure than required under the Act.

6. Defendant Arizona Department of Environmental Quality ("ADEQ") is an agency of the State of Arizona designated by the defendant Governor as the State's official air pollution control agency for purposes of the Act. Defendant Grumbles is responsible for the direction, operation and control of ADEQ.

7. All of the defendants are persons within the meaning of §7602(e).

FACTS

8. Pursuant to the Clean Air Act of 1970, EPA has established national ambient air quality standards (NAAQS) for carbon monoxide (CO), ozone and particulate matter 10 micrometers or less in size (PM-10) as pollution limits necessary to protect the public health and welfare.

9. Communities that violate the NAAQS are designated as "nonattainment" areas. 42 U.S.C. §7409(d). For each such area, the Act requires states to submit a state implementation plan (SIP) to provide for attainment of the NAAQS. These SIPs must be adopted by the states after notice and public hearing, and must contain enforceable measures backed by commitments of adequate resources and legal authority to implement them.

10. EPA must review each submitted SIP and either approve or disapprove it.

11. If EPA approves the SIP, in whole or in part, then the approved provisions become federally enforceable.

CARBON MONOXIDE

12. In 1978, EPA designated Maricopa County a nonattainment area for CO.

13. In November 1994, Phoenix submitted a CO SIP to the EPA, later supplementing it with an April 4, 1994 submittal. ("1993 SIP Revision"). The 1993 SIP Revision included numerous transportation control measures that had been recently adopted by the Arizona State Legislature in a special session called by Governor Fife Symington to consider "measures necessary to comply with the requirements of the Federal Clean Air Act as amended by P. L. 101-549." Proclamation by the Governor of the State of Arizona dated November 23, 1993.

14. Among the provisions enacted by the Legislature in the special session was an amendment to A.R.S. §5-522 providing for the use of lottery proceeds to fund expanded public transportation.

15. In the omnibus air quality bill passed during that special session, A.R.S. §5-522(A) was amended to provide not only for the payment of expenses of the commission and repayment of any advances made from the general fund, but also to require payment of not less than 31.5% of the revenues received, up to a maximum of $18,000,000 to the Local Transportation Assistance Fund ("LTAF") (unless the monies available to the state general fund were less than $45,000,000). The statute continued to include the payment of 75% of any "excess" funds up to $23,000,000 to the LTAF under Subsection B. Thus, under the statutory structure enacted in 1993 to comply with the requirements of the CAA, the LTAF would receive a maximum of $41,000,000 from lottery proceeds, provided the lottery generated sufficient funds.

16. The increase in transit funding was one of the measures that the State relied upon in the 1993 SIP Revision for numeric credit.

17. Although portions of the 1993 SIP were approved by EPA in 1995, the area continued to experience CO exceedances and in 1996, EPA reclassified Maricopa County as a "serious" nonattainment area.

18. In July 1999, the State submitted the 1999 Carbon Monoxide Serious Area Plan to EPA. The 1999 plan continued to include the transportation control measures included in the 1993 Revised Plan, including the transit funding authorized by HB2001.

19. In June 2003, the State submitted a request for redesignation and maintenance plan as a SIP revision. On September 22, 2003 EPA published a finding of attainment of the CO standard for Maricopa County. (68 FR 55008)

20. On March 9, 2005, EPA approved the Revised 1999 MAG CO Serious Area Plan and the Maintenance Plan, which is essentially a continuation of the Serious Area Plan (70 FR 11553). Thus, the use of lottery proceeds to fund transit authorized by HB2001 and included in the SIP revisions submitted in 1994, was approved by EPA as a part Arizona's CO SIP.

OZONE

21. Under the 1977 Amendments to the Clean Air Act, Phoenix was designated a nonattainment area for ozone. After the adoption of the 1990 Amendments to the CAA, in November 1990, Phoenix was classified as a "moderate" ozone nonattainment area.

22. On November 6, 1997, EPA reclassified the Phoenix area as a "serious" nonattainment area for ozone.

23. On December 14, 2000, ADEQ submitted the State's Serious Area Ozone SIP for Maricopa County.

24. In May 2004, the State submitted a One-Hour Ozone Redesignation Request and Maintenance Plan. The Serious Area Ozone SIP, the Maintenance Plan and the Redesignation request were all approved by EPA on June 14, 2005.

25. The next day, June 15, 2005, the one-hour ozone standard was revoked and the more stringent eight-hour standard went into effect.

26. Under the new standard, the Maricopa County eight-hour ozone nonattainment area was classified as "Basic" with an attainment date of June 15, 2009.

27. The State submitted its Eight Hour Ozone Plan for the Maricopa Nonattainment Area in June 2007 and in February 2009 submitted a Redesignation Request and Maintenance Plan. The eight-hour plan and maintenance plan, like the one-hour ozone plans before them, rely upon "the legally-binding committed measures in programs and plans that have already been approved by EPA [including]...the Serious Area Carbon Monoxide Plan and Carbon Monoxide Maintenance Plan, approved by EPA on April 8, 2005..." MAG Eight-Hour Ozone Redesignation Request and Maintenance Plan For The Maricopa Nonattainment Area, ES-3.

PARTICULATE MATTER

28. In 1996, the Phoenix area was classified as a serious PM-10 nonattainment area under the CAA and was required to develop a nonattainment plan that provided for

expeditious attainment of both the annual and 24 hours PM-10 standards and met the other applicable CAA plan requirements for serious areas.

29. Since 1996, Arizona has made several SIP submittals and adopted various control measures but continues to violate the 24-hour standard.

30. On July 25, 2002, EPA published its final approval of the PM-10 Serious Area Plan. The approval also granted the Phoenix area the maximum five year extension of the attainment deadline, giving the area until December 31, 2006 to come into compliance with the NAAQS.

31. The PM-10 Serious Area Plan approved by EPA, like the Ozone plans, relies in part upon committed existing control measures contained in the Serious Area Carbon Monoxide Plan. Thus, the LTAF funding is also an enforceable commitment under the Serious Area PM10 plan.

32. In March 2007 EPA filed a proposed finding of nonattainment and the final notice of nonattainment was published on June 6, 2007.

33. Under section 189(d) of the CAA, serious PM-10 nonattainment areas that fail to attain are required to submit within 12 months of the applicable attainment date, "plan revisions which provide for attainment of the PM-10 air quality standard and, from the date of such submission until attainment, for an annual reduction in PM-10 or PM-10 precursor emissions within the area of not less than 5 percent of the amount of such emissions as reported in the most recent inventory prepared for such area."

34. Arizona submitted its 5% plan to EPA by the December 2007 deadline.

REPEAL OF LTAF

35. During the 2010 Seventh Special legislative session, the Arizona Legislature passed House Bill 2012 which amended A.R.S. §5-522 to repeal the deposit of lottery funds into the LTAF.

36. Governor Brewer signed HB2012 into law on March 18, 2010 and, upon information and belief, the repeal will become effective June 15, 2010.

CLAIM FOR RELIEF

37. The State's repeal of the deposit of lottery funds into the LTAF constitutes a violation of an emissions standard or limitation under the Act within the meaning of §7604(f).

38. The State is subject to an order of this Court directing the State to comply with its commitments under the SIP pursuant to §7604(a)(1).

WHEREFORE the plaintiffs respectfully request that the Court enter an order providing the following relief:

1. Directing the State to fully implement its commitment to deposit lottery funds into the LTAF as required by the CO and PM-10 SIPs;
2. Granting the plaintiffs costs of litigation, including reasonable attorney fees; and
3. Providing such other relief as the court deems just and proper.

Dated this 14th day of June 2010.

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s/Joy E. Herr-Cardillo
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