St. Louis
Air Quality Management Plan

December 29, 2009

Missouri Department of Natural Resources
Illinois Environmental Protection Agency

Air Quality Management Plan
For the St. Louis area - Missouri and Illinois

12/29/09

Table of Contents

Figures

List of Tables

Executive Summary

The Missouri Department of Natural Resources and the Illinois Environmental Protection Agency have committed to implement an innovative air quality management paradigm for the St. Louis area. The two agencies have agreed to continue to work with East-West Gateway's Air Quality Advisory Committee, comprising a partnership of "3". This new philosophy involves the creation of this Air Quality Management Plan (AQMP3 – to reflect the three partners) document to use as the mechanism for the development of state-specific control plans in the future. The St. Louis AQMP process is designed to address air quality goals including nonattainment and maintenance of criteria pollutant standards and risk reductions of certain Hazardous Air Pollutants (HAP) with an emphasis on community involvement in the processes for both states.

The focus of the AQMP3 is to move away from single-pollutant planning towards multi-pollutant strategies to address all future air quality needs. In the past, both states have worked together to produce technical information necessary to develop air quality control plans for ground-level ozone and fine particulates, separately. These combined efforts have focused on the creation of air quality emission inventory and modeling analyses to better inform control strategy decisions for the area. The coordination of this formal workgroup process has been conducted by the East-West Gateway Coordinating Council (the metropolitan planning organization for St. Louis). The AQMP envisions local community involvement will continue to occur through the current workgroup process.

The goals of this St. Louis AQMP are:

(1) the completion of all required Clean Air Act submittals for compliance with the National Ambient Air Quality Standards (NAAQS) in St. Louis preferably using one air quality planning exercise for multiple pollutants under a combined State Implementation Plan (SIP);
(2) the inclusion of air toxics exposure as an important metric for consideration of alternative control requirements for all NAAQS;
(3) the incorporation of environmental justice and extensive community involvement in the decision-making process including the regulated and environmental communities; and
(4) consideration of other ancillary air quality issues in the development of the SIP including smart growth/transportation, energy issues, and climate change.

The participants in the development of the St. Louis AQMP3 agree that multi-pollutant planning has several benefits over the current approach. These include the formal consideration of co-benefits for all pollutants from specific control strategies, more efficient use of the limited human resources to perform the complex air quality analyses and rulemakings necessary for the airshed, increased consideration of the ancillary issues above in the decision-making process, quicker improvements in overall air quality, and increased certainty for the regulated community when dealing with multiple pollutant controls.

However, there are several issues that need to be addressed as part of the AQMP3 to ensure successful implementation of the plan. To address the ever-changing nature of air quality standards and goals, the AQMP3 includes a mechanism to address changing pollutants of interest and attempt to adapt to changes in plan requirements through a process called adaptive management. In general, adaptive management provides a framework for setting goals, developing priorities, implementing management actions, evaluating results and adjusting to lessons learned in an iterative manner.

One of the most significant issues is the prioritization of air quality problems to address and the manner in which "trade offs" are evaluated. After identification of the current air quality problems in St. Louis and with an understanding of potential future air quality goals and community initiatives, the AQMP3 includes an approach to prioritization and the mechanism each state will use to identify necessary emission reductions to fulfill St. Louis air quality goals. In some instances, trade offs may occur due to confounding emission reduction strategies (e.g. increased NOx emissions when controlling VOC emissions through incineration). The decisions related to trade offs are an important component of the AQMP3 and the strategy for this issue is addressed in the plan.

Another important issue is flexibility from EPA to administer this new approach. Due to the statutory timeframes mandated in the Clean Air Act, the pollutant-specific plans have very tight submittal deadlines. This new multi-pollutant approach could require additional development time to ensure all pollutants are addressed appropriately. At this time, the deadlines for submittal of any new plans are unknown and this issue may or may not be important for St. Louis. However, it is important to recognize this important problem as both states approach implementation of the AQMP.

In addition to the primary outcome of addressing NAAQS compliance in the St. Louis area, the AQMP3 will consider health-based outcomes and cost evaluation techniques that have been utilized in other metropolitan areas. One of the key components to this evaluation is the Benefits Mapping and Analysis Program (BenMAP) developed by USEPA. BenMAP uses estimated changes in pollutant concentrations to understand the adverse health effects on a community's population and the associated costs. For each pollutant, the adverse health outcomes being included are identified in Table 1.

Table 1 - Health Effects

Health Effect	PM2.5	Ozone	Air Toxics
Mortality	X	X	X
Chronic Bronchitis Onset	X		
Respiratory Hospital Admissions	X	X	
Cardiovascular Hospital Admissions	X		
Nonfatal Heart Attacks	X		
Asthma ER Visits	X	X	
Acute Respiratory Symptoms	X	X	
Asthma Attacks	X	X	
Work Loss Days	X		
Worker Productivity		X	

School Absence Days		X	
Cancer			X

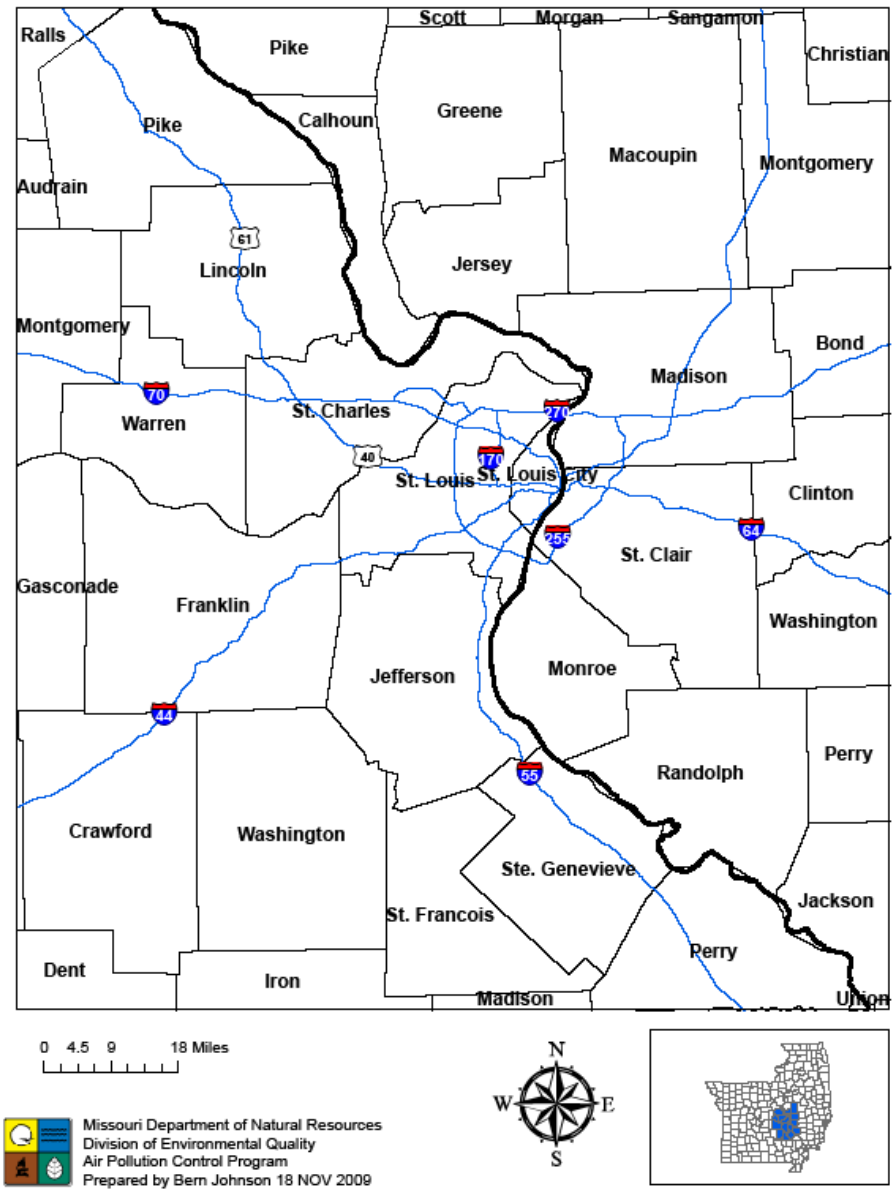
BenMAP has been designed to evaluate the outcomes from ozone and PM, but not from air toxics. As noted in the table, the air toxics evaluation will include only cancer and mortality effects. These responses will be based on specific data for the air toxics of interest and available literature.

Overall, the St. Louis AQMP3 Project is an effort that will provide a new mechanism to accomplish air quality planning and as such generate air quality improvements in a more efficient, expeditious, transparent, and cost-effective manner.

Section 1
Overview

The St. Louis area includes several counties in both Missouri and Illinois. The current planning area for ozone includes Jersey, Madison, Monroe, and St. Clair Counties in Illinois and Franklin, Jefferson, St. Charles, and St. Louis Counties in Missouri along with the City of St. Louis. The current $PM_{2.5}$ annual planning area includes these same areas (except Jersey County in Illinois) and a portion of Randolph County, Illinois. Figure 1 provides a map of the Greater St. Louis area.

Fig 1: Greater St. Louis Area



According to a 2007 public opinion survey of St. Louis area residents by the local chapter of the American Lung Association, 68% of the respondents replied that poor air quality was a "very serious" or "mostly serious" problem. Additionally, 64% of survey participants agreed that air quality has a negative health impact, especially on people with respiratory problems. The Clean Air Act is intended to address the negative impacts of air pollution.

Implementation of Clean Air Act regulations is primarily the responsibility of air programs within state environmental agencies, working with the United States Environmental Protection Agency. The respective air programs within the Missouri Department of Natural Resources and the Illinois Environmental Protection Agency have been working together for years to address air quality issues in the St. Louis area.

Based in part on recommendations from the 2004 National Research Council report "Air Quality Management in the United States", a coalition of state and local officials, working with their federal counterparts and the East-West Gateway Council of Governments (EWGCOG) have attempted to consolidate and improve the traditional approach towards air quality management within the St. Louis area. The result of these collaborations over a two year period is this Air Quality Management Plan (the AQMP3) for St. Louis.

The focus of the AQMP3 is to move away from single-pollutant planning towards multi-pollutant strategies to assess all future air quality needs. It is designed to address air quality goals including nonattainment and maintenance of criteria pollutant standards and risk reductions of certain Hazardous Air Pollutants (HAPs) with an emphasis on community involvement in the processes for both Missouri and Illinois.

A St. Louis-specific team was formed as a part of a pilot project initiated by the EPA (additional pilot areas include North Carolina and New York). After an initial pilot kick off meeting involving all three pilot areas hosted by EPA in Research Triangle Park, North Carolina in September, 2007, the team began meeting in October, 2007. Information and ideas were exchanged mainly via conference calls, but also by attending various EWGCOG Air Quality Advisory Committee meetings to seek input. The original St. Louis AQMP3 Team has changed since the project started in the fall of 2007. The current make up of the team is listed below.

St. Louis Area Air Quality Management Plan Pilot Project (AQMP3) Team:

Jeff Bennett	Missouri Department of Natural Resources
Rob Kaleel	Illinois Environmental Protection Agency
Jeff Sprague	Illinois Environmental Protection Agency
Mike Coulson	East-West Gateway Council of Governments – St. Louis, Missouri
Carol Lawrence	East-West Gateway Council of Governments – St. Louis, Missouri
Tyler Harris	City of St. Louis Air Pollution Control

Susannah Fuchs	American Lung Association of the Central States
Tom Rosendahl	EPA Office of Air Quality Planning and Standards
Gwen Yoshimura	EPA Region 7
Randy Robinson	EPA Region 5
Gilberto Alvarez	EPA Region 5

The team produced a number of "milestone" documents in support of the pilot project. These include the AQMP3 Workplan [2/27/08], Current Status of Air Quality and Air Quality Management in the St. Louis Area (AQMP Lay of the Land Document), Missouri's State Innovation Grant Workplan, and AQMP3 Conceptual Model [5/29/09]. The Lay of the Land and Conceptual model documents can be found on the OAQPS web site.
http://www.epa.gov/air/aqmp/

Section 2
Air Quality Requirements and Goals

The ultimate goal of this process is the development and implementation of an Air Quality Management Plan for the St. Louis area. The AQMP3 is a new mechanism for multi-pollutant air quality planning to be utilized in a bi-state metropolitan complex. These cooperative new plans (one for Missouri and one for Illinois) that will grow out of this process will be used to develop the SIPs for criteria pollutants in violation of NAAQS while considering air toxics exposure to the public and other community concerns. Alternatively, as the AQMP3 implementation occurs, it could someday lead to the submission of a single plan for multiple pollutants (e.g. ozone and $PM_{2.5}$) that have similar sources and timelines.

This single plan outcome would be a significant step forward in the AQMP3 process and needs to be coordinated closely with EPA-OAQPS and the respective regional offices. Based on this new paradigm, the states will continue to work closely with stakeholders (industry, environmental groups, local air agencies, the metropolitan planning organization, and concerned citizens) to ensure a transparent and informed public process for air quality management including control strategy decisions. The current Air Quality Advisory Committee inside the EWGCOC (local MPO) has served as the primary means for this interaction. Meetings of this group will continue as part of the AQMP3 development and implementation process along with enhanced outreach to the community. This outreach will include a series of meetings to identify air quality priorities for the area including input from stakeholders regarding any policy-related issues, community developments, and/or environmental justice issues.

The AQMP3 will address criteria air pollutants that have been or, in the future, will be nonattainment for counties in the St. Louis area along with toxic exposure to pollutants identified in the St. Louis Community Air Project Air Toxics Risk Characterization (e.g., U.S. EPA June 2005). This report was a direct result of the region's attempt to address environmental concerns related to air toxics in St. Louis. This report identified the following air toxics pollutants of concern for the St. Louis area: acetaldehyde, arsenic compounds, benzene, chromium compounds, formaldehyde, and diesel particulate matter. These pollutants will be specifically addressed in planning activities under the AQMP. The overall goal will be to reduce exposure to these toxics when control decisions are reached for the relevant criteria pollutants. In addition, consideration of ancillary air quality issues including environmental justice, smart growth, and climate change will be documented throughout the SIP process. The AQMP will not replace existing permitting, enforcement, or SIP requirements. It will emphasize those air pollutants most important to the local community while working toward compliance for all NAAQS and reductions in air toxics exposure to the community.

The AQMP3 will provide a timeline with respect to criteria pollutants of interest for both states' regulatory process along with interim milestones for the technical air quality analysis that is necessary for development of the SIP(s). It should be noted that the AQMP3 will change as air quality goals are met and new goals are developed (including

revised air quality standards). The current NAAQS pollutants will include ozone, $PM_{2.5}$, and lead for the St. Louis area based on revised standards promulgated by EPA during the last two years. Federal review is underway for the NO_2, SO_2, and CO NAAQS (see Table 4) and the AQMP3 will be flexible enough to respond to these changing air quality standards. The technical milestones will include the generation of a base-year, model-ready air toxics inventory in conjunction with the appropriate criteria pollutant inventory, a photochemical modeling exercise to evaluate certain air toxics along with $PM_{2.5}$ and ozone, future-year inventory development including control strategies that account for a variety of multi-pollutant strategies, and a site-specific lead analysis for one site in Missouri and another site in Illinois. It is the intention of the AQMP effort to focus air toxics evaluations on the St. Louis urban core (the areas identified in the previous air toxics evaluation) and utilize available resources to address inventory and other refinements within this area.

Environmental Justice

Both states are concerned with ensuring clean air for all citizens and the primary goal of this project is to bring areas not in compliance with air quality standards back into compliance. As part of this process, environmental justice areas will be evaluated to ensure consistent protection for all areas of the community.

The Environmental Protection Agency (EPA) defines environmental justice (EJ) as "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies."[1] As part of the community's on-going efforts for EJ, East West Gateway (EWG) established a precise definition of the EJ area in the St. Louis region.[2]. Figures 2 and 3 display the EJ areas in the St. Louis area. Figure 2 provides the EJ area for the entirety of the EWG jurisdiction and Figure 3 provides a close-up view of areas in the core metropolitan area (the City of St. Louis and East St. Louis, IL) along with a breakdown of the EJ category.

Minorities compose 23.3 percent of the St. Louis region's population. In terms of regional minority composition, St. Louis County is home to 44.1 percent of the region's minorities, the largest concentration in the region, followed by St. Louis City with 31.2 percent, and St. Clair County with 15.9 percent. This minority composition mirrors the boundary determined for the regional EJ area, which is predominately located in St. Louis City, St. Louis County, and St. Clair County. The areas were once home to various

[1] http://www.epa.gov/compliance/environmentaljustice

[2] Definition of EJ Area: In identifying the EJ area, the 2000 Census was used by EWG as its block-level data source. The criteria included minority (non-white) populations, working age (16 or older) persons with incomes below the poverty standard ($8,240 in 1999), disabled populations, zero car households and senior-headed (65 years of age or older) households with no cars. The threshold for inclusion into the EJ area was set at two standard deviations above the median of population subcategory concentrations within the region's block groups. The final EJ area is the union of each population subcategory. The result of the evaluation of sensitive population groups yielded the boundary shown in the Environmental Justice map.

industries (with associated legacy contamination), dominated by aging housing and infrastructure, and home to a multitude of brownfield sites. As part of the AQMP3, the population exposure metrics for each portion of the community will be examined and this will allow for consideration of EJ issues at that time. We discuss a set of proposed Human Health indicators in Section 8. The goal will be to engage community representatives as part of the public outreach efforts of the AQMP3.

Figure 2 – East-West Gateway Environmental Justice Map

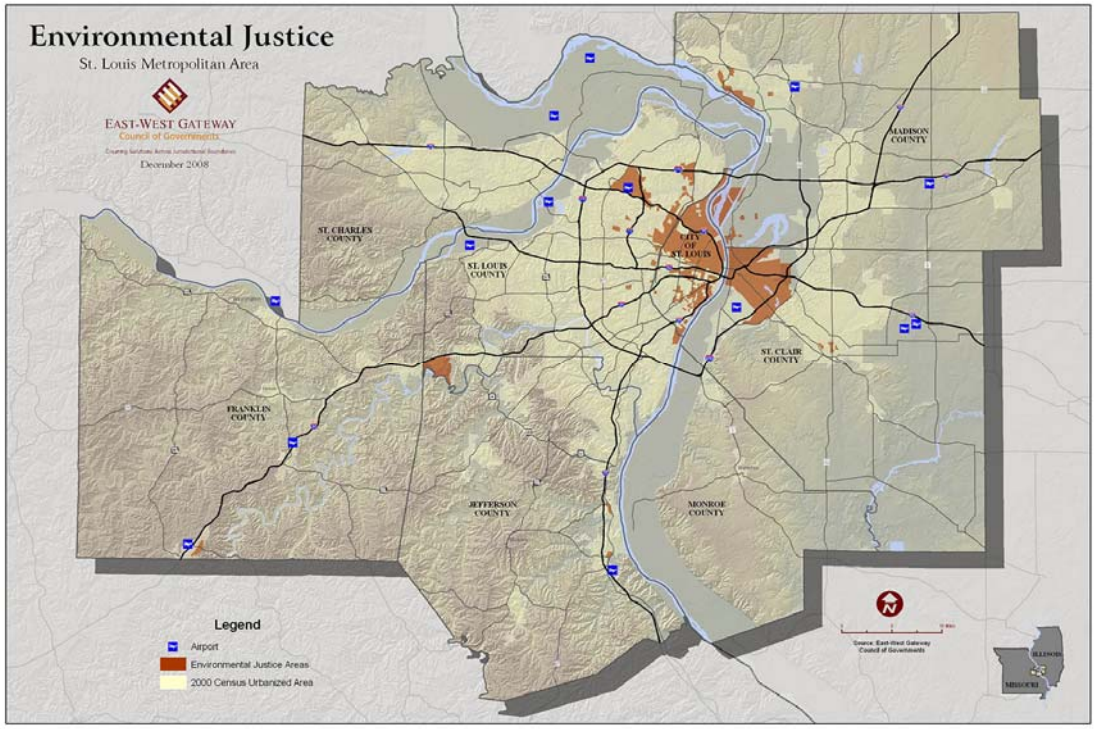
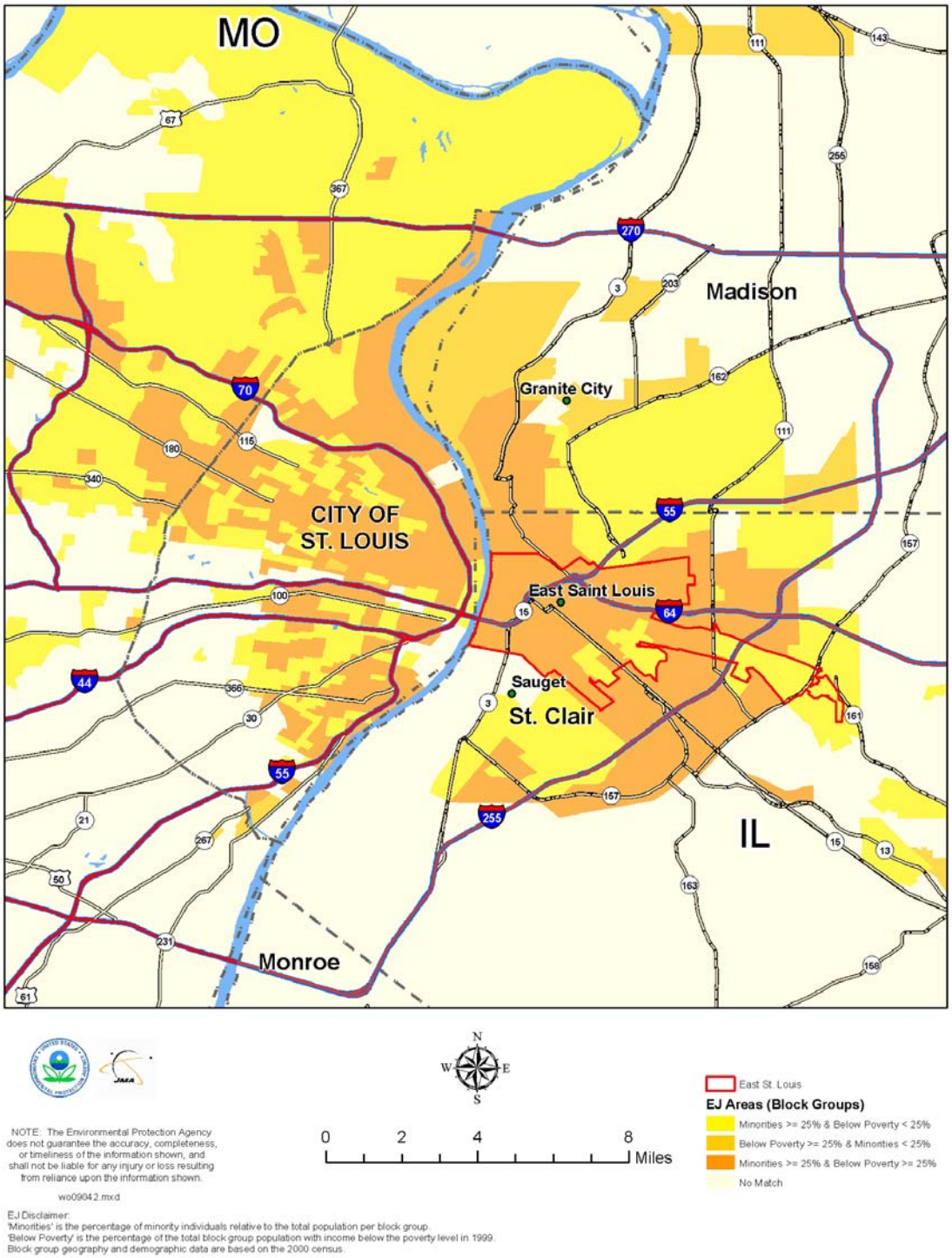


Figure 3 – St. Louis Core Environmental Justice Map



AQMP Benefits

The AQMP3 is being designed to provide regulatory efficiencies in the development of SIPs by using limited state/federal resources to provide the maximum air quality benefit in the quickest fashion possible while expending the least amount of resources from the citizenry and industry. It is also an effort by all the regulatory agencies to provide more transparent and timely decision-making for overall air quality management in the St. Louis area. The on-going technical efforts designed as part of the AQMP3 will be flexible enough to allow for consideration of "new" pollutant goals and potential removal of "old" or achieved pollutant goals. These future changes to the plan are critical to on-going air quality management in the region with the necessary emphasis on applicable air quality goals. Also, the AQMP3 will help provide additional certainty to the regulated community due to the consideration of multiple air quality goals in the same planning cycle instead of the current pollutant-specific approach. Further, ancillary air quality issues (e.g. smart growth, energy conservation, GHG reductions and climate change) will be evaluated in the state planning documents where applicable. In Section 5, we discuss examples of local activities to support air quality.

Other Impacts of the AQMP3

The AQMP will provide additional efficiency to allow for ever-shrinking resources to complete the Clean Air Act required analyses for the St. Louis area. However, when compared to the old pollutant-specific approach, there will be increased effort to evaluate control decisions for all pollutants simultaneously (including air toxics). While these efforts are necessary and will ultimately provide better air quality decisions for St. Louis, additional technical efforts will need to be completed to provide the necessary data for this type of collective decision-making. The outreach component of the AQMP is designed to allow meaningful discussion between the agencies and interested stakeholders pertaining to air quality goals and the community's perspective on different air quality problems.

Section 3
Air Quality, Health and Ecosystem Challenges

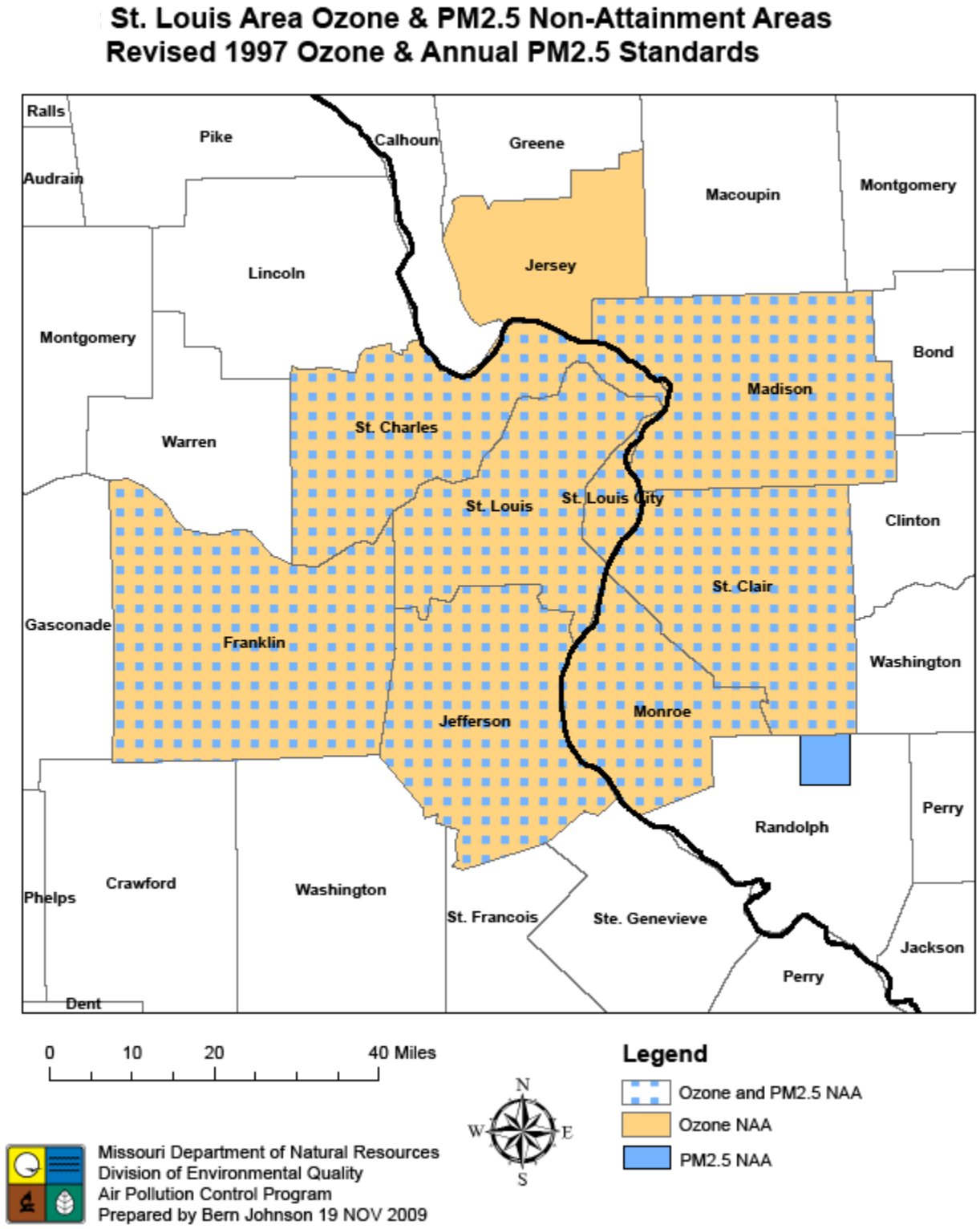
Currently, the St. Louis metropolitan area is designated nonattainment for the 1997 8-hour ozone standard (moderate) and the annual $PM_{2.5}$ NAAQS. The St. Louis ozone nonattainment area is composed of the following counties: Illinois – Madison, St. Clair, Monroe, and Jersey; and Missouri – St. Louis, St. Charles, Jefferson, Franklin, and the City of St. Louis. The St. Louis fine particulate nonattainment area is composed of Franklin, Jefferson, St. Charles and St. Louis counties and the City of St. Louis in Missouri and Madison, Monroe and St. Clair counties in Illinois. Baldwin Township in Randolph County, Illinois is also part of the fine particulates nonattainment area. Figure 4 illustrates the current nonattainment boundaries for both the 1997 8-hour ozone and annual fine particulate standards.

In March 2008, EPA issued a revision to the NAAQS for ozone. This standard had the same form as the 1997 standard (3-year average of the 4th highest value at any monitor), but changed the level of the standard to 75 parts per billion (ppb) from 84 ppb. Both states submitted the required designation recommendations and the state of Missouri included one additional county in the revised St. Louis nonattainment area. Lincoln County to the north-northwest of the current nonattainment area was included because of a monitored violation at the Foley monitor in 2006-08. This violation was due to ozone and precursor transport from the metropolitan area. NOTE: The Foley monitor is in compliance with the 2008 standard using 2007-09 data.

In September 2009, EPA determined that the 2008 ozone standard would be reconsidered. This decision and corresponding EPA actions "put on hold" the designation process for the 2008 standard. Further, the 2007-09 monitoring data for the St. Louis area demonstrates that the area is in compliance with the 1997 standard (design value of 78 ppb).

In October 2009, EPA designated the St. Louis area as attainment for the 2006 $PM_{2.5}$ 24-hour NAAQS. This standard is now 35 $\mu g/m^3$, reduced from 65 $\mu g/m^3$, and the St. Louis area design value is 34.7 $\mu g/m^3$ at the Granite City, Illinois site (2006-08 data). As discussed above, the St. Louis area is still violating the 1997 annual PM standard with a design value of 15.7 $\mu g/m^3$ at the Granite City site using 2006-08 monitoring data. All other monitors in the St. Louis area (Missouri and Illinois) are in compliance with both standards.

Figure 4 – Nonattainment Area for Ozone and PM 2.5



Ozone

Ozone History

Under the 1990 Clean Air Act Amendments (CAAA), St. Louis was classified as a moderate ozone nonattainment area for the 1-hour standard. The CAAA included very specific requirements for areas under each classification. The most important requirement for moderate areas was achieving attainment by 1996. Under the Amendments, failure to attain by the attainment date would result in reclassification (or "bump up") to the more demanding classification of "serious." Serious areas were subject to an additional set of mandatory requirements.

The St. Louis area was required to achieve a minimum of 15 percent reduction in emissions of volatile organic compounds (VOCs), and submit these Rate of Progress (ROP) plans for achieving that reduction. Missouri and Illinois submitted initial ROP plans in 1993 to the United States Environmental Protection Agency (US EPA).

Subsequent amendments to the original ROP plan were made in 1994, 1995, and 1996 by the state of Missouri. These amendments were the result of refinements to inventory calculations and improvements in the documents. Ultimately, the Missouri plan included an enhanced inspection and maintenance program for the nonattainment area, a myriad of industrial VOC regulations for major sources, a Stage I and II gasoline vapor recovery program, and a reduced Reid Vapor Pressure regulation (later reformulated gasoline). An Illinois plan included similar provisions, including an enhanced inspection and maintenance program, Reasonably Available Control Technology (RACT) on major industrial VOC sources, and a reduced Reid Vapor Pressure regulation (and more recently reformulated gasoline).

Although the ROP requirement was one of the key obligations of the CAAA, the primary obligation was a plan to achieve the national ozone standard for the St. Louis region. This obligation is referred to as an attainment demonstration. An attainment demonstration was prepared and submitted in 1995, which showed that the area would attain the standard by 1996. The St. Louis area, however, was not able to attain the 1-hour ozone standard by 1996. The States of Missouri and Illinois proceeded with a request to US EPA to extend the attainment deadline. To qualify for this extension the states had to demonstrate that the area was significantly affected by ozone or ozone precursors transported from upwind sources, that all necessary local control measures have been implemented, and that the states had made the necessary administrative submittals. As part of this attainment date extension, additional photochemical grid modeling was conducted. This modeling included a number of regional control measures, in addition to the 15 percent ROP controls such as RFG and the enhanced I/M programs.

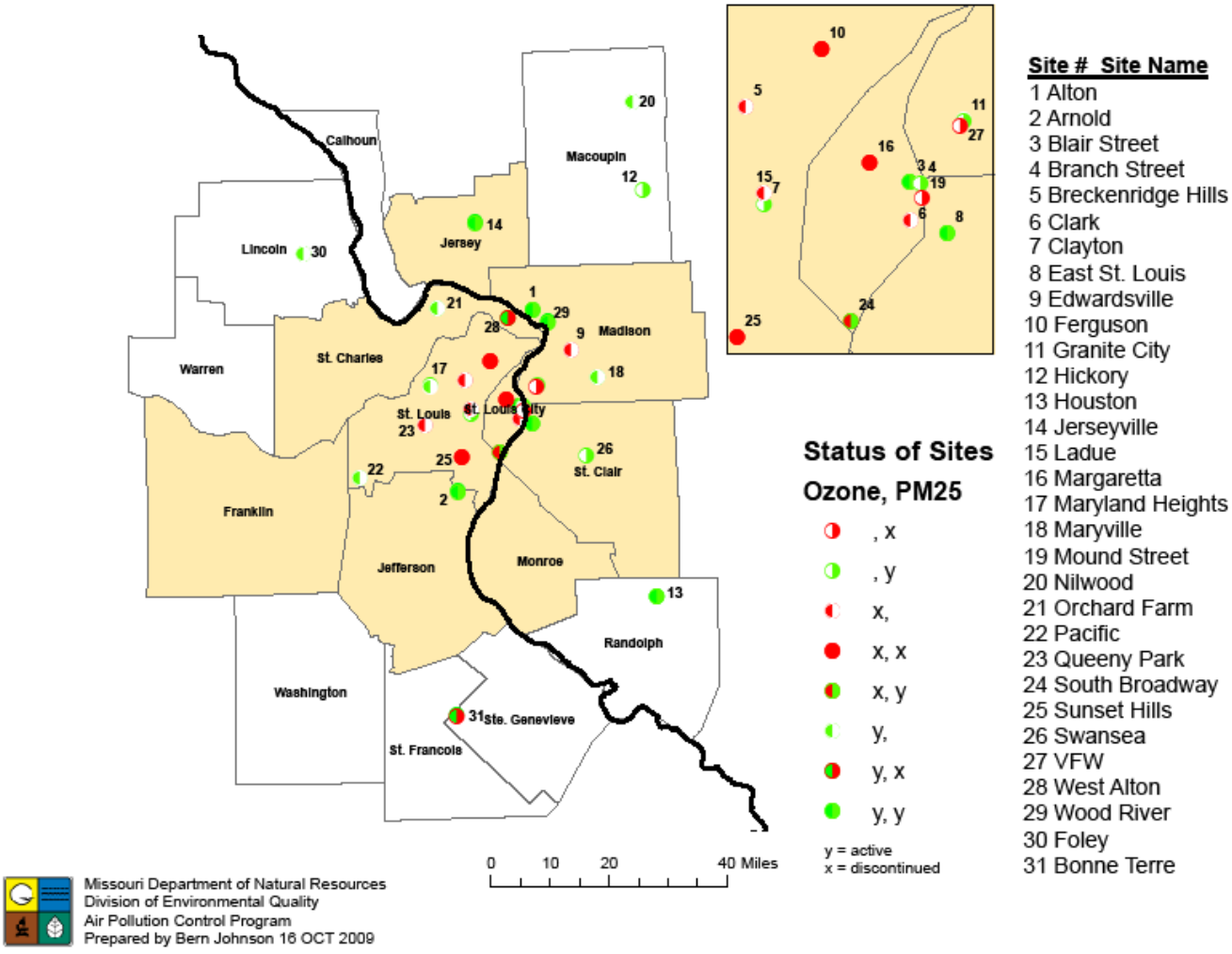
The attainment demonstration submitted as part of the 1-hour extension request focused on the evaluation of emission reductions that were expected from electric generating utilities resulting from US EPA's regional oxides of Nitrogen (NOx) control SIP call. The SIP call applied to twenty-two states in the eastern United States, and included emission

reductions from sources located in the eastern one-third of Missouri and the entire state of Illinois. The study showed that both regional NOx controls and local VOC controls were necessary for attainment of the 1-hour standard, and that St. Louis was significantly affected by ozone transport and emissions from other states, and therefore, qualified for the attainment date extension. Missouri and Illinois were granted the extension and subsequently attained the 1-hour ozone standard in 2002.

On April 15, 2004, EPA designated the St. Louis metropolitan area as a moderate nonattainment area for the 1997 eight-hour ozone standard. This area includes the following counties: Illinois - Jersey, Madison, Monroe, and St. Clair; Missouri - St. Louis, St. Charles, Jefferson, Franklin and the City of St. Louis. The eight-hour ozone SIP submittal deadline was June 15, 2007, and both the state of Missouri and the state of Illinois submitted a plan revision that demonstrates the St. Louis non-attainment area will reach attainment of the 1997 8-hour ozone standard beginning in 2009. St. Louis has attained the standard based on current monitoring data. See Figure 5 for the current map showing locations of ozone and $PM_{2.5}$ monitoring sites.

The latest plan revision for the region requires a decentralized On-Board Diagnostic inspection and maintenance program, continued use of Phase II reformulated gasoline, new federal motor vehicle requirements (Tier 2/Tier 4), the NOx emission reductions from the NOx SIP call and scheduled NOx reductions for utilities in the Clean Air Interstate Rule (CAIR), and continued compliance with industrial VOC and NOx RACT regulations.

Figure 5 – St. Louis Area Ozone and PM2.5 Monitoring Sites



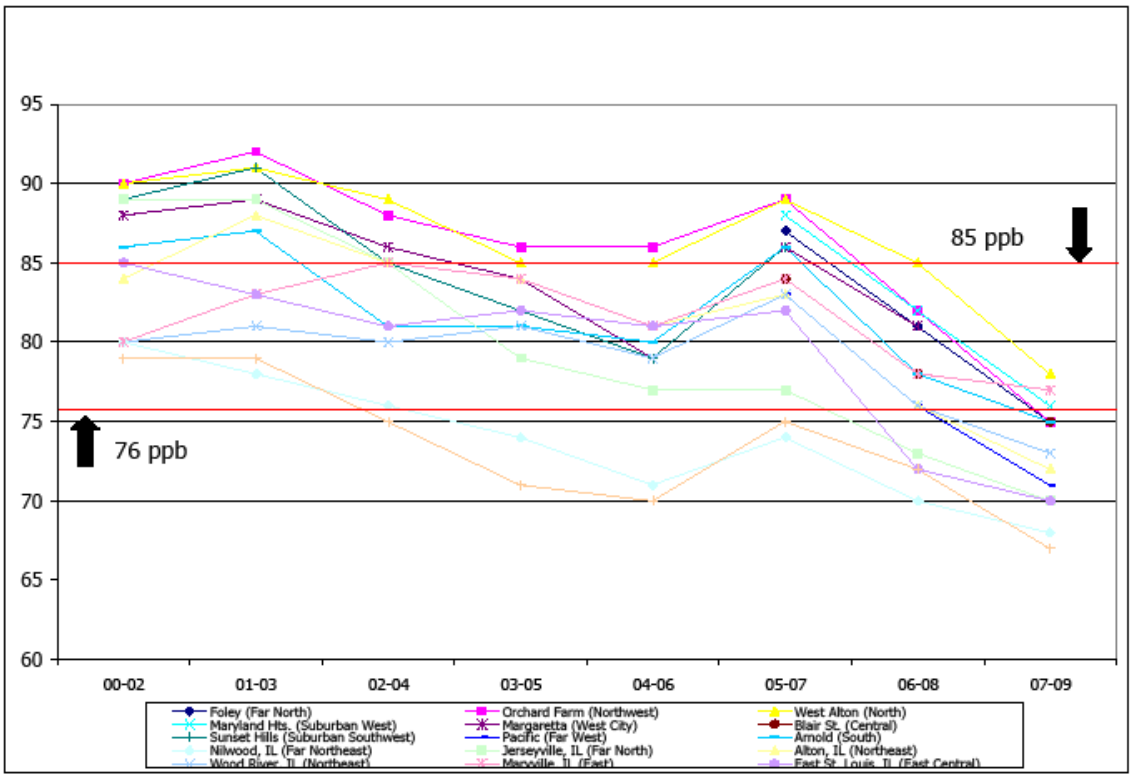
Relevant Ozone Information

Based on the analyses used to support the 1-hour and 1997 8-hour ozone SIP development, there are several conclusions that can be drawn. First, the St. Louis area is impacted by transport from the Ohio River Valley, southern Missouri and Illinois, along with the Memphis metropolitan area. The meteorological analyses denote that ozone concentrations over the 8-hour ozone standard are caused by a variety of synoptic weather patterns that typically involve anti-cyclonic behavior (an area of high pressure over the region resulting in low wind conditions). Most exceedances days have stagnant conditions in the early morning hours with southwesterly, southerly, southeasterly, or easterly surface wind flows later in the day. These wind differences are typically due to the location of a high pressure center to the east or north of the region. Second, even with

the new controls, the St. Louis area contributes more than half of its own ozone concentrations. These results are based on CAMx Anthropogenic Precursor Culpability Assessment analyses conducted for 2009 emissions in St. Louis. Third, the large amount of biogenic VOC emissions to the south and southeast of the nonattainment area also contribute significantly to the formation of ozone in St. Louis. These emissions are generated from the large oak and pine forests of south-central and southeastern Missouri. Fourth, the nature of ozone formation in St. Louis has changed slightly over the years. Prior to the 1-hour ozone SIP development, the area's ozone formed under a mixture of VOC- and NOx-limited conditions depending on the meteorological conditions (e.g. wind direction) for that episode. Under NOx-limited conditions, reductions in NOx emissions provide greater corresponding ozone reduction than VOC emission reductions. Recently, St. Louis has shifted to more NOx-limited conditions, but with some days that are VOC-limited. This pattern follows the overall trend of significant VOC emission reductions in the high emission density areas near downtown St. Louis.

Also, presented below is Figure 6 which illustrates the recent history of ozone design values at several critical sites in and around the St. Louis area. This figure illustrates a slight downward trend in concentrations influenced by previous SIP submittals from both Missouri and Illinois. Further, there is considerable year-to-year fluctuation in 4th highest concentration that reflects the strong meteorological variability seen not only in St. Louis but throughout the Midwest. To be clear, based on Missouri's recent 8-hour ozone SIP submittal, the area should see a sizable reduction in ozone concentrations due to the federal mobile source measures, continued implementation of utility NOx controls, and other local measures in the next few years.

Figure 6 - Ozone Design Values 2000-2009



A mix of emission sources continues to influence ozone concentrations in the St. Louis area. The average of the biogenic VOC emissions for all the episodes in the attainment demonstration from the nonattainment area is: Missouri NAA = 309.53 tons per day (TPD), Illinois NAA = 135.73 TPD with a total of 445.26 TPD. Sixty percent of the biogenic emissions in the nonattainment area are emitted from Franklin and Jefferson County, Missouri (south and west of the downtown area). In addition, the outlying Missouri counties to the south and west have substantially more biogenic VOC emissions. Over 90 percent of the total 2002 stationary point source NOx emissions in the Missouri portion of the nonattainment area were emitted by the four Ameren electric generating facilities, a cement kiln, and a group of industrial boilers. Two of the Ameren facilities have computer-controlled staged combustion and overfire air NOx measures (less than 0.15 lb/MMBTU) and all four are in compliance with the NOx SIP call requirements and are included in the Clean Air Interstate Rule program. In Illinois, there were two large non-utility point sources that emitted considerable NOx in 2002: Toscopetro and US Steel – Granite City Works. The 2002 point source VOC emissions

in the Missouri portion of St. Louis were dominated by an aluminum foil pack manufacturer (JW Aluminum) and four automobile manufacturing facilities (GM, Chrysler (2), and Ford which is currently idle along with one of the Chrysler plants).

Particulate Matter

PM History

The St. Louis metropolitan area was designated nonattainment for the annual $PM_{2.5}$ NAAQS on April 5, 2005. The St. Louis annual $PM_{2.5}$ nonattainment area is composed of the following counties: Illinois – Madison, St. Clair, Monroe, and Baldwin Township in Randolph County; Missouri – St. Louis, St. Charles, Jefferson, Franklin, and the City of St. Louis. The highest observational data in the St. Louis area exhibit a consistent pattern of organic compounds contributing at or near the majority of the total PM mass, with typical seasonal variations of sulfate and nitrate contributing to a large extent as well (summer sulfate, winter nitrate).

Missouri submitted its portion of the $PM_{2.5}$ SIP in October 2009. The Illinois portion is currently under development. There is only one monitor that violates the annual standard based on 2006-2008 data. The Granite City, IL monitor located north-northeast of the downtown area is the violating monitor. The geographic pattern of ambient concentrations is higher concentrations in the downtown and East St. Louis/Granite City areas and slightly lower annual concentrations in the suburban and rural sites around the area. This leads to the conclusion that there is a contribution to these monitors from local sources in the area along with a sizable component that is transported into the area. This is especially true regarding concentrations at the Granite City monitor due to very nearby sources that impact that monitor.

Relevant PM Information

The St. Louis area is one of the few urban areas in the nation that is unable to demonstrate compliance with the annual $PM_{2.5}$ standard using 2009 "on-the-books" control. Therefore, as part of the SIP submittal, Missouri has and Illinois will be applying for an attainment date extension to 2012 to allow for additional controls to be implemented. In 2006 and 2007, the State of Illinois promulgated the Multi-Pollutant Standard (35 IAC Part 225, Subpart B) and Combined Pollutant Standard (35 IAC Part 225, Subpart F), respectively, to achieve significant reductions in SO2, NOx, and mercury emissions from coal-fired electrical generating units. These rulemakings are anticipated to result in the elimination of 201,233 tons/year of SO2 emissions by 2015 and 233,600 tons/year by 2019. They are also expected to result in the elimination of NOx emissions of 61,434 tons/year by 2012. As of July 1, 2009, the affected power plants were to achieve 90% mercury capture or, alternatively, attain an output-based standard of 0.0080 lbs mercury per gigawatt-hour. In addition, two SO_2 RACT control regulations in Missouri for primary lead smelting and industrial boiler have been finalized that limit emissions of impacted sources in 2012 and 2011, respectively. Illinois

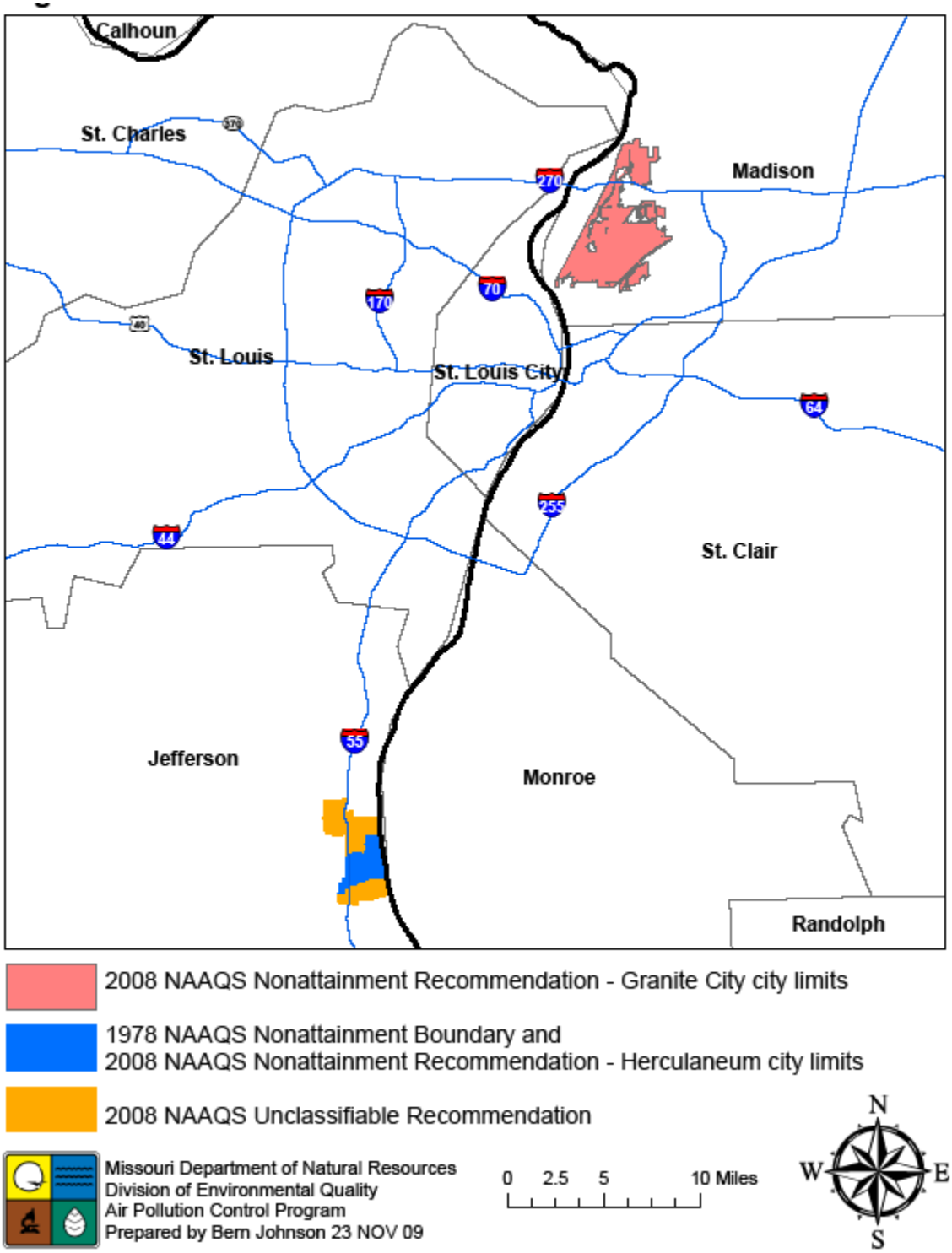
has committed to conclude their necessary rulemakings and have anticipated compliance dates in the 2012 timeframe for the annual $PM_{2.5}$ plan.

Lead

History

The city of Herculaneum, Missouri in Jefferson County contains a primary lead smelting operation (Doe Run Company) and is currently in violation of the 0.15 $\mu g/m^3$ rolling three month average lead NAAQS (finalized in October 2008). The state of Missouri submitted a SIP revision to address the most recent violations of the 1978 lead standard near the facility in spring 2007 and US EPA Region VII is preparing a rulemaking on that revision. The Doe Run Company is, also, the single largest non-utility source of sulfur dioxide in the $PM_{2.5}$ nonattainment area at around 40,000 tons per year. These SO_2 emissions are being controlled as part of the 2009 $PM_{2.5}$ SIP submittal by Missouri. Based on the new lead NAAQS, considerable additional effort will be necessary for lead attainment in Herculaneum. Also, the state of Illinois has recommended the Granite City, IL city limits for designation as nonattainment. These areas include all monitors that are not in compliance with the 2008 lead standard.

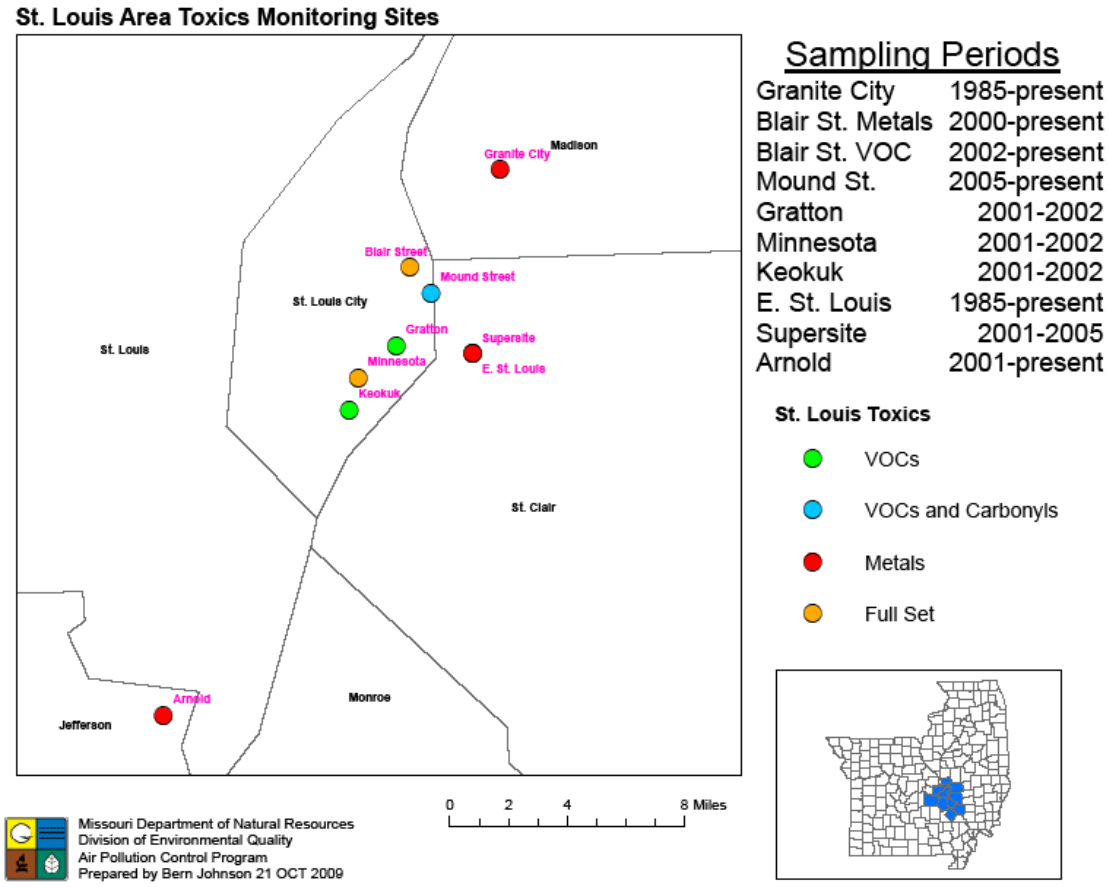
Figure 7 – St. Louis Lead Nonattainment Areas



Air Toxics

St. Louis is impacted by most of the urban air toxics typical of larger cities. In June 2005, EPA Region 7 - working with local officials - completed a St. Louis-specific air toxics study. The study produced a report titled "St. Louis Community Air Project Air Toxics Risk Characterization" (CAP Report). The CAP Report was a direct result of the region's attempt to address environmental concerns expressed by residents, workers and business owners in St. Louis. Specific air toxics of concern to the community cited in the report included five "priority air toxics of concern": acetaldehyde, arsenic compounds, benzene, chromium compounds and formaldehyde. It also listed a concern with diesel particulate matter. In addition to the CAP report, MDNR has continued to monitor for specific toxics in the area. Figure 9 shows the current air toxics monitoring sites and sampling periods in the St. Louis area. The AQMP3 analytical and control selection process will allow more knowledge of these urban air toxics to be considered in addressing multi-pollutant control strategies. The additional monitoring includes data collected at the National Air Toxics Trend Station on Blair St. near downtown St. Louis. A review of the data collected during 2005-08 has determined that the St. Louis area still contains air toxics compounds which contribute to risk above one additional cancer in a million exposed threshold. Consistently, the largest cancer risk was attributed to formaldehyde exposure in St. Louis (40-60 times over the threshold) with the following other pollutants indicating risk well above the one in a million threshold: arsenic compounds, benzene, acetaldehyde, and carbon tetrachloride. The "air toxics of concern" have not changed markedly since the 2002 CAP Study and, therefore, the initial AQMP evaluation of air toxics will include the original toxics of concern from the CAP study.

Figure 8 – St. Louis Area Air Toxics Monitoring Sites



Section 4
Current Emissions Assessment

The most current emission assessment for the entire area is from the 2009 attainment demonstration for $PM_{2.5}$ recently submitted by Missouri. This inventory is an annual inventory based on 2002 and projected to 2009 and 2012 to demonstrate attainment of the annual $PM_{2.5}$ NAAQS. Tables 2 and 3 provide an emission inventory for 2002 and 2009 for each state's portion of the ozone nonattainment area – Missouri (Franklin, Jefferson, St. Charles, St. Louis Counties and St. Louis City) and Illinois (Jersey, Madison, Monroe, and St. Clair).

Table 2 - 2002 St. Louis Area Emission Inventory (tons/year)

Missouri					
Pollutant	**Area**	**Point**	**Mobile**	**Non-Road**	**Total**
VOC	28,212	10,890	28,110	13,881	81,093
NOx	10,014	44,053	64,511	19,329	137,907
CO	20,977	9,208	442,992	188,367	661,543
PM2.5	11,661	2,416	996	1,171	16,245
SO2	18,676	183,534	1,349	1,770	205,329
Illinois					
VOC	14,388	4,144	9,593	3,160	31,285
NOx	1,900	33,386	18,341	12,278	65,906
CO	6,592	21,094	145,015	38,635	211,335
PM2.5	1,622	2,771	273	552	5,219
SO2	204	54,177	705	984	56,071

Table 3 - 2009 St. Louis Area Emission Inventory (tons/year)

Missouri					
Pollutant	**Area**	**Point**	**Mobile**	**Non-Road**	**Total**
VOC	29,676	15,486	18,913	13,839	77,913
NOx	10,538	38,471	42,250	20,193	111,452
CO	20,877	10,914	316,215	303,142	651,148
PM2.5	11,741	5,998	707	1,409	19,854
SO2	19,135	148,639	287	561	168,622
Illinois					
VOC	13,997	3,323	5,601	2,325	25,246
NOx	2,074	12,608	10,780	10,133	35,595
CO	6,858	6,135	71,587	36,189	120,769
PM2.5	1,742	2,731	164	445	5,083
SO2	229	40,004	61	177	40,471

This inventory was the basis for the SIPs for both ozone and $PM_{2.5}$. As with any emission inventory there is always room for improvement on the estimates that are utilized for decision-making. In general, both states have on-going emission inventory requirements for emission inventories (e.g. statewide National Emission Inventory [NEI]

reporting for all source categories, statewide annual emission inventory submittals from industrial sources, mobile source conformity budget development/compliance in St. Louis, statewide Toxic Release Inventory [TRI] requirements). As with all inventories used for planning or control purposes, these core inventories serve as the basis for the development of the modeling inventory database. A modeling inventory is an ever-improving product that utilizes the best available information at the time of its development. For the AQMP3, the ozone and PM modeling databases have been through a series of revisions and improvements related to updating emission rates, stack parameters, and other relevant information. However, for the toxics modeling inventories being planned as part of the AQMP3, there has been little quality assurance because it has never been utilized in state-specific planning analyses. Therefore, one of the significant technical components for AQMP3 implementation will be the development of a "model-ready" toxics inventory as part of the AQMP3 and SIP analyses.

Each state's on-going inventory efforts will continue to be utilized for the core emission products that drive control strategy decisions. Future inventory development will be based on the requirements for the relevant air quality standards (e.g. ozone and/or PM) with an emphasis on utilizing the highest quality data available.

Existing Control Strategies

Both state submitted SIPs for the St. Louis, Missouri and Metro-East (IL) portions of the St. Louis 8-hour ozone nonattainment area. These plans incorporated "on-the-books" controls for demonstrating attainment of the 1997 ozone NAAQS by 2009. These controls encompass the spectrum of anthropogenic emission sources---onroad mobile, offroad mobile, point, area. In Illinois, the reductions amount to approximately 20 tons VOC/day and 42 tons NOx/day and in Missouri, the emission reductions for this plan amount to 33 tons VOC/day and 79 tons NOx/day, when compared to the 2002 base year.

In large measure, the emission controls are directly or indirectly the result of federal rulemakings, federal enforcement actions, or statutory requirements imposed by the Clean Air Act Amendments of 1990. The "on-the-books" control measures, however, also reflect both state's rulemaking efforts and other controls related to enforcement actions. The following list identifies the principal "on-the-books" control programs:

- Tier 2 Light Duty Vehicle Standards and Gasoline Sulfur Control Requirements (65 *FR* 6697)
- Heavy-Duty Diesel Engine Standards / Low-Sulfur Diesel (66 *FR* 5002)
- Tier 4 Nonroad Diesel Engines / Diesel Fuel Sulfur Content (69 *FR* 38957)
- Vehicle Inspection & Maintenance Program (CAAA) – Missouri utilized a centralized, enhanced I/M program in the St. Louis area from 2000 – 2006
- Reformulated Gas (71 *FR* 77690) – required in Missouri since 1999 (Phase II in 2000); both states had to "opt-in" to RFG because St. Louis was not classified as a serious ozone nonattainment area
    - Low Reid Vapor Pressure Gas (starting at 7.8 and ending at 7.0 pounds per square inch) was utilized from 1992 until RFG was required

- NOx SIP Call (63 *FR* 57355)
    - Missouri Statewide NOx trading program – implemented in 2004; required emission limits on all electric generating units above 25 MW in Missouri through a trading program (this program supplemented the NOx SIP call because only the eastern 1/3 of Missouri utilities were in the SIP call)
- New Source Performance Standards (NSPS)
- National Emission Standards for Hazardous Air Pollutants (MACT)
- Locomotive Engine Standards (63 *FR* 18977)
- Marine Compression-Ignition Engine Standards (64 *FR* 73299)

State-specific measures in the St. Louis area:
Illinois

- Consent Decree---Dynegy Midwest Generation (Consent Decree entered May 27, 2005 by U.S. District Court for the Southern District of Illinois)
- Consent Decree---ConocoPhillips (Consent Decree filed January 27, 2005 by U.S. District Court for the Southern District in Texas)
- Control of Emissions from Consumer and Commercial Products
- Control of Emissions from Architectural and Industrial Maintenance (AIM) Coatings
- Control of Emissions from Rotogravure and Flexographic Printing Facilities
- Control of Emissions from Lithographic Printing
- Control of Emissions from Pavement Painting Operations
- Control of Emissions from Wood Furniture Manufacturing Operations
- Control of Emissions from Solvent Cleanup Operations
- Control of Emissions from Volatile Organic Liquid Storage
- Control of Emissions from Batch Process Operations
- Control of Petroleum Liquid Storage, Loading, and Transfer (Stage I)

Missouri

- Open Burning Restrictions
- Control of Emissions from Aerospace Manufacture and Rework Facilities
- Control of Emissions from Rotogravure and Flexographic Printing Facilities
- Control of Emissions from Bakery Ovens
- Control of Emissions from Lithographic Printing
- Control of Emissions from Traffic Coatings
- Control of Emissions from Aluminum Foil Rolling
- Control of Emissions from Wood Furniture Manufacturing Operations
- Control of Emissions from Solvent Cleanup Operations
- Control of Emissions from Volatile Organic Liquid Storage
- Control of Emissions from Batch Process Operations
- Control of Petroleum Liquid Storage, Loading, and Transfer (Stage I)
- Stage II Vapor Recovery (Automobile refueling control)
- NOx RACT controls - Missouri

Additionally, recent promulgation of the following federal and state control measures are expected to contribute to further air quality improvements:

- Portable Fuel Containers (72 *FR* 8427)
- VOC Coatings and Solvent Categories (63 *FR* 48819; 63 *FR* 48848; 73 *FR* 15421)
- NOx RACT Controls – Illinois
- VOC RACT Controls – Group II Consumer & Commercial Products: Lithographic Printing, Letterpress Printing, Flexible Package Printing, Flat Wood Paneling Coating, and Industrial Cleaning Operations.
- VOC RACT Controls – Group III Consumer & Commercial Products: Paper, Film and Foil Coatings, Large Appliance Coatings, and Metal Furniture Coatings.
- VOC RACT Controls – Group IV Consumer & Commercial Products: Miscellaneous Metal and Plastic Parts Coatings, Automobile and Light-Duty Truck Assembly Coatings, Industrial Adhesives, and Fiberglass Boat Manufacturing Materials.

The current fine particulate matter ($PM_{2.5}$) annual NAAQS SIP development effort for the St. Louis nonattainment area also benefits from many of the above-listed emission control measures. In addition to those measures, the Clean Air Interstate Rule (CAIR) in Missouri and the Multi-pollutant Standards (MPS) and Combined Pollutant Standard (CPS) in Illinois will provide substantial PM precursor reductions. Also, in its October 2009 SIP submittal, Missouri added two new regulations that control sulfur dioxide (SO2). These two regulations control industrial boilers in the St. Louis area and the primary lead smelting operation in the area. The amount of emission reductions will exceed 40,000 tons of SO2 per year when fully realized (in 2017) when compared to current conditions. The emission limitations under these rules will start to be implemented in 2011.

The St. Louis metropolitan area is currently designated as a nonattainment area for the annual $PM_{2.5}$ NAAQS, although current monitoring data shows that only one monitor in the area is violating the air quality standard. Elevated ambient $PM_{2.5}$ concentrations in Granite City, Illinois are largely attributable to local iron and steel-making operations. A refined modeling assessment (Local Area Analysis) is currently being completed by the IEPA for the Granite City area to augment the regional modeling analyses. This technical assessment is expected to result in further primary particulate matter reductions in order to demonstrate attainment of the annual $PM_{2.5}$ NAAQS.

Section 5
Local Activities in Support of Air Quality

In the St. Louis area, there are many local activities that coincide with or support the air quality management goals of this plan. These include:

Energy efficiency programs,
Local air pollution control programs - City of St. Louis and St. Louis County,
Renewable energy programs,
Anti-idling programs,
Clean diesel programs,
Vehicle miles traveled reduction program,
Green Buildings program,
Local transportation planning,
Air quality alerts,
Biking and walking program,
Regional water quality protection,
St. Louis City Forestry Program,
Sustainability, and
Greenhouse gas reduction program.

With respect to greenhouse gases, it is generally understood by air quality management officials that there is a correlation between efforts to reduce greenhouse gas emissions and improvements in air quality. There is ongoing research that will attempt to better quantify this relationship and as the AQMP3 for the St. Louis area evolves, the results of this research should inform that process. However, what air quality scientists recognize now is that higher temperatures lead to increased concentrations of ozone precursors and higher, more sustained ozone concentrations. Human Health effects research shows a clear link between higher ozone levels and increased adverse human health and ecological impacts.

As the national debate continues on how to structure a greenhouse gas reduction program, there are already many efforts underway at the local level to reduce emissions. These efforts address energy efficiency, renewable portfolio standards, land use, transportation and regional growth planning. As these efforts grow, there will likely be a corresponding effort on the part of the EPA to quantify improvements such that credits can be incorporated into SIPs. The AQMP for the St. Louis area recognizes this possibility.

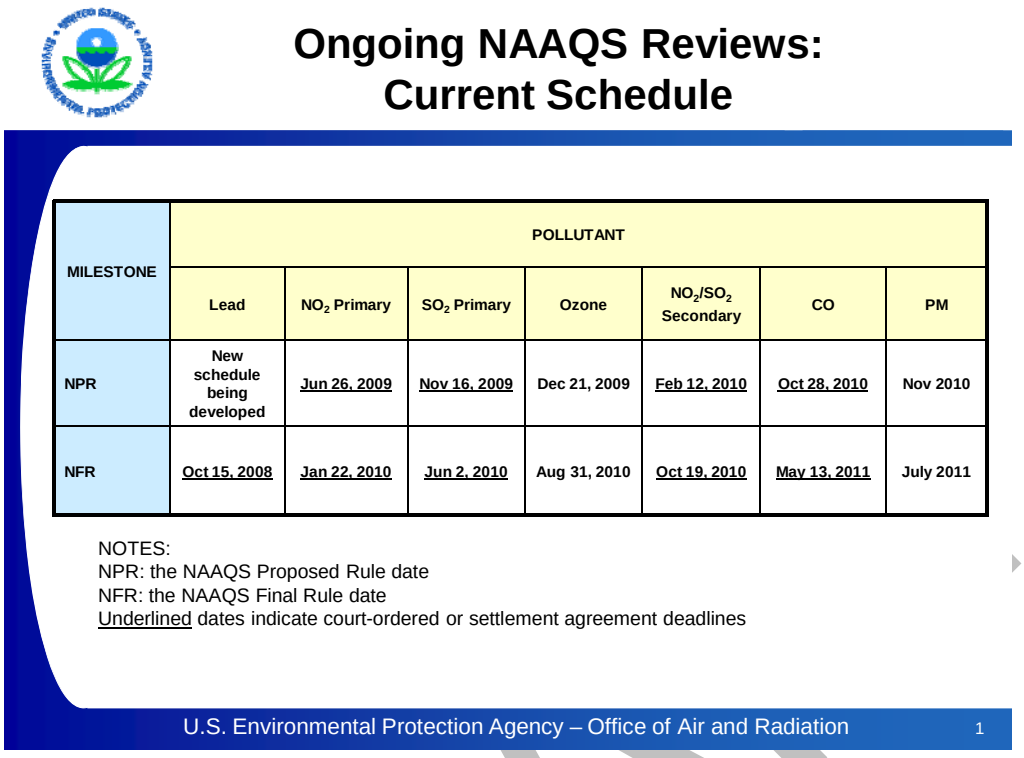
The AQMP3 team has assembled the current activities taking place within the St. Louis area. The team recognizes that this list may be incomplete, and looks forward to working with local partners to enhance this current list that contribute towards improving air quality in the St. Louis area. All these activities are summarized in table form as Appendix 1.

Section 6
Strategies for Managing Future Emissions

The AQMP3 will utilize a new paradigm for evaluating control strategies. Each strategy will be evaluated for all pollutants of concern in the St. Louis area including the air toxics identified in this document. This differs from the previous SIPs that have been developed in St. Louis because each pollutant was considered separately or with a very narrow review of any other pollutant co-benefits or emission increases. The process of evaluating multiple pollutants will require more effort during the control strategy development exercise. However, these efforts will be beneficial in developing emission reductions for several pollutants simultaneously to achieve all the air quality goals in the St. Louis area.

At this time, the primary pollutants of concern for St. Louis are ozone, particulate matter, and certain air toxics. The air quality goal for ozone is likely to change in the near future to a more strict standard than the 1997 8-hour standard currently in place for St. Louis (0.08 parts per million). The St. Louis area was recently designated an attainment area under the 2006 24-hour $PM_{2.5}$ standard due to "clean" air quality monitoring data for 2007-09, but is still nonattainment for the annual $PM_{2.5}$ standard. Based on information from EPA Office of Air Quality Planning and Standards (OAQPS), the revised ozone standard will be proposed in December 2009 and finalized in August 2010. The next PM standard review will be complete in 2011. Also, due to the recent release of a technical draft under the nitrogen dioxide (NO2) standard review, EPA has suggested a "near-roadway" form of the standard that could potentially impact the St. Louis area. Further, the SO2 NAAQS review may propose a standard that may impact large SO2 sources in the area. Table 4 lists the ongoing NAAQS reviews and current schedule.

Table 4 – Ongoing NAAQS Reviews



Ongoing NAAQS Reviews: Current Schedule

MILESTONE	POLLUTANT						
	Lead	NO_2 Primary	SO_2 Primary	Ozone	NO_2/SO_2 Secondary	CO	PM
NPR	New schedule being developed	Jun 26, 2009	Nov 16, 2009	Dec 21, 2009	Feb 12, 2010	Oct 28, 2010	Nov 2010
NFR	Oct 15, 2008	Jan 22, 2010	Jun 2, 2010	Aug 31, 2010	Oct 19, 2010	May 13, 2011	July 2011

NOTES:
NPR: the NAAQS Proposed Rule date
NFR: the NAAQS Final Rule date
Underlined dates indicate court-ordered or settlement agreement deadlines

U.S. Environmental Protection Agency – Office of Air and Radiation 1

Due to all these changes in the near future, it is very difficult to presume what air quality goals will be part of the St. Louis AQMP3. Nonetheless, the method for developing the air quality control plans to bring the area into attainment for all pollutants will not change substantially. Each state has a very specific and lengthy set of requirements to develop and implement regulations for the control of air pollution sources. Regulation promulgation is inherently part of the AQMP3 and the change that is being made is to the underlying technical process to develop these rules.

The St. Louis AQMP3 will use the co-benefit (and trade-off) approach to determining the best mix of controls for all necessary pollutants. This approach is designed to achieve the maximum amount of necessary emission reduction with the minimum expenditure to the community. For example, what is the trade-off when controlling VOC from painting operations by using thermal oxidizers for increased NOx emission from the control equipment? The AQMP3 approach for this type of trade-off will be to provide the emission increase/decrease data along with a best estimate of the impacts of the proposed emission changes. Also, one of the significant issues when developing the appropriate mix of controls for an area is to provide sufficient certainty for attainment of all air quality standards, while encouraging economic development within the area. This issue is at the core of the air quality management planning exercise and is addressed by identifying the necessary emission reductions and working with the regulated community

and/or the community at-large to implement the least-cost method for achieving those reductions.

The potential variations are too numerous to consider here. However, the outcome of this exercise will be to select the most beneficial control for all pollutants of interest. This means inevitably that prioritization will have to occur between pollutants of concern (e.g. ozone and PM). Based on the stringency of the new standards, the difficulties the area will have in meeting each of the new standards, and the overall health/economic impact from a program like BenMAP, the necessary decisions will be driven by the maximum amount of beneficial health impacts when considering the overall costs. This mirrors the current practice for individual pollutants, but these decisions will be informed by new information that allows a better understanding of the economic impacts of increased pollution to the public.

The overall goals of pollutant prioritization will be to ensure the attainment of all criteria air pollutants for the St. Louis area in the most expeditious fashion. In addition, the AQMP will strive to reduce air toxics exposure in the St. Louis community. With unknown air quality goals and deadlines at this time, it is impossible to determine the initial prioritization of pollutants in the St. Louis area. Nonetheless, the basic principle for this prioritization will be based on human health impacts from each pollutant. For example, if the "new" ozone standard is 65 parts per billion (ppb) and the analysis illustrates that half a million people are exposed to levels of over 80 ppb. Further, this level of exposure is projected to bring 1,000 additional hospital admissions. When compared to an annual PM2.5 standard of 15 micrograms/cubic meter ($\mu g/m^3$) with an exposure of 30,000 people to 15.5 $\mu g/m^3$. The increased risks are estimated as 10 additional hospital admissions. Therefore, given a finite set of economic and technical resources, both air quality problems will be addressed but the priority would be given to ozone reduction strategies. This type of prioritization will provide more benefit to the citizenry and establish a hierarchy for management of air pollution in St. Louis.

It is impossible to predict the level of control necessary for attainment of all the new standards at this time (either within the St. Louis area or of regional origin). However, the proposals for the new ozone standard could require controls on "smaller" industry in St. Louis and substantial industrial, area, or mobile source control throughout the eastern United States to achieve the standards being discussed (e.g. 60-70 ppb). During the last ozone plan development, both states identified the St. Louis area as being more NOx-limited during times of maximum ozone formation. This finding and the fact that ozone concentration continue to decline in the St. Louis area lead to the conclusion that VOC controls in the area have been very effective in reducing ozone concentration along with the regional NOx SIP calls controls. It will be important to consider both additional VOC and NOx controls in the area during control strategy development for ozone in St. Louis.

For air toxics, the co-benefits of certain ozone and/or PM control will be evaluated as part of the AQMP3 process. The focus will be to reduce the relevant air toxics exposure in conjunction with the reductions in criteria pollutant concentrations.

Section 7
Implementation

To develop the technical approach to achieve the goals of the AQMP3, an evaluation of the current status of air quality management was necessary. This air quality management evaluation included a review of the current attainment status of the St. Louis area for each of the criteria pollutants and a review of the air toxics exposure issues in the area. The evaluation included a review of the previous SIPs submitted by both states for ozone and $PM_{2.5}$ (Missouri only). Also, the previous air toxics evaluation was analyzed to better understand the air toxics of concern for the area. The evaluation also included a review of the state agency efforts for community outreach and cooperative efforts for development of the respective plans.

After that evaluation, the "new" tasks have been identified and reviewed for level of effort, workability of concept, continued functionality of the State coordination efforts, appraisal by State Management, and manpower/budget issues Both states have much expertise in developing SIPs and supporting technical analyses for ozone and $PM_{2.5}$. The primary new technical task is the use of air toxics exposure as a planning metric for the St. Louis area and simultaneous analysis of multiple pollutants. This will require the evaluation of tools developed by EPA during the recent multi-pollutant air quality studies that include air toxics. This transfer of knowledge has been largely completed and the St. Louis team is intent on using the expertise gained by OAQPS staff to assist in making decisions about specific technical details. For example, the OAQPS project included the use of two different modeling systems for control strategy evaluation. This was very cumbersome and required the creation of hybrid modeling output files. The St. Louis team has decided against this approach for ozone and/or $PM_{2.5}$ due to the excessive effort required for very limited benefit. As the AQMP is implemented, the St. Louis team will continue to work with EPA technical staff to ensure valid scientific choices are made at each decision point in the process and any new advances developed by EPA will be considered for inclusion.

The use of other "new" tools will be necessary including the cost functionality that will help communicate the findings to the public and stakeholders. The overall technical process will strongly resemble the current SIP development process and include base-year inventory development (including emissions modeling), meteorological modeling, initial base-case modeling (including model performance evaluations), iterative revisions to modeling inputs as a result of findings, approval of base-case inputs/results, growth of emissions to a future year, inclusion of "on-the-books" controls for all pollutants, and subsequent control strategy iterations. The new aspects for the St. Louis area will include the use of BenMAP to evaluate benefits on risk/exposure for changes in ozone and/or PM concentrations, the inclusion of air toxics in the modeling activities and monitoring data evaluations, a prioritization of control based on air quality/health/quality of living priorities in St. Louis, and an evaluation of issues linked to air quality like smart growth, transportation planning, and environmental justice within the St. Louis area.

As discussed previously, there are, at least, two significant problems with the implementation of the AQMP. The first was discussed previously and is the uncertainty of the air quality goals driven primarily by EPA's air quality standards review. The current lack of clear goals for ozone and PM precludes some of the initial planning that could be conducted for implementation of the plan. This is an obstacle that can be overcome given the flexible planning mechanism presented in Sections 8 and 9. The second problem involves the deadlines for air quality planning on a pollutant-specific basis in the Clean Air Act. The comprehensive planning and technical requirements under the AQMP were never considered as part of the 1990 Clean Air Act Amendments. Therefore, both states may need some measure of flexibility to conduct the multi-pollutant planning exercises including the local-scale toxics evaluation and regional-scale criteria pollutant analyses.

The current technical tools recommended by EPA to conduct the necessary local-scale toxics and regional-scale criteria pollutant modeling analyses are as follows:

Meteorological Models

MM-5 or WRF meteorological model

Emission Data/Tools/Models

Point source inventories (EPA, RPOs, state-provided)
Area source inventories (EPA, RPOs, state-provided)
BEIS3 biogenic model
MEGAN
Vehicle Miles Traveled (VMT) estimates (RPOs, state DOT)
MOBILE 6.2 or MOVES mobile emission factor model
NONROAD or MOVES nonroad emission factor model
SMOKE or CONCEPT emissions model for preparing emissions to be used in the air quality model
EGAS growth factor model or similar tool

Air Quality Models/Tools

CMAQ and/or CAMx air quality model
PAVE or other visualization program for model outputs
AERMOD for local scale analysis (i.e. lead NAAQS)

Supplemental Tools

BenMAP to illustrate PM and Ozone exposure/risk
AirControlNet and any other multi-pollutant control strategy development tools
EJSEAT Graphics

In general, the air toxics evaluation exercise will likely include a 1 km modeling grid structure within the core downtown area and somewhat beyond to address potential emission sources. This modeling will be conducted using the same modeling system as used for the PM2.5 and ozone analysis unless the modeling system is not capable of handling the pollutants of interest or a better tool exists (e.g. heavy metal air toxic compounds). This grid structure will be kept narrow to minimize run times and maximize ability to evaluate different emission scenarios. The larger, regional grid structure will be defined based on EPA guidance, but will likely resemble the previous ozone and PM2.5 evaluations conducted in St. Louis (Figure 9 – ozone and Figure 10 – PM2.5).

Figure 9 – St. Louis 1997 8-hour Ozone Modeling Grid Domains

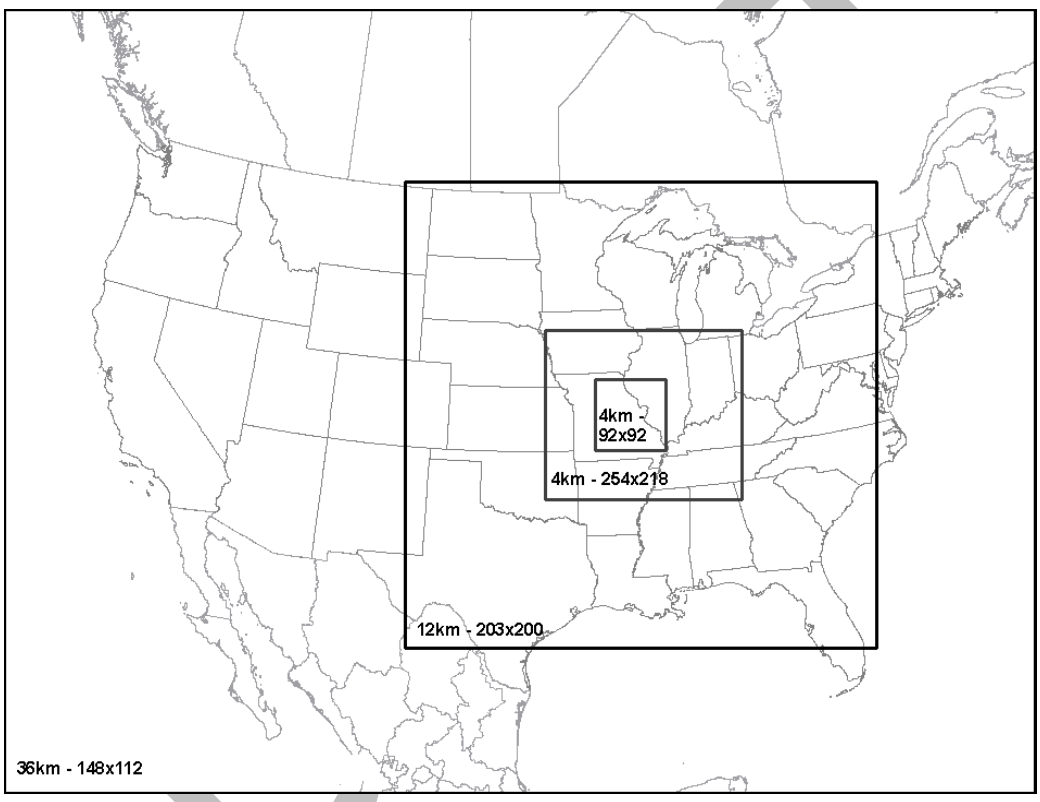
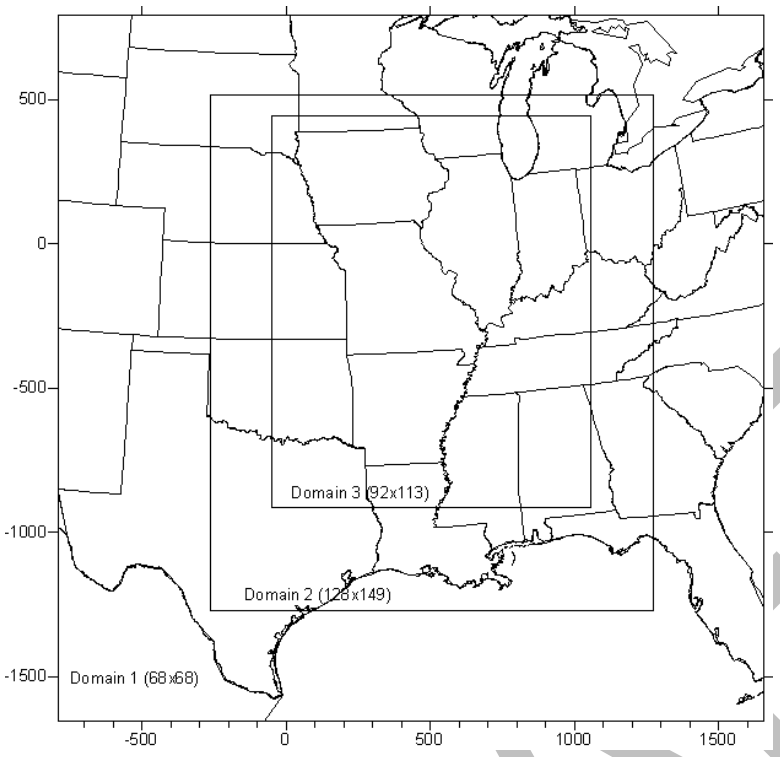


Figure 10 – St. Louis Annual PM2.5 Modeling Grid Domains



Currently, as part of the State Innovation Grant (SIG) project, the state of Missouri is beginning to train staff in the use of air toxics inventories for modeling evaluations, including SMOKE modeling activities. This training process will continue as the AQMP3 is developed for both emission and air quality models and issues discovered will be documented. This training is critical to ensure timely implementation of the multi-pollutant process when the AQMP3 is finalized. The inclusion of additional pollutants in the emission modeling and photochemical modeling exercises requires an understanding of those pollutants. The training required by experienced staff at the state level includes advanced emission and photochemical modeling training. Specifically, an emphasis of the use of additional species within the models is essential as part of the training.

When a decision regarding the evaluation year (dates for ozone) and grid structure is reached, the training activities completed by the technical group will be used to commence modeling activities for the AQMP3. Traditional monitoring data evaluations for toxics and criteria pollutants will also be a critical component to the AQMP3 technical process. These may include receptor modeling, "urban excess" data contribution analysis, and $PM_{2.5}$ speciation data and air toxics monitoring data evaluations.

The health outcomes from BenMAP will be used to inform decision makers regarding the monetary benefits of various control programs compared to the cost of control. This is accomplished by using population data contained within BenMAP and incorporating changes in modeled or monitored concentrations along with the health outcomes

associated with those concentration changes. This data will be utilized in conjunction with the traditional SIP tests (attainment demonstrations, exceedance days per year, overall concentration reductions, monitoring trend analyses, etc.) to gauge the effectiveness of control scenarios for all pollutants. As a part of the collaborative effort for the AQMP, the Lake Michigan Air Directors Consortium has expressed an interest and willingness to participate in the BenMAP analysis portion for the St. Louis area.

Other critical components to the implementation of the AQMP are the public outreach component to the plan and the ultimate decision-making necessary for attainment of the air quality standards under the plan. The public outreach component will be primarily conducted as part of the on-going Air Quality Advisory Committee (AQAC) through the East-West Gateway Coordinating Council. During the development of SIPs in both states, the AQAC has been utilized to communicate technical information and policy decisions to stakeholders including environmental and industry groups. Meetings of this committee and subcommittees developed to enhance technical information development are held regularly.

As with any control strategies contemplated under the Clean Air Act, the state agencies will be required to develop and implement those strategies to bring the St. Louis area into attainment of the air quality standards. This fact will not change because of the AQMP, but the information generated as part of the AQMP is designed to better inform the decision-making process. The "new" information will include more public-friendly air quality metrics, like avoided costs of air pollution along with potential reduction in hospital admissions and cancer exposure risks. This type of cost and health impact information has been utilized in other areas of the country to simplify the typical air quality metrics like reduction in parts per billion in a 4 kilometer x 4 kilometer modeled grid cell. It has been the experience of the states that this type of data is not well understood even with extensive outreach.

Section 8
Evaluation of Technical Achievements and Re-evaluation of AQMP Process

The AQMP3 will set goals based on NAAQS requirements, air toxics emission reductions, community health and economic factors. Ambient air monitoring will be used to determine progress in meeting NAAQS standards. Annual emissions reporting, vehicle miles traveled, and continued ambient monitoring data will be used to evaluate progress in reducing air toxics emissions and exposure to the public. Human health benefits will be calculated based on reductions in exposure to criteria and toxic air pollution. Economic benefits will be evaluated based on correlations with human health benefits. However, additional information concerning the costs of implemented controls and other emission reduction measures will be scrutinized to estimate a ratio of economic benefit to cost.

Human Health Benefits Tracking

The ultimate goal of the St. Louis AQMP is to improve human health and the environment. One key measure of the success of an AQMP is whether the area meets the NAAQS (attainment). Since the standards are set based on health effects, by default, this will translate into improved health benefits for a given area.

However, beyond the goal of attainment, the St. Louis AQMP team wanted to develop additional criteria for determining the success of the AQMP. Since the AQMP considers multi-pollutant improvements, as opposed to a single pollutant by pollutant approach, the challenge is to set a series of reliable, easy to understand public health indicators for a baseline that can be established prior to implementation of an AQMP process. The indicators must also be readily tracked over time to determine if there is measured improvement.

To this end, the team evaluated several methods to track the observable public health benefits from instituting a multipollutant planning approach in the St. Louis area. Establishing site specific health indicators on such a small scale proved to be too cumbersome. Instead, the team agreed it would make more sense to use an existing health tracking network created by the Center for Disease Control (CDC). The CDC's National Environmental Public Health Tracking Network was launched in 2009 and can be accessed at: http://ephtracking.cdc.gov/showHome.action .

The Tracking Network is a multimedia system of integrated health, exposure, and hazard information and data from a variety of national, state, and city sources. It is designed to track how environmental contaminants affect public health and provides information on a host of environmental problems and health issues. The network is an interactive, Internet-based system that tracks and reports environmental hazards and the health problems that may be related to them. It currently provides information from health departments in 16 states and one city, which were involved in a pilot program to build local tracking networks. Missouri is currently a participant and there are plans to include Illinois, although there is currently no data from the Illinois side of the St. Louis area. Our team

was most interested in tracking health indicators related to air quality. It was important to select a limited number of indicators that would be easily understood by the lay public in the St. Louis area. Where available, the data is listed by county (see Tables 5 through 8). The specific indicators selected from the available pool of data include:

Ozone – days above the regulatory standard
PM2.5 – days above the regulatory standard
Hospitalizations for Asthma
Hospitalizations for Heart Attacks

Please review the CDC Tracking Network for a thorough explanation of the caveats and disclaimers associated with the data. The goal of the AQMP tracking effort is to establish a baseline and see if certain trends can be established as AQMP implementation proceeds over the years. It is anticipated that data from the Illinois side of the St. Louis area will be added to the public health tracking system in time for AQMP implementation.

Table 5 – Select Counties; Number of Days with Maximum 8-hour average Ozone Concentration over the 1997 NAAQS during 2004-2006

County/State	2004	2005	2006
St. Louis City/Mo	n/a	21	5
St. Louis County/Mo	1	31	17
Madison/IL	5	27	13
St. Clair/MO	2	17	7

Table 6 – Select Counties; Number of Days with PM2.5 Concentrations over the NAAQS during 2004-2006

County/State	2004	2005	2006
St. Louis City/Mo	4	18	1
St. Louis County/Mo	1	24	0
Madison/IL	7	31	11

Table 7 – Select Missouri Counties; Number of Asthma Hospitalizations during 2003-2005

County	2003	2004	2005
Franklin	74	70	75
Jefferson	214	238	193
St. Charles	243	242	284
St. Louis City	1099	1028	1027
St. Louis County	1437	1462	1554

Table 8 – Select Missouri Counties; Number of Heart Attack Hospitalizations during 2003-2005

County	2003	2004	2005
Franklin	406	334	357
Jefferson	479	466	400
St. Charles	793	712	656
St. Louis City	843	723	722
St. Louis County	2678	2387	2309

Re-evaluation of the AQMP Process

After completion of the first generation of SIP submittals under the AQMP and subsequent submittals, there will be an evaluation to review the process including environmental/health-benefit outcomes, communication and coordination issues between the states and the public/stakeholders, decision-making criteria and outcomes (including air quality priorities), and resources utilized to complete the necessary plan(s) compared to past plans. After this evaluation, the AQMP will likely be modified to increase efficiency and correct any problems noted during the previous iteration. The AQMP concept is designed to provide flexibility in managing the air quality resource and accountability to the public and stakeholders. This tailors itself to a ever-changing process to best manage the air quality resource. Section 9 discusses the adaptive management philosophy that will be utilized for the AQMP.

Section 9
Looking Beyond Current Requirements

The AQMP3 team agreed that the AQMP3 must be designed to be flexible enough to incorporate changing laws, regulations and air quality realities. Adaptive Management is a decision process that promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood[3]. Adaptive Management provides a framework for setting goals, developing priorities, implementing management actions, evaluating results and adjusting to lessons learned. The United States Department of Interior has published a technical guide to define adaptive management and guide its implementation in natural resources management[4]; the AQMP3 will incorporate this approach to address changing conditions in air issues/goals and community health and wellness results.

The AQMP3 has incorporated adaptive management concepts in its implementation and evaluation of technical achievements. The steps are:

1) Stakeholder involvement – This process has been key to the development of the AQMP3 and will continue throughout its implementation as described in various sections throughout this document.
2) Objectives – The objectives of the AQMP3 are driven by achieving compliance with all the NAAQS, reduction in air toxics exposure when identifying control strategies for NAAQS compliance and secondary evaluation metrics such as environmental justice, "smart" growth/transportation planning, and greenhouse gas emission reduction goals. The primary objectives are specific, measurable, achievable, results-oriented and time-fixed.
3) Management actions – The AQMP3 will have a wide variety of management actions available, which will need to be evaluated based on models and outcomes for effectiveness. The fundamental issues with "management actions" are the policy ramifications and outcomes of specific actions recommended by the AQMP3 technical analyses.
4) Models – Models are inherent to the air quality management process and specific models that will be used on the AQMP3 are identified in Sections 6 and 8.
5) Monitoring plans – The existing (and future) air quality monitoring networks in both Missouri and Illinois will be used to assess the impacts of management actions. These plans include on-going air toxics sampling in the metropolitan area and potentially increased sampling for NO_2 and SO_2 under the "new" standards.
6) Decision making – Decisions will be made based on the objectives and technical analyses, including air quality modeling and monitoring data, with stakeholder input. As additional monitoring data is collected, decisions will be re-evaluated for effectiveness.

[3] Department of the Interior manual #3786 dated 2/1/08
[4] Williams, B. K., R. C. Szaro, and C. D. Shapiro. 2009. Adaptive Management: The U.S. Department of the Interior Technical Guide. Adaptive Management Working Group, U.S. Department of the Interior, Washington, DC.

7) Follow-up monitoring and human health metric analyses – Air quality monitoring will continue throughout the AQMP3 implementation. As discussed in Section 8, Human health and economic indicators will also be used to evaluate the effectiveness of the management actions and their impacts on the community as a whole.
8) Assessment – Assessment of the effectiveness of the AQMP3 approach and decisions made in the process will be conducted as described in Sections 6, 7 and 8. This assessment will include an evaluation of the complex technical analyses under the AQMP, but also the outreach component and decision-making components of the plan. This assessment will generate a formal report on the AQMP3 process including its benefits and remaining issues/problems.
9) Iteration – The iterative nature of adaptive management will allow the management actions to be regularly evaluated and adjusted as necessary to achieve the goals. It also provides the flexibility to revise the goals based on new NAAQS, new air toxics data, or other priorities such as energy efficiency, smart growth, and greenhouse gas emissions.

Executive state and local leadership must be committed to the use of this AQMP3 approach and accept the inherent acknowledgement of uncertainty and culture of experimentation, innovation and learning that are required. Other stakeholders must be actively involved and committed to the adaptive management approach. At the same time, the adaptive management process must remain in compliance with specific legal State and Federal requirements. Of course, the ultimate measure of success is achievement of the management objectives, in this case attainment of NAAQS standards, reductions in air toxics exposure and the resulting human health and ecosystem benefits.

Next Steps

The three partners, Missouri, Illinois and EWGCOG, will continue to work towards implementation of the concepts contained within this AQMP3. The Air Quality Advisory Committee will serve as the mechanism to allow stakeholder input and discussion of the most effective strategies to attain NAAQS, reduce public exposure to air toxics and improve human health and environmental quality in the St. Louis area. As this process proceeds, AQMP3 specific materials will be posted on the EWGCOG web site as needed at http://www.ewgateway.org/environment/aq/aq.htm.