Proposed Revision to the Allegheny County Portion of the Pennsylvania State Implementation Plan

Attainment Demonstration for the Liberty-Clairton $PM_{2.5}$ Nonattainment Area 2006 Standards

Allegheny County Health Department
Air Quality Program

May 10, 2013

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ACRONYMS AND ABBREVIATIONS

ACHD	Allegheny County Health Department
AERMOD	American Meteorological Society/Environmental Protection Agency Regulatory Model
AQS	Air Quality System (EPA)
BACT	Best Available Control Technology
CAA	Clean Air Act
CAIR	Clean Air Interstate Rule
CAMD	Clean Air Markets Division
CAMx	Comprehensive Air quality Model with extensions
CFR	Code of Federal Regulations
CSAPR	Cross-State Air Pollution Rule
CSN	Chemical Speciation Network
CTG	Control Technique Guidelines
CTM	Chemical (or Chemistry) Transport Model
DON	Degree of Neutralization
EC	Elemental Carbon
EGU	Electric Generating Unit
EPA	The United States Environmental Protection Agency
ERC	Emission Reduction Credit
FMVCP	Federal Motor Vehicle Control Program
FLM	Federal Land Managers
FR	Federal Register
FRM	Federal Reference Method monitor
FEM	Federal Equivalent Method monitor
LADCO	Lake Michigan Air Directors Consortium
L-C	Liberty-Clairton
LPM	Local Primary Material
MACT	Maximum Achievable Control Technology
MANE-VU	Mid-Atlantic/Northeast Visibility Union
MARAMA	Mid-Atlantic Regional Air Management Association
MATS	Modeled Attainment Test Software
MFB	Mean Fractional Bias
MFE	Mean Fractional Error
MOVES	Motor Vehicle Emission Simulator model
MPO	Metropolitan Planning Organization
MSA	Metropolitan Statistical Area
MW	Megawatt
µg/m³	Microgram per cubic meter
µm	Micrometer, or micron
NAAQS	National Ambient Air Quality Standard
NAA	Nonattainment Area
NEI	National Emission Inventory (EPA database)
NH_3	Ammonia
NH_4	Ammonium Ion

NO_3	Nitrate Ion
NO_x	Oxides of Nitrogen
OC	Organic Carbon
OCMmb	Organic Carbonaceous Mass by Mass Balance
OPP	Other Primary $PM_{2.5}$
OTC	Ozone Transport Commission
PA DEP	Pennsylvania Department of Environmental Protection
PBW	Particle Bound Water
PennDot	Pennsylvania Department of Transportation
PiG	Plume-in-Grid model
PIT	Pittsburgh International Airport
PM	Particulate Matter (airborne) of any size
$PM_{2.5}$	Particulate Matter less than or equal to a nominal 2.5 microns in aerodynamic diameter, also referred to as fine particulates
PM_{10}	Particulate Matter less than or equal to a nominal 10 microns in aerodynamic diameter
PMF	Positive Matrix Factorization model
POA	Primary Organic Aerosol
PSAT	Particulate Source Apportionment Technology
RACM	Reasonably Available Control Measure
RACT	Reasonably Available Control Technology
RFP	Reasonable Further Progress
RPO	Regional Planning Organization
RRF	Relative Response Factor
RVP	Reid Vapor Pressure
SANDWICH	Sulfate, Adjusted Nitrate, Derived Water, Inferred Carbonaceous Material Balance Approach
SIP	State Implementation Plan
SMAT	Speciated Modeled Attainment Test
SMOKE	Sparse Matrix Operator Kernel Emissions System
SOA	Secondary Organic Aerosol
SO_2	Sulfur Dioxide
SO_4	Sulfate Ion
SO_x	Sulfur Oxides
SPC	Southwestern Planning Commission
SWPA	Southwestern Pennsylvania
TOA	Total Organic Aerosol
TR	Transport Rule
TEOM	Tapered-Element Oscillating Microbalance monitor
TPY	Tons Per Year (or Tons/Year) of pollutant emissions
TSD	Technical Support Document
TS|Pechan	TranSystems|E.H. Pechan & Associates
USGS	United States Geological Survey
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compound
WRF	Weather Research and Forecasting model

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1 Executive Summary

Particulate matter is a mixture of microscopic solids and liquid droplets suspended in air that include: acid salts (such as nitrates and sulfates), organic chemicals, metals, soil or dust particles, and allergens (such as fragments of pollen or mold spores). Fine particle pollution or $PM_{2.5}$ describes particulate matter that is less than or equal to 2.5 micrometer (µm, or micron) in diameter, approximately $1/30^{th}$ the diameter of a human hair.

Health studies have shown a significant association between exposure to fine particles and premature death from heart or lung disease. Fine particles can aggravate heart and lung diseases and have been linked to effects such as cardiovascular symptoms, cardiac arrhythmias, heart attacks, respiratory symptoms, asthma attacks, and bronchitis. These effects can result in increased hospital admissions, emergency room visits, absences from school or work, and restricted activity days. Individuals that may be particularly sensitive to fine particle exposure include people with heart or lung disease, older adults, and children.

In 1997, the United States Environmental Protection Agency (EPA) promulgated $PM_{2.5}$ national ambient air quality standards (NAAQS) of 15.0 µg/m³ on an annual basis and 65 µg/m³ on a 24-hour basis. The annual standard is based on a long-term average of concentrations, while the 24-hour standard is based on 98^{th}-percentile values of maximum daily concentrations.[1]

On December 18, 2006, a revised 24-hour $PM_{2.5}$ NAAQS became effective. The United States Environmental Protection Agency (EPA) published air quality designations for the $PM_{2.5}$ standard based on air quality monitoring data from 2006-2008 in the Federal Register on November 13, 2009, effective on December 14, 2009.[2] On that date, areas were designated as being either in or out of attainment of the revised 24-hour $PM_{2.5}$ NAAQS.

Most of the Pittsburgh Metropolitan Statistical Area (MSA) was designated as an 8-county nonattainment area called the Pittsburgh-Beaver Valley area, consisting of Beaver, Butler, Washington, and Westmoreland counties, along with portions of Allegheny, Armstrong, Greene, and Lawrence counties.

One portion of southeastern Allegheny County, the Liberty-Clairton area, was designated as a separate nonattainment area within the larger Pittsburgh-Beaver Valley area. The Liberty-Clairton nonattainment area consists of the boroughs of Glassport, Liberty, Lincoln, Port Vue, and the city of Clairton. Liberty-Clairton monitored data and other designation factors indicated that a more focused strategy for emission control was required for this particular area.

By December 14, 2012, three years after the effective date of nonattainment designations, State Implementation Plans (SIPs) for nonattainment areas are due to the U.S. Environmental Protection Agency (EPA). These SIPs must demonstrate that, by December 14, 2014, nonattainment areas under the state/local agency's jurisdiction will be in attainment of the new

[1] NAAQS are given in CFR Title 40 Part 50: http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&tpl=/index.tpl

[2] EPA Region III designations: http://www.epa.gov/pmdesignations/2006standards/final/region3.htm

standard. This SIP provides a control strategy and attainment demonstration of the 2006 $PM_{2.5}$ standards for the Liberty-Clairton nonattainment area.

Based on 2006-2008 monitored data, $PM_{2.5}$ design values for the Liberty-Clairton area were 18.3 $\mu g/m^3$ on an annual basis and 53 on a 24-hour basis. Modeling for this SIP shows attainment of the 15.0 $\mu g/m^3$ and 35 $\mu g/m^3$ standards for future case year 2014.

The primary control measures that enable the Liberty-Clairton area to demonstrate attainment of the $PM_{2.5}$ NAAQS include:

- Interstate transport rules issued by EPA to reduce upwind transport of $PM_{2.5}$ precursors from power plants
- Upgrades and shutdowns to United States Steel Corporation's (U. S. Steel) Mon Valley Works – Clairton Plant

All other controls included in the attainment demonstration are as developed for Regional Planning Organization (RPO) emission inventories, such as the MANE-VU (Mid-Atlantic/Northeast Visibility Union) inventory for Mid-Atlantic and Northeastern states. Allegheny County Health Department (ACHD) revised the MANE-VU inventory in order to more accurately address local emissions impacting the Liberty-Clairton area.

Other local controls affecting the area that have not been used as part of the modeled demonstration of attainment have been included as "weight of evidence," supporting the case that the area will achieve emission reductions. These controls include proposed deactivations or upgrades to stationary point sources, area/nonroad source emission rules, and mobile source emission reduction programs.

The modeling demonstration was performed using the Comprehensive Air quality Model with extensions (CAMx) model, with the Plume-in-Grid (PiG) option for selected local sources. Grid sizes ranged from 36 km for the continental U.S. to 0.8 km for southern Allegheny County and the Liberty-Clairton area. Years included in the inventory and modeling were 2007 for baseline case and 2014 for future projected case.

Procedures for modeling and attainment tests were followed according to EPA Modeling Guidance and the ACHD Liberty-Clairton $PM_{2.5}$ Modeling Protocol. Attainment test methodology was used to combine final modeled results with actual monitored results over the 2007-2014 timeframe. Total mass was reconstructed for $PM_{2.5}$ species using the SANDWICH technique (sulfate, adjusted nitrate, derived water, inferred carbonaceous material balance approach).

Results from the attainment demonstration showed an overall reduction of sulfates, nitrates, and primary $PM_{2.5}$ emissions throughout southwestern PA, including 291 tons of primary $PM_{2.5}$ for the Liberty-Clairton nonattainment area.

Future projected design values for the Liberty and Clairton monitor sites are given below:

Projected Annual Design Value Ranges (Standard = 15.0 µg/m³)
Liberty 11.6-12.1 µg/m³
Clairton 8.9-9.1 µg/m³

Projected 24-Hour Design Value Ranges (Standard = 35 µg/m³)
Liberty 34-35 µg/m³
Clairton 18 µg/m³

A Reasonably Available Control Technology (RACT) and Reasonably Available Control Measures (RACM) analysis was made for the nonattainment area. No additional controls, or combination of additional controls, would advance the attainment date by one year, so RACT and RACM are satisfied for this SIP.

This SIP also contains a contingency plan that provides assurance that, should the Liberty-Clairton area fail to attain the NAAQS by the attainment date, the area can be brought back into attainment as expeditiously as practicable.

2 Problem Statement

2.1 Introduction

The Clean Air Act requires a State Implementation Plan (SIP) to be written for any area designated nonattainment for the annual $PM_{2.5}$ pollution standard of 15.0 µg/m³ and/or for the daily $PM_{2.5}$ pollution standard of 35 µg/m³. In 2009, the United States Environmental Protection Agency (EPA) designated the Liberty-Clairton area as a $PM_{2.5}$ nonattainment area for the 2006 standards. Liberty-Clairton is a 12.5 square mile subset of the surrounding Pittsburgh-Beaver Valley $PM_{2.5}$ nonattainment area. The area was designated separately from the surrounding Pittsburgh-Beaver Valley area as a result of the complex interaction of a local emission source with meteorology and topography and subsequent air quality ranking factors that are not consistent with the surrounding area.[3]

2.2 Location and Topography

The Liberty-Clairton nonattainment area, consisting of Glassport, Liberty, Lincoln, and Port Vue Boroughs and the City of Clairton, is located roughly 10 miles southeast of the City of Pittsburgh. The area is made up of complex river valley terrain, approximately 3 miles wide by 5 miles long. It includes a 4-mile winding portion of the Monongahela River and is bordered by the Youghiogheny River to the east. The area includes rural land, densely populated residential areas, and industrial facilities. The 2010 population of the Liberty-Clairton area is 18,700, about 1.5% of the population of the Allegheny County.[4]

The river valleys lie at 718 feet in elevation above mean sea level (MSL), while adjacent hilltops can be greater than 1250 feet. Large temperature differences can be observed between the hilltop and valley floor (e.g. 2° - 7° F) during clear, light-wind, nighttime conditions. Strong nighttime drainage flows can cause differences of up to 180° in wind direction with 3-4 mph downward flows. Spikes in localized $PM_{2.5}$ concentrations have coincided with temperature inversions.

The Liberty-Clairton area is home to several industrial sources of $PM_{2.5}$ pollution. The U. S. Steel Mon Valley Works – Clairton Plant is the largest coke plant in the country, producing roughly 4.7 million net tons of coke annually. In addition the Liberty-Clairton area is also home to Koppers Industries, Inc.'s Clairton Tar Plant, nine permitted minor sources, and numerous small sources that do not require operating permits.

The Liberty-Clairton and Pittsburgh-Beaver Valley $PM_{2.5}$ nonattainment areas are shown in Figure 2-1.

[3] EPA factor analysis for Liberty-Clairton: http://www.epa.gov/pmdesignations/2006standards/rec/letters/03_PA_EPAMOD3.pdf

[4] U.S. Census Bureau data: http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml

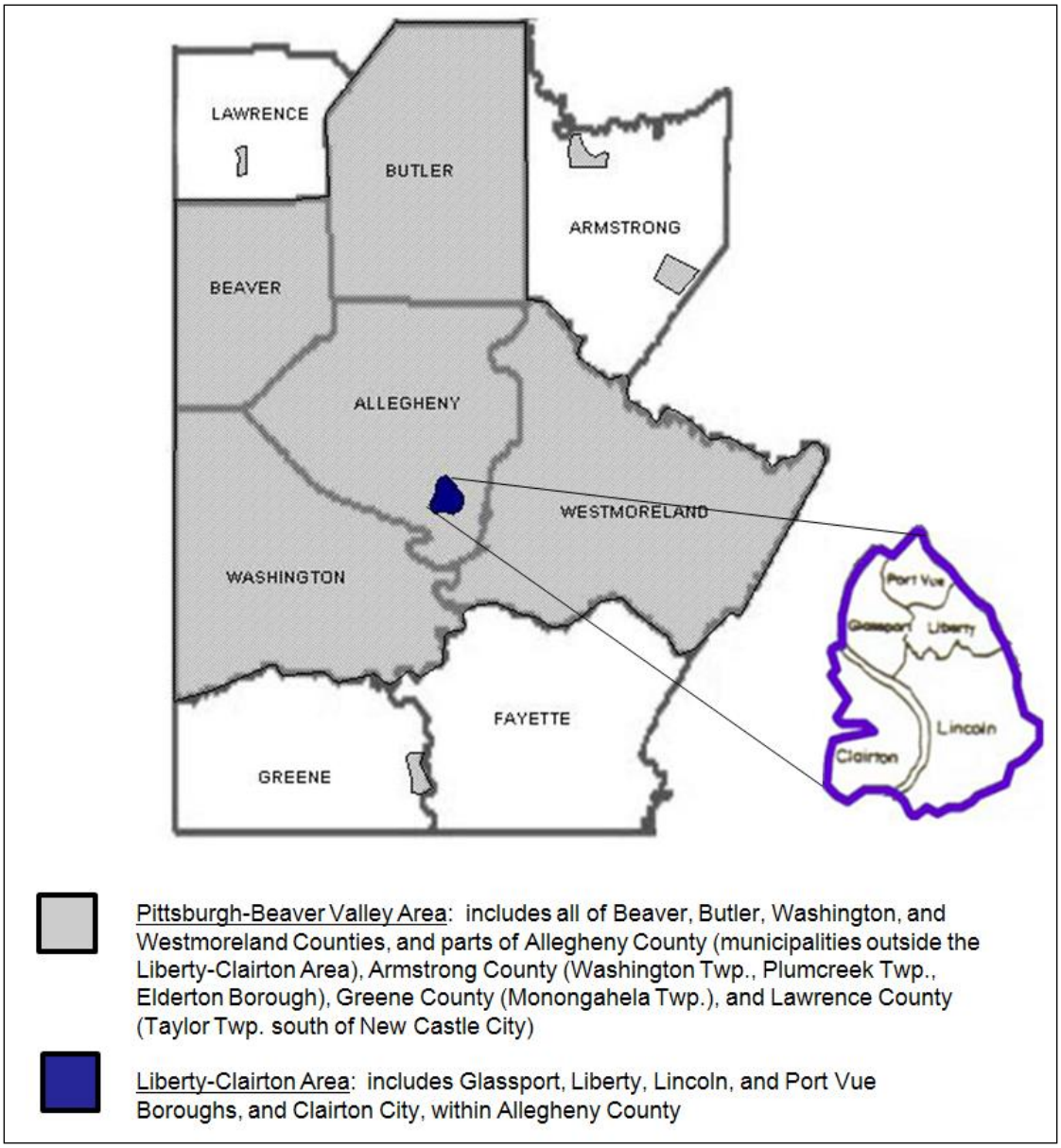

Figure 2-1. Map of the Liberty-Clairton Area within the Pittsburgh-Beaver Valley Area

2.3 Meteorology

Temperature inversions contribute to elevated levels of $PM_{2.5}$. (Note that, for the local region, temperature inversions are measured at least twice daily by balloon-borne radiosondes sent into the atmosphere by the National Weather Service (NWS) forecasting office near the Pittsburgh International Airport (PIT) and are assumed to represent stability conditions all across the county.) A temperature inversion occurs when the air at the surface becomes cooler than the air above it, i.e., the rate of cooling of the air is greatest at ground level whereas the rate of cooling of the air is less at elevated levels. The cooler, heavier air then becomes trapped at the lower elevation. As the major and minor sources of the area continue to emit $PM_{2.5}$ pollution and the lower, cooler air becomes buoyantly stable, the $PM_{2.5}$ is limited in its upward movement to disperse into the regional flow.

Typically, upon the inversion's break, local $PM_{2.5}$ is released into the upper atmospheric flow. Observations have shown that after this break, the Liberty monitor returns to a level comparable to or less than the concentrations measured at surrounding monitors.

Appendix A contains documentation of meteorological conditions affecting Allegheny County in general and the Liberty-Clairton area in particular. First, a report titled *Analysis of Meteorology on Days in 2005-2009 when $PM_{2.5}$ was At Least 35.5 $\mu g/m^3$ with a Focus on Extended, Continuous Exceedance Days* provides an examination of weather conditions observed at the Pittsburgh NWS office on days in 2005 through 2009 when Federal Reference Method (FRM) values in Allegheny County reached or exceeded a $PM_{2.5}$ level of 35.5 µg/m³ (the level at which an exceedance of the new standard may be registered).

The investigation focused on time periods with *extended* (i.e., at least four), *consecutive days* with $PM_{2.5}$ of at least 35.5 µg/m³. During 2005 through 2009, nine such periods were identified. These extended periods occurred from May through November. The synoptic weather map features were rather complicated, but generally indicated the influence of a high pressure system in the northeast U.S. with airflow backing from NW to W or SW at the 500 mb level (about 3.4 miles altitude). Typically, events associated with frontal activity, especially precipitation, appeared to dissipate the elevated $PM_{2.5}$.

The maximum temperature for the month was usually reached during the extended $PM_{2.5}$ periods. In fact, seven of the nine extended periods contained the monthly maximum temperature with the remaining two events reporting temperatures just one degree below the monthly high. Temperature *departures* averaged 7 °F above normal during the extended periods and even more within two days after $PM_{2.5}$ concentrations dropped below 35.5 µg/m³.

Resultant wind directions were around SW and speeds were light—typically 3 mph for resultant velocity and 4 mph for mean speed—during the high $PM_{2.5}$ days. Wind directions were generally outside the S through W quarter and a bit faster for two days prior to the high days, while the directions tended to be within the S through W quadrant but still faster for two days after.

Relative humidity averaged at the low 60 percent level. Levels prior to the elevated $PM_{2.5}$ event averaged a little higher, while levels after averaged more than ten percentage points higher, which makes sense, since precipitation often occurred to help end the pollution event. Prior to the event little to no precipitation was measured; however, the reported substantial amounts associated with the end of the event apparently were sufficient to independently dampen the $PM_{2.5}$ levels or at least to assist with the event's abridgement.

Finally, atmospheric stability conditions, as indicated by the presence of a significant (i.e., at least 1 °C in strength) morning ground temperature inversion, were evaluated. During the extended $PM_{2.5}$ events, morning inversions were generally moderate to strong, averaging 4.7 °C in strength and topping out at a mean of 200 m. The frequency was relatively high at 83% of mornings. By comparison, such inversions averaged only 2.8 °C at a height of 150 m and a frequency of 61% before the event and 1.5 °C at 140 m and 56% after.

With regard to the 2007 baseline case year, Figure 2-2 displays a wind, pollution, and temperature rose derived from Liberty continuous monitoring data. As indicated on the graph, the most frequent and fastest winds were generally from the SW through W directions. Concentrations of $PM_{2.5}$ as measured by Tapered-Element Oscillating Microbalance (TEOM) monitor equipment were largest from the S through SW directions. These are directions from which local and long-range transport carries substantial amounts of fine particulate matter to the Liberty monitoring site from large, stationary sources. And, logically, warmest temperatures were from the southerly directions. The coolest temperatures were from the W through NW directions.

The second document in Appendix A is an excerpt from *The Processing of CALMET Files for Allegheny County's $PM_{2.5}$ SIP Analysis* (Sullivan, 2007), which was a study conducted for a previous $PM_{2.5}$ SIP. This report includes pertinent weather data such as an analysis of the potential for low-level convergence during stable nocturnal conditions in the Liberty-Clairton area.

The third item in Appendix A is an excerpt from a report completed earlier for ACHD titled *Review of Meteorology at the Clairton Area: Strengthening Dispersion Modeling for State Implementation Plans* (Sullivan, 1996). The report's Executive Summary begins with the following:

> "Air quality management in Allegheny County is complicated by valley influences on pollutant transport and dispersion. In particular, valley meteorology has made it more difficult to establish the connection between emission control strategies and projected air quality benefits. Without sound projections of air quality benefits, costly control decisions can miss the mark, requiring repetitive attainment demonstrations that are costly to industry and the County. This is an important issue in the County that affects PM_{10} and SO_2 and potentially $PM_{2.5}$ (as an issue of the future) in several key valley segments in Allegheny County."

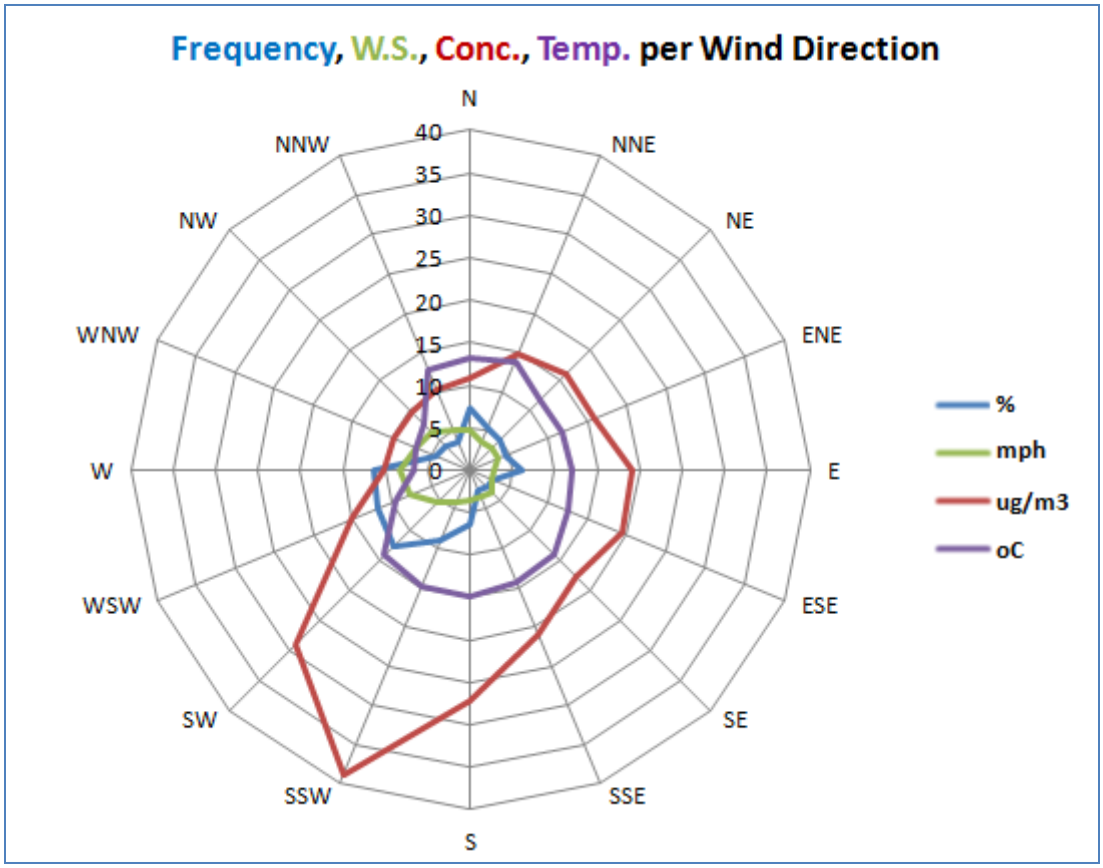

Figure 2-2. Wind Frequency and Speed, $PM_{2.5}$ Concentration (TEOM Measurements), and Temperature Roses for the Liberty Monitoring Site, 2007

2.4 Monitored Data

$PM_{2.5}$ monitors are currently located at 8 different monitoring locations throughout Allegheny County. The Lawrenceville monitor, located roughly 2 miles northeast of downtown Pittsburgh, is generally used to define urban concentrations of $PM_{2.5}$ and can sometimes be used to represent regional concentrations. Two FRM $PM_{2.5}$ monitors are located in the Liberty-Clairton area. The monitor at Liberty is located atop a school at high elevation near the center of the Liberty-Clairton area. The FRM monitor at Clairton is located atop a school at low elevation in the western portion of the area. Appendix B contains detailed monitored data and EPA Air Quality System (AQS) reports.

Allegheny County $PM_{2.5}$ annual and 24-hour design values (3-year averages of annual and 24-hour 98^{th}-percentiles, respectively) for the timeframe 2000-2011 are shown in Figures 2-3 and 2-4. All averages shown are for FRM monitors except Avalon, which was a Federal Equivalent Method (FEM) for 2010 and early 2011. The Liberty monitor shows concentrations that are higher than the rest of the Allegheny County network. (Note Figures 2-3 and 2-4 include some 3-year periods with low recovery quarters – i.e., less than 75% valid data per quarter – as noted in Appendix B.)

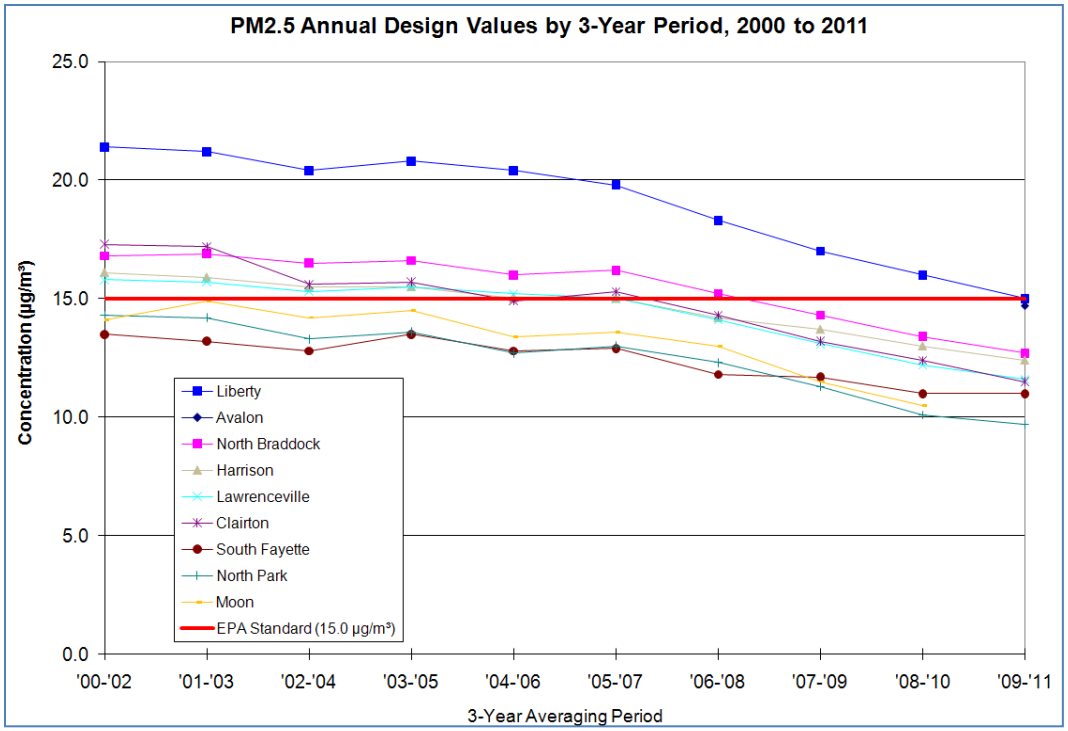

Figure 2-3. $PM_{2.5}$ FRM/FEM Annual Design Values, Allegheny County, 2000-2011

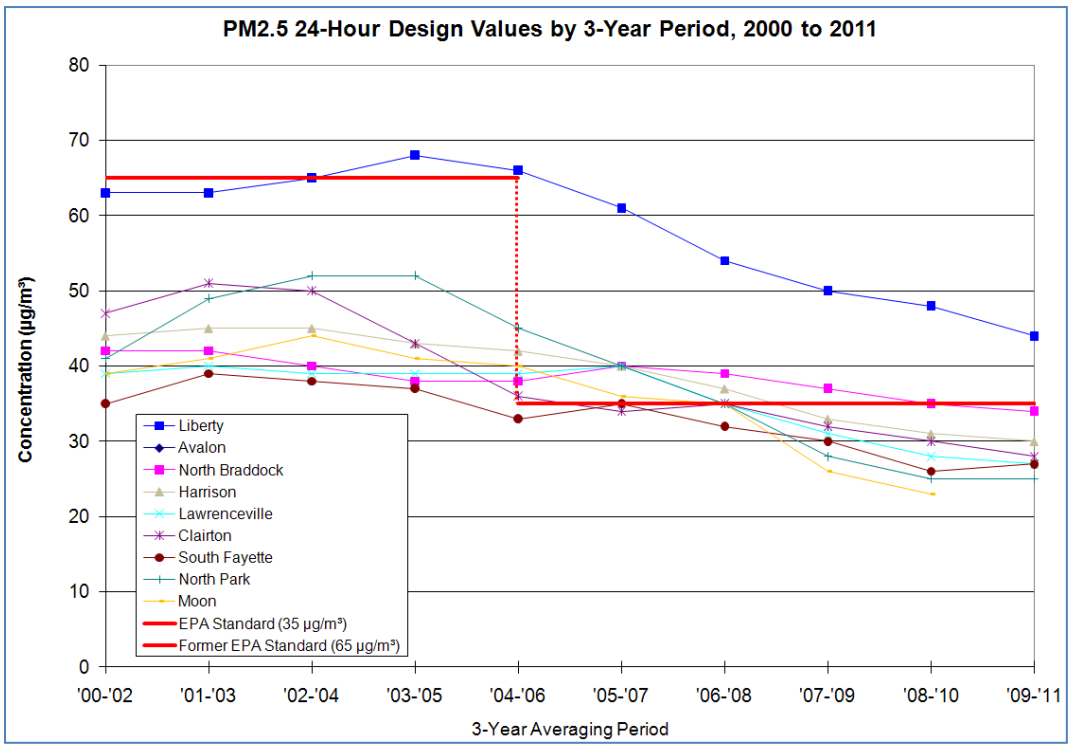

Figure 2-4. $PM_{2.5}$ FRM/FEM 24-Hour Design Values, Allegheny County, 2000-2011

Figure 2-5 shows 24-hour $PM_{2.5}$ concentrations at Liberty compared to the average of other Allegheny County sites on a 1-in-3 sampling schedule for year 2007 (the baseline case year for the modeling demonstration). Although the Liberty monitor shows concentrations similar to other sites at times, it also shows recurring peak days that are higher than the rest of Allegheny County. These high days lead to an excess of monitored $PM_{2.5}$ at Liberty on both long-term and short-term bases.

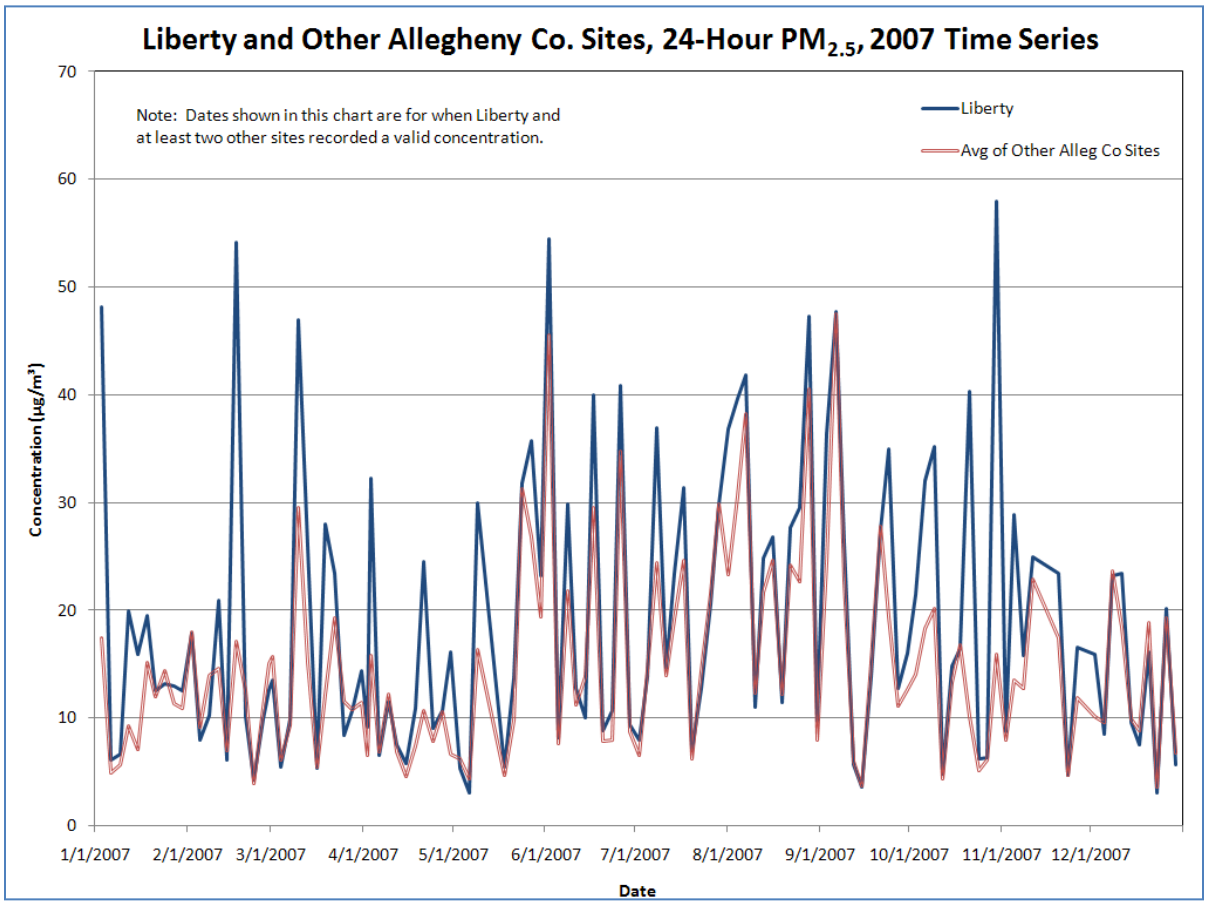

Figure 2-5. 24-Hour $PM_{2.5}$ Concentrations, 2007 Baseline Year, Liberty and Average of Other Allegheny County Sites

2.5 Speciation Data Analysis

Speciation data from the Chemical Speciation Network (CSN) and other networks are utilized to examine $PM_{2.5}$ at the component level. The localized excess in the Liberty-Clairton area has been determined through speciation data analysis.

A significant portion of the ambient $PM_{2.5}$ concentrations in the Pittsburgh Metropolitan Statistical Area (MSA) can be attributable to upwind sources in Ohio, West Virginia, and other states. Urban activity additionally contributes to concentrations within the Pittsburgh MSA,

compounded by localized activity in the Liberty-Clairton area. Liberty-Clairton is therefore impacted by a diverse combination of regional and local $PM_{2.5}$ sources. Source apportionment results based on speciated data can be found in the report *Allegheny County $PM_{2.5}$ Source Apportionment Results using the Positive Matrix Factorization Model (PMF Version 3.0) and Conditional Probability Function (CPF)* in Appendix C.

A comparison of regional, urban, and local concentrations shows species differences in the Liberty-Clairton area with respect to the surrounding area. Quaker City, OH and Dolly Sods, WV were examined as part of the rural/transport portion of $PM_{2.5}$, while Lawrenceville, Florence, and Greensburg are part of the urban excess portion of $PM_{2.5}$. Figure 2-6 shows long-term speciation averages, going west to east through the tri-state region, by major species over the weighted-data timeframe for this SIP.

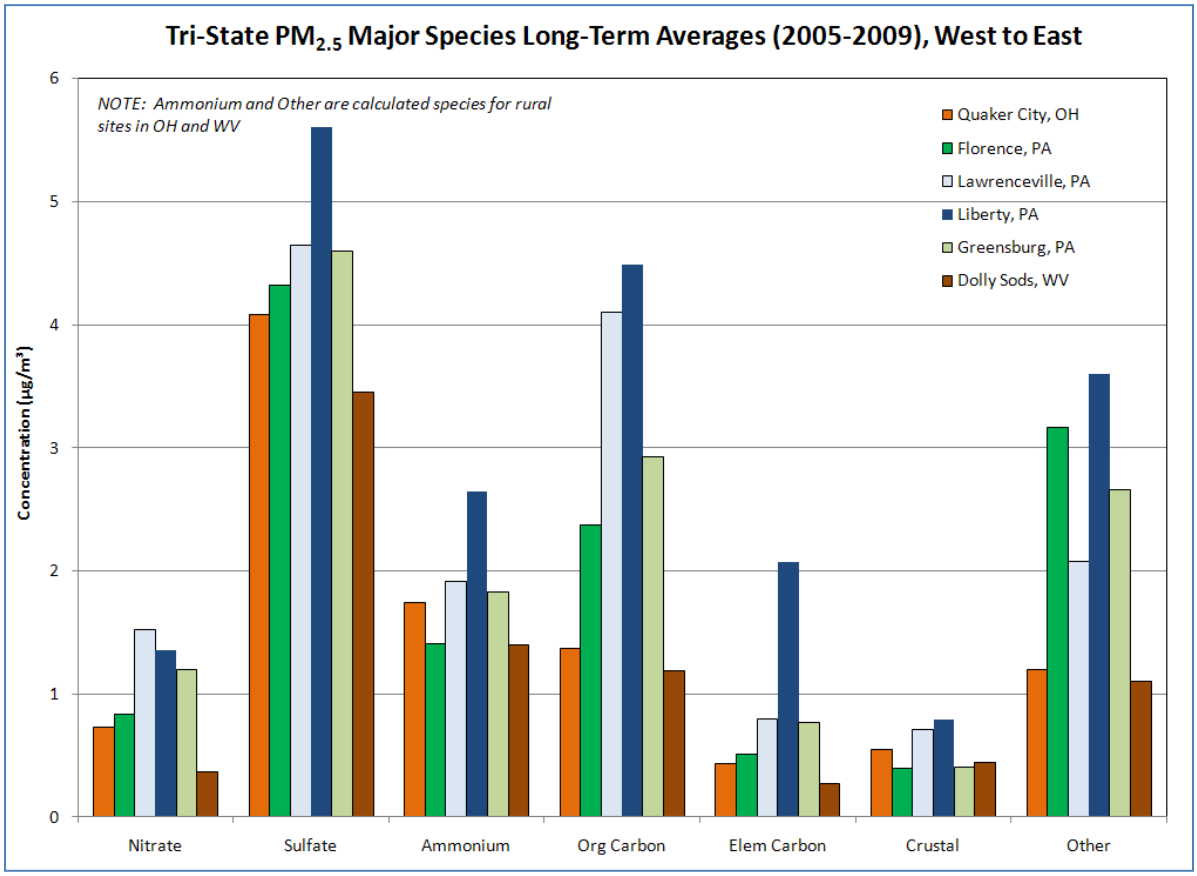

Figure 2-6. Tri-State Major $PM_{2.5}$ Species Concentrations

Concentrations at monitor sites roughly show increasing averages from west to east through the Pittsburgh MSA, followed by deceasing averages beyond the MSA. Liberty shows peaks for specific species, indicative of air composition that is not common throughout the greater tri-state region. (Note: "Other" component is the difference between total mass and the sum of the major

species. "Other" can represent particle-bound water, trace elements, unmeasured/unknown species, or differences due to analytical testing methods.)

Figure 2-7 below shows a pie chart of the long-term localized species excess at Liberty compared to the urban excess (i.e., Liberty minus the average of Lawrenceville, Florence, and Greensburg). These species are the focus of the modeling effort, since they are leading to the Liberty-specific concentrations compared to the surrounding area. (Note: EPA's SANDWICH method modifies the species, including nitrates, organic carbon, and "other" component; see Section 6, Attainment Tests.)

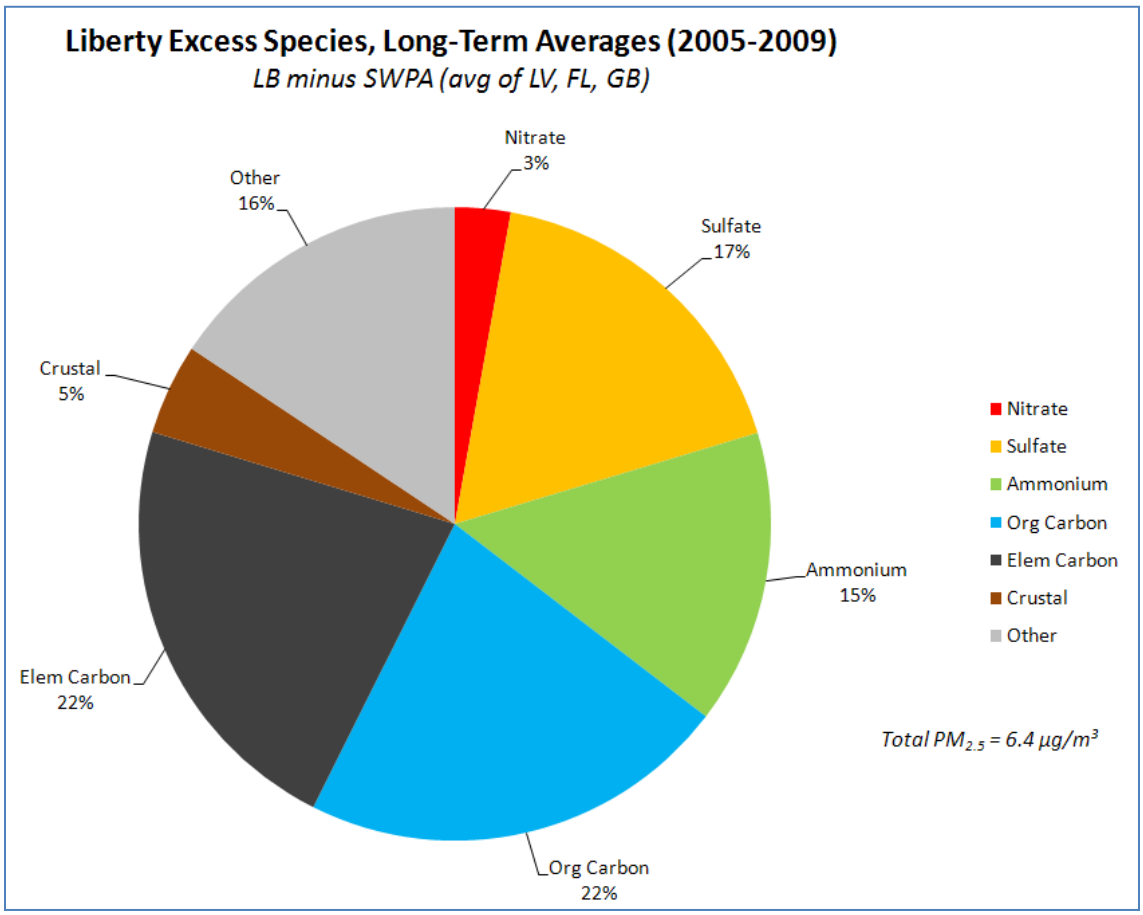

Figure 2-7. Localized Excess at Liberty, by Species Composition

An in-depth analysis of speciated $PM_{2.5}$ components in Allegheny County can be found in the report *$PM_{2.5}$ Chemical Speciation Analysis for the Liberty-Clairton Area, 2005-2009* in Appendix C-1.

3 Control Strategy

This section describes the control strategy implemented in order to reduce levels of $PM_{2.5}$ in the Liberty-Clairton nonattainment area. These controls have been incorporated in the future case modeling for this SIP.

3.1 Interstate Transport Rules for EGUs

EPA issued the Clean Air Interstate Rule (CAIR)[5] in March 2005 to reduce the emissions of SO_2 and NO_x from applicable electric generating units (EGUs) located in a participating state (in the Eastern U.S.) that were determined to contribute significantly to ozone and PM2.5 nonattainment areas in a neighboring downwind state (per the CAA §110(a)(2)(D)). CAIR is a regional cap-and-trade program that established SO_2 and NO_x emission budgets for each participating state.

EPA issued the Cross-State Air Pollution Rule (CSAPR)[6], originally known as the Transport Rule (TR), in July 2011 as a replacement interstate rule after CAIR was remanded without vacatur in Dec. 2008. CSAPR was subsequently vacated in Aug. 2012, with CAIR remaining in place for EGU emissions.

While ACHD continues to rely on CAIR as a federal interstate control program for EGUs, the CAIR inventory is an outdated inventory that may not adequately represent future conditions. There are inaccuracies in the CAIR projections as developed in 2005 regarding EGU controls and shutdowns. The CSAPR future case 2014 inventory was therefore used in the modeling demonstration as the more recent and realistic dataset for expected EGU emissions. Section 5.3.5 provides more details of CAIR/CSAPR, recently reported, and expected emissions for EGUs.

The CSAPR 2014 inventory included in the modeling for this SIP was based on the inventory developed in July 2011. Supplemental revisions and adjustments made to CSAPR from Dec. 2011 through June 2012 (not affecting PA allocations) were not included in the modeling inventories.

Figure 3-1 shows expected controls for coal-fired power plants in the Eastern U.S. by 2014.[7] Many of the controls involved power plants in the tri-state region of Pennsylvania, Ohio, and West Virginia (see Figure 3-2 for focus on this group of power plants, provided by EPA). Controls resulting from interstate EGU rules represent the majority of the regional reductions of $PM_{2.5}$ precursors (SO_2, NO_x) needed to achieve attainment in the Liberty-Clairton area.

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[5] CAIR information is available at: http://www.epa.gov/cair/. CAIR SO_2 budgets were promulgated upon issuance of the rule (see FR 70 (91) May 12, 2005, Table V-1), whereas the CAIR NO_x budgets are promulgated in 40 CFR 96.140 (annual NO_x) and 40 CFR 96.340 (ozone season NO_x). CAIR Phase I became effective on 1/1/2009 for NO_x and 1/1/2010 for SO_2. CAIR Phase II, with corresponding reductions in the state budgets, becomes effective on 1/1/2015. For SO_2, states have no discretion in their allowance allocation approach because CAIR uses the CAA Title IV SO_2 allowances, which have already been allocated in perpetuity to individual units per Title IV of the CAA. In PA, NO_x annual and ozone season allowances are allocated in accordance with 25 Pa. Code §§145.212 and 145.222, respectively.

[6] CSAPR information is available at: http://www.epa.gov/airtransport/

[7] Taken from EPA Clean Air Markets: http://epa.gov/airmarkets/quarterlytracking.html

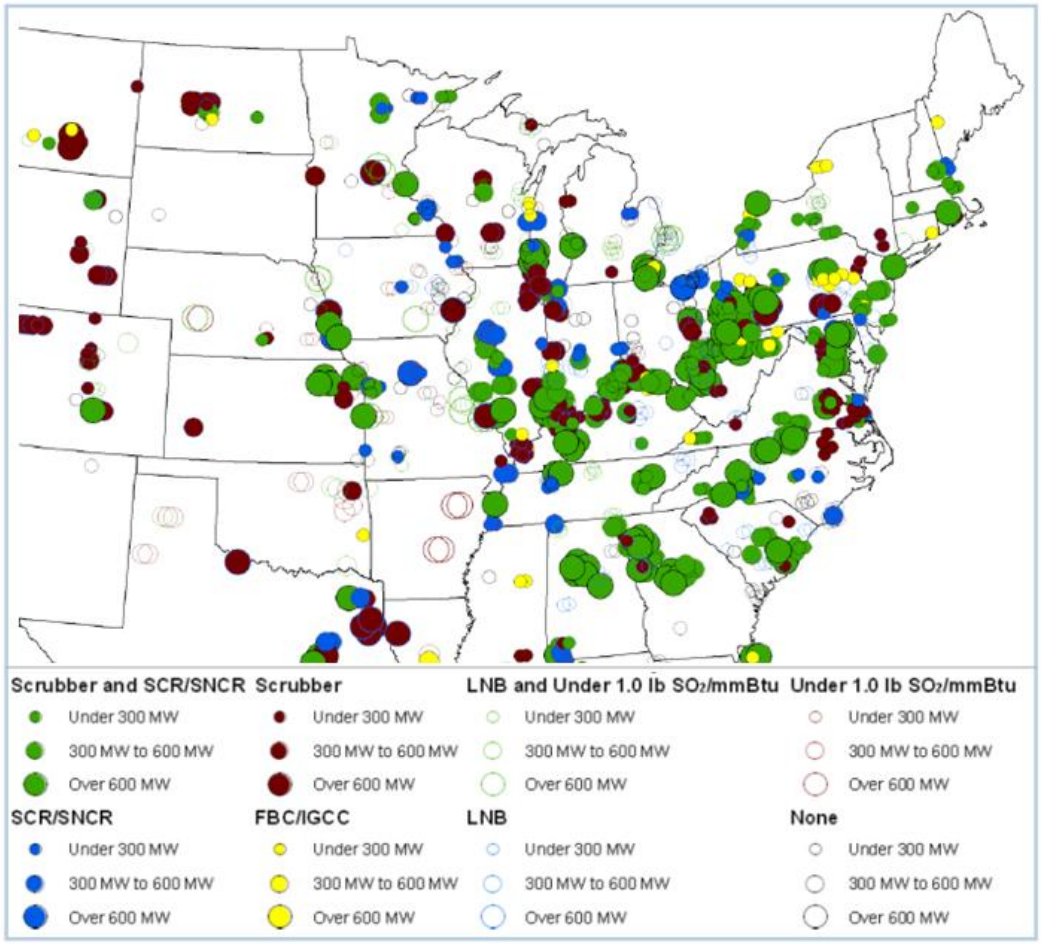

Figure 3-1. Expected Coal-Fired Power Plants Controls for SO_2 and NO_x by 2014

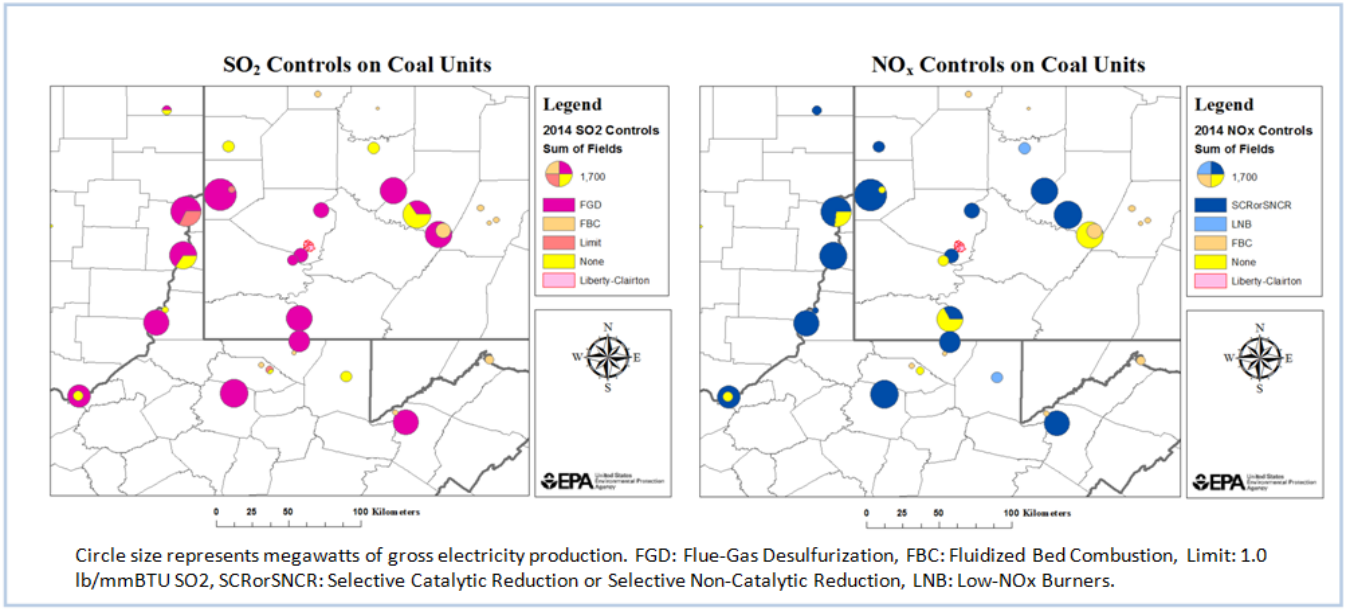

Figure 3-2. Tri-State Expected Coal-Fired Power Plants Controls for SO_2 and NO_x by 2014

3.2 U. S. Steel Mon Valley Works

United States Steel Corporation's (U. S. Steel) Mon Valley Works – Clairton Plant is the largest known individual source of $PM_{2.5}$ in the Liberty-Clairton area. The Clairton Plant is located in the City of Clairton on the west bank of the Monongahela River, directly upwind of the Liberty monitor site. Controls at the Clairton Plant represent the majority of the $PM_{2.5}$ reductions within the Liberty-Clairton area for future case year 2014.

A consent order and agreement between ACHD and United States Steel Corporation (U. S. Steel) was signed in March 2008, and amended in September 2010 and July 2011, requiring a number of actions at the U. S. Steel Mon Valley Works – Clairton Plant (and Edgar Thomson Plant) to resolve specific violations. Actions to be taken at the Clairton Plant included a number of installations and shutdowns, rebuilding of coke ovens, and other miscellaneous actions. The consent order and agreement is incorporated in the installation permit for the proposed Quench Towers 5A and 7A, constituting a federally enforceable agreement. The consent order as of July 2011 has been included in Appendix F-2 as supplemental information. The actions used in the modeling demonstration are as follows:

- Batteries 7, 8, and 9: Batteries 7-9 were permanently shut down on April 16, 2009. The original date for shut down was December 31, 2012 in the consent order and agreement. It is expected that the proposed new C Battery will replace the production of Batteries 7-9 at significantly lower emissions.

- Battery 19: U. S. Steel replaced 25 heating walls on Battery 19 by 2012. If necessary, an advanced patching plan will be implemented to reduce emissions.

- Quench Towers 5A and 7A: In September 2010, ACHD and U. S. Steel amended the March 2008 consent order and agreement to include the construction of new low emission quench towers for Batteries 13-15 and Batteries 19-20 by December 31, 2013. The new Quench Towers 5A and 7A will be used as the primary quench towers for Batteries 13-15 and Batteries 19-20, respectively. The current Quench Towers 5 and 7 will serve as auxiliary quench towers.

Additional Clairton Plant repairs included in the modeling demonstration were due to a previous consent agreement in 2007:

- B Battery: In June 2007, ACHD and U. S. Steel entered into a consent order and agreement to rebuild the B Battery heating walls, completed in 2010.

3.3 Source Shutdowns Adjacent to Liberty-Clairton

The following facilities immediately adjacent to the Liberty-Clairton area have been permanently retired, with no request for Emissions Reduction Credits (ERCs). Any future operation at these locations would require a new permit and new source review. These sources were therefore removed in the future case 2014 modeling inventory.

- General Motors (GM) Pittsburgh Facility: The GM stamping plant located in West Mifflin, west of Liberty-Clairton, was retired in April 2011.

- Ryan Metal Company, Inc.: The Ryan Metal scrap processing facility in McKeesport, east of Liberty-Clairton, was retired in 2009.

- Precoat Metals, a Division of Sequa Corporation: The Precoat metal surface coating facility in McKeesport, east of Liberty-Clairton, was retired in March 2009.

Tables of emissions by facility for Allegheny and Washington County sources, baseline and future cases, are given in Appendix F-2.

3.4 Regional Inventory Controls

Future case 2014 regional emissions inventories used for this attainment demonstration are as developed for Regional Planning Organizations (RPOs) such as the Mid-Atlantic/Northeast Visibility Union (MANE-VU) and the Lake Michigan Air Directors Consortium (LADCO). Control factors used to project regional emissions for these inventories incorporated federally enforceable rules and programs, including the following:

- Federal rules affecting specific sources/categories
- Federal MACT rules
- State-specific rules

Tables of the inventories used for the modeling demonstration by source category are given in Section 5. Technical Support Documents (TSDs) for the regional inventories and details of the specific controls are given in Appendices E and F. Projected emissions included the regional inventories that are not federally enforceable were used for modeling purposes only.

4 Emissions Inventory

Section 51.1008 of 40 CFR Part 51 requires an emissions inventory, based on the requirements of section 172(c)(3) of the CAA, for any $PM_{2.5}$ nonattainment area. As specified by the EPA, pollutants inventoried for the Liberty-Clairton $PM_{2.5}$ nonattainment area include PM_{10} and $PM_{2.5}$ along with precursors SO_2, NOx, VOC, and NH_3. Much of the particulate emissions within the nonattainment area are transported from the surrounding area, including Southwestern Pennsylvania and states to the west and south of Pennsylvania.

The emissions inventory for Liberty-Clairton was compiled for sources within the nonattainment area (City of Clairton, Glassport Borough, Liberty Borough, Lincoln Borough, Port Vue Borough). Sources in the emissions inventory include stationary point sources, area/nonroad sources, and mobile sources. The stationary point sources include two major sources (U. S. Steel Clairton and Koppers), two "synthetic minor" sources (Pennsylvania Electric Coil and Durabond), and seven minor sources.

Emissions inventories for all source classifications were developed for the Mid-Atlantic / Northeast Visibility Union (MANE-VU) for the Northeastern U.S. for use in regional analyses and SIPs. The Liberty-Clairton emissions inventory was developed from the regional MANE-VU inventories with revisions by TranSystems|E.H. Pechan (TS|Pechan) for area, nonroad, and mobile sources and by ACHD for stationary point sources. (More information on the TS|Pechan contract can be found in Section 5.) Emissions given are "actual" values based on pollutant emission factors and throughputs or capacities of each emission source. Emissions do not represent permitted or "allowable" limits.

The year 2007 was used for baseline emissions inventory, and year 2014 was used for the projected inventory. Local controls were focused on direct $PM_{2.5}$ emissions from stationary point emissions, while regional controls for SO_2 and NO_x were based on CSAPR allocations.

Source categories and methodologies used for the emissions inventory are described below. The inventory listings are included in Appendix D, and information on the development of the baseline and projected emissions and modeling inventories are given in Appendices E and F.

- Stationary point sources are sources for which ACHD collects individual emissions-related information. Revisions were made by ACHD to 2007 point source emissions based on newer emissions estimates that do not reflect originally submitted data. Additionally, the future case includes revisions by TS|Pechan that were not part of the MANE-VU projections.

- Area sources are industrial, commercial, and residential sources too small or too numerous to be handled individually. These include but are not limited to commercial and residential open burning, architectural and industrial maintenance coatings application and clean-up, consumer product use, and vehicle refueling at service stations. Area emissions for the Liberty-Clairton area were estimated by TS|Pechan.

- Nonroad sources encompass a diverse collection of engines, including but not limited to outdoor power equipment, recreational vehicles, farm and construction machinery, lawn and garden equipment, industrial equipment, recreational marine vessels, commercial marine vessels, locomotives, ships, and aircraft. Nonroad emissions for the Liberty-Clairton area were estimated by TS|Pechan.

- Mobile sources include passenger cars and light-duty trucks, other trucks, buses and motorcycles. The Motor Vehicle Emissions Simulator (MOVES) model was utilized to generate emissions based on traffic counts, vehicle speeds, vehicle population growth, and other factors. Mobile source emissions for the Liberty-Clairton area were estimated by TS|Pechan.

Emissions inventory summaries for baseline and future projected cases are shown in Tables 4-1 and 4-2 below. These emissions represent sources only within the 5-municipality Liberty-Clairton area and not the surrounding area.

Table 4-1. Baseline 2007 Emissions (Tons/Year)

Liberty-Clairton Area (2007)	**$PM_{2.5}$**	**PM_{10}**	**SO_2**	**NO_x**	**VOC**	**NH_3**
Stationary Point Sources	946.6	1136.9	1741.3	4841.9	590.5	18.4
Area Sources	26.3	50.5	50.1	38.8	255.9	4.2
Nonroad Sources	15.0	15.9	17.2	437.9	86.6	0.2
Mobile Sources	9.9	10.4	2.1	274.3	172.5	4.7
Totals	997.8	1213.8	1810.9	5592.9	1105.6	27.5

Table 4-2. Future Projected 2014 Emissions (Tons/Year)

Liberty-Clairton Area (2014)	**$PM_{2.5}$**	**PM_{10}**	**SO_2**	**NO_x**	**VOC**	**NH_3**
Stationary Point Sources	662.7	853.7	1720.5	4349.3	460.1	17.6
Area Sources	25.6	49.5	49.6	38.5	252.0	4.2
Nonroad Sources	12.4	12.7	6.0	387.1	58.5	0.2
Mobile Sources	6.2	6.6	0.9	151.0	95.1	3.4
Totals	706.8	922.4	1777.1	4925.9	865.6	25.3

5 Modeling

5.1 Design and Modeling Protocol

Modeling for the Liberty-Clairton area was focused on the simulation of regional impacts due to $PM_{2.5}$ precursors and the localized impacts from direct $PM_{2.5}$ sources. A photochemical model with plume-tracking options was utilized at fine grid resolution to adequately model both long-range transport and near-field impacts.

ACHD followed modeling procedures outlined by the *$PM_{2.5}$ Modeling Protocol, 2006 $PM_{2.5}$ Standards, Liberty-Clairton Nonattainment Area* (given in Appendix G-1) and by the EPA Modeling Guidance[8]. Modeling was performed using the CAMx model with the Plume-in-Grid (PiG) and Particle Source Apportionment Technology (PSAT) modules for local source tracking.

5.2 Emissions/Modeling Assistance

To better understand air-quality impacts from $PM_{2.5}$ emissions in Allegheny County, especially in the Liberty-Clairton area, and to continue with effective programs to attain and maintain the NAAQS, ACHD contracted three highly qualified consulting firms. The following three contractors assisted the ACHD with three different but interrelated $PM_{2.5}$ SIP projects.

- TranSystems|E.H. Pechan & Associates (TS|Pechan) of Springfield, VA conducted an in-depth investigation of transportation and area-wide sources of $PM_{2.5}$ in southern Allegheny County (ACHD contract title *Consultant Technical Support for Air Pollutant Area and Mobile Sources Analyses*)

- Alpine Geophysics of Arvada, CO operated a state-of-the-science meteorological model (ACHD contract title *Meteorological Data Preparation*)

- ENVIRON International Corporation (ENVIRON) of Novato, CA provided advanced computer modeling that incorporated the work of the other two contractors into a more-realistic representation of $PM_{2.5}$ impacts in Allegheny County (ACHD contract title *Reactive Pollutant Modeling*)

Each company had been tasked with a critical component of the "air-pollution system." This system consists of sources, dispersion, and receptors of pollutants. Furthermore, air-pollutant *modeling*, which was a critical part of the contracting work, ties the system components together to produce an expected impact of known pollution sources on surrounding communities.

Modeling is a mainstay of today's environmental field; it is a tool used to simulate real-world conditions. For air-quality studies, "air-dispersion modeling," as described by the EPA, "uses mathematical formulations to characterize the atmospheric processes that disperse a pollutant

[8] *Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze*, U.S. EPA, April 2007.

emitted by a source. Based on emissions and meteorological inputs, a dispersion model can be used to predict concentrations at selected downwind receptor locations."

Following are brief descriptions of the contract work that helped to produce the demonstration of Allegheny County's (including Liberty-Clairton area) attainment and continued maintenance of the new 24-hour $PM_{2.5}$ standard.

Consultant Technical Support for Air Pollutant Area and Mobile Sources Analyses contract. A more reliable representation of observed (and forecasted) air-quality concentrations can be achieved by collecting more and better information. Such collection is part of the ACHD's continued monitoring efforts throughout the county. However, additional investigation of $PM_{2.5}$ sources had been assigned to contractor TS|Pechan. Specifically, TS|Pechan reviewed existing $PM_{2.5}$ inventories and related documents for local area and mobile sources. The review included field work, records and data searches, and calculations necessary to evaluate and modify the existing 2007 SIP emissions inventories. Furthermore, TS|Pechan performed a reasonably available control measures (RACM) analysis, which included examining reasonably available control technology (RACT), on all area and mobile sources listed in the revised 2007 SIP emissions inventory. This work addressed the "source" component of the air-pollution system described above.

Meteorological Data Preparation contract. The "dispersion" aspect of the air-pollution system was assumed by the ACHD's analysis of ongoing county and federal meteorological station data along with the addition of Alpine Geophysics work. Under this contract, Alpine Geophysics expedited weather data processing for use with air-quality models such as, but not limited to AERMOD (American Meteorological Society/Environmental Protection Agency Regulatory Model), CALPUFF (originally sponsored by California Air Resources Board), and CAMx ("Comprehensive Air quality Model with extensions"). The data processing was performed using the WRF model (a model originally developed with assistance from the National Center for Atmospheric Research, the National Oceanic and Atmospheric Administration, and other government and university organizations). Large- and fine- mesh grids at numerous vertical levels were employed to simulate atmospheric conditions across Allegheny County, with a focus on the Liberty-Clairton area. In addition, the Plume-in-Grid (PiG) model was used to simulate fine particulate matter impacts within the Liberty-Clairton area. (Note that ENVIRON was a subcontractor to Alpine Geophysics on the data preparation work.)

Reactive Pollutant Modeling contract. Finally, to address the "receptors" of the air-pollution system, ENVIRON was contracted to assist the ACHD with determining present and future $PM_{2.5}$ concentrations in the county. ENVIRON's work involved application of CAMx - a model developed by ENVIRON. Using county tabulated emissions, and mobile and area emission values calculated from the Sparse Matrix Operator Kernel Emissions System (SMOKE) model, along with WRF model results as input to CAMx, ENVIRON conducted air modeling using large and fine grids (see below). Then, after validating the model, ENVIRON ran CAMx for present conditions and control strategies to demonstrate compliance with the $PM_{2.5}$ NAAQS. (Note that Alpine Geophysics was a subcontractor to ENVIRON on the modeling project.)

5.3 Methodology

The modeling methodology focused on the transformation of $PM_{2.5}$ precursors along with the near-field impact of primary $PM_{2.5}$. The EPA Modeling Guidance outlines techniques that can be used to model primary $PM_{2.5}$. This section describes the steps used to model the Liberty-Clairton area. More information on the model methodology can be found in Appendix G (Modeling Documentation).

5.3.1 Models Selection

The Comprehensive Air Quality Model with extensions (CAMx Version 5.4, released in October 2011) was used by ENVIRON for the modeling of the Liberty-Clairton area. The model was designed to include both regional and localized $PM_{2.5}$ impacts formed by both primary and secondary mechanisms. CAMx includes several features that were deemed important for $PM_{2.5}$ modeling of the Liberty-Clairton area:

- Two-way grid nesting to allow regional- and local-scale impacts within the same simulation
- Subgrid-scale PiG module to sample the puffs for the contributions of local sources
- CB6 chemical mechanism that represents the latest understanding of photochemistry
- PSAT, important for obtaining the separate contributions from local sources

Since the Liberty-Clairton excess is composed of both primary and secondary components of $PM_{2.5}$, emission inputs for CAMx included all $PM_{2.5}$ precursor pollutants (SO_2, NO_x, VOCs, NH_3) along with primary filterable and condensable $PM_{2.5}$.

Meteorological inputs for CAMx were generated by Alpine Geophysics using the WRF model. The WRF grids followed the same grid resolutions as the CAMx, creating several layers of meteorological data for each modeled grid cell.

5.3.2 Local Source Treatment

To account for significant individual emission sources in an area of interest, the Plume-in-Grid (PiG) option incorporates a puff/plume model within the larger-scale grid model CAMx. According to Karamchandani, et al., 2011, "[t]he embedded model tracks the sub-grid scale process (e.g., elevated point source emissions) until the fine scale variability becomes unimportant (referred to as the 'puff dumping' or 'hand-over' point), at which point the grid model takes over the calculations for that process while the embedded model continues tracking sub-grid scale processes." The authors go on to say that a plume "is represented by a myriad of three-dimensional puffs that are advected and dispersed according to the local micrometeorological characteristics…. Also, the effects of buoyancy on plume rise and initial dispersion are simulated by solving the conservation equations for mass, heat, and momentum." Furthermore, "[c]hemical species concentrations in the puffs are treated as perturbations from the background concentrations."

Additionally, the Particle Source Apportionment Technology (PSAT) option was used to track contributions from a selected group of local sources. This technique enabled the results of both regional and local impacts to be used in the attainment tests (see Section 6).

The local point sources selected for PiG and PSAT handling were based on location within or in close proximity to the Liberty-Clairton area, amount of baseline year 2007 pollutant emissions, and source factor "fingerprint" based on the PMF source apportionment. That is, these sources are the sources that are most likely leading to concentrations that are measured at the Liberty monitor site. Sources selected for local source treatment are given in Table 5-1 below, along with their associated precursor and $PM_{2.5}$ emissions in tons/year.

Table 5-1. Local Sources for PiG and PSAT Treatment

Facility	Precursors (tpy of SO_2, NOx,VOC,NH_3)	$PM_{2.5}$ (tpy)	Dist. From Liberty (km)	Comments
AKJ Industries	0.03	0.03	2.0	Liberty-Clairton area
Braddock Recovery	6.62	1.70	7.7	Located at US Steel ET Plant
Clairton Slag	12.87	2.75	6.6	Upwind
Consol Coal	0.87	0.66	6.3	Upwind
CP Industries	2.09	0.94	1.7	Proximity to area
Dura-Bond Industries	14.13	3.60	1.8	Liberty-Clairton area
Eastman Chemical Resins	25.50	17.57	7.0	Upwind, major source
ELG Metals	0.48	1.93	1.5	Liberty-Clairton area
Gardner Denver Nash	4.09	0.19	5.1	Upwind
GM Metal Stamping	9.24	1.28	3.6	Proximity to area
Guardian Industries	782.94	19.97	8.5	Upwind, major source
Kelly Run Sanitation	19.15	4.98	8.5	Upwind
Kinder-Morgan	4.64	0.20	3.5	Proximity to area
Koppers Tar Plant	29.13	5.96	2.3	Liberty-Clairton area
Liberty Pultrusions	11.74	0.05	3.1	Proximity to area
Marathon Ashland	6.94	0.37	8.4	Upwind
Mid-Continent C & C	6.55	1.79	2.8	Liberty-Clairton area
Mon Valley Transport	0.00	3.76	1.7	Liberty-Clairton area
Pennsylvania Electric Coil	2.38	0.03	2.3	Liberty-Clairton area
Precoat Metals	27.78	0.76	2.3	Proximity to area
Ryan Metals	0.42	7.10	2.3	Proximity to area
Sanyo	8.60	1.73	7.0	Upwind, located at Eastman
Tube City IMS Braddock	0.00	3.07	7.7	Located at US Steel ET Plant
Tube City IMS Clairton	0.00	0.31	2.8	Liberty-Clairton area
TYK Refractories	12.60	0.48	5.9	Upwind
US Steel – Clairton Plant	7136.30	929.18	2.1	Liberty-Clairton area
US Steel – ET Plant	2255.84	803.29	7.8	Major source
US Steel – Irvin Plant	1223.10	51.12	2.9	Major source
Allegheny Energy Mitchell	2145.24	79.85	14.3	EGU
GenOn Energy Elrama	10324.22	512.82	8.9	EGU

The local sources are additionally shown on an aerial map in Figure 5-1 below.

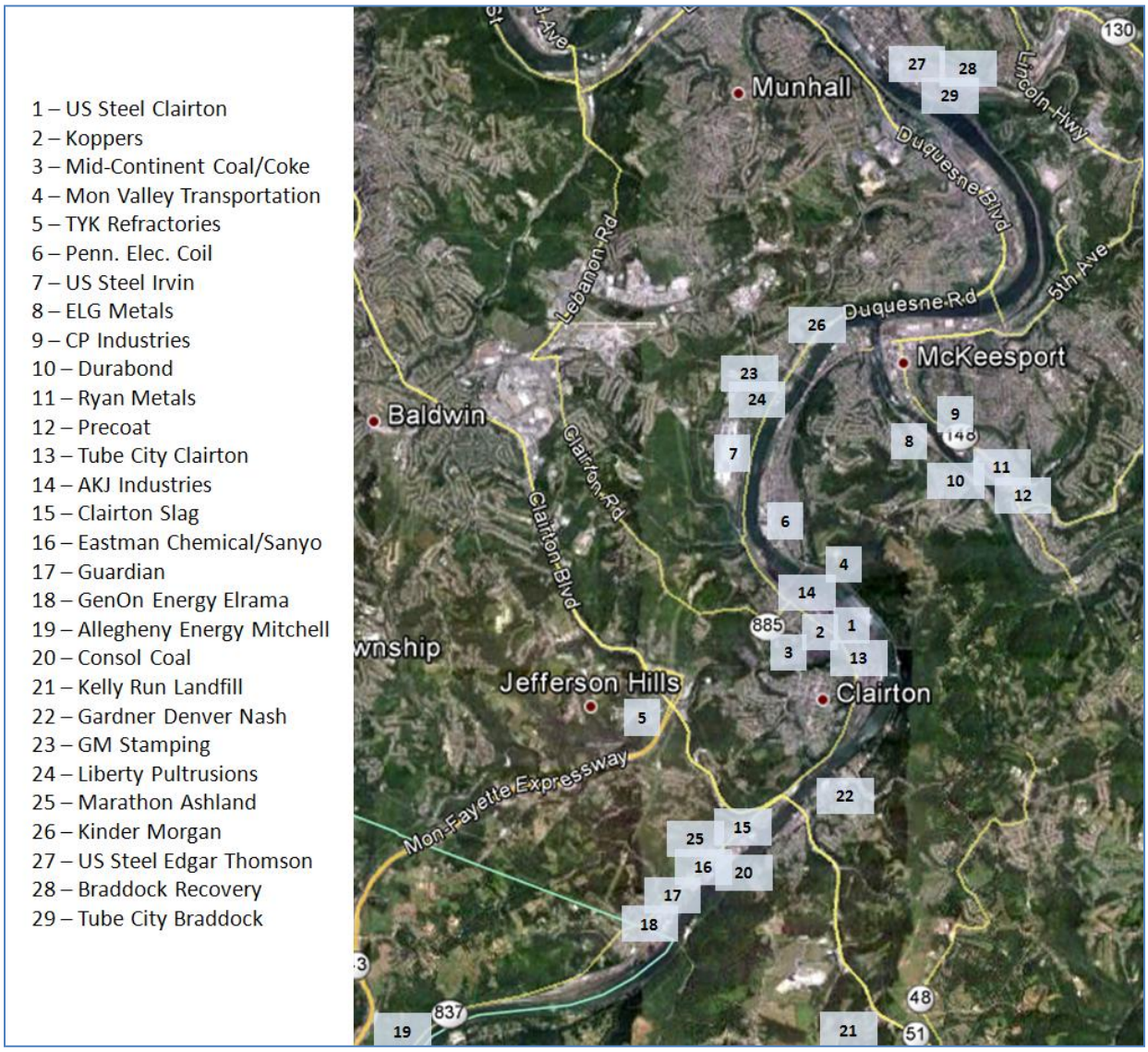

Figure 5-1. Aerial Map of Local Sources for PiG and PSAT Handling

5.3.3 Modeling Domains

WRF and CAMx were run for a 36/12/4/0.8 km domain structure, defined as follows:

- 36 km continental U.S. (CONUS) domain to be the standard RPO domain, run as a stand-alone simulation, results post-processed to define Boundary Conditions (BCs) for the 12 km North East U.S. (NEUS) domain
- 12 km NEUS domain that includes states in the Midwestern and Northeastern U.S. that the Cross State Air Pollution Rule (CSAPR) identified as contributing significantly to $PM_{2.5}$ at Liberty
- A 4 km domain that covers southwestern Pennsylvania (SWPA) and adjacent areas in West Virginia and Ohio
- A nested grid of 0.8 km (800 m) for the area within and surrounding the Liberty-Clairton area

Figures 5-2 through 5-4 show maps of the modeled domains.

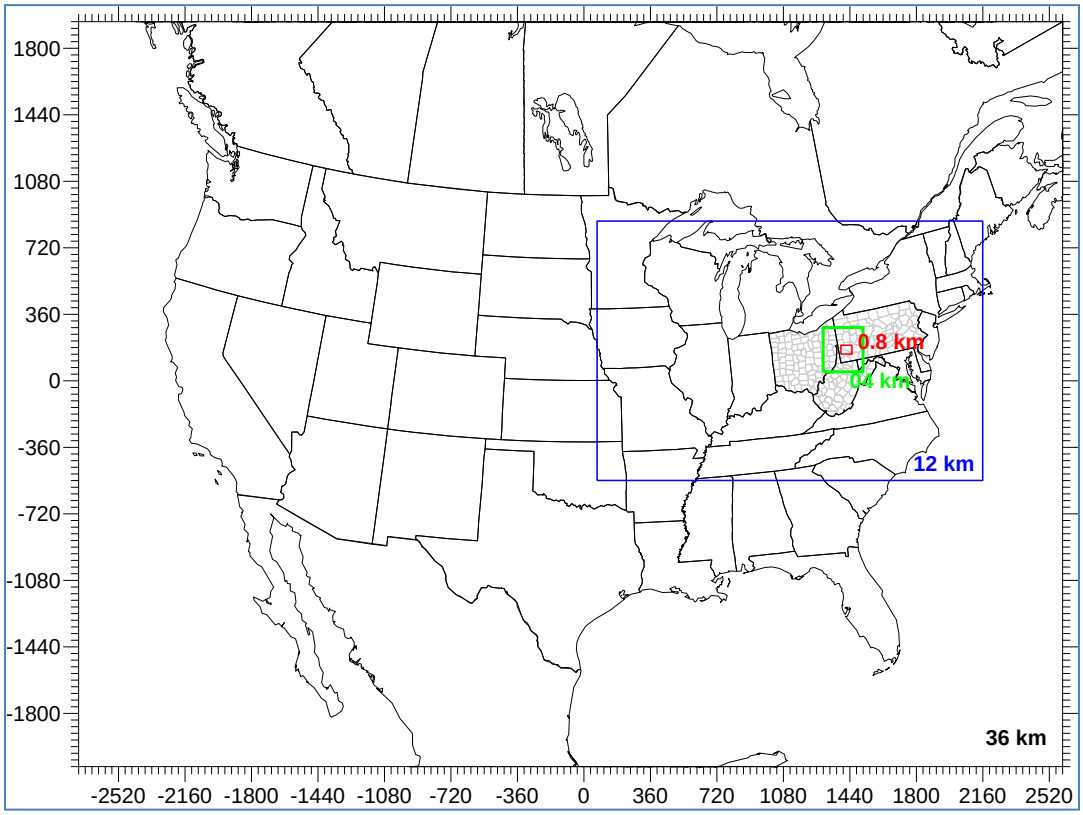

Figure 5-2. 36/12/4/0.8 km Modeling Domains

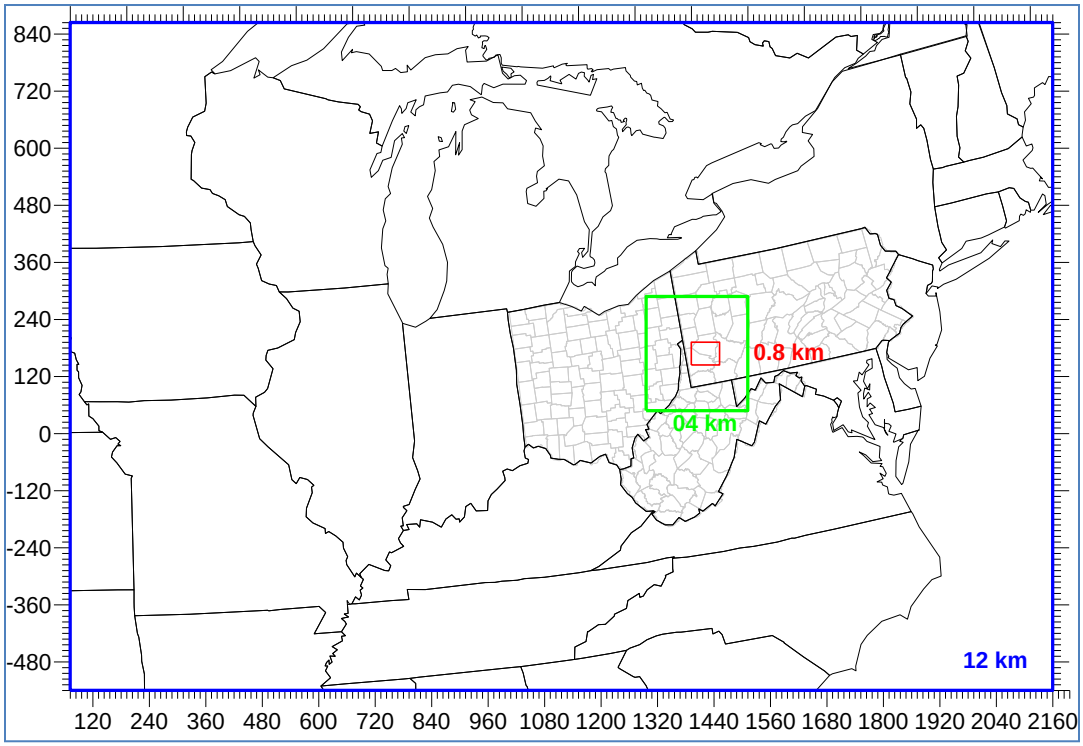

Figure 5-3. 12/4/0.8 km Modeling Domains

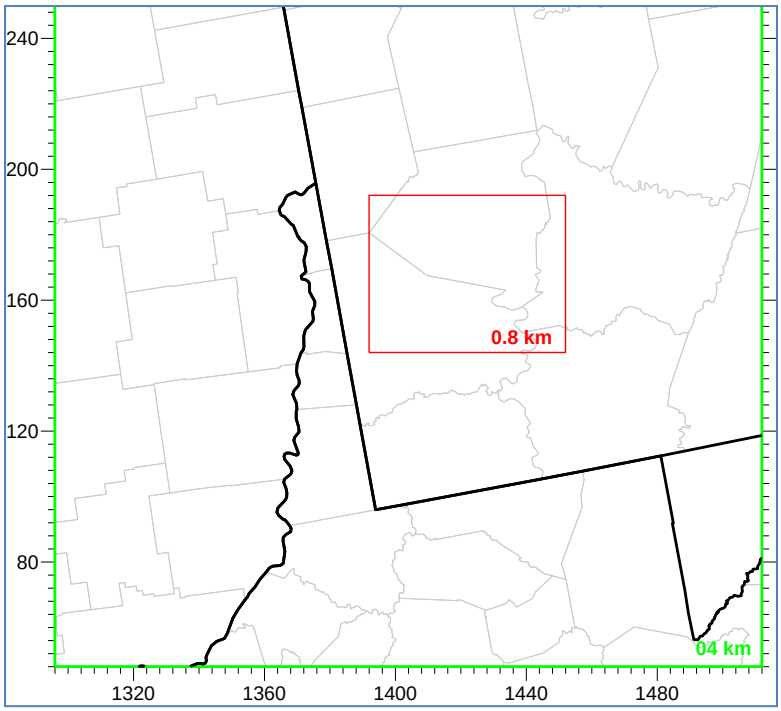

Figure 5-4. Initial 4/0.8 km Modeling Domains
(Note: The final 0.8 km domain was reduced in size.)

5.3.4 Modeled Inventories

Emissions inventories for the baseline year modeling were based on MANE-VU/MARAMA[9] LADCO[10], and the Southeastern Modeling, Analysis, and Planning (SEMAP[11]) Project 2007 inventories. In cases where the 2007 data was unavailable, U.S. EPA's 2008 National Emissions Inventory (NEI[12]) was back-casted to 2007. Revisions were made by ACHD and TS|Pechan to Allegheny County sources, based on updated stack test data, corrections to emissions or stack parameters, or revised emission calculation methodologies. Details of the inventory development are given in Appendices E and F. Table 5-2 below shows the 2007 modeled inventories by U.S. region.

Table 5-2. 2007 Baseline Case Inventories by Region

Source Category	Liberty-Clairton Area	Allegheny County/SWPA	MANE-VU States	SEMAP/ SESARM States	LADCO States	Other States
Area	TS|Pechan 2007	MANE-VU 2007v3 Final (corrected)	MANE-VU 2007v3 Final	EPA 2008 NEIv1.5	EPA 2008 NEIv1.5	EPA 2008 NEIv1.5
NonRoad	TS|Pechan 2007	MANE-VU 2007v3 Final (corrected)	MANE-VU 2007v3 Final	SEMAP 2007 Draft	EPA 2008 NEIv1.5	EPA 2008 NEIv1.5
OnRoad Mobile	LADCO 2007BaseCv8	LADCO 2007BaseCv8	LADCO 2007BaseCv8	LADCO 2007BaseCv8	LADCO 2007BaseCv 8	LADCO 2007BaseCv 8
NonEGU Point	ACHD 2007 (corrected)	ACHD 2007 (corrected)/ MANE-VU 2007v3 Final	MANE-VU 2007v3 Final	SEMAP 2007 Draft	EPA 2008 NEIv1.5	EPA 2008 NEIv1.5
EGU Point	---	MANE-VU 2007v3 Final	MANE-VU 2007v3 Final	SEMAP 2007 Draft	2007 day-specific hourly CEM	2007 day-specific hourly CEM
Fires	2007 BlueSky Fire Emissions EPA, 2010	2007 BlueSky Fire Emissions EPA, 2010	2007 BlueSky Fire Emissions EPA, 2010	SEMAP 2007 Draft	2007 BlueSky Fire Emissions EPA, 2010	2007 BlueSky Fire Emissions EPA, 2010
Biogenics	Day Specific SMOKE-BEIS	Day Specific SMOKE-BEIS	Day Specific SMOKE-BEIS	Day Specific SMOKE-BEIS	Day Specific SMOKE-BEIS	Day Specific SMOKE-BEIS

[9] http://www.marama.org/
[10] http://www.ladco.org/
[11] http://www.metro4-sesarm.org/SEMAPAbout.asp
[12] http://www.epa.gov/ttn/chief/net/2008inventory.html

Emissions inventories for the future year modeling were based on MANE-VU inventories interpolated to 2014, LADCO 2014 projections applied to NEI 2008 data, and CSAPR 2014 inventories.[13] Similar to the baseline case, revisions were made by ACHD and TS|Pechan to Allegheny County sources for 2014. Table 5-3 below shows the 2014 modeled inventories by U.S. region.

Table 5-3. 2014 Future Case Inventories by Region

Source Category	Liberty-Clairton Area	Allegheny County/SWPA	MANE-VU States	SEMAP/ SESARM States	LADCO States	Other States
Area	TS|Pechan 2014	MANE-VU 2017v3 Final (corrected, interpolated to 2014)	MANE-VU 2017v3 Final (interpolated to 2014)	CSAPR 2014 cs_05b	CSAPR 2014 cs_05b	CSAPR 2014 cs_05b
NonRoad	TS|Pechan 2014	MANE-VU 2017v3 Final (corrected, interpolated to 2014)	MANE-VU 2017v3 Final (interpolated to 2014)	CSAPR 2014 cs_05b	CSAPR 2014 cs_05b	CSAPR 2014 cs_05b
OnRoad Mobile	CSAPR 2014 cs_05b	CSAPR 2014 cs_05b	CSAPR 2014 cs_05b	CSAPR 2014 cs_05b	CSAPR 2014 cs_05b	CSAPR 2014 cs_05b
NonEGU Point	ACHD 2014 (corrected)	ACHD 2014 (corrected)/ MANE-VU 2017v3 Final (interpolated to 2014)	MANE-VU 2017v3 Final (interpolated to 2014)	CSAPR 2014 cs_05b	EPA 2008 NEIv1.5, w/LADCO 2014 factors	CSAPR 2014 cs_05b
EGU Point	---	CSAPR 2014 TR1_remedy	CSAPR 2014 TR1_remedy	CSAPR 2014 TR1_remedy	CSAPR 2014 TR1_remedy	CSAPR 2014 TR1_remedy
Fires	2007 BlueSky Fire Emissions EPA, 2010	2007 BlueSky Fire Emissions EPA, 2010	2007 BlueSky Fire Emissions EPA, 2010	SEMAP 2007 Draft	2007 BlueSky Fire Emissions EPA, 2010	2007 BlueSky Fire Emissions EPA, 2010
Biogenics	Day Specific SMOKE-BEIS	Day Specific SMOKE-BEIS	Day Specific SMOKE-BEIS	Day Specific SMOKE-BEIS	Day Specific SMOKE-BEIS	Day Specific SMOKE-BEIS

[13] http://www.epa.gov/ttn/chief/emch/index.html#final

Baseline-to-future case modeled emissions reductions for point, area, and nonroad source categories (including Marcellus Shale area source emission estimates for Fayette, Greene, Washington, and Westmoreland counties, see Appendix F-2 for details) in Southwestern PA (SWPA) are shown below in Table 5-4. Reductions are shown by county or source group – counties do not include electric generating units (EGUs), which are listed as a separate source group for SWPA. Note: Allegheny County excludes Liberty-Clairton area emissions.

Table 5-4. SWPA Modeled Emissions Reductions, Point/Area/Nonroad, 2007 to 2014

County/Group	SO2	NOx	VOC	NH3	PM10	PM2.5
Allegheny	-551	-2612	-2319	3	-250	-309
Liberty-Clairton Area	-33	-544	-163	-1	-287	-287
Armstrong	-44	-110	-295	3	-14	-20
Beaver	-134	-837	-451	36	-63	-57
Butler	-169	-658	-400	8	-37	-45
Fayette	-104	985	1146	3	-46	-6
Greene	-28	3013	4610	3	-16	58
Indiana	-75	-182	-264	5	-9	-22
Lawrence	-68	-1735	-268	7	-47	-37
Washington	-166	3479	7420	8	-19	65
Westmoreland	-446	822	784	5	-82	-41
EGUs	-499871	-46592	580	380	-200	1972

EGUs showed the largest reductions for SO_2 and NO_x, while Allegheny County and the Liberty-Clairton area showed the largest reductions for $PM_{2.5}$. Increases in NO_x and VOC emissions for Fayette, Greene, Washington, and Westmoreland Counties are due to projected increases in shale gas exploration and production.

5.3.5 Projected EGU Inventories

As mentioned in Section 3.1, CSAPR was used for the modeling of projected EGU emissions for 2014. The CAIR inventory was developed in 2005 on a 2001-based air quality modeling platform, while CSAPR was developed in 2011 using a 2005-based platform. The CSAPR future case inventory was used in the modeling as the more recent and realistic dataset for expected EGU emissions.

The CAIR and CSAPR future case remedy inventories (2015 and 2014, respectively) focused on the control of $PM_{2.5}$ precursor emissions of SO_2 and NO_x for the Eastern U.S. but also included emissions for the rest of the country. For a look at the validity of the CAIR and CSAPR

inventories in relation to recent reported data, future case emissions for CAIR[14] and CSAPR[15] were compared to 2012 reported values from EPA's Clean Air Markets Division (CAMD).[16]

Emissions shown in Table 5-5 below represent totals from CAIR and CSAPR future cases along with CAMD 2012 reported emissions for the following source categories: cogeneration, electric utility, and small power producer. Projected and reported SO_2 and NO_x emissions totals are shown by region: contiguous U.S. (excluding AK, HI, and DC), CSAPR-controlled states (28 eastern states), and PA and surrounding states (PA, OH, WV, and MD).

Table 5-5. CAIR 2015, CSAPR 2014, and CAMD 2012 SO_2 and NO_x Emissions

Region	SO_2 CAIR 2015 (tons)	SO_2 CSAPR 2014 (tons)	SO_2 CAMD 2012 (tons)
Contiguous U.S.	5,223,044	3,356,577	3,316,811
CSAPR-Controlled States	4,618,909	2,919,042	3,036,681
PA and Surrounding States	531,325	419,233	687,176

Region	NO_x CAIR 2015 (tons)	NO_x CSAPR 2014 (tons)	NO_x CAMD 2012 (tons)
Contiguous U.S.	2,199,729	1,890,578	1,706,442
CSAPR-Controlled States	1,561,493	1,428,480	1,354,453
PA and Surrounding States	222,766	279,901	278,436

CAMD data shows that reported emissions of SO_2 and NO_x have decreased significantly in the U.S. in recent years. Reported 2012 emissions for the contiguous U.S. and CSAPR states are already well below CAIR 2015 levels and are near or below CSAPR 2014 emissions. Only PA and surrounding states are significantly higher than projected CAIR or CSAPR values.

Long-term (10-year) trends for reported CAMD emissions and heat inputs were examined for the Eastern U.S. to determine if emissions are steadily decreasing without a loss in electricity demand. Figures 5-5 through 5-7 show trends for SO_2, NO_x, and heat inputs for CSAPR-controlled states over the timeframe 2003-2012.

[14] 2015 Final CAIR Modeling: http://www.epa.gov/airmarkets/progsregs/epa-ipm/cair/index.html

[15] 2014 CSAPR TR1 Remedy: ftp://ftp.epa.gov/EmisInventory/2005v4_2/2014emis

[16] CAMD database: http://ampd.epa.gov/ampd/ (accessed 2/13/2013)

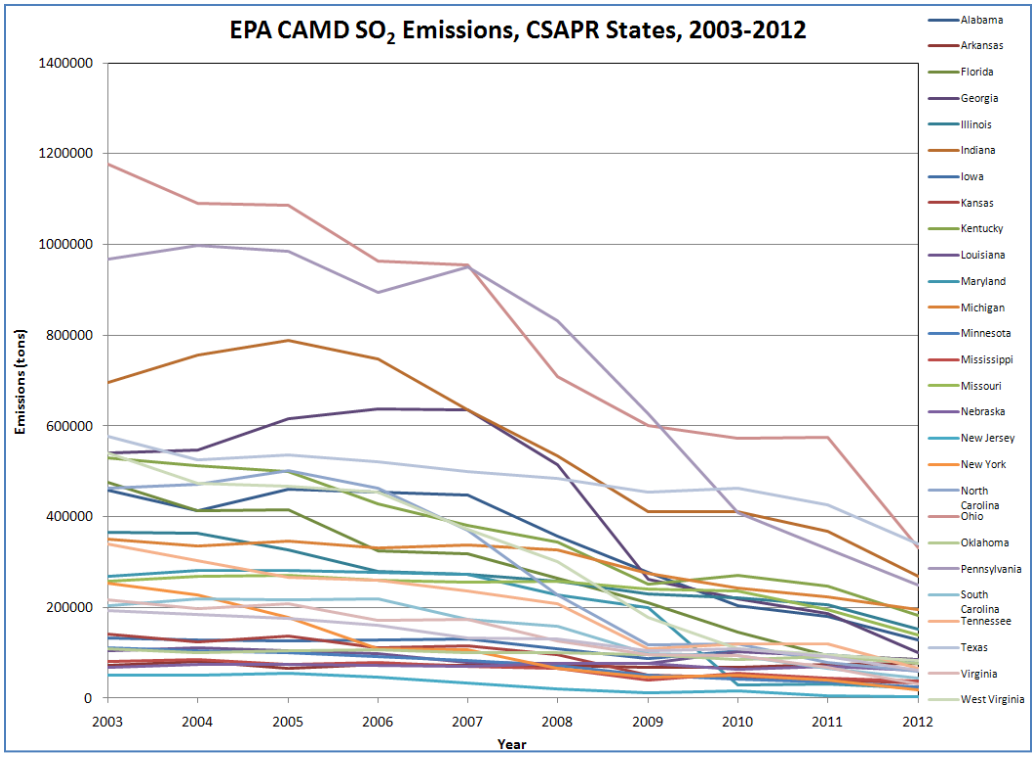

Figure 5-5. Reported CAMD SO_2 Emissions (tons), CSAPR States, 2003-2012

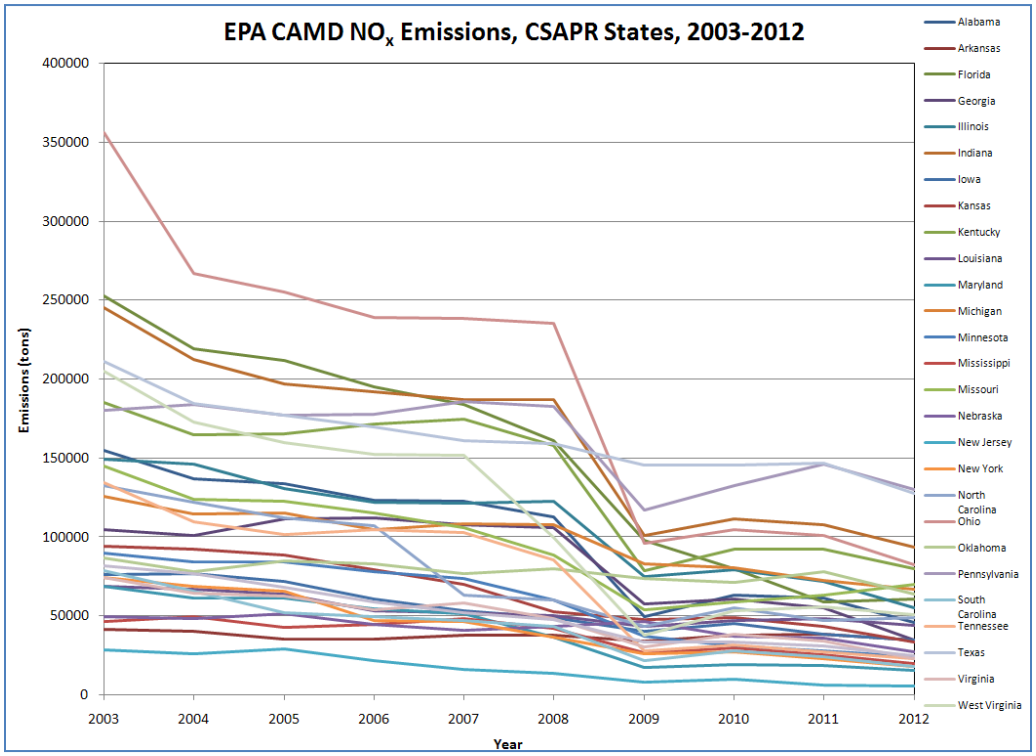

Figure 5-6. Reported CAMD NO_x Emissions (tons), CSAPR States, 2003-2012

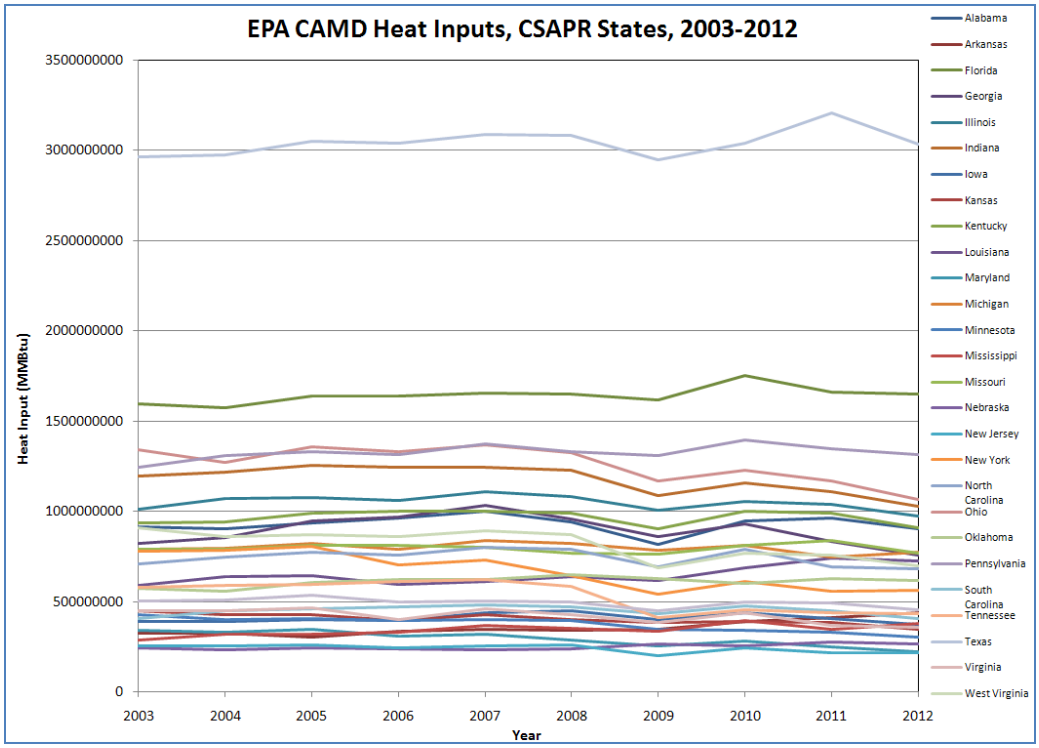

Figure 5-7. Reported CAMD Heat Inputs (MMBtu), CSAPR States, 2003-2012

The trends in Figures 5-5 through 5-7 indicate that SO_2 and NO_x are steadily decreasing in the Eastern U.S. over the 10-year timeframe with little change in heat input levels; therefore, decreases are not due solely to low electricity generation. It may be reasonable to assume that the emission reductions will continue to occur in the 2013-2014 timeframe.

Furthermore, deactivations of many EGUs occurred in 2012 or have been proposed for 2013 through mid-2015 due to compliance with the Mercury Air Toxics Standards and/or other factors. To examine the potential reductions due to the announced deactivations for PA and surrounding states, CAMD 2012 emission levels were revised to reflect the deactivations for 2012 through mid-2015, as tracked by PJM Interconnection.[17] (Deactivations occurring in 2012 were included to remove partial-year 2012 CAMD emissions).

Also, SO_2 emissions from the Homer City plant in Indiana County, PA were revised to reflect the planned installation of control equipment by Oct. 2014.[18]

[17] PJM Interconnection: http://www.pjm.com/~/media/planning/gen-retire/pending-deactivation-requests.ashx (pending as of Mar. 11, 2013)

[18] Homer City Plan Approval: http://files.dep.state.pa.us/RegionalResources/SWRO/SWROPortalFiles/AQ_HomerCity/Issued%20Plan%20Approval%20PA-32-00055H%204-2-12.pdf

Table 5-6 shows projected and reported SO_2 and NO_x emissions totals for U.S. regions, similar to the Table 5-5, but with CAMD 2012 emissions revised to include expected reductions due to proposed deactivations and planned controls.

Table 5-6. CAIR 2015, CSAPR 2014, and CAMD 2012 SO_2 and NO_x Emissions adjusted for PA and Surrounding State Expected Reductions 2013 to mid-2015

Region	SO_2 CAIR 2015 (tons)	SO_2 CSAPR 2014 (tons)	SO_2 CAMD 2012 with PA/Surrounding Expected Reductions by mid-2015 (tons)
Contiguous U.S.	5,223,044	3,356,577	2,901,220
CSAPR-Controlled States	4,618,909	2,919,042	2,621,090
PA and Surrounding States	531,325	419,233	322,020

Region	NO_x CAIR 2015 (tons)	NO_x CSAPR 2014 (tons)	NO_x CAMD 2012 with PA/Surrounding Expected Reductions by mid-2015 (tons)
Contiguous U.S.	2,199,729	1,890,578	1,656,886
CSAPR-Controlled States	1,561,493	1,428,480	1,304,897
PA and Surrounding States	222,766	279,901	241,772

The revised CAMD emissions with known expected reductions for PA and surrounding states would lower the current reported levels of SO_2 and NO_x to below CSAPR levels for all regions. Note that CAIR NO_x is lower than both CSAPR and reported levels for PA and surrounding states, suggesting that the CAIR NO_x projections may have been inaccurate.

Additionally, many EGUs that were projected to install emission controls are switching to natural gas. These fuel switches have not been accounted for in the CSAPR inventory as developed in 2011, resulting in a potentially conservative modeling approach for the future case.

Considering the comparisons to both CAIR and reported data, the CSAPR 2014 remedy case is an adequate inventory of expected EGU emissions for modeling purposes. Emissions totals are given by state (and by facility for PA and surrounding state CAMD data) in Appendix E-6.

5.4 Modeled Impacts

CAMx modeled impacts for the 0.8 km grid in and around the Liberty-Clairton area were combined on an hourly basis with locally-tracked 100 m "nearby" receptor concentrations at the Liberty and Clairton sites. These 100 m receptors were defined as receptors surrounding the FRM site at similar elevation that would measure similar concentrations to the actual monitor FRM location.

Figure 5-8 shows the "nearby" receptors that were used for Liberty (40 receptors) and Clairton (51 receptors).

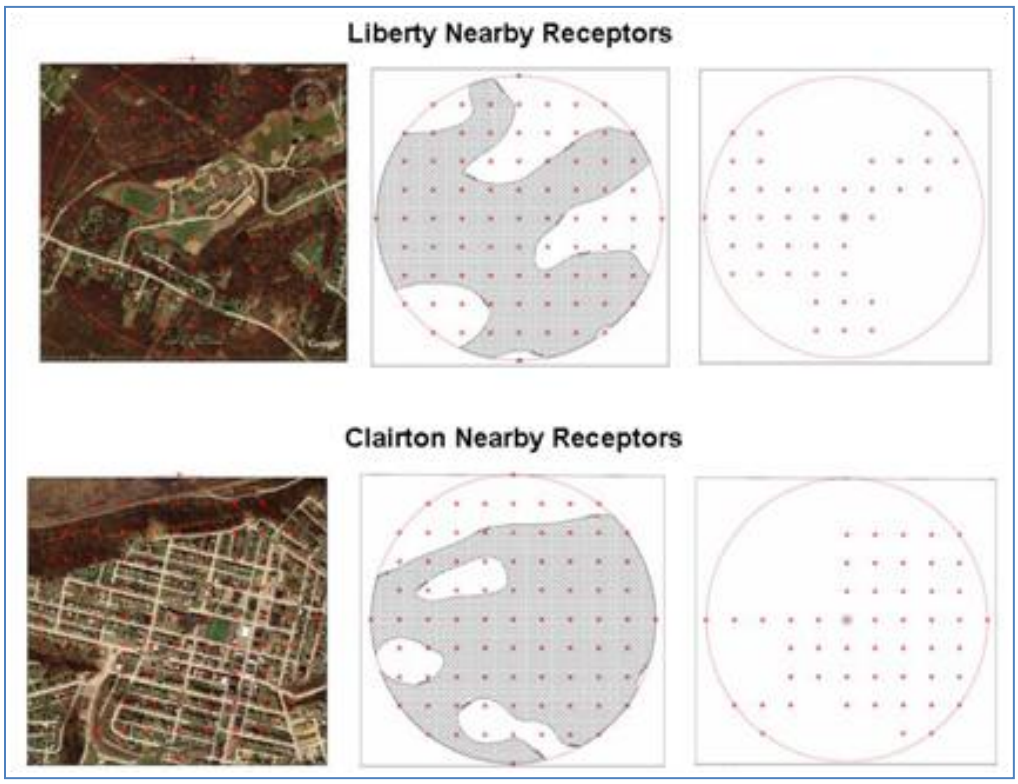

Figure 5-8. Liberty and Clairton Nearby Receptors

Additional details on the nearby receptors are given in the Modeling Protocol in Appendix G-1.

Modeled CAMx quarterly average and high day (top 10%) average impacts for the Liberty receptors, by regional and local impacts, are given in Tables 5-7 and 5-8. The local and regional impacts were tracked separately by the CAMx model using the Particulate Source Apportionment Technology tool. The modeled impacts from point sources identified for local treatment are summed as the local portion of the CAMx impacts.

All values in Tables 5-7 and 5-8 are in µg/m³, with the species defined as follows:

SO4 = sulfate ion
NO3 = nitrate ion
NH4 = ammonium ion
OTHER = unspeciated $PM_{2.5}$
POA = primary organic aerosol
SOA = secondary organic aerosol
EC = elemental carbon

Table 5-7. Liberty Quarterly Modeled Averages (µg/m³)

Local Impacts

2007	SO4	NO3	NH4	POA	SOA	EC	OTHER	TOTAL
1Q	0.310	0.016	0.090	0.169	0.000	0.202	1.557	2.344
2Q	0.407	0.008	0.118	0.221	0.000	0.274	2.018	3.046
3Q	0.612	0.002	0.184	0.282	0.000	0.373	3.134	4.587
4Q	0.439	0.013	0.154	0.203	0.000	0.280	2.386	3.475

2014	SO4	NO3	NH4	POA	SOA	EC	OTHER	TOTAL
1Q	0.254	0.020	0.079	0.159	0.000	0.190	1.215	1.917
2Q	0.347	0.014	0.091	0.209	0.000	0.264	1.632	2.557
3Q	0.491	0.004	0.141	0.261	0.000	0.358	2.464	3.719
4Q	0.352	0.019	0.124	0.186	0.000	0.264	1.845	2.790

Regional Impacts

2007	SO4	NO3	NH4	POA	SOA	EC	OTHER	TOTAL
1Q	2.475	2.040	1.348	3.478	0.053	1.386	4.190	14.970
2Q	4.791	0.402	1.244	1.008	0.022	0.823	1.714	10.004
3Q	7.259	0.051	1.369	0.997	0.029	1.026	2.293	13.024
4Q	3.542	1.632	1.421	3.664	0.039	1.531	4.560	16.389

2014	SO4	NO3	NH4	POA	SOA	EC	OTHER	TOTAL
1Q	1.668	1.818	1.062	2.773	0.044	0.606	3.677	11.648
2Q	2.251	0.378	0.880	0.707	0.017	0.318	1.454	6.005
3Q	3.047	0.065	0.986	0.659	0.023	0.405	1.966	7.151
4Q	2.057	1.242	1.008	2.968	0.034	0.665	3.921	11.895

Table 5-8. Liberty Quarterly High Day Modeled Averages (µg/m³)

Local Impacts

2007	SO4	NO3	NH4	POA	SOA	EC	OTHER	TOTAL
1Q	0.788	0.058	0.211	0.424	0.000	0.507	3.748	5.736
2Q	1.036	0.024	0.383	0.383	0.000	0.589	5.679	8.094
3Q	1.145	0.001	0.429	0.366	0.000	0.587	6.005	8.533
4Q	0.880	0.076	0.206	0.395	0.000	0.433	4.222	6.212

2014	SO4	NO3	NH4	POA	SOA	EC	OTHER	TOTAL
1Q	0.615	0.082	0.189	0.387	0.000	0.464	2.664	4.401
2Q	0.835	0.054	0.301	0.357	0.000	0.577	4.456	6.580
3Q	1.001	0.009	0.378	0.384	0.000	0.671	5.597	8.040
4Q	0.690	0.093	0.165	0.358	0.000	0.391	3.043	4.740

Regional Impacts

2007	SO4	NO3	NH4	POA	SOA	EC	OTHER	TOTAL
1Q	5.520	3.924	2.649	7.158	0.097	2.892	8.052	30.292
2Q	11.162	0.114	1.987	1.140	0.026	1.218	2.425	18.072
3Q	15.827	0.030	2.199	1.223	0.038	1.406	3.334	24.057
4Q	6.915	5.755	3.513	11.620	0.089	3.995	11.931	43.818

2014	SO4	NO3	NH4	POA	SOA	EC	OTHER	TOTAL
1Q	3.873	3.752	2.242	5.642	0.080	1.185	6.959	23.733
2Q	4.071	0.541	1.406	0.896	0.024	0.531	2.085	9.554
3Q	4.675	0.072	1.503	0.878	0.031	0.681	2.993	10.833
4Q	4.062	4.377	2.498	9.488	0.084	1.678	10.372	32.559

Modeled CAMx quarterly average and high day (top 10%) average impacts for the Clairton receptors, by regional and local impacts, are given in Tables 5-9 and 5-10. Like with the Liberty impacts, the local and regional impacts were tracked separately by the CAMx model using the Particulate Source Apportionment Technology tool. The modeled impacts from point sources identified for local treatment are summed as the local portion of the CAMx impacts.

All values in Tables 5-9 and 5-10 are in µg/m³, with the species defined as follows:

SO4 = sulfate ion
NO3 = nitrate ion
NH4 = ammonium ion
OTHER = unspeciated $PM_{2.5}$
POA = primary organic aerosol
SOA = secondary organic aerosol
EC = elemental carbon

Table 5-9. Clairton Quarterly Modeled Averages (µg/m³)

Local Impacts

2007	SO4	NO3	NH4	POA	SOA	EC	OTHER	TOTAL
1Q	0.338	0.021	0.096	0.171	0.000	0.247	1.952	2.825
2Q	0.560	0.008	0.148	0.274	0.000	0.403	3.141	4.534
3Q	0.732	0.002	0.203	0.319	0.000	0.534	4.029	5.819
4Q	0.333	0.014	0.128	0.175	0.000	0.291	1.819	2.760

2014	SO4	NO3	NH4	POA	SOA	EC	OTHER	TOTAL
1Q	0.245	0.023	0.084	0.153	0.000	0.233	1.365	2.103
2Q	0.421	0.015	0.117	0.247	0.000	0.382	2.254	3.436
3Q	0.512	0.004	0.153	0.281	0.000	0.507	2.799	4.256
4Q	0.247	0.017	0.108	0.160	0.000	0.281	1.325	2.138

Regional Impacts

2007	SO4	NO3	NH4	POA	SOA	EC	OTHER	TOTAL
1Q	2.498	2.034	1.342	2.875	0.051	1.404	3.766	13.970
2Q	4.880	0.419	1.256	1.007	0.022	1.006	1.759	10.349
3Q	7.306	0.047	1.371	1.018	0.029	1.224	2.365	13.360
4Q	3.559	1.616	1.389	3.088	0.037	1.665	4.155	15.509

2014	SO4	NO3	NH4	POA	SOA	EC	OTHER	TOTAL
1Q	1.685	1.821	1.055	2.206	0.043	0.603	3.295	10.708
2Q	2.294	0.385	0.882	0.688	0.017	0.432	1.486	6.184
3Q	3.066	0.062	0.986	0.660	0.023	0.530	2.016	7.343
4Q	2.066	1.222	0.973	2.403	0.033	0.721	3.542	10.960

Table 5-10. Clairton Quarterly High Day Modeled Averages (µg/m³)

Local Impacts

2007	SO4	NO3	NH4	POA	SOA	EC	OTHER	TOTAL
1Q	1.590	0.114	0.438	0.752	0.000	1.028	9.296	13.218
2Q	1.443	0.016	0.336	0.671	0.000	0.851	8.368	11.685
3Q	1.578	0.005	0.515	0.605	0.000	1.080	9.552	13.335
4Q	1.007	0.071	0.527	0.538	0.000	0.998	5.510	8.651

2014	SO4	NO3	NH4	POA	SOA	EC	OTHER	TOTAL
1Q	1.071	0.134	0.374	0.615	0.000	0.837	5.741	8.772
2Q	1.244	0.031	0.342	0.744	0.000	0.973	7.188	10.522
3Q	1.345	0.007	0.477	0.734	0.000	1.343	8.194	12.100
4Q	0.692	0.092	0.419	0.454	0.000	0.836	3.491	5.984

Regional Impacts

2007	SO4	NO3	NH4	POA	SOA	EC	OTHER	TOTAL
1Q	5.017	2.865	2.365	6.313	0.080	3.189	6.856	26.685
2Q	6.637	0.172	1.264	1.499	0.027	1.522	2.218	13.339
3Q	12.759	0.113	1.963	1.292	0.035	1.599	2.909	20.670
4Q	6.385	5.583	3.271	10.178	0.086	4.374	10.816	40.693

2014	SO4	NO3	NH4	POA	SOA	EC	OTHER	TOTAL
1Q	3.635	3.211	2.071	5.048	0.071	1.351	6.352	21.739
2Q	1.946	0.428	0.875	0.991	0.023	0.611	1.783	6.657
3Q	3.678	0.117	1.080	0.693	0.026	0.583	1.945	8.122
4Q	3.752	4.429	2.266	8.394	0.083	1.915	9.615	30.454

Model input/output and post-processing files can be obtained by request.

5.5 Model Performance

Model performance review provides a method to examine modeled data in comparison to actual monitored data for the same timeframe. For the baseline 2007 case, model performance for Liberty was examined by ACHD and ENVIRON.

The EPA Modeling Guidance recommends performance statistics for use in operational evaluation of the modeled results. Equations for the Mean Fractional Bias (MFB) and Mean Fractional Error (MFE) metrics are given below:

Mean Fractional Bias (%)

$$FBIAS = \frac{2}{N}\sum_{1}^{N}\left(\frac{(Model - Obs)}{(Model + Obs)}\right) \cdot 100\%$$

Mean Fractional Error (%)

$$FERROR = \frac{2}{N}\sum_{1}^{N}\left(\frac{|Model - Obs|}{(Model + Obs)}\right) \cdot 100\%$$

These equations were used to test the accuracy of the modeled results compared to the monitored data. "Goal" represents a good statistical relationship, while "criteria" represents average results (limits were used in regional model evaluations, given in the EPA Modeling Guidance). Statistics shown below in Table 5-11 were generated for total daily $PM_{2.5}$ (all species).

Table 5-11. Statistics for the Modeled Daily Liberty Averages Compared to the Liberty FRM Values, Year-Round and by Season, 2007

Daily Results	Mean Fractional Bias (MFB)	Mean Fractional Error (MFE)
1st Quarter	26.65%	42.53%
2nd Quarter	-24.21%	34.71%
3rd Quarter	-28.94%	38.93%
4th Quarter	16.95%	40.05%
Year-Round	-2.62%	39.03%
GOAL	*Within ± 30%*	*≤ 50%*
CRITERIA	*Within ± 60%*	*≤ 75%*

Positive MFB bias (MFE is always positive) indicates that the model overestimated in 1st and 4th quarters, with the 2nd and 3rd quarters showing negative bias (underestimation). All quarters and year-round statistics fell within the goal range, indicative of good results.

Figure 5-9 shows a "soccer plot" that visually displays the daily statistics as data points within the goal and criteria ranges (red and blue boxes, respectively). All points lie within the "goal" of the soccer plot.

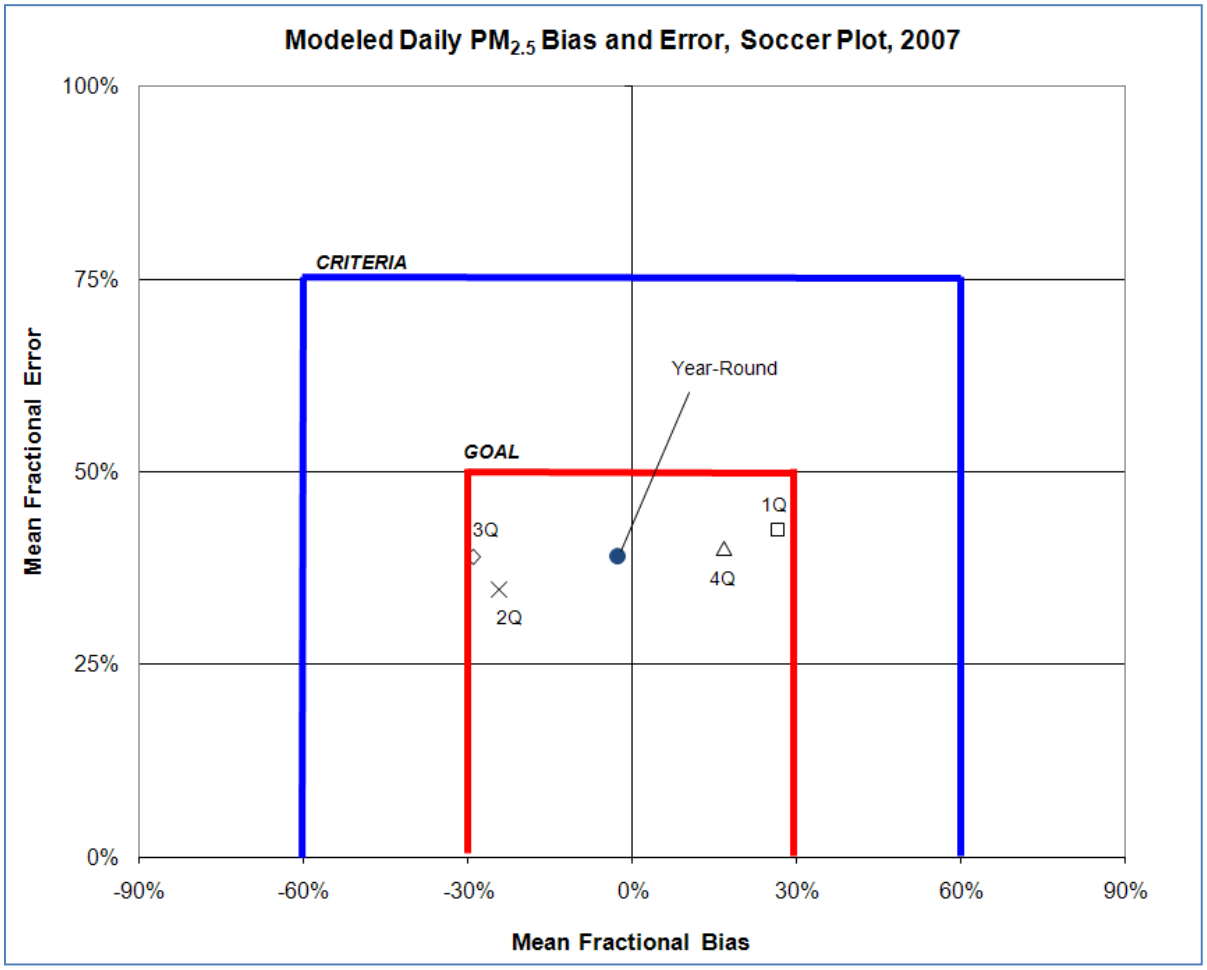

Figure 5-9. Liberty Daily Soccer Plot, Baseline 2007

A detailed report of model performance, including performance by individual species, is given in Appendix G-2.

6 Attainment Tests

This section describes the calculations used for the attainment tests for Liberty and Clairton. Since the CAMx modeling provided modeled data on both total and regional/local bases, both options were tested for future attainment. Weighted values for 2005-2009 were used for this demonstration.

6.1 Monitored Data Assumptions

Speciation and PMF analyses (Appendix C) show that a diverse mix of $PM_{2.5}$ components makes up the localized excess in the Liberty-Clairton area. The majority of the excess was measured as carbons, but other components such as ammonium sulfate and crustal component were also part of the excess.

The SANDWICH (sulfate, adjusted nitrate, derived water, inferred carbonaceous material balance approach) method outlined by EPA Modeling Guidance reconstructs $PM_{2.5}$ species to better represent FRM monitored data. The SANDWICH species reconstructions are shown in detail in Appendix H (Attainment Tests). Using this technique, species are adjusted as follows:

- Nitrate is based on retained estimations
- Indirect ammonium is dependent on sulfate, nitrate, and degree of neutralization (DON) values
- Organic carbon is calculated by mass balance from all other species
- Water is calculated from sulfate, nitrate, and ammonium values

Assumptions are made with the monitored data handling to ensure that all species are accounted for and that the speciation data are correctly used for each FRM site. Assumptions for the CSN speciation and FRM data for Liberty and Clairton are listed below:

- Organic carbon mass by mass balance accounts for all differences between the FRM and other species and can include trace elements or other species that may be associated with organic carbon.

- Indirect ammonium best accounts for the ammonium and the calculated particle-bound water species. Any measured excess of ammonium may or may not be retained on the FRM filter and is accounted for in the organic carbon mass by mass balance. Furthermore, the ammonium generated by the CAMx model is based on associated sulfate and nitrate.

- "Other" component represents unknown mass from the speciation monitor. The SANDWICH technique recalculates most of the "other" component as particle-bound water associated with hygroscopic compounds.

- Liberty speciation data is assumed to be representative of both the Liberty and Clairton monitored areas. I.e., the Liberty species compositions are representative of Clairton but

at smaller overall concentrations. Liberty species compositions are therefore used with Clairton weighted FRM values in the design value calculation.

- No exceptional events or anomalies are evident in the FRM or speciation data. However, species mass balance problems led to the exclusion of two quarters of Liberty speciation data in the attainment test calculations.

- Degrees of Neutralization (DON) of sulfate are held constant for baseline to future case. DON has been supplied with the pre-calculated EPA speciation SMAT/MATS data set.

6.2 Annual Attainment Test Methodology

Speciated Modeled Attainment Test (SMAT) methodology for the annual standard is given in the EPA Modeling Guidance.[19] Species reconstruction is based on the SANDWICH technique. The steps for the annual SMAT are listed below:

- *Calculate 5-year weighted FRM quarterly averages*. This is the average of the 2005-2007, 2006-2008, and 2007-2009 3-year quarterly averages. This is done for the Liberty and Clairton FRM monitored values.

- *Calculate retained nitrate ($NO3_r$) by speciation sample*. This has been provided as part of the SMAT/MATS data set, pre-calculated by EPA. The formula used for retained nitrate is shown below, as given in the EPA Modeling Guidance:

$$\text{delta NO3 (ug/m3)} = 745.7/T_R * 1/24 * \sum_{i=1}^{24} (K_i^{1/2})$$

delta NO3 is the amount of volatilized nitrate

T_R is the reference temperature

K_i is the dissociation constant for ammonium nitrate

- *Calculate quarterly averages of non-dependent species*. Averages for nitrate, sulfate, carbons, other primary $PM_{2.5}$ (OPP), and concurrent FRM values are calculated. Quarterly averages for measured organic carbon are used for comparison to an organic carbon minimum (or OC_{floor}). Quarterly averages for DON are also calculated for use in the retained ammonium calculation.

- *Calculate quarterly averages of retained ammonium ($NH4_r$)*. Averages for retained ammonium are calculated from quarterly sulfate, nitrate, and DON averages. The formula is given below, as given in the EPA Modeling Guidance:

[19] *Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze*, EPA, April 2007.

$$NH4_r = DON*SO4 + 0.29*NO3_r$$

- *Calculate quarterly averages of particle bound water (PBW).* Averages for PBW are calculated from quarterly sulfate, retained nitrate, and indirect ammonium averages. The formula is given below for low acidity (DON >= 0.225), as given in the MATS User's Guide:

```
S =  SO4 / (SO4 + NO3r + NH4r)
N = NO3r / (SO4 + NO3r + NH4r)
A = NH4r / (SO4 + NO3r + NH4r)

PBW = {202048.975 - 391494.647 *S   - 390912.147 *N  + 442.435 *(S**1.5)
        - 155.335 *(N**1.5)   - 293406.827 *(A**1.5)  + 189277.519 *(S**2)
        + 377992.610 *N*S    + 188636.790 *(N**2)  - 447.123 *(S**2.5)
        - 507.157 *(S**1.5)*N   - 12.794 *(S**3)  + 146.221 *(N**1.5)*S
        + 217.197 *(N**2.5)   + 29.981 *(N**1.5)*(S**1.5) - 18.649 *(N**3)
        + 216266.951 *(A**1.5)*S   + 215419.876 *(A**1.5)*N
        - 621.843 *(A**1.5)*(S**1.5)    + 239.132 *(A**1.5)*(N**1.5)
        + 95413.122 *(A**3)}    *    (SO4+NO3r+NH4r)
```

- *Calculate quarterly averages of organic carbon mass by mass balance (OCM_{mb}).* Averages for OCM_{mb} are calculated from the concurrent FRM quarterly averages minus the sum of the other species. This accounts for material associated with organics and/or uncertainties in the measured species. The calculated organic mass is compared to the OC_{floor} to ensure that the mass balance method does not lead to lower concentrations than measured.

- *Calculate quarterly species compositions; apply to weighted quarterly FRM averages.* This is done by calculating fractions of the total (minus 0.5 passive blank mass) by individual species. For this step, the data is calculated twice to examine results by both total and by regional and local species. The species fractions are then applied to the weighted FRM values.

- *Calculate quarterly Relative Response Factors (RRFs) from modeling.* Direct RRFs are calculated from baseline and future CAMx modeled impacts for sulfate, nitrate, total organic aerosol (TOA), elemental carbon, and unspeciated $PM_{2.5}$. For the total and regional/local options, this step is done twice.

- *Calculate future quarterly species averages from RRFs, re-calculate ammonium and PBW.* The RRFs reduce the sulfate, nitrate, carbons, and OPP from the weighted baseline case values. Future case ammonium and PBW is calculated from the new quarterly averages. This step is performed twice to examine by both total and by regional and local species.

- *Calculate the future design value.* This is done by adding the future case species by quarter (plus 0.5 blank) and averaging the quarterly future FRM values, rounded to the nearest tenth for comparison to the annual standard. For an area with strong concentration gradients such as Liberty-Clairton, ACHD followed EPA Modeling Guidance by using a one-cell (single-site) analysis in place of a spatially-averaged array for the design values at Liberty and Clairton.

6.3 24-Hour Attainment Test Methodology

The Speciated Modeled Attainment Test (SMAT) for the 24-hour standard uses the same methodology as the annual standard for reconstruction of species and RRFs. But, modeled and observed concentrations are based on specific high day averages instead of quarterly averages.

- *Indentify observed (monitored) high days in baseline timeframe*. This is done by selecting the 8 highest days in each quarter over the 2005-2009 timeframe. (For Clairton, due to the 1-in-6 sampling schedule, only the 3 highest days per quarter were used.) This method focuses on high days that represent seasonal highs rather than overall maximums.

- *Calculate quarterly species compositions for speciation high days*. This is done using the same technique as the annual species compositions, but the quarterly averages are based on the highest 10% (3 samples were used per quarter) of speciation samples by overall concentration.

- *Calculate weighted species compositions for baseline high days*. This is done by using the quarterly species fractions for each of the high observed days. The end results are high day compositions per quarter for each year (2005-2009). Similar to the annual test, this step is done twice to examine the results by total and regional/local options.

- *Calculate quarterly Relative Response Factors (RRFs) for high days from modeling.* The high modeled days are identified after summing all components. Regional OPP is excluded from the total in this ranking method, due to overestimation of the modeled OPP.[20] The top 10% (10 days) by quarter are then averaged for sulfate, nitrate, carbons, and OPP. RRFs are calculated from the baseline and future modeled results. For the total and regional/local options, this step is done twice.

- *Calculate future high days from RRFs; re-calculate ammonium and PBW for each future high day.* Using the same methodology as the annual test, high day species are reduced for the future case by the quarterly RRFs, and ammonium and PBW concentrations are

[20] This method was used in the Transport Rule (CSAPR) modeling (see References).

re-calculated from the future sulfate, nitrates. This step is performed twice to examine by both total and by regional and local species.

- *Calculate future design value.* The future projected high days are re-ranked by year, and the 98th-percentile value is identified for each year. The weighted 98th-percentile average is the average of the 2005-2007, 2006-2008, and 2007-2009 3-year averages, rounded to the nearest integer for comparison to the 24-hour standard.

6.4 Annual Attainment Test Results

A summary of the annual design value calculations for Liberty, by total species and by regional/local species, is given in Tables 6-1 and 6-2. Spreadsheets showing the expanded design value calculations are given in Appendix H. All compositions and design values are given in µg/m^3, while RRFs are dimensionless ratios.

For the regional/local split option, local modeled carbons and unspeciated $PM_{2.5}$ (OTHER) were summed as local primary material (LPM) and re-apportioned based on monitored compositions. This method better accounts for local primary modeled $PM_{2.5}$ that may be overestimated as crustal component.

Table 6-1. Liberty Annual Attainment Test, by Total Species

Baseline 2007 Quarterly Compositions

QTR	FRMw	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
1Q	14.637	0.500	14.137	3.814	1.508	3.793	1.352	0.679	1.765	1.227
2Q	18.051	0.500	17.551	4.888	2.014	5.336	0.065	0.990	1.962	2.295
3Q	22.600	0.500	22.100	4.689	2.262	8.018	0.000	0.966	2.721	3.444
4Q	18.186	0.500	17.686	5.647	2.631	4.426	0.545	0.789	1.753	1.894
AVG	18.4									

RRFs

QTR				TOA	EC	SO4	NO3	OTHER
1Q				0.804	0.501	0.690	0.893	0.851
2Q				0.746	0.531	0.500	0.956	0.827
3Q				0.721	0.545	0.450	1.304	0.816
4Q				0.817	0.513	0.605	0.766	0.830

Future 2014 Quarterly Compositions

QTR	FRMf	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
1Q	10.850	0.500	10.350	3.067	0.756	2.618	1.208	0.578	1.298	0.825
2Q	10.900	0.500	10.400	3.647	1.069	2.667	0.062	0.819	0.989	1.146
3Q	12.280	0.500	11.780	3.382	1.233	3.604	0.000	0.789	1.223	1.548
4Q	12.440	0.500	11.940	4.611	1.350	2.679	0.417	0.655	1.086	1.141
AVG	11.6									

Table 6-2. Liberty Annual Attainment Test, by Regional/Local Species

Baseline 2007 Quarterly Compositions, Local

QTR				OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
1Q				0.821	0.904	0.881	0.124	0.284	0.445	0.329
2Q				1.273	1.370	0.480	0.014	0.297	0.329	0.299
3Q				0.000	1.548	0.960	0.000	0.372	0.554	0.803
4Q				2.756	1.993	1.698	0.000	0.413	0.625	0.765

Local RRFs

QTR				TOA	EC	SO4	NO3	OTHER
1Q				0.811	0.811	0.821	1.209	0.811
2Q				0.837	0.837	0.851	1.815	0.837
3Q				0.827	0.814	0.802	2.396	0.814
4Q				0.800	0.800	0.802	1.379	0.800

Baseline 2007 Quarterly Compositions, Regional

QTR				OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
1Q				2.993	0.604	2.912	1.228	0.395	1.319	0.898
2Q				3.615	0.644	4.857	0.051	0.693	1.633	1.996
3Q				4.689	0.714	7.058	0.000	0.594	2.168	2.641
4Q				2.892	0.638	2.728	0.545	0.376	1.128	1.129

Regional RRFs

QTR				TOA	EC	SO4	NO3	OTHER
1Q				0.798	0.437	0.674	0.891	0.878
2Q				0.704	0.386	0.470	0.939	0.849
3Q				0.665	0.394	0.420	1.264	0.858
4Q				0.811	0.434	0.581	0.761	0.860

Future 2014 Quarterly Compositions, Combined Regional and Local

QTR	FRMf	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
1Q	11.236	0.500	10.736	3.054	0.997	2.686	1.244	0.577	1.333	0.846
2Q	11.265	0.500	10.765	3.610	1.397	2.690	0.074	0.837	1.001	1.156
3Q	12.576	0.500	12.076	3.119	1.541	3.733	0.000	0.812	1.267	1.603
4Q	13.377	0.500	12.877	4.550	1.872	2.946	0.415	0.654	1.182	1.258
AVG	12.1									

The Liberty annual attainment tests project a design value range of 11.6-12.1 µg/m³, below the standard of 15.0 µg/m³.

A summary of the annual design value calculations for Clairton is given in Tables 6-3 and 6-4. Spreadsheets showing the expanded design value calculations are given in Appendix H. All compositions and design values are given in µg/m³, while RRFs are dimensionless ratios.

Table 6-3. Clairton Annual Attainment Test, by Total Species

Baseline 2007 Quarterly Compositions

QTR	FRMw	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
1Q	12.489	0.500	11.989	3.234	1.279	3.216	1.146	0.576	1.496	1.040
2Q	12.797	0.500	12.297	3.425	1.411	3.739	0.046	0.694	1.375	1.608
3Q	19.594	0.500	19.094	4.051	1.954	6.927	0.000	0.835	2.351	2.976
4Q	12.261	0.500	11.761	3.755	1.750	2.943	0.362	0.525	1.166	1.260
AVG	14.3									

RRFs

QTR				TOA	EC	SO4	NO3	OTHER
1Q				0.776	0.507	0.681	0.897	0.815
2Q				0.730	0.578	0.499	0.934	0.763
3Q				0.706	0.590	0.445	1.340	0.753
4Q				0.787	0.512	0.594	0.760	0.815

Future 2014 Quarterly Compositions

QTR	FRMf	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
1Q	9.123	0.500	8.623	2.509	0.648	2.189	1.029	0.469	1.091	0.689
2Q	7.747	0.500	7.247	2.500	0.815	1.866	0.043	0.530	0.692	0.802
3Q	10.596	0.500	10.096	2.860	1.153	3.084	0.000	0.629	1.047	1.325
4Q	8.258	0.500	7.758	2.954	0.896	1.749	0.276	0.428	0.710	0.745
AVG	8.9									

Table 6-4. Clairton Annual Attainment Test, by Regional/Local Species

Baseline 2007 Quarterly Compositions, Local

QTR				OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
1Q				0.696	0.767	0.747	0.105	0.241	0.378	0.279
2Q				0.892	0.960	0.336	0.010	0.208	0.230	0.209
3Q				0.000	1.337	0.829	0.000	0.321	0.478	0.693
4Q				1.832	1.326	1.129	0.000	0.275	0.416	0.509

Local RRFs

QTR				TOA	EC	SO4	NO3	OTHER
1Q				0.739	0.739	0.725	1.109	0.739
2Q				0.755	0.755	0.752	1.804	0.755
3Q				0.746	0.735	0.700	2.123	0.735
4Q				0.773	0.773	0.743	1.235	0.773

Baseline 2007 Quarterly Compositions, Regional

QTR				OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
1Q				2.538	0.512	2.469	1.041	0.335	1.119	0.761
2Q				2.533	0.451	3.403	0.036	0.486	1.144	1.398
3Q				4.051	0.617	6.098	0.000	0.513	1.873	2.282
4Q				1.923	0.424	1.814	0.362	0.250	0.750	0.751

Regional RRFs

QTR				TOA	EC	SO4	NO3	OTHER
1Q				0.769	0.430	0.675	0.895	0.875
2Q				0.685	0.429	0.470	0.918	0.845
3Q				0.653	0.433	0.420	1.309	0.853
4Q				0.779	0.433	0.580	0.756	0.852

Future 2014 Quarterly Compositions, Combined Regional and Local

QTR	FRMf	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
1Q	9.276	0.500	8.776	2.465	0.787	2.207	1.049	0.471	1.103	0.694
2Q	7.782	0.500	7.282	2.408	0.919	1.852	0.051	0.567	0.689	0.796
3Q	10.621	0.500	10.121	2.644	1.250	3.139	0.000	0.674	1.066	1.349
4Q	8.783	0.500	8.283	2.915	1.208	1.892	0.274	0.425	0.761	0.807
AVG	9.1									

The Clairton annual attainment tests project a design value range of 8.9-9.1 µg/m³, below the standard of 15.0 µg/m³.

6.5 24-Hour Attainment Test Results

A summary of the 24-hour design value calculations for Liberty is given in Tables 6-5 and 6-6. Spreadsheets showing the expanded design value calculations are given in Appendix H. All compositions and design values are given in µg/m³, while RRFs are dimensionless ratios.

Quarterly species compositions are calculated in a similar manner used in the annual test, but the results are applied to high days for each quarter instead of averages. RRFs are calculated by ratios of the modeled future case to baseline case results for high days. The future case results are then calculated by multiplying the baseline results by the corresponding RRF by species.

For the regional/local split option, similar to the annual results, local modeled carbons and OPP were summed as local primary material (LPM) and re-apportioned based on monitored compositions.

Table 6-5. Liberty 24-Hour Attainment Test, by Total Species

Baseline High Days

Baseline FRM High Days	Year	2005	2006	2007	2008	2009
	98th-Percentile	69.6	55.7	54.7	50.0	45.3
3-Year Design Values	3-Year Period	Avg				
	2005-2007	60.0				
	2006-2008	53.5				
	2007-2009	50.0				
5-Year Weighted Average	5-Year Period	Avg				
	2005-2009	54				

RRFs

QTR	TOA	EC	SO4	NO3	OTHER
1Q	0.796	0.485	0.712	0.963	0.815
2Q	0.824	0.614	0.402	4.326	0.807
3Q	0.795	0.678	0.334	2.600	0.920
4Q	0.820	0.467	0.610	0.767	0.830

Future High Days

Future Projected FRM High Days	Year	Year 1	Year 2	Year 3	Year 4	Year 5
	98th-Percentile	41.5	35.6	32.0	31.7	31.1
3-Year Design Values	3-Year Period	Avg				
	Years 1-3	36.4				
	Years 2-4	33.1				
	Years 3-5	31.6				
5-Year Weighted Average	5-Year Period	Avg				
	Years 1-5	34				

Table 6-6. Liberty 24-Hour Attainment Test, by Regional/Local Species

Baseline High Days

Baseline FRM High Days	Year	2005	2006	2007	2008	2009
	98th-Percentile	69.6	55.7	54.7	50.0	45.3
3-Year Design Values	3-Year Period	Avg				
	2005-2007	60.0				
	2006-2008	53.5				
	2007-2009	50.0				
5-Year Weighted Average	5-Year Period	Avg				
	2005-2009	54				

Local RRFs

QTR	TOA	EC	SO4	NO3	OTHER
1Q	0.751	0.751	0.781	1.419	0.751
2Q	0.811	0.811	0.806	2.278	0.811
3Q	0.956	0.956	0.874	7.379	0.956
4Q	0.751	0.751	0.784	1.226	0.751

Regional RRFs

QTR	TOA	EC	SO4	NO3	OTHER
1Q	0.789	0.410	0.702	0.956	0.864
2Q	0.788	0.436	0.365	4.749	0.860
3Q	0.721	0.484	0.295	2.401	0.898
4Q	0.818	0.420	0.587	0.761	0.869

Future High Days, Combined Regional and Local

Future Projected FRM High Days	Year	Year 1	Year 2	Year 3	Year 4	Year 5
	98th-Percentile	42.9	36.8	34.0	32.8	32.9
3-Year Design Values	3-Year Period	Avg				
	Years 1-3	37.9				
	Years 2-4	34.5				
	Years 3-5	33.2				
5-Year Weighted Average	5-Year Period	Avg				
	Years 1-5	35				

The Liberty 24-hour attainment tests project a design value range of 34-35 µg/m³, within the standard of 35 µg/m³.

A summary of the 24-hour design value calculations for Clairton is given in Tables 6-7 to 6-8. Spreadsheets showing the expanded design value calculations are given in Appendix H. All compositions and design values are given in µg/m³, while RRFs are dimensionless ratios.

Table 6-7. Clairton 24-Hour Attainment Test, by Total Species

Baseline High Days

Baseline FRM High Days	Year	2005	2006	2007	2008	2009
	98th-Percentile	30.9	35.8	35.0	34.6	25.9
3-Year Design Values	3-Year Period	Avg				
	2005-2007	33.9				
	2006-2008	35.1				
	2007-2009	31.8				
5-Year Weighted Average	5-Year Period	Avg				
	2005-2009	34				

RRFs

QTR	TOA	EC	SO4	NO3	OTHER
1Q	0.803	0.519	0.712	1.123	0.749
2Q	0.800	0.668	0.395	2.445	0.848
3Q	0.752	0.719	0.350	1.052	0.814
4Q	0.827	0.512	0.601	0.799	0.803

Future High Days

Future Projected FRM High Days	Year	Year 1	Year 2	Year 3	Year 4	Year 5
	98th-Percentile	17.6	19.2	17.4	20.2	14.8
3-Year Design Values	3-Year Period	Avg				
	Years 1-3	18.1				
	Years 2-4	18.9				
	Years 3-5	17.5				
5-Year Weighted Average	5-Year Period	Avg				
	Years 1-5	18				

Table 6-8. Clairton 24-Hour Attainment Test, by Regional/Local Species

Baseline High Days

Baseline FRM High Days	Year	2005	2006	2007	2008	2009
	98th-Percentile	30.9	35.8	35.0	34.6	25.9
3-Year Design Values	3-Year Period	Avg				
	2005-2007	33.9				
	2006-2008	35.1				
	2007-2009	31.8				
5-Year Weighted Average	5-Year Period	Avg				
	2005-2009	34				

Local RRFs

QTR	TOA	EC	SO4	NO3	OTHER
1Q	0.650	0.650	0.674	1.175	0.650
2Q	0.900	0.900	0.862	1.979	0.900
3Q	0.914	0.914	0.852	1.494	0.914
4Q	0.679	0.679	0.687	1.291	0.679

Regional RRFs

QTR	TOA	EC	SO4	NO3	OTHER
1Q	0.801	0.424	0.725	1.121	0.927
2Q	0.664	0.401	0.293	2.487	0.804
3Q	0.541	0.365	0.288	1.035	0.669
4Q	0.826	0.438	0.588	0.793	0.889

Future High Days, Combined Regional and Local

Future Projected FRM High Days	Year	Year 1	Year 2	Year 3	Year 4	Year 5
	98th-Percentile	17.3	19.1	17.7	20.5	14.5
3-Year Design Values	3-Year Period	Avg				
	Years 1-3	18.0				
	Years 2-4	19.1				
	Years 3-5	17.5				
5-Year Weighted Average	5-Year Period	Avg				
	Years 1-5	18				

The Clairton 24-hour attainment tests project a design value of 18 µg/m³, below the standard of 35 µg/m³.

Weight of evidence, as given in Section 9, provides additional assertions that the Liberty-Clairton area will demonstrate attainment of the NAAQS.

6.6 Unmonitored Area Analysis

The EPA Modeling Guidance recommends examination of "unmonitored" areas for possible future exceedances of the NAAQS standards by employing a combination of interpolated monitored and modeled relative response ratios within spatial fields across the area.

The Liberty and Clairton Monitors are part of a complete network for Allegheny County – according to monitoring network guidance[21], there are no "unmonitored" areas. However, for a more complete analysis, ENVIRON generated grid concentrations using EPA's MATS program for 0.8 km grid cells surrounding and in between the Liberty and Clairton sites. ENVIRON applied MATS using its unmonitored area analysis feature to "spatially interpolate current year annual $PM_{2.5}$ design value concentrations and project 2014 annual $PM_{2.5}$ future design value concentrations throughout the 0.8 km and 4 km modeling domains using the CAMx 0.8 and 4 km modeling results, respectively."

The analysis showed that no 0.8 km grid cell in the Liberty-Clairton area contained projected design values above the NAAQS. Details of the unmonitored analysis are given in Appendix G-3.

[21] EPA $PM_{2.5}$ monitoring policy and guidance: http://www.epa.gov/ttnamti1/pmpolgud.html

7 Reasonably Available Control Technology and Measures

Reasonably Available Control Technology (RACT) and Reasonably Available Control Measures (RACM) for each $PM_{2.5}$ nonattainment area require a demonstration that the agency has adopted all reasonably available control measures, including RACT for stationary sources, necessary to demonstrate attainment as expeditiously as practicable.

In determining whether a particular emission reduction measure or set of measures must be adopted as RACM, the agency must consider the cumulative impact of implementing the available measures. Potential measures that are reasonably available considering technical and economic feasibility must be adopted as RACM if, considered collectively, they would advance the attainment date by one year or more.

The sole purpose of this RACT/RACM analysis is to determine if additional reasonable controls are available that could advance the attainment date by one year. These reviews should not and cannot be used by any source to satisfy any RACT analysis required by that source in a present or future permitting project.

Primary $PM_{2.5}$ is the pollutant of concern in the Liberty-Clairton nonattainment area and was the focus of the RACT/RACM analysis. Precursors SO_2 and NO_x were also reviewed for specific RACM options. Key RACT/RACM findings are included in this section, with further details of this analysis found in Appendix I.

RACT at U. S. Steel Mon Valley Works – Clairton Plant and Alternatives Considered

The U. S. Steel Clairton Plant is the largest source of $PM_{2.5}$ located within the Liberty-Clairton area. Both U. S. Steel and ACHD separately reviewed the $PM_{2.5}$ emissions units for the facility and found them to be satisfactory for this RACM demonstration.

As part of the Clairton Plant installation permit application for C Battery, U. S. Steel performed a Best Available Control Technology (BACT) analysis for all the affected emission units. The Clairton Plant batteries are of the conventional by-product coke oven type. The new installation of Battery C with the PROven system was determined to be BACT at the time. An alternative option of non-by-product recovery coke ovens using the Sun Coke Co. process and electric power generation was not considered technically feasible for integration into the other portions of the by-product coke oven plant.

The coke oven batteries 7, 8, and 9 were shut down in 2009. Coke oven batteries 1-3, 13-15, 19-20, and B have some of the nation's strictest standards, either as ACHD Article XXI regulations or as permit conditions, so there were few alternatives to operational controls to be considered. Appendix I contains a detailed list of the controls by process.

For the new Quench Towers C, 5A, and 7A, double baffles are RACT versus alternative shorter quench towers with single baffles. Coke dry quenching (CDQ) was considered but found unacceptable for this project due to available space and cost. This was the same conclusion on

the other remaining quench towers. Other options were reviewed but would required extensive construction and installation costs. Included in this review were a "wet Low Emission Quench (LEQ)," a "ThyssenKrupp EnCoke World Steel, Bochum Coke Stabilization Quenching (CSQ) process," a "Kress Indirect Cooling (KIDC) system," and others.

Alternatives to such pushing emissions control are the use of a coke side shed enclosure vented to a control device or a mobile capture and control unit. However, the shed system is too costly and the mobile capture is not technically feasible for this SIP. For battery process upsets, the atmospheric venting of raw coke oven gas through by-pass/bleeder stacks is first passed through a flare system. The alternatives to this are to use either regenerative thermal oxidation or catalytic thermal oxidation; however, these alternatives are too costly to be feasible for this SIP. Similarly, the impacts from the emissions of Boiler #1, Boiler #2, R1 Boiler, R2 Boiler, T1 Boiler, T2 Boiler, and the Desulfurization Plant Afterburner do not warrant additional control.

RACT at Koppers Industries, Inc. and Alternatives Considered

Koppers Industries, Inc. Clairton Plant is a chemical processing plant where crude coal tar is debenzolized and distilled into pitch and various other products such as creosote, carbon black oil, and refined chemical oil.

For the tar refining process, gases from the fume vents, pressure reliefs, ejectors, chiller, and condensate separator are manifolded together and burned in the eight process heaters. As alternative controls, the fumes could be flared or catalytically oxidized – but neither of the two alternatives would result in added emission reductions. Flaring would be less efficient and catalytic oxidation is more costly, so they are unacceptable alternatives.

When manufacturing the rod pitch, the process utilizes a pitch cooler and dryer. A low temperature pulse-jet baghouse is used to control particulate emissions from the two units. As an alternative, a wet scrubber could be utilized, but there would be an undesirable wastewater disposal problem without gaining any emission reduction advantage.

RACT at Mid Continent Coal and Coke Co. and Alternatives Considered

Mid-Continent Coal and Coke Company is a metallurgical coke breeze screening unit, serving the U. S. Steel Clairton Plant. Total $PM_{2.5}$ emissions from this plant are less than 1 to 5 tons per year from all sources, including roads. No combination of sources that include this plant would advance attainment by a year.

The only emissions of interest from this plant are unpaved roadways. As alternatives, the roadway areas could have dust suppressant or watering; however, the emission reduction benefit from these alternatives is minimal because the amounts are small from the onset and the grounds tend to retain significant moisture.

RACT at Dura-Bond Coating Company and Alternative Considered

Dura-Bond Coating Company is a specialty coater of steel pipe. The pipe is intended for underground installation and is designed to withstand many years of use. The coating protects the steel pipe from moisture, thermal expansion, and other stresses. Total $PM_{2.5}$ emissions from this plant are 1 to 5 tons per year from all sources.

RACT for this facility is: baghouses for powder coating line P001 shot blast pipe cleaners, powder reclaimer for powder coating operation PE1, baghouse for extruded polyethylene coating (X-Tec) line P003, gasoline storage tank conservation vent, watering roadways to limit road dust emissions, and catalytic retrofit and spark adjustment for forklifts. Since these RACT options are being implemented, no combination of sources that include this plant would advance attainment by a year. No additional RACT were considered for this facility.

RACT at Pennsylvania Electric Coil and Alternative Considered

Pennsylvania Electric Coil manufactures high voltage stator coils, up to 15Kv, as well as rotor, armature, field coils, and brake, magnet and specialty coils. The facility also repairs, rewinds, and remanufactures AC/DC motors, generators, and other types of apparatus, in shop or on site. Total $PM_{2.5}$ emissions from this plant are less than one ton per year from all sources.

RACT for this facility is: integral afterburners for the burn-off ovens, cover for Safety-Kleen parts cleaner, cyclone used for the abrasive blasting operation, paint booth filters, baghouse for the tinning process, conservation vents for storage areas/tanks, and opacity monitoring for various processes. Since these RACT options are being implemented, no combination of sources that include this plant would advance attainment by a year. No additional RACT were considered for this facility.

RACT at Mon Valley Transportation Center, Inc. and Alternatives Considered

The Mon Valley Transportation Center, Inc. facility in Glassport, PA operates as a coal, coke and aggregate transshipment and storage facility. Total $PM_{2.5}$ emissions from this plant are less than one ton per year from all sources.

RACT for this facility is: barge loader #2 water sprayer, railcar unloader water sprayer, covered conveyors, drop sleeves, catalytic retrofits and spark adjustments for diesel-fuel vehicles, watering storage piles, and watering and/or using dust suppressants on unpaved roadways. Since these RACT options are being implemented, no combination of sources that include this plant would advance attainment by a year. No additional RACT were considered for this facility.

RACT at AKJ Clairton LLC and Alternatives Considered

The AKJ Clairton plant is a sludge mixing operation facility that uses coal tar decanter sludge from the U. S. Steel Clairton Plant and different liquid diluents and a dispersant in a batch operation to produce liquefied coal waste sludge for re-use. $PM_{2.5}$ emissions from this facility are negligible (less than 0.1 ton per year).

RACT at Tech Met, Inc. and Alternatives Considered

Tech Met provides chemical milling services to a variety of aerospace, medical, and industrial customers. Total $PM_{2.5}$ emissions from this plant are less than 1 to 5 tons per year from all sources, including roads. No combination of sources that include this plant would advance attainment by a year.

RACM at Nonpoint Sources

TranSystems|E.H. Pechan (TS|Pechan), along with KB Environmental Sciences, Inc., examined RACT/RACM several RACM options for area, nonroad, and mobile sources in the Liberty Clairton area. RACT/RACM and alternatives for point and nonpoint sources are summarized in Table 7-1 below. Additional details of the RACT/RACM analysis can be found in Appendix I.

Table 7-1. RACT/RACM and Alternatives Considered for the Liberty-Clairton Area

Source	Reasonably Available Control Measure	Alternative(s) Considered	Remarks
U.S. Steel	New Batteries and Quench Towers	No	
Koppers Industries, Inc.	1) For tar refining, fumes are burned for process heat. 2) For making rod pitch, a cooler/dryer and baghouse used.	Flaring or catalytic oxidation, and wet scrubber, respectively.	Flaring less efficient, catalytic oxidation more costly, and scrubber creates wastewater problem.
Mid Continental Coal and Coke Company	Negligible PM emissions overall.	Roadway watering	Grounds inherently retain water.
Dura-Bond Coating Company	Negligible PM emissions. RACT is baghouse, powder reclaimer, storage tank conservation vent, road watering.	No	
Pennsylvania Electric Coil	Negligible PM emissions. RACT is afterburners, cover for cleaner, cyclone, paint booth filters, baghouse storage tanks conservation vents, and opacity monitoring.	No	

Source	Reasonably Available Control Measure	Alternative(s) Considered	Remarks
Mon Valley Transportation Center, Inc.	Negligible PM emissions. RACT is water sprayers for loaders/unloader, covered conveyors, diesel vehicle retrofits, water dust suppressant.	No	
AKJ Clairton, LLC	Negligible PM emissions.	No	
Tech Met, Inc.	Negligible PM emissions.	No	
Restaurants – commercial charbroiling	Currently no RACM.	Rules to require charbroiler exhaust stack catalytic oxidizer s for chain driven broilers, and HEPA filters for under-fired broilers.	Full implementation could take five (5) years.
Residential Wood Burning –stoves and fireplaces	Currently no RACM.	Woodstove exchange program, education & outreach on burning clean, curtailment of burning with expected high ambient levels of PM, and replacement of old stoves when homes are sold.	Options 1 and 3 have quantifiable emissions reductions, but time to implement is longer than needed. Option 2 is difficult to quantify and Option 4 does not generate significant reductions.
Residential Wood Burning – Wood fired boilers.	Currently no RACM.	Compliance with state OWB regulation and curtailment of burning with expected high ambient levels of PM.	Option 1 does not produce significant emissions reductions, and time to implement Option 2 is longer than needed.
Residential Coal Furnaces	Currently no RACM.	Replace coal furnaces with natural gas or electric systems.	Coal furnace emissions are negligible.

Source	Reasonably Available Control Measure	Alternative(s) Considered	Remarks
Four Stroke Gasoline Lawnmowers	Currently no RACM.	Gas for Electric mower trade program, Upgrade mower engine to higher Tier standards, native landscaping, and reduced commercial mowing.	Extremely small reductions for trading programs and commercial mowing reductions, and unquantifiable reductions from native landscaping.
Commercial Gasoline Leaf Blowers	Currently no RACM.	Gas for Electric trade program.	Extremely small emissions reductions.
Commercial and Residential Gasoline Snowblowers.	Currently no RACM.	Gas for Electric trade program.	Extremely small emissions reductions.
On-road mobile sources	Currently no RACM.	Diesel engine retrofits, expanded use of clean fuel, replacement of public or private fleets ahead of normal schedule.	
Diesel Powered Construction Equipment	Idling restrictions in effect.	Diesel engine retrofits and engine replacement with higher Tier engine.	Cost of emission reductions can be expensive and relatively small total reductions.
Non-road Gasoline and Diesel equipment and vehicles	Currently no RACM.	Expand the use of clean burning B20 and E10.	Relatively small reductions.
Off-road Diesel Equipment	Currently no RACM.	Emissions testing & repair/maintenance program, and roadside anti-smoke inspections.	There is not sufficient time to implement programs.
Recreational Marine Boats	Currently no RACM.	Reduce emissions or accelerate retirement of high emitting boats.	Recreational boats are insignificant source in L-C area.

Source	Reasonably Available Control Measure	Alternative(s) Considered	Remarks
Diesel Powered Short-haul and Long-haul Trucks	Currently no RACM.	Diesel retrofits or engine replacement, compliance with idling law, and emission/opacity testing.	
Diesel Switcher Locomotives	Currently no RACM.	Locomotive retrofit with Idle Reduction Technologies – APU's. Replacement with new switchers.	Relatively low emission reduction for APUs. Cost is an issue for replacements.
Diesel Line-Haul Locomotives	Currently no RACM.	Replacement of pre-Tier 0 and Tier 0 engines with Tier 2. Accelerated replacement with Tier 4 locomotives.	First option – high cost. Second option has low impact because engines operate outside NAA.
Commercial Marine Vessels	Currently no RACM.	Repowering from Tier 0 to Tier 2 engines. Retrofit tugboats with diesel particulate filters. Control idling.	Idling restrictions are not workable since tugs are constantly deployed.

In summary, emission reductions needed to reach attainment in Liberty-Clairton are dependent primarily on shutdowns and modifications at the U. S. Steel Mon Valley Works – Clairton Plant. The proposed new configuration at the Clairton Plant will lead to a reduction of 284 tons per year, and the new equipment has already engaged reasonably or best available control technology. The projected Liberty-Clairton area beyond the Clairton Plant will total less than 62 tons per year of primary $PM_{2.5}$.

The finding of this analysis is that the identified RACMs (or combination thereof) for the Liberty-Clairton $PM_{2.5}$ nonattainment area are not likely to advance the attainment date by one year or more. ACHD has, therefore, adopted RACT and RACM as defined for this $PM_{2.5}$ SIP.

8 Contingency Measures

As outlined in the $PM_{2.5}$ Implementation Guidance,[22] $PM_{2.5}$ contingency measures are additional control measures to be implemented in the event that an area fails to meet Reasonable Further Progress (RFP) or fails to attain the standards by its attainment date. RFP documentation is not required for this SIP since an extension of attainment date is not necessitated.

This attainment demonstration is based on a baseline year of 2007, with an attainment year of 2014. Thus, the time period for the projected reductions is 7 years. Contingency measures are recommended to be based on approximately one year of additional emissions reduction.

The majority of reductions that are pertinent within the Liberty-Clairton area involve direct $PM_{2.5}$ emissions. The reduction in $PM_{2.5}$ for all source categories is 290.9 tons, as shown below in Table 8-1. While reductions of $PM_{2.5}$ precursors are also projected, the size of the Liberty-Clairton area and nature of the localized excess necessitates reduction of the direct $PM_{2.5}$ more so than the precursors.

Table 8-1. Calculation of Required and Excess Emission Reductions

Liberty-Clairton Area	**$PM_{2.5}$ (tons/year)**
Baseline (2007) Liberty-Clairton Area Emissions	997.8
Projected (2014) Liberty-Clairton Area Emissions	706.8
Change in Emissions	-290.9
Target Reductions for Contingency Measures (1/7)	41.6

EPA Implementation Guidance states that contingency measures should consist of other control measures for the area that are not included in the control strategy for the SIP. This could include federal measures and local measures already scheduled for implementation, along with measures to be implemented if attainment is not achieved.

Should attainment not be achieved by December 2014, the consent order and agreement with U.S. Steel (as amended in September 2010 and July 2011) specifies the following: coke oven wall rebuilds for Battery 20 to be implemented in late 2014. U. S. Steel will replace 88 heating walls by October 31, 2014, and the battery will meet its opacity limits by December 31, 2014, including an advanced patching plan and a revitalization plan of the battery heating system, as

[22] Federal Register, Vol. 72, No. 79, Pages 20642-3, and EPA March 2, 2012 Memo from S. D. Page.

necessary. Emissions reduced by the improvements to Battery 20 are expected to be 10.8 tons/year.

Therefore, a minimum of an additional 30.8 tons/year reduction is required. To attain this reduction, the consent order and agreement with U. S. Steel (to be amended by Dec. 31, 2013) specifies the following: within 18 months after receiving notice from ACHD that EPA is requiring implementation of the contingency measures, U. S. Steel's Clairton Plant will reduce emissions from the current Quench Tower 1 by 30.8 tons from emissions in the 2014 attainment demonstration inventory as modeled in this SIP; or implement emission reductions greater than or equal to 30.8 tons per year (unless a lesser amount is needed to demonstrate attainment of the 2006 24-hour $PM_{2.5}$ NAAQS).

Total emissions reductions from the contingency measures are given in Table 8-2.

Table 8-2. Contingency Measures Emission Reductions

Process	$PM_{2.5}$ 2014 Modeled Emissions Value (tons/year)	$PM_{2.5}$ Contingency Value (tons/year)	$PM_{2.5}$ Reduction (Inventory – Contingency) Value (tons/year)
Battery 20 – Rebuilds, Combustion Stack	21.1	11.3	9.8
Battery 20 – Rebuilds, Door Leaks	2.1	1.1	1.0
Quench Tower 1	65.5	34.7	30.8
Totals	88.7	47.1	41.6

The emissions reductions due to the contingency measures would be equal to 1 year's worth of emissions reductions required by the attainment demonstration; therefore, the identified reductions satisfy the requirement for contingency measures.

9 Weight of Evidence

EPA's *Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze* (2007) encourages the use of corroboratory analyses to support the modeled attainment demonstration. These analyses, collectively referred to as "weight of evidence" (WOE), help bolster the assertions that an area will achieve attainment in the allotted time.

9.1 Liberty-Clairton Monitored Data Trends

Allegheny County sites have shown decreasing trends for $PM_{2.5}$ since 2000 (see Figures 2-3 and 2-4). Figures 9-1 and 9-2 show annual and 24-hour design values for the Liberty and Clairton monitors over a 10-year timeframe, with linear regression trend lines extrapolating data to 2014 (i.e., design values for 2012-2014).

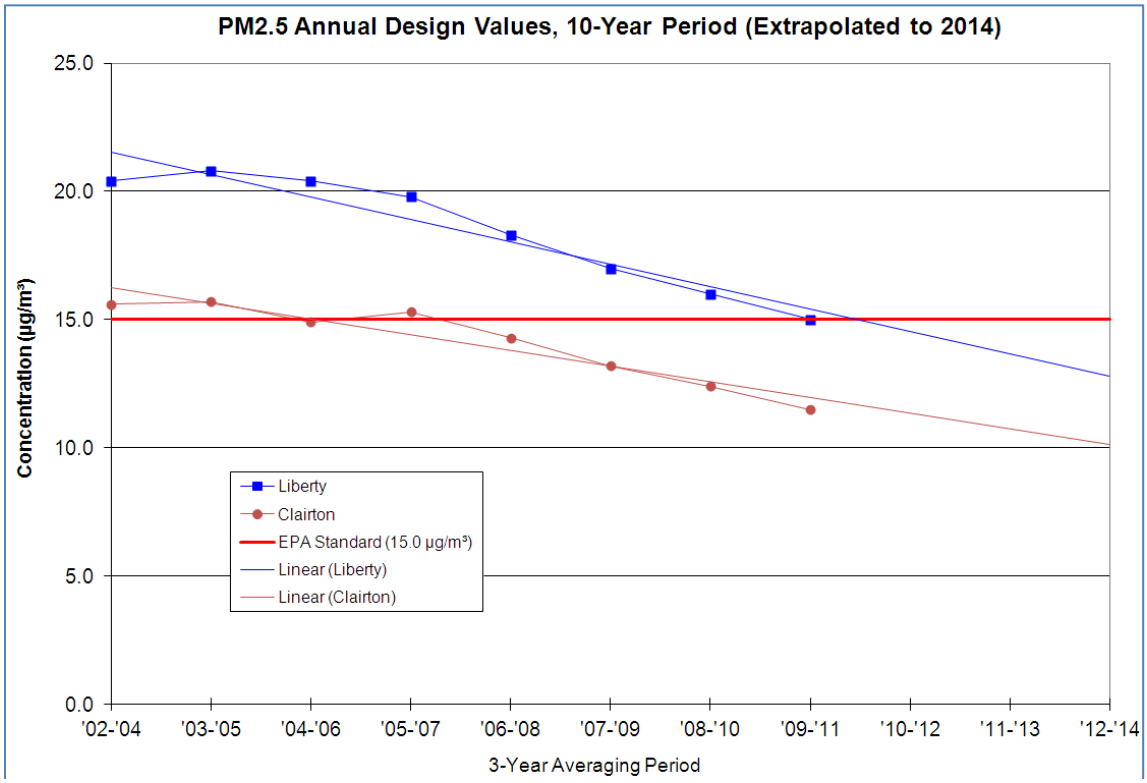

Figure 9-1. Liberty and Clairton FRM Annual Design Values, with Trend Lines Extrapolated to 2014

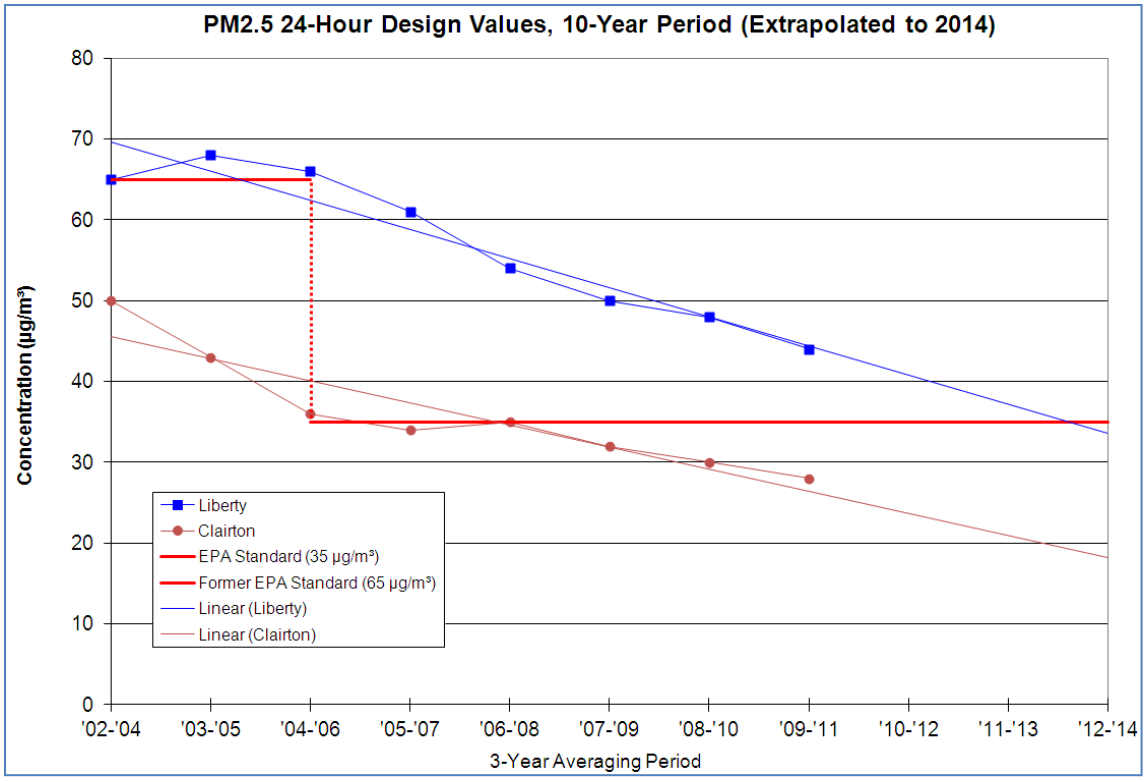

Figure 9-2. Liberty and Clairton FRM 24-Hour Design Values, with Trend Lines Extrapolated to 2014

Based on monitored data alone, Figures 9-1 and 9-2 show projected $PM_{2.5}$ design values for Liberty and Clairton that are below the standards. Both sites show a long-term decline in $PM_{2.5}$ concentrations that are statistically significant[23]. These trend lines do not account for any additional influences to future emission levels that are discussed in this SIP, such as the modifications at the U. S. Steel Mon Valley Works – Clairton Plant.

9.2 Local Major Source Modifications

Major source modifications that were not included in the modeling demonstration will lead to additional reductions of background and/or direct emissions that affect the Liberty-Clairton area. These modifications include the following:

- U. S. Steel Mon Valley Works – Edgar Thomson Plant: U. S. Steel implemented enhanced operating and maintenance plans and installed upgrades to the Basic Oxygen Process (BOP) operations in 2009-2010. Reductions of pollutants due to these controls were not estimated for the modeling demonstration.

[23] Based on EPA Region III's R Analysis of the Liberty Clairton $PM_{2.5}$ Area, 2012.

- Bellefield Boiler: The Bellefield plant refueled its coal-fired boilers to natural gas in 2009. Emissions reductions due to the fuel switch have been "banked" as emission reduction credits (ERCs) and were not included in the modeling demonstration.

- Eastman Chemical Resins, Inc.: In December 2011, Eastman entered into a consent decree and agreement with the U.S. Dept. of Justice, EPA, and ACHD to install VOC control equipment at its Jefferson Plant. Estimates of pollutant reductions due to these controls were not available for the modeling demonstration.

9.3 EGU Deactivations

Effective October 1, 2012, GenOn (now NRG) Energy deactivated the four coal-fired electric generating units (EGUs) located at the Elrama Power Plant, upwind of the Liberty-Clairton area. (At the time of this SIP submittal, the units were deactivated but not permanently retired.) Elrama emissions used in the future case modeling were based on CSAPR allocations.

Several additional coal-fired units in PA and surrounding states (OH, WV, and MD) were deactivated in 2012[24] but were included in the modeling demonstration at CSAPR emissions levels. Table 9-1 below provides details of the deactivated units.

Table 9-1. EGU Deactivations in 2012, PA and Surrounding States

Plant	Owner/Operator	State	Unit(s)	Capacity (MW)
Elrama	GenOn Energy	PA	1-4	460
Armstrong	First Energy	PA	1,2	243
Walter C Beckjord	Duke Energy	OH	1	94
Niles	GenOn Energy	OH	1,2	217
Bay Shore	First Energy	OH	2,3,4	495
Eastlake	First Energy	OH	4,5	837
Conesville	AEP	OH	3	165
Albright	Mon Power	WV	1,2,3	283
Willow Island	Mon Power	WV	1,2	189
R Paul Smith	First Energy	MD	3,4	115

Additional deactivations are expected in future years due to EPA's Mercury Air Toxics Standards, increased natural gas production, and/or other factors. (See Section 5.3.5 for EGU emission projections through mid-2015.)

[24] PJM Interconnection: http://www.pjm.com/~/media/planning/gen-retire/generator-deactivations.ashx (as of Jan. 10, 2013)

9.4 Population Trends

Allegheny County is unique in the fact that the population has been declining since the 1960s. Localized regions of population growth are occurring, but the general trend for the county is one of negative growth. The 2010 census shows continued decrease in population in the five municipalities of the Liberty-Clairton area as well. According to the U.S. Census Bureau, from 2000 to 2010, the City of Clairton had a decrease in population of about 20%, the largest population decrease in the nonattainment area. (See Figure 9-3 below.)

Population decreases were also seen in the remaining nonattainment area boroughs. Glassport saw a population change of -10.2%, Liberty -4.5%, Lincoln -12.0%, and Port Vue -10.2%. In total, the five nonattainment area municipalities decreased in population by 2,900 people, or -13.4% from 2000 to 2010. This continues a trend of decline of from the 1990-2000 period, which saw an average decrease in the nonattainment area of -6.6%.

Decreasing populations signal less use of cars and a lesser need for school buses and other diesel-engine vehicles. Additionally, various consumption activities will decline (power use, water use, etc.), and lower amounts of waste will be produced. Combining all of this with the local and national regulations and trends toward more efficient and cleaner cars and fuels, it is expected that $PM_{2.5}$ in the nonattainment area will reach levels lower than the models show.

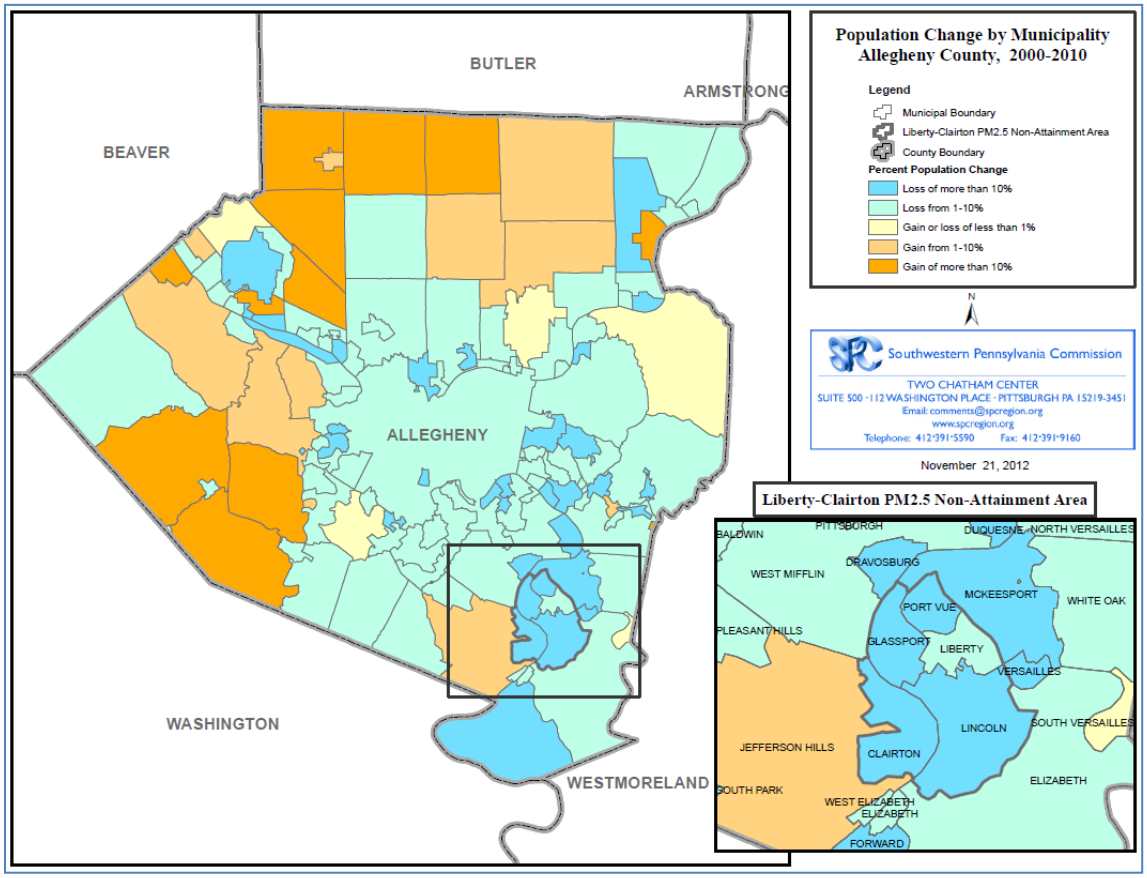

Figure 9-3. Population Trends for Allegheny County, 2000-2010

9.5 Wood Stoves and Wood-Fired Boilers

Receptor modeling and source apportionment showed that vegetative burning is a contributor of $PM_{2.5}$ at Liberty. (Source apportionment results can be found in Appendix C-2.) Fine particulate pollution producing wood burning stoves and outdoor wood-fired boilers are used throughout Allegheny County. Further work in this area, including federal and local regulations addressing wood-burning stoves and boilers, respectively, will reduce particulate pollution further in the nonattainment zone.

9.5.1 Wood Stoves

At the federal level, EPA has promulgated regulations establishing emissions limits for newly manufactured woodstoves. "EPA-certified" wood stoves can reduce particulate emissions 70-80% per unit compared to an older, non-certified woodstove. Taking advantage of that, from 2005-2007, ACHD participated in EPA's Great American Wood Stove Changeout Campaign, replacing 176 older non-EPA certified woodstoves in Southwest Pennsylvania with new, cleaner burning "EPA-certified" units. According to EPA, changing out 20 wood stoves results in a net reduction of 1 ton of particulate matter pollution. While newly manufactured wood stoves have emission controls, older non-certified stoves continue to pollute the air and could be part of a future wood stove changeout campaign.

Additionally, as of May, 2011, EPA drafted proposed revised New Source Performance Standards (NSPS) for residential wood heaters that will continue to reduce particulate pollution from wood stoves, leading to fewer emissions from future installations.

ACHD conducted educational campaigns, covering the health effects and environmental impact of wood smoke, are ongoing. These include campaigns to inform municipalities about pollution from wood stoves, and their ability to curtail it, the availability of cleaner units, and encouraging clean burning practices among those who already own and operate wood stoves.

9.5.2 Outdoor Wood-Fired Boilers

Outdoor Wood-Fired Boilers (OWBs), also known as hydronic heaters, are another source of particulate pollution for the Allegheny County and Liberty-Clairton areas. Over the past five years, a voluntary federal program, a state regulation, and some local ordinances have been established in order to help control OWB generated pollution.

EPA' Voluntary Hydronic Heater Program, launched in 2007, provides a process for manufacturers to demonstrate that their "Qualified" models are 90 percent cleaner than older unqualified units. At the state level, 25 Pa. Code, Chapter 123.14, "Outdoor wood-fired boilers", became effective on October 2, 2010, and regulates the use of OWBs in the Commonwealth. The rule prohibits the sale, purchase, and installation of an OWB unless it is a Phase II qualified OWB. The rule also requires that any new OWB be installed a minimum of 50 feet from the nearest property line, and have a stack that extends at least 10 feet above the ground. There are also requirements that appropriate fuels be used, such as clean, dry wood or wood pellets.

In 2012, ACHD added similar OWB regulations to Article XXI, along with a limited number of health enhancing revisions, including an increased setback requirement of 150 feet, additional stack height criteria, use restrictions on Air Quality Action Days, and the addition of simple reporting requirements at purchase time. An outreach campaign targeted at OWB manufacturers and distributors is planned to help educate potential buyers of the ACHD regulations they must be in compliance with. ACHD expects this to help prevent improper burning and excess pollution production.

In addition to the new regulation, Article XXI §2104.01, Visible Emissions, and §2104.04, Odor Emissions, are in place which are useful enforcement tools for managing wood burning stoves and boilers. The clean-burning educational campaigns ongoing at ACHD encourage all Allegheny County residents to consider how and what they burn and how it impacts their health and environment.

The implementation of the OWB regulation by ACHD, and additional work including potential municipal ordinances regulating the use of wood-burning stoves and OWBs, will reduce particulate pollution further in the nonattainment zones.

9.6 Diesel Campaign

ACHD has a robust diesel reduction program that since 2004 has included the implementation of diesel idling regulations affecting school buses, trucks and transit buses, and off-road construction-type vehicles and equipment. The program also has made available nearly $6.6 million in funding for projects involving retrofitting or repowering of school buses, transit buses, and locomotive and construction equipment, as well as scientific studies of the extent and location of diesel particulate emissions.

In addition, the efforts of local environmental groups have been significant in developing new city and county laws and regulations, as well as non-governmental funding of several retrofit programs.

9.6.1 Idling

Idling regulations are currently in place at the state and county levels. On October 9, 2008, Act 124, The Pennsylvania Diesel-Powered Motor Vehicle Idling Act, was signed by Governor Rendell. It became effective on February 6th, 2009, prohibiting the owners and drivers of any commercial diesel-powered on-road motor vehicle with a gross weight of greater than 10,001 pounds from idling for more than five minutes in any 60-minute period. Exemptions are in place for the operator's safety and the comfort of passengers in high or low temperatures. Extensive signage requirements in the law have been integral in spreading the news of this new regulation across the state. All truck docks and other places where diesel trucks may park or idle are required to post signs regarding the regulation.

In addition to the coverage of the State Act 124, Allegheny County has passed and has on the books, effective May 1, 2010, §2105.93 of Article XXI, "In-Use Off-Road Diesel Powered Mobile Equipment Engine Idling," which prohibits idling of off-road vehicles for more than five consecutive minutes, unless exempt. Operators of such vehicles can be reported to ACHD and can be fined up to $500 if they are found in non-compliance. The County regulation primarily affects construction vehicles, which can operate as a nuisance point source at construction sites in highly populated areas. An extensive outreach campaign was conducted by Allegheny County to help owners and managers inform their employees of the regulation to avoid fines and to avoid producing excess pollution.

9.6.2 City Legislation & Industry Initiatives

In 2011, The City of Pittsburgh passed the Clean Air Act of 2011, which required certain publicly subsidized construction projects in Pittsburgh to utilize clean diesel equipment. This legislation will help to reduce diesel particulate pollution from construction projects in the city, both by the direct requirement for retrofitted equipment, and the incentives construction companies now have to retrofit their equipment in advance of securing a contract for a publicly subsidized project, so as to remain competitive. Local nonprofits have begun to work to pass similar legislation covering Allegheny County.

Other similar efforts to address diesel particulate pollution from construction sources have been taken up by local businesses and other organizations. In 2011, The University of Pittsburgh Medical Center (UPMC) established language for all future contracts that requires all construction equipment used at any UPMC construction site to meet Tier 4 standards. This requirement went into effect in the spring of 2011, three years before EPA will require Tier 4 standards on all newly manufactured equipment. UPMC currently has several hospitals and other health facilities throughout Allegheny County and is the second largest employer in the Commonwealth.

9.6.3 ACHD/Heinz Endowment Retrofit Project

In 2011, ACHD initiated a project to provide funding to federally-registered small construction companies to help offset the costs of procuring certified and/or verified diesel retrofit technology. An amount of $925,000 was made available for the construction companies to purchase equipment, and ACHD selected the Mid-Atlantic Regional Air Management Association (MARAMA) to manage the project. A local philanthropic organization, the Heinz Endowments, matched ACHD's funds and doubled the amount of money for MARAMA to distribute to construction companies in Allegheny County. ACHD's portion of the funding is to be spent retrofitting equipment in Allegheny County. The Heinz Endowment's portion will go toward helping construction companies comply with the above-mentioned City of Pittsburgh's Clean Air Act of 2011.

Applicants will receive between $10,000 and $100,000 each, if selected. The costs of diesel particulate filters (DPFs) will be covered 100% and companies will receive up to 75% of the cost of engine repowers and rebuilds. ACHD and MARAMA expect somewhere between 15 and 20

individual companies to receive funding for various pieces of diesel-engine construction equipment.

9.6.4 Federally Funded Competitive ARRA Clean Diesel Retrofit Projects

The Allegheny County Health Department, with input from the Group Against Smog and Pollution (GASP) and Clean Water Action (CWA), applied for and was awarded federal funds for projects to reduce diesel particulate pollution in the spring of 2009. A total of $3,498,106 was awarded by the U.S. EPA to the Department and funded four projects to help reduce diesel pollution in Pittsburgh, the Liberty-Clairton nonattainment area, and throughout Southwestern PA. The money came from the American Recovery and Reinvestment Act (ARRA) via the National Clean Diesel Program. The four projects, outlined below, were completed by September 2011.

- The Port Authority of Allegheny County used ARRA funds to assist in replacing two 1996 model year transit buses with cleaner 2010 model-year diesel hybrid electric buses and to repower nine 2003 model year diesel buses with engines that met tighter 2007 emission standards. This project reduces particulate matter pollution by approximately 0.1 tons per year, carbon monoxide by 1.5 tons per year, and nitrogen oxides by 4.8 tons per year.

- The Constructors Association of Western Pennsylvania used ARRA funds to retrofit or repower 39 pieces of heavy-duty diesel-powered, non-road construction equipment in Western Pennsylvania. The various upgrades reduce particulate matter pollution by 9.4 tons per year, carbon monoxide by 72 tons per year, hydrocarbons by 11.3 tons per year, and nitrogen oxides by 69 tons per year.

- Harsco Metals of Americas provides trucking for U. S. Steel. With ARRA funds they installed diesel particulate filters on eight dump trucks operating in and around U. S. Steel's Mon Valley Works. These trucks are now 90-percent less polluting than before the project. It is estimated that these diesel particulate filters will remove 0.02 tons of particulate matter per year, 0.20 tons of carbon monoxide per year, and 0.03 tons of hydrocarbons per year.

- CSX Transportation used ARRA funds to replace one vintage diesel switcher locomotive without emission controls with a two-engine configuration that has the latest in emission control technology. The GenSet switcher locomotive engine operates at CSX's McKeesport/Demmler rail yard, bringing immediate air quality benefits to the residential neighborhood nearby. The project cuts diesel particulate matter by approximately 0.5 tons per year, carbon dioxide by 172 tons per year, and nitrogen oxides by 16.6 tons per year. It also saves 15,000 gallons of diesel fuel annually.

9.6.5 State Allocation Diesel Retrofit Project

ACHD also received $433,100 in funding from the Pennsylvania DEP to equip 33 of the City of Pittsburgh's diesel-powered refuse haulers with diesel particulate filters. The money came from

the ARRA via the State Allocation Grant Program. Because of the frequent starting and stopping of the vehicles, and the proximity to all neighborhoods and families in the city, this project significantly helps local air quality. It is estimated that these diesel particulate filters will remove 0.09 tons of particulate matter per year, 0.4 tons of carbon monoxide per year, and 0.1 tons of hydrocarbons per year. The project was completed in June 2010. A previous project led by GASP and Clean Water Action installed diesel particulate filters on 13 other City waste haulers, bringing the total number of diesel particulate filters installed to 46.

9.6.6 ACHD Clean Air Fund Retrofits

Through its Clean Air Fund, ACHD has completed the retrofit of 85 school buses and 11 pieces of municipal equipment, the latter were all at the City of Clairton. It is estimated that these diesel oxidation catalysts will remove 0.08 tons of particulate matter per year, 1.15 tons of carbon monoxide per year, and 0.42 tons of hydrocarbons per year.

9.7 Monitored Data During Low Production Periods

Economic recession in 2009 led to decreased levels of production at many industrial facilities in Southwest PA.[25] To examine the effect of low production levels on $PM_{2.5}$ concentrations, 2009 continuous $PM_{2.5}$ (TEOM) and Federal Reference Method (FRM) data were compared to previously monitored data for previous years. Liberty data was compared to Lawrenceville data to reveal differences between the regional and localized components. (Note: TEOM monitors are not considered "official" $PM_{2.5}$ monitors by EPA but can be used for short-term trends and for real-time reporting of data. Data shown here has not been corrected to make FRM-like.)

Long-term hourly averages for the continuous TEOMs are shown in Figure 9-4 for Liberty and Lawrenceville during the period of 2000-2008. Hours are given according to Eastern Standard Time (EST).

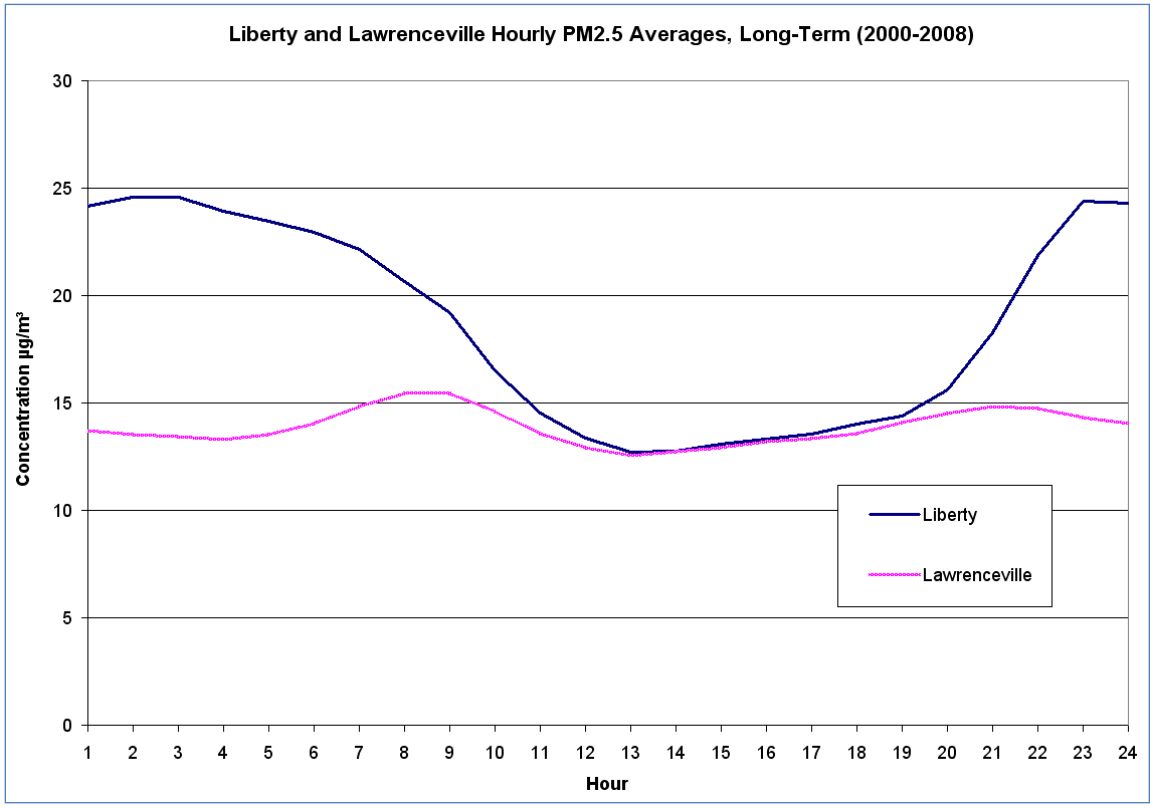

Figure 9-4. Long-Term Hourly $PM_{2.5}$ TEOM Averages at Liberty and Lawrenceville, 2000-2008

[25] Also note that, in general, much of the Midwest was a bit cooler and wetter than normal in 2009. However, NWS records for Pittsburgh International Airport indicate that closer to the Liberty-Clairton area, the average annual temperature was near normal and total annual precipitation was near or substantially below normal in 2009.

Long-terms trends show that Liberty TEOM concentrations are much higher than Lawrenceville during nighttime hours but are nearly similar during daytime hours (specifically during afternoon to early evening hours). This diurnal trend is due to the strong influence of inversions that lead to the nighttime accumulation of particles in the Liberty-Clairton area. Smaller peaks can be seen at Lawrenceville due during peak traffic periods, also possibly influenced by inversions.

Long-term hourly averages (2000-2008) at each site were compared to averages for 2009 data. The Liberty long-term averages are shown along with 2009 averages in Figure 9-5 below.

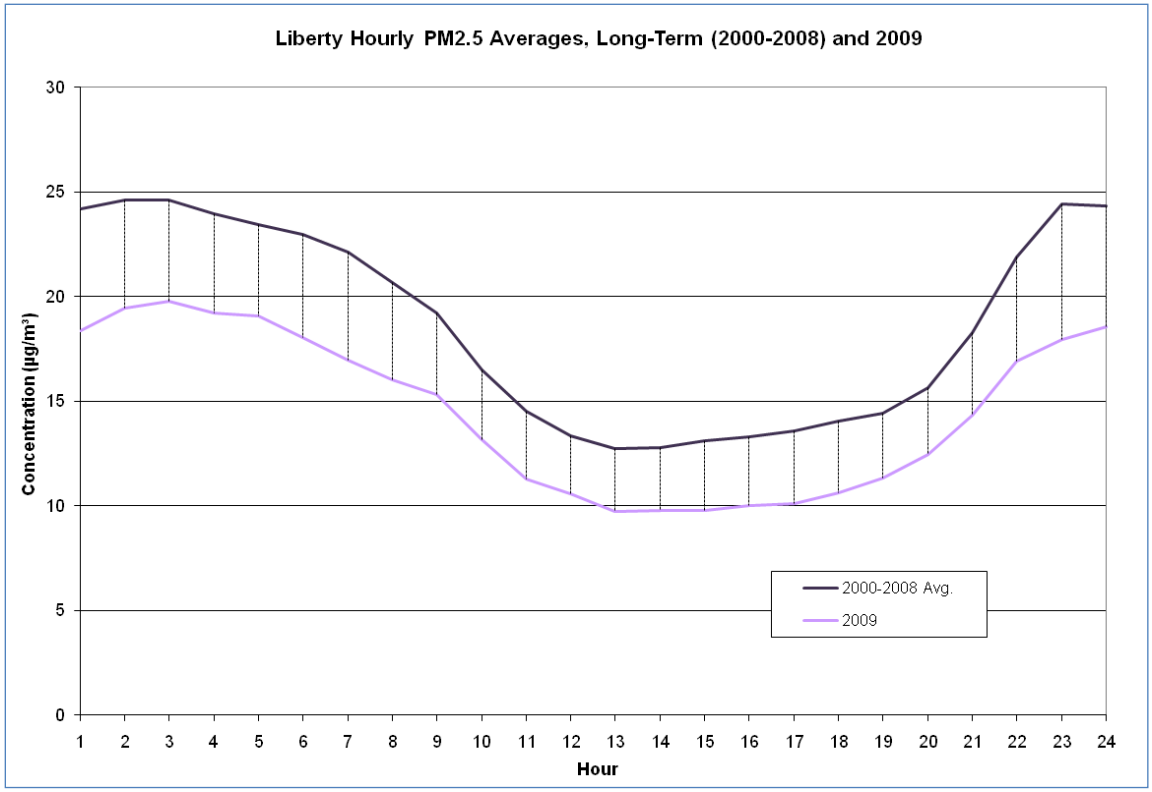

Figure 9-5. Hourly 2009 $PM_{2.5}$ TEOM Averages at Liberty Compared to Long-Term 2000-2008 Averages

Liberty TEOM data show the same diurnal trend in 2009 as in previous years but at lower concentrations. Additionally, the dotted high-low lines visually indicate a higher nighttime difference between long-term and 2009 data. This is evidence that the 2009 low-production conditions led to lower concentrations during typical peak periods, supporting the control strategy addressed in this SIP.

The Lawrenceville long-term averages are shown along with 2009 averages in Figure 9-6 below.

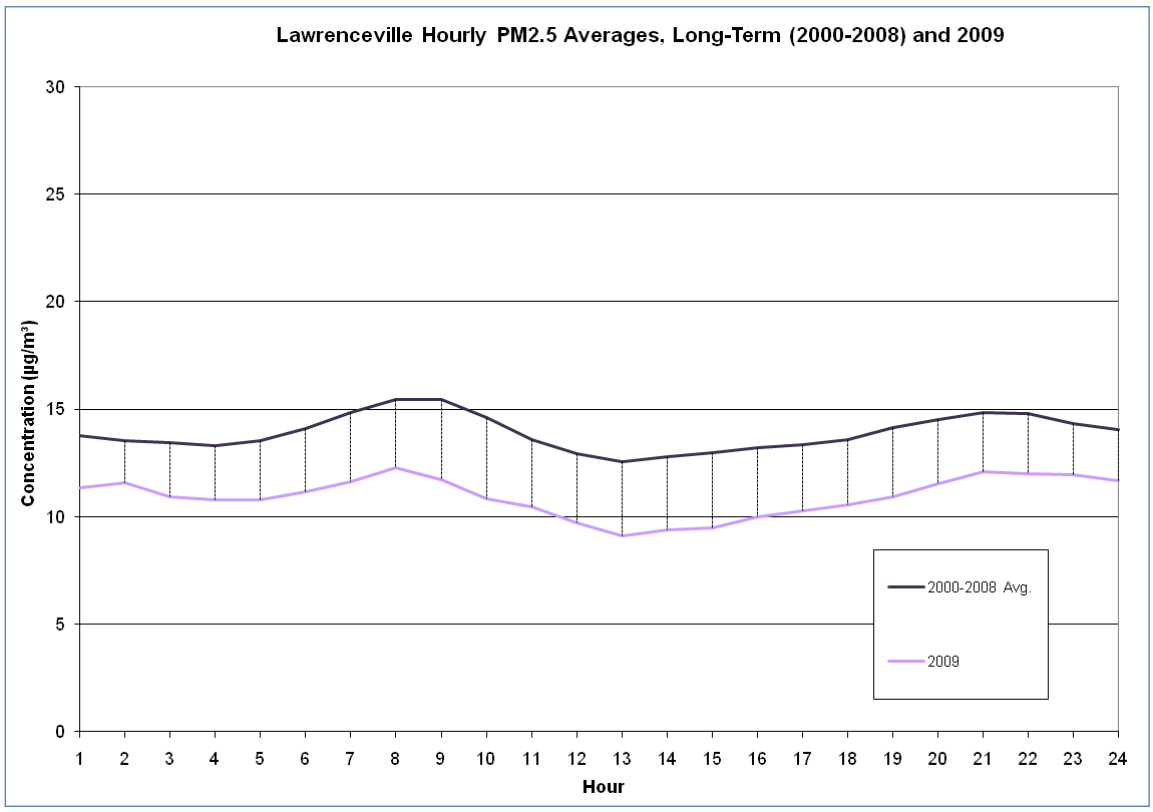

Figure 9-6. Hourly 2009 $PM_{2.5}$ TEOM Averages at Lawrenceville Compared to Long-Term 2000-2008 Averages

Lawrenceville TEOM data show an overall decrease in concentrations in 2009, with the high-low lines showing a slightly higher difference between long-term and 2009 daytime concentrations.

Decreases in overall concentrations at both sites can be due to regionally lower production levels, while lower nighttime levels at Liberty may be evident of lower local source production levels. To examine this, differences in concentrations between the two sites were calculated.

Table 9-2 below shows quarterly average FRM data over a 5-year timeframe for years 2005-2008 and for 2009. Averages are given for Liberty, Lawrenceville, and the difference between the two sites (Liberty minus Lawrenceville).

Table 9-2. $PM_{2.5}$ FRM Quarterly Averages, 2005-2008 and 2009

Liberty	**1Q**	**2Q**	**3Q**	**4Q**
2005-2008 Average	14.9	19.1	23.6	18.9
2009	15.0	13.7	15.1	16.4
Lawrenceville	**1Q**	**2Q**	**3Q**	**4Q**
2005-2008 Average	12.5	13.8	19.4	12.3
2009	12.7	11.2	12.9	9.7
Difference (Lib.-Law.)	**1Q**	**2Q**	**3Q**	**4Q**
2005-2008 Average	2.4	5.2	4.2	6.6
2009	2.3	2.5	2.2	6.7

The difference parameters for 2nd and 3rd quarters in 2009 are significantly smaller than in previous years, coinciding with low production levels at local sources.

At the U. S. Steel Mon Valley Works – Clairton Plant, Batteries 13-15 were idled from Mar.-Dec. 2009, along with B Battery from Apr.-Jun. 2009, due to economic recession. Batteries 7-9 were also permanently idled in April 2009. At the NRG Elrama power plant, all boiler units operated at an average capacity of 8.1% from March to October 2009.

To further illustrate the lower localized source influence in 2009 data, a plot of the Liberty-Lawrenceville TEOM difference is shown in Figure 9-7 for 2009 and previous years. For this chart, long-term hourly averages for 2000-2008 are compared to hourly averages for 2009. The hours have been shifted by 12 hours to show the nighttime period in the center of the chart.

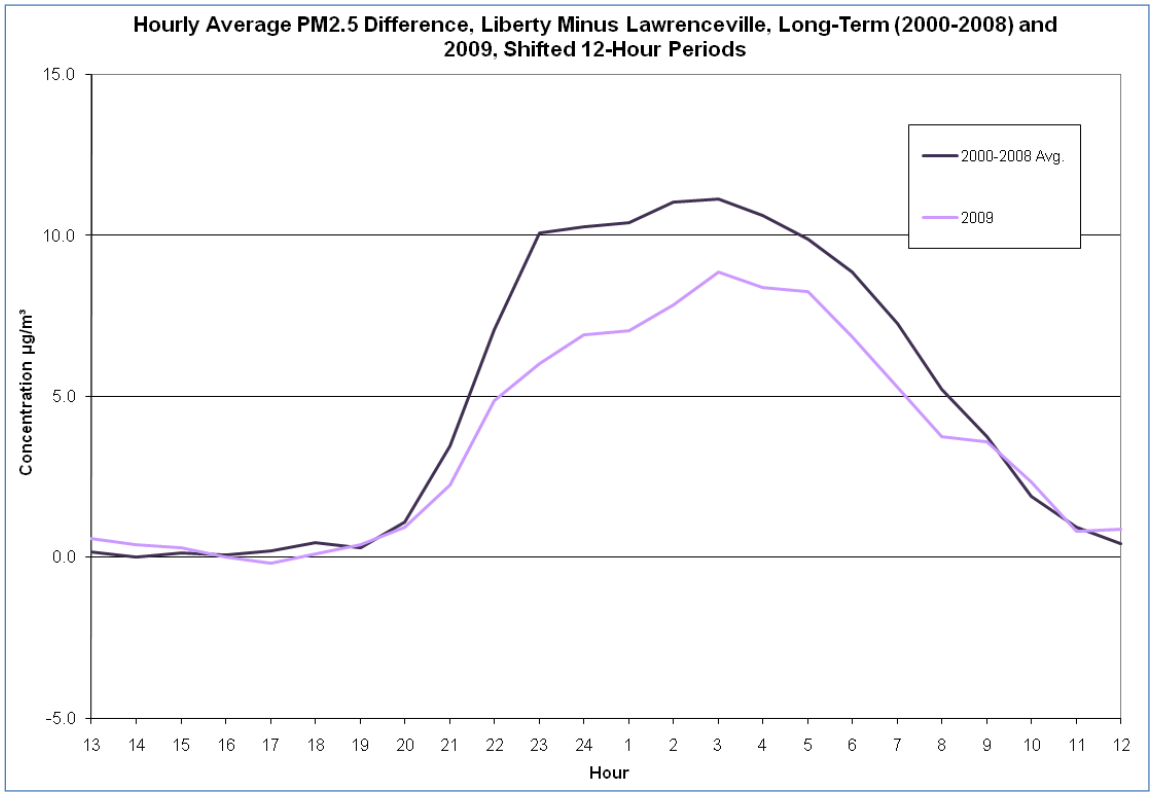

Figure 9-7. Hourly 2009 $PM_{2.5}$ TEOM Average Differences Between Liberty and Lawrenceville Compared to Long-Term 2000-2008 Data

The nighttime peak in the Liberty-Lawrenceville difference has been lowered in the 2009 data, reflecting the influence of reduced production in 2009 compared to that of normal production in 2000-2008. Decreases in concentration differences are greatest in the late evening/early morning period.

10 Emergency Episodes

Subpart H of 40 CFR part 51 specifies requirements for SIPs to address emergency air pollution episodes in order to prevent air pollutant levels from reaching levels determined to cause significant harm to the health of persons. No levels are currently recommended by EPA for $PM_{2.5}$ emergency episodes, however ACHD Rules and Regulations Article XXI §2106.03, which defines the procedures for emergency air pollution episodes as well as the values for air pollutants, includes PM_{10} levels. ACHD will use the levels set for PM_{10} as $PM_{2.5}$ levels.

ACHD assumes one $\mu g/m^3$ of $PM_{2.5}$ to be equal to at least one $\mu g/m^3$ of PM_{10}, therefore if any $PM_{2.5}$ monitor exceeds any of the levels listed for PM_{10}, it will be assumed that the PM_{10} levels have been exceeded, and appropriate action will be taken according to the predetermined Episode Actions of Article XXI §2106.04.

11 Legal Documents

11.1 Notice of Public Hearing and Comment Period

Posted on: Jan. 17, 2013

NOTICE of Public Hearing on the Proposed Revision to the Allegheny County Portion of the Pennsylvania State Implementation Plan -- Attainment Demonstration for the Liberty - Clairton PM2.5 Nonattainment Area 2006 Standards.

The Allegheny County Board of Health will hold a public hearing on Tuesday, February 19, 2013, at 6:00 PM at Clairton City School District cafeteria, 501 Waddell Avenue, Clairton, PA 15025, to take testimony on the proposed revision to Allegheny County's portion of the State Implementation Plan (SIP) for particulate matter of 2.5 microns or less in diameter (PM2.5).

The SIP revision demonstrates that the Liberty-Clairton area will attain the 2006 PM2.5 National Ambient Air Quality Standards (NAAQS) by 2014, based on pollutant emission reductions and air-dispersion modeling. This revision will be submitted to EPA for approval as a SIP revision.

Copies of the proposed SIP revision may be examined beginning Friday, January 18, 2013, at the Allegheny County Law Library, Room 921 City-County Building, Grant Street, Pittsburgh, PA 15219, from 8:30 AM to 5:00 PM; at the Allegheny County Health Department Document Control Room, Building 7, Clack Health Center, from 8:30 AM until 4:00 PM, Monday through Friday; on the Allegheny County Health Department web site: www.achd.net; or by calling 412-578-8120 to request a mailed printed copy.

Oral testimony must be pre-scheduled by calling 412-578-8008 no less than 24 hours in advance of the public hearing. Speakers will be limited to five minutes and should bring a written copy of their comments to the hearing.

The Board will accept written testimony beginning Friday, January 18, 2013, and concluding 4:00 PM on Tuesday, March 5, 2013, by mail to Board of Health, 3333 Forbes Avenue, Pittsburgh, PA 15213, by email to BOH@achd.net, or by fax to 412-578-8325.

11.2 Transmittals of Hearing Notice to PA DEP and EPA

COUNTY OF ALLEGHENY

RICH FITZGERALD
COUNTY EXECUTIVE

January 15, 2013

Ms. Joyce Epps, Director
Department of Environmental Protection
Bureau of Air Quality
Rachel Carson Building
400 Market Street, P. O. Box 8468
Harrisburg, PA 17105-8468

Dear Ms. Epps:

Enclosed is a Notice of Public Hearing scheduled to occur on February 19, 2013, regarding a proposed revision to Allegheny County's portion of the PA State Implementation Plan (SIP) for $PM_{2.5}$ for the Liberty-Clairton Nonattainment Area.

The SIP revision is available for download at: http://www.achd.net/air.html. Hard copies and modeling file DVDs are available by request.

The SIP revision is being tracked as our Revision Tracking Number 75. Copies of this notice have also been sent to Region V Pittsburgh Office for their information and review. Your comments are welcome.

Sincerely,

/SIGNED/

James Thompson, Manager
Air Quality Program

cc: Steve Hepler

Enclosure
* Public Hearing Notice

AIR QUALITY PROGRAM
301 39TH STREET – BUILDING #7
PITTSBURGH PA 15201-1891
PHONE (412) 578-8103 FAX (412) 578-8144

RONALD E. VOORHEES, MD, MPH, ACTING DIRECTOR
ALLEGHENY COUNTY HEALTH DEPARTMENT
3333 FORBES AVENUE • PITTSBURGH, PA 15213
PHONE (412) 687-ACHD (2243) • FAX (412) 578-8325 • WWW.ACHD.NET

COUNTY OF ALLEGHENY

RICH FITZGERALD
COUNTY EXECUTIVE

January 14, 2013

Diana Esher, Director
Air Protection Division
Region III (3AP00)
U. S. Environmental Protection Agency
1680 Arch Street
Philadelphia, PA 19103-2029

Dear Ms. Esher:

Enclosed is a Notice of Public Hearing scheduled to occur on February 19, 2013, regarding a proposed revision to Allegheny County's portion of the PA State Implementation Plan (SIP) for $PM_{2.5}$ for the Liberty-Clairton Nonattainment Area.

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The SIP revision is being tracked as our Revision Tracking Number 75. Your comments are welcome.

Sincerely,

/SIGNED/

James Thompson, Manager
Air Quality Program

Enclosure

* Public Hearing Notice

Air Quality Program
301 39th Street, Bldg. 7
Pittsburgh, PA 15201-1891

RONALD E. VOORHEES, MD, MPH, ACTING DIRECTOR
ALLEGHENY COUNTY HEALTH DEPARTMENT
3333 FORBES AVENUE • PITTSBURGH, PA 15213
PHONE (412) 687-ACHD (2243) • FAX (412) 578-8325 • WWW.ACHD.NET

11.3 Proof of Publication and Certification of Public Hearing

No. _____ Term, _____

Proof of Publication of Notice in Pittsburgh Post-Gazette

Under Act No 587, Approved May 16, 1929, PL 1784, as last amended by Act No 409 of September 29, 1951

Commonwealth of Pennsylvania, County of Allegheny, ss C. Mohamed, being duly sworn, deposes and says that the Pittsburgh Post-Gazette, a newspaper of general circulation published in the City of Pittsburgh, County and Commonwealth aforesaid, was established in 1993 by the merging of the Pittsburgh Post-Gazette and Sun-Telegraph and The Pittsburgh Press and the Pittsburgh Post-Gazette and Sun-Telegraph was established in 1960 and the Pittsburgh Post-Gazette was established in 1927 by the merging of the Pittsburgh Gazette established in 1786 and the Pittsburgh Post, established in 1842, since which date the said Pittsburgh Post-Gazette has been regularly issued in said County and that a copy of said printed notice or publication is attached hereto exactly as the same was printed and published in the regular editions and issues of the said Pittsburgh Post-Gazette a newspaper of general circulation on the following dates, viz:

17 of January, 2013

Affiant further deposes that he/she is an agent for the PG Publishing Company, a corporation and publisher of the Pittsburgh Post-Gazette, that, as such agent, affiant is duly authorized to verify the foregoing statement under oath, that affiant is not interested in the subject matter of the afore said notice or publication, and that all allegations in the foregoing statement as to time, place and character of publication are true.

COPY OF NOTICE OR PUBLICATION

NOTICE of Public Hearing on the Proposed Revision to the Allegheny County Portion of the Pennsylvania State Implementation Plan -- Attainment Demonstration for the Liberty - Clairton PM2.5 Non-attainment Area 2006 Standards

The Allegheny County Board of Health will hold a public hearing on Tuesday, February 19, 2013, at 6:00 PM at Clairton City School District cafeteria, 501 Waddell Avenue, Clairton, PA 15025, to take testimony on the proposed revision to Allegheny County's portion of the State Implementation Plan (SIP) for particulate matter of 2.5 microns or less in diameter (PM2.5).

The SIP revision demonstrates that the Liberty-Clairton area will attain the 2006 PM2.5 National Ambient Air Quality Standards (NAAQSs) by 2014, based on pollutant emission reductions and air-dispersion modeling. This revision will be submitted to EPA for approval as a SIP revision.

Copies of the proposed SIP revision may be examined beginning Friday, January 18, 2013, at the Allegheny County Law Library, Room 921 City-County Building, Grant Street, Pittsburgh, PA 15219, from 8:30 AM to 5:00 PM; at the Allegheny County Health Department Document Control Room, Building 7, Clack Health Center, from 8:30 AM until 4:00 PM, Monday through Friday; on the Allegheny County Health Department web site (www.achd.net<http://www.achd.net>; or by calling 412-578-8120 to request a mailed printed copy.

Oral testimony must be pre-scheduled by calling 412-578-8008 no less than 24 hours in advance of the public hearing. Speakers will be limited to five minutes and should bring a written copy of their comments to the hearing.

The Board will accept written testimony beginning Friday, January 18, 2013, and concluding 4:00 PM on Tuesday, March 5, 2013, by mail to Board of Health, 3333 Forbes Avenue, Pittsburgh, PA 15213, by

C. Mohamed

PG Publishing Company

Sworn to and subscribed before me this day of:
January 17, 2013

Linda M. Gaertner

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Linda M. Gaertner, Notary Public
City of Pittsburgh, Allegheny County
My Commission Expires Jan. 31, 2015
MEMBER, PENNSYLVANIA ASSOCIATION OF NOTARIES

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Attorney For

Revision 75

SIP Revision for $PM_{2.5}$ for Liberty-Clairton, 2006 NAAQS

Certification of Hearing

Anthony J. Sadar deposes and says that he is an Air Pollution Administrator with the Air Quality Program of the Allegheny County Health Department and hereby certifies that a Public Hearing was held on February 19, 2013 regarding the proposed revision to Allegheny County's portion of the State Implementation Plan (SIP) for particulate matter 2.5 microns or less in diameter (PM2.5); that the opportunity for written comments was given during the period January 18, 2013 through March 5, 2013 in accordance with the requirements of 40 CFR 51.102; that notice of such hearing was given by publication in a newspaper of general circulation on January 17, 2013; and to the best of his knowledge, belief and understanding, such proceedings were in full compliance with all applicable state and federal laws, regulations, and other requirements.

Anthony J. Sadar
Air Pollution Administrator
Air Quality Program
Allegheny County Health Department

3-6-2013
Date

11.4 Summary of Public Comments and Responses

Comment and Response Document for the Proposed SIP Revision 75
Revision to State Implementation Plan for $PM_{2.5}$ for Allegheny County
Liberty-Clairton $PM_{2.5}$ Attainment Plan, 2006 NAAQS

February 19, 2013 Public Hearing
Public Comment Period ending March 5, 2013

GENERAL
Comments related to the $PM_{2.5}$ SIP in general.

1. **Comment:** Coal coke smell is evident throughout Liberty Borough. Liberty and surrounding communities deserve the strongest level of protection possible.

   Commenter: Reverend Don Polito, Pastor, Liberty Presbyterian Church.

   Response: ACHD appreciates the comment and will continue to work on air quality plans in order to protect the community.

2. **Comment:** Evidence suggests that daily peaks of pollution in the Mon Valley are triggering asthma attacks, other lung diseases, and heart attacks. If residents are asked to reduce emissions on bad air quality days, industry should be asked to curtail emissions on those days as well.

   Commenter: Clean Water Action.

   Response: A SIP is a plan developed to meet attainment of NAAQS to protect public health. On Air Quality Action Days, both the public and industry are requested to minimize emissions. ACHD will continue to work on air quality plans in order to protect the community.

3. **Comment:** The SIP shows future design values that are close to the NAAQS. ACHD should closely monitor emissions and take aggressive action should attainment not be met. U. S. Steel should be applauded for their actions to date but also asked to continue the installation of newer technologies such as low-emission quench towers.

   Commenter: Clean Water Action.

   Response: ACHD will continue to monitor the air in Allegheny County and work with industry and other pollutant sectors in order to control emissions.

4. **Comment:** Although the SIP shows a decrease in particulate matter, the SIP does not address the exposure to volatile carcinogenic gases from the coke plant. Daily exposures to these emissions should be made publically available, especially for peak periods.

   Commenter: Constance Jennings, MD.

   Response: This plan is only for the control of fine particulates. However, up-to-date information on monitored data is available at the ACHD web site: http://www.achd.net/air/index.php.

5. **Comment:** The Mon Valley has a high rate of heart attacks and cancer due to airborne particulates. Laws for the control of particulates from vehicles and off-road equipment are not being enforced. Also, ACHD should develop a prevention and testing program for toxics such as mercury and arsenic, similar to lead testing for children.

   Commenter: William Donofrio, Your Environment.

   Response: ACHD appreciates the recommendation and will continue to work on air quality plans and prevention programs in order to protect the community. The comment related to enforcement of particulate matter from vehicles and off-road equipment may relate to the City of Pittsburgh's "Clean Air Act of 2010," which is not applicable to the Mon Valley.

6. **Comment:** Clean air should be a priority for SWPA, plans for air quality should be continued, and current regulations should not be weakened.

   Commenter: Joan Smith; and Christopher D. Conte.

   Response: ACHD follows all national air quality rules and regulations and will continue to implement local regulations and programs for better air quality. No regulation has been weakened in this plan.

7. **Comment:** On Jan. 4, 2013, the U.S. Court of Appeals for the District of Columbia Circuit (D.C. Circuit) remanded to EPA the Final Clean Air Fine Particle Implementation Rule. The D.C. Circuit found that EPA erred in the implementation of the 1997 $PM_{2.5}$ NAAQS according to Subpart 1 of Part D of Title I of the Clean Air Act, rather than Subpart 4. EPA is still interpreting this court decision and its potential implications for attainment demonstrations.

   Commenter: U.S. EPA Region III.

   Response: ACHD acknowledges the court ruling and will work with EPA in response to potential implications to the attainment demonstration. ACHD believes the requirements of both Subpart 1 and Subpart 4 have been satisfied (see responses to comments 8 and 27).

8. **Comment:** Based on the Jan. 4, 2013 D.C. Circuit ruling, the Liberty-Clairton SIP should comply with Title I, Part D, Subpart 4 of the Clean Air Act. The SIP must be revised to reflect the requirements applicable to moderate areas under Subpart 4. This includes a due date of June 14, 2011, an attainment deadline of Dec. 31, 2015 without contingency measures, compliance with RACM by Dec. 14, 2013, and presumptive regulation of VOCs and NH_3.

   Commenter: Clean Air Council, PennFuture, GASP, Clean Water Action, Sustainable Pittsburgh, Sierra Club, REACH Mon Valley, and Center for Coalfield Justice.

   Response: With addition of discussion of VOCs and NH_3, ACHD believes the requirements of both Subpart 1 and Subpart 4 have been satisfied. (See also response to previous comment and comment 27.)

9. **Comment:** The Liberty-Clairton area is at high risk of being reclassified as a "serious" nonattainment area under Title I, Part D, Subpart 4 of the Clean Air Act if attainment is not met. The attainment demonstration shows no practical support for its conclusion that will attain the 24-hour standard by Dec. 14, 2014. The lack of federally enforceable commitments and reductions beyond 2011 will likely lead to nonattainment and reclassification to "serious" by EPA.

   Commenter: Clean Air Council et al.

   Response: ACHD is confident that attainment will be reached with this SIP.

10. **Comment:** The executive summary should include the revised $PM_{2.5}$ NAAQS, especially since the projected design values are near or below the new 12 µg/m³ annual standard.

    Commenter: U. S. Steel Corporation.

    Response: This SIP is specific to the 2006 NAAQS and provides an attainment demonstration to those standards only. The 2012 NAAQS will be addressed in future demonstrations.

PROBLEM STATEMENT

Comments related to the description of the Liberty-Clairton $PM_{2.5}$ problem.

11. **Comment:** Lawrenceville data is used in the analysis of regional $PM_{2.5}$ concentrations. Lawrenceville does not represent background conditions for Allegheny County or the Liberty-Clairton Area. Averaging Lawrenceville speciation data with Florence and Greensburg data may be skewing the calculated excess at Liberty. Additionally, Liberty data should not be considered uncommon to SWPA since its species composition is similar to other sites.

    Commenter: U. S. Steel Corporation.

Response: The Speciation Report in Appendix C-1 helps explain the regional and local analysis. The purpose of the analysis is to separate Liberty-dominant species from the more widespread species. Lawrenceville is typically representative of urban excess emissions but is also part of the regional component. Averaging Lawrenceville with Florence and Greensburg for the regional component minimizes site influences at each monitor, and the average of the 3 sites is the best representation of SWPA air surrounding the Liberty-Clairton area.

For the calculations used in the attainment tests, speciation data is combined with FRM data using the SANDWICH technique, which adjusts the species compositions. Figures 4-1 and 4-5 in Appendix C-1 show that the SANDWICH technique produces nearly identical species concentrations for the Lawrenceville, Florence, and Greensburg sites on both long-term and high-day bases.

Although the species are the same, the Liberty data is considered to be uncommon to SWPA because it shows species concentrations that are specific to a smaller area. It is not a highest-concentration monitor that is consistent with air throughout the SWPA air shed; rather, it represents a portion of long-range transport and urban $PM_{2.5}$ along with a localized component. This concept is part of the basis for designating Liberty-Clairton as a separate area within Allegheny County.

12. **Comment:** Figures 2-3 and 2-4 should indicate if there are any monitors that collected insufficient data to calculate a valid design value, in accordance with 40 CFR Part 50 Appendix N.

    Commenter: U.S. EPA Region III.

    Response: Figures 2-3 and 2-4 have been noted accordingly. Appendix B has been revised to include details of the incomplete data and attainment status of each monitor, as taken from the EPA design values web site (http://www.epa.gov/airtrends/values.html). The Liberty monitor satisfied all data requirements.

METEOROLOGY

Comments related to the meteorological analysis included in the SIP.

13. **Comment:** Figure 2-2 should note that hourly Tapered-Element Oscillating Microbalance (TEOM) monitor data and not Federal Reference Method (FRM) monitor data were used for the data shown in the figure.

    Commenter: U.S. EPA Region III.

    Response: Figure 2-2 has been noted accordingly.

14. Comment: Section 2.3 mentions that meteorological data from Pittsburgh airport data is assumed representative of stability conditions throughout the county; but, the report referenced later in the section states that valley meteorology complicates the connection between emissions controls and air quality benefits.

Commenter: U. S. Steel Corporation.

Response: ACHD used the best available meteorological information deemed representative for the modeling demonstration. The closest, twice daily, National Weather Service (NWS) upper air data is collected near the Pittsburgh International Airport in Moon Township, PA, about 24 miles northwest of the U. S. Steel Clairton Plant. (Note that the NWS operates only about 70 upper air stations throughout the conterminous U.S.) For modeling purposes, this data is representative of the stability across Allegheny County. The meteorological evaluation given in Appendix A-1 took valley conditions into consideration by examining morning ground inversions beginning at 1^{o}C in strength and assuming that valley areas on days when such PIT NWS inversions were present would also be experiencing significant inversions.

15. Comment: The SIP states that precipitation helps end a pollutant event. This should be revised to reflect that precipitation can help end an inversion, regardless of $PM_{2.5}$ levels.

Commenter: U. S. Steel Corporation.

Response: Precipitation helps to end a pollutant event, regardless of whether an inversion is present or not. So, the statements in the SIP related to the effects of precipitation are appropriate.

16. Comment: ACHD historically and erroneously points to meteorology as a cause of nonattainment. While inversions may inhibit dispersion, nonattainment levels of $PM_{2.5}$ are caused by emissions. If there were no emissions present, there would be no peak levels. Meteorology cannot be controlled; the direct relationship between source emissions and impacts must be the focus of SIP efforts.

Commenter: Clean Air Council et al.

Response: Inversions can lead to increased levels of pollutants anywhere in Allegheny County. In the case of the Liberty-Clairton area, nonattainment can be attributed to a combination of emissions, complex terrain, and meteorology acting together to trap pollutants in the area.

CONTROL STRATEGY

Comments related to the controls used to show projected attainment.

17. Comment: The attainment plan includes emissions reductions of SO_2 and NO_x from the Cross State Air Pollution Rule (CSAPR) as a control measure. On August 21, 2012, The D.C. Circuit issued a decision to vacate CSAPR and to continue administering the Clean Air Interstate Rule (CAIR) for controls, pending the promulgation of a valid replacement. EPA is evaluating the ramifications of that decision and its potential implications for attainment plans. At this time, it is reasonable for the Liberty-Clairton attainment plan to rely on CAIR for the control of interstate emissions.

Commenter: U.S. EPA Region III; Clean Air Council et al.

Response: ACHD will rely on CAIR, state, and permit controls until a replacement for CSAPR is promulgated. However, at this time, ACHD believes that the inventory used in the federal CAIR modeling demonstration is an outdated inventory that may not adequately represent future emissions from the electric generating unit (EGU) sector; the CSAPR future case inventory was therefore used in the modeling demonstration. ACHD maintains that, in lieu of any additional inventory, the CSAPR inventory is an updated version of the CAIR inventory that is best representative of expected EGU controls. See Section 3.1, Section 5.3.5, and Appendix E-6 of the SIP for more details on the CAIR/CSAPR inventories.

18. Comment: ACHD cannot rely on *expected* emissions reductions from CSAPR that are not SIP-approved. Even if CSAPR was not vacated, ACHD would still be obligated to delineate the specific controls and limitations from each source.

Commenter: Clean Air Council et al.

Response: See response to previous comment.

19. Comment: Control measures contained in the consent order with U. S. Steel should be clearly identified in the SIP. The consent order should be attached to the plan as supporting information.

Commenter: U.S. EPA Region III.

Response: Control measures are listed in Section 3.2 of the SIP and, as stated, are included in a consent agreement that, in turn, is federally enforceable through the installation permit and Title V permit. The consent order agreement as of 2011 is provided as supplemental information in Appendix F-2.

20. Comment: ACHD must list each specific emissions reduction measure at the U. S. Steel Coke Plant and ensure that those provisions are federally enforceable.

Commenter: Clean Air Council et al.

Response: See response to previous comment.

21. Comment: The consent order amendment date of July 2011 should be added to the SIP. Additionally, the consent order identifies that the consent order was entered into in response to visible emissions and opacity violations; U. S. Steel disagrees with this statement.

Commenter: U. S. Steel Corporation.

Response: The consent order amendment date of July 2011 has been added to the SIP. Regarding the reason for the consent order, this order resolves several violations at the Mon Valley Works. Section 3.2 of the SIP has been revised for clarification.

22. Comment: The regional inventory controls must be federally enforceable. These controls are not listed in the SIP.

Commenter: Clean Air Council et al.

Response: The compliance modeling includes an expected actual emissions inventory, based on both federally enforceable local and regional controls, and, in the case of more distant sources, expected future activity. Appendix E-2 specifies in detail the controls used in the regional inventories. Section 3.4 of the SIP has been revised for further clarification.

23. Comment: Emissions reductions included shutdowns from local sources adjacent to the Liberty-Clairton area, including GM, Ryan Metals, and Precoat. These shutdowns must be permanent, enforceable and quantifiable. The SIP should include information to support the permanent shutdowns of these facilities, as well as quantification of the emissions reductions.

Commenter: U.S. EPA Region III; Clean Air Council et al.

Response: These facilities have been permanently shut down, without emissions credits or current operating permits. Any future operation at these locations would require a new permit and new source review. Additional language has been added to Section 3.3 of the SIP for clarification. Also, quantifiable emissions for Allegheny and Washington County facilities, base and future cases, have been added to Appendix F-2.

24. Comment: The SIP identifies the U. S. Steel Clairton Plant as the largest pollutant source. The SIP should be revised to state that the Clairton Plant is the largest known *individual* source in the Liberty-Clairton area, as the largest sources of *pollutants* are background and regional sources.

Commenter: U. S. Steel Corporation.

Response: The SIP has been revised accordingly.

25. Comment: The Battery 19 discussion should be updated to state that 25 heating walls were replaced by 2012, and if necessary, an advanced heating plan will be implemented to reduce emissions.

Commenter: U. S. Steel Corporation.

Response: The SIP has been revised accordingly.

26. Comment: Based on emissions inventory, U. S. Steel's Clairton Plant is the primary influence on ambient air in the Liberty-Clairton area. Controls must be in place in a timely fashion, as there are no further reductions planned beyond 2013.

Commenter: Clean Air Council et al.

Response: The attainment demonstration is based on controls from both the local and regional sources of $PM_{2.5}$. The primary influence on the ambient air in SWPA is regional (incoming) air pollution. The largest controls locally in Liberty-Clairton are for the Clairton Plant. The projected year of attainment is 2014, so reductions beyond that have not been considered for this SIP.

EMISSIONS INVENTORY

Comments related to the pollutant inventories used for the baseline and projected emissions.

27. Comment: Emissions inventories for the base and projected years show decreases of $PM_{2.5}$ and its precursors. Address or elaborate on why control measures were needed for $PM_{2.5}$, SO_2, and NO_x and not for VOC and NH_3.

Commenter: U.S. EPA Region III.

Response: Direct $PM_{2.5}$ represents the largest amount of localized excess at Liberty monitor, while regional sulfates and nitrates are the largest portions of the regional component of $PM_{2.5}$ in SWPA. Controls for these pollutants lead to the largest reductions in SWPA and the Liberty-Clairton area. While not the focus of the control strategies, Tables 4-1 and 4-2 also show reductions for VOC and NH_3 for the Liberty-Clairton area.

Additionally, VOC emissions showed negligible transformation to secondary organic aerosols (SOA) in the CAMx model, both regionally and locally. NH_3 emissions also showed little transformation to NH_4 not associated with sulfates and nitrates (see Section 5.4

of the SIP). Therefore, additional control of these precursors is unlikely to show reductions in the modeled impacts.

28. Comment: The $PM_{2.5}$ emissions provided in Table 5-1 for the Mitchell and Elrama power plants do not match those reported in PA DEP's eFACTS system. Elaborate on this discrepancy.

Commenter: U.S. EPA Region III.

Response: Some reported $PM_{2.5}$ 2007 facility emissions in the eFACTS system do not include or are erroneous for the condensable portion of $PM_{2.5}$. Condensable $PM_{2.5}$ emissions were included in the 2007 MANE-VU inventory used in the modeling, as calculated according to the TSD in Appendix E-1, similar to other inventories such as the National Emissions Inventory (NEI).

29. Comment: More recent emissions data should be used for power plants on "long term cold storage" for future modeled projections.

Commenter: Clean Air Council et al.

Response: Unless permanently retired with PJM Interconnection, power plants proposed for deactivation were kept in the future case inventory. The future case modeling simulation may therefore be considered conservative for power plant impacts. Discussion of the proposed deactivations in 2012 was included as weight of evidence.

MODELING

Comments related to the methodology used for modeling and the resulting modeled impacts.

30. Comment: The explanation of the selection of the nearby receptors used in the modeling is unclear. It is also unclear if the receptor selection is similar to the process described in Section 3.2 of the EPA Modeling Guidance.

Commenter: U.S. EPA Region III.

Response: The selection of the nearby receptors for Liberty and Clairton is described in more detail in the Modeling Protocol (Appendix G-1). The selection of the receptors varies somewhat from the method described in Section 3.2 of the EPA Modeling Guidance, as the Liberty-Clairton attainment tests were more of a local area analysis than a grid cell analysis. The selection of receptors for the FRM locations were based on the extent of concentrations contours seen in previous modeling efforts.

31. Comment: Additional language would be helpful in Section 5 to explain the construction of the local and regional modeled impacts shown in Tables 5-7 through 5-10.

Commenter: U.S. EPA Region III.

Response: The local and regional impacts were tracked separately by the CAMx model using the Particulate Source Apportionment Technology tool. The modeled impacts from point sources identified for local treatment are summed as the local portion of the CAMx impacts. Additional language has been added Section 5 to further explain the treatment of the local and regional impacts.

32. Comment: It is unclear if the Relative Response Factors (RRFs) used for the unmonitored area analysis were calculated from a single grid cell or from a combination of grid cells around the Liberty and Clairton monitors.

Commenter: U.S. EPA Region III.

Response: The unmonitored area analysis is described in more detail in Appendix G-3. The unmonitored analysis was performed using the EPA Modeled Attainment Test Software (MATS) using the default options. The RRFs were based on modeled results for each single grid cell, with the design values spatially interpolated based on the modeled gradients.

33. Comment: Meteorological conditions in 2007 are not representative of maximum $PM_{2.5}$ concentrations. The maximum concentrations given in Table 2 of Appendix A are higher in 2005, 2006, and 2009 than the maximum concentration in 2007.

Commenter: Clean Air Council et al.

Response: The baseline year 2007 was chosen because it was a recent year in which a complete and verified national emissions data set was available from Regional Planning Organizations (RPOs) and represented typical meteorology, developed specifically for $PM_{2.5}$ and ozone demonstrations. The inventories were reviewed for SIP-quality and were considered the best available at the time of the modeling for this SIP.

Monitored data shows that 2007 is typical of high $PM_{2.5}$ days for the 5-year weighted timeframe of 2005-2009. The attainment tests outlined in EPA Modeling Guidance are based on a 5-year weighted methodology, and the baseline year is used to represent a 5-year timeframe. Year 2007 contains the second highest amount of days with concentrations greater than or equal to 35.5 µg/m³ (the level at which an exceedance of the new standard may be registered) and the most consecutive days greater than or equal to 35.5 µg/m³.

Additionally, the 24-hour attainment test is based on averages of the 98^{th}-percentile values, not maximum values. The 98^{th}-percentile concentration for 2007 was 54.7 µg/m³, which is close to a midpoint between 2005 and 2009 (98^{th}-percentile values of 69.6 µg/m³and 45.3

µg/m³, respectively). Thus, year 2007 is an appropriately representative year over the 5-year timeframe for $PM_{2.5}$ concentrations.

34. Comment: ACHD has partially double-counted emissions reductions from controls and shutdowns occurring in 2009.

Commenter: Clean Air Council et al.

Response: The attainment demonstration uses a baseline modeled year of 2007 applied to a weighted timeframe of 2005-2009 according to the methodology outlined in the EPA Modeling Guidance. There is inherently some under- and over-counting in the combination of modeled impacts (based on 1 year of emissions) with monitored impacts (based on 5 years of monitored data), and the local source shutdowns occurred for only a portion of 2009. Since the modeled/monitored results are combined in a relative sense (see also responses to comments 35 and 37), these discrepancies would not adversely impact the modeling demonstration.

35. Comment: The WRF meteorological model failed the performance benchmarks by overestimating winds. Overestimation of winds can lead to underestimation of $PM_{2.5}$ impacts.

Commenter: Clean Air Council et al.

Response: The WRF model is a state-of-the-science meteorological model appropriate for air quality modeling use. The benchmarks presented on the soccer plots in Appendix G-2 are not intended to be used as an absolute pass/fail for model performance. They are intended to be a general guide for interpreting such performance. These guidelines were developed from examining historical meteorological applications which were used for photochemical air quality studies. The majority of the model applications used 4 km horizontal grid spacing and fairly short time periods during which high ozone occurred in stagnant conditions.

It is also important to understand that the reported statistics are monthly average values and that at any hour the model may be over or underestimating the wind speeds. Furthermore, no model is able to capture the subtle features of the atmosphere. State-of-science meteorological modeling was conducted for the Liberty-Clairton $PM_{2.5}$ SIP, and the evaluation of that state-of-science modeling was suggestive of where caution should be taken in interpreting the air quality modeling results.

Additionally, the modeling results are being used in a "relative" way. EPA recognizes limitations in modeling; thus, procedures developed by EPA to reduce limitations include the use of Relative Response Factors (RRFs) for attainment tests. So, in conformance with EPA's recommended model attainment test, model results for the projected year (2014) were compared to results for the baseline year (2007). Therefore, model performance is acceptable for estimating future attainment.

36. Comment: The selection of the CAMx model over CMAQ is not justified. It should be noted that CMAQ is the EPA-developed model. It was used for PA SIPs for the 1997 NAAQS, including Liberty-Clairton, Pittsburgh-Beaver Valley, and Philadelphia-Wilmington. In non-attainment areas where both models have been used (e.g., Los Angeles and the South Coast Air Basin), CMAQ is the principal model while CAMx has been restricted to a supporting role, providing corroborating evidence to the CMAQ model predictions.

Commenter: Clean Air Council et al.

Response: There is no specific EPA-preferred model for photochemical modeling. CAMx was selected as the model for reasons specified in the Modeling Protocol (Appendix G-1), including local source treatment and two-way grid nesting features that are not available in the current version of CMAQ. CAMx has been used as the principal model for recent EPA modeling simulations such as CSAPR and for SIPs such as the South Coast Air Basin/Los Angeles 2007 Air Quality Management Plan.

37. Comment: The CAMx model is inaccurate due to severe underestimation of $PM_{2.5}$ species and understates emissions controls. The tendency of underestimation invalidates the CAMx predictions and the attainment demonstration. Also, due to the underestimation of CAMx, CMAQ should be used as corroborative evidence or supplemental runs for the SIP.

Commenter: Clean Air Council et al.

Response: Both the CMAQ and CAMx models are sufficiently accurate for this type of demonstration. EPA recognizes limitations in the models; the purpose of procedures developed by EPA to use Relative Response Factors (RRFs) for the attainment tests is to minimize these limitations. (See also response to comment 35.)

Furthermore, as noted in EPA's 2007 Modeling Guidance, "[b]y definition, models are simplistic approximations of complex phenomena" (EPA, 2007, pg. 98). This is especially true for PM where different measurement technologies can produce large differences in concentrations (e.g., different carbon measurement technologies can vary by 30%). For the Liberty-Clairton CAMx application, the model is achieving the PM Performance Criteria for all species but nitrate (as noted in the Table 7-8 of Appendix G-2). The CAMx nitrate underprediction occurs in the summer and warm months when observed and modeled nitrate concentrations are near zero because nitrate is a volatile chemical whose formation is favored under cooler temperatures. During the winter when nitrate concentrations are higher, CAMx performs much better and achieves the PM Performance Criteria (see Figure 7-19 in Appendix G-2). As noted in Figure 2-3 of Appendix G-2, ammonium nitrate is a small component of annual $PM_{2.5}$ at Liberty (8%) and primarily occurs in the winter when CAMx achieves the PM Performance Criteria.

For projecting 2014 $PM_{2.5}$ concentrations using the CAMx 2007 and 2014 modeling results, EPA's Modeling Guidance was followed using the Speciated Modeled Attainment Test

(SMAT), which utilizes the modeling results in a relative sense to scale the observed current year $PM_{2.5}$ species concentrations to project 2014 future year $PM_{2.5}$ concentrations. EPA recommends using the relative changes in the modeling results between 2007 and 2014 because it roots the PM projections in the observations and reduces uncertainties; for example, if the model is underestimating the 2007 $PM_{2.5}$ species, it is also likely underestimating the 2014 $PM_{2.5}$ species concentrations. So, by taking their ratio to scale the observed $PM_{2.5}$ species concentration, the underestimation cancels out in the 2014 projection procedure. Thus, a CAMx underestimation or overestimation bias does not mean that it underestimates or overestimates the effects of the changes in emissions between 2007 and 2014 on PM concentrations since the modeling results are used in a relative fashion as recommended by EPA.

38. Comment: Nearby receptors for primary $PM_{2.5}$ modeling are too coarse to capture maximum concentrations from local sources. To capture maximum concentrations, receptors should be spaced at 25 m or less, without averaging the receptors.

Commenter: Clean Air Council et al.

Response: The nearby receptors were chosen to represent the FRM sites within a perimeter of similar terrain, and there are no sources that were not accounted for within the 100 m spacing. This receptor methodology uses a much finer scale than that prescribed by the EPA Modeling Guidance, which recommends averaging the concentrations across a 7 x 7 array of grid cells centered on the monitor.

39. Comment: The CAMx model is invalid for predicting *primary* $PM_{2.5}$ concentrations from large point sources within a fine grid at 0.8 km spacing. The submodel PiG in CAMx has not been approved by EPA; AERMOD should have been used for the modeling of local primary $PM_{2.5}$. Additionally, Liberty meteorology was not used for the AERMOD comparison given in Appendix G-3.

Commenter: Clean Air Council et al.

Response: The choice of CAMx was reviewed with EPA Region III during the development of the Modeling Protocol. CAMx was one of several models recommended by the EPA to predict fine particulate matter concentrations in nonattainment areas. Section 13.1 in EPA's 2007 Modeling Guidance document notes that "a State may use a regional photochemical grid model to address both primary and secondary components of particulate matter …."

The plume-in-grid modeling option incorporates a puff/plume model within a larger-scale grid model such as CAMx, to account for significant individual emission sources in an area of interest. According to Karamchandani, P., Vijayaraghavan, K., and Yarwood, G. (2011) in an article titled "Sub-grid scale plume modeling" in the journal *Atmosphere* (vol. 2, pages 389-406), "[t]he embedded model tracks the sub-grid scale process (e.g., elevated point source emissions) until the fine scale variability becomes unimportant (referred to as the

'puff dumping' or 'hand-over' point), at which point the grid model takes over the calculations for that process while the embedded model continues tracking sub-grid scale processes" (pg. 394). Karamchandani, et al., 2011, go on to say that a plume "is represented by a myriad of three-dimensional puffs that are advected and dispersed according to the local micrometeorological characteristics…. Also, the effects of buoyancy on plume rise and initial dispersion are simulated by solving the conservation equations for mass, heat, and momentum." Furthermore, "[c]hemical species concentrations in the puffs are treated as perturbations from the background concentrations" (pg. 395).

Lastly, the comparison to AERMOD in Appendix G-3 used Liberty meteorological data for the AERMOD simulation, with PIT airport data used only for substitution during missing periods. CAMx with PiG estimated concentrations as well as or better than CAMx with AERMOD.

40. Comment: The CAMx model is invalid for predicting *secondary* $PM_{2.5}$ concentrations from large point sources within a fine grid at 0.8 km spacing. The CAMx model uses eddy diffusion coefficients for treating turbulent diffusion in the atmosphere. This K-theory approximation is known to be invalid near large point sources.

Commenter: Clean Air Council et al.

Response: The use of the K-theory approximation was appropriate for this modeling situation. The commenter's K-theory statement is likely based on pages 885 through 889 in Seinfeld, J.H., and Pandis, S.N. (1998), *Atmospheric Chemistry and Physics: From Air Pollution to Climate Change* (New York: John Wiley & Sons). In particular, page 889 states that a key equation that describes statistical properties of concentrations "is a valid description of turbulent diffusion and chemical reaction as long as [specified basic restrictions] hold, namely, that the reaction processes are slow compared with turbulent transport and the characteristic lengthscale and timescale for changes in the mean concentration field are large compared with the corresponding scales for turbulent transport. Because the eddy timescale…and the lengthscale…are often quite large in the atmosphere, the above conditions are violated near strong isolated sources."

However, the discussion on page 889 continues with "…to satisfy the condition that the characteristic lengthscale of the concentration field be much greater than that of the turbulence, the spatial scale for variations in [concentration]… must be of the order of 100 to 1000 m. In addition, under these conditions the timescale of the fastest reactions must be no smaller than on the order of about 10 min. The conclusion we draw at this point is that [the key equation] is a valid model *provided it is applied to situations in which chemical reactions are 'slow' and the distribution of sources is 'smooth'*" (emphasis in original). The source-receptor situation in the nonattainment area and the way the situation was modeled satisfy these two criteria.

41. Comment: The SIP states on Page 21 (also in the Modeling Protocol, Appendix G-1) that CB6 chemical mechanism represents the latest *understating* of photochemistry. This must be a typographical error, which should read "understanding" of photochemistry.

Commenter: Clean Air Council et al.

Response: The SIP and Appendix G-1 have been corrected accordingly.

42. Comment: CAMx predictions may be misleading since its 25 vertical layers are collapsed from the 37 WRF layers. The CMAQ Operational Guidance Document states that layer collapsing is "not recommended, as dynamical inconsistencies can develop and lead to misleading results."

Commenter: Clean Air Council et al.

Response: Most CAMx applications use layer collapsing to reduce the number of vertical layers in CAMx for computational efficiency. For the Liberty-Clairton SIP modeling, a no layer collapsing sensitivity test was performed and found essentially identical modeling results whether layer collapsing was used or not (see Appendix G-3). Note that the Denver ozone SIP also used a similar layer collapsing scheme to reduce the 37 vertical layers in WRF to 25 in CAMx and also conducted a no layer collapsing sensitivity test and found essentially identical results. Thus, there do not appear to be any inconsistencies whether layer collapsing is used or not. EPA's recommendations for running CMAQ are not relevant to CAMx.

43. Comment: CAMx uses boundary conditions derived from the predictions of the global MOZART model without justification. In the CSAPR modeling, EPA used boundary conditions derived from the GEOS-Chem model. The selection of MOZART over GEOS-Chem should be documented.

Commenter: Clean Air Council et al.

Response: At the time that the CAMx model inputs were developed, 2007 global chemistry model output was readily available for only the MOZART global chemistry model. Furthermore, MOZART model produces comparable results to other global chemical transport models. MOZART provides sufficient horizontal resolution to simulate chemical transport on synoptic weather scales and sufficient vertical resolution to simulate mass exchange between the upper- and surface-layer atmospheres.

44. Comment: CAMx sensitivity to key modeling inputs such as initial conditions, boundary conditions, and emissions has not been analyzed.

Commenter: Clean Air Council et al.

Response: The sensitivity of the model to local emissions sources was extensively analyzed using the Plume-in-Grid module and PM Source Apportionment Technology (PSAT) probing tool. The modeled local source contribution to annual $PM_{2.5}$ concentrations at Liberty was compared to an estimate based on analysis of observations. Overall model performance was evaluated and found satisfactory.

45. Comment: The ACHD staff is to be commended for conducting some of the most sophisticated localized modeling ever performed. The modeling projects that the area will be in attainment with both the 2006 daily and 2012 annual $PM_{2.5}$ standards.

Commenter: Greater Pittsburgh Chamber of Commerce.

Response: ACHD staff appreciates the comment.

ATTAINMENT TESTS

Comments related to the assumptions and methodology used for the design value calculations.

46. Comment: ACHD should consider the use of significant figures in the calculations shown in Sections 6.4 and 6.5.

Commenter: U.S. EPA Region III.

Response: The data shown for the attainment test calculations were rounded to a precision of three decimal places for all intermediate calculations. For better comparison to the NAAQS, the final design values will be revised in the tables to show the values according to rounding conventions given in 40 CFR Part 50 Appendix N, with the annual design values rounded to the nearest tenth and the 24-hour rounded to the nearest whole number.

47. Comment: Liberty speciation data was used to represent both Liberty and Clairton in the attainment tests. This assumption is not accurately or adequately supported by the information given in the SIP.

Commenter: U. S. Steel Corporation.

Response: With no other speciation data available, the Liberty speciation data is used to represent species composition throughout the area. This follows the EPA Modeling Guidance methodology to use the nearest speciation site when no other data is available. The SANDWICH technique used for the attainment tests adjusts the species fractions to the FRM data measured at the Clairton site.

48. Comment: Tables 6-5 through 6-8 show projected data for the weighted timeframe of 2005-2009, which does not coincide with the monitored data.

Commenter: Clean Air Council et al.

Response: ACHD apologizes for the confusion in these tables. The years shown are based on the recalculation of the 2005-2009 24-hour design values using the modeled reductions,

according to the EPA attainment test methodology. The tables have been revised to show "Year 1, Year 2," and so on.

RACT/RACM

Comments related to the RACT/RACM analysis in the SIP.

49. Comment: The SIP states that the Clairton Plant coke batteries have some of the nation's strictest standards. As part of the RACT/RACM analysis, a more specific explanation should be provided of which standards apply to these units in order for EPA to determine if they meet RACT/RACM requirements.

Commenter: U.S. EPA Region III.

Response: A detailed list of controls by process for the U. S. Steel Clairton Plant has been provided in Appendix I. The RACT/RACM section of the SIP has been revised for clarification.

CONTINGENCY MEASURES

Comments related to the additional contingency controls used in case the plan fails to demonstrate attainment by the attainment date.

50. Comment: It is inappropriate that U. S. Steel's Clairton Plant is the only source required to reduce emissions should attainment not be met. Such an approach is inequitable and unreasonable considering that significant sources of $PM_{2.5}$ and precursors upwind of the Liberty-Clairton area would not be obligated to reduce emissions. If CSAPR is not enforceable due to the vacatur, U. S. Steel may be forced to implement contingency measures based on poor background or regional air quality. The language in Section 8 should be revised to allow for the cause of nonattainment to be evaluated prior to the contingency measures taking effect.

Commenter: U. S. Steel Corporation.

Response: ACHD recognizes that both local and regional sources impact the Liberty-Clairton area and will continue to analyze air quality contributions in the future. For the purposes of this SIP, the contingency measures are appropriate considering the control strategy and supporting analyses. Continuous monitored data shows that exceedances of the 24-hour $PM_{2.5}$ standard are driven by short-term peak levels occurring during inversion periods. These peak levels can occur in all seasons and can be independent of regional air quality. The most significant local source factors from the PMF analysis (Appendix C-2) are industrial carbons, influenced strongly by inversions, with the highest contributions from the southwest of the Liberty monitor. While other source factors are evident and can lead to both long-term and short-term impacts, exceedance levels can be most attributed to local industrial carbons sources.

51. Comment: The SIP represents a step forward in the continued improvement of our region's air quality. However, continued attention is needed to ensure future environmental regulations do not disproportionately impact economic development and that the burden of emissions reductions is not unfairly shouldered by select industries or organizations. The contingency plan's only course of action should the area fail to come into attainment is to wrest further reductions from the U. S. Steel Clairton facility. But, many emission sources, including alternative home heating sources, out-of-region transport, and vehicle traffic contribute to the area's pollutants.

Commenter: Greater Pittsburgh Chamber of Commerce.

Response: See response to previous comment. A contingency measure is not necessarily a remedy to a nonattainment situation but rather a starting point that allows for reductions to take place while a new overall plan is developed.

WEIGHT OF EVIDENCE

Comments related to the supporting evidence used to show that the Liberty-Clairton area shows decreasing trends of $PM_{2.5}$.

52. Comment: ACHD should address if a switch to natural gas for diesel-burning equipment is foreseeable, and if this shift would affect local/regional $PM_{2.5}$.

Commenter: U.S. EPA Region III.

Response: Any switches to natural gas from diesel would lower the carbon contributions from stationary or mobile sources. Possible increases in NO_x from increased natural gas usage would not likely affect $PM_{2.5}$ concentrations in the Liberty-Clairton area, as nitrates make up only a small portion of the localized excess at Liberty. Additionally, regional increases of upwind NO_x due to shale gas production in the future modeled case showed little apparent effect on the future case $PM_{2.5}$ impacts in Liberty-Clairton.

53. Comment: The SIP should mention the potential benefits associated with the EPA Boiler MACT rules promulgated on January 13, 2013.

Commenter: U. S. Steel Corporation.

Response: The Boiler MACT and other federal MACT rules were included as on-the-book controls in the MANE-VU inventories. The weight of evidence section focused on rules or other supporting factors that were not included in the modeling inventories.

54. Comment: The SIP mentions wood stoves and wood-fired boilers regulations that provide particulate reductions, but U. S. Steel is concerned with the difficulty in locating these sources and

proper enforcement of the regulations. U. S. Steel is also concerned about the ability to enforce anti-idling regulations.

Commenter: U. S. Steel Corporation.

Response: ACHD maintains an enforcement staff that includes full-time field inspectors that investigate potential air quality violations in response to complaints or based on personal observations. Local law enforcement and PA DEP enforce idling regulations in the state of PA.

Furthermore, the wood stove and outdoor wood-fired boilers programs result in the manufacturing and sales of cleaner-burning units, independent of the location of units. To address wood-burning units not covered by these programs, ACHD has implemented an emission mitigating "clean-burning" educational campaign to proactively reduce wood smoke emissions.

55. Comment: Emissions reduction measures listed in the weight of evidence section may be relied upon only if they are federally enforceable.

Commenter: Clean Air Council et al.

Response: The weight of evidence section is based on qualitative evidence that the Liberty-Clairton area will incur reductions that were not incorporated in the modeling demonstration. This can include population trends, local programs, and other factors that lead to reductions that were not included in the control strategy or quantified in the modeled inventories. These factors need not be federally enforceable.

56. Comment: Section 9.7 regarding the monitored data during low productions periods should be examined by individual year, correlating changes in emission rates with monitored data. Additionally, subtracting Lawrenceville averages from Liberty may not be a valid technique for examining local vs. regional trends.

Commenter: Clean Air Council et al.

Response: The monitored data during low production was provided as weight of evidence to show that low production levels yielded real-world changes in monitored data, similar to the expected modeling reductions. Individual years were not examined as year 2009 experienced much lower levels of production than in previous years. However, air quality has continued to improve after 2009. Additionally, the Lawrenceville site was used to represent regional $PM_{2.5}$ concentrations since it is the only other continuous $PM_{2.5}$ site in Allegheny County.

Notes on commenters:

- U.S. EPA Region III comments were submitted by Diana Esher, Director, Air Protection Division, U.S. EPA Region III.

- Greater Pittsburgh Chamber of Commerce comments were submitted by Barbara McNees, President, Greater Pittsburgh Chamber of Commerce.

- U. S. Steel Corporation comments were submitted by Coleen M. Davis, Senior Environmental Engineer, U. S. Steel.

- Clean Water Action comments were submitted by Tom Hoffman, Western Pennsylvania Director, Clean Water Action.

- Clean Air Council et al. comments were collaborative comments from Clean Air Council (Council), Citizens for Pennsylvania's Future (PennFuture), Group Against Smog and Pollution (GASP), Clean Water Action, Sustainable Pittsburgh, Sierra Club, Residents for a Clean and Healthy (REACH) Mon Valley, and Center for Coalfield Justice, signed by the following:

    - Joseph Otis Minott, Esq., Executive Director, Clean Air Council
    - Tom Hoffman, Western Pennsylvania Director, Clean Water Action
    - Heather Langeland, Esq., Staff Attorney, PennFuture
    - Joe Osborne, Esq., Legal Director, Group Against Smog and Pollution
    - Court Gould, Executive Director, Sustainable Pittsburgh
    - Randy Francisco, Pennsylvania Organizing Representative, Sierra Club
    - REACH Mon Valley
    - Joanne Kilgour, Esq., Legal Director, Center for Coalfield Justice

    Contributors to these comments also included the following:

    - Khanh Tran, Principal, AMI Environmental, on behalf of Clean Air Council
    - William Charlton, on behalf of Citizens for Pennsylvania's Future

11.5 Certification of Adoption

CERTIFICATION of ADOPTION

To the best of my knowledge, information, and belief, I the undersigned hereby certify that the revision to the County's Portion of the Pennsylvania State Implementation Plan for the Attainment and Maintenance of the National Ambient Air Quality Standards for $PM_{2.5}$ was adopted by the Allegheny County Board of Health on May 1, 2013.

Michael A. Parker
Assistant Solicitor
Allegheny County Health Department

May 9, 2013
Date

COMMONWEALTH OF PENNSYLVANIA)
) SS:
COUNTY OF ALLEGHENY)

On the 9th day of May, 2013
Michael A Parker personally appeared before me, the undersigned authority, satisfactorily proven to me to be the person whose name appears above, and did in my presence execute the above certification for the purposes contained therein.

WHEREFORE, I have hereunto set my hand and official seal the 9 day of May, 2013.

NOTARIAL SEAL
JANET M NORKUS
Notary Public
PITTSBURGH CITY, ALLEGHENY COUNTY
My Commission Expires May 29, 2015

Janet M Norkus
NOTARY PUBLIC

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