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***Baltimore Nonattainment Area
PM_{2.5}
Maintenance Plan***

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Prepared for:

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1. Introduction

The State of Maryland is submitting this maintenance plan for the Baltimore, MD 1997 fine particulate (PM_{2.5}) nonattainment area to the United States Environmental Protection Agency (USEPA) in support of the Baltimore, MD redesignation request for that standard. This document demonstrates that PM_{2.5} air quality in the Baltimore, MD area will remain compliant with the 1997 PM_{2.5} NAAQS, as measured by a monitoring network that meets all federal requirements. This plan includes mobile vehicle emissions budgets for the interim year of 2017 and the out year of 2025. It also contains contingency measures that will be implemented in the unlikely event that the area experiences an exceedance of the 1997 PM_{2.5} NAAQS.

1.1 National Ambient Air Quality Standard (NAAQS) for Fine Particulate Matter

When USEPA establishes a NAAQS, this standard applies to the concentration of a pollutant in ambient outdoor air. Ambient air is considered to be the air that someone in the general public would breathe. If the air quality in a geographic area meets or is cleaner than the national standard, it is designated an attainment area; areas that do not meet the national standard or contribute to another area that violates the air quality standard are designated as nonattainment areas.

Fine particulate matter, or PM_{2.5}, is a mixture of microscopic solids and liquid droplets suspended in air. PM_{2.5} describes particulate matter that is 2.5 micrometers in diameter and smaller, 1/30th the diameter of a human hair. Fine particles are generally emitted from activities such as industrial and residential combustion and from vehicle exhaust. Fine particles are also formed in the atmosphere when gases such as sulfur dioxide, nitrogen oxides, and volatile organic compounds are chemically transformed into particles.

USEPA established the fine particle standards in July of 1997 after evaluating health studies and conducting an extensive peer review process. The 1997 annual standard was established at a level of 15 micrograms per cubic meter, based on the 3-year average of annual mean PM_{2.5} concentrations.

2. Background

In 1997, USEPA established two new PM_{2.5} standards: an annual standard of 15.0 µg/m³ and a 24-hour standard of 65 µg/m³. USEPA designated the Baltimore, MD area as nonattainment for the 1997 PM_{2.5} NAAQS with an effective date of April 5, 2005 (Federal Register, Vol. 70, No. 3, 1/05/2005).

Since this designation was made, PM_{2.5} air quality in the Baltimore, MD area has improved such that the air quality is significantly better than required by the 1997 PM_{2.5} NAAQS. The Baltimore, MD region's federal reference monitors have demonstrated compliance with the 65 µg/m³ daily standard since the inception of the PM_{2.5} monitoring programs within each state. The federal reference monitors have demonstrated compliance with the 15.0 µg/m³ annual standard since 2008. The most recent design value for the 24-hour standard, based on 2009-2011 data, is 29 µg/m³, and the most recent design value for the annual standard, based on 2009-2011 data, is 11.1 µg/m³.

These improvements in air quality are due to permanent and enforceable emissions reductions of sulfur dioxide (SO₂) and nitrogen oxides (NO_x), the precursors to PM_{2.5}, and also in reductions of primary PM_{2.5} emissions. This document provides a maintenance plan, as required under Section 175A of the federal Clean Air Act (CAA), to ensure that the citizens of the Baltimore, MD area enjoy the benefits of healthy air quality that complies with the 1997 PM_{2.5} NAAQS for a minimum of 10 years, through 2025. This maintenance plan supports the redesignation request that the State of Maryland is submitting to USEPA concurrently with this document.

2.1 Health Effects from Elevated Concentrations of PM_{2.5}

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.

Roughly one out of every three people in the United States is at a higher risk of experiencing PM_{2.5} related health effects. One group at high risk is active children because they often spend a lot of time playing outdoors at times when concentrations of fine particles are higher. In addition, children's bodies are still developing and they breathe more air per pound of body weight than adults do. The elderly population is often at high risk due to reduced lung capacity or preexisting medical conditions. People of all ages who are active outdoors are at increased risk because during physical activity, PM_{2.5} penetrates deeper into the parts of the lungs that are more vulnerable to injury.

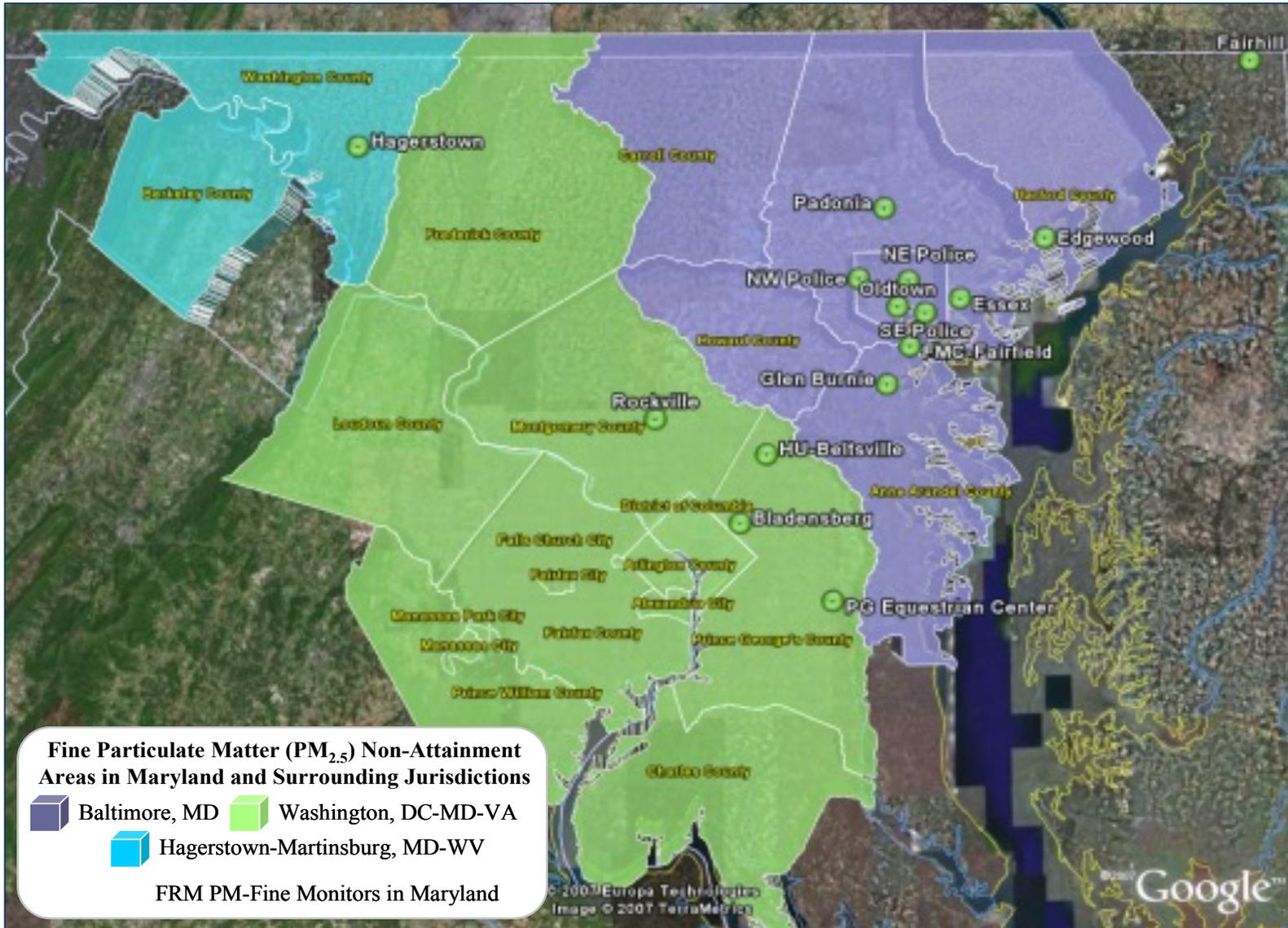
2.2 Geographical Description of the Baltimore, MD PM_{2.5} Nonattainment Area

USEPA designated the Baltimore, MD area as nonattainment for the 1997 PM_{2.5} NAAQS with an effective date of April 5, 2005 (Federal Register, Vol. 70, No. 3, 1/05/2005). **Table 2-1** provides the jurisdictions within the Baltimore, MD 1997 PM_{2.5} nonattainment area, and **Figure 2-1** depicts the map of the area.

Table 2-1: Baltimore, MD Nonattainment Area with FIPS Codes

<u>County Name</u>	<u>State/County FIPS</u>
Anne Arundel County	24003
Baltimore County	24005
Carroll County	24013
Harford County	24025
Howard County	24027
Baltimore City	24510

Figure 2-1: Baltimore, MD 1997 PM_{2.5} NAAQS Nonattainment Area (purple on map)



3. U.S. EPA Redesignation and Maintenance Plan Requirements

An area designated as nonattainment for a pollutant can be redesignated to attainment if specific conditions are met. Maryland followed the USEPA published memorandum entitled “Procedures for Processing Requests to Redesignate Areas to Attainment” (September 4, 1992) in preparing the redesignation demonstration and the maintenance plan. The memorandum provides guidance regarding the processing of requests for redesignation of nonattainment areas to attainment for ozone, carbon monoxide, particulate matter, sulfur dioxide, nitrogen dioxide, and lead.

Furthermore, the CAA lists five obligations that the USEPA must meet during the redesignation process. Section 107(d)(3)(E) states:

The Administrator may not promulgate a redesignation of a nonattainment area (or portion thereof) to attainment unless –

- (i) the Administrator determines that the area has attained the national ambient air quality standard;
- (ii) the Administrator has fully approved the applicable implementation plan for the area under section 110(k);
- (iii) the Administrator determines that the improvement in air quality is due to permanent and enforceable reductions in emissions resulting from implementation of the applicable implementation plan and applicable Federal air pollutant control regulations and other permanent and enforceable reductions;
- (iv) the Administrator has fully approved a maintenance plan for the area as meeting the requirements of section 175A; and
- (v) the State containing such area has met all requirements applicable to the area under section 110 and part D.

These 5 obligations must be met before redesignation to attainment status; however, a state may submit both the redesignation request and the maintenance plan at the same time so that rulemaking on both may proceed on a parallel track. This document outlines Maryland’s redesignation request and demonstrates how the state supports EPA’s promulgation obligations towards the redesignation of the Baltimore nonattainment area under the 1997 PM_{2.5} NAAQS.

3.1 Attainment of the Standard

A state requesting redesignation must show that the area is attaining the applicable NAAQS. EPA, in turn, must determine that the annual PM_{2.5} NAAQS in ambient air is demonstrated if the design value based on the last three (3)-year annual mean is less than the 15.0 microgram per cubic meter level of the NAAQS. In Maryland’s redesignation request, Maryland presents information that demonstrates that the Baltimore, MD region has attained the NAAQS for PM_{2.5}. This demonstration is based on three years of quality assured monitoring data as specified in 40 CFR 58. On November 23, 2011, USEPA published a proposed rule in the Federal Register stating that the Baltimore, MD PM_{2.5} nonattainment area had attained the

1997 annual PM_{2.5} standard based on three years of quality assured ambient air quality data (76 FR 72374, November 23, 2011). On May 22, 2012, EPA published a final rule in the Federal Register stating that the Baltimore, Maryland fine particulate (PM_{2.5}) nonattainment area has attained the 1997 annual PM_{2.5} standard based on three years of quality assured ambient air quality data (77 FR 30208). Due to this improvement in PM_{2.5} air quality, the Baltimore, MD nonattainment area is currently operating under a clean data determination (Federal Register, Vol. 77, No. 99, Tuesday, May 22, 2012).

3.2 Implementation Plan Approval

The area must have a fully approved PM_{2.5} implementation plan. The State of Maryland State Implementation Plan and Attainment Demonstration for PM_{2.5} for the Baltimore, MD Nonattainment Area was presented for public hearing on April 30, 2008 and was submitted to USEPA in June 2008. Section 110(k) of the CAA established criteria that any plan submission must meet before USEPA is required to act on the submission. This PM_{2.5} SIP was deemed to be complete on December 8, 2008. In that plan, Maryland adopted several regulations and programs as needed to reduce PM_{2.5} and precursors.

3.3 Permanent and Enforceable Improvement

The USEPA must show that the improvement in air quality between the year when violations occurred and the attainment year is attributed to permanent and enforceable emission reductions. Section 4 of this document presents the reduction that was achieved from federal and state measures. The emission reduction is not based on temporary shutdowns or adverse economic conditions, but due to permanent and enforceable control measures. Section 4.3.2 of this document includes an outline of the control measures that have brought the area into attainment of the PM_{2.5} standard. This plan includes a state commitment to continue to enforce all applicable requirements of past revisions to the SIP after the PM_{2.5} nonattainment area is redesignated to attainment.

3.4 Maintenance Plan

The redesignation process provides that a state may petition USEPA to redesignate a nonattainment area as attainment and that USEPA may approve the redesignation subject to certain criteria being met. Section 107(d)(3)(D) states:

(D) The Governor of any State may, on the Governor's own motion, submit to the Administrator a revised designation of any area or portion thereof within the State. Within 18 months of receipt of a complete State redesignation submittal, the Administrator shall approve or deny such redesignation. The submission of a redesignation by a Governor shall not affect the effectiveness or enforceability of the applicable implementation plan for the State.

Section 107(d)(3)(E) stipulates one of these criteria, that USEPA must fully approve a maintenance plan that meets the requirements of § 175A. A state may submit both the redesignation request and the maintenance plan at the same time, and rulemaking on both may proceed on a parallel track. All applicable nonattainment area requirements must remain in

place. The maintenance plan constitutes a SIP revision and must provide for maintenance of the relevant NAAQS in the area for at least 10 years after redesignation, including additional measures to ensure prompt correction of any violation of the NAAQS. The state must also submit a SIP revision 8 years after the original redesignation request is approved to provide for maintenance of the NAAQS for an additional 10 years following the first 10-year period. USEPA provided guidance dated September 4, 1992 on the redesignation request and maintenance plan process in the memorandum from John Calcagni, Director, Air Quality Management Division to Regional Air Directions entitled *Procedures for Processing Requests to Redesignate Areas to Attainment* (redesignation guidance).¹ Other requirements are provided in 40 CFR 51 Subpart Z, entitled *Provisions for Implementation of PM_{2.5} National Ambient Air Quality Standards* (implementation rule). Additional guidance was received in the development of this maintenance plan from USEPA regional staff.

The Maintenance Plan must contain the following elements:

- A comprehensive “attainment year” emissions inventory of primary PM_{2.5} and the precursors of secondary PM_{2.5}: oxides of nitrogen (NO_x) and sulfur dioxide (SO₂). In the Clean Air Fine Particle Implementation Rule (72 FR 20586, April 25, 2007), EPA did not make a finding that all precursors should be evaluated in each nonattainment area. Fine particulate matter, SO₂, and NO_x were required to be evaluated, however ammonia and volatile organic compounds were not;
- A projection of the emissions inventory forward to a year at least ten years after redesignation and a demonstration that the projected level of emissions is sufficient to maintain attainment of the PM_{2.5} NAAQS;
- A demonstration of maintenance by showing that future emissions of a pollutant or its precursors will not exceed the level of the attainment inventory over the 10-year period following redesignation;
- A commitment that, once redesignated, the state will continue to operate an appropriate monitoring network to verify maintenance of the attainment status;
- A demonstration of legal authority to implement and enforce all control measures contained in the SIP;
- Provisions for future updates of the inventory to enable tracking of emissions levels, including an annual emissions statement from major sources;
- Motor vehicle emissions budgets for transportation conformity for the ten-year maintenance period;
- A commitment to submit a revised Maintenance Plan eight years after redesignation;

¹ See <http://www.epa.gov/ttn/oarpg/t5/memoranda/redesignmem090492.pdf>, accessed April 27, 2012.

- A commitment to enact and implement additional contingency measures expeditiously in the event that future violations of the NAAQS occur; and
- A list of potential contingency measures that would be implemented in such an event.

This Maintenance Plan has been prepared in accordance with the requirements specified in EPA's guidance document and additional guidance received from USEPA staff. The following subsections of this document describe how EPA's requirements for a maintenance plan have been met.

3.5 Commitment to Revise Plan

Under Section 175A of the Clean Air Act, an area designated as maintenance for a NAAQS is required to submit a second maintenance plan eight (8) years after redesignation of any area as an attainment area under Section 107(d). This second maintenance plan is intended to maintain the NAAQS for ten (10) years after the expiration of the initial ten year period. The Department recognizes the importance of an up-to-date, current maintenance plan, and commits to updating it as necessary.

3.6 Public Participation

In accordance with Section 110(a)(2) of the CAA, the Maryland is required to hold a public hearing prior to adoption of this maintenance plan and the subsequent submittal to the EPA. The Department will notify the public and other interested parties of an upcoming public hearing and comment period thirty (30) days prior to holding such hearing for this maintenance plan.

3.7 Legal Authority to Implement and Enforce

The Maryland Department of the Environment has the legal authority to develop, implement and enforce regulations regarding air pollution including the requirements of this SIP submittal.

4. Maintenance Plan Development

The State of Maryland has developed a maintenance plan that meets all USEPA requirements and demonstrates that because of permanent and enforceable measures, emissions over the 10 years following redesignation approval will remain below the 2007 attainment year levels while allowing for growth in population and vehicle miles traveled. The period covered by this maintenance plan is 2007 through 2025.

The State of Maryland has developed an emissions inventory, in accordance with USEPA guidance, that identifies the level of emissions sufficient to achieve the 1997 PM_{2.5} NAAQS. This attainment inventory consists of the actual emissions for a year, during the three-year period associated with the monitoring data, showing attainment of the 1997 PM_{2.5} NAAQS. The year is 2007. The plan includes a demonstration that emissions will remain beneath the 2007 levels for a 10-year period by keeping in place key elements of the current federal and state regulatory programs and putting in place additional controls. The state has the legal authority to implement and enforce specified measures necessary to attain and maintain the NAAQS.

In addition to maintaining key elements of regulatory programs, the State of Maryland will acquire air quality and source emissions data to track attainment and maintenance. The State of Maryland will continue to operate and maintain its air quality monitoring network.

The maintenance plan includes contingency measures, as necessary, to promptly correct any NAAQS violation that occurs after redesignation of the area.

The following sections provide detail on each of the requirements, and the State of Maryland's approach to meeting each requirement.

4.1 Attainment Inventory

The State of Maryland must develop an attainment year emissions inventory to identify the level of emissions sufficient to achieve the 1997 PM_{2.5} NAAQS. The attainment inventory consists of the actual emissions for the year during the three-year period associated with the monitoring data showing attainment of the 1997 PM_{2.5} NAAQS. In this case, the year is 2007. The 2007 inventory is appropriate to use because it represents the typical inventory for the three-year period demonstrating attainment of the standard.

The 2007 inventory is consistent with USEPA guidance; is based on annual emissions of SO₂, NO_x, and primary PM_{2.5} during 2007; and contains a list of sources and emissions in tons per year. Volatile Organic Compounds (VOC) and ammonia (NH₃) were determined to be insignificant for the PM_{2.5} NAAQS for the Baltimore, MD PM_{2.5} nonattainment area and for this reason they are not included in the attainment inventory. This determination was based on USEPA's policy regarding VOC and NH₃ as they relate to fine particle formation in the atmosphere as noted in the implementation rule (FR Vol.72, No. 79, 4/25/2007, section IIA (precursors and pollutants contributing to fine particle formation), pp.20591-20593).

4.1.1 Summary

A summary of the 2007 Attainment Year Inventory is presented in Table 4-1: 2007 Baltimore, MD Attainment Year Inventory.

A more detailed accounting of the inventory is contained in **Error! Reference source not found.**. A description of the procedures and methods used to develop the attainment year inventory is contained in **Error! Reference source not found.**. A detailed emission inventory spreadsheet is presented in **Error! Reference source not found.**.

Table 4-1: 2007 Baltimore, MD Attainment Year Inventory

Category	Pollutant		
	NO _x (tpy)	SO ₂ (tpy)	PM _{2.5} -PRI ² (tpy)
Point	35,553.82	98,424.42	8,973.22
Area	4,732.44	2,315.81	6,701.79
Non-Road Mobile	27,168.92	2,383.98	1,540.88
On-Road Mobile	49,140.10	385.30	1,789.30
TOTAL ³	116,595.28	103,509.50	19,005.19

4.2 Projection Inventory

A Maintenance Plan must contain a demonstration that the levels of emissions projected for the ten-year period following redesignation are sufficient to maintain the NAAQS.

Accordingly, the MDE has projected PM_{2.5}, NO_x, and SO₂ emissions for the Baltimore, MD PM_{2.5} nonattainment area for 2025, as well as an interim year, 2017. Emissions for these projection years are compared to emissions levels in 2007 to determine if emissions are sufficient to maintain the NAAQS during this period.

The projected inventories are derived by applying the appropriate growth factors to the 2007 Attainment Year Emissions Inventory. USEPA guidance describes four typical indicators of growth. In order of priority, these are as follows: (1) product output, (2) value added, (3) earnings, and (4) employment. Surrogate indicators of activity; for example, population growth, are also acceptable methods.

Projected emissions for electric generating unit (EGU) point sources were developed based on electricity generation projections that are delineated by region and fuel. Growth factors are based on AEO2011 Table 96 - Electricity Generation by Electricity Market Module Region and Fuel Source.

Projected emissions for non-EGU unit point sources were developed using state-level

² PRI refers to primary particulate matter, which is directly released into the environment from human activities and natural sources, as compared with secondary particulate matter, which forms via chemical reactions in the environment.

³ Sums in the "Total" column may reflect rounding errors.

employment projections by NAICS code (unless employment growth rate is negative, in which case use “no growth”) and other state-specific emission projection data.

Projected emissions for on-road mobile sources were developed using USEPA’s MOVES2010a mobile source inventory model. These estimates are based on vehicle-specific registration data obtained from each jurisdiction. Mobile source emission projections included the National Low Emission Vehicle Program (NLEV); the 2004 Tier 2 and Low Sulfur Gasoline Rule; the 2004 and 2007 Heavy-Duty Diesel Vehicle (HDDV) Rules; and the 2006 Low Sulfur Diesel Rule. All jurisdictions were modeled with Phase II Reformulated Gasoline (RFG) and an enhanced I/M program for all analysis years.

Projected emissions for non-road vehicles and equipment except for marine, air, and railway locomotives were developed using NMIM2008 (version NMIM20090504), which used NONROAD2008a model (version July 2009). This version of NONROAD2008a is USEPA’s most recently approved emissions estimation tool for the above-mentioned nonroad sources.

Projected emissions for non-point (area), marine, air, and railway locomotive sources were calculated using the most updated practices and inputs, such as the demographic forecasts (population, household, and employment projections), endorsed by the Baltimore Regional Transportation Board (BRTB). BRTB is the federally designated Metropolitan Planning Organization (MPO) for the Baltimore region.

A more detailed accounting of the 2017 and 2025 projection inventories are contained in **Error! Reference source not found.** and **Error! Reference source not found.**, respectively. A description of the procedures and methods used to develop the attainment year inventory is contained in **Error! Reference source not found.**. A detailed emission inventory spreadsheet is presented in **Error! Reference source not found.**.

4.2.1 Summary

Table 4-2: Growth Assumptions Used in Emission Inventory Projections

Category	Level of Detail	Source
Stationary/Industrial Source Growth	Source/Unit/Process Specific	AEO State/Federal Requirements
Area and Non-Road Mobile Source Growth	Category Specific	Cooperative Forecast
Vehicle Miles Traveled Growth	Jurisdiction-specific	Baltimore Metropolitan Council and MDE

4.3 Demonstration of Maintenance

States may demonstrate maintenance of the NAAQS by showing that future emissions of a pollutant or its precursors will not exceed the level of the attainment inventory. The demonstration should be for a period of 10 years following the redesignation. The projected inventory should consider future growth, including population and industry. It should also be consistent with the attainment inventory, and it should document data inputs and assumptions.

All elements of the demonstration should be consistent with current USEPA guidance. Enforceability through regulations must also be demonstrated.

Any assumptions concerning emission rates must reflect permanent, enforceable measures. States generally cannot take credit for reductions unless there are regulations in place requiring those reductions or the reductions are otherwise shown to be permanent. Therefore, states are expected to maintain the implemented control strategy despite redesignation to attainment unless such measures are shown to be unnecessary for maintenance or are replaced with measures that achieve equivalent reductions. Emission reductions from source shutdowns can be considered permanent and enforceable to the extent that those shutdowns have been reflected in the SIP and all applicable permits have been modified accordingly.

4.3.1 Projected Emissions below Attainment Year Emissions

Table 4-3 demonstrates how future emissions of SO₂, NO_x, and primary PM_{2.5} will not exceed the levels of the Baltimore, MD attainment inventory for a minimum of 10 years following redesignation. The projected emissions reflect the expected annual emissions based on the best available growth rates and projections, as noted in Table 4-3.

Table 4-3: Baltimore, MD NO_x, SO₂, & Primary PM_{2.5} Emissions, 2007 to 2025

SOURCE CATEGORY	BNAA NO _x			BNAA SO ₂			BNAA PM _{2.5} -PRI		
	2007	2017	2025	2007	2017	2025	2007	2017	2025
Point	35,553.82	22,170.09	22,300.20	98,424.42	23,818.42	23,788.38	8,973.22	9,286.94	9,500.15
Area	4,732.44	4,964.77	5,167.45	2,315.81	305.16	315.02	6,701.79	5,116.71	5,197.30
Non-Road Mobile	27,168.92	17,213.18	12,785.60	2,383.98	353.69	283.18	1,540.88	959.79	720.31
On-Road Mobile	49,140.10	24,910.01	17,995.80	385.300	236.87	233.06	1789.28	1010.31	786.75
TOTAL	116,595.28	69,258.05	58,249.06	103,509.50	24,714.15	24,619.64	19,005.19	16,373.75	16,204.50
Δ (2017-2007)	-47,337.25			-78,795.39			-2,631.42		
Δ (2025-2007)	-58,346.24			-78,889.90			-2,800.67		

4.3.2 Control Measures for Maintenance of Good Air Quality

Point, non-road, and on-road emission projections for 2017 and 2025 include a variety of control strategies that will reduce emissions of PM_{2.5}, NO_x, and SO₂ in the future years. The sections below describe the major control programs in each category. Many of these programs are federal programs that are enforced on a regional or national level. In cases where the programs are delegated programs or state programs, the State of Maryland commits to the continuation of each program, to include compliance and enforcement mechanisms as appropriate to ensure that reductions assumed in 2017 and 2025 will be achieved.

4.3.2.1 Point Sector Controls

Point source emissions of PM_{2.5}, SO₂, and NO_x are dominated in the Baltimore, MD region by the emissions from electrical generating units (EGU). The EGUs located in the Baltimore, MD nonattainment area are the Herbert A. Wagner Station in Anne Arundel County (ORIS 1554); the Brandon Shores Station in Anne Arundel County (ORIS (602); Riverside in Baltimore County (ORIS 1559), C.P. Crane Station in Baltimore County (ORIS 1552); the Perryman Power Plant in Harford County (ORIS 1556), and the Westport Station in Baltimore City (ORIS 1560). These facilities are subject to a variety of federal and state-enforceable mechanisms that have reduced emissions at these units since 2007 and will continue to reduce emissions into the future.

4.3.2.1.1 Maryland Healthy Air Act

The Maryland Healthy Air Act (HAA) regulations became effective on July 16, 2007 and required reductions in NO_x, SO₂, and mercury emissions from large coal burning power plants in Maryland. Specifically, this program limits emissions from the Brandon Shores Generating Plant, the Herbert A. Wagner Generating Plant, and the C.P. Crane Generating Plant, all of which are coal-fired power plants located within the Baltimore, MD nonattainment area. Emission reductions from the HAA are phased. The first phase required reductions in the 2009/2010 timeframe. The second phase of emission controls will occur in the 2012/2013 time frame. At full implementation, the HAA will reduce NO_x emissions for the affected units by approximately 65 percent from 2002 levels and SO₂ emissions by approximately 80 percent from 2002 levels resulting in the removal of approximately 15,000 and 75,000 tons per year of NO_x and SO₂, respectively. The first phase of the HAA was successfully implemented, and the second phase of the program is expected to be implemented in a timely manner.

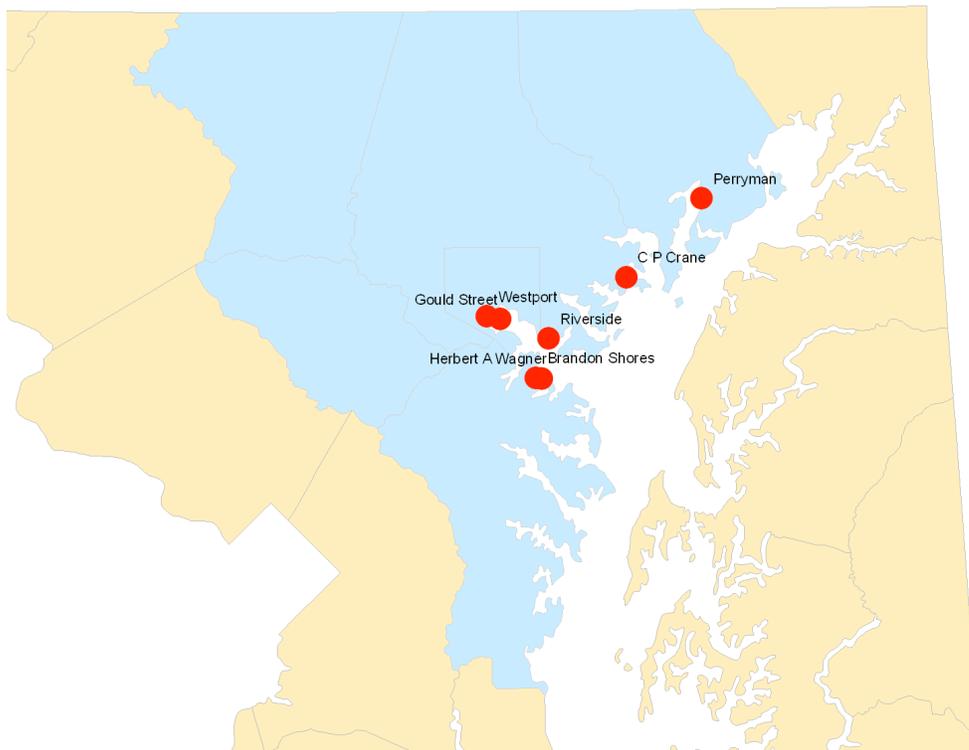


Figure 4-1: Large EGUs in the Baltimore, MD Area

4.3.2.1.2 Future Point Source Emission Reduction Programs

Three federal regulations may reduce emissions of SO₂ even further than is already estimated by the 2017 and 2025 inventory shown in Table 4-3 for the Baltimore, MD area. These rules were not yet finalized as of the time of the development of the projection inventory and therefore were not considered in the 2017 and 2025 estimates included in this document. If these regulations are finalized, each should prompt significant further reductions, both within and outside the Baltimore, MD area.

- **Mercury and Air Toxics Rule:** On February 16, 2012, USEPA published the final Mercury and Air Toxics Rule to reduce emissions of toxic air pollutants from new and existing coal and oil-fired EGUs (Federal Register, Vol. 77, No. 32, 2/16/2012). The rule establishes numerical emission limits for hydrogen chloride (HCl) as a surrogate for toxic acid gases or alternative standards for SO₂. USEPA has estimated that this rule will affect approximately 1,200 coal-fired units nationwide and will reduce SO₂ emissions from power plants by 55 percent. Existing sources may be required to demonstrate compliance with applicable standards by 2015.
- **2010 SO₂ NAAQS:** On June 2, 2010, USEPA strengthened the primary NAAQS for SO₂ by revising the primary SO₂ standard to 75 ppb averaged over one hour. This short term standard is significantly more stringent than the revoked standards of 140 ppb averaged over 24 hours and 30 ppb averaged annually. Under the new standard's proposed guidance, facilities emitting more than 100 tpy of SO₂, many of which are EGUs, will be required to demonstrate compliance with the standard no later than 2017.
- **Industrial/Commercial/Institutional (ICI) Boiler Maximum Achievable Control Technology (MACT) Standard:** USEPA finalized the revised ICI Boiler MACT on February 21, 2011, although portions of the rule are under reconsideration. USEPA estimates that implementation of the revised rulemaking will reduce emissions nationwide from major source boilers and process heaters by 47,000 tpy of PM, 440,000 tpy of SO₂, and 7,000 tpy of VOCs.

4.3.2.2 Nonroad Diesel Emission Reduction Programs

Under 40 CFR Part 89, U.S. EPA adopted standards for emissions of NO_x, hydrocarbons, and carbon monoxide (CO) from several groups of nonroad engines, including industrial spark-ignition engines and recreational nonroad vehicles. Industrial spark-ignition engines power commercial and industrial applications and include forklifts, electric generators, airport baggage transport vehicles, and a variety of farm and construction applications. Nonroad recreational vehicles include snowmobiles, off-highway motorcycles, and all-terrain vehicles. These rules were initially effective in 2004 and will be fully phased in by 2012.

The nonroad diesel rule sets standards that reduced emissions by more than 90 percent from nonroad diesel equipment and, beginning in 2007, the rule reduced fuel sulfur levels by 99 percent from previous levels. The reduction in fuel sulfur levels applied to most nonroad diesel fuel in 2010 and will apply to fuel used in locomotives and marine vessels in 2012.

This program will continue to provide emission reductions of NO_x as new equipment is purchased and older equipment is scrapped. Additionally, SO₂ emissions from the combustion of nonroad diesel fuel and locomotive and marine diesel fuel will continue to be reduced through 2012.

4.3.2.3 On-Road Emission Reduction Programs

In the 2007 heavy-duty highway rule, which is codified in 40 CFR Part 86, Subpart P, USEPA set a PM emission standard of 0.01 grams per brake horsepower-hour (g/bhp-hr) for new heavy-duty engines. This standard took full effect for diesel engines in the 2007 model year. This rule included the following standards for NO_x and non-methane hydrocarbons (NMHC): 0.20 g/bhp-hr and 0.14 g/bhp-hr, respectively. These diesel engine NO_x and NMHC standards were successfully phased in together between 2007 and 2010. The rule also required that sulfur in diesel fuel be reduced to facilitate the use of modern pollution control technology on these trucks and buses. USEPA required a 97 percent reduction in the sulfur content of highway diesel fuel -- from levels of 500 parts per million (ppm) for low sulfur diesel to 15 ppm for ultra-low sulfur diesel. The reductions in sulfur content engendered similar reductions in SO₂ emissions. These requirements were successfully implemented on the timeline in the regulation.

The Tier 2 vehicle and gasoline sulfur program, as codified in Subpart H of 40 CFR Part 80, 40 CFR Part 85, and 40 CFR Part 86, became effective in the 2005 model year. This program for fleet averaging of on-road vehicles is modeled after the California LEV II standards. The Tier 2 program allows manufacturers to produce vehicles with emissions ranging from relatively dirty to very clean, but the mix of vehicles that a manufacturer sells each year must have average NO_x emissions below a specified value. Mobile emissions continue to show reductions from this program as motorists replace older, more polluting vehicles with cleaner vehicles.

In addition to the federal Tier 2 program and the federal 2007 heavy duty highway rule, the State of Maryland has instituted enhanced vehicle emissions inspection and maintenance (enhanced I/M) requirements. The requirements involve mandating regional vehicle emission I/M programs that are stricter than basic programs, as required under Sections 182 and 202 of the CAA. Before 1994, basic automobile emissions testing checked only tailpipe emissions while idling and sometimes at 2,500 rpm. Enhanced I/M procedures include the use of On Board Diagnostic (OBD) system evaluations, a wider range of vehicles tested, and may include a dynamometer (treadmill) test that checks the car's emissions under driving conditions. The OBD evaluations provide a more complete inspection, checking for excess evaporative emissions and other issues that might affect emissions from the vehicle.

4.4 Commitment to Operate Air Quality Monitoring Network

Once an area has been redesignated, the states must continue to operate an appropriate air quality monitoring network in accordance with 40 CFR Part 58, to verify the area's attainment status. In cases where measured mobile source parameters (for example, vehicle miles traveled) have changed over time, the state may also need to perform a saturation monitoring study to determine the need for and location of additional permanent monitors.

The State of Maryland operates a monitoring network that is significantly more robust than required by federal regulation. Figure 4-2 **Error! Reference source not found.** provides a map showing the locations of the various PM_{2.5} monitoring sites in the current network.

The State of Maryland commits to operating and maintaining an air quality network for PM_{2.5} monitoring that meets all federal requirements. Should measured mobile source parameters change significantly over time, the State of Maryland will perform a saturation monitoring study to determine the need for and location of PM_{2.5} monitors.

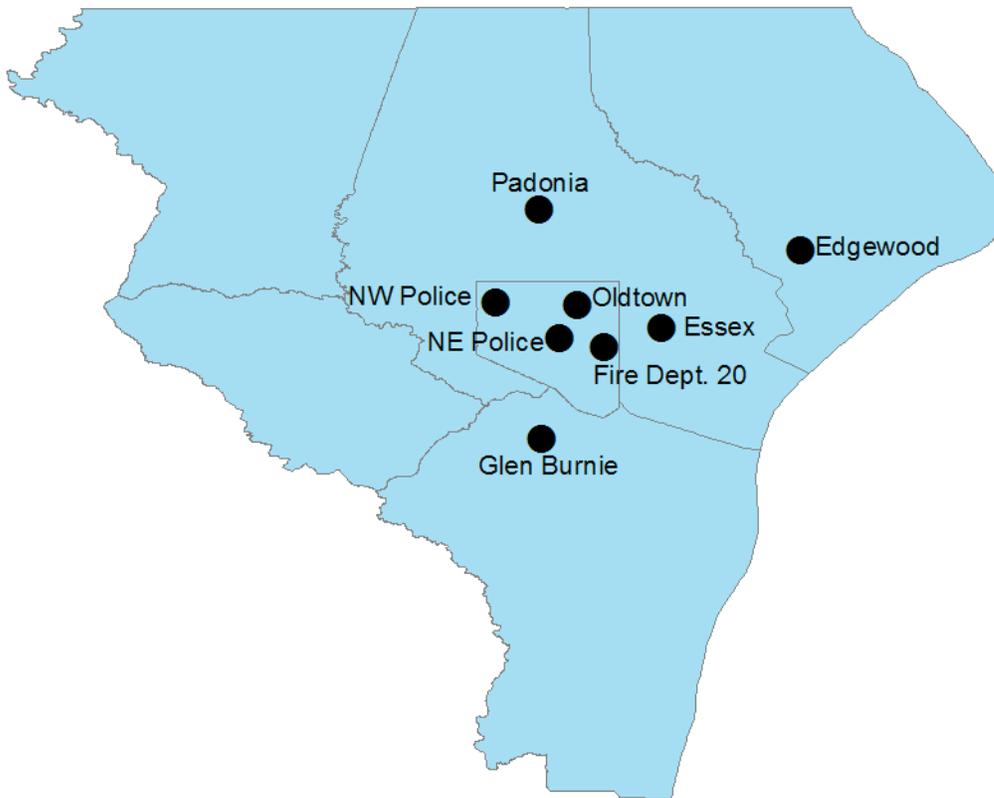


Figure 4-2: Baltimore, MD PM_{2.5} Monitoring Sites

4.5 Legal Authority – Verify Continued Attainment

States must ensure that they have the legal authority to implement and enforce all measures necessary to attain and maintain the NAAQS. Sections 110(a)(2)(B) and (F) of the CAA, and regulations promulgated in 40 CFR 51.110(k) suggest that one such measure is the acquisition of air quality and source emission data to demonstrate attainment and maintenance. The submittal must indicate how the states will track the progress of the maintenance plan. This is necessary due to the fact that the emission projections made for the maintenance demonstration depend on assumptions of point, area, and mobile source growth.

One option for tracking the progress of the maintenance demonstration would be for the states to periodically update the emissions inventory. In this case, the maintenance plan should specify the frequency of any planned inventory updates. Such an update could be based, in part, on the annual update of the USEPA Aerometric Information Retrieval System (AIRS) and could indicate new source growth and other changes from the attainment inventory (such as changes in vehicle miles traveled or in traffic patterns). As an alternative to a complete update of the inventory, states may choose to do a comprehensive review of the factors that were used in developing the attainment inventory to show no significant change. If this review does show a significant change, states should then perform an update of the inventory.

The State of Maryland has the legal authority to implement and enforce specified measures necessary to attain and maintain the NAAQS. Key regulatory elements that the State will keep in place to maintain attainment are as follows:

- Shutdown requirements, permitting requirements, and regulatory requirements
- I/M program requirements.

In addition to maintaining key elements of its regulatory program, the state will acquire ambient and source emission data to track attainment and maintenance. The state will track the progress of the maintenance demonstration by periodically updating the emissions inventory. This tracking will consist of annual and periodic evaluations. The annual evaluation will consist of checks on key emissions trend indicators such as the annual emissions update of stationary sources, the Highway Performance Monitoring System (HPMS) vehicle miles traveled data reported to the Federal Highway Administration, and other growth indicators. These indicators will be compared to the growth assumptions used in the plan to determine if the predicted versus the observed growth remains relatively constant. The state will also develop and submit to the USEPA comprehensive tracking inventories every three years or as required by federal regulation during the maintenance plan period.

4.6 Transportation Conformity and Mobile Source Emissions Budgets

Transportation conformity is a way to ensure that federal funding and approval are given to those transportation activities that are consistent with air quality goals. Transportation activities should not worsen air quality or interfere with an area's continued compliance in regards to the 1997 PM_{2.5} NAAQS. The federal transportation conformity rule is codified in 40 CFR Part 93, subpart A, entitled *Determining Conformity of Federal Actions to State or*

Federal Implementation Plans (transportation conformity rule). This rule applies to areas designated as nonattainment for one or more NAAQS or that have been redesignated to attainment with federally approved air quality maintenance plans.

Transportation conformity is required under CAA Section 176(c) (42 U.S.C. 7506(c)) to ensure that transportation plans, transportation improvement programs (TIPs) and federally supported highway transit project activities are consistent with (“conform to”) the purpose of the state air quality implementation plan (SIP). “Conform to the purpose of the SIP” means that transportation activities will not cause new air quality violations, worsen existing violations, or delay timely attainment of the relevant NAAQS or any interim milestones. These requirements are found in Clean Air Act Section 176(c)(B)(i), (ii), and (iii), which states: “Conformity to an implementation plan means—... That such activities will not cause or contribute to any new violation of any standard in any area; increase the frequency or severity of any existing violation of any standard in any area; or delay timely attainment of any standard or any required interim emissions reductions or other milestones in any area.” The federal transportation conformity rule is codified in 40 CFR Part 93, subpart A, entitled *Determining Conformity of Federal Actions to State or Federal Implementation Plans* (transportation conformity rule). Transportation conformity applies to areas that are designated nonattainment, and those areas redesignated to attainment after 1990 (“maintenance areas”) for transportation-related criteria pollutants: Carbon monoxide (CO), ozone, nitrogen dioxide (NO₂) and particulate matter (PM_{2.5} and PM₁₀).

As stated in 40 CFR 93.102, for PM_{2.5} areas, transportation conformity applies to directly emitted PM_{2.5}. In addition, it applies to NO_x in these areas, unless both the USEPA Regional Administrator and the director of the state air agency have made a finding that transportation-related emissions of NO_x within the nonattainment area are not a significant contributor to the PM_{2.5} nonattainment problem. Such a finding has not been made for the Baltimore, MD annual PM_{2.5} nonattainment area. Therefore, mobile source emission budgets for both PM_{2.5} and NO_x are proposed in this maintenance plan.

40 CFR 93.102 further specifies that in PM_{2.5} areas, transportation conformity applies to VOC, SO₂, and/or ammonia as PM_{2.5} precursors, as well as re-entrained road dust, if the USEPA Regional Administrator or the director of the state air agency has made a finding that transportation-related emissions of any of these precursors or re-entrained road dust within the nonattainment area are a significant contributor to the PM_{2.5} nonattainment area. Such a finding has not been made for any of these precursors or for re-entrained road dust for the Baltimore, MD PM_{2.5} nonattainment area. For these pollutants and precursors, the highway contribution to those emissions may be insignificant. In that case, the transportation conformity rule allows such pollutants and precursors to be exempt from conformity analysis under certain circumstances:

40 CFR 93.109 (k) *Areas with insignificant motor vehicle emissions.* Notwithstanding the other paragraphs in this section, an area is not required to satisfy a regional emissions analysis for §93.118 and/or §93.119 for a given pollutant/precursor and NAAQS, if EPA finds through the adequacy or approval process that a SIP demonstrates that

regional motor vehicle emissions are an insignificant contributor to the air quality problem for that pollutant/precursor and NAAQS. The SIP would have to demonstrate that it would be unreasonable to expect that such an area would experience enough motor vehicle emissions growth in that pollutant/precursor for a NAAQS violation to occur. Such a finding would be based on a number of factors, including the percentage of motor vehicle emissions in the context of the total SIP inventory, the current state of air quality as determined by monitoring data for that NAAQS, the absence of SIP motor vehicle control measures, and historical trends and future projections of the growth of motor vehicle emissions. . .

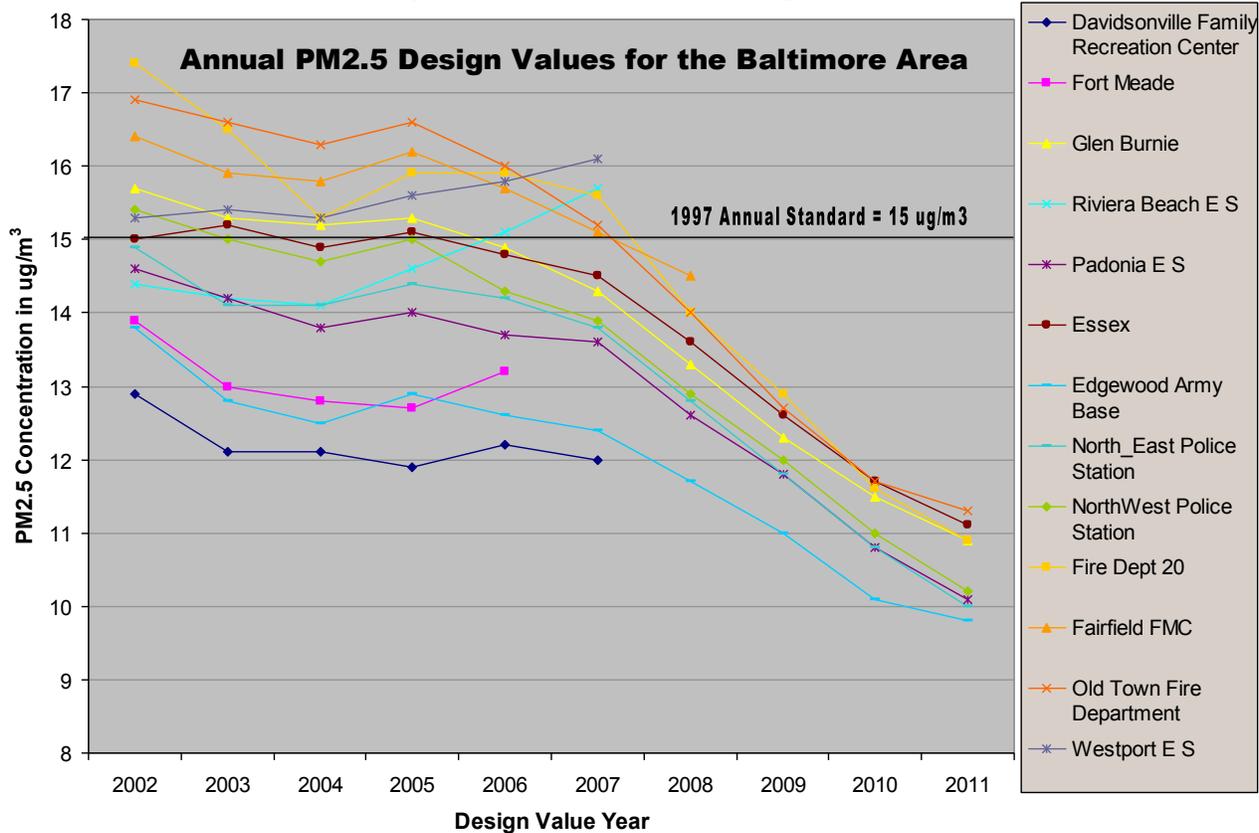
For this reason, VOC, SO₂, ammonia and re-entrained road dust are not addressed in this maintenance plan for transportation conformity purposes. In fact the State of Maryland is herein making a finding that regional highway emissions of SO₂ are insignificant contributors to the PM_{2.5} air quality of the Baltimore, MD area. The finding will become final if USEPA concurs and approves this maintenance plan. This finding is due to the fact that the regional highway SO₂ emissions inventory constitutes a very small fraction of the overall emissions inventory in the Baltimore, MD area as shown in Table 4-4.

Table 4-4: Comparison of SO₂ Emissions from On-Road Sources to the Total SO₂ Inventory

Year	BNAATotal SO2 Emissions tpy	On-Road SO2 Emissions tpy	% On-Road SO2 Emissions
2007	103,509.54	385.34	0.37%
2017	24,714.15	236.87	0.96%
2025	24,619.64	233.06	0.95%

Additionally, PM_{2.5} air quality in the region is good and getting better. Figure 4-3 provides the regional trends in PM_{2.5} air quality for the federal reference method monitoring sites. The design value for the 1997 PM_{2.5} annual standard for the Baltimore, MD region is 11.1 µg/m³ for years 2009-2011; this is 3.9 µg/m³ beneath the standard. The contribution of on-road mobile SO₂ emissions remains proportionally small in both the interim year and projection year. Therefore, it is highly unlikely that any increase in growth assumptions or activity data, beyond those already included in the on-road SO₂ emissions estimation methodology, could account for an exceedance or violation of the 1997 PM_{2.5} NAAQS annual standard. For these same reasons, the likelihood of on-road emissions of SO₂ contributing to an exceedance of the 1997 PM_{2.5} 24-hour standard is even smaller.

Figure 4-3: Baltimore, MD Annual PM_{2.5} Trend⁴



4.6.1 Budget Level for On-Road Mobile Source Emissions

As part of the development of this SIP revision, the MDE formally establishes annual mobile source emissions budget for NO_x and PM_{2.5}. The mobile emissions budgets are based on the projected mobile source emissions accounting for all mobile control measures. This budget will be the benchmark used to determine if the region's twenty-year long-range transportation plan (LRTP) and three-year transportation improvements program (TIP) conform to the SIP. These budgets represent the level of mobile source emissions that can be emitted in the area while supporting the air quality plan

For NO_x and PM_{2.5}, initial, interim and final mobile source budgets have been developed to accommodate the fluctuation in mobile source emissions estimates over time. In the near term, mobile source emissions are rapidly decreasing due to the implementation of the NLEV, Tier 2, and Heavy-Duty Diesel Vehicle (HDDV) rules, even as vehicle miles travelled (VMT) continues to grow. Once these rules have sufficiently penetrated the fleet, growth in VMT becomes more pronounced and eventually pushes mobile emissions back on an upward trend.

⁴ PM_{2.5} Design Values, MDE Ambient Air Quality Monitoring Program

Table 4-5 contains the motor vehicle emissions budgets for the Baltimore area.

Table 4-5: Baltimore, MD Maintenance Plan On-Road Mobile Source Emissions Budgets

Year	NO _x On-Road Emissions Budget (tpy)	PM _{2.5} On-Road Emissions Budget (tpy)
2007 Attainment Year	49,140.10	1,789.28
2017 Interim Budget	29,892.01	1,218.60
2025 Final Budget	21,594.96	1,051.39

The above budgets for the Baltimore area, agreed upon as part of the interagency consultation process, include the emission estimates calculated for 2017 and 2025 with an additional margin of safety allocated to PM_{2.5} and NO_x in 2017 and 2025. Safety margins are explicitly defined and provided for in EPA's Conformity Regulations, and the use of such safety margins is common practice in maintenance plans approved by EPA. Because of significant declines projected in both precursor NO_x and primary PM_{2.5} emissions from motor vehicles over the 2007 through 2025 period of the maintenance plan, these recommended safety margins can be included in the plan while still ensuring maintenance of the PM_{2.5} standard for the region.

Table 4-6 shows the maintenance of the PM_{2.5} standard with the margin of safety included in the on-road mobile emissions.

Table 4-6: Baltimore, MD NO_x, SO₂, & Primary PM_{2.5} Emissions, 2007 to 2025 with Mobile Budgets

SOURCE CATEGORY	BNAA NO _x			BNAA SO ₂			BNAA PM _{2.5} -PRI		
	2007	2017	2025	2007	2017	2025	2007	2017	2025
Point	35,553.82	22,170.09	22,300.20	98,424.42	23,818.42	23,788.38	8,973.22	9,286.94	9,500.15
Area	4,732.44	4,964.77	5,167.45	2,315.81	305.16	315.02	6,701.79	5,116.71	5,197.30
Non-Road Mobile	27,168.92	17,213.18	12,785.60	2,383.98	353.69	283.18	1,540.88	959.79	720.31
On-Road Mobile	49,140.10	29,892.01	21,594.96	385.300	236.87	233.06	1789.28	1218.60	1,051.39
TOTAL	116,595.28	74,240.05	61,848.22	103,509.50	24,714.15	24,619.64	19,005.19	16,582.04	16,469.14
Δ (2017-2007)	-42,355.25			-78,795.39			-2,423.13		
Δ (2025-2007)	-54,747.08			-78,889.90			-2,536.03		

4.7 Contingency Measures

Section 175(A) of the Clean Air Act specifies the requirements for maintenance plans. In addition to providing a plan for the maintenance of the NAAQS for at least ten (10) years after the redesignation, the plan shall also include a list of contingency measures to correct any violation of the fine particulate matter NAAQS after redesignation to attainment. The plan should also provide a commitment to submit a revised maintenance plan eight years after redesignation to ensure continued maintenance for the next ten year maintenance period.

Contingency measures are to be used to further reduce emissions if a violation of the fine particulate matter NAAQS occurs after redesignation to attainment. While these measures do not need to be fully adopted by the Maryland Department of the Environment prior to the occurrence of a NAAQS violation, the contingency measures are expected to be implemented as expeditiously as possible once a triggering event occurs. The maintenance plan must identify the triggers that determine when contingency measures will be adopted, and the measures that the state will consider.

The maintenance plan must include contingency measures, as necessary, to promptly correct two future situations. The first situation is an inventory estimate that indicates the Baltimore, MD area had actual emissions of either SO₂, NO_x, or PM_{2.5} in any future year that were greater than that of the attainment year inventories listed in Table 4-1. The second situation is any NAAQS violation that occurs after redesignation of an area. The plan should include measures to be adopted, a schedule and procedures for adoption and implementation, and a specific time limit for action. Specific triggers that would put the plan into motion must be identified. This plan is considered to be an enforceable part of the SIP and should ensure that the contingency measures are adopted explicitly once they are triggered.

The ability of the Baltimore, MD nonattainment area to stay in compliance with the 1997 PM_{2.5} NAAQS depends at least partially on the level of NO_x, SO₂, and primary PM_{2.5} emissions in the region. Emissions are projected to stay well below the 2007 attainment year levels, through 2025. However, if emissions increase, the area may experience a PM_{2.5} violation. To address this unlikely situation, the State of Maryland has developed a contingency plan. The situations described below would trigger the implementation of the contingency measures as described in Section 4.7.1, Section 4.7.2, or Section 4.7.3.

- Annual actual emissions of SO₂, NO_x, or PM_{2.5} exceeding the attainment year inventories in Table 4-1.
- Any annual exceedance (annual average for one year at any federal reference method monitor in the Baltimore, MD nonattainment area) of 15.0 µg/m³ or greater.
- Any violation (three year average of the annual average at any federal reference method monitor in the Baltimore, MD nonattainment area) of 15.0 µg/m³ or greater.

4.7.1 Exceedance of the Attainment Year Emissions Inventory

Should any future year emissions inventory data indicate that the Baltimore, MD area's total emissions of SO₂, NO_x, or PM_{2.5} exceeded the levels in Table 4-1, the State of Maryland, would first undertake an audit to determine whether inventory refinements were needed. This audit may include, but would not be limited to, a determination that appropriate models, control strategies, monitoring strategies, planning assumptions, industrial throughput, and production data were used in the attainment year and future year estimates. If this audit does not reconcile the originally estimated emissions exceedances, then the State of Maryland commits to implementing one or more of the programs listed in Table 4-7 so that future total emission estimates for the Baltimore, MD area will not exceed those listed in Table 4-1.

4.7.2 Near Term Contingency Measures for Air Quality Exceedances

If an annual exceedance or violation of 15.0 µg/m³ occurs prior to January 1, 2013, the Maryland Healthy Air Act's second phase will provide significant emissions reductions of precursors to PM_{2.5}. This regulation, included in COMAR 26.11.27, requires additional SO₂ reductions beginning January 1, 2013, for applicable coal-fired power plants in Maryland. These applicable units include coal-fired boilers located at the C.P. Crane Power Plant, the Herbert A. Wagner Power Plant, and the Brandon Shores Power Plant in the Baltimore, MD nonattainment area. In 2013 the allowable tonnage cap for the units at these facilities will be reduced from 23,407 tpy of SO₂ to 17,926 tpy of SO₂, a reduction of over 23 percent. This regulation has the added benefit of already being codified; these reductions will take place in January of 2013 without further action by the State of Maryland.

4.7.3 Long Term Contingency Measures

If an annual exceedance of 15.0 µg/m³ occurs after January 1, 2013, the State of Maryland commits to implementing one of the programs listed in Table 4-7 to garner additional emission reductions for air quality improvement.

If an annual violation occurs after January 1, 2013, the State of Maryland commits to implementing two or more of the programs listed in Table 4-7 to garner additional emission reductions for air quality improvement.

Table 4-7: Contingency Control Measures

PM _{2.5} Reasonable Available Control Measure (RACM) Determination
NO _x RACM Determination
Non Road Diesel Emission Reduction Strategies
Low Sulfur Home Heating Oil Requirements
Alternative Fuel and Diesel Retrofit Programs for Fleet Vehicle Operations
Concrete Manufacturing – Wet Suppression Upgrade Requirements

4.7.4 Contingency Measure Implementation Schedule

The State of Maryland commits to the implementation of any long term contingency measure on the following schedule:

- Schedule onset: notification received from USEPA that a contingency measure must be implemented, or three months after quality assured data determine that an exceedance or violation occurred within the previous year.
- Applicable regulation or program to be adopted six months after this date.
- Applicable regulation to be implemented six months after adoption.
- Compliance with regulation, or full program implementation, to be achieved within 12 months of adoption.

Appendices

Appendix A – 2007 Attainment Year Inventory

Appendix A-1 – 2007 Point Source Emissions

Appendix A-2 – 2007 Area Source Emissions

Appendix A-3 – 2007 On-Road Mobile Source Emissions

Appendix A-4 – 2007 Off-Road Mobile Source Emissions

Appendix B – 2017 Interim Year Projection Year Inventory

Appendix B-1 – 2017 Point Source Emissions

Appendix B-2 – 2017 Area Source Emissions

Appendix B-3 – 2017 On-Road Mobile Source Emissions

Appendix B-4 – 2017 Off-Road Mobile Source Emissions

Appendix C – 2025 Projection Year Inventory

Appendix C-1 – 2025 Point Source Emissions

Appendix C-2 – 2025 Area Source Emissions

Appendix C-3 – 2025 On-Road Mobile Source Emissions

Appendix C-4 – 2025 Off-Road Mobile Source Emissions

Appendix D – Emission Inventory Documentation

Appendix E – Emission Inventory Detail Spreadsheet

Appendix F – Onroad Mobile MOVES Documentation, Conformity Data and Budgets

Appendix G – Information Addressing NRDC v. EPA, Case No. 08-12150