

Commonwealth of Virginia
Department of Environmental Quality

**Maintenance Plan Update for The City
of Fredericksburg, Spotsylvania
County, and Stafford County 1997 8-
Hour Ozone NAAQS Maintenance
Area: NO_x Motor Vehicle Emission
Budget Revisions Based on
MOVES2010a**

FINAL



Table of Contents

1	Introduction and Background	1
2	USEPA Requirements.....	2
2.1	Maintenance Plan Demonstration and New Motor Vehicle Emissions Budgets	4
2.2	Non-Mobile Inventory Review	5
2.2.1	Nonroad Sector Emissions.....	5
2.2.2	Point Source Sector Emissions	6
2.2.3	Area Sector Emissions	7
2.3	Safety Margins	7
3	Conclusion	8

List of Figures

Figure 1:	Fredericksburg Attainment/Maintenance Area	1
Figure 2:	MOBILE6.2 and MOVES2010a Comparison for Fredericksburg.....	2

List of Tables

Table 1:	2010 Fredericksburg Ozone Design Value.....	3
Table 2:	NO _x Motor Vehicle Emissions Budgets Calculated with MOVES2010a.....	4
Table 3:	Fredericksburg Area NO _x emissions from 2004 to 2015	4
Table 4:	NO _x Nonroad Emissions - NONROAD Model Comparisons	6
Table 5:	2009 NO _x Point Source Emissions, Actual versus Estimated.....	6
Table 6:	Socioeconomic Data Comparison for the Fredericksburg Area	7

1 Introduction and Background

On July 18, 1997, the United States Environmental Protection Agency (USEPA) promulgated the 1997 8-hour National Ambient Air Quality Standards (NAAQS) for ozone. This regulation set the primary and secondary ozone standards equal to 0.08 parts per million (ppm) over an 8-hour average, which was a significantly more stringent standard than the prior 1991 ozone NAAQS. The 1997 standard was published in a numerical format to the hundredths, with two decimal places following the decimal point. Therefore, the effective value of the standard was 0.084 ppm based on USEPA guidance and monitoring equipment tolerance levels. USEPA published the listing of nonattainment areas for the 1997 standard on April 30, 2004 (69 FR 23858), and this listing included the Fredericksburg area as a nonattainment area. The Fredericksburg area consists of the counties of Spotsylvania and Stafford as well as the city of Fredericksburg.

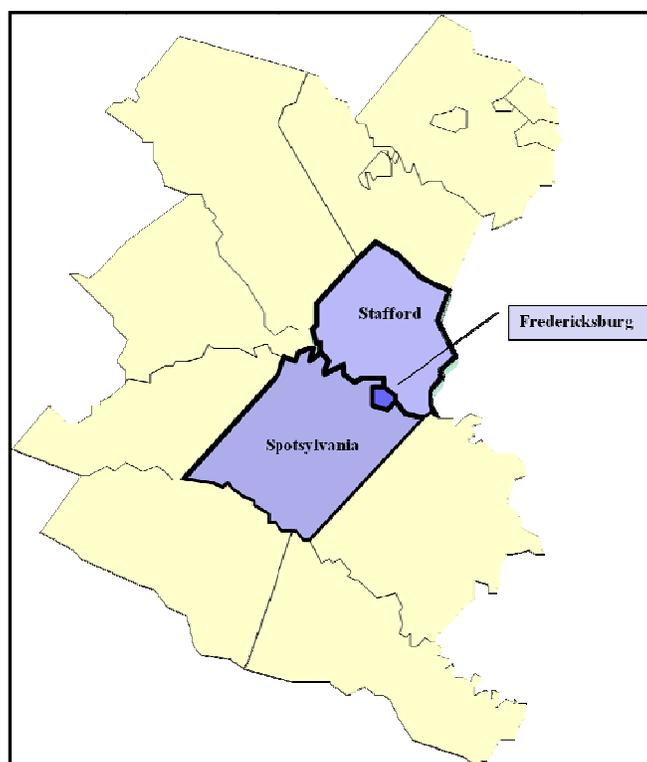


Figure 1: Fredericksburg Attainment/Maintenance Area

Subsequent to the designation of nonattainment, improvement in air quality allowed the region to request redesignation to attainment in 2005. The area developed a maintenance plan in conjunction with the redesignation request to ensure good air quality through 2015. This document was entitled, “Maintenance Plan for the City of Fredericksburg, Spotsylvania County and Stafford County 8-hour Ozone Nonattainment Area” and is hereafter referred to as the 1997 ozone NAAQS Fredericksburg maintenance plan. The 1997 ozone NAAQS Fredericksburg maintenance plan and redesignation request were submitted to USEPA in May of 2005. The 1997 ozone NAAQS Fredericksburg maintenance plan was approved into Virginia’s state

implementation plan (SIP) on December 23, 2005 (70 FR 76165). At that time, USEPA also approved the motor vehicle emissions budgets for volatile organic compounds (VOC) and nitrogen oxides (NO_x) contained in the document. These budgets were created using the motor vehicle emission factor model approved by USEPA at the time, MOBILE6.2. However, on March 2, 2010, USEPA officially released MOVES2010. This model is now required to be used for all SIP submittals. EPA provided a two-year conformity grace period for the use of this model through March 2, 2012 (75 FR 9411). Therefore, any transportation conformity analysis

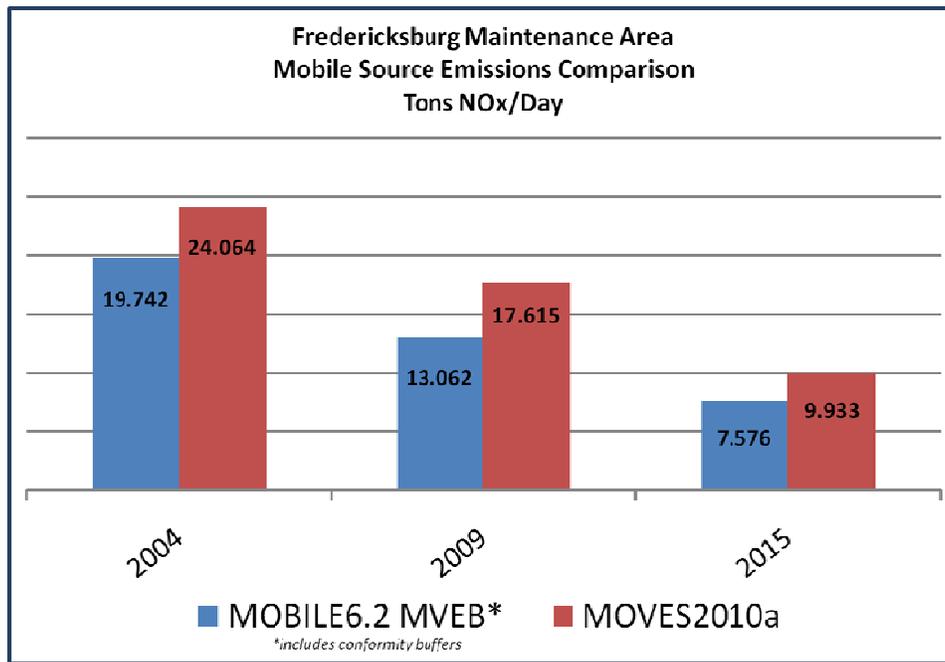


Figure 2: MOBILE6.2 and MOVES2010a Comparison for Fredericksburg

begun after March 2, 2012 must be developed using the most recent version of MOVES2010, which is currently MOVES2010a. Figure 2 compares the NO_x motor vehicle emissions budgets developed using MOBILE6.2 to the inventories developed using MOVES2010a.

To help ensure that the Fredericksburg region can demonstrate transportation conformity using MOVES2010a once the 2-year conformity grace period expires, the NO_x motor vehicle emissions budgets will need to be updated using MOVES2010a. The purpose of this revision to Virginia’s state implementation plan for the Fredericksburg area is to revise the 2009 and 2015 motor vehicle emissions budgets for NO_x using MOVES2010a.

2 USEPA Requirements

In maintenance area planning, Virginia relies on the September 4, 1992 USEPA guidance memorandum from John Calcagni entitled, “Procedures for Processing Requests to Redesignate Areas to Attainment.” Based on this guidance, Virginia developed an attainment emissions inventory for NO_x, VOC, and carbon monoxide (CO) to identify the level of emissions sufficient to achieve the NAAQS. This inventory was consistent with USEPA’s most recent requirements for nonattainment area emission inventories and included emissions during the time period

associated with the monitored data showing attainment of the 1997 ozone NAAQS, which in this case was 2004. The inventory was based on “typical summer weekday” emissions of VOC, NO_x, and CO. As a result of the 1992 USEPA guidance, Virginia developed a 2004 attainment year emissions inventory that identified the level of emissions sufficient to achieve the 1997 ozone NAAQS. It should be noted that this inventory development process examined emissions within the Fredericksburg area. It did not, however, address emission reductions of transported emissions to the area, which have a large impact on air quality in the Fredericksburg area.

As required by the 1992 USEPA guidance, Virginia demonstrated maintenance of the 1997 ozone NAAQS by showing that future emissions of NO_x, VOC, and CO from the Fredericksburg area would not exceed the level of the 2004 attainment inventory for a period of 10 years following the redesignation. The projected inventory considered future growth and was consistent with the attainment inventory. Additionally, Virginia provided a significant level of detail on all data inputs and assumptions to assure that the demonstration was consistent with USEPA requirements.

The most recent monitoring data for the Fredericksburg region continues to demonstrate compliance with the 1997 ozone NAAQS, as shown in Table 1.

Table 1: 2010 Fredericksburg Ozone Design Value

Monitor	2008	2009	2010	3-year average
Stafford County 51-179-0001	69 ppb	64 ppb	78 ppb	70 ppb

The USEPA’s Office of Transportation and Air Quality (OTAQ) provided guidance in December of 2009 entitled, “Policy Guidance on the Use of MOVES2010 for State Implementation Plan Development, Transportation Conformity, and Other Purposes.” This document contains numerous requirements for SIP revisions, including the following:

- Demonstration that the 1997 ozone NAAQS Fredericksburg maintenance plan submitted in May of 2005 continues to meet applicable requirements with the new level of motor vehicle emissions inventories as calculated by MOVES2010a and recalculation of the attainment year, interim year, and out year motor vehicle emissions budgets with the latest planning assumptions, including documentation of the updated assumptions;
- Review of the point, area, and nonroad emissions inventories for the interim year and out year to determine if growth and control strategy assumptions have changed and if so, an analysis to determine if these changes affect the conclusion of the 2005 maintenance plan that air quality will remain compliant with the 1997 NAAQS for ozone; and
- Assessment to confirm excess emissions exist and the quantification of these excess emissions for use in the safety margin applied to the motor vehicle emissions budgets.

The following paragraphs provide more information on each of these requirements and Virginia’s approach to each analysis.

2.1 Maintenance Plan Demonstration and New Motor Vehicle Emissions Budgets

Table 2 presents the updated 2004, 2009, and 2015 NO_x motor vehicle emissions budgets calculated using the latest planning assumptions for the Fredericksburg area and MOVES2010a. Assumptions used in the MOVES2010a modeling, including growth assumptions, are provided in the Technical Support Document. Since existing VOC motor vehicle emission budgets based on MOBILE6.2 will allow a seamless transportation conformity process when using MOVES2010a, the existing VOC motor vehicle emission budgets are not being revised.

Table 2: NO_x Motor Vehicle Emissions Budgets Calculated with MOVES2010a

Year	NO _x Emissions tons/day
2004 Attainment year	24.064
2009 Predicted Emissions	17.615
Conformity Buffers	2.000
2009 Interim Budget Year	19.615
2015 Predicted Emissions	9.933
Conformity Buffers	3.000
2015 Final Budget	12.933

Table 3 demonstrates how future emissions of NO_x will not exceed the level of Virginia's attainment inventory for a 10-year period following redesignation. The projected emissions for the point and area source categories reflect the expected ozone season daily emissions based on the best available growth rates and projections used in the 1997 ozone NAAQS Fredericksburg maintenance plan. The nonroad category reflects emissions estimated using EPA's latest approved nonroad model, NONROAD2008a. The paragraphs below, as well as the Technical Support Document, provide analyses showing that the projected emissions from the point and area source categories do not need to be updated and continue to demonstrate that air quality will remain compliant with the 1997 ozone NAAQS through 2015 and beyond.

Table 3: Fredericksburg Area NO_x emissions from 2004 to 2015

Year	NO _x in tons/day				
	Point	Area ¹	Nonroad	Mobile ²	Total
Year 2004	0.179	3.465	4.950	24.064	32.658
Year 2009	0.180	3.926	4.286	19.615	28.007
Δ 2004-2009	0.001	0.461	-0.664	-4.449	-4.651
Year 2015	0.182	4.742	2.953	12.933	20.810
Δ 2004-2015	0.003	1.277	-1.997	-11.131	-11.848

¹Includes selected local controls (open burning)

²Includes conformity buffers identified in Table 2

2.2 Non-Mobile Inventory Review

The 2009 OTAQ guidance requires documentation that the growth and control strategy assumptions for non-motor vehicle emissions sources continue to be valid and that any minor updates to the NO_x emissions inventory do not change the overall conclusion of the 1997 ozone NAAQS Fredericksburg maintenance plan. The overall conclusion of this plan is that the area will continue to demonstrate compliance with the 1997 ozone NAAQS due to the fact that the interim and out year NO_x emissions inventories are less than the 2004 attainment year NO_x inventory. The 2009 OTAQ guidance also points out that non-motor vehicle emissions inventory categories do not necessarily need revision to account for changes that reduce the emissions in a future year relative to the existing SIP.

Growth and control strategy assumptions for the area and point source emissions inventories have changed since the development of the 1997 ozone NAAQS Fredericksburg maintenance plan. However, the changes made to these assumptions have generally decreased future year estimates of emissions. Certain growth assumptions used in that time frame have been shown to be too aggressive. More control programs have been implemented, both on a federal and a state level, which also reduce emissions. The paragraphs below provide an overview of the area and point source sectors and discuss the rationale for not revising the interim and out year NO_x emissions inventories for these sectors. Also provided below is information summarizing the 2004, 2009, and 2015 results of the NONROAD2008a model for the nonroad sector. More detailed information on each sector can be found in the Technical Support Document.

2.2.1 Nonroad Sector Emissions

The nonroad emissions category includes a diverse collection of engines, equipment, vehicles, and vessels. These include outdoor power equipment, recreational vehicles, farm and construction machinery, lawn and garden equipment, marine vessels, locomotives, and many other applications. In the 1997 ozone NAAQS Fredericksburg maintenance plan, USEPA's draft NONROAD2004 model was used to determine the NO_x emissions from this category of equipment. Since that time, USEPA has twice significantly updated the nonroad emissions estimation tool, once in 2005 and again in 2008. NONROAD2008a is now the latest version of this model. Most of the changes between these versions allow the model to account for emission reductions associated with a variety of new rules that affect equipment in this sector, such as:

- The November 2002 final rule (67 FR 68242) on recreation vehicles, non road large spark ignition equipment, and diesel recreational marine engines over 50 hp (only the exhaust benefits were covered in draft NONROAD2004);
- Diesel recreational marine standards in the 2008 final rule on locomotive and marine engines (73 FR 25098); and
- The October 2008 small spark ignition and spark ignition recreational marine final rule (73 FR 59034).

However, some changes have increased overall NO_x emissions from this sector for certain counties, as shown in Table 4 below. For each year analyzed, the total NO_x emissions calculated by the NONROAD2008a model are higher than those estimated by the

NONROAD2004 model, although the NONROAD2008a model provides for a greater reduction in NO_x emissions between the attainment year and the interim/out years. The results of both models demonstrate a downward trend in the nonroad sector’s NO_x emissions, which supports the conclusion that the area will continue to experience good air quality into the future.

Table 4: NO_x Nonroad Emissions - NONROAD Model Comparisons

Inventory Year	2004		2009		2015	
NONROAD Model Version	2008a	2004	2008a	2004	2008a	2004
Fredericksburg	0.156	0.169	0.119	0.121	0.073	0.081
Spotsylvania	2.359	2.149	2.033	1.850	1.400	1.308
Stafford	2.435	1.283	2.134	1.109	1.480	0.806
Total NO_x	4.950	3.601	4.286	3.080	2.953	2.195

Data supplied in units of ozone season tons per day of NO_x.

2.2.2 Point Source Sector Emissions

The point source sector includes emissions from larger commercial, institutional, and industrial facilities, such as chemical manufacturing facilities, large waste disposal sites, and large heating and electrical generation units (EGUs). The point source sector emissions estimates for 2009 and 2015 were created using growth factors calculated by the Economic Growth Analysis System (EGAS), USEPA’s recommended growth factor model at the time of the 1997 ozone NAAQS Fredericksburg maintenance plan’s development. However, EGAS factors have been determined to be too aggressive when compared against actual data. The draft Transport Rule documentation notes that an assumption of no growth from 2005 was used for both 2012 and 2014 estimates for many source sectors based on an examination of historical emissions and economic data (“TSD for the Transport Rule,” EPA-OAR, 2010). Also, the Fredericksburg area is dominated by non-point source emissions sectors so that the point source emissions sector is quite small.

To corroborate the assumption that NO_x point source emissions for 2009 were overestimated, the 2009 actual NO_x point source emissions for Fredericksburg in tons per ozone season day are provided below in Table 5 to allow comparison between the actual 2009 data and the estimated 2009 data. The data show that the NO_x emissions from the point source category

Table 5: 2009 NO_x Point Source Emissions, Actual versus Estimated

2009 Data	NO _x tons/day
Estimated	0.180
Actual	0.099

were overestimated in 2009 by the 1997 ozone NAAQS Fredericksburg maintenance plan. Due to the conservative nature of the 2009 NO_x estimates within the 1997 ozone NAAQS Fredericksburg maintenance plan and the small amounts of emissions associated with the point source sector in this area, recalculation of the 2009 and 2015 emissions estimates from the Fredericksburg area would not change the conclusions of the 1997 ozone NAAQS

Fredericksburg maintenance plan. More detailed 2009 actual point source information may be found in the Technical Support Document.

2.2.3 Area Sector Emissions

The area sector includes emissions from such source categories as surface coating; commercial and consumer solvent usage; residential heating and residential solvent usage; and other sources that generally have small emissions but a large population of emitters. The 1997 ozone NAAQS Fredericksburg maintenance plan relied upon several categories of socioeconomic data to calculate emissions: population, housing by dwelling units, industrial employment, and total employment. Table 6 shows the data for 2009 and 2015 used in the 1997 ozone NAAQS Fredericksburg maintenance plan as compared to the most recent information obtained from the George Washington Regional Commission’s 2035 Constrained Long-Range Transportation Plan.

Table 6: Socioeconomic Data Comparison for the Fredericksburg Area

Metric	Maintenance Plan Estimate (2005)	Transportation Plan Estimate (2008)
2009 Population	241,872	270,603
2015 Population	282,112	334,785
2009 Dwelling Units	87,191	100,351
2015 Dwelling Units	103,435	119,900
2009 Industrial Employment	22,664	8,257
2015 Industrial Employment	27,756	8,329
2009 Total Employment	93,926	90,849
2015 Total Employment	122,861	123,410

**Data from George Washington Regional Commission’s 2035 Constrained Long-Range Transportation Plan*

Population and dwelling unit numbers were underestimated in the 1997 ozone NAAQS Fredericksburg maintenance plan when compared to the latest estimates used in the 2035 transportation plan for the area. However, the reverse is true for employment data. Population data are used for many of the VOC categories in the area source sector while industrial employment data are important to the NO_x emissions in the area source sector. Based on this information, NO_x emissions are expected to be overestimated in the 2009 and 2015 inventories created for the 1997 ozone NAAQS Fredericksburg maintenance plan as compared to inventories calculated using the most recent planning assumptions. Therefore, no updates to the area source sector NO_x emissions estimates are necessary, and the estimates continue to support the conclusion of the 1997 ozone NAAQS Fredericksburg maintenance plan. More information may be found in the Technical Support Document for the area source emissions sector.

2.3 Safety Margins

The updated NO_x motor vehicle emission budgets provided in Table 2 will help ensure that the Fredericksburg region can demonstrate transportation conformity with MOVES2010a once the two-year conformity grace period expires. As the update from MOBILE6.2 to MOVES2010a has shown, changes to the models and other assessment methodologies used in transportation conformity determinations can result in significantly higher future year emissions

estimates. Therefore, it is prudent to provide adequate safety margins to help ensure that any future planning assumption updates will not negatively impact the region's ability to demonstrate transportation conformity. Adequate safety margins will also guard against the need for future SIP submittal updates, where the purpose of the SIP submittal is only to update numbers and not to realize any actual emissions reductions to the atmosphere.

Safety margins are especially important at this point in time since many of Virginia's metropolitan planning organizations are in the process of updating their travel demand models and preparing updated socio-economic data based in part on 2010 Census data. Each region will also be using updated registration and other traffic data required by MOVES2010a within the next year. Additionally, several changes to the conformity regulation in 40 CFR Part 91 have recently been proposed, providing more uncertainty to the transportation conformity process.

To help ensure that the transportation conformity process is not needlessly delayed, a two ton/day safety margin has been applied to the NO_x motor vehicle emissions budgets in 2009 and a three ton/day safety margin has been applied to the NO_x motor vehicle emissions budget in 2015. The paragraphs above demonstrate qualitatively that the estimated 2009 and 2015 area and point source emissions inventories for the Fredericksburg area that were included in the 1997 ozone NAAQS Fredericksburg maintenance plan are conservative in nature. That is, all indications are that the 2009 and 2015 estimates made for area and point source sectors in the 1997 ozone NAAQS Fredericksburg maintenance plan should be higher than any current quantification made for those same years. Due to changes in EPA's approved nonroad model, the nonroad inventory for the area has been recalculated using the latest planning assumptions. Table 3 shows quantitatively that these safety margins will continue to allow the area to remain well below the 2004 attainment year emissions inventory cap, thereby ensuring that future air quality will continue to meet the 1997 ozone NAAQS.

3 Conclusion

The tables above, and the information in the Technical Support Document, show that the conclusion of the 1997 ozone NAAQS Fredericksburg maintenance plan continues to be valid: air quality in the area will continue to maintain compliance with the 1997 ozone NAAQS. Updating the NO_x motor vehicle emissions budgets using MOVES2010a will not negatively affect this area's ability to comply with this standard. Indeed, air quality and emissions data trends show that the area's air quality is compliant with the 1997 ozone NAAQS, has improved so that monitored values are well below that standard, and should continue to improve into the future.