Environment

Submitted for:
Virginia Electric and Power Company
Warren County, Virginia

Submitted by:
AECOM
Raleigh, North Carolina
60136907
Mitsubishi-
Revision 2 - April 2010

Air Permit Application – Volume II

Warren County Combined-Cycle Project
Warren County, Virginia

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Prepared By Joshua Ralph

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Contents

List of Appendices

List of Tables

List of Figures

6.0 PSD Class II Modeling Procedures – Significant Impact Level Analysis

The dispersion modeling analyses conducted for this project adheres to the EPA "Guideline on Air Quality Models" (GAQM), revised July 2003, and direction received from the VA DEQ Modeling Section. A dispersion modeling protocol delineating all the procedures to be followed was electronically submitted to VA DEQ on January 7, 2010 and was accepted by VA DEQ on March 23, 2010. The following sections present the source data modeled, the procedures for assessing ambient air impacts from the plant's emissions and the standards to which the predicted impacts were compared. Many of the modeling procedures are identical for both PSD Class I and II areas due to the proximity of the Shenandoah National Park to the Project site.

6.1 Background Discussion

The proposed project is a major source with regards to PSD. Per VA DEQ guidance, an air dispersion modeling analysis was required for PM_{10}, $PM_{2.5}$, NO_2 and CO. Modeling analyses performed were evaluated for compliance with applicable PSD increments for these pollutants. In addition, compliance with the National Ambient Air Quality Standards (NAAQS) and 9 VAC 5-60-300 was also evaluated.

Based on the current project design, the natural gas-fired combustion turbines are the primary source of pollutant emissions for the proposed project. Much smaller quantities of criteria pollutants are emitted from the inlet turbine chiller, auxiliary boiler, diesel-fired emergency generator, diesel-fired fire water pump and fuel gas heater. Air dispersion modeling was performed for the combustion turbines, inlet turbine chiller, auxiliary boiler, diesel-fired emergency generator, diesel-fired fire water pump and fuel gas heater.

As will be discussed in the following sections of this document, the dispersion modeling for this project was conducted in a manner that utilized the worst-case operating conditions associated with the ambient temperature range in an effort to predict the highest impact for each averaging period. Maximum predicted impacts from the worst case scenarios were compared to the Significant Impact Levels (SILs), as presented in Table 6-1. For those pollutants which have maximum predicted impacts below the applicable SIL, no additional analyses are necessary since, by definition, the plant would not cause or contribute to a NAAQS violation or an exceedance of a PSD increment for that pollutant.

Table 6-1 Criteria Pollutant Significant Impact Levels for PSD Class II Areas

Pollutant	Averaging Time				
	Annual ($\mu g/m^3$)	24-hour ($\mu g/m^3$)	8-hour ($\mu g/m^3$)	3-hour ($\mu g/m^3$)	1-hour ($\mu g/m^3$)
NO_2	1	-	-	-	-
CO	-	-	500	-	2,000
PM_{10}	1	5	-	-	-
Source: 9 VAC 5-80-1715 B.1					

6.2 Source Data

6.2.1 Normal Operations

The air dispersion modeling analysis was conducted with emission rates and flue gas exhaust characteristics (flow rate and temperature) that are expected to represent the worst-case parameters among the range of possible values for the Mitsubishi M501 GAC turbines considered for the proposed project. Since turbine emission rates and flue gas characteristics for a given turbine load vary as a function of ambient temperature, data was derived for the following ambient temperatures and load scenarios for the proposed project:

<u>Mitsubishi M501 GAC Combined-Cycle Combustion Turbines – Natural Gas Operations</u>

- 4 operating loads (100% w/ Duct Firing, 100%, 75%, 60%)
- 3 ambient temperatures (100°F, 59°F, 0°F)

A summary of the combined-cycle exhaust data and emission rates for the PSD-regulated pollutants for each ambient temperature and operating load during natural gas combustion is provided in Table 6-2. The proposed Mitsubishi M501 turbines are rated at a maximum capacity of 3,496 MMBtu/hr at 0°F (2,996 MMBtu/hr rating for just the combustion turbines and 500 MMBtu/hr rating for the duct burners).

Based on current project design parameters, Dominion intends to apply for a permit that will allow unrestricted annual operation (8,760 hours per year) of each combined-cycle combustion turbine.

In order to conservatively calculate ground-level concentrations, a composite “worst-case” set of emission parameters was used in the modeling. For each combined-cycle operating load, the highest pollutant-specific emission rate coupled with the lowest exhaust temperature and exhaust flow rate was selected. Table 6-3 summarizes the worst-case emission parameters for the Mitsubishi M501 GAC combined-cycle operating loads firing natural gas.

Table 6-4 provides the stack parameters and criteria pollutant emission rates for the inlet turbine chillers, auxiliary boiler, and the fuel gas heater. Since the performance data for the auxiliary equipment are not affected by ambient conditions, only one set of parameters was modeled (e.g., stack parameters and emission rates associated with 100% load). The inlet turbine chillers, auxiliary boiler and the fuel gas heater are expected to operate 8,760 hours per year.

Table 6-2 Source Parameters and Criteria Pollutant Emission Rates[1] Natural Gas-Fired Mitsubishi M501 GAC Combined-Cycle Combustion Turbine Operation

Scenario[2]	Heat Input (MMBtu/hr)	Stack Height (ft)	Stack Dia. (ft)	Exit Temp. (°F)	Exit Velocity (fps)	Maximum Hourly Emissions (lb/hr)[3]				
						NO_X	CO	PM_{10}	$PM_{2.5}$	SO_2
100% load with Duct Firing @ 0°F	***3,496***	175.0	22.0	195.80	70.44	***25.32***	***17.41***	***21.16***	***21.16***	(4)
100% load with Duct Firing @ 59°F	3,108	175.0	22.0	***191.20***	62.73	22.51	16.12	19.09	19.09	(4)
100% load with Duct Firing and Inlet Chiller @ 59°F	3,170	175.0	22.0	192.30	63.96	22.96	16.33	19.42	19.42	(4)
100% load with Duct Firing @ 100°F	2,841	175.0	22.0	195.30	***57.83***	20.57	15.24	17.66	17.66	(4)
100% load with Duct Firing and Inlet Chiller @ 100°F	3,170	175.0	22.0	199.30	64.65	22.96	16.33	19.42	19.42	(4)
100% load @ 0°F	***2,996***	175.0	22.0	202.10	70.64	***21.70***	***9.91***	***15.51***	***15.51***	(4)
100% load @ 59°F	2,608	175.0	22.0	***197.70***	62.89	18.89	8.62	13.51	13.51	(4)
100% load with Inlet Chiller @ 59°F	2,670	175.0	22.0	198.40	64.09	19.34	8.83	13.83	13.83	(4)
100% load @ 100°F	2,341	175.0	22.0	199.60	***57.74***	16.95	7.74	12.12	12.12	(4)
100% load with Inlet Chiller @ 100°F	2,670	175.0	22.0	205.10	64.74	19.34	8.83	13.83	13.83	(4)
75% load @ 0°F	***2,302***	175.0	22.0	194.60	56.78	***16.67***	***7.61***	***11.92***	***11.92***	(4)
75% load @ 59°F	2,052	175.0	22.0	***191.50***	52.08	14.86	6.78	10.63	10.63	(4)
75% load @ 100°F	1,874	175.0	22.0	192.90	***48.32***	13.57	6.20	9.70	9.70	(4)
60% load @ 0°F	***1,966***	175.0	22.0	187.20	47.01	***14.24***	***6.50***	***10.18***	***10.18***	(4)
60% load @ 59°F	1,770	175.0	22.0	***185.00***	43.60	12.82	5.85	9.17	9.17	(4)
60% load @ 100°F	1,627	175.0	22.0	185.70	***41.16***	11.78	5.38	8.43	8.43	(4)

(1) Data provided by Dominion.
(2) Data presented are for four operating loads/conditions at three ambient temperatures
(3) Hourly emissions reflect operation of a Mitsubishi M501GAC combined-cycle combustion turbine firing pipeline natural gas only.
(4) Emission estimates indicate that SO_2 will not be subject to PSD review. Therefore, an SO_2 modeling analysis was not performed.

Table 6-3 Worst Case Data for Proposed Natural Gas-Fired Mitsubishi M501 GAC Combined-Cycle Combustion Turbine Operation

		Value[(1)]			
Load (%)		**100 w/ Duct Firing**	**100**	**75**	**60**
Stack Height (ft)		175.0	175.0	175.0	175.0
Stack Diameter (ft)		22.0	22.0	22.0	22.0
Exit Temperature (°F)		191.20	197.70	191.50	185.00
Exit Velocity (ft/sec)		57.83	57.74	48.32	41.16
Heat Input (MMBtu/hr)		3,496	2,996	2,302	1,966
Pollutant Emissions Per Combustion Turbine(lb/hr)	**SO_2**	(2)	(2)	(2)	(2)
	PM_{10} 24 hour	21.16	15.51	11.92	10.18
	PM_{10} Annual[(3)]	19.38	19.38	19.38	19.38
	$PM_{2.5}$ 24 Hour	21.16	15.51	11.92	10.18
	$PM_{2.5}$ Annual[(3)]	19.38	19.38	19.38	19.38
	NO_X Annual[(3)]	24.18	24.18	24.18	24.18
	CO	17.41	9.91	7.61	6.50

(1) The values in the table represent the worst-case stack parameters and the emission rates for the four operating loads taken from the Table 3-6 (bold and italicized)

(2) Emission estimates indicate that SO_2 was not subject to PSD review. Therefore, an SO_2 modeling analysis was not performed.

(3) Annual emissions based on the worst case emissions across all normal operations or normal operating plus SUSD. The following worst case annual emissions will be annualized and modeled across all operating loads:

- PM_{10} – 84.89 tpy / 8760*2000 = 19.38 lb/hr
- NO_x – 105.90 tpy / 8760*2000 = 24.18 lb/hr

Table 6-4 Source Parameters and Criteria Pollutant Emission Rates[1] For the Auxiliary Equipment

Source ID	Stack Height (ft)	Stack Diameter (ft)	Exit Temp. (°F)	Exit Velocity (fps)	Hourly Emissions (lb/hr)				
					NO_X	CO	PM_{10}	$PM_{2.5}$	SO_2
Inlet turbine chiller1[2]									
CHLR1	42.88	12.00	70.00	24.50	--	--	5.99E-03	1.84E-05	--
Inlet turbine chiller2[2]									
CHLR2	42.88	12.00	70.00	24.50	--	--	5.99E-03	1.84E-05	--
Inlet Turbine chiller3[2]									
CHLR3	42.88	12.00	70.00	24.50	--	--	5.99E-03	1.84E-05	--
Auxiliary Boiler									
AUX_BLR	115.00	3.00	300.00	61.00	0.97	3.26	0.44	0.44	[3]
Fuel Gas Heater									
FGH	45.00	3.33	300.00	32.00	0.57	1.92	0.39	0.39	[3]

(1) Data provided by Dominion.

(2) The hourly emissions represent the emissions from a single cell of the 6-cell inlet turbine chiller.

(3) Emission estimates indicate that SO_2 was not subject to PSD review. Therefore, an SO_2 modeling analysis was not performed.

The emergency diesel generator and fire-water pump engine are expected to operate one (1) hour per week per unit and 52 hours per year per unit under non-emergency conditions (operability testing). Therefore, for modeling associated with these units, the modeled emission rates were annualized based on the 52 hours per year. The short- term emission rates were also normalized based on 1 hour per week, but this hour was conservatively modeled such that it can be any hour of the year. Table 6-5 provides the stack parameters and criteria pollutant emission rates for the emergency generator and the fire water pump. Please note that the project will accept a permit condition for each unit that limits non-emergency use to 52 hours per year and total use (non-emergency plus emergency) to 500 hours per year.

Table 6-5 Source Parameters and Criteria Pollutant Emission Rates[1] For the Emergency Equipment

Source ID	Stack Height (ft)	Stack Diameter (ft)	Exit Temp. (°F)	Exit Velocity (fps)	Hourly Emissions (lb/hr)[2]							
					NO_X	CO		PM_{10}		$PM_{2.5}$		SO_2
						1-hour	8-hour	24-hour	Annual	24-hour	Annual	
Diesel-Fired Emergency Generator												
DSL_GEN	20.00	1.23	987.00	135.00	0.14	12.62	1.58	0.06	0.0086	0.06	0.0086	(3)
Diesel-Fired Fire Water Pump Engine												
FWP	20.00	0.44	845.00	135.00	0.012	1.72	0.22	0.0083	0.0012	0.0083	0.0012	(3)

(1) Data provided by Dominion.

(2) Emissions rates were normalized based on the following equations:
Short-term Averaging Period – Emission Rate *(1/ Hours of Averaging Period)
Annual Averaging Period - Emission Rate * 52 hours per year / 8,760

(3) Emission estimates indicate that SO_2 was not subject to PSD review. Therefore, an SO_2 modeling analysis was not performed.

6.2.2 Startup/Shutdown Operations

For the modeling analysis, it has been assumed that the turbines will startup in sequence; therefore, no more than one turbine can startup at any one time. Short-term emissions resulting from start-up/shutdown operations for the proposed turbines are based on warm starts and cold starts. Each warm start is expected to last 101 minutes and each cold start is expected to last 252 minutes before the turbine is operating at minimum normal operation. To add a measure of conservatism to the emission calculations, it has been assumed that the turbines will reach their maximum potential emissions (100% load with duct burners) immediately after the startup (warm/cold).

Short-term emissions for the turbines were calculated based on the maximum of either startup/shutdown emissions or a mix of startup/shutdown and normal operation emissions (if the startup period is shorter than the total averaging period). For the averaging periods for which the duration of the startup is shorter than the averaging period, the remaining time (in the averaging period) for the turbines were assumed to be associated with worst-case load conditions (100% with duct burners). Table 6-6 presents a summary of the startup emissions for each of the short- term averaging periods for the proposed turbines.

As directed by VA DEQ, a startup modeling analysis was performed for all the criteria pollutants subject to PSD review. For averaging periods where the duration of the startup is shorter than the averaging period, a separate startup stack and normal operation stack was modeled. Table 6-7 presents the stack parameters that were used in the analysis for the short-term pollutants.

Table 6-6 Short-term Averaging Period Startup Summary[1]

	Offline min	Start min	Normal min	Total min	Start lb	Normal lb	Total lb
CO 1-hour							
Turbine 1	0	60	0	60	813.90	0	813.90
Turbine 2	60	0	0	60	0	0	0
Turbine 3	60	0	0	60	0	0	0
Startup Total							813.90
Normal Operation Total[2]							52.23
CO 8-hour							
Turbine 1	0	252	228	480	2205.30	66.16	2271.46
Turbine 2	252	101	127	480	804.20	36.85	841.05
Turbine 3	353	101	26	480	804.20	7.54	811.74
Startup Total							3924.25
Normal Operation Total[2]							417.84
PM_{10} 24-hour							
Turbine 1	0	252	1188	1440	23.30	418.97	442.27
Turbine 2	252	101	1087	1440	8.90	383.35	392.25
Turbine 3	353	101	986	1440	8.90	347.73	356.63
Startup Total							1191.15
Normal Operation Total[2]							1523.52
$PM_{2.5}$ 24-hour							
Turbine 1	0	252	1188	1440	23.30	418.97	442.27
Turbine 2	252	101	1087	1440	8.90	383.35	392.25
Turbine 3	353	101	986	1440	8.90	347.73	356.63
Startup Total							1191.15
Normal Operation Total[2]							1523.52
NO_X 24-hour[3]							
Turbine 1	0	252	1188	1440	115.10	501.34	616.44
Turbine 2	252	101	1087	1440	77.00	458.71	535.71
Turbine 3	353	101	986	1440	77.00	416.09	493.09
Startup Total							1645.24
Normal Operation Total[2]							1823.04
SO_2 24-hour[3]							
Turbine 1	0	252	1188	1440	1.28	19.40	20.68
Turbine 2	252	101	1087	1440	0.49	17.75	18.24
Turbine 3	353	101	986	1440	0.49	16.10	16.59
Startup Total							55.52
Normal Operation Total[2]							70.56

(1) Startup emissions presented are for the Mitsubishi M501GAC turbines.
(2) Normal operation emissions correspond to those for 100% load with duct burners
(3) NO_X 24-hour and SO_2 24-hour calculated for determining if additional Class I visibility modeling is needed for startup.

Table 6-7 Stack parameters and modeled emissions rates

Operating Mode	Exit Velocity (fps)	Exit Temp (^{0}F)	CO 1-hour (lb/hr)			CO 8–hour (lb/hr)			$PM_{10}/PM_{2.5}$ 24–hour (lb/hr)		
			Turbine 1	Turbine 2	Turbine 3	Turbine 1	Turbine 2	Turbine 3	Turbine 1	Turbine 2	Turbine 3
Startup											
Cold Start(1),(2)	37.92	185.00	813.90	NA	NA	275.66	NA	NA	0.97	NA	NA
Warm Start(1),(2)	37.93	185.00	NA	NA	NA	NA	100.53	100.53	NA	0.37	0.37
Normal Operation(3)	57.83	191.20	NA	NA	NA	8.27	4.61	0.94	17.46	15.97	14.49

(1) Average exhaust velocity during startup, provided by vendor and/or Dominion
(2) Lowest exit temperature for 60% load from performance data provided by vendor and/or Dominion
(3) Exit velocity and temperature for the 100% load with duct burner from performance data provided by vendor and/or Dominion

Annual emissions resulting from start-up/shutdown operations for the proposed turbines are based on 174 hot starts/year, 15 warm starts/year, and 6 cold starts/year. For each hot start, the turbines are assumed to be offline for at least 4 hours. For each warm start, the turbines are assumed to be offline for at least 40 hours, and for each cold start, the turbines are assumed to be offline for at least 72 hours. Under this operating scenario, it is estimated that the turbines will be offline for 1,728 hours/year.

Annual emissions for the proposed turbines were calculated based on the maximum of either 8,760 hr/year of continuous operation or a mix of continuous operation and the maximum number of startup/shutdown events. Table 6-8 provides a summary of the startup emissions for the annual averaging periods for the proposed Mitsubishi turbines.

Table 6-8 Annual Averaging Period Startup Summary

Operating Mode	hr/yr	NO_x		PM_{10}	
		lb/hr	tpy	lb/hr	tpy
Startup					
Offline	1,728	0.00	0	0.00	0
Without duct burning	811	21.70	8.8	15.51	6.3
With duct burning	6,000	25.32	76.0	21.16	63.5
Hot start	125	83.86	5.2	5.72	0.4
Warm start	25	45.74	0.6	5.29	0.1
Cold start	25	27.40	0.3	5.55	0.1
Shutdown	46	102.00	2.3	5.57	0.1
TOTALS	8,760		**93.2**		**70.4**

Normal Operation					
100% load					
Without duct burning	2,760	21.70	29.9	15.51	21.4
With duct burning	6,000	25.32	76.0	21.16	63.5
TOTALS	8,760		**105.9**		**84.9**
100% load w/o duct burners	8,760	21.70	**95.0**	15.51	**67.9**

The emissions from the startup/shutdown were annualized and conservatively modeled with an averaged stack exit velocity (averaged over all the possible startups and shutdown scenario) and lowest stack exit temperature from the 60% load. The worst-case emissions from the normal operations were annualized and conservatively modeled across all operating loads using the load specific exit velocity and exit temperature (see table 6-9).

Table 6-9 Stack parameters and modeled emissions rates for Annual Pollutants

Operating Mode	Exit Velocity (fps)	Exit Temp (^{0}F)	NO_X Annual (lb/hr)			$PM_{10}/PM_{2.5}$ Annual (lb/hr)		
			Turbine 1	Turbine 2	Turbine 3	Turbine 1	Turbine 2	Turbine 3
Startup(1),(2)	32.375	184.90	1.93	1.93	1.93	0.14	0.14	0.14
Normal Operation(3)								
100% with Duct Burner	57.83	191.20	19.35	19.35	19.35	15.93	15.93	15.93
100%	57.74	197.71	19.35	19.35	19.35	15.93	15.93	15.93
75%	48.32	191.50	19.35	19.35	19.35	15.93	15.93	15.93
60%	41.16	185.00	19.35	19.35	19.35	15.93	15.93	15.93

(1) Average exhaust velocity across all types of startups and shutdown, provided by the vendor and/or Dominion
(2) Lowest exit temperature for 60% load from performance data provided by vendor and/or Dominion
(3) Exit velocity and temperature from performance data provided by vendor and/or Dominion

6.3 AERMOD Model Applicability and Model Options

The United States Environmental Protection Agency (USEPA) adopted a final rule (Federal Register November 9, 2005) that replaced the Industrial Source Complex (ISC) model with AERMOD (AERMIC MODel) (USEPA 2004). The rule became effective on December 9, 2005, and the ISC model was phased out as of December 9, 2006.

Therefore, this modeling analysis utilized the AERMOD dispersion model to evaluate air quality impacts from the proposed project. The AERMOD model was developed by the AERMIC work group (the American Meteorological Society/EPA Regulatory Model Improvement Committee) and was intended to incorporate improved understanding of planetary boundary layer (PBL) meteorology into air dispersion calculations. The current version of AERMOD is 09292 and includes the Prime (Plume

Rise Model Enhancement) building downwash algorithms. The AERMOD modeling system consists of two preprocessors and the dispersion model. AERMET is the meteorological preprocessor component and AERMAP is the terrain pre-processor component that characterizes the terrain and generates receptor elevations along with critical hill heights for those receptors.

6.4 Good Engineering Practice Stack Height Analysis

A Good Engineering Practice (GEP) stack height analysis was performed based on the proposed project design to determine the potential for building-induced aerodynamic downwash for the proposed combustion turbine stacks. The analysis procedures described in EPA's Guidelines for Determination of Good Engineering Practice Stack Height (EPA, 1985), Stack Height Regulations (40 CFR 51), and current Model Clearinghouse guidance was used.

The GEP formula height is based on the observed phenomenon of disturbed atmospheric flow in the immediate vicinity of a structure resulting in higher ground level concentrations closer to the building than would otherwise occur. It identifies the minimum stack height at which significant aerodynamic downwash is avoided. The GEP formula stack height, as defined in the 1985 final regulations, is calculated from:

$H_{GEP} = H_{BLDG} + 1.5L$
Where:

- HGEP is the maximum GEP stack height
- HBLDG is the height of the nearby structure, and
- L is the lesser dimension (height or projected width) of the nearby structure

Both the height and width of the structure are determined from the frontal area of the structure projected onto a plane perpendicular to the direction of the wind. In all instances, the GEP stack height is based on the plane projections of any nearby building which result in the greatest justifiable height. For purposes of the GEP analysis, "nearby" refers to the "sphere of influence," defined as five times the height or width of the building, whichever is less, downwind from the trailing edge of the structure. In the case where a stack is not influenced by nearby structures, the maximum GEP stack height is defined as 65 meters.

The EPA's Building Profile Input Program (BPIP-Version 04274) version that is appropriate for use with PRIME algorithms in AERMOD was used to incorporate downwash effects in the model. The building dimensions of each structure were input in BPIPPRM program to determine direction specific building data. PRIME addresses the entire structure of the wake, from the cavity immediately downwind of the building, to the far wake. Figure 6-1 shows the buildings and source locations considered in the modeling analysis.

6.5 Receptor Grid and AERMAP Processing

The Class II grid consisted of receptors spaced 25 m apart along the fence line. A spacing of 50 m was used for the receptors beyond the fence line and extending out to 1 km from the fence line. Beyond 1 km from the fence line, a spacing of 100 m was used up to 2.5 km from the plant. Between 2.5 and 5 km, a spacing of 500 m was used. Between 5 and 10 km, a spacing of 1000 m was used. Beyond 10 km, a spacing of 2000 m was used. No receptors within the Shenandoah National Park were included in the Class II analysis. Receptors with 1000-m spacing were placed at the boundary of the Class I Area extending out to 20 km. The receptor grid used in the modeling analysis was based on NAD 83 datum and in zone 17. The extent of this grid was sufficient to capture maximum impacts in the Class II area analysis. Figures 6-2 and 6-3 show the far-field and near field Cartesian receptor grid respectively considered for the modeling analysis.

As mentioned in the protocol, the receptor grid was refined around the receptor with the maximum concentration, if it was outside the 50-meter spacing grid. This was done to ascertain that none of the receptors with impacts potentially exceeding the SILs were missed. The maximum impacts for CO 1-hour and 8-hour, NO_X annual and PM_{10} annual were found to be within the 50-meter spacing and therefore, no refined receptors were added to the Cartesian grid. A 2-km by 2-km grid with 50-meter spacing receptors centered on the receptor with maximum impact across all operating loads for each year was added to the above-mentioned discrete Cartesian grid for the PM_{10} 24-hour averaging period. Figure 6-4 shows the refined receptor grid considered for the PM_{10} 24-hour modeling analysis.

Receptor height scales at each receptor location (used in AERMOD) were developed by AERMAP (version 09040), the terrain preprocessor for AERMOD. AERMAP was run using the 1/3 arc second (~10 m resolution) National Elevation Data (NED) for the proposed project location which was downloaded from the United States Geological Services (USGS) website (http://seamless.usgs.gov/index.php). As per the AERMAP User's Guide (USEPA, 2004), the domain was sufficiently large enough to accommodate all the significant nodes such that all terrain features that exceed a 10% elevation slope from any given receptor were considered. Figure 6-5 shows the modeling domain to demonstrate this. The full report generated by AERMAP is provided in Appendix F and is included with the modeling files on the DVD.

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Figure 6-1 Source Locations and Main Building Structures Included in GEP-BPIP PRIME Analysis

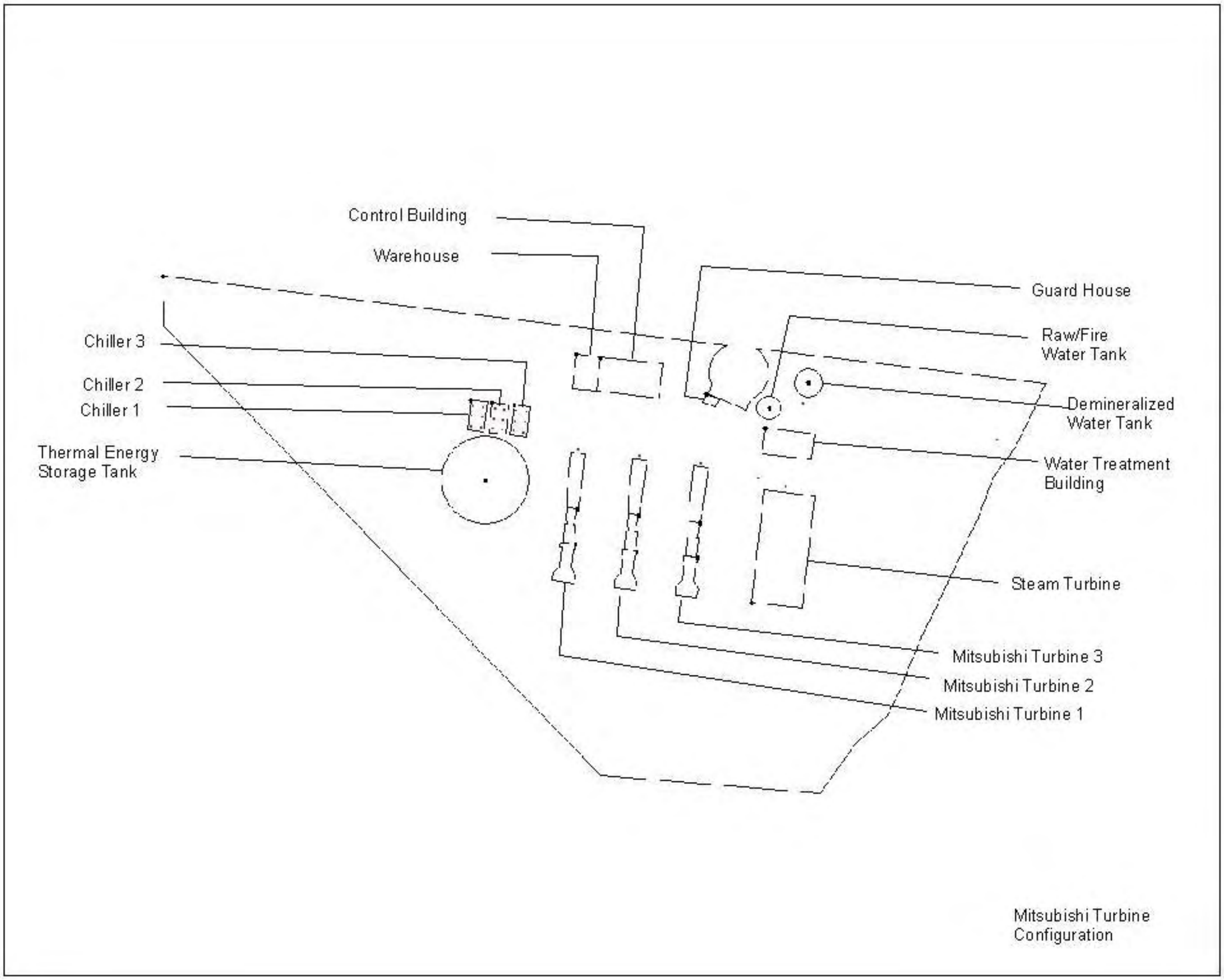


Figure 6-2 20-km Receptor Grid for SIL AERMOD Modeling Analysis

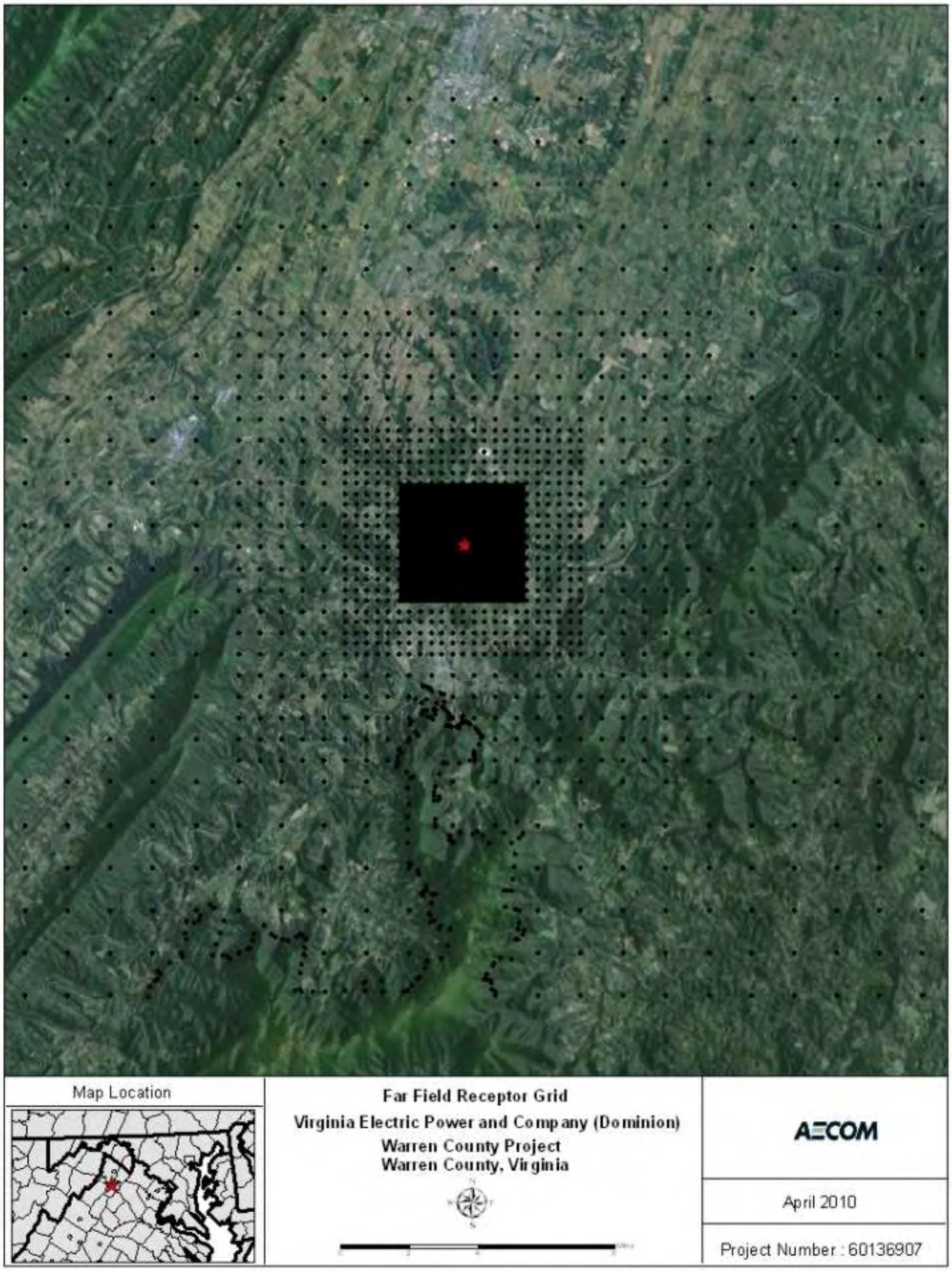


Figure 6-3 Near-Field Receptor Grid for SIL AERMOD Modeling Analysis

Figure 6-4 Refined Receptor Grid for PM_{10} 24-hour SIL AERMOD Modeling Analysis

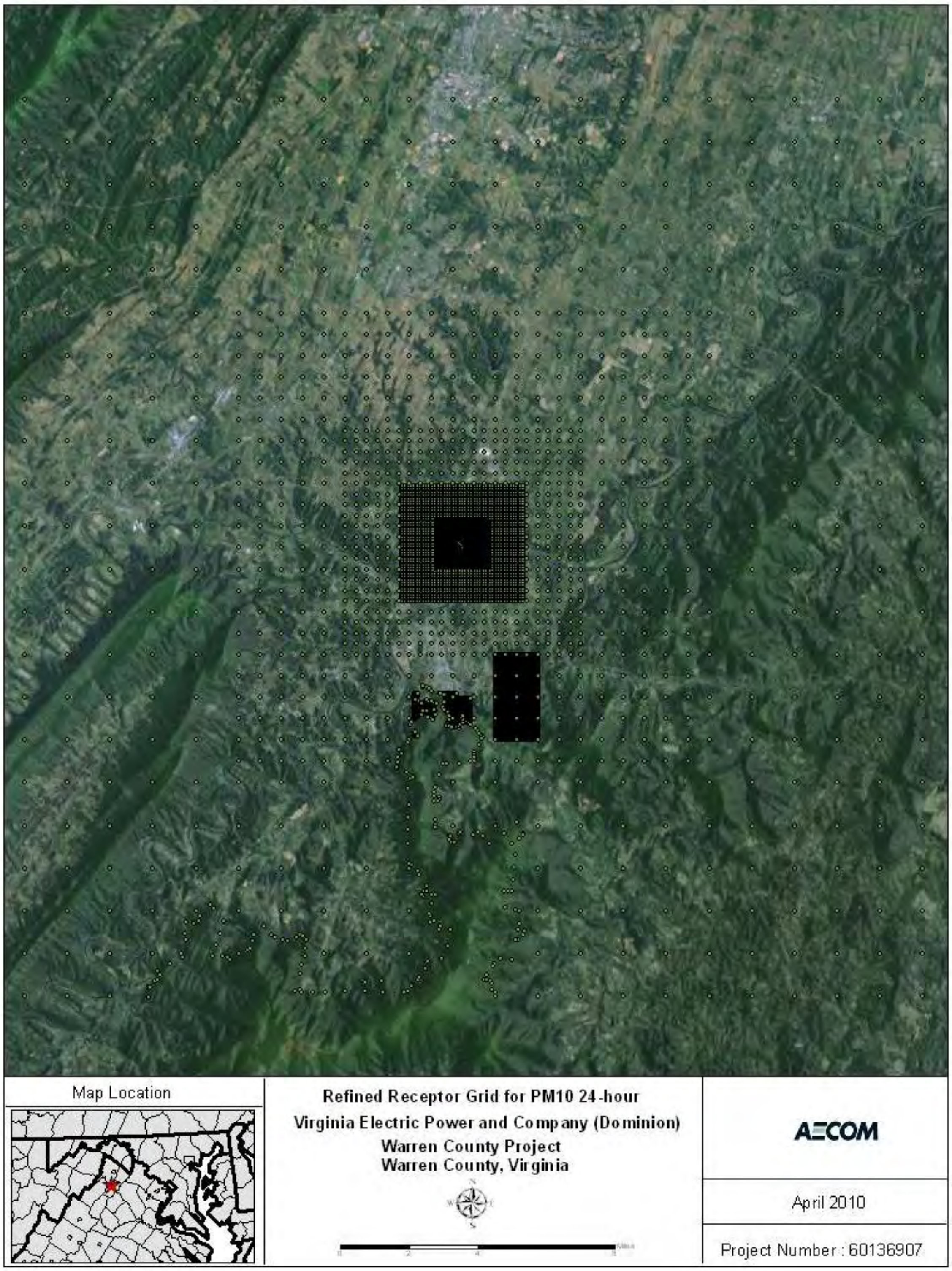
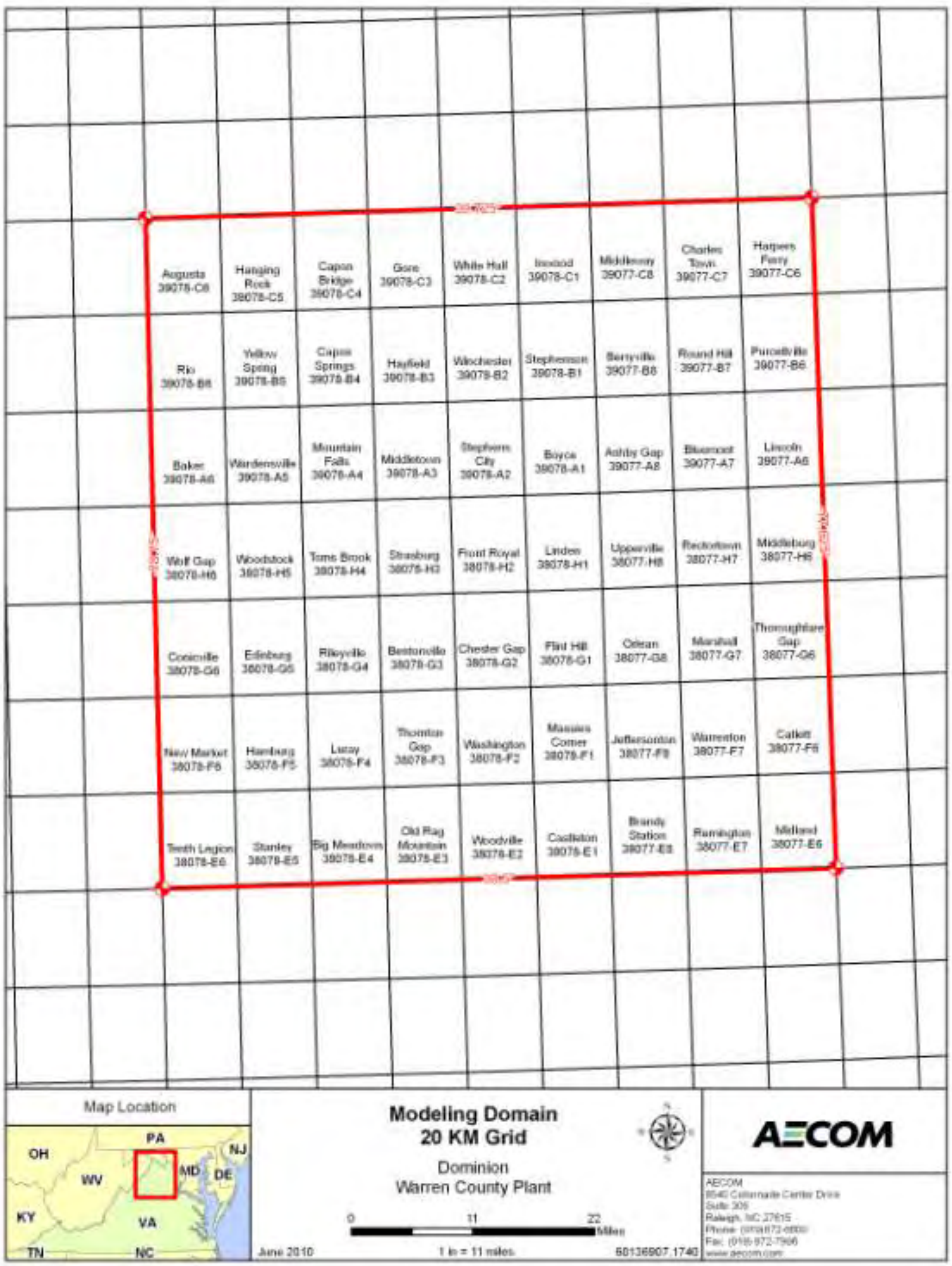


Figure 6-5 Modeling Domain Used in the Class II Modeling Analysis



6.6 Meteorological Data Processing

For the previous permitting of the Project at this same site, VA DEQ and the National Park Service (NPS) agreed to the use of five years of National Weather Service (NWS) data from Dulles International Airport. For this project, we retained the use of the same database. Detailed justification of the database has been provided in the modeling protocol. Figure 6-6 shows the locations of the Project relative to the airport location. Both sites are located in relatively flat areas, with the overall orientation of distant terrain features consistent from southwest to northeast.

Five years of hourly surface meteorological data were processed with AERMET, the meteorological preprocessor for AERMOD. The meteorological data required for input to AERMOD was created with the latest version of AERMET (06341), the meteorological preprocessor, which utilized hourly surface observations from Dulles International Airport along with concurrent upper air data from Sterling, VA. Table 6-10 gives site locations and information on these data sets. The surface data (wind direction, wind speed, temperature, sky cover, and relative humidity) was measured at 6.1 m above ground level. AERMET creates two output files for input to AERMOD:

- SURFACE: a file with boundary layer parameters such as sensible heat flux, surface friction velocity, convective velocity scale, vertical potential temperature gradient in the 500-meter layer above the planetary boundary layer, and convective and mechanical mixing heights. Also provided are values of Monin-Obukhov length, surface roughness, albedo, Bowen ratio, wind speed, wind direction, temperature, and heights at which measurements were taken.
- PROFILE: a file containing multi-level meteorological data with wind speed, wind direction, temperature, sigma-theta (σ_θ) and sigma-w (σ_w) when such data are available. For this application involving representative data from the nearest NWS station, the profile file will contain a single level of wind data (6.1 meters) and the temperature data (2 meters).

In modeling AERMET, the observed airport hourly wind direction was randomized. Missing morning soundings account for only about 2% of the days, so these were not filled in by interpolation or substitution.

AERMET requires specification of site characteristics including surface roughness (z_o), albedo (r), and Bowen ratio (B_o). These parameters were developed according to the guidance provided by US EPA in the recently revised AERMOD Implementation Guide (AIG) (EPA, 2009).

The revised AIG provides the following recommendations for determining the site characteristics:

1. The determination of the surface roughness length should be based on an inverse distance weighted geometric mean for a default upwind distance of 1 kilometer relative to the measurement site. Surface roughness length may be varied by sector to account for variations in land cover near the measurement site; however, the sector widths should be no smaller than 30 degrees.
2. The determination of the Bowen ratio should be based on a simple un-weighted geometric mean (i.e., no direction or distance dependency) for a representative domain, with a default domain defined by a 10-km by 10-km region centered on the measurement site.

3. The determination of the albedo should be based on a simple un-weighted arithmetic mean (i.e., no direction or distance dependency) for the same representative domain as defined for Bowen ratio, with a default domain defined by a 10-km by 10-km region centered on the measurement site.

Sectors used to define the meteorological surface characteristics for the airport site are shown in Figure 6-7.

Table 6-10 Meteorological Data Used in Running AERMET

Met Site	Latitude	Longitude	Base Elevation (m)	Data Source	Data Format
Dulles Airport, VA	38.934	-77.447	88	NCDC	CD-144
Sterling, VA	38.983	-77.467	85	WebMet	6201FB

Figure 6-6 Location of Project Site Relative to Dulles International Airport

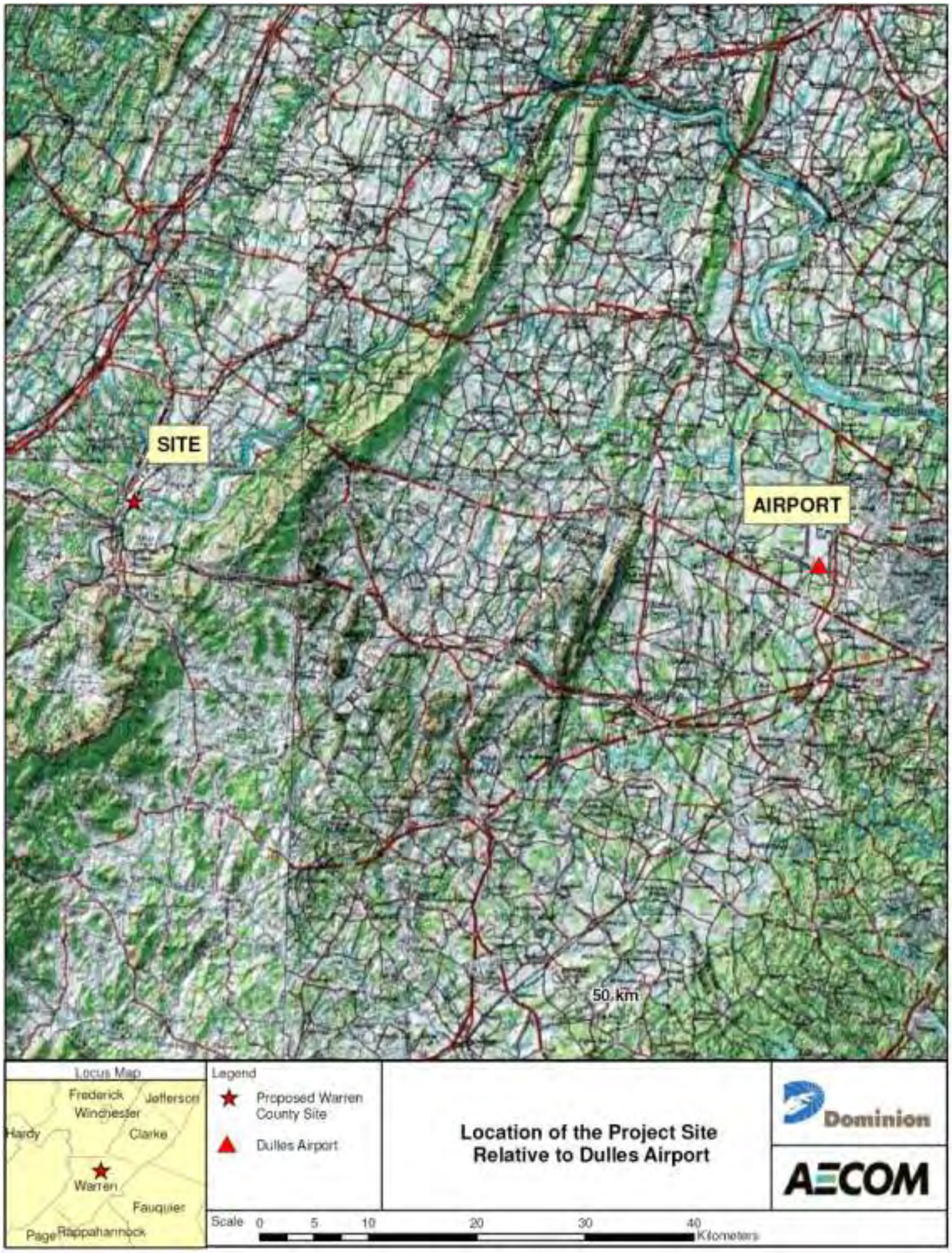


Figure 6-7 Sectors Used for Surface Characteristics at Dulles International Airport

The AIG recommends that the surface characteristics be determined based on digitized land cover data. US EPA has developed a tool called AERSURFACE that can be used to determine the site characteristics based on digitized land cover data in accordance with the recommendations from the AIG discussed above. AERSURFACE incorporates look-up tables of representative surface characteristic values by land cover category and seasonal category. AERSURFACE was applied with the instructions provided in the AERSURFACE User's Guide.

The current version of AERSURFACE (Version 08009) supports the use of land cover data from the USGS National Land Cover Data 1992 archives[3] (NLCD92). The NLCD92 archive provides data at a spatial resolution of 30 meters based upon a 21-category classification scheme applied over the continental U.S. The AIG recommends that the surface characteristics be determined based on the land use within 1 km surrounding the site where the surface meteorological data were collected, as shown in Figure 6-8 with selected sectors. The selection of the land use types assigned in the NLCD92 database was reviewed and one erroneous land use assignment was corrected for input to AERSURFACE, as discussed in Appendix E.

In AERSURFACE, the various land cover categories are linked to a set of seasonal surface characteristics. As such, AERSURFACE requires specification of the seasonal category for each month of the year. The following five seasonal categories are supported by AERSURFACE, with the applicable months of the year specified for this site.

1. Midsummer with lush vegetation (May-September).
2. Autumn with un-harvested cropland (October-November).
3. Late autumn after frost and harvest, or winter with no snow (December-February)
4. Winter with continuous snow on ground (none).
5. Transitional spring with partial green coverage or short annuals (March-April).

For Bowen ratio, the land use values are linked to three categories of surface moisture corresponding to average, wet and dry conditions. The surface moisture condition for the site may vary depending on the meteorological data period for which the surface characteristics will be applied. AERSURFACE applies the surface moisture condition for the entire data period. Therefore, if the surface moisture condition varies significantly across the data period, then AERSURFACE can be applied multiple times to account for those variations. As recommended in AERSURFACE User's Guide, the surface moisture condition for each month was determined by comparing precipitation for the data period of data that was processed to the 30-year climatological record, selecting "wet" conditions if precipitation was in the upper 30th-percentile, "dry" conditions if precipitation was in the lower 30th-percentile, and "average" conditions if precipitation was in the middle 40th-percentile. The 30-year precipitation data set used in this modeling was taken from Dulles International Airport, VA.

The monthly designations of surface moisture input to AERSURFACE are summarized in Table 6-11.

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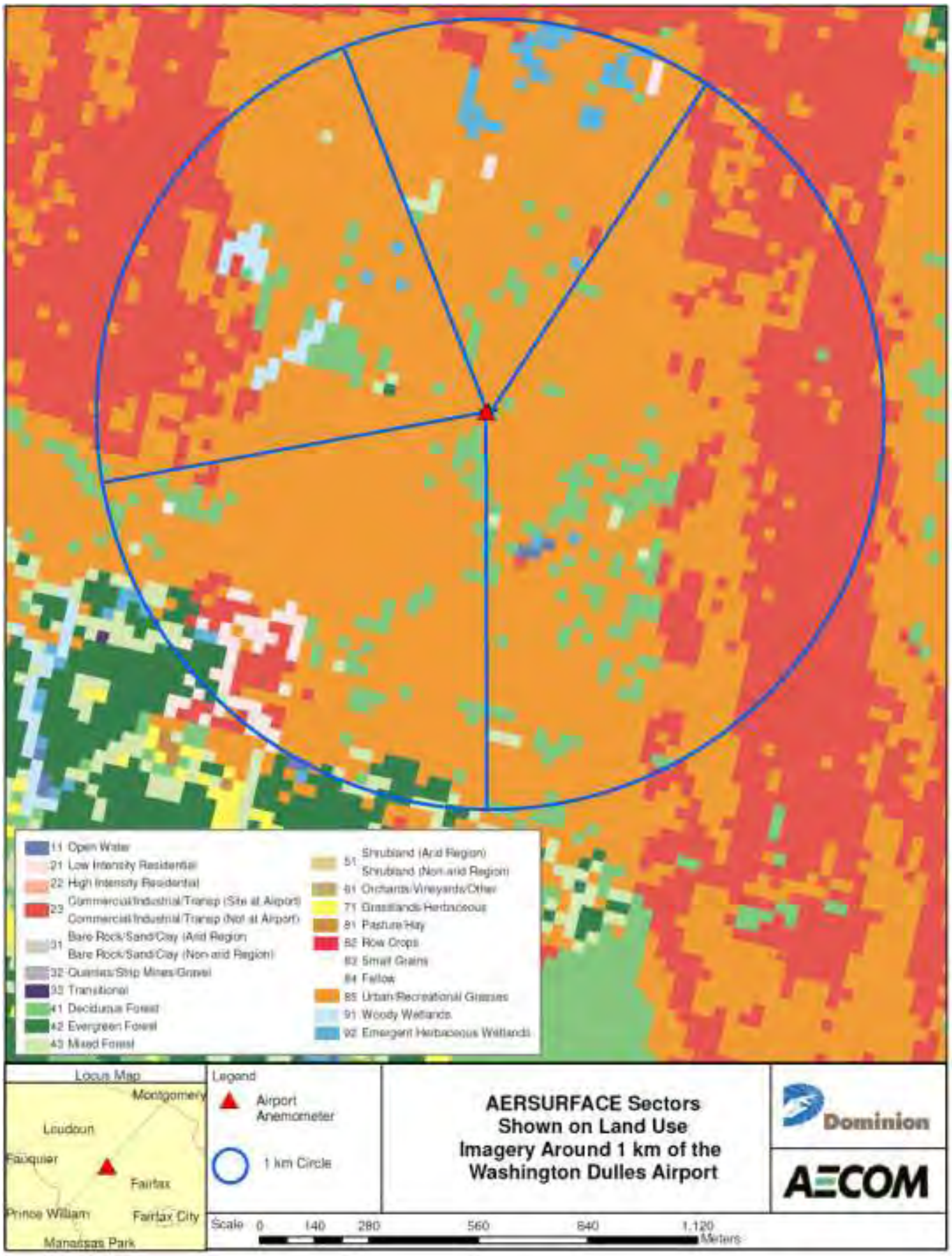
[3] http://edcftp.cr.usgs.gov/pub/data/landcover/states/

Table 6-11 AERSURFACE Bowen Ratio Condition Designations

Month	1988	1989	1990	1991	1992
January	Average	Average	Wet	Average	Average
February	Average	Average	Dry	Dry	Average
March	Dry	Average	Average	Wet	Average
April	Dry	Average	Wet	Dry	Average
May	Wet	Wet	Average	Dry	Average
June	Dry	Wet	Dry	Wet	Average
July	Wet	Wet	Wet	Average	Wet
August	Average	Dry	Wet	Dry	Dry
September	Dry	Average	Dry	Average	Wet
October	Dry	Wet	Wet	Dry	Average
November	Average	Average	Average	Average	Wet
December	Dry	Dry	Wet	Wet	Wet

Figure 6-8 1-km Radius for Dulles International Airport With Surface Roughness Sectors Shown on Land Use Imagery



6.7 Compliance with Class II Air Quality Standards

The predicted impacts from the air quality impact analysis, presented in Section 7, for the proposed project were compared to the appropriate standards as summarized in the tables listed below:

Table 6-1 Criteria Pollutant Significant Impact Levels
Table 6-12 PSD Increments
Table 6-13 Ambient Air Quality Standards

Table 6-12 PSD Increments for PSD Class II Areas

Pollutant and Averaging Period	Class II Increment (μg/m^3)
Nitrogen Dioxide	
Annual Arithmetic Average	25
Particulate Matter (PM-10)	
Annual Geometric Average	17
24-Hour	30
Source: 9 VAC 5-80-1635	

Table 6-13 **Ambient Air Quality Standards for PSD Class II Areas**

Pollutant	Averaging Period(2)	National AAQS(1)	
		Primary	Secondary
CO	8-hour	10,000	--(3)
	1-hour	40,000	--(3)
NO_2	Annual	100	100
PM_{10}	24-hour	150	150
$PM_{2.5}$	24-hour	35	35
	Annual	15	15

(1) All standards in this table are expressed in $\mu g/m^3$.

(2) Short term ambient standards may be exceeded once per year; annual standards may never be exceeded.

(3) No ambient standard for this pollutant and/or averaging period

Source: 9 VAC 5 Chapter 30

6.8 Pre-Construction Ambient Monitoring Waiver

The highest predicted pollutant impacts from the proposed project were compared to the monitoring exemption levels (9 VAC 5-80-1695 E) as listed in Table 6-8. As noted in Section 7, predicted impacts are below these monitoring exemption levels. Since VOC emissions for the proposed project exceed 100 tons per year, ambient air quality data from the nearest monitor, Luray Caverns Airport, has been included in Appendix F for the VA DEQ's approval.

Table 6-14 **PSD Monitoring Threshold Concentrations**

Pollutant	Averaging Period	Threshold Concentration ($\mu g/m^3$)
CO	8-hour	575
NO_2	Annual	14
PM/PM_{10}	24-hour	10
O_3	N/A	(1)

(1) Exempt if VOC emissions are less than 100 tons per year (tpy)

Based on the modeling data and Virginia ambient air quality data, which is "representative of the area of concern," Dominion requests a waiver from the requirement for a pre-construction ambient monitoring program from the VA DEQ's Air Quality Assessment Group (AQAG).

6.9 Ambient Air Quality Data

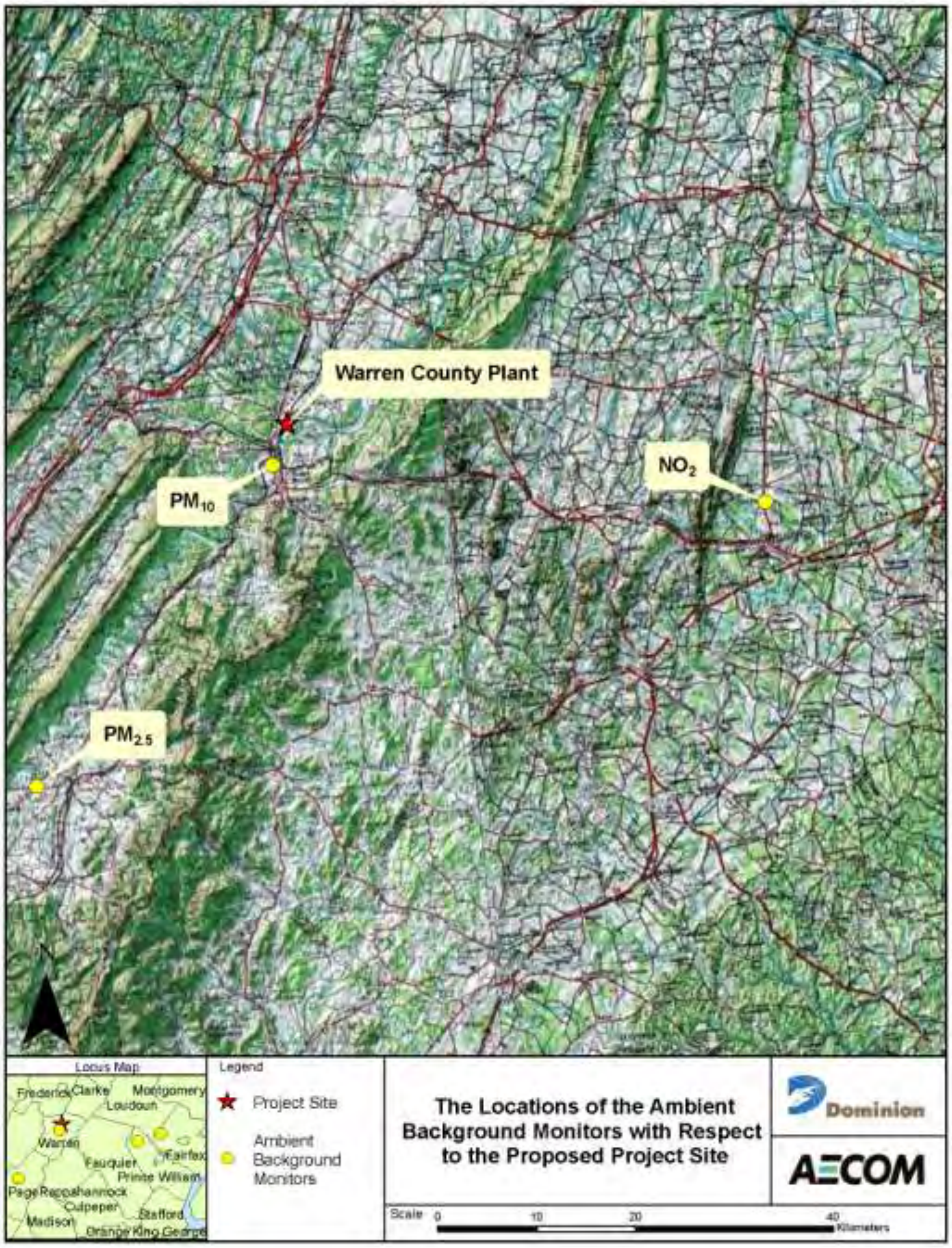
Preliminary modeling has indicated that the project will have significant impacts in Class II areas for PM_{10} 24-hour and 24-hour and annual $PM_{2.5}$ (based on the lowest proposed SILs) and in Class I areas for annual NO_2, 24-hour and annual PM_{10}, and 24-hour and annual $PM_{2.5}$ (based on the lowest proposed SILs). As such, a table of representative background air quality data has been prepared. The background air quality data presented in Table 6-15 will be added to modeled concentrations to determine compliance with the applicable NAAQS either in the Class I or Class II areas. Figure 6-8 shows the location of the ambient background monitors for the criteria pollutants considered in the analysis.

Table 6-15 Proposed Ambient Background Concentrations

Pollutant	Averaging Period	Year	Background Concentrations ($\mu g/m^3$)	Monitoring Station
PM_{10} (1)	24-HR (3)	2006	36.00	Front Royal, Warren County
	24-HR (3)	2007	32.00	Front Royal, Warren County
	24-HR (3)	2008	36.00	Front Royal, Warren County
NO_2 (1)	Annual	2006	13.17	James S. Long Park
	Annual	2007	13.17	James S. Long Park
	Annual	2008	11.29	James S. Long Park
$PM_{2.5}$ (2)	24-HR	2008	28.00	Luray Caverns Airport, Page County
$PM_{2.5}$ (2)	Annual	2008	11.70	Luray Caverns Airport, Page County

(1) Background data taken from the 2006-2008 USEPA AirData database.
(2) Design value from taken from Virginia Ambient Air Monitor 2008 Report Data
(3) 2nd highest maximum value used

Figure 6-9 Location of the Ambient Background Monitors with respect to the Project Site



7.0 Class II Area Significant Impact Level (SIL) Analysis Results and Cumulative Impact Assessment Methodology and Results

In this section, results of the air quality impact analyses performed for the proposed project are presented. These air quality analyses were conducted using the inputs and methodologies described in Section 6 of this report. Discussions to be found in this section include the projected impacts of the proposed project relating to Significant Impact Levels.

The air quality modeling analysis results are presented in the following discussions and are summarized in a series of tables. In accordance with the VA DEQ requirements, all modeling input and output files are included on a compact disc (DVD) in Appendix F.

7.1 Normal Operation

The first step in an air quality analysis is to determine if the proposed facility will result in significant impacts for any criteria pollutant. Section 6 contains a discussion of the pollutant specific criteria for determination of significant impacts. The Federal SILs are presented in Table 6-1. The SILs define the impact thresholds that establish the complexity of the air quality analysis required to support the permitting of a new or modified facility. A refined modeling analysis, consisting of a cumulative impact study, must be conducted for each pollutant predicted to exceed its respective SIL. If results of the modeling analysis demonstrate that all maximum impacts are less that the SILs, then a cumulative evaluation is not required for criteria pollutants.

Note that the modeling reflects the following operational restrictions/assumptions:

- The annual emission rate for the combined-cycle turbines is based on 8,760 hours per year.
- The inlet turbine chiller will operate up to 8,760 hours per year.
- The auxiliary boiler will operate up to 8,760 hours per year.
- The diesel-fired fire-water pump and diesel-fired emergency generator are expected to operate one (1) hour per week and 52 hours per year under non-emergency conditions (warranty testing).
- The fuel gas heater will operate up to 8,760 hours per year.

As mentioned earlier, the short-term emission rates for the diesel generator and the fire-water pump engine were normalized based on 1 hour per week, but this hour was conservatively modeled such that it can occur any hour of the year. Similarly, the annual emission rates were annualized based on the 52 hours per year for these units.

Tables 7-1 through 7-4 provide detailed summaries of the AERMOD modeling results for the Class II Cartesian grid and fence line receptors. These tables present the maximum ground level concentrations at each of the four operating loads for the Cartesian receptor grid for NO_X annual, PM_{10} annual and PM_{10} 24-hour, and CO 1-hour and 8-hour pollutants. The PM_{10} 24-hour impacts tabulated below are for the

Class II Cartesian grid, fence line receptors and the additional refined receptor grid. The maximum ground level concentrations for PM_{10} 24-hour correspond to the refined receptor grid – refined receptors around the maximum impact and the regular Cartesian grid. Each of the four load groups include the three combined-cycle combustion turbines at the respective load, inlet turbine chillers, auxiliary boiler, diesel-fired fire-water pump, diesel-fired emergency generator and fuel gas heater.

Table 7-1 AERMOD SIL Modeling Results – 100% Load with Duct Firing Scenario

Pollutant	Averaging Period	Maximum Concentration ($\mu g/m^3$)	Worst Case Year	SIL	Significant? (Yes or No)	SIA (km)
NO_X	Annual	0.60	1992	1	No	-
PM_{10}	24-Hour	6.74	1990	5	Yes	9.7
	Annual	0.33	1988	1	No	-
CO	1-Hour	359.71	1991	2,000	No	-
	8-Hour	33.51	1988	500	No	-

Table 7-2 AERMOD SIL Modeling Results – 100% Load Scenario

Pollutant	Averaging Period	Maximum Concentration ($\mu g/m^3$)	Worst Case Year	SIL	Significant? (Yes or No)	SIA (km)
NO_X	Annual	0.60	1992	1	No	-
PM_{10}	24-Hour	4.87	1990	5	No	-
	Annual	0.32	1988	1	No	-
CO	1-Hour	359.71	1991	2,000	No	-
	8-Hour	33.51	1988	500	No	-

Table 7-3 AERMOD SIL Modeling Results – 75% Load Scenario

Pollutant	Averaging Period	Maximum Concentration (μg/m^3)	Worst Case Year	SIL	Significant? (Yes or No)	SIA (km)
NO_X	Annual	0.61	1988	1	No	-
PM_{10}	24-Hour	4.22	1990	5	No	-
	Annual	0.37	1988	1	No	-
CO	1-Hour	359.71	1991	2,000	No	-
	8-Hour	33.51	1988	500	No	-

Table 7-4 AERMOD SIL Modeling Results – 60% Load Scenario

Pollutant	Averaging Period	Maximum Concentration (μg/m^3)	Worst Case Year	SIL	Significant? (Yes or No)	SIA (km)
NO_X	Annual	0.62	1988	1	No	-
PM_{10}	24-Hour	4.10	1990	5	No	-
	Annual	0.43	1988	1	No	-
CO	1-Hour	359.71	1991	2,000	No	-
	8-Hour	33.53	1988	500	No	-

7.2 Startup/Shutdown Operations

As mentioned earlier in Section 6, a startup/shutdown analysis was completed for all the criteria pollutants subject to PSD review based on the direction received by VA DEQ. Table 7-5 provides summary of the AERMOD modeling results for the Class II Cartesian grid and fence line receptors. The short-term pollutants were modeled for either a cold or a warm startup and the remaining time in the averaging period with the normal operation emissions at 100% with duct firing load. The annual pollutants were modeled based on a combination of annualized startup/shutdown emissions with startup/shutdown stack parameters and the annualized normal operation emissions with their respective stack parameters across all the operating loads.

Table 7-5 AERMOD Modeling Results – Startup/Shutdown Operations

Pollutant	Averaging Period	Maximum Concentration ($\mu g/m^3$)	Worst Case Year	SIL	Significant? (Yes or No)	SIA (km)
NO_X	Annual	0.61	1988	1	No	-
PM_{10}	24-Hour	3.91	1989	5	No	-
	Annual	0.37	1988	1	No	-
CO	1-Hour	871.60	1988	2,000	No	-
	8-Hour	139.23	1990	500	No	-

7.3 Summary of Significant Impact Analysis

A comparison of the overall maximum pollutant impacts with the Class II Significant Impact Levels is presented in Table 7-6. For each pollutant and averaging period, the table lists the maximum predicted concentration for all years of meteorological data and worst-case turbine operating loads during the normal operations or startup/shutdown operations.

Table 7-6 Summary of Maximum AERMOD Concentrations to Significant Impact Levels

Pollutant	Averaging Period	Maximum Concentration ($\mu g/m^3$)	Worst Case Year Modeled	SIL ($\mu g/m^3$)	Significant? (Yes or No)	SIA (km)
NO_X	Annual	0.62	1988	1	No	-
PM_{10}	24-hour	6.74	1990	5	Yes	9.7
	Annual	0.43	1988	1	No	-
CO	1-hour	871.60	1988	2,000	No	-
	8-hour	139.23	1990	500	No	-

As is depicted in Table 7-6, modeled concentrations for CO 1-hour and 8-hour, PM_{10} annual and NO_X annual are below the corresponding SILs. No further analyses were required for these pollutants at the indicated averaging periods. However, modeled concentrations for PM_{10} 24-hour exceeded the corresponding SIL. Therefore, a cumulative impact assessment for PM_{10} 24-hour was necessary which is presented in the following sections.

The contours showing the maximum impacts across all the operating loads and the worst- case year have been presented in Appendix H for all the criteria pollutants.

7.4 Pre-Construction Monitoring

Table 7-7 presents a comparison of the proposed project's highest predicted impacts with the monitoring exemption concentrations. Since VOC emissions for the proposed project exceed 100 tons per year, ambient air quality data from the nearest monitor, Luray Caverns Airport, has been included in Appendix F for the VA DEQ's approval. Since predicted impacts are below the monitoring exemption concentrations, Dominion hereby requests a waiver from the PSD pre-construction monitoring requirement from VA DEQ's Air Quality Assessment Group (AQAG).

Table 7-7 Comparison of Predicted Impacts with Monitoring Exemption Concentrations

Pollutant	Averaging Period	Maximum Concentration ($\mu g/m^3$)(1)	De Minimis Monitoring Concentration ($\mu g/m^3$) (2)
NO_X	Annual	0.62	14
CO	8-Hour	139.23	575
PM_{10}	24-Hour	6.74	10

(1) Highest impacts from AERMOD Modeling (from Table 7-6)
(2) 9 VAC 5-80-1695 E

7.5 Methodology for the Cumulative Impact Assessment

As demonstrated in Sections 7.1 and 7.2, a cumulative impact assessment is required for the PM_{10} 24-hour as the maximum modeled concentration was found to be above the corresponding SIL. The sections that follow describe the methods that were used to compile the data and perform the multi-source modeling analysis. A complete background emission inventory is provided on the DVD (along with other modeling files) in Appendix F.

7.6 Modeling Approach

The area to be assessed for compliance with the PSD increment and NAAQS was limited to the areas where the Project has a significant air quality impact. Listed below is a general summary of the multi-source modeling that was performed for compliance with the NAAQS and PSD increment consumption. A conservative approach for the PSD increment analysis was followed. All the background sources that were modeled as NAAQS sources were considered to be PSD increment-consuming sources. Additional details are provided on these steps in the sections that follow:

<u>Step 1</u>

AECOM developed the initial background source inventories with the assistance of the VA DEQ, the West Virginia Department of Environmental Protection (WV DEP), and the Maryland Department of the Environment (MDE) based on a preliminary Significant Impact Area (SIA).

Step 2

AECOM determined the SIA for PM_{10} 24-hour as it exceeded the SIL.

Step 3

AECOM adjusted the initial inventory based on the refined SIA and the two screening approaches- elimination of those sources whose emissions are less than 5 tpy and the Q/D approach.

Step 4

To further refine the inventory, AECOM screened out the fugitive sources of emissions that are located more than 10 km outside the SIA.

Step 5

AECOM used AERMOD to model the background sources along with the proposed project sources.

Step 6

The modeling results were compared to NAAQS and PSD increments to determine compliance. The appropriate background concentrations for the NAAQS compliance demonstration were obtained from the USEPA Airdata database for the most recent years (2006-2008) to account for distant or minor sources that were not explicitly modeled.

7.7 Background Emission Inventories

This section describes the steps that were taken in processing the data in the background emission inventories for appropriate use in the multi-source modeling analyses. For the initial inventory, a summary of sources which emit pollutants above the SIL was developed based on a preliminary SIA. These sources were obtained from the background emission inventory provided by VA DEQ, WV DEP, and MDE, respectively. The initial inventory was then refined based on the steps described in the following sections. A list of the background sources that were included in the multi-source modeling is provided in Appendix G. The complete background emission inventories are provided on the DVD (along with the other modeling files) in Appendix F. After the major steps have been described in detail, a few subsections will follow to describe unique aspects of each inventory.

7.8 Determination of Significant Impact Area

The significance modeling that was conducted for the proposed project sources in AERMOD was used to determine the SIA for each pollutant exceeding its respective SIL. The screening radius was determined by adding 50 km to the SIA. The screening radius is the basis for obtaining a background source inventory for the NAAQS and PSD Increment Compliance analysis. The domain for evaluating the background sources extended into West Virginia and Maryland. The background sources listed in the emission inventories were evaluated in the screening analysis if they were inside the screening radius.

The SIA radius and the corresponding screening radius for PM_{10} 24-hour averaging period is provided below.

PM_{10} 24 Hour:	9.7 km	59.7 km

7.9 Adjustments to the Inventory

7.9.1 Modification of Significant Impact Area

Since the initial background emission inventories were developed from a larger preliminary SIA and corresponding screening radius, there were some sources in the inventories that were now outside the actual screening radius. The first screening method was to eliminate the sources in the inventories that were outside the actual pollutant specific screening radius. The calculations for this screening method, which is a part of the complete background emission inventory, are provided on the DVD in Appendix F.

7.9.2 Refinement of the Emission Inventory

Out of those facilities that were within the 50 km plus the SIA distance, the sources were refined based on a 2-step approach – facilities less than 5 tpy and the Q/D ratio for PM_{10} 24-hour. Sources were first screened out if their emissions were less than 5 tpy (generally considered an insignificant source) as those impacts are usually accounted for in the conservative monitoring background value. Secondly, sources were screened out based on a ratio of their short-term emissions (for all facility stacks combined) expressed in tons per year (Q) divided by the distance from the Project site in kilometers (D). Sources with a Q/D ratio of less than 0.30 for PM_{10} were presumed to cause an insignificant concentration gradient in the SIA modeling area. The Q/D thresholds are derived from the significant emissions increase for a proposed project (e.g., 15 tons per year for PM_{10}) divided by 50 km.

7.9.3 Refined Adjustments

AECOM applied the following further refinements to the inventory:

- Any source identified as a fugitive source located 10 km beyond the SIA was eliminated from modeling considerations as the impacts from these sources would likely be confined within a few kilometers of the fugitive source.
- Any missing stack parameters in the VA DEQ's background inventory were filled with the 2005 NEI database. Any missing stack parameters in the WV DEP's and MDE's inventory were filled with appropriate stack parameters to represent a worst-case modeling scenario. Values of 10 ft for the stack height, 68°F for the stack exit temperature, 0.0003 fps for the stack exit velocity and 0.003 ft for the stack diameter were used to fill the data gaps in the WV and MD inventories. However based on some limitations in the number of decimal places that can be used in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps).

7.9.3.1 Virginia Inventory

The emission inventory for the area covered by the screening radius in Virginia was provided by VA DEQ in spreadsheet format. Only the NAAQS source inventory was provided for PM_{10}. All the NAAQS sources which were within the screening radius (50 km plus the SIA) were assumed to be PSD increment-consuming sources. Missing data points were filled using the 2005 NEI database.

The missing base elevation of the sources/facilities included in the NAAQS and PSD Increment Compliance Analyses were filled with the base elevations of the sources with the same coordinate location.

7.9.3.2 West Virginia Inventory

The domain for evaluating the background sources extended into West Virginia and therefore an emission inventory was requested from WV DEP. Only the NAAQS source inventory was provided for PM_{10}. All the NAAQS sources which were within the screening radius (50 km plus the SIA) were assumed to be PSD increment-consuming sources. The inventory had some missing stack parameters that were filled with appropriate stack parameters to represent the worst-case modeling scenario.

The missing base elevations of the sources/facilities included in the NAAQS and PSD Increment Compliance Analyses were obtained from the Topozone website (www.topozone.com). An averaged coordinate location was used to get a base elevation for all the sources of that facility.

7.9.3.3 Maryland Inventory

The domain for evaluating the background sources extended into Maryland and therefore an emission inventory was requested from MDE. Only the NAAQS source inventory was provided for PM_{10}. All the NAAQS sources that were within the screening radius (50 km plus the SIA) were assumed to be PSD consuming sources. The inventory had some missing stack parameters that were filled with appropriate stack parameters to represent the worst-case modeling scenario.

The missing base elevations of the sources/facilities included in the NAAQS and PSD Increment Compliance Analyses were obtained from the Topozone website (www.topozone.com). An averaged coordinate location was used to get a base elevation for all the sources of that facility.

7.10 Application of the Multi-Source Modeling Analysis

As previously mentioned, the AERMOD model was used in the multi-source modeling analyses. After a thorough evaluation of the background sources for the multi-source modeling, the application of the model was determined. The methodology is discussed below.

For NAAQS compliance, AECOM used AERMOD to model the NAAQS background sources along with the proposed project's sources in simple and complex terrain. The objective for using this model is to capture cumulative impacts within the SIA.

For the proposed project, the same stack parameters and emission rates (see Section 6 for details) as used for the SIL modeling was used for the multi-source modeling analyses. The model receptor grid consisted of receptors that exceeded SILs for the PM_{10} 24-hour multi-source application. The cumulative receptor grid consisted of the receptors that exceeded the PM_{10} 24-hr SIL for each load and each year. Any duplicate receptors were deleted from the combined receptor grid. The same set of meteorological data from the SIL Analysis was used for this analysis.

The high second-high (short-term pollutants) impacts were retrieved, and added to the corresponding monitored background concentration averaged over 2006-2008 provided in Table 6-15. These final values were then compared to the NAAQS to determine compliance. Figure 6-9 shows the location of the ambient background monitors for the criteria pollutants considered in the analysis.

The same modeling procedures and applications described above were applied to the PSD Increment analysis, with the exception that monitored background concentrations were not added to the modeled impacts for the PSD Increment compliance evaluation.

7.11 Results of the Multi-Source Modeling Analysis

The results of the multi-source modeling analysis are presented in the following sub-sections below.

7.11.1 Summary of NAAQS Analysis

A complete summary of the NAAQS analysis is presented in Table 7-8. "High 2nd High (H2H) Model Concentration" refers to the combined impacts from the proposed project sources and the NAAQS background sources. The model concentrations were determined by finding the H2H (short-term) impacts from the AERMOD model. The appropriate monitored background concentration was added to the high 2nd high model concentration to obtain the final concentration, which is listed in the "Total Concentration" column, for comparison to the NAAQS. The table below presents the high 2nd high model concentration over the four operating loads and five years of meteorological data.

As shown in Table 7-8, the predicted impacts for PM_{10} 24-hour in the NAAQS cumulative impact analysis will be less than the NAAQS. The results of the NAAQS modeling analysis show that the project will not cause or contribute to a NAAQS violation. Hence, the proposed project is deemed to be in compliance with the applicable NAAQS standards.

Table 7-8 Summary of NAAQS Analysis

Pollutant	Averaging Period	High 2nd High Model Concentration (μg/m^3)	Monitored Background Concentration (μg/m^3) (1)	Total Concentration (μg/m^3)	NAAQS (μg/m^3)	Complies (Y/N)?
PM_{10}	24-hour	4.98	34.70	39.68	150	Y

(1) Average monitored background concentration over 2006-2008

7.11.2 Compliance with PSD Increment

A complete summary of the PSD Increment Analysis is presented in Table 7-9. "High 2nd High Model Concentration" refers to the combined impacts from the proposed project sources and the PSD Increment-consuming background sources. The model concentrations were determined by finding the H2H (short-term) impacts from the AERMOD model. The high 2nd high concentrations were compared with the Class II Increment values.

As shown in Table 7-9, the predicted impacts for all criteria pollutants in the Increment cumulative impact analysis will be less than the corresponding standard values. The results of the increment modeling analysis show that the project will not exceed the allowable increments. Hence, the proposed project will not cause or contribute to a Class II area PSD increment violation for PM_{10}.

Table 7-9 Summary of PSD Increment Analysis

Pollutant	Averaging Period	High 2nd High Model Concentration (μg/m³)	PSD Increments (μg/m³)	Complies (Y/N)?
PM_{10}	24-hour	4.98	30	Y

8.0 Class I Area Modeling Analysis

8.1 Modeling Procedures

Figure 8-1 shows the location of the Project relative to PSD Class I areas. It is noteworthy that while the closest Class I area, Shenandoah National Park, has its closest point within 10 km of the Project site, the next closest Class I area, Dolly Sods Wilderness Area, is about 100 km away. Dolly Sods is also in a location associated with a very low wind direction frequency from the proposed project.

In accordance with the draft FLAG 2009 guidance that is recommended by the Federal Land Managers, we excluded from modeling consideration Class I areas that are beyond the FLAG-specified screening distance from the Project site. The screening distance was determined by adding the permitted short-term emissions from proposed routine (non-emergency) point sources for SO_2 + NO_x + PM_{10} + H_2SO_4. The sum of these emissions for the scenario with the highest emissions is not expected to exceed 600 tons per year, based upon information provided in Section 3. With a FLAG-prescribed screening distance of 600/10 = 60 km, this confirms that only impacts within the Shenandoah National Park need to be considered for Air Quality Related Values (AQRVs). Therefore, we conducted all Class I modeling with a focus upon the portion of Shenandoah National Park within 50 km of the Project site using AERMOD. We used the same modeling platform and approach as that used for the PSD Class II modeling (described in Section 6). Treatment of the emission sources was the same for the Class II and Class I modeling.

Figure 8-2 shows the receptor coverage of this portion of the park. The grid consists of receptors spaced at 100 m out to 10 km from the Project site, 500 m between 10 and 30 km from the Project site, and 1000 m spacing between 30 and 50 km from the Project site.

Figure 8-1 Location of the Proposed Project Relative to Nearby Class I Areas

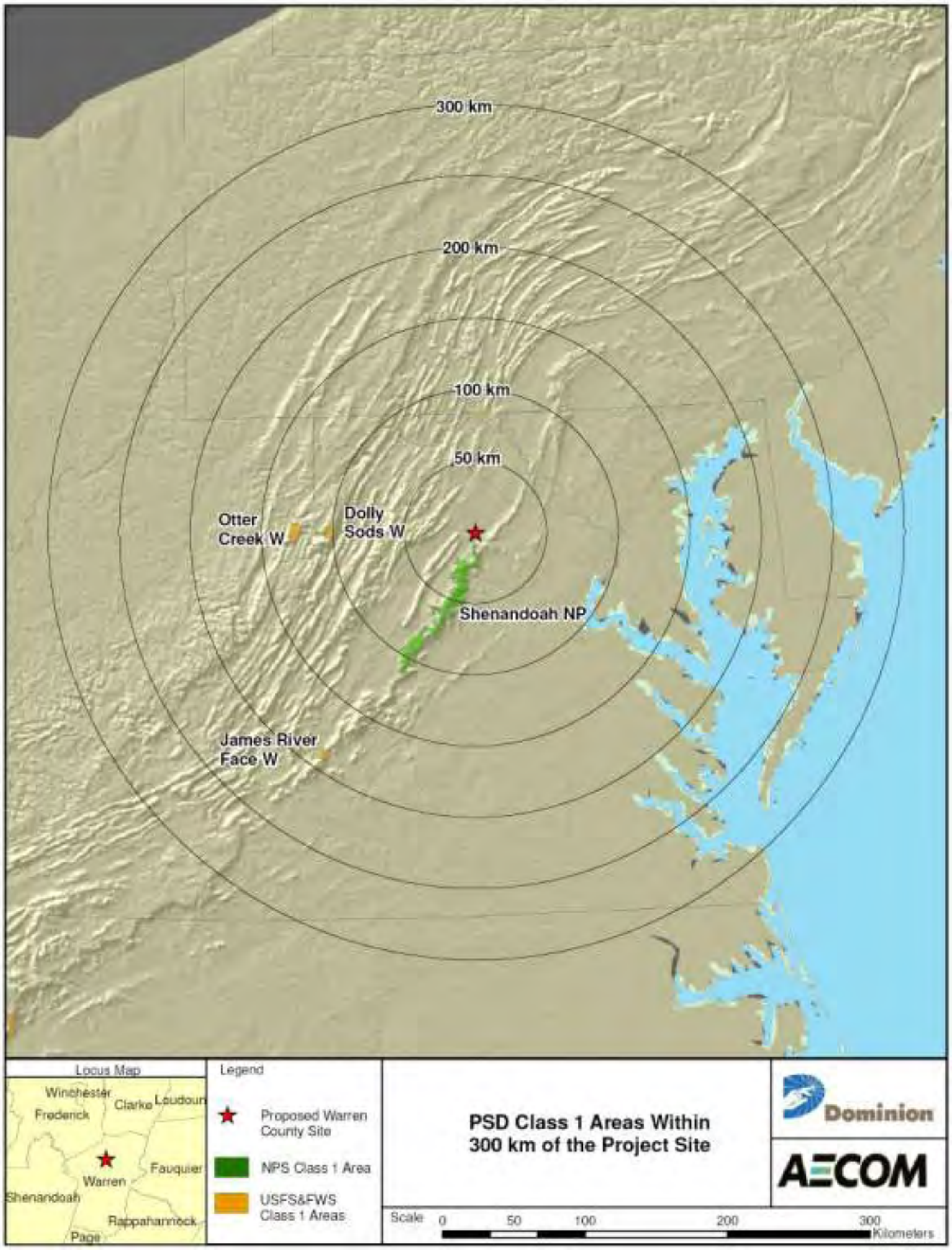
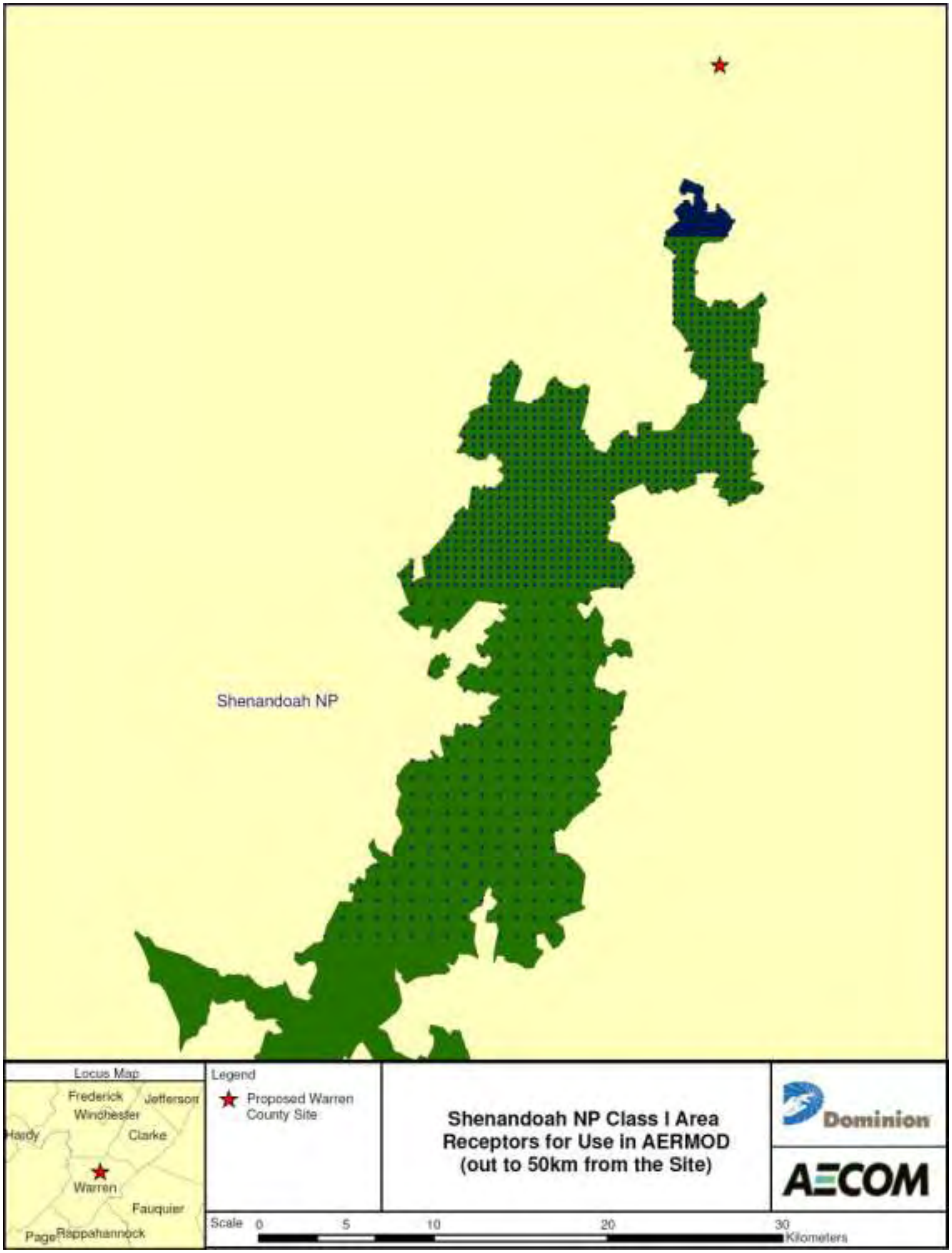


Figure 8-2 Receptor Coverage in Shenandoah National Park



For the Class I modeling that was conducted in areas within 50 km of the Project site, the considerations for the modeling requirements and modeling selection were the same for both Class I and Class II areas. This approach is described in Section 6.

For estimating deposition of acidic species associated with emissions of NO_X and SO_2, we followed a tiered screening approach. For sulfur deposition associated with SO_2 emissions, the Tier 1 Screening method in IWAQM Phase 1 multiplies the modeled annual average SO_2 concentration by a deposition velocity of 0.5 cm/sec. For nitrogen deposition associated with NO_X emissions, the Tier 1 Screening method in IWAQM Phase 1 assumes that all NO_X emitted is readily transformed to nitric acid as it enters the atmosphere. The annual nitrogen deposition is then estimated by multiplying the modeled annual average concentration by a deposition velocity of 5 cm/sec. The deposition velocity for nitric acid is more than an order of magnitude greater than that for either NO or NO_2. This simplified screening approach is likely to be overly conservative in this case because only a small fraction of NO_X emissions would be expected to be transformed to nitric acid over nearby Shenandoah National Park.

Therefore, we found it useful for nitrogen deposition to conduct a Tier 2 screening assessment that incorporated a conservative, but more realistic, estimate of nitric acid formation and deposition. This approach still used the conservatively high deposition velocity of 5 cm/sec. However, the average rate of conversion of NO_X to HNO_3 was computed by applying the following equation for nitrate transformation rate ($k_,$ % per hour), which is used in CALPUFF when the default MESOPUFF II chemistry module is selected:

For daytime conditions, the transformation rate (k_3) in %/hr is:

$$k_3 = 1261 \left[O_3\right]^{1.45} S^{-1.34} \left[NO_x\right]^{-0.12}$$

,

where:

S is the stability category (1=A, 6=F),

$[O_3]$ is the ambient ozone concentration (ppm), and

$[NO_X]$ is the average modeled concentration (ppm) within the plume (modeled with a simple Gaussian equation).

The following hourly data was used to implement the refined method for daytime hours:

- hourly ozone data from the Shenandoah Big Meadows CASTNET site (concurrent with the AERMOD meteorological data)
- stability class computed from the AERMET-provided friction velocity and Monin-Obukhov length using the Golder (1972) algorithm to calculate the stability class (code from the AERMOD subroutine “LTOPG”)

For nighttime conditions, the transformation rate (k_4) is 2%/hr.

The nitrate species that are formed are typically comprised of ammonium nitrate and nitric acid, with the ratio depending on a variety of factors, including the availability of ammonia and ambient temperature. Ammonium nitrate is a fine particulate that has a much lower deposition velocity than nitric acid, which is highly reactive. In cold and humid conditions, ammonium nitrate is more likely to form. Due to the NNE trajectory of winds required to transport the plume from the Project site to Shenandoah, it is likely that colder than average temperatures would prevail for transport, thus favoring the formation of ammonium nitrate with the much lower deposition velocity. For this Tier 2 screening assessment, it was conservatively assumed that all nitrate formed from NO_X emissions is in the form of nitric acid, acknowledging that a the actual deposition velocity could be substantially lower.
.

The deposition of nitrogen due to deposition of HNO_3 was then conservatively computed according to the following equation for each hour of the the worst-case year identified by Tier 1 for the Shenandoah receptor location for which the Tier 1 screening deposition analysis indicated the maximum deposition would occur. An hourly computation for the refined approach was followed for the worst-case receptor for annual deposition. The hourly deposition values were then summed to estimate the annual deposition.

Nitrogen deposition (kg/ha/hr) =

$$V_d * [NO_X] * MWR *(1-\exp(-k/100)*X/u)) * (3600 \text{ sec/hr}) * (10^4 \text{ m}^2\text{/ha}) * (10^{-9} \text{ kg/µg})$$

Where:

X= distance (km) to the Class I area receptor,

k = NO_3 conversion rate for daytime and nighttime conditions (%/hr)

MWR = ratio of molecular weight of atomic nitrogen to nitrogen dioxide = 0.3043

u= wind speed (km/hr),

$[NO_X]$ = modeled ground-level concentrations at the receptor of interest (µg/m^3), and

V_d = the IWAQM nitric acid deposition velocity = 0.05 m/sec.

The conservatively modeled sulfur and nitrogen deposition values are reported later in this report and compared to the conservatively low screening Deposition Analysis Thresholds (NPS, 2002) for the Eastern United States of 0.010 kg/ha/yr.

For plume visibility impacts inside Shenandoah National Park within 50 km, the PLUVUE II model was used, consistent with past permitting on this project. The procedures for this analysis have been established and agreed to by the National Park Service for the previous permitting of the Warren County project (previously called “CPV Warren”) at the same site (see TRC Class I modeling report, 2003). The results of the PLUVUE II modeling analysis are described below in this report.

8.2 Class I Area Results for Project-Only Impacts

Due to the proximity of the project site to the Shenandoah National Park (within 10 km), there is an additional trigger for PSD review, if “any emissions rate or any net emissions increase associated with a major stationary source or major modification, which could construct within 10 km of a Class I area, and have an impact on such area equal to or greater than 1 $\mu g/m^3$ (24-hour average)". This trigger could potentially affect SO_2 and Pb. However, the modeling results for SO_2 indicate that the highest 24-hour predicted concentration at any receptor within the park is only about 0.2 $\mu g/m^3$. Therefore, the project does not trigger PSD review for SO_2 and Pb.

The first step in the PSD Class I air quality analysis involved a comparison of the modeled impacts of PM_{10} and NO_2 to the proposed SILs, as listed in Table 8-1. Modeling of CO was not conducted because the Class II impacts reported in Section 7 show results well below the Class II SIL, and there is no separate Class I SIL for CO. The emissions used in the Class I modeling are the same as those used for the Class II modeling.

Tables 8-2 through 8-5 provide detailed summaries of the AERMOD modeling results for the Class I receptor grid. These tables present the maximum ground level concentrations at each of the four operating loads. Each of the four load groups include emissions from the three combined-cycle combustion turbines at the respective load, inlet turbine chiller, auxiliary boiler, diesel-fired fire-water pump, diesel-fired emergency generator and fuel gas heater. The results show that the project has significant impacts in the Shenandoah National Park for NO_2 and PM_{10}. A cumulative modeling analysis was conducted for these pollutants for compliance with the NAAQS (see Section 8.3) and PSD increments (see Section 8.4).

Table 8-1 Proposed Significant Impact Levels for PSD Class I Areas

Pollutant	Averaging Time	
	Annual ($\mu g/m^3$)	24-hour ($\mu g/m^3$)
NO_2	0.1	-
PM_{10}	0.2	0.3
Source: Federal Register, 23 July 1996.		

Table 8-2 AERMOD SIL Modeling Results – 100% Load with Duct Firing Scenario

Pollutant	Averaging Period	Maximum Concentration ($\mu g/m^3$)	Worst Case Year	SIL	Significant? (Yes or No)
NO_2	Annual	0.224	1988	0.1	YES
PM_{10}	24-Hour	5.549	1989	0.3	YES
	Annual	0.179	1988	0.2	NO

Table 8-3 AERMOD SIL Modeling Results – 100% Load Scenario

Pollutant	Averaging Period	Maximum Concentration ($\mu g/m^3$)	Worst Case Year	SIL	Significant? (Yes or No)
NO_2	Annual	0.221	1988	0.1	YES
PM_{10}	24-Hour	3.991	1989	0.3	YES
	Annual	0.177	1988	0.2	NO

Table 8-4 AERMOD SIL Modeling Results – 75% Load Scenario

Pollutant	Averaging Period	Maximum Concentration ($\mu g/m^3$)	Worst Case Year	SIL	Significant? (Yes or No)
NO_2	Annual	0.243	1988	0.1	YES
PM_{10}	24-Hour	3.411	1989	0.3	YES
	Annual	0.194	1988	0.2	NO

Table 8-5 AERMOD SIL Modeling Results – 60% Load Scenario

Pollutant	Averaging Period	Maximum Concentration ($\mu g/m^3$)	Worst Case Year	SIL	Significant? (Yes or No)
NO_2	Annual	0.266	1988	0.1	YES
PM_{10}	24-Hour	3.090	1989	0.3	YES
	Annual	0.213	1988	0.2	YES

8.3 Cumulative Analysis for NAAQS Compliance in Shenandoah National Park

For the cumulative modeling analysis for PM_{10} and NO_2 NAAQS compliance analysis, AECOM contacted the Virginia DEQ and the West Virginia Department of Environmental Protection for a list of background sources within 50 km of the Shenandoah National Park, within the area shown in Figure 8-3. Very small sources not expected to result in a significant concentration gradient in the vicinity of the proposed project were excluded from the cumulative modeling analysis, as described in Section 7. Sources were initially considered to be excluded based on the following criteria:

- All agency-identified sources within 50 km of Shenandoah with very small emissions (facility totals less than 5 tons per year), whose impacts would be accounted for by regional background were not included in the cumulative modeling.
- For sources within 50 km of Shenandoah whose facility emission totals exceed 5 TPY a Q/D screening approach was applied. Where D is defined as the shortest distance in km of a candidate background source to Shenandoah NP and Q as the permitted short-term facility total emissions expressed in tons per year (TPY). The Q/D ratios used in this instance were 0.3 and 0.8 respectively for NO_2 and PM_{10}. This is based on these pollutants significant emission increase threshold of 40 and 15 10 TPY for NO_2 and PM_{10}. The Q/D was then set such that at a distance of 50 km, the threshold short-term emission rate for screening out is 40 and 15 TPY.

The results of the cumulative NAAQS compliance modeling analysis for PM_{10} and NO_2 are presented in Table 8-6. The results indicate that the total predicted impacts are well below the daily PM_{10} NAAQS (note that EPA has withdrawn the annual PM_{10} NAAQS) as well as the annual NO_2 NAAQS.

Table 8-6 Cumulative NAAQS Compliance Modeling Results for Shenandoah National Park

Pollutant	Averaging Period	Model Concentration ($\mu g/m^3$)	Monitored Background Concentration ($\mu g/m^3$) (1)	Total Concentration ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	Complies (Y/N)?
NO_2	Annual (Highest)	0.45	12.54	12.99	100	Y
PM_{10}	24-hour (High 2nd High)	5.15	34.67	39.82	150	Y
(1) Average monitored background concentration over 2006-2008						

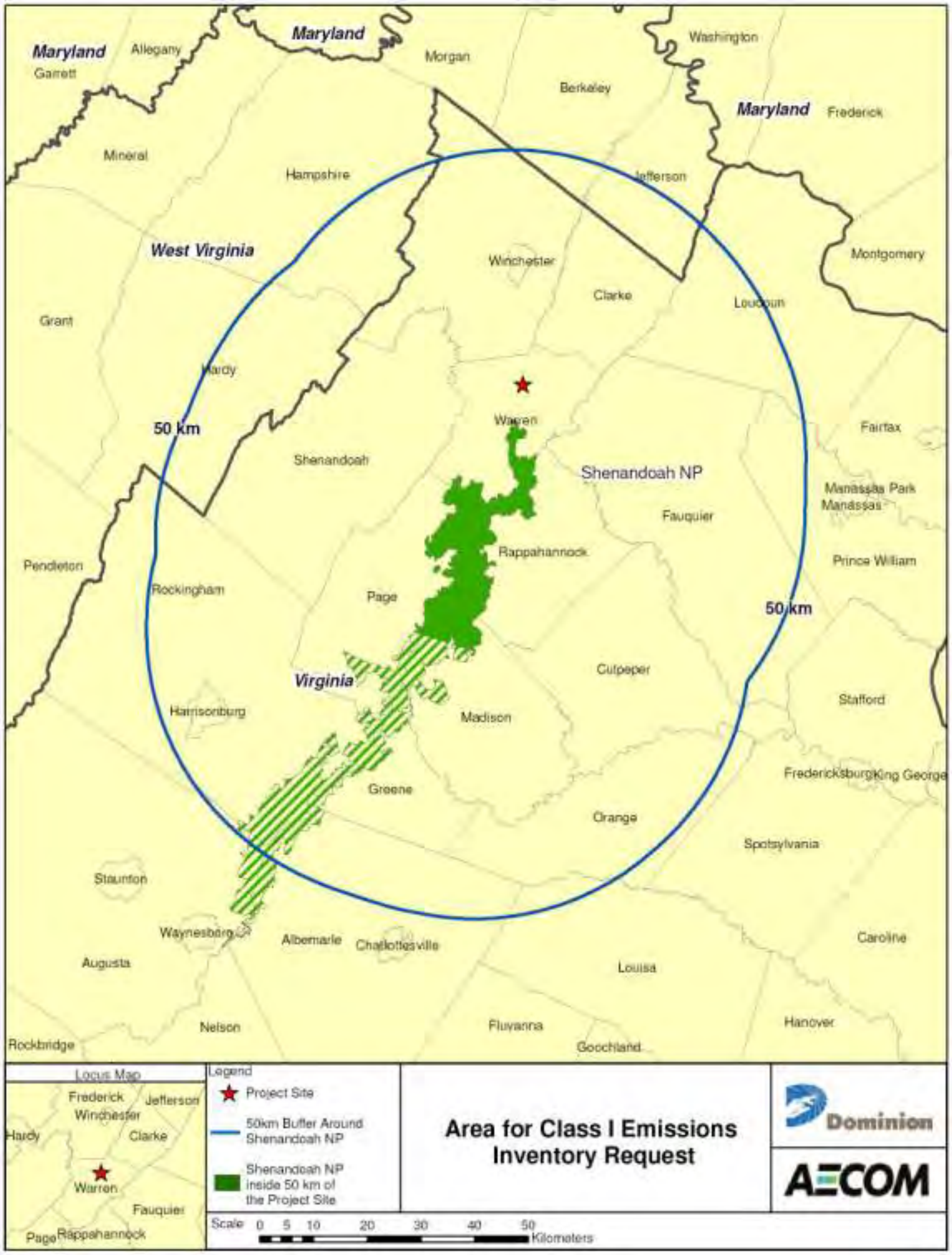
8.4 Cumulative Analysis for PSD Increment Consumption in Shenandoah National Park

The background source inventory received from Virginia and West Virginia did not specify which sources are PSD increment-consuming. For a Tier 1 approach, we conservatively assumed that all reported sources consume increment. The results of the PSD increment modeling analysis for PM_{10} and NO_2 are presented in Table 8-7. The results of the PSD increment modeling analysis with this conservative assumption show that the project will not cause or contribute to a PSD increment violation for PM_{10} and NO_2 in the Shenandoah National Park.

Table 8-7 Cumulative PSD Increment Modeling Results for Shenandoah National Park

Pollutant	Averaging Period	Model Concentration (μg/m^3)	PSD Increments (μg/m^3)	Complies (Y/N)?
NO_2	Annual (Highest)	0.45	2.5	Y
PM_{10}	24-hour (High 2nd High)	5.15	8	Y
PM_{10}	Annual (Highest)	0.27	4	Y

Figure 8-3 Area for Background Source Emissions Modeling for Shenandoah National Park



8.5 Plume Visibility Analysis for Shenandoah National Park

8.5.1 Modeling Procedures

For plume visibility impacts inside Shenandoah National Park within 50 km, the PLUVUE II model was used, consistent with past permitting on this project. The procedures for this analysis have been established and agreed to by the National Park Service for the previous permitting of the CPV project at the same site (see TRC Class I modeling report, 2003).

Following these procedures, the modeling approach consisted of the elements described below.

- Five years of meteorological data (1988-1992) from Dulles airport were used for the analysis, consistent with the other portions of the modeling analysis.
- The 2003 TRC report refers to preliminary seasonal analyses that were conducted to identify a subset of conditions and hours for the PLUVUE II analysis. Details provided in Appendix E of that document describe specific wind directions of interest and consideration of views within the Park itself. This analysis reviewed the PLUVUE results from “typical average” conditions within possible meteorological combinations in order to eliminate most cases for which the plume contrast (|C|) and plume perceptibility (ΔE) results would be less than 85% of the Class I Levels of Concern for PLUVUE II (an absolute value of at least 0.017 for |C| and 0.85 for ΔE). This analysis was repeated for this project due to the higher emissions relative to past permitting for CPV. Groups of hours for which the seasonal PLUVUE II results for “typical average” conditions exceeded these reduced thresholds were modeled individually for each applicable hour of meteorological conditions.
- Specific viewpoints discussed below have been selected for the plume visibility analysis. For each of these viewpoints, the meteorological database was screened for the frequency of the occurrence of appropriate conditions during daylight hours and cases for which the plume was transported close to the observer (within 10 degrees). The final database included only hours with non-overcast conditions because the PLUVUE II model assumes clear skies.
- Emissions rates for SO_2, NO_x, and PM_{10} were consistent with those modeled for criteria pollutant concentrations. Although PLUVUE II double-counts the sulfur atoms in SO_2 and sulfate emissions, the small level of emissions in this case do not warrant an adjustment to PLUVUE II for this input.
- The PM_{10} emission rate includes both filterable and condensable components, including sulfates.

For the previous permitting, the National Park Service and VA DEQ agreed upon five viewpoints to be analyzed for plume visibility effects (see Figure 5-1, copied from the 2003 TRC report referenced above). Three of the selected locations are overlooks situated along Skyline Drive. These areas are directly accessible by automobile, have clear views of terrain, and are relatively unobstructed. Two other viewpoints were added by NPS staff. The viewpoints that were analyzed are described below, and are displayed collectively in Figure 8-4 and individually with lines of sight in Figures 8-5 through 8-9 (copied from the 2003 TRC report).

- Shenandoah Valley Overlook: located about 9 km from the proposed project site, it offers views to the north toward Front Royal.

- Dickey Ridge: located about 11 km from the proposed project site, it offers views to the northeast within the Park, and views to the southeast and southwest toward terrain within the Park.
- Signal Knob Overlook: located about 12.5 km from the proposed project site, it offers fairly long views to the south, southwest, and southeast within Park boundaries. In addition, there is a view toward the west to areas beyond Park boundaries.
- Compton Gap Road: selected as a supplemental viewpoint by the NPS due to its location at the highest point along Compton Gap Road, about 14.6 km from the project site. It offers long views of Park terrain toward the southwest, and shorter views toward the west and northwest.
- Lands Run Road Gate: selected as a supplemental viewpoint by the NPS for its location where Lands Run Road crosses the western boundary of the Park. It is approximately 16.5 km from the proposed project site and it offers long views to the south and southwest, although viewing distances to the east are limited by elevated terrain.

In concurrence with the previously approved methodology, any wind direction that causes the plume centerline to pass within 10 degrees of a viewpoint is excluded from the assessment, because PLUVUE II is known to over-predict in these cases. This excludes the following viewpoint wind direction combinations: for Shenandoah Valley Overlook, Dickey Ridge and Signal Knob Overlook: 10°, 20°; for Compton Gap: 0° and for Lands Run Road Gate: 0° and 10°.

PLUVUE II was run for each hour identified from the 5-year meteorological period for meteorological conditions associated with the Class I Levels of Concern (an absolute value of at least 0.02 for |C| and 1.0 for ΔE). The results of the PLUVUE II analyses were summarized for each viewpoint, and the probability of potential future occurrences during peak project emission periods were calculated by reviewing the frequency of hours determined to be above perceptible visibility thresholds, especially during periods of peak park visitation. Note that the threshold values specified above are considerably more stringent than the values of 0.05 for |C| and 2.0 for ΔE used for the Level 1 and 2 plume visibility modeling.

As a refinement to the assessment using these stringent plume perceptibility thresholds, a supplemental analysis has been conducted to account for effects on plume perceptibility due to the apparent plume width. As noted by Richards et al. (2007),

> "In the real world, plumes are viewed against a background of sky or terrain that does not have a uniform luminance and color, even when there are no clouds. For faint plumes, the effect of a plume is to introduce a small distortion in the luminance and color profile of the background. As the angle subtended by a plume increases (i.e., the plume fills a larger portion of the observers total field of view), the plume is spread over a larger change in the luminance and color of the background sky. For a given value of the plume contrast or color difference, the changes in luminance and color attributable to the plume become a smaller fraction of the naturally occurring variations in the luminance and color of the background sky. Thus, it is reasonable to believe that the adjustment needed to convert laboratory contrast thresholds into thresholds appropriate for the real world increases as the plume subtended angle increases."

The procedures for implementing an adjustment to |C| and ΔE are described by Richards et al. (2007) as well as Zell et al. (2007). This involves computation of the plume angle subtended for each line of sight and simulated PLUVUE hour, computing appropriate threshold values for |C| and ΔE and then comparing the modeled plume parameter to this threshold.

8.5.2 Plume Visibility Findings

The seasonal plume visibility analysis indicated a number of meteorological conditions for each viewpoint that exceeded the specified thresholds for |C| and ΔE. These meteorological conditions were then used to identify individual hours to be evaluated over the 5-year period in a refined PLUVUE II assessment. This refined assessment estimated the number of hours that the visible plume parameter thresholds could be exceeded. Supplemental information regarding the intensity, geographic extent, duration, frequency and timing of these cases is provided in Appendix F.

Table 8-8 provides the number of excursions, defined as hours when the conservative FLAG visible plume thresholds (0.02 for |C| and 1.0 for ΔE) could be exceeded. The table also provides the associated percentage of the daytime excursions (based on average 12 hours of daytime per day) over the 5-year period. Signal Knob Overlook has the greatest number of excursion hours and Shenandoah Valley Overlook has the fewest hours. At no viewpoint would excursion hours occur more than about 0.5% of the daytime. Following the established protocol, wind directions that cause the plume to nearly pass over (within 10 degrees) a viewpoint were excluded in Table 8-8, because PLUVUE does not adequately simulate this geometry. Table 8-9 provides an indication of the plume visibility parameters (|C| and ΔE for sky or terrain) that trigger the threshold excursions. |C| and ΔE for terrain background, as opposed to sky, account for the vast majority of the excursions. This indicates that an elevated plume viewed against the background sky would seldom be visible. Because the model simulates terrain with uniform reflectivity (grey, white or black) the degree to which a plume could be visible against actual terrain of various colors is likely to be exaggerated (Henry, 2002).

Table 8-10 provides the results of a refined analysis of the number of excursion hours based on more realistic thresholds for |C| and ΔE, which account for the apparent plume width, as discussed above. The analysis indicates that a plume is likely to be perceptible less than 0.15% of the time at Signal Knob overlook and at a much smaller percentage of the time at other viewpoints. Thus, both the plume visibility assessment using the conservative FLAG perceptibility thresholds and the refined thresholds indicate that the modeled frequency of visible plumes associated with the project will be well less than one percent, the Level 2 significance threshold established in Workbook for Plume Visual Impact Screening and Analysis (U.S. EPA, 1992).

Figure 8-4 Scenic Overlooks Analyzed in PLUVUE II Plume Visibility Analysis

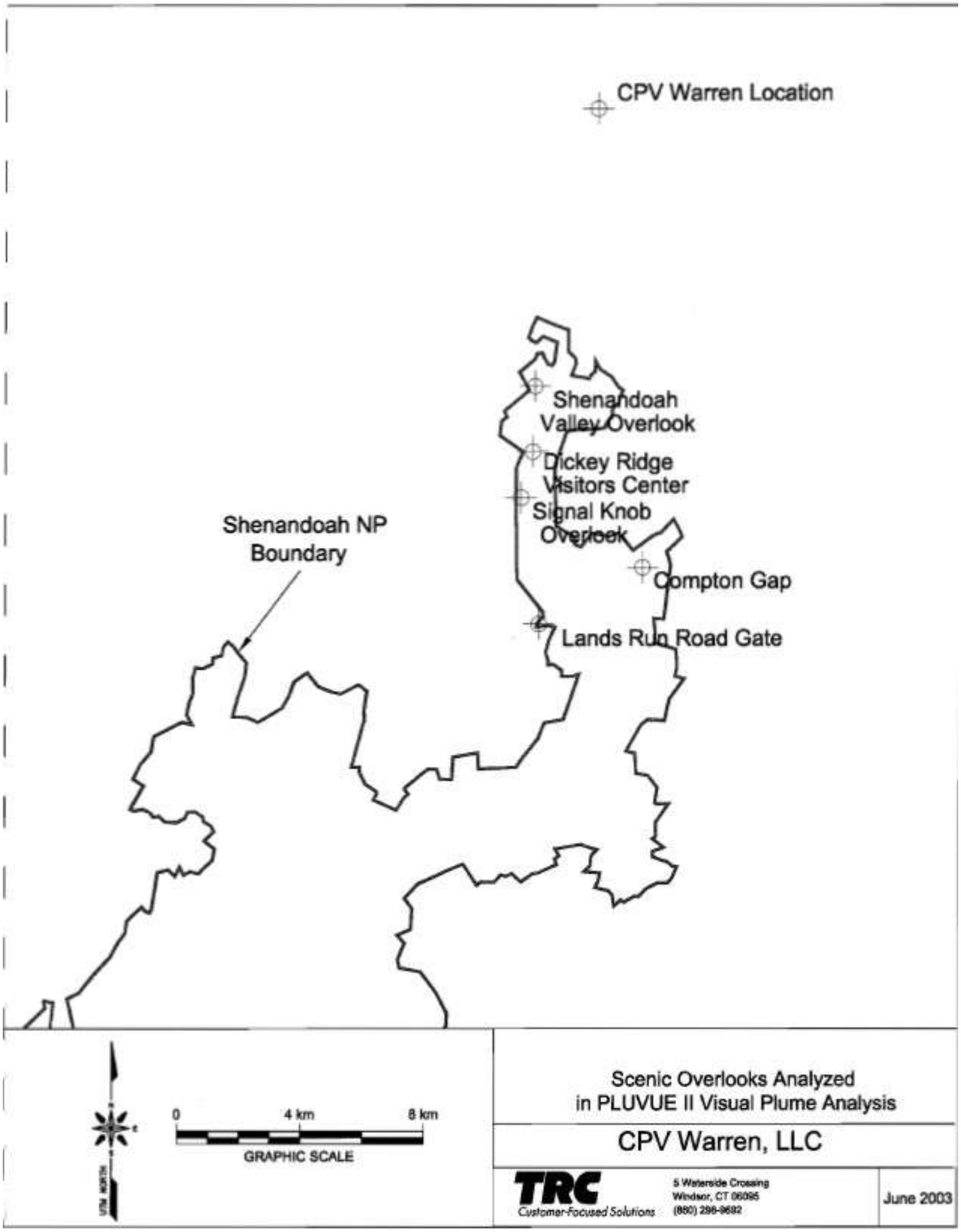


Figure 8-5 Lines of Sight for Shenandoah Valley Overlook

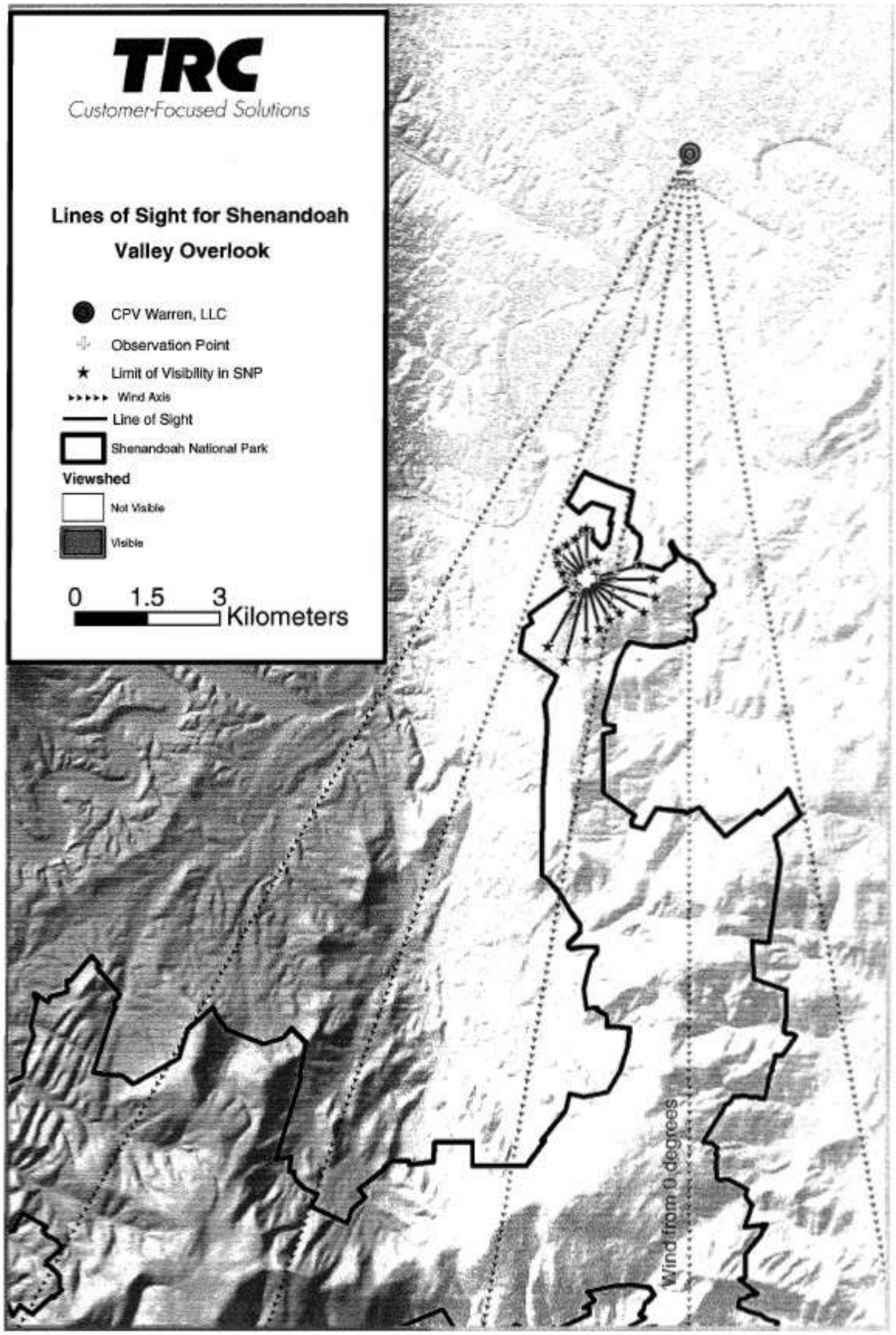


Figure 8-6 Lines of Sight for Dickey Ridge Visitor Center

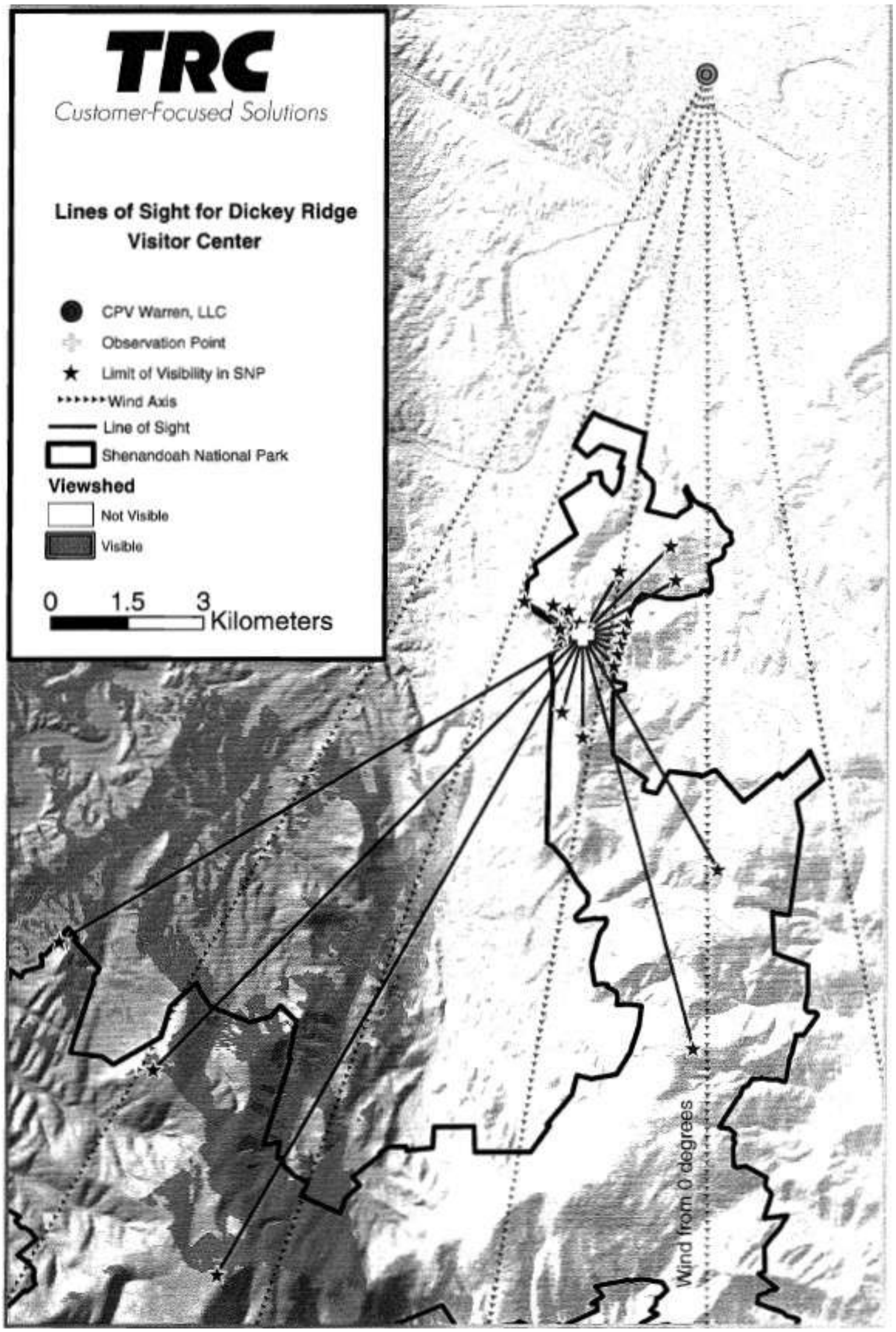


Figure 8-7 Lines of Sight for Signal Knob

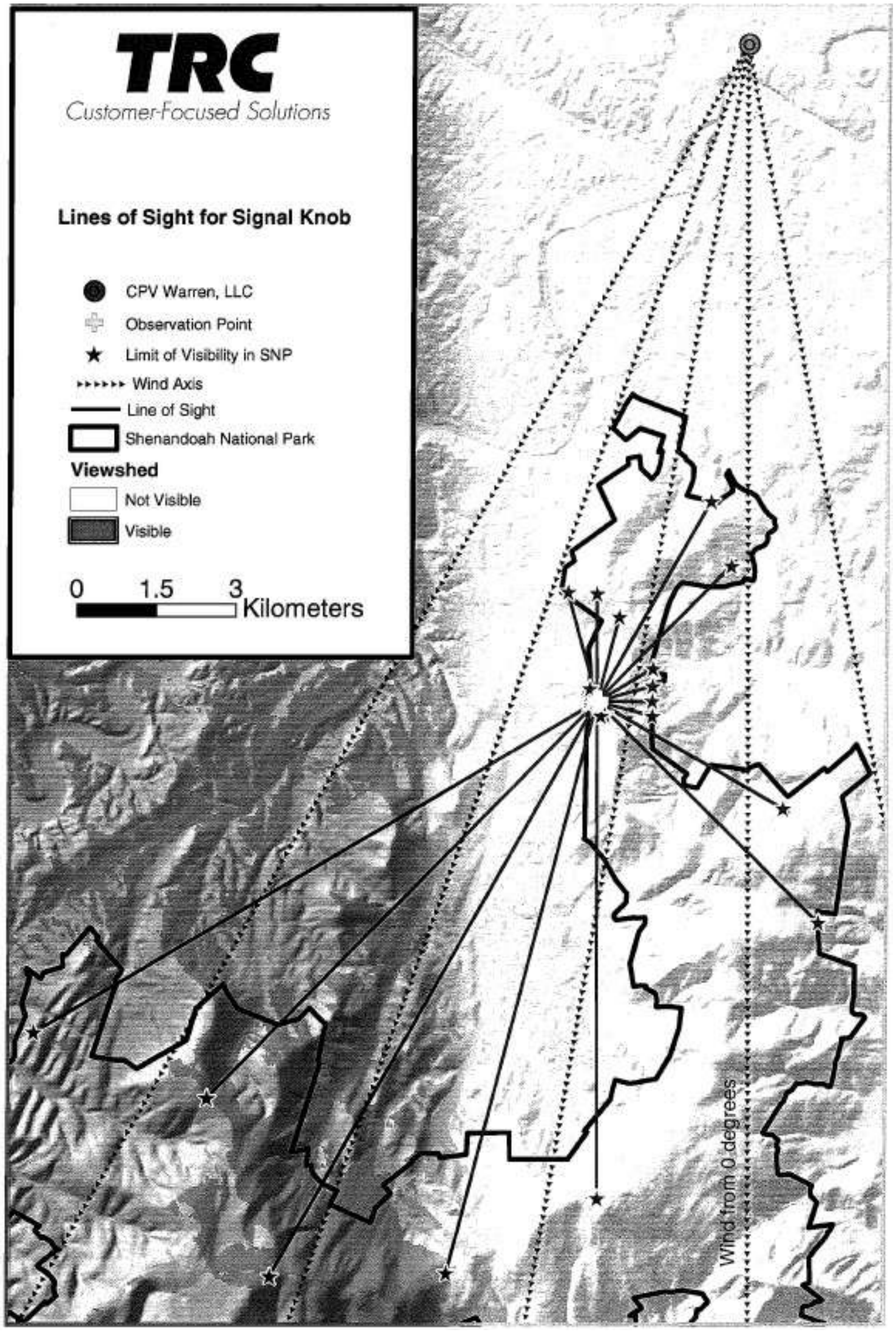


Figure 8-8 Lines of Sight for Compton Gap

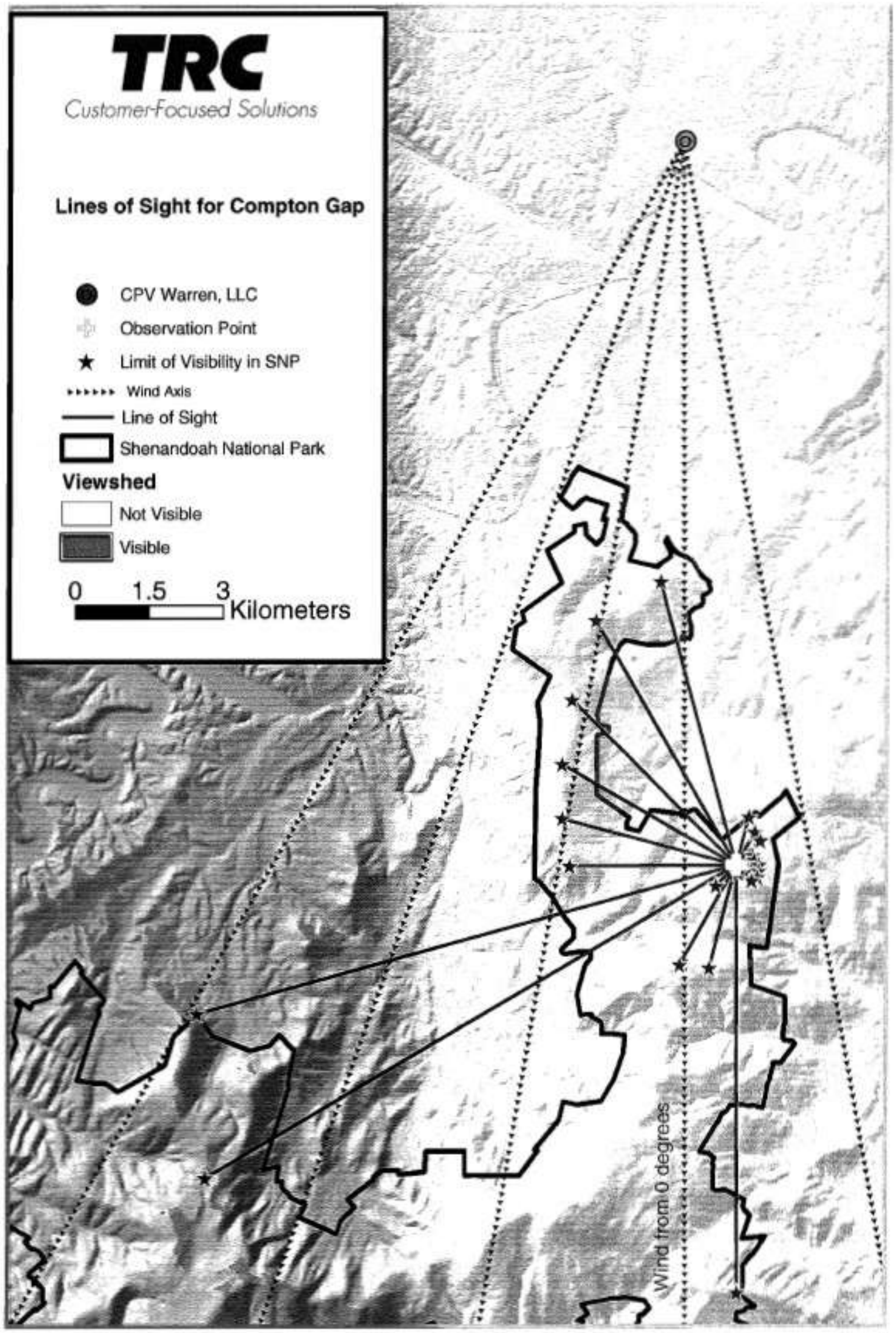


Figure 8-9 Lines of Sight for Lands Run Road Gate

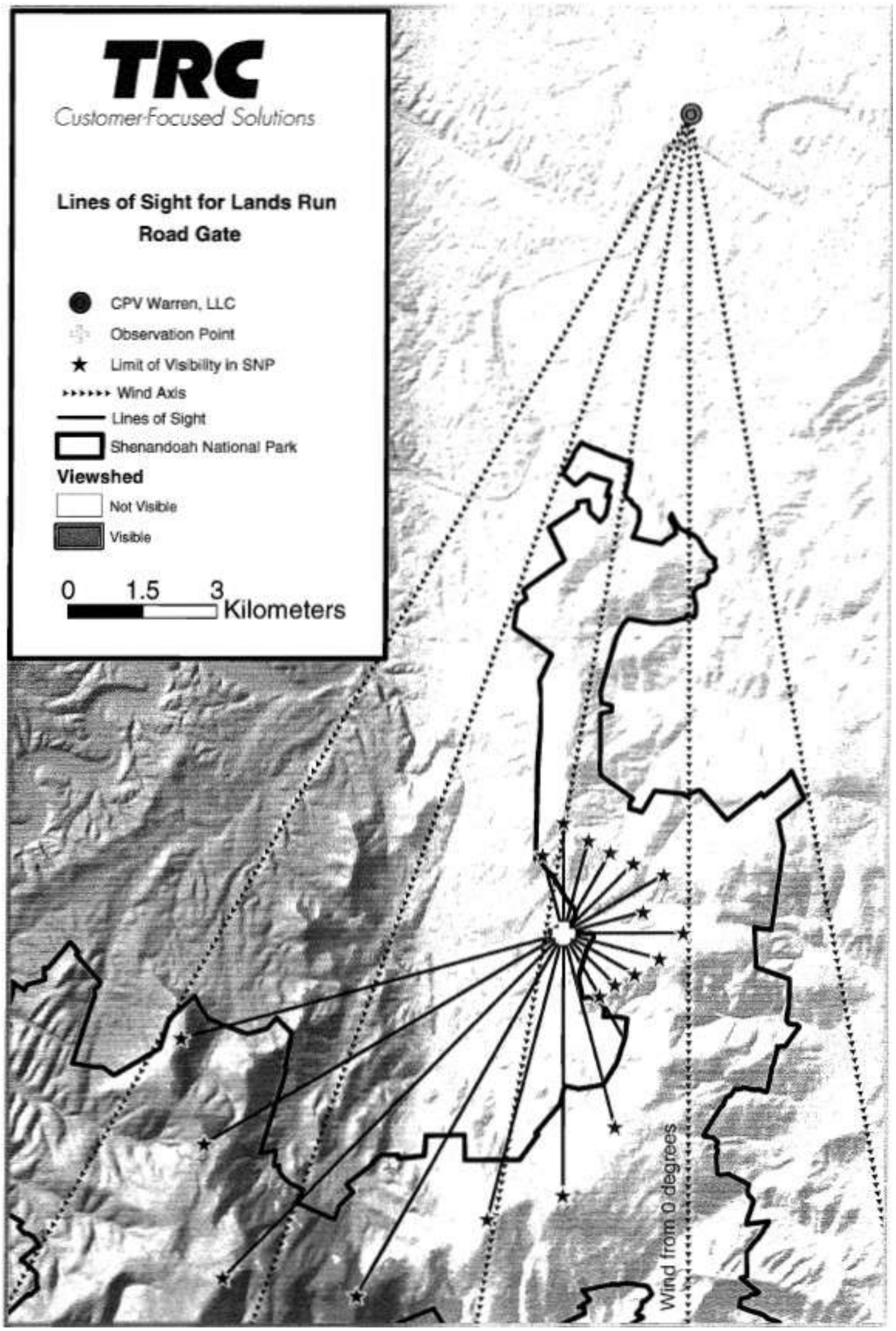


Table 8-8 Number of Excursion Hours for Each Viewpoint Using FLAG Visibility Thresholds

Predicted Number of Excursion Hours over 5 Years (at least one visibility parameter exceeding significance threshold) 3 Gas-Fired Turbines (Mitsubishi Turbine Option)						
Wind from (degrees) -->	**0**	**10**	**20**	**30**	**Total**	**Percentage of Daytime Hours (%)**
Shenandoah Valley Overlook	5	(1)	(1)	0	5	0.02%
Dickey Ridge	94	(1)	(1)	0	94	0.43%
Signal Knob Overlook	99	(1)	(1)	16	115	0.52%
Compton Gap Road	(1)	32	16	2	50	0.23%
Lands Run Road Gate	(1)	(1)	26	0	26	0.12%
(1) Indicates that results for the given wind direction and viewpoint were not taken into account because the viewpoint is within 10° of the downwind axis of the source.						

Table 8-9 Distribution of Excursion Hours for |C| and ΔE

Predicted Number of Excursion Hours over 5 Years (|C| or ΔE for sky or terrain exceeding significance threshold) 3 Gas-Fired Turbines (Mitsubishi Turbine Option)											
Observation Point -->	**Compton Gap Road**			**Dickey Ridge**		**Signal Knob Overlook**		**Lands Run**		**Shenandoah Valley Overlook**	
Wind from degrees/north -->	**10**	**20**	**30**	**0**	**30**	**0**	**30**	**20**	**30**	**0**	**30**
Hours with Contrast Excursions											
Sky Background	3	0	0	2	0	3	0	5	0	5	0
Terrain Background	32	16	2	94	0	99	16	26	0	0	0
Contrast Total	32	16	2	94	0	99	16	26	0	5	0
Hours with delta E Excursions											
Sky Background	0	0	0	7	0	9	0	5	0	4	0
Terrain Background	15	5	1	22	0	36	11	15	0	0	0
Delta E Total	15	5	1	25	0	36	11	16	0	4	0
Total Excursion Hours	32	16	2	94	0	99	16	26	0	5	0

Table 8-10 Refined Number of Excursion Hours for Each Viewpoint Accounting for Realistic Visibility Parameter Thresholds

Predicted Number of Excursion Hours over 5 Years based on the Apparent Plume Width (at least one visibility parameter exceeding significance threshold) 3 Gas-Fired Turbines (Mitsubishi Turbine Option)						
Wind from (degrees) -->	**0**	**10**	**20**	**30**	**Total**	**Percentage of Daytime Hours (%)**
Shenandoah Valley Overlook	3	(1)	(1)	0	3	0.01%
Dickey Ridge	16	(1)	(1)	0	16	0.07%
Signal Knob Overlook	27	(1)	(1)	2	29	0.13%
Compton Gap Road	(1)	13	4	0	17	0.08%
Lands Run Road Gate	(1)	(1)	8	0	8	0.04%
(1) Indicates that results for the given wind direction and view point were not taken into account because the view point is within 10° of the downwind axis of the source.						

8.6 Acidic Deposition Analysis

The results of the Tier 1 deposition analysis for sulfur resulted in a low impact of about 0.008 kg/ha-yr, less than the Analysis Threshold (DAT) of 0.01 kg/ha-yr for the Eastern United States. The results of the Tier 1 acidic deposition analysis for nitrogen resulted in higher impacts, as expected, because NO_x emission rates are much greater than SO_2. The peak AERMOD impacts are relatively close to the source (within an hour's transport), but the conversion rate of NO_2 to nitric acid is only a few percent. The Tier 2 analysis resulted in a peak nitrogen deposition rate of about 0.04 kg/ha-yr, which is about 4 times the screening nitrogen DAT of 0.01 kg/ha-yr for the Eastern United States. As discussed below, the area covered by this peak deposition rate is quite small.

An important study[4] of the sensitivity of Shenandoah National Park ("SHEN") to acid deposition published by the National Park Service in 2006 facilitates the interpretation of the results of the acidic deposition analysis. This study, which is available at http://www.nps.gov/nero/science/FINAL/SHEN_acid_dep/SHEN_acid_dep.htm, indicates that the northern portion of Shenandoah National Park where the modeled nitrogen deposition is greatest may be less sensitive to acid than the central and southern portions of the park. The key excerpts from this study follow:

> Four categories of concern were adopted for soil and surface water conditions in SHEN: 1) *Low Concern*; 2) *Moderate Concern*; 3) *Elevated Concern*; and 4) *Acute Concern*. While the same category names were used for maps of adverse effects on both surface water and soils, the biological effects for each category are specific to either aquatic or terrestrial ecosystems.
>
> Concern for Adverse Effects of Acid Deposition on Aquatic Ecosystems in Shenandoah National Park

[4] Cosby, B.J., J.R. Webb, J.N. Galloway, and F. A. Deviney, 2006. Acidic Deposition Impacts on Natural Resources in Shenandoah National Park. Technical Report NPS/NER/NRTR—2006/066. Available at http://www.nps.gov/nero/science/FINAL/SHEN_acid_dep/SHEN_acid_dep.htm.

The categories of concern for surface water conditions are based on stream water Acid Neutralizing Capacity (ANC) and include a number of observed effects for a number of aquatic organisms in SHEN.

Low Concern. (Average ANC greater than 100 µeq/L). Reproducing brook trout populations expected where habitat is suitable. Fish species richness probably unaffected. Diversity and/or evenness of aquatic macroinvertebrate communities unaffected. Number of families and/or number of individuals of aquatic insects unaffected.

Moderate Concern. (Average ANC in the range 50–100 µeq/L). Reproducing brook trout populations expected where habitat is suitable. Fish species richness much reduced. Diversity and/or evenness of aquatic macroinvertebrate communities begin to decline. Number of families and/or number of individuals of aquatic insects begin to decline.

Elevated Concern. (Average ANC in the range 0–50 µeq/L). Brook trout populations sensitive and variable, lethal and sub-lethal effects possible. Fish species richness much reduced. Diversity and/or evenness of macroinvertebrate communities decline markedly. Number of families of aquatic insects declines markedly. Number of individuals in most aquatic insect families declines markedly. Number of individuals of acidophilic aquatic insect families increases sharply.

Acute Concern. (Average ANC less than 0 µeq/ L). Lethal effects on brook trout populations probable. Complete extirpation of fish populations expected (species richness equal zero). Extremely low diversity and/or evenness of aquatic macroinvertebrates communities. Extremely reduced number of families of aquatic insects. Extremely reduced numbers of individuals of most aquatic insect families. Large numbers of individuals of acidophilic aquatic insect families.

The categories of concern for soils are somewhat problematic in that direct observations of adverse effects of acidification are lacking in SHEN for terrestrial organisms. Nonetheless, there exist strong correlations between soil base saturation (BS) and measures of base cation availability for both forests and streams in SHEN. Because the relationships for effects of soil acidification are weaker than for surface waters, the expected effects for each category are less specific than for surface waters, but nonetheless represent best current knowledge.

Low Concern. (Average soil BS greater than 20%). No effects. Base cation availability for forests and surface waters not affected.

Moderate Concern. (Average soil BS in the range 10–20%). Moderate effects probable. Base cation availability for forests reduced and forest growth probably slowed. Base cation availability for surface waters reduced and moderate effects on aquatic biota expected (lowered stream water ANC).

Elevated Concern. (Average soil BS in the range 5–10%). Moderate effects certain and severe effects probable. Base cation availability for forests greatly reduced with resultant risk of mortality from various stresses (particularly if the base saturation was previously above 10% during the life of the tree). Base cation availability for surface waters greatly reduced producing sharp declines in stream water ANC (particularly during storm events) and resultant moderate to severe effects on stream water biota.

Acute Concern. (Average soil BS less than 5%). Severe effects certain. High risk of forest

mortality from various stresses including direct- acidification effects on roots and seedlings. Surface water ANC's are likely to be in the range of severe biological effects (certainly episodically and perhaps chronically).

Stream water ANC, pH, and base cation concentrations in SHEN are strongly correlated with bedrock geology. SHEN landscape includes three major bedrock types, siliceous (quartzite and sandstone), felsic (granitic), and mafic (basaltic).

Sulfate is the major strong-acid anion present in most SHEN streams. Nitrate concentrations are generally negligible, except in association with forest defoliation by the gypsy moth.

The three bedrock classes are mapped in Figure 8-10 (Figure 1.2 in the NPS report), and the figure shows that the northern portion of the park features mafic bedrock, which is the least susceptible to acidification effects.

Figures 8-11 and 8-12 show the areas of concern in Shenandoah National Park for acidification effects upon stream conditions and soils, respectively. These figures indicate that for areas in SHEN within 14 km of the proposed project, there is "low concern" for acidification effects on streams and soils. Beyond 14 km, there is a "moderate concern" for acidification effects.

Figures 8-13 and 8-14 show that the peak AERMOD NO_2 prediction occurs at a distance of about 9 km from the proposed project site, and that the predicted concentration drops off substantially at a distance of 14 km, such that the Tier 2 deposition analysis would indicate predicted nitrate deposition below the DAT. Therefore, we conclude that the project's nitrogen deposition effects will not adversely affect the Shenandoah National Park.

Figure 8-10 Watersheds in Shenandoah National Park in Relation to Major Bedrock Classes

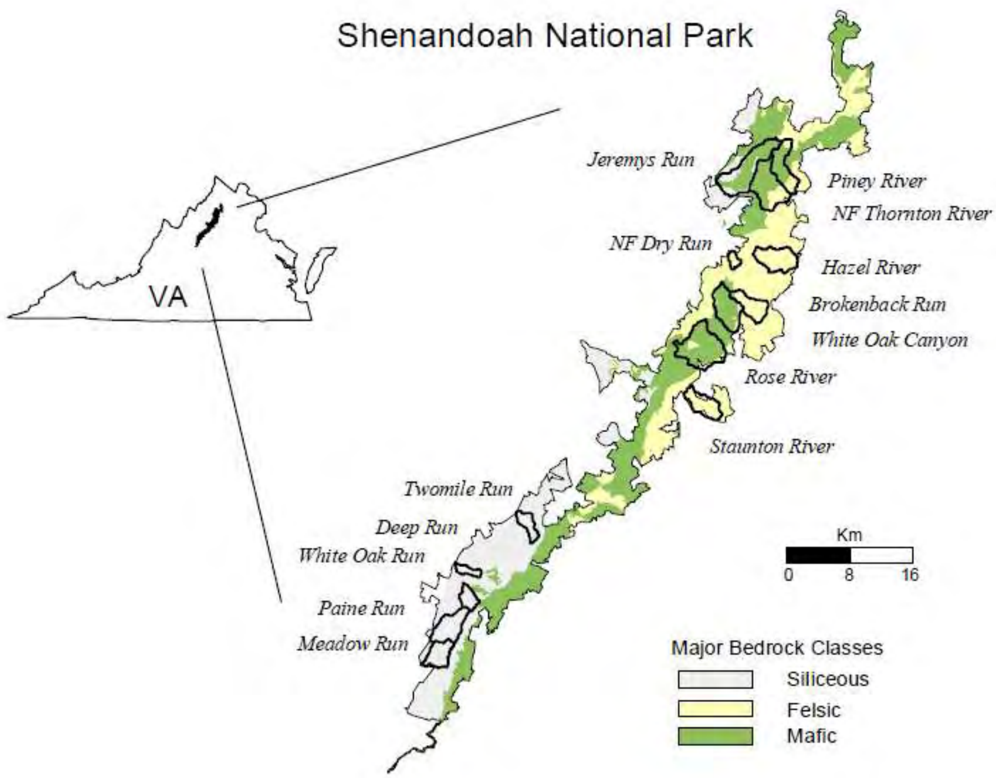


Figure 8-11 Areas of Concern for Adverse Effects from Acidic Deposition on Surface Water Conditions in Shenandoah National Park

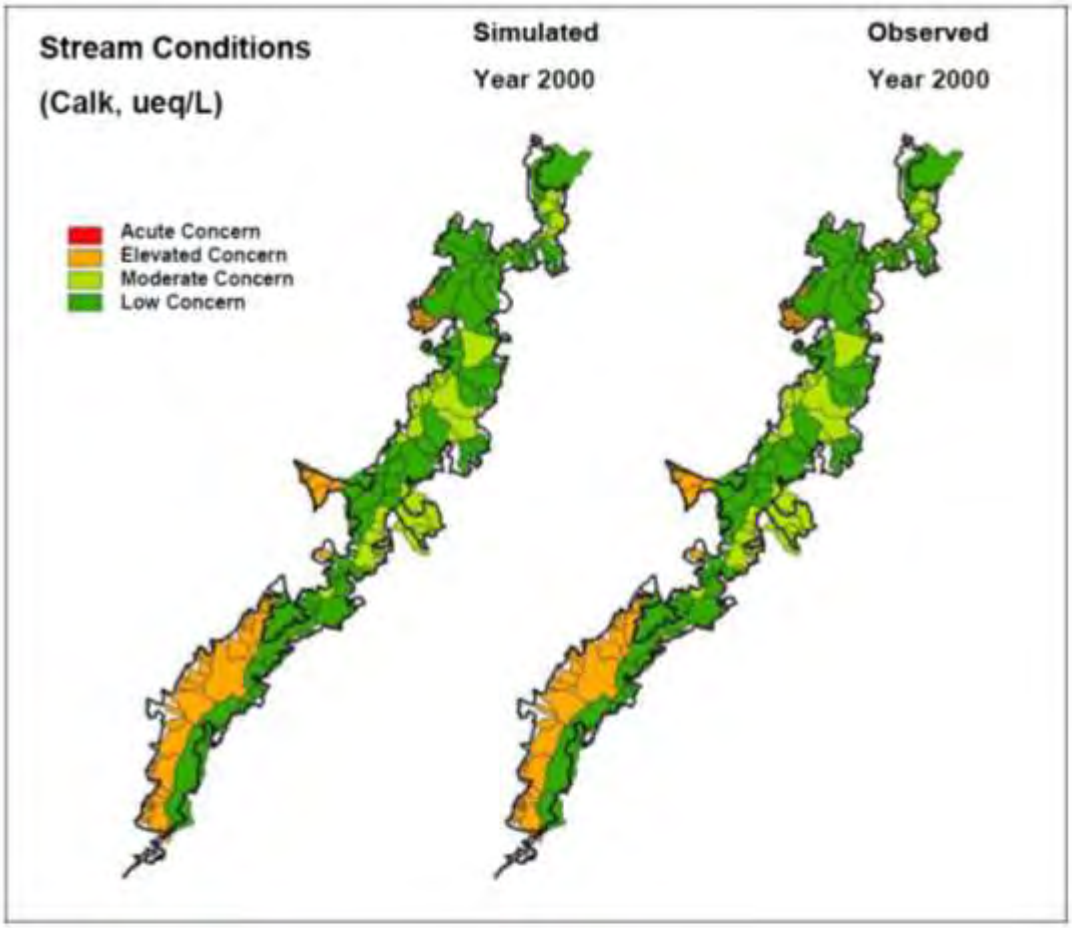


Figure 8-12 Areas of Concern for Adverse Effects from Acidic Deposition on Soil Conditions in Shenandoah National Park

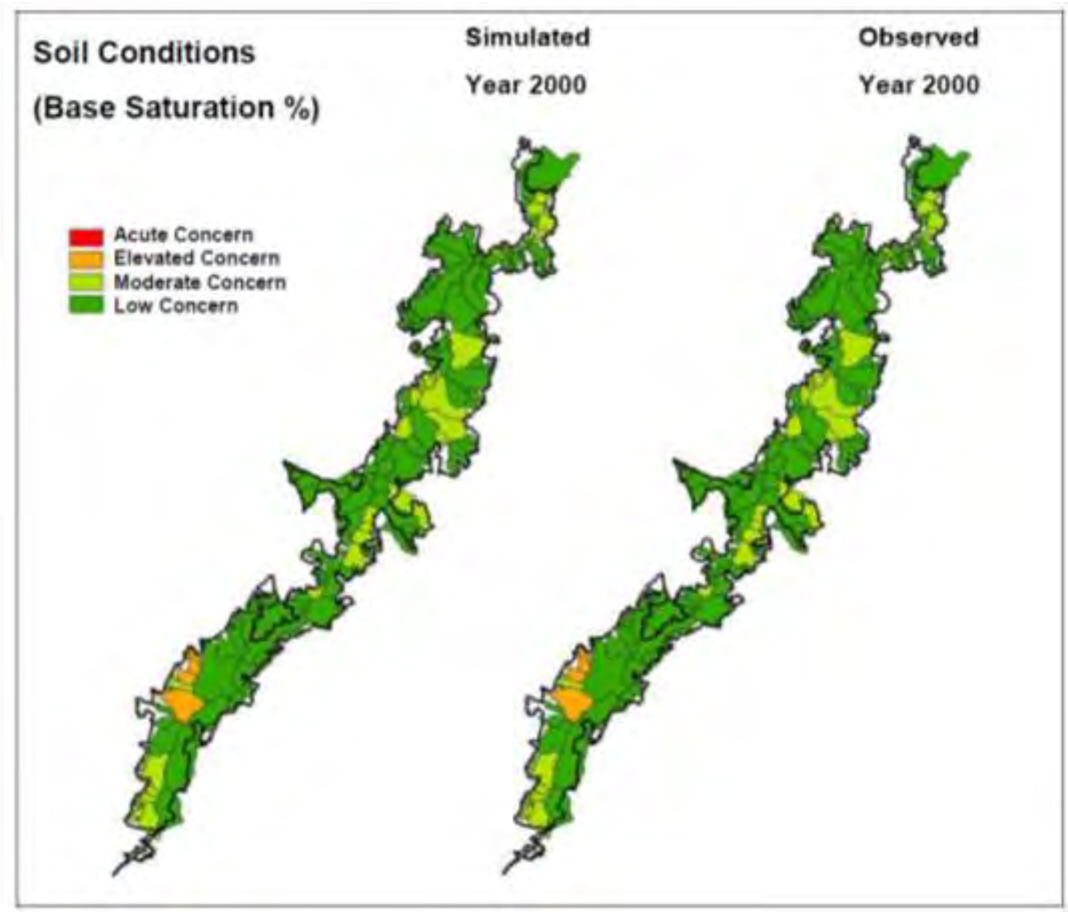


Figure 8-13 Isopleths of Annual NO_2 Concentrations Predicted for the Proposed Project Emissions

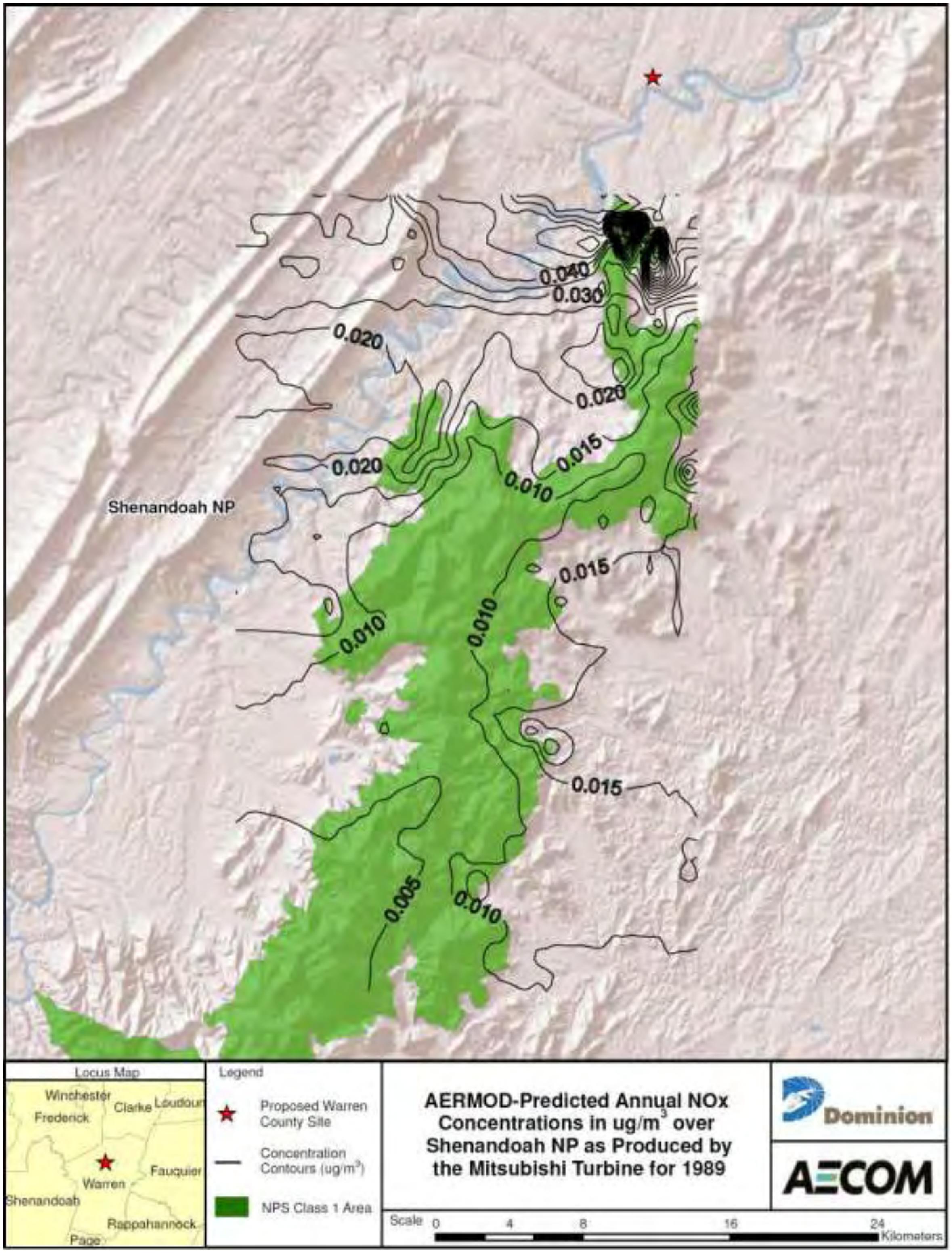
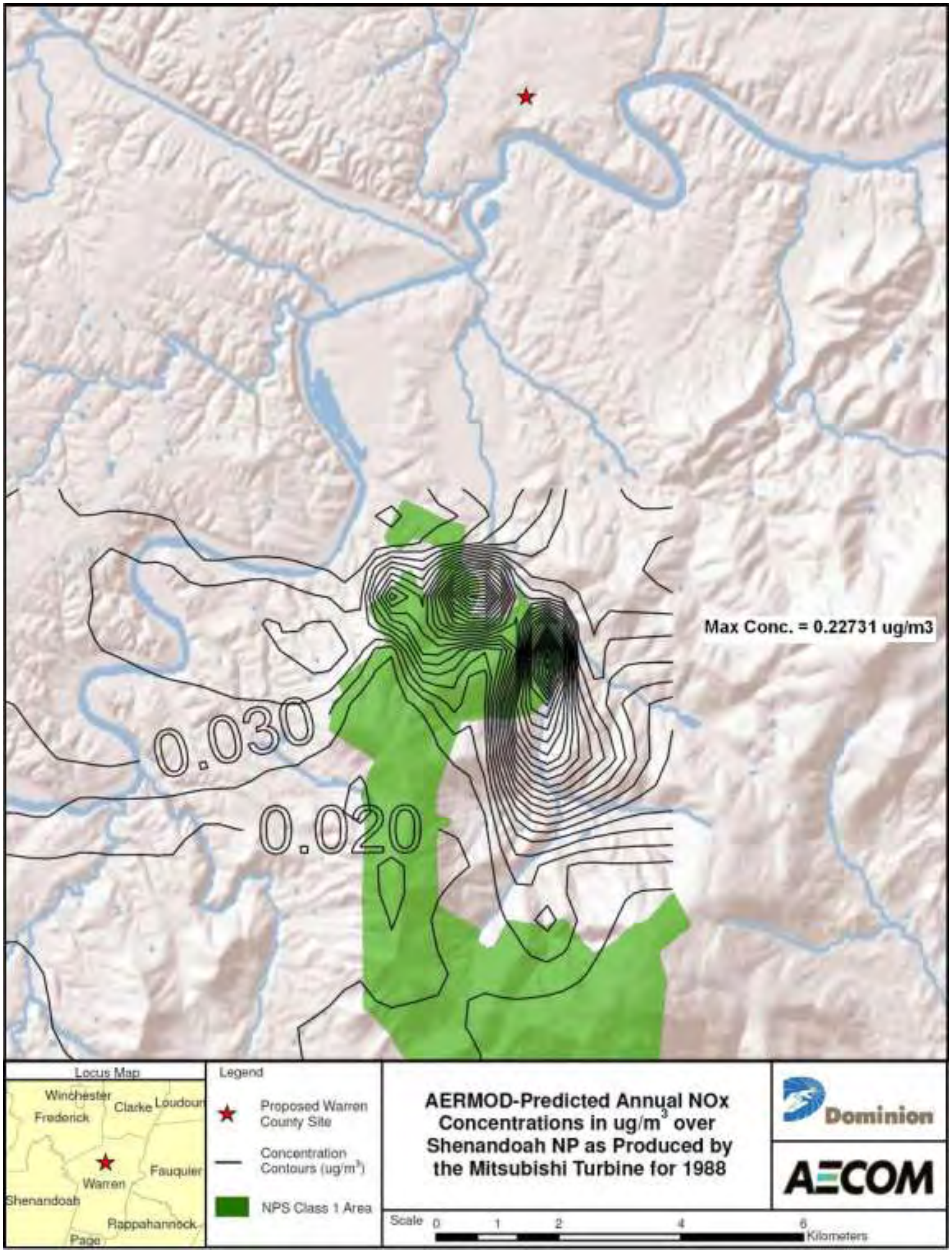


Figure 8-14 Zoomed in Version of the Isopleths of Annual NO_2 Concentrations Predicted for the Proposed Project Emissions



8.7 Summary of Class I Area Assessment

The AERMOD modeling of project emissions of NO_2 and PM_{10} indicate that the Project will have a significant impact within Shenandoah National Park for these two pollutants. Therefore, a cumulative modeling analysis was conducted, using a background source inventory provided by Virginia and West Virginia. The results of the cumulative modeling will be provided in an addendum to this analysis.

Plume visibility modeling using PLUVUE II, conducted with procedures consistent with those used in previous permitting, indicated that the likelihood of visible plumes is insignificant, well less than a one percent probability for each observer point.

Acidic deposition results for nitrogen indicate that there is a limited area for which the deposition exceeds the screening thresholds. However, in that area, the stream and soil conditions are of "low concern" for acidification effects. Therefore, we conclude that the potential nitrogen deposition effects will not be adverse.

9.0 Other Air Quality Issues

The preceding sections of the PSD permit application have focused on demonstrating that the proposed facility will incorporate Best Available Control Technology and will not have significant criteria pollutant air quality impacts in Class II areas. PSD regulations also require review of additional air quality items as part of an application for a permit to construct. The following section discusses considerations of impacts that could result from the proposed project with respect to the following:

- Associated Growth
- Vegetation and Soils
- Toxic Air Pollutant Analysis

9.1 Associated Growth

A growth analysis examines the potential emissions from secondary sources associated with the proposed project. While these activities are not directly involved in project operation, the emissions involve those that can reasonably be expected to occur; for instance, industrial, commercial, and residential growth that will occur in the Project area due to the Project itself. Secondary emissions do not include any emissions which come directly from a mobile source, such as emissions from the tailpipe of any on-road motor vehicle or the propulsion of a train (USEPA 1990). They also do not include sources that do not impact the same general area as the source under review.

The work force expected for the Project will range from 400 to 600 jobs during various phases of construction. It is expected that a significant regional construction force is already available to build the Project. Therefore, it is expected that no new housing, commercial or industrial construction will be necessary to support the Project during the two-year construction schedule. The Project will also require approximately 20 to 25 permanent positions. Individuals that already live in the region will perform a number of these jobs. For any new personnel moving to the area, no new housing requirements are expected. Further, due to the small number of new individuals expected to move onto the area to support the Project and existence of some commercial activity in the area, new commercial construction will not be necessary to support the Project's permanent work force. In addition, no significant level of industrial related support will be necessary for the Project, thus industrial growth is not expected.

Based on the growth expectations above, no new significant emissions from secondary growth during Project construction and operation are anticipated.

9.2 Vegetation and Soils

The screening methodology provided in the EPA's guidance document for soils and vegetation, "*A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals (EPA 450/2-81-078)",* was supplemented with a more robust soils and vegetation analysis for the proposed project.

Vegetation Analysis

As an indication of whether emissions from the proposed project will significantly impact the surrounding vegetation (i.e., cause acute or chronic exposure to each evaluated pollutant), the modeled emission concentrations were compared against both a range of injury thresholds found in various peer-reviewed research articles that specifically examine effects of different pollutants on vegetation as well as established National Ambient Air Quality Standard (NAAQS) secondary standards. Since the NAAQS secondary standards were set to protect public welfare, including protection against damage to crops and vegetation, comparing the modeled emissions to these standards provides an indication as to whether potential impacts are likely to be significant. However, given that secondary standards for some criteria pollutants are under review, comparison to the secondary NAAQS may not be definitive. Contribution to the deposition of nitrogen (N) in the Shenandoah National Park was discussed in Section 8.6.

For the vegetation analysis, modeled concentrations of NO_x, PM_{10}, and CO were compared against the vegetation sensitivity thresholds listed in the aforementioned 1980 EPA guidance, secondary NAAQS, and plant injury thresholds found in the literature. Table 9-1 illustrates injury threshold ranges determined through a review of readily available research. The same meteorological data and Cartesian grid (20-km extent) as described in Section 6 was used for the vegetation analysis. Please not e that the receptor grid was not refined for any criteria pollutant for the vegetation analysis. As shown in Table 9-2, the results clearly indicate that no adverse impacts will occur to sensitive vegetation as a result of operation of the proposed project. In Section 8.6, the N deposition fluxes resulting from the proposed project were evaluated.

Table 9-1 Injury Threshold for Vegetation

Pollutants	**Injury Threshold (Dose) ($\mu g/m^3$) (1)**	**NAAQS ($\mu g/m^3$)**	**EPA's 1980 Screening Concentration ($\mu g/ m^3$) (2)**
NO_x (as NO_2)	940 (1 hour) 280 (annual)	100 (annual)	94 (annual)
			3,760 (4 hour)
			564 (1 month)
PM (as PM_{10})	See NAAQS	150 (24 hour)	None
		50 (annual; revoked in 2006 but retained for this analysis)	
CO	None		1,800,000 (weekly)

(1) Values, suggested in the Spiritwood Station PSD permit application; see http://www.greatriverenergy.com/makingelectricity/newprojects/spiritwood_applicationsandreports.html
(2) "A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals". EPA 450/2-81-078, December 1980

Table 9-2 Comparison to EPA Criteria for Gaseous Pollutant Impacts on Natural Vegetation and Crops

Pollutant	Averaging Period	Maximum Impact of Proposed Facility ($\mu g/m^3$)	Minimum Impact Level for Effects On Sensitive Plants ($\mu g/m^3$) (1)
NO_X	1-hour	607.13	940
	4-hour	113.74	3,760
	1-month	1.12	564
	Annual	0.62	94
PM_{10}	24-Hour	5.00	150
	Annual	0.41	50
CO	1-week(2)	8.89	1,800,000

(1) Minimum Impact is the lowest threshold found in Table 9-1.
(2) 24-hour average used to conservatively represent 1 week average impact.

Soil assessment

To determine whether the Project emissions could adversely affect the soil in the vicinity of the Project, the type of soil surrounding the Project site was reviewed. The soil type was determined from data collected from the U.S. Department of Agriculture, National Resource Conservation Service's (NRCS), Soil Survey Geographic (SSGUGO) database[5] and the NRCS Web Soil Survey tool[6]. In addition, descriptions of soil type within Shenandoah National Park from the National Park Service's Technical Report, *Acidic Deposition Impacts on Natural Resources in Shenandoah National Park*, were reviewed. Aside from Shenandoah National Park, soil types within adjacent Warren, Clarke, Frederick and Shenandoah Counties were examined. Our evaluation indicates that for Warren County, the predominant soil types are a variety of silt and stony loams. In Clarke County, the predominate soil types are a mixture of silt and sandy loams and rocky outcrops with Frederick County containing a mixture of silt and gravely/cobbly loams with some areas of fine sandy loams. In Shenandoah County, the predominate soil types are also a mixture of silt, clay, cobbly and sandy loams. Finally, our evaluation indicates that the Shenandoah National Park contains a variety of silt and sandy loams, along with colluvial fans, talus deposits, and exposed rock. Soils in the park

[5] U.S. Department of Agriculture, National Resource Conservation Service's (NRCS), Soil Survey Geographic (SSGUGO) database . Accessed 17 December 2009. http://soils.usda.gov/survey/geography/ssurgo/

[6] U.S. Department of Agriculture, National Resource Conservation Service's Web Soil Survey Tool. Accessed 17 December 2009. http://weboilsurvey.nrcs.usda.gov/app/HomePage.htm

originate predominately from the weathering of bedrock or the transport of weathered material from upslope material.

The most important aspect of the Project's impact upon soils is the effect of acidic deposition, as discussed in Section 8.6. That discussion indicates that the type of bedrock in the northern portion of the Shenandoah National Park is of relatively low concern to the National Park Service for acidic effects.

An area of approximately 10,000 acres in size comprising the northern portion of the Shenandoah National Park using the NRCS Web Soil Survey tool (see Figure 9-1) shows that the area is predominately composed of silt and silt-clay loam. Silt and clay loams are considered to have a moderate to high buffering capacity, thus having a higher capacity to absorb acidic deposition without changing the soil pH.[7] A similar sized area of interest centering around the proposed project site indicates soil composition similar to what was found in the area around the northern reaches of the Shenandoah National Park. Predominate soil type is silt loam, with areas of rock outcrops. A comparison of soil types within the Shenandoah National Park area of interest and the project site is provided in Table 9-3. Given the relatively low emissions due to the proposed project, and because the soil types immediately around the proposed project site and within the northern reaches of the Shenandoah National Park (where the NPS report indicates areas of low concern regarding soil) are similar, no adverse impacts on soils due to Project emissions are anticipated.

[7] Murphy, Stephanie Ph.D., Rutgers Soil Testing Laboratory, New Jersey Agricultural Experiment Station. "Soil pH and Lime Requirements for Home Grounds Plantings".

Figure 9-1 Soil Evaluation Areas of Interest

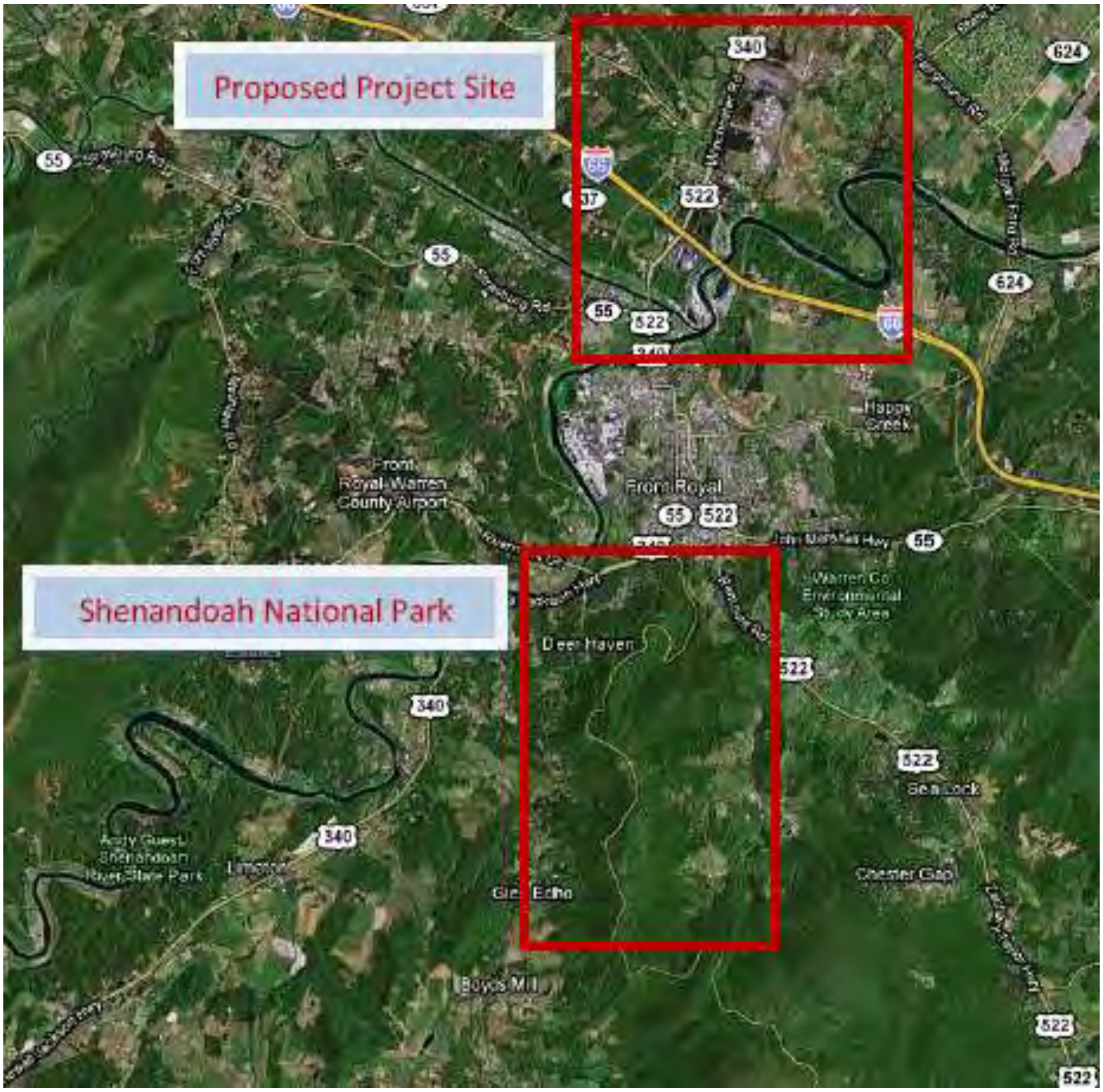


Table 9-3 Buffering Capacity of Soils Around Project Site and Northern Shenandoah National Park

	Project Site (% in area of interest)	Shenandoah National Park (% in area of interest)
High and Moderate Buffering Capacity Soils	**94.1**	**95**
High Buffer Capacity (Clay Loams)		
Silty clay loam	7.3	30.9
TOTAL	**7.3**	**30.9**
Moderate Buffer Capacity (Sandy Loam, Loam, Silt Loam)		
Silt loam	77	46.8
Sandy loam	5.2	1.5
Loam	4.6	15.8
TOTAL	**86.8**	**64.1**
Low Buffer Capacity (Sand, Loamy Sand)		
Loamy sand	0.5	0
Cobbly loam	0	4.4
TOTAL	**0.5**	**4.4**
Other		
Pits, quarries, dumps, and water	5.4	0.4
TOTAL	**5.4**	**0.4**

9.3 Toxic Pollutant Analysis

In addition to predicting the ambient air concentrations of criteria pollutants, the concentrations of other pollutants from the Warren County Project emission sources regulated under VA DEQ air toxics program were evaluated.

Table 9-4 contains a listing of the potential emissions of HAP pollutants for the proposed Project. The emissions were estimated using emission factors (AP-42) and vendor data. In addition to the potential emission listing, the exemption levels for each pollutant are also listed in Table 9-4.

As shown in Table 9-4, all HAPS are exempt except for Acrolein, Cadmium, Chromium, Nickel and Formaldehyde. The same set of meteorological data and Cartesian grid (20-km extent) as described in Section 6 was used for the toxics analysis as well. Please note that the receptor grid was not refined for the toxic analysis as with the criteria pollutant analysis. The HAPs were modeled with the worst-case emission rate across all operating loads and impacts were compared to the VA DEQ State Ambient Air Concentrations (SAAC) presented in Table 9-5.

Table 9-4 Summary of HAP Emission Rates and VA DEQ Exemption Levels

Pollutant	Total HAP Emissions		Virginia Air Toxics Exemption Levels		Exempt? (hourly)	Exempt? (annual)
	Maximum Hourly (lb/hr)	Annual (tpy)	Maximum Hourly (lb/hr)	Annual (tpy)	Yes/No	Yes/No
1,3-Butadiene	2.79E-03	1.19E-02	1.452	3.19	Yes	Yes
2-Methylnaphthalene	2.80E-05	8.86E-05	-	-	Yes	Yes
3-Methylchloranthrene	2.10E-06	6.64E-06	-	-	Yes	Yes
7,12-Dimethylbenz(a)anthracene	1.87E-05	5.90E-05	-	-	Yes	Yes
Acenaphthene	8.45E-05	2.72E-05	-	-	Yes	Yes
Acenaphthylene	1.70E-04	4.86E-05	-	-	Yes	Yes
Acetaldehyde	2.54E-01	1.10E+00	8.91	26.1	Yes	Yes
Acrolein	4.06E-02	1.76E-01	0.02277	0.03335	No	No
Anthracene	2.79E-05	1.51E-05	-	-	Yes	Yes
Benz(a)anthracene	1.65E-05	1.02E-05	-	-	Yes	Yes
Benzene	9.32E-02	3.42E-01	2.112	4.64	Yes	Yes
Benzo(a)pyrene	6.18E-06	5.62E-06	-	-	Yes	Yes
Benzo(b)flouoranthene	2.11E-05	1.14E-05	-	-	Yes	Yes
Benzo(g,h,I)perylene	1.08E-05	6.78E-06	-	-	Yes	Yes
Benzo(k)fluoranthene	6.14E-06	7.65E-06	-	-	Yes	Yes
Chrysene	2.88E-05	1.33E-05	-	-	Yes	Yes
Dibenzo(a,h)anthracene	8.59E-06	6.23E-06	-	-	Yes	Yes
Dichlorobenzene	1.40E-03	4.43E-03	21.813	65.395	Yes	Yes
Ethylbenzene	2.01E-01	8.82E-01	17.919	62.93	Yes	Yes
Fluoranthene	8.91E-05	3.25E-05	-	-	Yes	Yes
Fluorene	2.87E-04	8.12E-05	-	-	Yes	Yes
Formaldehyde (g)	1.48E+00	6.34E+00	0.0825	0.174	No	No
Hexane	2.10E+00	6.64E+00	11.616	25.52	Yes	Yes
Indeno(1,2,3-cd)pyrene	9.96E-06	8.61E-06	-	-	Yes	Yes
Naphthalene	1.13E-02	3.87E-02	2.607	7.54	Yes	Yes
PAHs	1.38E-02	6.06E-02	-	-	Yes	Yes

Pollutant	Total HAP Emissions		Virginia Air Toxics Exemption Levels		Exempt? (hourly)	Exempt? (annual)
	Maximum Hourly (lb/hr)	Annual (tpy)	Maximum Hourly (lb/hr)	Annual (tpy)	Yes/No	Yes/No
Phenanathrene	7.77E-04	2.52E-04	-	-	Yes	Yes
Propylene Oxide	1.82E-01	7.99E-01	3.168	6.96	Yes	Yes
Pyrene	7.95E-05	3.69E-05	-	-	Yes	Yes
Toluene	8.27E-01	3.60E+00	18.645	54.665	Yes	Yes
Xylene	4.07E-01	1.76E+00	21.483	62.93	Yes	Yes
Arsenic	2.08E-03	1.00E-03	0.0132	0.029	Yes	Yes
Beryllium	1.25E-04	6.02E-05	0.000132	0.00029	Yes	Yes
Cadmium	1.15E-02	5.51E-03	0.0033	0.00725	No	Yes
Chromium	1.46E-02	7.02E-03	0.0033	0.00725	No	Yes
Cobalt	8.75E-04	4.21E-04	0.0033	0.00725	Yes	Yes
Lead	5.21E-03	2.51E-03	0.0099	0.02175	Yes	Yes
Manganese	3.96E-03	1.91E-03	0.33	0.725	Yes	Yes
Mercury	2.71E-03	1.30E-03	0.0033	0.00725	Yes	Yes
Nickel	2.19E-02	1.05E-02	0.0066	0.0145	No	Yes
Selenium	2.50E-04	1.20E-04	0.0132	0.029	Yes	Yes

Table 9-5 Maximum Concentrations for Non-Exempt HAPs

HAP	Averaging period	Maximum Modeled Concentration (μg/m^3)	VA SAAC (μg/m^3)	Complies Yes/No
Acrolein	1 Hour	4.36E-02	17.25	Yes
	Annual	2.30E-04	0.46	Yes
Formaldehyde	1 Hour	1.58E+00	62.50	Yes
	Annual	9.25E-03	2.40	Yes
Cadmium	1 Hour	1.23E-02	2.50	Yes
Chromium	1 Hour	1.56E-02	2.50	Yes
Nickel	1 Hour	2.34E-02	5.00	Yes

10.0 $PM_{2.5}$ Modeling Analysis

10.1 Overview of Modeling Approach

EPA has not yet provided national guidance for modeling compliance with the $PM_{2.5}$ NAAQS. Until recently, EPA accepted modeled compliance with the PM_{10} NAAQS as a surrogate for indicating compliance with the $PM_{2.5}$ NAAQS, in accordance with a 1997 Office of Air Quality Planning and Standards memo that provided EPA guidance on this matter. However, recent rulings by EPA have resulted in revised guidance for permit applicants to attempt to address the issue of modeled compliance with the $PM_{2.5}$ NAAQS directly, even in the absence of EPA modeling guidance.

In response to a request from VA DEQ to propose an approach for modeling compliance with the $PM_{2.5}$ NAAQS, AECOM proposed a tiered approach. One key issue with demonstrating compliance with the $PM_{2.5}$ NAAQS is that background concentrations typically constitute a large fraction of the NAAQS, and are often much higher than the Project impacts. EPA modeling guidance in 40 CFR Part 51, Appendix W addresses situations where background concentrations are not dominant, and this guidance has not been updated to address the $PM_{2.5}$ NAAQS cases in which background concentrations are dominant. In fact, there is no substantial discussion in the EPA modeling guidance that addresses $PM_{2.5}$ modeling. One key issue is that the assumption of high background concentrations on every modeled day can result in false indications of potential modeled NAAQS violations.

Another modeling issue that is unresolved for compliance with the $PM_{2.5}$ NAAQS is that EPA has not yet defined the Significant Impact Levels (SILs) that are applicable for $PM_{2.5}$. These SILs are proposed in the September 21, 2007 Federal Register (72 FR 54139-54140), which also establishes the legal basis for SILs to determine whether a proposed source will cause or contribute to a NAAQS violation. Therefore, AECOM adopted the option with the overall lowest EPA-proposed values for both PSD Class I and II modeling in order to define the extent to which receptors need to be placed for cumulative modeling. Support for the use of the lowest proposed SIL comes from Mr. Dan DeRoeck of EPA, who indicated (2009) that the final EPA rule would have a SIL within the range of the proposed options. Therefore, the use of the lowest proposed SILs is a conservative approach. The SILs that were used for the permit application are the EPA-proposed Option 3 values of 1.2 $\mu g/m^3$ and 0.3 $\mu g/m^3$ for the daily and annual averages for PSD Class II modeling, and 0.07 $\mu g/m^3$ and 0.06 $\mu g/m^3$ for daily and annual averages for PSD Class I modeling. Cumulative NAAQS modeling was limited to those receptors for which the lowest proposed SILs were exceeded for modeling of the Project impacts alone.

10.2 $PM_{2.5}$ Significant Impact Level Analysis

10.2.1 $PM_{2.5}$ Significant Impact Analysis for Class II Areas

As mentioned earlier, AECOM conducted the analysis using the overall lowest EPA-proposed values for the PSD Class II modeling. The SILs that were used for the permit application are the EPA-proposed Option 3 values of 1.2 $\mu g/m^3$ and 0.3 $\mu g/m^3$ for the daily and annual averages for PSD Class II modeling.

The same methodology as used for the SIL Analysis of the criteria pollutants was used for the SIL Analysis of $PM_{2.5}$. The same set of meteorological data as used for the other criteria pollutants SIL Analysis was used for the $PM_{2.5}$ modeling analysis. However, the Class II receptor grid was extended farther than the other criteria pollutants grid to capture maximum extents.

The Class II grid consisted of receptors spaced 25 m apart along the fence line. A spacing of 50 m was used for the receptors beyond the fence line and extending out to 1 km from the fence line. Beyond 1 km from the fence line, a spacing of 100 m was used up to 2.5 km from the plant. Between 2.5 and 5 km, a spacing of 500 m was used. Between 5 and 10 km, a spacing of 1,000 m was used. Beyond 10 km, a spacing of 2000 m was used extending out to 25 km from the plant. No receptors within the Shenandoah National Park were included in the Class II analysis. Receptors with 1000-m spacing were placed at the boundary of the Class I Area extending out to 25 km. The receptor grid used in the modeling analysis was based on NAD 83 datum and in zone 17. The extent of this grid was sufficient to capture maximum impacts in the Class II area analysis. Figure 10-1 shows the far-field Cartesian receptor grid considered in the modeling analysis.

As discussed in the protocol, the receptor grid was refined around the receptor with the maximum concentration, if it was outside the 50-meter spacing grid. This was done to ascertain that none of the receptors with impacts potentially exceeding the SILs were missed. The maximum impacts for $PM_{2.5}$ annual were found to be within the 50-meter spacing and therefore, no refined receptors were added to the Cartesian grid. A 2-km by 2-km grid with 50-meter spacing receptors centered on the receptor with maximum impact for each year was added to the above-mentioned discrete Cartesian grid for the $PM_{2.5}$ 24-hour averaging period. Figure 10-2 shows the refined receptor grid considered for the $PM_{2.5}$ 24-hour modeling analysis.

The same methodology, as discussed for other criteria pollutants in Section 6, was followed for the startup/shutdown modeling analysis for $PM_{2.5}$ as well. The same receptor grid (20-km Cartesian grid) as used for other criteria pollutants was used for the $PM_{2.5}$ startup/shutdown analysis.

Receptor height scales at each receptor location (used in AERMOD) were developed by AERMAP (version 09040), the terrain preprocessor for AERMOD. AERMAP was run using the 1/3 arc second (~10 m resolution) National Elevation Data (NED) for the proposed project location which was downloaded from the United States Geological Services (USGS) website (http://seamless.usgs.gov/index.php). As per the AERMAP User's Guide (USEPA, 2004), the domain was sufficiently large enough to accommodate all the significant nodes such that all terrain features that exceed a 10% elevation slope from any given receptor were considered. Figure 10-3 shows the modeling domain to demonstrate this. The full report generated by AERMAP is provided in Appendix F and is included with the modeling files on the DVD.

Figure 10-1 Far Field Receptor Grid for $PM_{2.5}$ Modeling Analysis

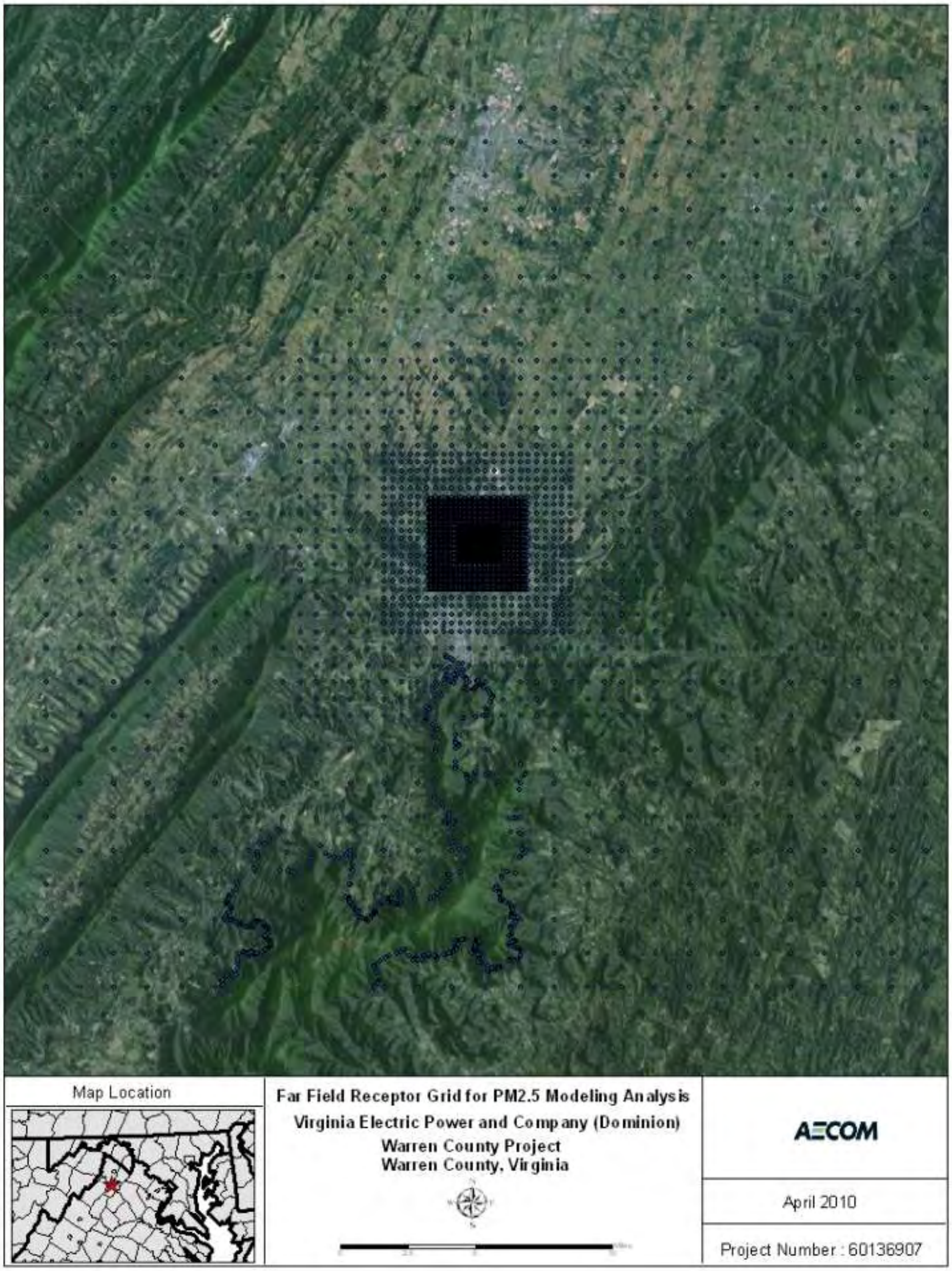


Figure 10-2 Refined Receptor Grid for $PM_{2.5}$ 24-hour SIL AERMOD Modeling Analysis

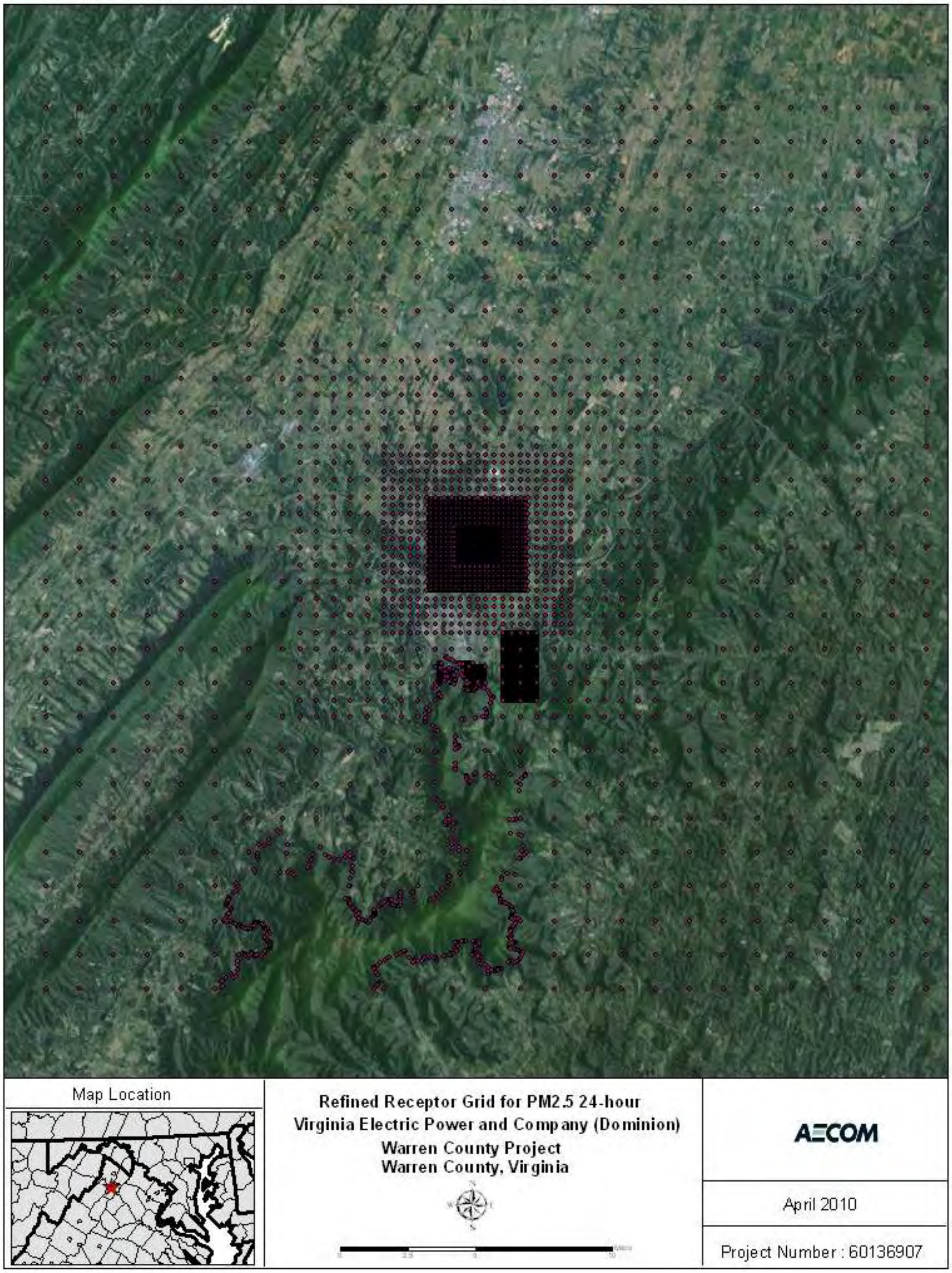
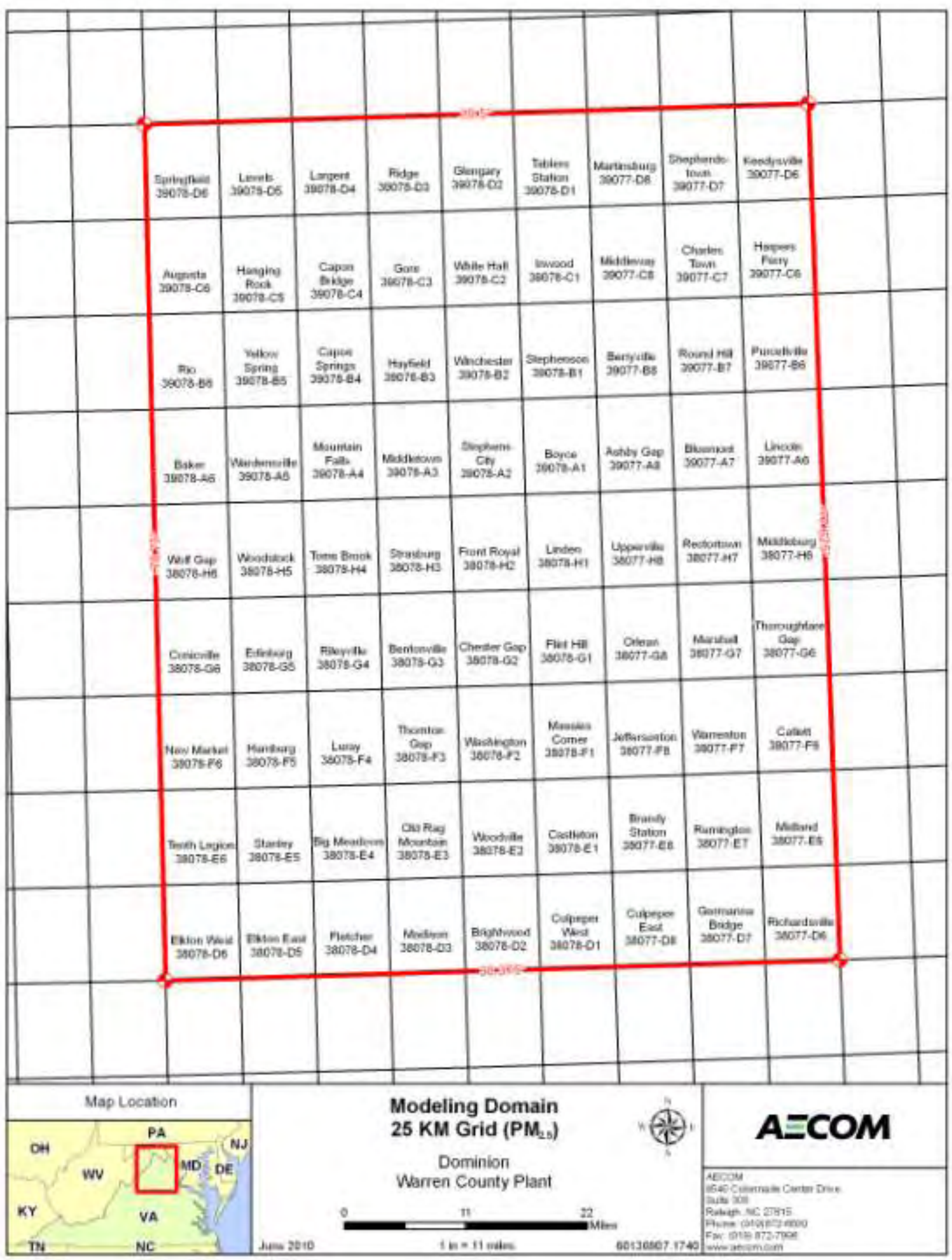


Figure 10-3 Domain Used in the Modeling Analysis for $PM_{2.5}$



The results of the $PM_{2.5}$ modeling for comparison to the lowest proposed Class II SILs are presented in Tables 10-1 for the normal operations and 10-2 for startup/shutdown operations. The table 10-1 presents the maximum ground-level concentrations at each of the four operating loads for the Cartesian receptor grid for $PM_{2.5}$ annual. The maximum ground level concentrations for $PM_{2.5}$ 24-hour correspond to the refined receptor grid – refined receptors around the maximum impact and the regular Cartesian grid. Each of the four load groups include emissions from the three combined-cycle combustion turbines at the respective load, inlet turbine chillers, auxiliary boiler, diesel-fired fire-water pump, diesel-fired emergency generator, and fuel gas heater. Table 10-2 presents the maximum ground level concentrations for the short-term pollutants that were modeled for either a cold or a warm startup and the remaining time in the averaging period with the normal operation emissions at 100% with duct firing load. Table 10-2 also presents the maximum ground level concentrations for the annual pollutants that were modeled based on the combination of annualized startup/shutdown emissions and the annualized normal operation emissions across all the operating loads.

Table 10-1 PSD Class II $PM_{2.5}$ Impacts of Proposed Project Sources Only – Normal Operations

Pollutant	Averaging Period	Total Maximum Impact (µg/m^3)	Lowest Proposed SIL (µg/m^3)	Cumulative Modeling Needed? (Yes/No)
100% Load with Duct Firing				
$PM_{2.5}$	24-Hr	6.74	1.2	Yes
	Annual	0.31	0.3	Yes
100% Load				
$PM_{2.5}$	24-Hr	4.87	1.2	Yes
	Annual	0.31	0.3	Yes
75% Load				
$PM_{2.5}$	24-Hr	4.22	1.2	Yes
	Annual	0.36	0.3	Yes
60% Load				
$PM_{2.5}$	24-Hr	4.10	1.2	Yes
	Annual	0.41	0.3	Yes

Table 10-2 PSD Class II $PM_{2.5}$ Impacts of Proposed Project Sources Only – Startup/Shutdown Operations

Pollutant	Averaging Period	Total Maximum Impact (µg/m^3)	Lowest Proposed SIL (µg/m^3)	Cumulative Modeling Needed? (Yes/No)
$PM_{2.5}$	24-Hr	3.91	1.2	Yes
	Annual	0.36	0.3	Yes

The results indicate that the proposed project impacts' trigger a cumulative modeling analysis when compared to the lowest proposed SILs. For a background inventory, $PM_{2.5}$ emissions were used for the sources for which a $PM_{2.5}$ emission rate was provided, otherwise, the PM_{10} emissions were used, even though $PM_{2.5}$ emissions are a subset of PM_{10} emissions.

The results of the multi-source modeling analysis are discussed in Section 10.3.

10.2.2 $PM_{2.5}$ Significant Impact Analysis for Shenandoah National Park

As mentioned earlier, AECOM conducted the analysis using the overall lowest EPA-proposed values for the PSD Class I modeling. The SILs that were used for the permit application are the EPA-proposed Option 3 values of 0.07 µg/m^3 and 0.06 µg/m^3 for the daily and annual averages for PSD Class I modeling.

The same methodology used for the Class I SIL Analysis of the criteria pollutants was used for the Class I SIL Analysis of $PM_{2.5}$. The same set of meteorological data, receptors, and model options as used for the other criteria pollutants Class I SIL Analysis was used for the Class I $PM_{2.5}$ modeling analysis.

The results of the $PM_{2.5}$ modeling for comparison to the lowest proposed Class I SILs are presented in Table 10-3. The table presents the maximum ground level concentrations at each of the four operating loads for $PM_{2.5}$ 24-hour and annual. Each of the four load groups include emissions from the three combined-cycle combustion turbines at the respective load, inlet turbine chillers, auxiliary boiler, diesel-fired fire-water pump, diesel-fired emergency generator and fuel gas heater.

The results indicate that the proposed project impacts trigger a Class I cumulative modeling analysis when compared to the lowest proposed SILs. For a background inventory, $PM_{2.5}$ emissions were used for the sources for which a $PM_{2.5}$ emission rate was provided, otherwise the PM_{10} emissions were used, even though $PM_{2.5}$ emissions are a subset of PM_{10} emissions.

The results of the multi-source modeling analysis are discussed in Section 10.3.

Table 10-3 PSD Class I $PM_{2.5}$ Impacts of Proposed Project Sources Only

Pollutant	Averaging Period	Total Maximum Impact ($\mu g/m^3$)	Lowest Proposed SIL ($\mu g/m^3$)	Cumulative Modeling Needed? (Yes/No)
100% Load with Duct Firing				
$PM_{2.5}$	24-Hr	5.548	0.07	Yes
	Annual	0.179	0.06	Yes
100% Load				
$PM_{2.5}$	24-Hr	3.990	0.07	Yes
	Annual	0.176	0.06	Yes
75% Load				
$PM_{2.5}$	24-Hr	3.410	0.07	Yes
	Annual	0.194	0.06	Yes
60% Load				
$PM_{2.5}$	24-Hr	3.089	0.07	Yes
	Annual	0.212	0.06	Yes

10.3 $PM_{2.5}$ Cumulative Impact Analysis

10.3.1 $PM_{2.5}$ Cumulative Impact Analysis for Class II Areas

The Tier 1 (conservative) approach utilized for any cumulative modeling of $PM_{2.5}$ adopted a, design value from the nearby representative $PM_{2.5}$ monitor at Luray Caverns Airport. This concentration was conservatively assumed to apply for each modeled day at all receptors.

The modeled impact for $PM_{2.5}$ NAAQS compliance was done in with a five-year average of 1988-1992, consistent with AERMOD guidance posted at www.epa.gov/scram001. For the 5-year period, the modeled annual concentration of interest was the highest average of the 5 years modeled at each receptor. Similarly, the modeled 24-hour concentration of interest was the 5-year average of the each year's 98^{th} percentile (H8H) concentrations at each receptor.

In addition to the modeled project impacts plus a design value, impacts were included from those background sources with emissions high enough and close enough to likely cause a significant concentration gradient within an area referred to as the "Significant Impact Area", or SIA. This area is defined for Class II areas as the farthest distance from the source (up to 50 km) for which a peak modeled impact at a receptor exceeds the Class II SIL for either daily or annual averages. Consistent with previous guidance from Mr. Don Shepherd of the National Park Service (2006), a "Q/D" approach was used for screening out sources (using facility-total emissions) beyond the extent of the SIA in Class II areas as follows:

- All agency-identified sources within the SIA were modeled with the exception of very small sources (we proposed total permitted short-term emissions less than 5 tons per year) whose impacts would be accounted for by regional background.
- For sources beyond the extent of the SIA, define D as the distance in km of a candidate background source beyond the SIA, and Q as the permitted short-term emissions expressed in tons per year (TPY). Since for $PM_{2.5}$, the significant emission increase threshold is 10 TPY, define Q/D such that at a distance of 50 km, the threshold short-term emission rate for screening out is 10 TPY. For this case, a Q/D value of 0.2 was applied for $PM_{2.5}$, although the exclusion of nominal sources of 5 TPY or less would be used beyond the SIA as well.

The same methodology for screening and refining the inventory as discussed in Sections 7.4 through 7.9 was also applied to the multi-source modeling analysis for $PM_{2.5}$. The SIA radius and the corresponding screening radius for $PM_{2.5}$ (24-hour and annual averaging period) is provided below:

- $PM_{2.5}$ 24 Hour: 26.5 km 76.5 km
- $PM_{2.5}$ annual : 1.0 km 51.0 km

A summary of the background sources that were modeled, after the screenings, is provided in Appendix G. The complete background emission inventories are provided on the DVD (along with the other modeling files) in Appendix F.

As previously mentioned, the AERMOD model was used in the multi-source modeling analyses. After a thorough evaluation of the background sources for multi-source modeling analysis, the application of the model was determined. The methodology is discussed below.

For NAAQS compliance, AECOM used AERMOD to model the NAAQS background sources along with the proposed project's sources in simple and complex terrain. The objective for using this model is to capture cumulative impacts within the SIA.

For the proposed project, the same stack parameters and emission rates (see Section 6 for details) as used for the SIL modeling was used for the multi-source modeling analyses. The cumulative receptor grid consisted of the receptors that exceeded the $PM_{2.5}$ 24-hr SIL for each load and each year. Any duplicate receptors were deleted from the combined receptor grid. The same set of meteorological data from the SIL Analysis was used for this analysis but as described above, the 5-year meteorological data was combined into one.

The highest annual and 98th percentile (H8H) short-term impacts were retrieved, and added to the corresponding design value. The design values for $PM_{2.5}$ from the nearby representative $PM_{2.5}$ monitor at Luray Caverns airport is provided in Table 6-15. These final values were then compared to the NAAQS to determine compliance. Figure 6-8 shows the location of the ambient background monitor for $PM_{2.5}$ considered in the analysis.

The results of the multi-source modeling analysis are presented below.

10.3.2 Summary of Class II Area $PM_{2.5}$ NAAQS Analysis

A complete summary of the NAAQS analysis is presented in Table 10-4. "Model Concentration" refers to the combined impacts from the proposed project sources and the NAAQS background sources. The model concentrations were determined by finding the highest annual and H8H short-term impacts from the AERMOD model. The appropriate design value was added to the model concentration to obtain the final concentration, which are listed in the "Total Concentration" column, for comparison to the NAAQS. The table below presents the model concentration over the four operating loads and five years of meteorological data.

As shown in Table 10-4, the predicted impacts for $PM_{2.5}$ 24-hour in the NAAQS cumulative impact analysis will be less than the NAAQS. The results of the NAAQS modeling analysis show that the project will not cause or contribute to a NAAQS violation. Hence, the proposed project is deemed to be in compliance with the applicable NAAQS standards.

Table 10-4 Summary of Class II Area $PM_{2.5}$ NAAQS Analysis

Pollutant	Averaging Period	Model Concentration ($\mu g/m^3$)	Design Value ($\mu g/m^3$) (1)	Total Concentration ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	Complies (Y/N)?
$PM_{2.5}$	24-hour	1.62	28.00	29.62	35.00	Y
$PM_{2.5}$	Annual	0.48	11.70	12.18	15.00	Y
(1) Design value from taken from Virginia Ambient Air Monitor 2008 Report Data						

10.3.3 $PM_{2.5}$ Cumulative Impact Analysis for Shenandoah National Park

Similar to the Class II $PM_{2.5}$ cumulative impact assessment, the Tier 1 (conservative) approach for any cumulative modeling of $PM_{2.5}$ adopted a conservatively high 98th percentile daily monitored background concentration, averaged over the period of 2006-2008, from the nearby representative $PM_{2.5}$ monitor at Luray Caverns airport. This concentration was conservatively assumed to apply for each modeled day at all receptors.

The modeled impact for $PM_{2.5}$ NAAQS compliance was done with a 5-year meteorological data files groups, consistent with AERMOD guidance posted at www.epa.gov/scram001. For each 5-year period, the modeled annual concentration of interest was the highest5-year average over all modeled receptors. Similarly, the modeled 24-hour concentration of interest was the highest 5-year average 98th percentile (H8H) concentrations over all modeled receptors.

In addition to the modeled project impacts plus a regional background value, impacts were included from those background sources with emissions high enough and close enough to likely cause a significant concentration gradient within 50 km of Shenandoah NP. Consistent with previous guidance from Mr. Don Shepherd of the National Park Service (2006), a "Q/D" approach was used for screening out sources (using facility-total emissions) beyond 50 km from the nearest edge of Shenandoah NP.

- All agency-identified sources within 50 km of Shenandoah with very small emissions (facility totals less than 5 tons per year), whose impacts would be accounted for by regional background were not included in the cumulative modeling.
- For sources within 50 km of Shenandoah whose facility emission totals exceed 5 TPY a Q/D screening approach was applied, where D is defined as the shortest distance in km of a candidate background source to Shenandoah NP and Q as the permitted short-term facility

total emissions expressed in tons per year (TPY). Since for $PM_{2.5}$, the significant emission increase threshold is 10 TPY, define Q/D such that at a distance of 50 km, the threshold short-term emission rate for screening out is 10 TPY. For this case, a Q/D value of 0.2 was applied for $PM_{2.5}$, although the exclusion of nominal sources of 5TPY or less would be used beyond the SIA as well.

A summary of the background sources that were modeled, after the screenings, is provided in Appendix G. The complete background emission inventories are provided on the DVD (along with the other modeling files) in Appendix F.

As previously mentioned, the AERMOD model was used in the multi-source modeling analyses. After a thorough evaluation of the background sources for multi-source modeling analysis, the application of the model was determined. The methodology is discussed below.

For NAAQS compliance, AECOM used AERMOD to model the NAAQS background sources along with the proposed project's sources in simple and complex terrain. The objective for using this model is to capture cumulative impacts within the SIA. The model options, meteorology, source data used for the SIL modeling was also used for the multi-source modeling analysis. In addition, the meteorological data from the SIL Analysis was used for this analysis but as described above, the meteorological data was combined into a single 5-year data file.

The highest annual and 98^{th} percentile (H8H) short-term impacts were retrieved, and added to the corresponding design value. The design value for $PM_{2.5}$ from the nearby representative $PM_{2.5}$ monitor at Luray Caverns Airport is provided in Table 6-15. These final values were then compared to the NAAQS to determine compliance. Figure 6-8 shows the location of the ambient background monitor for $PM_{2.5}$ considered in the analysis.

The results of the multi-source modeling analysis are presented below.

10.3.4 Summary of NAAQS Analysis for Shenandoah National Park

A complete summary of the NAAQS analysis for Shenandoah National Park is presented in Table 10-5. "Model Concentration" refers to the combined impacts from the proposed project sources and the NAAQS background sources. The model concentrations were determined by finding the 5-year average highest annual and H8H short-term impacts from the AERMOD model averaged over the 5-year period. The appropriate design value was then added to the model concentration to obtain the final concentration, which are listed in the "Total Concentration" column, for comparison to the NAAQS. The table below presents the model concentration over the four operating loads and five years of meteorological data.

As shown in Table 10-5, the predicted impacts for 24-hour and annual $PM_{2.5}$ in the NAAQS cumulative impact analysis will be less than the NAAQS. The result of the NAAQS modeling analysis shows that the project will not cause or contribute to a NAAQS violation. Hence, the proposed project is deemed to be in compliance with the applicable NAAQS standards.

Table 10-5 Summary of NAAQS Analysis for Shenandoah National Park

Pollutant	Averaging Period	Model Concentration (μg/m^3)	Design Value (μg/m^3) [1]	Total Concentration (μg/m^3)	NAAQS (μg/m^3)	Complies (Y/N)?
$PM_{2.5}$	24-hour[2]	1.27	28.0	29.27	35.00	Y
$PM_{2.5}$	Annual[3]	0.13	11.7	11.83	15.00	Y

(1) Design value taken from Virginia Air Monitor 2008 Report Data.
(2) Modeled concentration represents the 5-year average H8H over all modeled receptors.
(3) Modeled concentration represents the 5-year average H1H over all modeled receptors.

11.0 References

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Appendix F

Air Dispersion Modeling Files

DIRECTORIES/SUB-DIRECTORIES PROVIDED ON DVD-ROM

DIRECTORIES/SUB-DIRECTORIES PROVIDED ON DVD-ROM

AERMET

YYYY	AERMET processing files (1988 provided as example below)
AERSURFACE	AERSURFACE modeling files (See file descriptions below)

The file naming convention is the same for each year. 1988 is shown below.
File naming Convention for AERMET Modeling:

1988

y.inp	AERMET input files for Stage 1, 2 and 3
y.err	AERMET message file for stage 1, 2 and 3
y.rep	AERMET report file for Stage 1, 2 and 3
y.ext	AERMET upper air sounding and surface observation extraction files
y.qa	AERMET upper air sounding and surface observation quality assessment files Where y = Stage 1, 2, or 3
93734_88_unfilled.ua	Unfilled upper air sounding data file in TD6201 format
IAD88.FIL	Filled surface data file in CD144 format
IAD88.met	Unfilled surface data file in CD144 format
IAD88.REP	Report file for the filled surface data file
MET.MRG	AERMET Stage 2 merged file
MET_88.PFL	AERMET profile output file (input to AERMOD)
MET_88.SFC	AERMET surface output file (input to AERMOD)

AERMET.exe	AERMET Stage 1, 2 and 3 executable (Version 06341)

AERSURFACE

File naming Convention for AERSURFACE Modeling:

x.dat	AERSURFACE input file
x.out	AERSURFACE output file
x.log	AERSURFACE output – log file of extracted land use data for
x_albedo_bowen_domain.txt	AERSURFACE output – log file of extracted albedo and Bowen ratio data
x_roughness_domain.txt	AERSURFACE output – log file of extracted surface roughness data

where x = surface moisture conditions (dry, wet, average)

AERSURFACE.exe	AERSURFACE executable (Version 08009)
The Plains AP precip.txt	Precipitation data for Plains AP; used to determine monthly surface moisture conditions
Washington Dulles AP precip.txt	Precipitation data for Washington, D.C. Dulles AP; used to determine monthly surface moisture conditions
Airport AERSURFACE Stage3 for 4 sectors 5yrs.xls	Excel spreadsheet used to create the bowen ratio, albedo, and surface roughness table for input into AERMET stage 3 input file
NLCD_Landuse_file.zip	NLCD92 land use data (in GeoTiff format)

AERSURFACE_CODE

Includes the AERSURFACE code which was recompiled to change the urban and recreational grasses to grasslands

Class I

AERMOD Project	modeling files for project alone runs (descriptions below)
AERMOD Cumulative	modeling files for cumulative runs (descriptions below)
AERMOD Deposition	modeling files used Level II nitrogen deposition analysis
AERMAP	AERMAP files (descriptions below)
PLUVUE	See ReadMe_Pluvue_Mitsubishi.doc
Soil and Veg	Contains ref. material used for the soils and veg analysis

File naming Convention for AERMOD Project:

AERMOD Project

Mitsubishi_x_y_z.t

where,

Mitsubishi = Turbine Configuration

x = Year (1988, 1989, 1990, 1991, 1992)

y = Pollutant ID
- NO_x – Nitrogen Oxides
- PM_{10} – Particulate Mater (< 10 microns)
- $PM_{2.5}$ – Particulate Mater (< 2.5 microns)
- SO_2 – Sulfur Dioxide

z = Averaging Period
- ANN – Annual
- 24HR – 24-hour averaging period
- 3HR – 3-hour averaging period

t = file type (dta=input, lst=output)

aermod.exe AERMOD executable (version 09292)

File naming Convention for AERMOD Cumulative:

AERMOD Cumulative

Mitsubishi_x_y_z.t

where,

Mitsubishi = Turbine Configuration

x = Year (1988, 1989, 1990, 1991, 1992)

y = Pollutant ID
- NO_x – Nitrogen Oxides
- PM_{10} – Particulate Mater (< 10 microns)
- $PM_{2.5}$ – Particulate Mater (< 2.5 microns)

z = Averaging Period
- ANN – Annual
- 24HR – 24-hour averaging period

t = file type (dta=input, lst=output)

aermod.exe — AERMOD executable (version 09292)

AERMOD Deposition

Mitsubishi_x_y_z.t

where,

Mitsubishi = Turbine Configuration

x = Year (1988, 1989, 1990, 1991, 1992)

y = Pollutant ID
- NO_x – Nitrogen Oxides
- PM_{10} – Particulate Mater (< 10 microns)
- $PM_{2.5}$ – Particulate Mater (< 2.5 microns)

z = Averaging Period
- 1HR – 1-hour aveaging period
- DAY – Daytime MET hours
- NT – Nighttime MET hours

t = file type (dta=input, lst=output)

aermod.exe — AERMOD executable (version 09292)

File naming Convention for AERMAP Modeling:

AERMAP

AERMAP_EPA_09040.EXE	The AERMAP executable (version 09040)
rec.api	AERMAP input file
rec.ast	AERMAP output file
rec.rou	Receptor file created by AERMAP for input to AERMOD; Includes the NPS receptors as well as AECOM's refined receptor grid
rec_rev.rou	Receptor file used in AERMOD modeling; Same as rec.rou file except that NPS receptors have been removed
NED_File.zip	NED terrain file used in AERMAP with a resolution of 1/3 arcsec (10 m)

Class II

AERMAP – 20km grid	AERMAP files for the 20-km receptor grid
AERMAP – 25km grid	AERMAP files for the 25-km receptor grid for $PM_{2.5}$ modeling analysis
AERMOD	AERMOD modeling files (See file descriptions below)

The file naming convention is the same for both the 20-km and 25-km receptor grid. The 20-km receptor grid is shown below.

File naming Convention for AERMAP Modeling:

AERMAP for SIL Analysis

AERMAP_EPA_09040.EXE	Located in Class I folder
Dominion_Warren County.MAP	AERMAP input file
Dominion_Warren County.Mot	AERMAP output file
Dominion_Warren County.rcf	Receptor file created by AERMAP for input to AERMOD
NED_20-km grid.zip	NED terrain file used in AERMAP with a resolution of 1/3 arcsec (10 m)

File naming Convention for AERMOD Modeling:

SIL Analysis

Dominion_Mitsubishi_Arpt_3x3x1_x_y_z.t

where, Dominion_Mitsubishi_Arpt_3x3x1= BEEST (.bst) file for SIL Analysis for the Mitsubishi Turbine configuration

Mitsubishi = Turbine Configuration

x = Year (1988, 1989, 1990, 1991, 1992)

y = Pollutant ID
- NO_x – Nitrogen Oxides
- PM_{10} – Particulate Mater (< 10 microns)
- $PM_{2.5}$ – Particulate Mater (< 2.5 microns)

CO – Carbon Monoxide

z = Averaging Period
ANN – Annual
24HR – 24-hour averaging period
8HR – 8-hour averaging period
1HR – 1-hour averaging period

t = file type (dta=input, lst=output)

SIL Analysis – Refined Grid for PM_{10} and $PM_{2.5}$

Dominion_Mitsubishi_Arpt_3x3x1_refined grid_x_y_z.t

where, Dominion_ Mitsubishi _Arpt_3x3x1_refined grid = BEEST (.bst) file for SIL Analysis for PM_{10} and $PM_{2.5}$ for the Mitsubishi turbine configuration

Mitsubishi = Turbine Configuration

x = Year (1988, 1989, 1990, 1991, 1992)

y = Pollutant ID
PM_{10} – Particulate Mater (< 10 microns)
$PM_{2.5}$ – Particulate Mater (< 2.5 microns)

z = Averaging Period
24HR – 24-hour averaging period

t = file type (dta=input, lst=output)

Cumulative Impact Analysis - PM_{10}

Dominion_Mitsubishi_Arpt_3x3x1_Cumulative_x_y_z.t

where, Dominion_Mitsubishi_Arpt_3x3x1_Cumulative = BEEST (.bst) file for the Cumulative Impact Analysis (CIA) for the Mitsubishi turbine configuration

Mitsubishi = Turbine Configuration

x = Year (1988, 1989, 1990, 1991, 1992)

y = Pollutant ID
PM_{10} – Particulate Mater (< 10 microns)

z = Averaging Period
    24HR – 24-hour averaging period

t = file type (dta=input, lst=output)

Cumulative Impact Analysis - $PM_{2.5}$

Dominion_Mitsubishi_Arpt_3x3x1_Cumulative_x_y.t

where,
Dominion_Mitsubishi_Arpt_3x3x1_Cumulative = BEEST (.bst) file for the Cumulative Impact Analysis (CIA) for the Mitsubishi turbine configuration

Mitsubishi = Turbine Configuration

x = Year (1988-92)

y = Pollutant ID
    $PM_{2.5}$ – Particulate Mater (< 2.5 microns)

t = file type (dta=input, lst=output)

Vegetation Analysis

Dominion_Mitsubishi_Arpt_3x3x1_Veg_x_y_z.t

where, Dominion_ Mitsubishi _Arpt_3x3x1_Veg = BEEST (.bst) file for Vegetation Analysis for the Mitsubishi turbine configurations

Mitsubishi = Turbine Configuration

x = Year (1988, 1989, 1990, 1991, 1992)

y = Pollutant ID
    NO_x – Nitrogen Oxides
    PM_{10} – Particulate Mater (< 10 microns)
    CO – Carbon Monoxide

z = Averaging Period
    ANN – Annual
    1M – Month
    24HR – 24-hour averaging period
    4HR – 4-hour averaging period

t = file type (dta=input, lst=output)

Toxics Analysis

Dominion_ Mitsubishi_Arpt_3x3x1_Toxic_x_y_z.t

where, Dominion_ Mitsubishi _Arpt_3x3x1_Toxic = BEEST (.bst) file for Toxics Analysis for the Mitsubishi turbine configurations

Mitsubishi = Turbine Configuration

x = Year (1988, 1989, 1990, 1991, 1992)

y = Pollutant ID
- ACRL – Acrolein
- FRML – Formaldehyde
- CADM – Cadmium
- CHRM – Chromium
- NCKL – Nickel

z = Averaging Period
- ANN – Annual
- 1HR – 1-hour averaging period

t = file type (dta=input, lst=output)

aermod.exe — Located in Class I folder

Startup/Shutdown (SUSD) Analysis

Dominion_Mitsubishi_y_SU_x_y_z.t

where, Dominion_Mitsubishi_y_SU = BEEST (.bst) file for Starup/Shutdown for the Mitsubishi Turbine configuration

Mitsubishi = Turbine Configuration

x = Year (1988, 1989, 1990, 1991, 1992)

y = Pollutant ID
- NO_x – Nitrogen Oxides
- PM_{10} – Particulate Mater (< 10 microns)
- $PM_{2.5}$ – Particulate Mater (< 2.5 microns)
- CO – Carbon Monoxide

z = Averaging Period

ANN – Annual

24HR – 24-hour averaging period

8HR – 8-hour averaging period

1HR – 1-hour averaging period

t = file type (dta=input, lst=output)

Stack Identification:

Warren County Combined-Cycle Project Sources

CCNG1A – 100% Load with Duct Firing
CCNG2A – 100% Load with Duct Firing
CCNG3A – 100% Load with Duct Firing
CCNG1B – 100% Load
CCNG2B – 100% Load
CCNG3B – 100% Load
CCNG1C – 75% Load
CCNG2C – 75% Load
CCNG3C – 75% Load
CCNG1D – 60% Load
CCNG2D – 60% Load
CCNG3D – 60% Load
AUX_BLR – Auxiliary Boiler
DSL_GEN – Diesel Engine Generator
FWP – Diesel Fire Pump
FGH – Fuel Gas Heater
CHLR1_U1 – Chiller 1 - Unit 1
CHLR1_U2 – Chiller 1 - Unit 2
CHLR1_U3 – Chiller 1 - Unit 3
CHLR1_U4 – Chiller 1 - Unit 4
CHLR1_U5 – Chiller 1 - Unit 5
CHLR1_U6 – Chiller 1 - Unit 6
CHLR2_U1 – Chiller 2 - Unit 1
CHLR2_U2 – Chiller 2 - Unit 2
CHLR2_U3 – Chiller 2 - Unit 3
CHLR2_U4 – Chiller 2 - Unit 4
CHLR2_U5 – Chiller 2 - Unit 5
CHLR2_U6 – Chiller 2 - Unit 6
CHLR3_U1 – Chiller 3 - Unit 1
CHLR3_U2 – Chiller 3 - Unit 2
CHLR3_U3 – Chiller 3 - Unit 3
CHLR3_U4 – Chiller 3 - Unit 4
CHLR3_U5 – Chiller 3 - Unit 5
CHLR3_U6 – Chiller 3 - Unit 6

Background Sources for the Cumulative Impact Assessment

Please refer to the background source emission inventory included on the DVD (also included as Appendix G) for a list of the modeled background sources included in the cumulative impact analysis (CIA) for both PM_{10} and $PM_{2.5}$

Description of the Background Inventories provided on the DVD-ROM:

Class I - Entire Background Source Emission Inventory.pdf – File with the initial background source emission inventory with all screening procedures for the Class I Cumulative Modeling Analysis.

Class II - Entire Background Source Emission Inventory.pdf – File with the initial background source emission inventory with all screening procedures for the Class II Cumulative Modeling Analysis.

Class I - Modeled Background Sources.pdf – File listing just the modeled background sources in the Class I Cumulative Analysis (also enclosed in the Appendix G).

Class II - Modeled Background Sources.pdf – File listing just the modeled background sources in the Class II Cumulative Analysis (also enclosed in the Appendix G).

Ozone Background Values

Pollutant	Averaging Period	Ranking	Year	Concentration (ppm)	Number of Exceedences	Monitor ID	Monitor Address	County	State
O_3	8-hour	H4H	2006	0.0730	0	511390004	Luray Caverns Airport, Route 647	Page	VA
		H4H	2007	0.0690	0	511390004	Luray Caverns Airport, Route 647	Page	VA
		H4H	2008	0.0680	0	511390004	Luray Caverns Airport, Route 647	Page	VA

Source: USEPA AirData database http://www.epa.gov/air/data/index.html

Appendix G

Background Emission Inventory

Class II Background Emission Inventory

Facility	Stack	UTM E (m)	UTM N (m)	Base Elevation (ft)	Stack Height (ft)	Stack Temperature (°F)	Stack Exit Velocity (ft/sec)	Stack Diameter (ft)	PM10 (lb/hr)	Notes
Virginia										
Virginia Industries Inc	2	762267.37	4262445.36	100.00	10.00	72.00	0.003	0.003	1.67	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps).
Virginia Industries Inc	2	762267.37	4262445.36	100.00	10.00	72.00	0.003	0.003	1.67	
Virginia Industries Inc	2	762267.37	4262445.36	100.00	10.00	72.00	0.003	0.003	1.67	
Virginia Industries Inc	1	762267.37	4262445.36	100.00	60.00	300.00	37.73	3.00	0.44	
Virginia Industries Inc	2	762267.37	4262445.36	100.00	10.00	72.00	0.003	0.003	1.67	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps).
Virginia Industries Inc	2	762267.37	4262445.36	100.00	10.00	72.00	0.003	0.003	1.67	
Virginia Industries Inc	2	762267.37	4262445.36	100.00	10.00	72.00	0.003	0.003	1.67	
Virginia Industries Inc	2	762267.37	4262445.36	100.00	10.00	72.00	0.003	0.003	1.67	
Virginia Industries Inc	2	762267.37	4262445.36	100.00	10.00	72.00	0.003	0.003	1.67	
Frederick County Landfill	4	749117.27	4336620.59	710.00	10.00	72.00	0.003	0.003	2.31	
Frederick County Landfill	5	749117.27	4336620.59	670.00	28.00	1500.00	6.09	0.66	0.13	
O-N Minerals (Chemstone) Company - Middletown	2	733617.43	4324020.60	680.00	17.00	180.00	69.29	3.50	2.52	
O-N Minerals (Chemstone) Company - Middletown	2	733617.43	4324020.60	680.00	17.00	180.00	69.29	3.50	2.52	
O-N Minerals (Chemstone) Company - Middletown	1	733617.43	4324020.60	680.00	10.00	72.00	0.003	0.003	0.29	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps).
O-N Minerals (Chemstone) Company - Middletown	1	733617.43	4324020.60	680.00	10.00	72.00	0.003	0.003	0.29	
Valley Proteins, Inc.	1	737817.27	4345720.54	900.00	25.00	350.00	0.01	2.00	0.98	
Valley Proteins, Inc.	1	737817.27	4345720.54	900.00	25.00	350.00	0.01	2.00	0.98	
Valley Proteins, Inc.	1	737817.27	4345720.54	900.00	25.00	350.00	0.01	2.00	0.98	
Valley Proteins, Inc.	2	737817.27	4345720.54	900.00	25.00	350.00	0.01	2.00	0.60	
Shenandoah County Sanitary Landfill - Edinburg	1	713337.37	4302980.68	800.00	10.00	72.00	0.003	0.003	5.07	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps).
Toray Plastics	2	745417.42	4319420.67	565.30	72.00	86.00	45.01	1.29	1.88	
Toray Plastics	1	745417.42	4319420.67	565.30	50.00	350.00	17.32	2.50	0.12	
Toray Plastics	3	745417.42	4319420.67	565.30	72.00	130.00	99.61	0.70	0.002	
Toray Plastics	3	745417.42	4319420.67	565.30	72.00	130.00	99.61	0.70	0.002	
Miller Milling Co	4	746917.23	4343520.56	680.00	115.00	68.00	68.97	2.00	0.00	
Miller Milling Co	8	746917.23	4343520.56	680.00	80.00	400.00	94.31	1.50	0.21	
Miller Milling Co	7	746917.23	4343520.56	680.00	115.00	68.00	58.36	2.00	0.00	
Miller Milling Co	1	746637.23	4343940.56	680.00	75.00	68.00	26.53	2.00	0.00	
Miller Milling Co	2	746917.23	4343520.56	680.00	115.00	68.00	87.33	2.70	0.00	
Miller Milling Co	3	746917.23	4343520.56	680.00	115.00	68.00	104.79	2.70	1.22	
Miller Milling Co	3	746917.23	4343520.56	680.00	115.00	68.00	104.79	2.70	1.22	
Miller Milling Co	6	746917.23	4343520.56	680.00	115.00	68.00	10.61	2.00	0.00	
Miller Milling Co	5	746917.23	4343520.56	680.00	115.00	68.00	10.61	2.00	0.00	
O-N Minerals (Chemstone) Company - Clear Brook	6	751417.15	4348920.54	625.00	8.00	880.00	124.51	0.28	0.005	

Facility	Stack	UTM E (m)	UTM N (m)	Base Elevation (ft)	Stack Height (ft)	Stack Temperature (°F)	Stack Exit Velocity (ft/sec)	Stack Diameter (ft)	PM10 (lb/hr)	Notes
O-N Minerals (Chemstone) Company - Clear Brook	5	751407.15	4348910.54	625.00	45.00	100.00	58.36	2.00	0.00	
O-N Minerals (Chemstone) Company - Clear Brook	8	751407.15	4348910.54	625.00	85.00	70.00	79.58	2.00	0.67	
O-N Minerals (Chemstone) Company - Clear Brook	9	751407.15	4348910.54	623.00	27.00	70.00	79.58	2.00	0.002	
O-N Minerals (Chemstone) Company - Clear Brook	1	751407.15	4348910.54	625.00	10.00	72.00	0.003	0.003	4.15	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps).
O-N Minerals (Chemstone) Company - Clear Brook	3	751407.15	4348910.54	625.00	185.00	269.00	34.76	6.00	0.42	Elevation assumed to be the same as that provided with same coordinate.
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps).
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	Elevation assumed to be the same as that provided with same coordinate.
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps).
O-N Minerals (Chemstone) Company - Clearbrook	50	751417.15	4348920.54	600.00	10.00	72.00	0.003	0.003	0.27	
O-N Minerals (Chemstone) Company - Clearbrook	50	751417.15	4348920.54	600.00	10.00	72.00	0.003	0.003	0.27	
O-N Minerals (Chemstone) Company - Clearbrook	1	751417.15	4348920.54	600.00	10.00	72.00	0.003	0.003	0.46	
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps). Elevation assumed to be the same as that provided with same coordinate
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	
O-N Minerals (Chemstone) Company - Clearbrook	5	750817.16	4348520.54	600.00	20.00	500.00	26.53	4.00	2.28	
O-N Minerals (Chemstone) Company - Clearbrook	5	750817.16	4348520.54	600.00	20.00	500.00	26.53	4.00	2.28	
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMODEL (BEEST INTERFACE), stack exit velocity was limited to 0.003 fps from 0.0003 fps.
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	
O-N Minerals (Chemstone) Company - Clearbrook	2	750807.16	4348510.54	600.00	10.00	72.00	0.003	0.003	0.05	
O-N Minerals (Chemstone) Company - Clearbrook	2	750807.16	4348510.54	600.00	10.00	72.00	0.003	0.003	0.05	
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	
Trex Company Inc	4	743017.32	4335720.59	745.00	51.00	133.00	30.80	0.83	6.92	
Trex Company Inc	5	743017.32	4335720.59	721.00	12.00	850.00	1285.97	0.50	0.00	

Facility	Stack	UTM E (m)	UTM N (m)	Base Elevation (ft)	Stack Height (ft)	Stack Temperature (°F)	Stack Exit Velocity (ft/sec)	Stack Diameter (ft)	PM10 (lb/hr)	Notes
O-N Minerals (Chemstone) Company - Portable 81576	1	731297.43	4322000.60	650.00	10.00	72.00	0.003	0.003	0.000	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps). Elevlation assumed to be the same as that provided with same coordinate
O-N Minerals (Chemstone) Company - Strasburg	5	732307.44	4322010.61	630.00	10.00	72.00	0.003	0.003	1.68	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps).
O-N Minerals (Chemstone) Company - Strasburg	8	731307.43	4322010.60	630.00	25.00	77.00	63.66	2.00	0.45	
O-N Minerals (Chemstone) Company - Strasburg	6	732307.44	4322010.61	630.00	79.00	475.00	132.63	4.00	0.18	
O-N Minerals (Chemstone) Company - Strasburg	1	731307.43	4322010.60	630.00	79.00	200.00	16.58	4.00	0.00	
O-N Minerals (Chemstone) Company - Strasburg	1	731307.43	4322010.60	630.00	79.00	200.00	16.58	4.00	0.00	
O-N Minerals (Chemstone) Company - Strasburg	4	732307.44	4322010.61	630.00	50.00	100.00	46.67	1.20	0.95	
O-N Minerals (Chemstone) Company - Strasburg	1	731297.43	4322000.60	650.00	10.00	72.00	0.003	0.003	0.04	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps).
O-N Minerals (Chemstone) Company - Strasburg	1	731307.43	4322010.60	630.00	79.00	200.00	16.58	4.00	0.00	
O-N Minerals (Chemstone) Company - Strasburg	9	732307.44	4322010.61	630.00	10.00	72.00	0.003	0.003	0.00	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps).
O-N Minerals (Chemstone) Company - Strasburg	2	731297.43	4322000.60	650.00	10.00	72.00	0.003	0.003	1.68	
O-N Minerals (Chemstone) Company - Strasburg	3	732307.44	4322010.61	630.00	47.00	550.00	57.63	3.59	0.00	
O-N Minerals (Chemstone) Company - Strasburg	1	731307.43	4322010.60	630.00	79.00	200.00	16.58	4.00	0.00	
O-N Minerals (Chemstone) Company - Strasburg	1	731307.43	4322010.60	630.00	79.00	200.00	16.58	4.00	0.00	
O-N Minerals (Chemstone) Company - Strasburg	2	732307.44	4322010.61	630.00	79.00	200.00	132.63	4.00	3.67	
O-N Minerals (Chemstone) Company - Strasburg	7	732307.44	4322010.61	630.00	60.00	150.00	11.94	4.00	0.00	
O'Sullivan Films Inc	18	743517.29	4338910.57	720.00	53.00	470.00	36.53	1.50	0.00	
O'Sullivan Films Inc	6	743517.29	4338910.57	720.00	70.00	77.00	67.79	0.60	1.36	
O'Sullivan Films Inc	8	743517.29	4338920.57	720.00	10.00	77.00	0.003	0.003	1.22	Missing values of the stack height, stack exit velocity and stack diameter were filled with values of 10ft, 0.003 fps and 0.003 ft to represent a worst-case modeling scenario.
O'Sullivan Films Inc	18	743517.29	4338910.57	720.00	53.00	470.00	36.53	1.50	0.00	
O'Sullivan Films Inc	2	743517.29	4338910.57	720.00	30.00	475.00	16.83	2.00	0.03	
O'Sullivan Films Inc	3	743517.29	4338910.57	720.00	25.00	350.00	19.26	0.80	0.05	
O'Sullivan Films Inc	10	743517.29	4338920.57	720.00	50.00	205.00	43.83	6.75	0.02	
O'Sullivan Films Inc	12	743517.29	4338920.57	720.00	10.00	300.00	1.00	1.00	0.01	
O'Sullivan Films Inc	4	743517.29	4338910.57	720.00	35.00	77.00	17.50	3.00	0.97	
O'Sullivan Films Inc	18	743517.29	4338910.57	720.00	53.00	470.00	36.53	1.50	0.00	
O'Sullivan Films Inc	13	743517.29	4338920.57	720.00	25.00	350.00	0.03	0.80	0.03	
O'Sullivan Films Inc	15	743517.29	4338920.57	720.00	50.00	300.00	55.54	4.90	0.02	
O'Sullivan Films Inc	1	743517.29	4338910.57	720.00	40.00	470.00	13.15	2.50	0.02	
Horizon Milling	2	762252.26	4261141.62	400.00	4.00	77.00	7.47	2.50	0.26	

Facility	Stack	UTM E (m)	UTM N (m)	Base Elevation (ft)	Stack Height (ft)	Stack Temperature (°F)	Stack Exit Velocity (ft/sec)	Stack Diameter (ft)	PM10 (lb/hr)	Notes
Horizon Milling	1	762252.26	4261141.62	400.00	20.00	350.00	18.33	1.00	0.00	
Horizon Milling	3	762252.26	4261141.62	400.00	42.00	77.00	116.71	2.00	9.62	

Facility	Stack	UTM E (m)	UTM N (m)	Base Elevation (ft)	Stack Height (ft)	Stack Temperature (°F)	Stack Exit Velocity (ft/sec)	Stack Diameter (ft)	PM10 (lb/hr)	Notes
West Virginia										
CAPITOL CEMENT - ESSROC MARTINSBURG	1	759903.04	4369249.25	522.00	43.00	68.00	78.00	1.31	0.19	An averaged base elevation for this Facility has been obtained from the website Topozone (www.topozone.com)
CAPITOL CEMENT - ESSROC MARTINSBURG	2	759902.01	4369280.09	522.00	11.00	68.00	65.80	3.85	1.80	
CAPITOL CEMENT - ESSROC MARTINSBURG	4	759902.01	4369280.09	522.00	40.00	68.00	54.70	1.26	0.08	
CAPITOL CEMENT - ESSROC MARTINSBURG	3	759902.01	4369280.09	522.00	72.00	68.00	65.30	1.87	0.42	
CAPITOL CEMENT - ESSROC MARTINSBURG	6	759902.01	4369280.09	522.00	40.00	68.00	54.70	1.26	0.08	
CAPITOL CEMENT - ESSROC MARTINSBURG	5	759902.01	4369280.09	522.00	72.00	68.00	65.30	1.87	0.42	
CAPITOL CEMENT - ESSROC MARTINSBURG	7	759902.01	4369280.09	522.00	200.00	350.00	32.80	14.83	17.57	
CAPITOL CEMENT - ESSROC MARTINSBURG	9	759902.01	4369280.09	522.00	73.00	250.00	54.70	7.50	4.43	
CAPITOL CEMENT - ESSROC MARTINSBURG	10	759902.01	4369280.09	522.00	73.00	250.00	54.70	7.50	4.13	
CAPITOL CEMENT - ESSROC MARTINSBURG	8	759806.36	4369276.89	522.00	100.00	400.00	34.00	12.50	13.80	
CAPITOL CEMENT - ESSROC MARTINSBURG	11	759902.01	4369280.09	522.00	73.00	250.00	54.70	7.50	4.11	
CAPITOL CEMENT - ESSROC MARTINSBURG	12	759902.01	4369280.09	522.00	18.00	200.00	10.80	1.83	0.08	
CAPITOL CEMENT - ESSROC MARTINSBURG	13	759806.36	4369276.89	522.00	86.00	120.00	67.50	0.73	0.11	
CAPITOL CEMENT - ESSROC MARTINSBURG	14	759806.36	4369276.89	522.00	86.00	120.00	67.50	0.73	0.00	
CAPITOL CEMENT - ESSROC MARTINSBURG	15	759806.36	4369276.89	522.00	30.00	120.00	67.50	0.73	0.11	
CAPITOL CEMENT - ESSROC MARTINSBURG	16	759806.36	4369276.89	522.00	29.00	120.00	67.50	0.73	0.00	
CAPITOL CEMENT - ESSROC MARTINSBURG	49	760027.77	4369099.08	522.00	73.00	68.00	0.003	2.18	0.00	Missing values of the stack temperature and stack exit velocity were filled with values of 68F and 0.003 fps to represent a worst-case modeling scenario
CAPITOL CEMENT - ESSROC MARTINSBURG	17	759902.01	4369280.09	522.00	60.00	225.00	66.80	2.76	1.44	
CAPITOL CEMENT - ESSROC MARTINSBURG	18	759902.01	4369280.09	522.00	53.00	225.00	50.60	1.59	0.18	
CAPITOL CEMENT - ESSROC MARTINSBURG	19	759902.01	4369280.09	522.00	60.00	225.00	89.10	2.76	0.88	
CAPITOL CEMENT - ESSROC MARTINSBURG	20	759902.01	4369280.09	522.00	66.00	225.00	66.80	2.76	0.79	
CAPITOL CEMENT - ESSROC MARTINSBURG	21	759902.01	4369280.09	522.00	60.00	225.00	50.30	1.59	0.10	
CAPITOL CEMENT - ESSROC MARTINSBURG	23	759902.01	4369280.09	522.00	60.00	225.00	55.70	2.76	3.71	
CAPITOL CEMENT - ESSROC MARTINSBURG	22	759902.01	4369280.09	522.00	18.00	225.00	54.20	4.79	1.27	
CAPITOL CEMENT - ESSROC MARTINSBURG	24	759902.01	4369280.09	522.00	122.00	100.00	74.30	2.00	1.92	
CAPITOL CEMENT - ESSROC MARTINSBURG	25	759902.01	4369280.09	522.00	52.00	68.00	43.50	0.77	0.00	
CAPITOL CEMENT - ESSROC MARTINSBURG	26	759902.01	4369280.09	522.00	52.00	68.00	43.50	0.77	0.00	
CAPITOL CEMENT - ESSROC MARTINSBURG	27	759902.01	4369280.09	522.00	104.00	100.00	57.80	2.35	2.06	
CAPITOL CEMENT - ESSROC MARTINSBURG	28	759902.01	4369280.09	522.00	106.00	100.00	57.50	1.22	0.55	
CAPITOL CEMENT - ESSROC MARTINSBURG	29	759902.01	4369280.09	522.00	58.00	68.00	43.50	0.77	0.00	
CAPITOL CEMENT - ESSROC MARTINSBURG	30	759902.01	4369280.09	522.00	58.00	68.00	43.50	0.77	0.00	
CAPITOL CEMENT - ESSROC MARTINSBURG	31	759806.36	4369276.89	522.00	122.00	100.00	62.10	1.78	1.28	
CAPITOL CEMENT - ESSROC MARTINSBURG	32	759806.36	4369276.89	522.00	52.00	68.00	43.50	0.77	0.00	
CAPITOL CEMENT - ESSROC MARTINSBURG	33	759806.36	4369276.89	522.00	52.00	68.00	43.50	0.77	0.00	
CAPITOL CEMENT - ESSROC MARTINSBURG	34	759902.01	4369280.09	522.00	53.00	100.00	45.70	1.86	0.37	
CAPITOL CEMENT - ESSROC MARTINSBURG	35	759902.01	4369280.09	522.00	53.00	100.00	88.00	1.53	0.47	
CAPITOL CEMENT - ESSROC MARTINSBURG	38	759902.01	4369280.09	522.00	53.00	100.00	66.70	1.78	0.98	
CAPITOL CEMENT - ESSROC MARTINSBURG	37	759902.01	4369280.09	522.00	53.00	100.00	71.10	1.86	1.14	

Facility	Stack	UTM E (m)	UTM N (m)	Base Elevation (ft)	Stack Height (ft)	Stack Temperature (°F)	Stack Exit Velocity (ft/sec)	Stack Diameter (ft)	PM10 (lb/hr)	Notes
CAPITOL CEMENT - ESSROC MARTINSBURG	39	759902.01	4369280.09	522.00	59.00	100.00	64.80	1.40	0.00	
CAPITOL CEMENT - ESSROC MARTINSBURG	36	759902.01	4369280.09	522.00	52.00	68.00	70.60	1.31	0.00	
CAPITOL CEMENT - ESSROC MARTINSBURG	37	759902.01	4369280.09	522.00	53.00	100.00	71.10	1.86	0.17	
CAPITOL CEMENT - ESSROC MARTINSBURG	40	759902.01	4369280.09	522.00	76.00	100.00	56.60	1.73	0.78	
CAPITOL CEMENT - ESSROC MARTINSBURG	42	759902.01	4369280.09	522.00	35.00	100.00	45.90	0.94	0.19	
CAPITOL CEMENT - ESSROC MARTINSBURG	41	759902.01	4369280.09	522.00	35.00	100.00	45.90	0.94	0.19	
CAPITOL CEMENT - ESSROC MARTINSBURG	44	759902.01	4369280.09	522.00	70.00	100.00	35.40	1.79	0.20	
CAPITOL CEMENT - ESSROC MARTINSBURG	43	760117.22	4369287.30	522.00	20.00	300.00	26.20	0.92	0.00	
CAPITOL CEMENT - ESSROC MARTINSBURG	45	760117.22	4369287.30	522.00	87.00	68.00	90.90	0.66	0.04	
CAPITOL CEMENT - ESSROC MARTINSBURG	46	760117.22	4369287.30	522.00	87.00	68.00	90.90	0.66	0.04	
CAPITOL CEMENT - ESSROC MARTINSBURG	47	760117.22	4369287.30	522.00	30.00	68.00	42.50	0.50	0.10	
CAPITOL CEMENT - ESSROC MARTINSBURG	50	760027.77	4369099.08	522.00	73.00	68.00	0.003	2.18	0.00	Missing values of the stack temperature and stack exit velocity were filled with values of 68F and 0.003 fps to represent a worst-case modeling scenario
CAPITOL CEMENT - ESSROC MARTINSBURG	48	760027.77	4369099.08	522.00	10.00	68.00	0.003	0.66	0.01	
GUARDIAN FIBERGLASS, INC.	2	755908.07	4365535.60	554.00	60.00	200.00	58.60	2.33	0.09	An averaged base elevation for this Facility has been obtained from the website Topozone (www.topozone.com)
GUARDIAN FIBERGLASS, INC.	9	755981.87	4365476.29	554.00	60.00	149.00	83.90	2.33	0.03	
GUARDIAN FIBERGLASS, INC.	3	756289.82	4365579.06	554.00	120.00	110.00	40.20	6.50	3.54	
GUARDIAN FIBERGLASS, INC.	10	756005.80	4365477.08	554.00	120.00	97.00	36.60	7.17	1.41	
GUARDIAN FIBERGLASS, INC.	4	756409.44	4365583.01	554.00	120.00	282.00	69.40	4.33	0.27	
GUARDIAN FIBERGLASS, INC.	11	756027.69	4365539.54	554.00	120.00	242.00	45.60	4.75	0.13	
GUARDIAN FIBERGLASS, INC.	5	756409.44	4365583.01	554.00	1.00	68.00	0.003	1.00	0.26	Missing values of the stack temperature and stack exit velocity were filled with values of 68F and 0.003 fps to represent a worst-case modeling scenario
GUARDIAN FIBERGLASS, INC.	8	765990.35	4365565.69	554.00	43.00	300.00	2.60	2.00	0.02	
GUARDIAN FIBERGLASS, INC.	6	765990.35	4365565.69	554.00	15.00	300.00	9.40	0.67	0.001	
GUARDIAN FIBERGLASS, INC.	7	766301.37	4365576.35	554.00	13.00	300.00	24.00	0.42	0.01	
OX PAPERBOARD, LLC	1	775985.17	4356620.93	410.00	90.00	330.00	55.10	3.96	3.12	Base elevation for this Facility has been obtained from the website Topozone (www.topozone.com)
Facility	**Stack**	**UTM E (m)**	**UTM N (m)**	**Base Elevation (ft)**	**Stack Height (ft)**	**Stack Temperature (°F)**	**Stack Exit Velocity (ft/sec)**	**Stack Diameter (ft)**	**PM10 (lb/hr)**	**Notes**
Maryland - None (All sources outside the (SIA+50km)										

Facility	Stack	UTM E (m)	UTM N (m)	Base Elevation (ft)	Stack Height (ft)	Stack Temperature (°F)	Stack Exit Velocity (ft/sec)	Stack Diameter (ft)	PM2.5 (lb/hr)	Notes
Virginia										
Virginia Industries Inc	2	762267.37	4262445.36	100.00	10.00	72.00	0.003	0.003	1.24	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps).
Virginia Industries Inc	2	762267.37	4262445.36	100.00	10.00	72.00	0.003	0.003	1.24	
Virginia Industries Inc	2	762267.37	4262445.36	100.00	10.00	72.00	0.003	0.003	1.24	
Virginia Industries Inc	1	762267.37	4262445.36	100.00	60.00	300.00	37.73	3.00	0.42	
Virginia Industries Inc	2	762267.37	4262445.36	100.00	10.00	72.00	0.003	0.003	1.24	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps).
Virginia Industries Inc	2	762267.37	4262445.36	100.00	10.00	72.00	0.003	0.003	1.24	
Virginia Industries Inc	2	762267.37	4262445.36	100.00	10.00	72.00	0.003	0.003	1.24	
Virginia Industries Inc	2	762267.37	4262445.36	100.00	10.00	72.00	0.003	0.003	1.24	
Virginia Industries Inc	2	762267.37	4262445.36	100.00	10.00	72.00	0.003	0.003	1.24	
American Woodmark Orange Dimension Plant	7	752817.46	4266221.40	50.00	35.00	68.00	38.20	5.00	2.77	
O-N Minerals (Chemstone) Company - Middletown	2	733617.43	4324020.60	680.00	17.00	180.00	69.29	3.50	2.52	
O-N Minerals (Chemstone) Company - Middletown	2	733617.43	4324020.60	680.00	17.00	180.00	69.29	3.50	2.52	
O-N Minerals (Chemstone) Company - Middletown	1	733617.43	4324020.60	680.00	10.00	72.00	0.003	0.003	0.29	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps).
O-N Minerals (Chemstone) Company - Middletown	1	733617.43	4324020.60	680.00	10.00	72.00	0.003	0.003	0.29	
Valley Proteins, Inc.	1	737817.27	4345720.54	900.00	25.00	350.00	0.01	2.00	0.54	
Valley Proteins, Inc.	1	737817.27	4345720.54	900.00	25.00	350.00	0.01	2.00	0.54	
Valley Proteins, Inc.	1	737817.27	4345720.54	900.00	25.00	350.00	0.01	2.00	0.54	
Valley Proteins, Inc.	2	737817.27	4345720.54	900.00	25.00	350.00	0.01	2.00	0.60	
Mountain View Rendering Company	3	707207.29	4305410.62	1090.00	45.00	100.00	59.09	5.19	1.48	
Mountain View Rendering Company	1	707207.29	4305410.62	1090.00	40.00	398.00	54.41	2.09	0.30	
Mountain View Rendering Company	4	707207.29	4305410.62	1090.00	45.00	100.00	59.09	5.19	0.49	
Mountain View Rendering Company	2	707207.29	4305410.62	1090.00	45.00	100.00	59.09	5.19	0.002	
Toray Plastics	2	745417.42	4319420.67	565.30	72.00	86.00	45.01	1.29	1.88	
Toray Plastics	1	745417.42	4319420.67	565.30	50.00	350.00	17.32	2.50	0.12	
Toray Plastics	3	745417.42	4319420.67	565.30	72.00	130.00	99.61	0.70	0.002	
Toray Plastics	3	745417.42	4319420.67	565.30	72.00	130.00	99.61	0.70	0.002	
Valley Proteins Inc - Linville	1	688916.89	4267620.90	1200.00	38.00	400.00	36.61	2.00	1.82	
Valley Proteins Inc - Linville	3	688916.89	4267620.90	1200.00	38.00	400.00	40.53	2.00	0.09	
Valley Proteins Inc - Linville	2	688916.89	4267620.90	1200.00	21.00	400.00	0.01	1.70	0.01	
Valley Proteins Inc - Linville	1	688916.89	4267620.90	1200.00	38.00	400.00	36.61	2.00	1.82	
Valley Proteins Inc - Linville	1	688916.89	4267620.90	1200.00	38.00	400.00	36.61	2.00	1.82	
Valley Proteins Inc - Linville	1	688916.89	4267620.90	1200.00	38.00	400.00	36.61	2.00	1.82	
Valley Proteins Inc - Linville	1	688916.89	4267620.90	1200.00	38.00	400.00	36.61	2.00	1.82	
Valley Proteins Inc - Linville	1	688916.89	4267620.90	1200.00	38.00	400.00	36.61	2.00	1.82	
Valley Proteins Inc - Linville	1	688916.89	4267620.90	1200.00	38.00	400.00	36.61	2.00	1.82	
Miller Milling Co	4	746917.23	4343520.56	680.00	115.00	68.00	68.97	2.00	0.00	
Miller Milling Co	8	746917.23	4343520.56	680.00	80.00	400.00	94.31	1.50	0.21	
Miller Milling Co	7	746917.23	4343520.56	680.00	115.00	68.00	58.36	2.00	0.00	

Facility	Stack	UTM E (m)	UTM N (m)	Base Elevation (ft)	Stack Height (ft)	Stack Temperature (°F)	Stack Exit Velocity (ft/sec)	Stack Diameter (ft)	PM2.5 (lb/hr)	Notes
Miller Milling Co	1	746637.23	4343940.56	680.00	75.00	68.00	26.53	2.00	0.00	
Miller Milling Co	2	746917.23	4343520.56	680.00	115.00	68.00	87.33	2.70	0.00	
Miller Milling Co	3	746917.23	4343520.56	680.00	115.00	68.00	104.79	2.70	1.22	
Miller Milling Co	3	746917.23	4343520.56	680.00	115.00	68.00	104.79	2.70	1.22	
Miller Milling Co	6	746917.23	4343520.56	680.00	115.00	68.00	10.61	2.00	0.00	
Miller Milling Co	5	746917.23	4343520.56	680.00	115.00	68.00	10.61	2.00	0.00	
O-N Minerals (Chemstone) Company - Clear Brook	6	751417.15	4348920.54	625.00	8.00	880.00	124.51	0.28	0.005	
O-N Minerals (Chemstone) Company - Clear Brook	5	751407.15	4348910.54	625.00	45.00	100.00	58.36	2.00	0.00	
O-N Minerals (Chemstone) Company - Clear Brook	8	751407.15	4348910.54	625.00	85.00	70.00	79.58	2.00	0.67	
O-N Minerals (Chemstone) Company - Clear Brook	9	751407.15	4348910.54	623.00	27.00	70.00	79.58	2.00	0.002	
O-N Minerals (Chemstone) Company - Clear Brook	1	751407.15	4348910.54	625.00	10.00	72.00	0.003	0.003	4.15	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps).
O-N Minerals (Chemstone) Company - Clear Brook	3	751407.15	4348910.54	625.00	185.00	269.00	34.76	6.00	0.42	Elevation assumed to be the same as that provided with same coordinate
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database.
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps).
O-N Minerals (Chemstone) Company - Clearbrook	50	751417.15	4348920.54	600.00	10.00	72.00	0.003	0.003	0.27	
O-N Minerals (Chemstone) Company - Clearbrook	50	751417.15	4348920.54	600.00	10.00	72.00	0.003	0.003	0.27	
O-N Minerals (Chemstone) Company - Clearbrook	1	751417.15	4348920.54	600.00	10.00	72.00	0.003	0.003	0.46	
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database.
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	
O-N Minerals (Chemstone) Company - Clearbrook	5	750817.16	4348520.54	600.00	20.00	500.00	26.53	4.00	2.28	
O-N Minerals (Chemstone) Company - Clearbrook	5	750817.16	4348520.54	600.00	20.00	500.00	26.53	4.00	2.28	
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database.
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	
O-N Minerals (Chemstone) Company - Clearbrook	2	750807.16	4348510.54	600.00	10.00	72.00	0.003	0.003	0.05	
O-N Minerals (Chemstone) Company - Clearbrook	2	750807.16	4348510.54	600.00	10.00	72.00	0.003	0.003	0.05	
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	Elevation assumed to be the same as that provided with same coordinate
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	
O-N Minerals (Chemstone) Company - Portable 81477	1	751417.15	4348920.54	630.00	8.00	68.00	36.96	0.83	0.00	
O-N Minerals (Chemstone) Company - Portable 81485	1	751417.15	4348920.54	519.00	10.00	72.00	0.003	0.003	0.99	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps).
O-N Minerals (Chemstone) Company - Portable 81485	1	751417.15	4348920.54	519.00	10.00	72.00	0.003	0.003	0.99	
Trex Company Inc	4	743017.32	4335720.59	745.00	51.00	133.00	30.80	0.83	6.92	
Trex Company Inc	5	743017.32	4335720.59	721.00	12.00	850.00	1285.97	0.50	0.00	

Facility	Stack	UTM E (m)	UTM N (m)	Base Elevation (ft)	Stack Height (ft)	Stack Temperature (°F)	Stack Exit Velocity (ft/sec)	Stack Diameter (ft)	PM2.5 (lb/hr)	Notes
O-N Minerals (Chemstone) Company - Portable 81576	1	731297.43	4322000.60	650.00	10.00	72.00	0.003	0.003	0.00	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Elevation assumed to be the same as that provided with same coordinate
O-N Minerals (Chemstone) Company - Strasburg	5	732307.44	4322010.61	630.00	10.00	72.00	0.003	0.003	1.68	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps).
O-N Minerals (Chemstone) Company - Strasburg	8	731307.43	4322010.60	630.00	25.00	77.00	63.66	2.00	0.45	
O-N Minerals (Chemstone) Company - Strasburg	6	732307.44	4322010.61	630.00	79.00	475.00	132.63	4.00	0.18	
O-N Minerals (Chemstone) Company - Strasburg	1	731307.43	4322010.60	630.00	79.00	200.00	16.58	4.00	0.00	
O-N Minerals (Chemstone) Company - Strasburg	1	731307.43	4322010.60	630.00	79.00	200.00	16.58	4.00	0.00	
O-N Minerals (Chemstone) Company - Strasburg	4	732307.44	4322010.61	630.00	50.00	100.00	46.67	1.20	0.95	
O-N Minerals (Chemstone) Company - Strasburg	1	731297.43	4322000.60	650.00	10.00	72.00	0.003	0.003	0.04	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps).
O-N Minerals (Chemstone) Company - Strasburg	1	731307.43	4322010.60	630.00	79.00	200.00	16.58	4.00	0.00	
O-N Minerals (Chemstone) Company - Strasburg	9	732307.44	4322010.61	630.00	10.00	72.00	0.003	0.003	0.00	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps).
O-N Minerals (Chemstone) Company - Strasburg	2	731297.43	4322000.60	650.00	10.00	72.00	0.003	0.003	1.68	
O-N Minerals (Chemstone) Company - Strasburg	3	732307.44	4322010.61	630.00	47.00	550.00	57.63	3.59	0.00	
O-N Minerals (Chemstone) Company - Strasburg	1	731307.43	4322010.60	630.00	79.00	200.00	16.58	4.00	0.00	
O-N Minerals (Chemstone) Company - Strasburg	1	731307.43	4322010.60	630.00	79.00	200.00	16.58	4.00	0.00	
O-N Minerals (Chemstone) Company - Strasburg	2	732307.44	4322010.61	630.00	79.00	200.00	132.63	4.00	3.67	
O-N Minerals (Chemstone) Company - Strasburg	7	732307.44	4322010.61	630.00	60.00	150.00	11.94	4.00	0.00	
O'Sullivan Films Inc	18	743517.29	4338910.57	720.00	53.00	470.00	36.53	1.50	0.00	
O'Sullivan Films Inc	6	743517.29	4338910.57	720.00	70.00	77.00	67.79	0.60	1.36	
O'Sullivan Films Inc	8	743517.29	4338920.57	720.00	10.00	77.00	0.003	0.003	1.22	Missing values of the stack height, stack exit velocity and stack diameter were filled with values of 10ft, 0.003 fps and 0.003 ft to represent a worst-case modeling scenario
O'Sullivan Films Inc	18	743517.29	4338910.57	720.00	53.00	470.00	36.53	1.50	0.00	
O'Sullivan Films Inc	2	743517.29	4338910.57	720.00	30.00	475.00	16.83	2.00	0.03	
O'Sullivan Films Inc	3	743517.29	4338910.57	720.00	25.00	350.00	19.26	0.80	0.05	
O'Sullivan Films Inc	10	743517.29	4338920.57	720.00	50.00	205.00	43.83	6.75	0.02	
O'Sullivan Films Inc	12	743517.29	4338920.57	720.00	10.00	300.00	1.00	1.00	0.01	
O'Sullivan Films Inc	4	743517.29	4338910.57	720.00	35.00	77.00	17.50	3.00	0.97	
O'Sullivan Films Inc	18	743517.29	4338910.57	720.00	53.00	470.00	36.53	1.50	0.00	
O'Sullivan Films Inc	13	743517.29	4338920.57	720.00	25.00	350.00	0.03	0.80	0.03	
O'Sullivan Films Inc	15	743517.29	4338920.57	720.00	50.00	300.00	55.54	4.90	0.02	
O'Sullivan Films Inc	1	743517.29	4338910.57	720.00	40.00	470.00	13.15	2.50	0.01	
Horizon Milling	2	762252.26	4261141.62	400.00	4.00	77.00	7.47	2.50	0.26	
Horizon Milling	1	762252.26	4261141.62	400.00	20.00	350.00	18.33	1.00	0.00	
Horizon Milling	3	762252.26	4261141.62	400.00	42.00	77.00	116.71	2.00	9.62	
Virginia Poultry Growers Cooperative Inc- Broadway	9	691416.95	4275320.79	1040.00	46.00	70.00	1.58	0.82	0.00	
Virginia Poultry Growers Cooperative Inc- Broadway	7	691406.95	4275310.79	1040.00	25.00	90.00	80.17	3.00	2.48	
Virginia Poultry Growers Cooperative Inc- Broadway	7	691406.95	4275310.79	1040.00	25.00	90.00	80.17	3.00	2.48	

Facility	Stack	UTM E (m)	UTM N (m)	Base Elevation (ft)	Stack Height (ft)	Stack Temperature (°F)	Stack Exit Velocity (ft/sec)	Stack Diameter (ft)	PM2.5 (lb/hr)	Notes
Virginia Poultry Growers Cooperative Inc- Broadway	3	691406.95	4275310.79	1040.00	10.00	72.00	0.003	0.003	0.05	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps).
Virginia Poultry Growers Cooperative Inc- Broadway	4	691406.95	4275310.79	1040.00	10.00	72.00	0.003	0.003	0.03	
Virginia Poultry Growers Cooperative Inc- Broadway	1	691406.95	4275310.79	1040.00	22.00	400.00	0.02	1.00	0.01	
Virginia Poultry Growers Cooperative Inc- Broadway	5	691406.95	4275310.79	1040.00	46.00	70.00	1.58	0.82	0.15	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps).
Virginia Poultry Growers Cooperative Inc- Broadway	8	691406.95	4275310.79	1040.00	30.00	77.00	16.50	2.00	0.00	
Virginia Poultry Growers Cooperative Inc- Broadway	2	691406.95	4275310.79	1040.00	26.00	350.00	38.18	1.70	0.03	
Virginia Poultry Growers Cooperative Inc- Broadway	6	691406.95	4275310.79	1040.00	46.00	70.00	1.58	0.82	0.24	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps).

Facility	Stack	UTM E (m)	UTM N (m)	Base Elevation (ft)	Stack Height (ft)	Stack Temperature (°F)	Stack Exit Velocity (ft/sec)	Stack Diameter (ft)	PM2.5 (lb/hr)	Notes
West Virginia										
GUARDIAN FIBERGLASS, INC.	2	755908.07	4365535.60	554.00	60.00	200.00	58.60	2.33	0.09	An averaged base elevation for this Facility has been obtained from the website Topozone (www.topozone.com)
GUARDIAN FIBERGLASS, INC.	9	755981.87	4365476.29	554.00	60.00	149.00	83.90	2.33	0.03	
GUARDIAN FIBERGLASS, INC.	3	756289.82	4365579.06	554.00	120.00	110.00	40.20	6.50	3.54	
GUARDIAN FIBERGLASS, INC.	10	756005.80	4365477.08	554.00	120.00	97.00	36.60	7.17	1.41	
GUARDIAN FIBERGLASS, INC.	4	756409.44	4365583.01	554.00	120.00	282.00	69.40	4.33	0.27	
GUARDIAN FIBERGLASS, INC.	11	756027.69	4365539.54	554.00	120.00	242.00	45.60	4.75	0.13	
GUARDIAN FIBERGLASS, INC.	5	756409.44	4365583.01	554.00	1.00	68.00	0.003	1.00	0.26	Missing values of the stack temperature and stack exit velocity were filled with values of 68F and 0.003 fps to represent a worst-case modeling scenario
GUARDIAN FIBERGLASS, INC.	8	765990.35	4365565.69	554.00	43.00	300.00	2.60	2.00	0.02	
GUARDIAN FIBERGLASS, INC.	6	765990.35	4365565.69	554.00	15.00	300.00	9.40	0.67	0.001	
GUARDIAN FIBERGLASS, INC.	7	766301.37	4365576.35	554.00	13.00	300.00	24.00	0.42	0.01	
OX PAPERBOARD, LLC	1	775985.17	4356620.93	410.00	90.00	330.00	55.10	3.96	1.35	Base elevation for this Facility has been obtained from the website Topozone (www.topozone.com)
CAPITOL CEMENT - ESSROC MARTINSBURG	1	759903.04	4369249.25	522.00	43.00	68.00	78.00	1.31	0.07	An averaged base elevation for this Facility has been obtained from the website Topozone (www.topozone.com)
CAPITOL CEMENT - ESSROC MARTINSBURG	2	759902.01	4369280.09	522.00	11.00	68.00	65.80	3.85	0.64	
CAPITOL CEMENT - ESSROC MARTINSBURG	4	759902.01	4369280.09	522.00	40.00	68.00	54.70	1.26	0.03	
CAPITOL CEMENT - ESSROC MARTINSBURG	3	759902.01	4369280.09	522.00	72.00	68.00	65.30	1.87	0.15	
CAPITOL CEMENT - ESSROC MARTINSBURG	6	759902.01	4369280.09	522.00	40.00	68.00	54.70	1.26	0.03	
CAPITOL CEMENT - ESSROC MARTINSBURG	5	759902.01	4369280.09	522.00	72.00	68.00	65.30	1.87	0.15	
CAPITOL CEMENT - ESSROC MARTINSBURG	7	759902.01	4369280.09	522.00	200.00	350.00	32.80	14.83	13.23	
CAPITOL CEMENT - ESSROC MARTINSBURG	9	759902.01	4369280.09	522.00	73.00	250.00	54.70	7.50	2.33	

Facility	Stack	UTM E (m)	UTM N (m)	Base Elevation (ft)	Stack Height (ft)	Stack Temperature (°F)	Stack Exit Velocity (ft/sec)	Stack Diameter (ft)	PM2.5 (lb/hr)	Notes
CAPITOL CEMENT - ESSROC MARTINSBURG	10	759902.01	4369280.09	522.00	73.00	250.00	54.70	7.50	2.18	
CAPITOL CEMENT - ESSROC MARTINSBURG	8	759806.36	4369276.89	522.00	100.00	400.00	34.00	12.50	10.39	
CAPITOL CEMENT - ESSROC MARTINSBURG	11	759902.01	4369280.09	522.00	73.00	250.00	54.70	7.50	2.16	
CAPITOL CEMENT - ESSROC MARTINSBURG	12	759902.01	4369280.09	522.00	18.00	200.00	10.80	1.83	0.03	
CAPITOL CEMENT - ESSROC MARTINSBURG	13	759806.36	4369276.89	522.00	86.00	120.00	67.50	0.73	0.04	
CAPITOL CEMENT - ESSROC MARTINSBURG	14	759806.36	4369276.89	522.00	86.00	120.00	67.50	0.73	0.00	
CAPITOL CEMENT - ESSROC MARTINSBURG	15	759806.36	4369276.89	522.00	30.00	120.00	67.50	0.73	0.04	
CAPITOL CEMENT - ESSROC MARTINSBURG	16	759806.36	4369276.89	522.00	29.00	120.00	67.50	0.73	0.00	
CAPITOL CEMENT - ESSROC MARTINSBURG	49	760027.77	4369099.08	522.00	73.00	68.00	0.003	2.18	0.00	Missing values of the stack temperature and stack exit velocity were filled with values of 68F and 0.003 fps to represent a worst-case modeling scenario
CAPITOL CEMENT - ESSROC MARTINSBURG	17	759902.01	4369280.09	522.00	60.00	225.00	66.80	2.76	0.51	
CAPITOL CEMENT - ESSROC MARTINSBURG	18	759902.01	4369280.09	522.00	53.00	225.00	50.60	1.59	0.06	
CAPITOL CEMENT - ESSROC MARTINSBURG	19	759902.01	4369280.09	522.00	60.00	225.00	89.10	2.76	0.31	
CAPITOL CEMENT - ESSROC MARTINSBURG	20	759902.01	4369280.09	522.00	66.00	225.00	66.80	2.76	0.28	
CAPITOL CEMENT - ESSROC MARTINSBURG	21	759902.01	4369280.09	522.00	60.00	225.00	50.30	1.59	0.04	
CAPITOL CEMENT - ESSROC MARTINSBURG	23	759902.01	4369280.09	522.00	60.00	225.00	55.70	2.76	1.31	
CAPITOL CEMENT - ESSROC MARTINSBURG	22	759902.01	4369280.09	522.00	18.00	225.00	54.20	4.79	0.45	
CAPITOL CEMENT - ESSROC MARTINSBURG	24	759902.01	4369280.09	522.00	122.00	100.00	74.30	2.00	0.68	
CAPITOL CEMENT - ESSROC MARTINSBURG	25	759902.01	4369280.09	522.00	52.00	68.00	43.50	0.77	0.00	
CAPITOL CEMENT - ESSROC MARTINSBURG	26	759902.01	4369280.09	522.00	52.00	68.00	43.50	0.77	0.00	
CAPITOL CEMENT - ESSROC MARTINSBURG	27	759902.01	4369280.09	522.00	104.00	100.00	57.80	2.35	0.73	
CAPITOL CEMENT - ESSROC MARTINSBURG	28	759902.01	4369280.09	522.00	106.00	100.00	57.50	1.22	0.19	
CAPITOL CEMENT - ESSROC MARTINSBURG	29	759902.01	4369280.09	522.00	58.00	68.00	43.50	0.77	0.00	
CAPITOL CEMENT - ESSROC MARTINSBURG	30	759902.01	4369280.09	522.00	58.00	68.00	43.50	0.77	0.00	
CAPITOL CEMENT - ESSROC MARTINSBURG	31	759806.36	4369276.89	522.00	122.00	100.00	62.10	1.78	0.45	
CAPITOL CEMENT - ESSROC MARTINSBURG	32	759806.36	4369276.89	522.00	52.00	68.00	43.50	0.77	0.00	
CAPITOL CEMENT - ESSROC MARTINSBURG	33	759806.36	4369276.89	522.00	52.00	68.00	43.50	0.77	0.00	
CAPITOL CEMENT - ESSROC MARTINSBURG	34	759902.01	4369280.09	522.00	53.00	100.00	45.70	1.86	0.13	
CAPITOL CEMENT - ESSROC MARTINSBURG	35	759902.01	4369280.09	522.00	53.00	100.00	88.00	1.53	0.17	
CAPITOL CEMENT - ESSROC MARTINSBURG	38	759902.01	4369280.09	522.00	53.00	100.00	66.70	1.78	0.35	
CAPITOL CEMENT - ESSROC MARTINSBURG	37	759902.01	4369280.09	522.00	53.00	100.00	71.10	1.86	0.40	
CAPITOL CEMENT - ESSROC MARTINSBURG	39	759902.01	4369280.09	522.00	59.00	100.00	64.80	1.40	0.00	
CAPITOL CEMENT - ESSROC MARTINSBURG	36	759902.01	4369280.09	522.00	52.00	68.00	70.60	1.31	0.00	
CAPITOL CEMENT - ESSROC MARTINSBURG	37	759902.01	4369280.09	522.00	53.00	100.00	71.10	1.86	0.03	
CAPITOL CEMENT - ESSROC MARTINSBURG	40	759902.01	4369280.09	522.00	76.00	100.00	56.60	1.73	0.28	
CAPITOL CEMENT - ESSROC MARTINSBURG	42	759902.01	4369280.09	522.00	35.00	100.00	45.90	0.94	0.07	
CAPITOL CEMENT - ESSROC MARTINSBURG	41	759902.01	4369280.09	522.00	35.00	100.00	45.90	0.94	0.07	
CAPITOL CEMENT - ESSROC MARTINSBURG	44	759902.01	4369280.09	522.00	70.00	100.00	35.40	1.79	0.07	
CAPITOL CEMENT - ESSROC MARTINSBURG	43	760117.22	4369287.30	522.00	20.00	300.00	26.20	0.92	0.00	
CAPITOL CEMENT - ESSROC MARTINSBURG	45	760117.22	4369287.30	522.00	87.00	68.00	90.90	0.66	0.01	
CAPITOL CEMENT - ESSROC MARTINSBURG	46	760117.22	4369287.30	522.00	87.00	68.00	90.90	0.66	0.01	
CAPITOL CEMENT - ESSROC MARTINSBURG	47	760117.22	4369287.30	522.00	30.00	68.00	42.50	0.50	0.04	
CAPITOL CEMENT - ESSROC MARTINSBURG	50	760027.77	4369099.08	522.00	73.00	68.00	0.003	2.18	0.00	Missing values of the stack temperature and stack exit velocity were filled with values of 68F and 0.003 fps to represent a worst-case modeling scenario
CAPITOL CEMENT - ESSROC MARTINSBURG	48	760027.77	4369099.08	522.00	10.00	68.00	0.003	0.66	0.01	

Facility	Stack	UTM E (m)	UTM N (m)	Base Elevation (ft)	Stack Height (ft)	Stack Temperature (°F)	Stack Exit Velocity (ft/sec)	Stack Diameter (ft)	PM2.5 (lb/hr)	Notes
Facility	**Stack**	**UTM E (m)**	**UTM N (m)**	**Base Elevation (ft)**	**Stack Height (ft)**	**Stack Temperature (°F)**	**Stack Exit Velocity (ft/sec)**	**Stack Diameter (ft)**	**PM2.5 (lb/hr)**	**Notes**
Maryland										
Mirant - Dickerson Generating Station	1	804863.57	4345683.43	226.00	703.00	181.00	61.00	25.00	12.42	Base elevation for this Facility has been obtained from the website Topozone (www.topozone.com)
Mirant - Dickerson Generating Station	2	804863.57	4345683.43	226.00	703.00	181.00	61.00	25.00	15.34	
Mirant - Dickerson Generating Station	3	804863.57	4345683.43	226.00	703.00	181.00	61.00	25.00	16.10	
Mirant - Dickerson Generating Station	4	804863.57	4345683.43	226.00	30.00	850.00	86.00	9.75	0.00	
Mirant - Dickerson Generating Station	10	804863.57	4345683.43	226.00	128.00	1150.00	96.00	20.00	0.41	
Mirant - Dickerson Generating Station	9	804863.57	4345683.43	226.00	128.00	1150.00	96.00	20.00	0.25	
Mirant - Dickerson Generating Station	5	804863.57	4345683.43	226.00	10.00	68.00	0.003	0.003	0.00	Missing values of the stack temperature and stack exit velocity were filled with values of 68F and 0.003 fps to represent a worst-case modeling scenario
Mirant - Dickerson Generating Station	7	804863.57	4345683.43	226.00	25.00	950.00	110.00	0.83	0.00	
Montgomery County Resource Recovery Facility (MCRRF)	1	806017.77	4345049.05	325.00	275.00	267.00	65.00	13.42	3.45	Base elevation for this Facility has been obtained from the website Topozone (www.topozone.com)
Montgomery County Resource Recovery Facility (MCRRF)	2	806017.77	4345049.05	325.00	275.00	250.00	65.00	13.42	0.31	
Montgomery County Resource Recovery Facility (MCRRF)	3	806017.77	4345049.05	325.00	275.00	271.00	65.00	13.42	0.88	
Essroc Cement - Frederick	1	806964.64	4361270.66	308.00	21.00	400.00	13.00	2.25	0.002	Base elevation for this Facility has been obtained from the website Topozone (www.topozone.com)
Essroc Cement - Frederick	2	806964.64	4361270.66	308.00	21.00	400.00	13.00	2.25	0.00	
Essroc Cement - Frederick	3	806964.64	4361270.66	308.00	76.00	98.00	43.00	3.33	1.09	
Essroc Cement - Frederick	5	806964.64	4361270.66	308.00	85.00	160.00	17.00	4.33	1.78	
Essroc Cement - Frederick	6	806964.64	4361270.66	308.00	85.00	160.00	17.00	4.33	1.91	
Essroc Cement - Frederick	7	806964.64	4361270.66	308.00	295.00	360.00	12.00	15.50	3.45	
Essroc Cement - Frederick	8	806964.64	4361270.66	308.00	295.00	360.00	12.00	15.50	3.71	
Essroc Cement - Frederick	9	806964.64	4361270.66	308.00	92.00	54.00	57.00	2.25	4.71	
Essroc Cement - Frederick	10	806964.64	4361270.66	308.00	66.00	54.00	100.00	0.67	0.11	
Essroc Cement - Frederick	11	806964.64	4361270.66	308.00	88.00	120.00	71.00	3.00	1.71	
Essroc Cement - Frederick	12	806964.64	4361270.66	308.00	88.00	120.00	71.00	3.00	3.95	
Essroc Cement - Frederick	13	806964.64	4361270.66	308.00	88.00	120.00	71.00	3.00	4.03	
Essroc Cement - Frederick	14	806964.64	4361270.66	308.00	139.00	176.00	48.00	1.08	1.92	
R. Paul Smith Power Station	1	772413.29	4387895.01	358.00	187.00	350.00	74.00	7.50	6.73	Base elevation for this Facility has been obtained from the website Topozone (www.topozone.com)
R. Paul Smith Power Station	2	772413.29	4387895.01	358.00	200.00	305.00	47.00	12.58	0.27	
R. Paul Smith Power Station	3	772413.29	4387895.01	358.00	10.00	68.00	0.003	0.003	0.00	Missing values of the stack temperature and stack exit velocity were filled with values of 68F and 0.003 fps to represent a worst-case modeling scenario

Facility	Stack	UTM E (m)	UTM N (m)	Base Elevation (ft)	Stack Height (ft)	Stack Temperature (°F)	Stack Exit Velocity (ft/sec)	Stack Diameter (ft)	PM2.5 (lb/hr)	Notes
Virginia										
O-N Minerals (Chemstone) Company - Middletown	2	733617.43	4324020.60	680.00	17.00	180.00	69.29	3.50	2.52	
O-N Minerals (Chemstone) Company - Middletown	2	733617.43	4324020.60	680.00	17.00	180.00	69.29	3.50	2.52	
O-N Minerals (Chemstone) Company - Middletown	1	733617.43	4324020.60	680.00	10.00	72.00	0.003	0.003	0.29	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps).
O-N Minerals (Chemstone) Company - Middletown	1	733617.43	4324020.60	680.00	10.00	72.00	0.003	0.003	0.29	
Valley Proteins, Inc.	1	737817.27	4345720.54	900.00	25.00	350.00	0.01	2.00	0.54	
Valley Proteins, Inc.	1	737817.27	4345720.54	900.00	25.00	350.00	0.01	2.00	0.54	
Valley Proteins, Inc.	1	737817.27	4345720.54	900.00	25.00	350.00	0.01	2.00	0.54	
Valley Proteins, Inc.	2	737817.27	4345720.54	900.00	25.00	350.00	0.01	2.00	0.60	
Mountain View Rendering Company	3	707207.29	4305410.62	1090.00	45.00	100.00	59.09	5.19	1.48	
Mountain View Rendering Company	1	707207.29	4305410.62	1090.00	40.00	398.00	54.41	2.09	0.30	
Mountain View Rendering Company	4	707207.29	4305410.62	1090.00	45.00	100.00	59.09	5.19	0.49	
Mountain View Rendering Company	2	707207.29	4305410.62	1090.00	45.00	100.00	59.09	5.19	0.002	
Toray Plastics	2	745417.42	4319420.67	565.30	72.00	86.00	45.01	1.29	1.88	
Toray Plastics	1	745417.42	4319420.67	565.30	50.00	350.00	17.32	2.50	0.12	
Toray Plastics	3	745417.42	4319420.67	565.30	72.00	130.00	99.61	0.70	0.002	
Toray Plastics	3	745417.42	4319420.67	565.30	72.00	130.00	99.61	0.70	0.002	
Miller Milling Co	4	746917.23	4343520.56	680.00	115.00	68.00	68.97	2.00	0.00	
Miller Milling Co	8	746917.23	4343520.56	680.00	80.00	400.00	94.31	1.50	0.21	
Miller Milling Co	7	746917.23	4343520.56	680.00	115.00	68.00	58.36	2.00	0.00	
Miller Milling Co	1	746637.23	4343940.56	680.00	75.00	68.00	26.53	2.00	0.00	
Miller Milling Co	2	746917.23	4343520.56	680.00	115.00	68.00	87.33	2.70	0.00	
Miller Milling Co	3	746917.23	4343520.56	680.00	115.00	68.00	104.79	2.70	1.22	
Miller Milling Co	3	746917.23	4343520.56	680.00	115.00	68.00	104.79	2.70	1.22	
Miller Milling Co	6	746917.23	4343520.56	680.00	115.00	68.00	10.61	2.00	0.00	
Miller Milling Co	5	746917.23	4343520.56	680.00	115.00	68.00	10.61	2.00	0.00	
O-N Minerals (Chemstone) Company - Clear Brook	6	751417.15	4348920.54	625.00	8.00	880.00	124.51	0.28	0.005	
O-N Minerals (Chemstone) Company - Clear Brook	5	751407.15	4348910.54	625.00	45.00	100.00	58.36	2.00	0.00	
O-N Minerals (Chemstone) Company - Clear Brook	8	751407.15	4348910.54	625.00	85.00	70.00	79.58	2.00	0.67	
O-N Minerals (Chemstone) Company - Clear Brook	9	751407.15	4348910.54	623.00	27.00	70.00	79.58	2.00	0.002	
O-N Minerals (Chemstone) Company - Clear Brook	1	751407.15	4348910.54	625.00	10.00	72.00	0.003	0.003	4.15	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps).
O-N Minerals (Chemstone) Company - Clear Brook	3	751407.15	4348910.54	625.00	185.00	269.00	34.76	6.00	0.42	Elevation assumed to be the same as that provided with same coordinate
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database.
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps).
O-N Minerals (Chemstone) Company - Clearbrook	50	751417.15	4348920.54	600.00	10.00	72.00	0.003	0.003	0.27	
O-N Minerals (Chemstone) Company - Clearbrook	50	751417.15	4348920.54	600.00	10.00	72.00	0.003	0.003	0.27	
O-N Minerals (Chemstone) Company - Clearbrook	1	751417.15	4348920.54	600.00	10.00	72.00	0.003	0.003	0.46	

Facility	Stack	UTM E (m)	UTM N (m)	Base Elevation (ft)	Stack Height (ft)	Stack Temperature (°F)	Stack Exit Velocity (ft/sec)	Stack Diameter (ft)	PM2.5 (lb/hr)	Notes
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database.
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	
O-N Minerals (Chemstone) Company - Clearbrook	5	750817.16	4348520.54	600.00	20.00	500.00	26.53	4.00	2.28	
O-N Minerals (Chemstone) Company - Clearbrook	5	750817.16	4348520.54	600.00	20.00	500.00	26.53	4.00	2.28	
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Elevation assumed to be the same as that provided with same coordinate
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	
O-N Minerals (Chemstone) Company - Clearbrook	2	750807.16	4348510.54	600.00	10.00	72.00	0.003	0.003	0.05	
O-N Minerals (Chemstone) Company - Clearbrook	2	750807.16	4348510.54	600.00	10.00	72.00	0.003	0.003	0.05	
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	
O-N Minerals (Chemstone) Company - Clearbrook	4	751417.15	4348920.54	625.00	10.00	72.00	0.003	0.003	0.20	
O-N Minerals (Chemstone) Company - Portable 81477	1	751417.15	4348920.54	630.00	8.00	68.00	36.96	0.83	0.00	
O-N Minerals (Chemstone) Company - Portable 81485	1	751417.15	4348920.54	519.00	10.00	72.00	0.003	0.003	0.99	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps).
O-N Minerals (Chemstone) Company - Portable 81485	1	751417.15	4348920.54	519.00	10.00	72.00	0.003	0.003	0.99	
Trex Company Inc	4	743017.32	4335720.59	745.00	51.00	133.00	30.80	0.83	6.92	
Trex Company Inc	5	743017.32	4335720.59	721.00	12.00	850.00	1285.97	0.50	0.00	
O-N Minerals (Chemstone) Company - Portable 81576	1	731297.43	4322000.60	650.00	10.00	72.00	0.003	0.003	0.00	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps). Elevlation assumed to be the same as that provided with same coordinate
O-N Minerals (Chemstone) Company - Strasburg	5	732307.44	4322010.61	630.00	10.00	72.00	0.003	0.003	1.68	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps).
O-N Minerals (Chemstone) Company - Strasburg	8	731307.43	4322010.60	630.00	25.00	77.00	63.66	2.00	0.45	
O-N Minerals (Chemstone) Company - Strasburg	6	732307.44	4322010.61	630.00	79.00	475.00	132.63	4.00	0.18	
O-N Minerals (Chemstone) Company - Strasburg	1	731307.43	4322010.60	630.00	79.00	200.00	16.58	4.00	0.00	
O-N Minerals (Chemstone) Company - Strasburg	1	731307.43	4322010.60	630.00	79.00	200.00	16.58	4.00	0.00	
O-N Minerals (Chemstone) Company - Strasburg	4	732307.44	4322010.61	630.00	50.00	100.00	46.67	1.20	0.95	
O-N Minerals (Chemstone) Company - Strasburg	1	731297.43	4322000.60	650.00	10.00	72.00	0.003	0.003	0.04	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps).
O-N Minerals (Chemstone) Company - Strasburg	1	731307.43	4322010.60	630.00	79.00	200.00	16.58	4.00	0.00	
O-N Minerals (Chemstone) Company - Strasburg	9	732307.44	4322010.61	630.00	10.00	72.00	0.003	0.003	0.00	Missing values of the stack parameters (stack height, exit velocity, stack temperature and stack diameter) were filled from the NEI Database. Based on the limitations in the AERMOD interface, stack exit velocity was made consistent with that of the horizontal stacks at 0.001 m/s (0.003 fps).
O-N Minerals (Chemstone) Company - Strasburg	2	731297.43	4322000.60	650.00	10.00	72.00	0.003	0.003	1.68	
O-N Minerals (Chemstone) Company - Strasburg	3	732307.44	4322010.61	630.00	47.00	550.00	57.63	3.59	0.00	

Facility	Stack	UTM E (m)	UTM N (m)	Base Elevation (ft)	Stack Height (ft)	Stack Temperature (°F)	Stack Exit Velocity (ft/sec)	Stack Diameter (ft)	PM2.5 (lb/hr)	Notes
O-N Minerals (Chemstone) Company - Strasburg	1	731307.43	4322010.60	630.00	79.00	200.00	16.58	4.00	0.00	
O-N Minerals (Chemstone) Company - Strasburg	1	731307.43	4322010.60	630.00	79.00	200.00	16.58	4.00	0.00	
O-N Minerals (Chemstone) Company - Strasburg	2	732307.44	4322010.61	630.00	79.00	200.00	132.63	4.00	3.67	
O-N Minerals (Chemstone) Company - Strasburg	7	732307.44	4322010.61	630.00	60.00	150.00	11.94	4.00	0.00	
O'Sullivan Films Inc	18	743517.29	4338910.57	720.00	53.00	470.00	36.53	1.50	0.00	
O'Sullivan Films Inc	6	743517.29	4338910.57	720.00	70.00	77.00	67.79	0.60	1.36	
O'Sullivan Films Inc	8	743517.29	4338920.57	720.00	10.00	77.00	0.003	0.003	1.22	Missing values of the stack height, stack exit velocity and stack diameter were filled with values of 10ft, 0.003 fps and 0.003 ft to represent a worst-case modeling scenario
O'Sullivan Films Inc	18	743517.29	4338910.57	720.00	53.00	470.00	36.53	1.50	0.00	
O'Sullivan Films Inc	2	743517.29	4338910.57	720.00	30.00	475.00	16.83	2.00	0.03	
O'Sullivan Films Inc	3	743517.29	4338910.57	720.00	25.00	350.00	19.26	0.80	0.05	
O'Sullivan Films Inc	10	743517.29	4338920.57	720.00	50.00	205.00	43.83	6.75	0.02	
O'Sullivan Films Inc	12	743517.29	4338920.57	720.00	10.00	300.00	1.00	1.00	0.01	
O'Sullivan Films Inc	4	743517.29	4338910.57	720.00	35.00	77.00	17.50	3.00	0.97	
O'Sullivan Films Inc	18	743517.29	4338910.57	720.00	53.00	470.00	36.53	1.50	0.00	
O'Sullivan Films Inc	13	743517.29	4338920.57	720.00	25.00	350.00	0.03	0.80	0.03	
O'Sullivan Films Inc	15	743517.29	4338920.57	720.00	50.00	300.00	55.54	4.90	0.02	
O'Sullivan Films Inc	1	743517.29	4338910.57	720.00	40.00	470.00	13.15	2.50	0.01	
Facility	**Stack**	**UTM E (m)**	**UTM N (m)**	**Base Elevation (ft)**	**Stack Height (ft)**	**Stack Temperature (°F)**	**Stack Exit Velocity (ft/sec)**	**Stack Diameter (ft)**	**PM2.5 (lb/hr)**	**Notes**
West Virginia										
GUARDIAN FIBERGLASS, INC.	2	755908.07	4365535.60	554.00	60.00	200.00	58.60	2.33	0.09	An averaged base elevation for this Facility has been obtained from the website Topozone (www.topozone.com)
GUARDIAN FIBERGLASS, INC.	9	755981.87	4365476.29	554.00	60.00	149.00	83.90	2.33	0.03	
GUARDIAN FIBERGLASS, INC.	3	756289.82	4365579.06	554.00	120.00	110.00	40.20	6.50	3.54	
GUARDIAN FIBERGLASS, INC.	10	756005.80	4365477.08	554.00	120.00	97.00	36.60	7.17	1.41	
GUARDIAN FIBERGLASS, INC.	4	756409.44	4365583.01	554.00	120.00	282.00	69.40	4.33	0.27	
GUARDIAN FIBERGLASS, INC.	11	756027.69	4365539.54	554.00	120.00	242.00	45.60	4.75	0.13	
GUARDIAN FIBERGLASS, INC.	5	756409.44	4365583.01	554.00	1.00	68.00	0.003	1.00	0.26	Missing values of the stack temperature and stack exit velocity were filled with values of 68F and 0.003 fps to represent a worst-case modeling scenario
GUARDIAN FIBERGLASS, INC.	8	765990.35	4365565.69	554.00	43.00	300.00	2.60	2.00	0.02	
GUARDIAN FIBERGLASS, INC.	6	765990.35	4365565.69	554.00	15.00	300.00	9.40	0.67	0.001	
GUARDIAN FIBERGLASS, INC.	7	766301.37	4365576.35	554.00	13.00	300.00	24.00	0.42	0.01	
OX PAPERBOARD, LLC	1	775985.17	4356620.93	410.00	90.00	330.00	55.10	3.96	1.35	Base elevation for this Facility has been obtained from the website Topozone (www.topozone.com)
Facility	**Stack**	**UTM E (m)**	**UTM N (m)**	**Base Elevation (ft)**	**Stack Height (ft)**	**Stack Temperature (°F)**	**Stack Exit Velocity (ft/sec)**	**Stack Diameter (ft)**	**PM2.5 (lb/hr)**	**Notes**
Maryland - None (All sources outside the (SIA+50km)										

Class I Background Emission Inventory

Missing values of stack heights, stack diameter, stack gas velocty and exit temperatures were substituted from 2005 NEI data. Substituted data is highlighted in yellow and font color is black

Whenever no data is available from 2008 VA data or from 2005 NEI data , default values of 10 ft stack height, 0.003 ft stack dia, 0.003 fps stack gas velocity and 72 F exit temp were used. Highlighted in yellow and font color is red.

Facility Name	Stack No	UTM E (m)	UTM N (m)	Base Elevation	Stack Height	Stack Temp	Stack Exit Velocity	Stack Diameter	Nox Emissions	Actual Emissions
				ft	ft	°F	fps	ft	lb/hr	tons/yr
Virginia										
Columbia Gas Transmission Corp - Bickers	5	722100.00	4239200.00	600	20	600	166.05	2	0.00	0.01
Columbia Gas Transmission Corp - Bickers	1	722100.00	4239200.00	600	44	600	184.3	2	1.25	5.48
Columbia Gas Transmission Corp - Bickers	2	722100.00	4239200.00	600	44	600	184.3	2	1.31	5.72
Columbia Gas Transmission Corp - Bickers	4	722100.00	4239200.00	600	53	600	184.3	2	4.27	18.69
Columbia Gas Transmission Corp - Bickers	3	722100.00	4239200.00	600	44	600	184.3	2	1.14	5
Columbia Gas Transmission Corp - Bickers	6	722100.00	4239200.00	600	20	600	166.05	2	0.00	0.02
City of Harrisonburg - Resource Recovery Facility	2	686500.00	4255800.00	1420	70	375	39.37	2.5	0.61	2.69
City of Harrisonburg - Resource Recovery Facility	3	686500.00	4255800.00	1420	43	350	63.66	0.5	0.03	0.11
City of Harrisonburg - Resource Recovery Facility	1	686500.00	4255790.00	1420	150	280	37.97	4	22.89	100.25
Old Dominion Electric Cooperative Louisa	4	744000.00	4222400.00	250	56	958	105.95	18	1.37	6
Old Dominion Electric Cooperative Louisa	8	744000.00	4222400.00	250	20	752	120	0.67	0.05	0.23
Old Dominion Electric Cooperative Louisa	6	744000.00	4222400.00	250	25	775	5.22	2	0.00	0.02
Old Dominion Electric Cooperative Louisa	5	744000.00	4222400.00	250	90	1058	168.91	18	2.37	10.4
Old Dominion Electric Cooperative Louisa	1	744000.00	4222400.00	250	56	958	105.95	18	1.69	7.4
Old Dominion Electric Cooperative Louisa	3	744000.00	4222400.00	250	56	958	105.95	18	1.53	6.7
Old Dominion Electric Cooperative Louisa	7	744000.00	4222400.00	250	25	775	5.22	2	0.00	0.02
Old Dominion Electric Cooperative Louisa	2	744000.00	4222400.00	250	56	958	105.95	18	1.94	8.5
Transcontinental Gas Pipeline - Station 180	9	765481.35	4243393.70	321	29	650	174.48	1.5	12.62	55.28
Transcontinental Gas Pipeline - Station 180	18	765481.35	4243393.70	321	19	1032	165.05	0.3	0.20	0.88
Transcontinental Gas Pipeline - Station 180	5	765481.35	4243393.70	321	43	760	130.7	1.7	19.34	84.7
Transcontinental Gas Pipeline - Station 180	17	765481.35	4243393.70	321	21	800	80.23	0.69	0.15	0.67
Transcontinental Gas Pipeline - Station 180	19	765481.35	4243393.70	321	18	1076	151.85	0.3	1.49	6.52
Transcontinental Gas Pipeline - Station 180	10	765481.35	4243393.70	321	29	650	194.29	1.5	10.75	47.09
Transcontinental Gas Pipeline - Station 180	1	765481.35	4243393.70	321	43	675	117.48	1.7	70.69	309.64
Transcontinental Gas Pipeline - Station 180	20	765481.35	4243393.70	321	9	400	15.29	1.29	0.07	0.32
Transcontinental Gas Pipeline - Station 180	3	765481.35	4243393.70	321	43	650	117.48	1.7	69.77	305.61
Transcontinental Gas Pipeline - Station 180	6	765481.35	4243393.70	321	43	760	130.7	1.7	18.71	81.93
Transcontinental Gas Pipeline - Station 180	2	765481.35	4243393.70	321	43	675	117.48	1.7	71.68	313.97
Transcontinental Gas Pipeline - Station 180	21	765481.35	4243393.70	321	14	400	17.7	1.2	0.05	0.24
Transcontinental Gas Pipeline - Station 180	8	765481.35	4243393.70	321	29	660	189.57	1.5	7.95	34.8
Transcontinental Gas Pipeline - Station 180	7	765481.35	4243393.70	321	43	675	117.48	1.7	61.87	270.98
Transcontinental Gas Pipeline - Station 180	15	765481.35	4243393.70	321	21	800	80.23	0.69	0.16	0.69
Transcontinental Gas Pipeline - Station 180	16	765481.35	4243393.70	321	21	800	80.23	0.69	0.16	0.7
Transcontinental Gas Pipeline - Station 180	14	765481.35	4243393.70	321	49	600	124.02	3	21.89	95.9
Transcontinental Gas Pipeline - Station 180	13	765481.35	4243393.70	321	40	600	115.44	2.5	28.16	123.36
Transcontinental Gas Pipeline - Station 180	12	765481.35	4243393.70	321	39	660	100.84	2.5	25.47	111.54

Facility Name	Stack No	UTM E (m)	UTM N (m)	Base Elevation	Stack Height	Stack Temp	Stack Exit Velocity	Stack Diameter	Nox Emissions	Actual Emissions
				ft	ft	°F	fps	ft	lb/hr	tons/yr
Transcontinental Gas Pipeline - Station 180	11	765481.35	4243393.70	321	48	575	93.71	2.5	18.76	82.19
Transcontinental Gas Pipeline - Station 180	4	765481.35	4243393.70	321	43	650	117.48	1.7	69.39	303.92
Valley Proteins Inc - Linville	1	688900.00	4267400.00	1200	38	400	36.61	2	9.57	41.91
Valley Proteins Inc - Linville	3	688900.00	4267400.00	1200	38	400	40.53	2	1.29	5.67
Valley Proteins Inc - Linville	1	688900.00	4267400.00	1200	38	400	36.61	2	9.57	41.91
Valley Proteins Inc - Linville	1	688900.00	4267400.00	1200	38	400	36.61	2	9.57	41.91
Valley Proteins Inc - Linville	1	688900.00	4267400.00	1200	38	400	36.61	2	9.57	41.91
Valley Proteins Inc - Linville	2	688900.00	4267400.00	1200	21	400	0.01	1.7	0.17	0.73
Valley Proteins Inc - Linville	1	688900.00	4267400.00	1200	38	400	36.61	2	9.57	41.91
Valley Proteins Inc - Linville	1	688900.00	4267400.00	1200	38	400	36.61	2	9.57	41.91
Valley Proteins Inc - Linville	1	688900.00	4267400.00	1200	38	400	36.61	2	9.57	41.91
Mountain View Rendering Company	2	707190.00	4305190.00	1090	45	100	59.09	5.19	0.47	2.05
Mountain View Rendering Company	1	707190.00	4305190.00	1090	40	398	54.41	2.09	4.01	17.55
E I DuPont de Nemours & Co Inc - Front Royal	1	744790.00	4318190.00	575	75	625	48	2.4	1.81	7.93
Bowman Apple Products Co Inc	4	706600.00	4293400.00	885	26	480	34.59	2	1.27	5.57
Bowman Apple Products Co Inc	3	706590.00	4293390.00	885	90	375	47.16	4.5	1.07	4.69
Bowman Apple Products Co Inc	1	706590.00	4293390.00	885	90	375	28.82	4.5	0.73	3.18
Bowman Apple Products Co Inc	2	706590.00	4293390.00	885	35	450	31.57	2.3	0.94	4.125
The Rochester Corporation	2	761000.00	4262000.00		10	430	0.003	1	0.02	0.09
The Rochester Corporation	4	761000.00	4262000.00	100	12	300	40.32	1	6.91	30.26
The Rochester Corporation	1	761000.00	4262000.00		10	430	0.003	1	0.09	0.41
The Rochester Corporation	7	761000.00	4262000.00		10	72	0.003	0.003	0.00	0
Dominion - Remington CT Station	9	781452.71	4271135.70		10	72	0.003	0.003	0.01	0.04
Dominion - Remington CT Station	8	781452.71	4271135.70		10	72	0.003	0.003	0.01	0.04
Dominion - Remington CT Station	3	781452.71	4271135.70	270	65	1097	74.8	18	2.51	11
Dominion - Remington CT Station	1	781452.71	4271135.70	270	65	1097	74.8	18	3.68	16.1
Dominion - Remington CT Station	4	781452.71	4271135.70	270	65	1097	74.8	18	2.58	11.3
Dominion - Remington CT Station	5	781452.71	4271135.70	270	65	1097	74.8	18	0.00	0
Dominion - Remington CT Station	2	781452.71	4271135.70	270	65	1097	74.8	18	3.06	13.4
Old Dominion Electric Cooperative - Marsh Run	1	781678.84	4269516.58	300	90	1058	168.85	18	4.22	18.5
Old Dominion Electric Cooperative - Marsh Run	6	781678.84	4269516.58	300	30	725	27.7	1.5	0.03	0.15
Old Dominion Electric Cooperative - Marsh Run	7	781678.84	4269516.58	300	9	752	111.42	0.67	0.02	0.07
Old Dominion Electric Cooperative - Marsh Run	5	781678.84	4269516.58	300	30	725	27.7	1.5	0.11	0.46
Old Dominion Electric Cooperative - Marsh Run	4	781678.84	4269516.58	300	90	1058	168.85	18	0.00	0
Old Dominion Electric Cooperative - Marsh Run	2	781678.84	4269516.58	300	90	1058	168.85	18	4.20	18.4
Old Dominion Electric Cooperative - Marsh Run	3	781678.84	4269516.58	300	90	1058	168.85	18	2.95	12.9
Dominion - Gordonsville Power Station	1	745000.00	4223290.00	597	150	280	92	14.3	8.24	36.1
Dominion - Gordonsville Power Station	2	745000.00	4223290.00	597	150	280	92	14.3	6.44	28.2
Dominion - Gordonsville Power Station	2	745000.00	4223290.00	597	150	280	92	14.3	6.44	28.2
Dominion - Gordonsville Power Station	1	745000.00	4223290.00	597	150	280	92	14.3	8.24	36.1
Dominion - Gordonsville Power Station	3	745000.00	4223290.00	597	150	580	78.18	1.5	0.00	0.01
Dominion - Gordonsville Power Station	1	745000.00	4223290.00	597	150	280	92	14.3	8.24	36.1
Dominion - Gordonsville Power Station	3	745000.00	4223290.00	597	150	580	78.18	1.5	0.01	0.0336
Dominion - Gordonsville Power Station	2	745000.00	4223290.00	597	150	280	92	14.3	6.44	28.2

Facility Name	Stack No	UTM E (m)	UTM N (m)	Base Elevation	Stack Height	Stack Temp	Stack Exit Velocity	Stack Diameter	Nox Emissions	Actual Emissions
				ft	ft	°F	fps	ft	lb/hr	tons/yr
Shenandoah Compressor Station	2	707190.00	4271290.00	1100	40	1000	14.31	5.63	1.49	6.54
Shenandoah Compressor Station	1	707190.00	4271290.00	1100	40	1000	14.31	5.63	1.99	8.73
Shenandoah Compressor Station	4	707190.00	4271290.00	1100	20	350	20.9	1.33	0.08	0.34
Shenandoah Compressor Station	3	707190.00	4271290.00	1100	15	900	141.08	0.33	0.00	0
Merck Sharp & Dohme Corporation	21	705100.00	4250900.00	1000	150	300	49.77	6	3.88	17.01
Merck Sharp & Dohme Corporation	21	705100.00	4250900.00	1000	150	300	49.77	6	3.88	17.01
Merck Sharp & Dohme Corporation	7	705090.00	4250890.00	1000	10	72	0.003	0.003	0.48	2.1
Merck Sharp & Dohme Corporation	14	705090.00	4250890.00	1000	10	800	200.67	0.67	1.75	7.68
Merck Sharp & Dohme Corporation	3	705090.00	4250890.00	1000	150	300	49.77	6	0.00	0
Merck Sharp & Dohme Corporation	1	705090.00	4250890.00	1000	78	360	31.65	5.5	0.56	2.47
Merck Sharp & Dohme Corporation	3	705090.00	4250890.00	1000	150	300	49.77	6	0.00	0
O-N Minerals (Chemstone) Company - Strasburg	2	732290.00	4321790.00	630	79	200	132.63	4	59.98	262.72
O-N Minerals (Chemstone) Company - Strasburg	3	732290.00	4321790.00	630	47	550	57.63	3.59	4.76	20.869
O-N Minerals (Chemstone) Company - Strasburg	1	731290.00	4321790.00	630	79	200	16.58	4	0.00	0
O-N Minerals (Chemstone) Company - Strasburg	1	731290.00	4321790.00	630	79	200	16.58	4	0.00	0
O-N Minerals (Chemstone) Company - Strasburg	1	731290.00	4321790.00	630	79	200	16.58	4	0.00	0
O-N Minerals (Chemstone) Company - Strasburg	1	731290.00	4321790.00	630	79	200	16.58	4	0.00	0
O-N Minerals (Chemstone) Company - Strasburg	1	731290.00	4321790.00	630	79	200	16.58	4	0.00	0
MillerCoors LLC	31	702500.00	4247400.00	1011	43	600	29.25	2.29	0.00	0
MillerCoors LLC	31	702500.00	4247400.00	1011	43	600	29.25	2.29	0.00	0
MillerCoors LLC	30	702500.00	4247400.00	1011	50	444	56	4	2.28	9.98
MillerCoors LLC	32	702500.00	4247400.00	1011	50	350	40	3	0.07	0.32
MillerCoors LLC	50	702500.00	4247400.00	1011	20	340	11.22	1.5	0.14	0.62
MillerCoors LLC	30	702500.00	4247400.00	1011	50	444	56	4	2.28	9.98
MillerCoors LLC	51	702500.00	4247400.00	1011	20	340	11.22	1.5	0.51	2.24
MillerCoors LLC	31	702500.00	4247400.00	1011	43	600	29.25	2.29	0.00	0
MillerCoors LLC	30	702500.00	4247400.00	1011	50	444	56	4	2.28	9.98
Johns Manville	1	713190.00	4302000.00	880	55	180	40.58	3.1	3.00	13.16
Johns Manville	2	713190.00	4302000.00	880	66	160	34.41	3.5	2.16	9.445
Johns Manville	6	713190.00	4302000.00	880	67	300	42.44	2.5	1.05	4.61
Johns Manville	3	713190.00	4302000.00	880	60	157	15.95	7	2.54	11.13
Johns Manville	8	713190.00	4302000.00	880	10	72	0.003	0.003	0.07	0.312

Missing values of stack heights, stack diameter, stack gas velocty and exit temperatures were substituted from 2005 NEI data. Substituted data is highlighted in yellow and font color is black

Whenever no data is available from 2008 VA data or from 2005 NEI data , default value of 10 ft stack height, 0.003 ft stack dia, 0.003 fps stack gas velocity and 72 F exit temp were used. Highlighted in yellow and font color is red.

Facility Name	Stack No	UTM E	UTM N	Base Elevation	Stack Height	Stack Temp	Stack Exit Velocity	Stack Diameter	PM10
		m	m	ft	ft	°F	fps	ft	lb/hr
Virginia									
Virginia Industries Inc	2	238790.00	4262190.00	100	10	300	0.003	0.003	1.67
Virginia Industries Inc	2	238790.00	4262190.00	100	10	300	0.003	0.003	1.67
Virginia Industries Inc	2	238790.00	4262190.00	100	10	300	0.003	0.003	1.67
Virginia Industries Inc	1	238790.00	4262190.00	100	60	300	37.73	3	0.44
Virginia Industries Inc	2	238790.00	4262190.00	100	10	300	0.003	0.003	1.67
Virginia Industries Inc	2	238790.00	4262190.00	100	10	300	0.003	0.003	1.67
Virginia Industries Inc	2	238790.00	4262190.00	100	10	300	0.003	0.003	1.67
Virginia Industries Inc	2	238790.00	4262190.00	100	10	300	0.003	0.003	1.67
Virginia Industries Inc	2	238790.00	4262190.00	100	10	300	0.003	0.003	1.67
Pilgrim's Pride Corporation	9	685700.00	4260000.00	1380	10	72	0.003	0.003	0.34
Pilgrim's Pride Corporation	9	685700.00	4260000.00	1380	10	72	0.003	0.003	0.34
Pilgrim's Pride Corporation	7	685690.00	4260000.00	1380	152	77	58.95	0.6	0.05
Pilgrim's Pride Corporation	7	685690.00	4260000.00	1380	152	77	58.95	0.6	0.05
Pilgrim's Pride Corporation	10	685700.00	4260000.00	1380	10	72	0.003	0.003	0.24
Pilgrim's Pride Corporation	10	685700.00	4260000.00	1380	10	72	0.003	0.003	0.24
Pilgrim's Pride Corporation	3	685700.00	4260000.00	1380	139	68	0.41	20	0.49
Pilgrim's Pride Corporation	3	685700.00	4260000.00	1380	139	68	0.41	20	0.49
Pilgrim's Pride Corporation	8	685690.00	4260000.00	1380	156	100	62.36	3.5	4.24
Pilgrim's Pride Corporation	8	685690.00	4260000.00	1380	156	100	62.36	3.5	4.24
Pilgrim's Pride Corporation	1	685700.00	4260000.00	1380	80	350	21.49	2.83	0.05
Pilgrim's Pride Corporation	1	685700.00	4260000.00	1380	80	350	21.49	2.83	0.05
Pilgrim's Pride Corporation	3	685700.00	4260000.00	1380	139	68	0.41	20	0.49
Pilgrim's Pride Corporation	3	685700.00	4260000.00	1380	139	68	0.41	20	0.49
Pilgrim's Pride Corporation	5	685700.00	4260000.00	1380	20	77	51.87	1.5	0.01
Pilgrim's Pride Corporation	5	685700.00	4260000.00	1380	20	77	51.87	1.5	0.01
Pilgrim's Pride Corporation	9	685700.00	4260000.00	1380	10	72	0.003	0.003	0.34
Pilgrim's Pride Corporation	9	685700.00	4260000.00	1380	10	72	0.003	0.003	0.34
Pilgrim's Pride Corporation	6	685690.00	4260000.00	1380	20	77	51.87	1.5	0.23
Pilgrim's Pride Corporation	6	685690.00	4260000.00	1380	20	77	51.87	1.5	0.23
American Woodmark Orange Dimension Plant	7	752800.00	4266000.00	50	35	68	38.2	5	2.77
Battle Creek Landfill	2	709850.00	4277700.00	1200	10	72	0.003	0.003	2.10
Valley Proteins Inc - Linville	1	688900.00	4267400.00	1200	38	400	36.61	2	3.06
Valley Proteins Inc - Linville	3	688900.00	4267400.00	1200	38	400	40.53	2	0.09
Valley Proteins Inc - Linville	2	688900.00	4267400.00	1200	21	400	0.01	1.7	0.01
Valley Proteins Inc - Linville	1	688900.00	4267400.00	1200	38	400	36.61	2	3.06
Valley Proteins Inc - Linville	1	688900.00	4267400.00	1200	38	400	36.61	2	3.06
Valley Proteins Inc - Linville	1	688900.00	4267400.00	1200	38	400	36.61	2	3.06
Valley Proteins Inc - Linville	1	688900.00	4267400.00	1200	38	400	36.61	2	3.06

Facility Name	Stack No	UTM E	UTM N	Base Elevation	Stack Height	Stack Temp	Stack Exit Velocity	Stack Diameter	PM10
		m	m	ft	ft	°F	fps	ft	lb/hr
Valley Proteins Inc - Linville	1	688900.00	4267400.00	1200	38	400	36.61	2	3.06
Valley Proteins Inc - Linville	1	688900.00	4267400.00	1200	38	400	36.61	2	3.06
Howell Metal Co	6	699890.00	4281090.00	1000	45	90	2.12	1	0.005
Howell Metal Co	2	699890.00	4281090.00	1000	10	72	0.003	0.003	0.92
Howell Metal Co	1	699890.00	4281090.00	1000	45	150	0.02	1	0.05
Howell Metal Co	5	699890.00	4281090.00	1000	26	77	35.37	3	0.97
Mountain View Rendering Company	3	707190.00	4305190.00	1090	45	100	59.09	5.19	1.48
Mountain View Rendering Company	1	707190.00	4305190.00	1090	40	398	54.41	2.09	0.30
Mountain View Rendering Company	4	707190.00	4305190.00	1090	45	100	59.09	5.19	0.49
Mountain View Rendering Company	2	707190.00	4305190.00	1090	45	100	59.09	5.19	0.002
Shenandoah County Sanitary Landfill - Edinburg	1	713320.00	4302760.00	800	10	72	0.003	0.003	5.07
Toray Plastics	2	745400.00	4319200.00	565.3	72	86	45.01	1.29	1.88
Toray Plastics	1	745400.00	4319200.00	565.3	50	350	17.32	2.5	0.12
Toray Plastics	3	745400.00	4319200.00	565.3	72	130	99.61	0.7	0.002
Toray Plastics	3	745400.00	4319200.00	565.3	72	130	99.61	0.7	0.002
Horizon Milling	2	238690.00	4260890.00	400	4	77	7.47	2.5	0.26
Horizon Milling	1	238690.00	4260890.00	400	20	350	18.33	1	0.001
Horizon Milling	3	238690.00	4260890.00	400	42	77	116.71	2	9.62
George's Foods LLC	3	686300.00	4258200.00	1337	10	72	0.003	0.003	0.0002
George's Foods LLC	6	686300.00	4258200.00	1337	14	77	67.97	0.8	0.20
George's Foods LLC	2	686300.00	4258200.00	1340	25	440	44.25	1.67	0.03
George's Foods LLC	5	686300.00	4258200.00	1337	25	90	70.74	3	3.92
George's Foods LLC	4	686300.00	4258200.00	1337	10	72	0.003	0.003	0.01
George's Foods LLC	1	686300.00	4258200.00	1337	18	370	47.16	1.5	0.00
Dominion - Gordonsville Power Station	3	745000.00	4223290.00	597	150	580	78.18	1.5	0.0001
Dominion - Gordonsville Power Station	1	745000.00	4223290.00	597	150	280	92	14.3	4.37
Dominion - Gordonsville Power Station	2	745000.00	4223290.00	597	150	280	92	14.3	3.55
Dominion - Gordonsville Power Station	2	745000.00	4223290.00	597	150	280	92	14.3	3.55
Dominion - Gordonsville Power Station	1	745000.00	4223290.00	597	150	280	92	14.3	4.37
Dominion - Gordonsville Power Station	2	745000.00	4223290.00	597	150	280	92	14.3	3.55
Dominion - Gordonsville Power Station	3	745000.00	4223290.00	597	150	580	78.18	1.5	0.0003
Dominion - Gordonsville Power Station	1	745000.00	4223290.00	597	150	280	92	14.3	4.37
American Woodmark Orange Dimension Plant	1	752790.00	4237500.00	460	50	555	60.06	2.2	1.08
American Woodmark Orange Dimension Plant	5	752790.00	4237500.00	100	10	72	0.003	0.003	0.0003
American Woodmark Orange Dimension Plant	5	752790.00	4237500.00	100	10	72	0.003	0.003	0.0003
American Woodmark Orange Dimension Plant	3	752790.00	4237500.00		10	72	0.003	0.003	0.00000
American Woodmark Orange Dimension Plant	2	752790.00	4237500.00	480	50	266	41.76	2.5	2.30
American Woodmark Orange Dimension Plant	5	752790.00	4237500.00	100	10	72	0.003	0.003	0.00
American Woodmark Orange Dimension Plant	4	752790.00	4237500.00	100	30	77	94.7	3	0.001
Transcontinental Gas Pipeline - Station 180	1	240790.00	4243190.00	321	43	675	117.48	1.7	0.71
Transcontinental Gas Pipeline - Station 180	16	240790.00	4243190.00	321	21	800	80.23	0.69	0.0005
Transcontinental Gas Pipeline - Station 180	5	240790.00	4243190.00	321	43	760	130.7	1.7	0.66
Transcontinental Gas Pipeline - Station 180	11	240790.00	4243190.00	321	48	575	93.71	2.5	0.83
Transcontinental Gas Pipeline - Station 180	10	240790.00	4243190.00	321	29	650	194.29	1.5	0.73
Transcontinental Gas Pipeline - Station 180	14	240790.00	4243190.00	321	49	600	124.02	3	2.11

Facility Name	Stack No	UTM E	UTM N	Base Elevation	Stack Height	Stack Temp	Stack Exit Velocity	Stack Diameter	PM10
		m	m	ft	ft	°F	fps	ft	lb/hr
Transcontinental Gas Pipeline - Station 180	21	240790.00	4243190.00	321	14	400	17.7	1.2	0.005
Transcontinental Gas Pipeline - Station 180	15	240790.00	4243190.00	321	21	800	80.23	0.69	0.0003
Transcontinental Gas Pipeline - Station 180	20	240790.00	4243190.00	321	9	400	15.29	1.29	0.00
Transcontinental Gas Pipeline - Station 180	2	240790.00	4243190.00	321	43	675	117.48	1.7	0.74
Transcontinental Gas Pipeline - Station 180	13	240790.00	4243190.00	321	40	600	115.44	2.5	1.29
Transcontinental Gas Pipeline - Station 180	12	240790.00	4243190.00	321	39	660	100.84	2.5	1.16
Transcontinental Gas Pipeline - Station 180	8	240790.00	4243190.00	321	29	660	189.57	1.5	0.77
Transcontinental Gas Pipeline - Station 180	6	240790.00	4243190.00	321	43	760	130.7	1.7	0.64
Transcontinental Gas Pipeline - Station 180	7	240790.00	4243190.00	321	43	675	117.48	1.7	0.67
Transcontinental Gas Pipeline - Station 180	4	240790.00	4243190.00	321	43	650	117.48	1.7	0.69
Transcontinental Gas Pipeline - Station 180	9	240790.00	4243190.00	321	29	650	174.48	1.5	0.73
Transcontinental Gas Pipeline - Station 180	3	240790.00	4243190.00	321	43	650	117.48	1.7	0.73
Transcontinental Gas Pipeline - Station 180	18	240790.00	4243190.00	321	19	1032	165.05	0.3	0.002
Transcontinental Gas Pipeline - Station 180	17	240790.00	4243190.00	321	21	800	80.23	0.69	0.001
Transcontinental Gas Pipeline - Station 180	19	240790.00	4243190.00	321	18	1076	151.85	0.3	0.02
R R Donnelley & Sons Co Harrisonburg Mfg North	4	687000.00	4261190.00	1475	63	75	10	7.25	3.31
R R Donnelley & Sons Co Harrisonburg Mfg North	1	687000.00	4261190.00	1475	34	350	35.71	1.29	0.02
R R Donnelley & Sons Co Harrisonburg Mfg North	7	687000.00	4261190.00	1475	56	80	45.65	1.67	0.11
R R Donnelley & Sons Co Harrisonburg Mfg North	3	687000.00	4261190.00	1475	14	350	58.95	1.2	0.01
R R Donnelley & Sons Co Harrisonburg Mfg North	2	687000.00	4261190.00	1475	34	350	35.71	1.29	0.00
Virginia Poultry Growers Cooperative Inc- Broadway	9	691400.00	4275100.00	1040	46	70	1.58	0.82	0.00
Virginia Poultry Growers Cooperative Inc- Broadway	7	691390.00	4275090.00	1040	25	90	80.17	3	2.48
Virginia Poultry Growers Cooperative Inc- Broadway	7	691390.00	4275090.00	1040	25	90	80.17	3	2.48
Virginia Poultry Growers Cooperative Inc- Broadway	3	691390.00	4275090.00	1040	10	72	0.003	0.003	0.05
Virginia Poultry Growers Cooperative Inc- Broadway	4	691390.00	4275090.00	1040	10	72	0.003	0.003	0.03
Virginia Poultry Growers Cooperative Inc- Broadway	1	691390.00	4275090.00	1040	22	400	0.02	1	0.01
Virginia Poultry Growers Cooperative Inc- Broadway	5	691390.00	4275090.00	1040	10	72	0.003	0.003	0.15
Virginia Poultry Growers Cooperative Inc- Broadway	8	691390.00	4275090.00	1040	30	77	16.5	2	0.00
Virginia Poultry Growers Cooperative Inc- Broadway	2	691390.00	4275090.00	1040	26	350	38.18	1.7	0.03
Virginia Poultry Growers Cooperative Inc- Broadway	6	691390.00	4275090.00	1040	10	72	0.003	0.003	0.24
Masco Builder Cabinet Group	4	703690.00	4289190.00	925	33	250	31.67	2	0.15
Masco Builder Cabinet Group	3	703690.00	4289190.00	925	30	70	35.28	6.69	0.35
Masco Builder Cabinet Group	1	703690.00	4289190.00	925	40	400	55.68	2.5	0.80
Masco Builder Cabinet Group	4	703690.00	4289190.00	925	33	250	31.67	2	0.15
Masco Builder Cabinet Group	2	703690.00	4289190.00	925	40	325	28.73	2.29	0.00
Masco Builder Cabinet Group	4	703690.00	4289190.00	925	33	250	31.67	2	0.15
Masco Builder Cabinet Group	4	703690.00	4289190.00	925	33	250	31.67	2	0.15
O-N Minerals (Chemstone) Company - Strasburg	5	732290.00	4321790.00	630	10	72	0.003	0.003	1.68
O-N Minerals (Chemstone) Company - Strasburg	8	731290.00	4321790.00	630	25	77	63.66	2	0.45
O-N Minerals (Chemstone) Company - Strasburg	6	732290.00	4321790.00	630	10	72	0.003	0.003	0.18
O-N Minerals (Chemstone) Company - Strasburg	1	731290.00	4321790.00	630	79	200	16.58	4	0.00
O-N Minerals (Chemstone) Company - Strasburg	1	731290.00	4321790.00	630	79	200	16.58	4	0.00
O-N Minerals (Chemstone) Company - Strasburg	4	732290.00	4321790.00	630	50	100	46.67	1.2	0.95
O-N Minerals (Chemstone) Company - Strasburg	1	731280.00	4321780.00	650	10	72	0.003	0.003	0.04
O-N Minerals (Chemstone) Company - Strasburg	1	731290.00	4321790.00	630	79	200	16.58	4	0.00

Facility Name	Stack No	UTM E	UTM N	Base Elevation	Stack Height	Stack Temp	Stack Exit Velocity	Stack Diameter	PM10
		m	m	ft	ft	°F	fps	ft	lb/hr
O-N Minerals (Chemstone) Company - Strasburg	9	732290.00	4321790.00	630	10	72	0.003	0.003	0.00
O-N Minerals (Chemstone) Company - Strasburg	2	731280.00	4321780.00	650	79	475	0.003	4	1.68
O-N Minerals (Chemstone) Company - Strasburg	3	732290.00	4321790.00	630	47	550	57.63	3.59	5.98
O-N Minerals (Chemstone) Company - Strasburg	1	731290.00	4321790.00	630	79	200	16.58	4	0.00
O-N Minerals (Chemstone) Company - Strasburg	1	731290.00	4321790.00	630	79	200	16.58	4	0.00
O-N Minerals (Chemstone) Company - Strasburg	2	732290.00	4321790.00	630	79	200	132.63	4	3.67
O-N Minerals (Chemstone) Company - Strasburg	7	732290.00	4321790.00	630	60	150	11.94	4	0.0000
O'Sullivan Films Inc	18	743500.00	4338690.00	720	53	470	36.53	1.5	0.00
O'Sullivan Films Inc	6	743500.00	4338690.00	720	70	77	67.79	0.6	1.36
O'Sullivan Films Inc	8	743500.00	4338700.00	720	10	77	0.003	0.003	1.22
O'Sullivan Films Inc	18	743500.00	4338690.00	720	53	470	36.53	1.5	0.00
O'Sullivan Films Inc	2	743500.00	4338690.00	720	30	475	16.83	2	0.03
O'Sullivan Films Inc	3	743500.00	4338690.00	720	25	350	19.26	0.8	0.05
O'Sullivan Films Inc	10	743500.00	4338700.00	720	50	205	43.83	6.75	0.002
O'Sullivan Films Inc	12	743500.00	4338700.00	720	10	300	0.003	1	0.01
O'Sullivan Films Inc	4	743500.00	4338690.00	720	35	77	17.5	3	0.97
O'Sullivan Films Inc	18	743500.00	4338690.00	720	53	470	36.53	1.5	0.00
O'Sullivan Films Inc	13	743500.00	4338700.00	720	25	350	0.03	0.8	0.01
O'Sullivan Films Inc	15	743500.00	4338700.00	720	50	300	55.54	4.9	0.02
O'Sullivan Films Inc	1	743500.00	4338690.00	720	40	470	13.15	2.5	0.02
Johns Manville	11	713190.00	4302000.00	880	46	77	57.96	4	2.53
Johns Manville	8	713190.00	4302000.00	880	10	72	0.003	0.003	0.002
Johns Manville	10	713190.00	4302000.00	880	50	77	55.17	1	0.02
Johns Manville	15	713190.00	4302000.00	880	60	160	18.84	7	2.60
Johns Manville	14	713190.00	4302000.00	880	52	400	8.6	7	0.53
Johns Manville	13	713190.00	4302000.00	880	55	180	40.58	3.1	0.25
Johns Manville	7	713190.00	4302000.00	880	67	300	42.44	2.5	0.69
Riverton Corporation	1	743790.00	4315000.00	495	10	72	0.003	0.003	0.004
Riverton Corporation	6	743500.00	4315000.00	490	26	370	106.1	2	0.33
Riverton Corporation	7	743500.00	4315000.00	490	10	72	0.003	0.003	0.64
Riverton Corporation	4	743790.00	4315000.00	490	10	72	0.003	0.003	0.14
Riverton Corporation	2	743790.00	4315000.00	495	30	77	42.44	1.5	2.59
Riverton Corporation	3	743800.00	4315000.00	490	60	118	0.003	3	0.01
Riverton Corporation	2	743790.00	4315000.00	490	55	400	10.61	3	0.00
Riverton Corporation	8	743500.00	4315000.00	490	10	72	0.003	0.003	0.004
Riverton Corporation	3	743790.00	4315000.00	490	60	118	10.47	3	0.00
Riverton Corporation	5	743790.00	4315000.00	490	10	72	0.003	0.003	0.03
Riverton Corporation	1	743790.00	4315000.00	490	10	72	0.003	0.003	0.00

Missing values of stack heights, stack diameter, stack gas velocty and exit temperatures were substituted from 2005 NEI data. Substituted data is highlighted in yellow and font color is black

Whenever no data is available from 2008 VA data or from 2005 NEI data , default value of 10 ft stack height, 0.003 ft stack dia, 0.003 fps stack gas velocity and 72 F exit temp were used. Highlighted in yellow and font color is red.

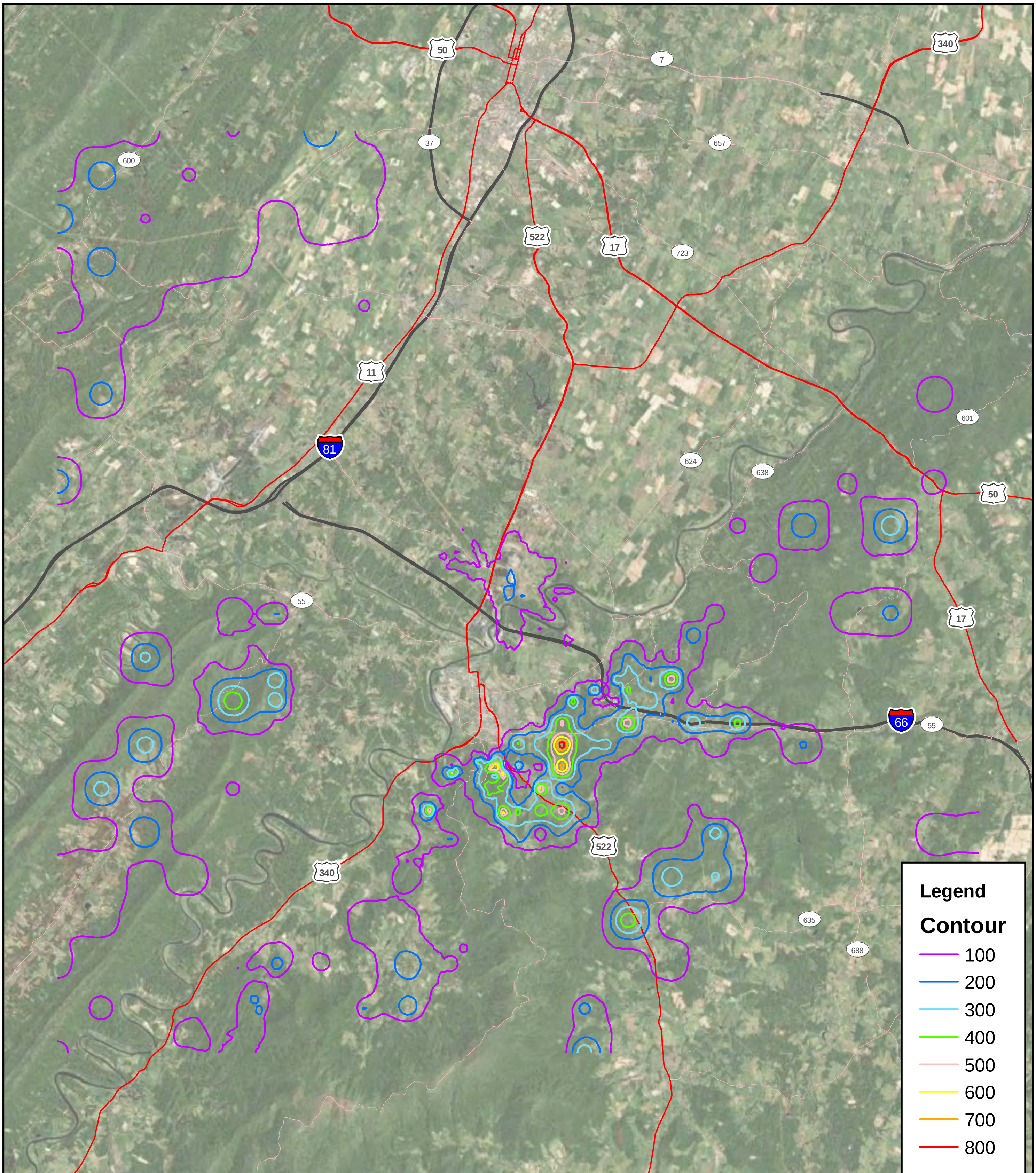
Plant Name	Stack No	UTM E	UTM N	Base Elevation	Stack Height	Stack Temp	Stack Exit Velocity	Stack Diameter	PM2.5
		m	m	ft	ft	°F	fps	ft	lb/hr
Virginia									
Virginia Industries Inc	2	238790.00	4262190.00	100	10	300	0.003	0.003	1.237
Virginia Industries Inc	2	238790.00	4262190.00	100	10	300	0.003	0.003	1.237
Virginia Industries Inc	2	238790.00	4262190.00	100	10	300	0.003	0.003	1.237
Virginia Industries Inc	1	238790.00	4262190.00	100	60	300	37.73	3	0.416
Virginia Industries Inc	2	238790.00	4262190.00	100	10	300	0.003	0.003	1.237
Virginia Industries Inc	2	238790.00	4262190.00	100	10	300	0.003	0.003	1.237
Virginia Industries Inc	2	238790.00	4262190.00	100	10	300	0.003	0.003	1.237
Virginia Industries Inc	2	238790.00	4262190.00	100	10	300	0.003	0.003	1.237
Virginia Industries Inc	2	238790.00	4262190.00	100	10	300	0.003	0.003	1.237
Old Dominion Electric Cooperative - Marsh Run	2	258650.00	4268200.00	300	90	1058	168.85	18	0.888
Old Dominion Electric Cooperative - Marsh Run	3	258650.00	4268200.00	300	90	1058	168.85	18	0.717
Old Dominion Electric Cooperative - Marsh Run	1	258650.00	4268200.00	300	90	1058	168.85	18	0.868
Old Dominion Electric Cooperative - Marsh Run	6	258650.00	4268200.00	300	30	725	27.7	1.5	0.005
Old Dominion Electric Cooperative - Marsh Run	5	258650.00	4268200.00	300	30	725	27.7	1.5	0.002
Valley Proteins Inc - Linville	1	688900.00	4267400.00	1200	38	400	36.61	2	1.815
Valley Proteins Inc - Linville	3	688900.00	4267400.00	1200	38	400	40.53	2	0.087
Valley Proteins Inc - Linville	2	688900.00	4267400.00	1200	21	400	0.01	1.7	0.014
Valley Proteins Inc - Linville	1	688900.00	4267400.00	1200	38	400	36.61	2	1.815
Valley Proteins Inc - Linville	1	688900.00	4267400.00	1200	38	400	36.61	2	1.815
Valley Proteins Inc - Linville	1	688900.00	4267400.00	1200	38	400	36.61	2	1.815
Valley Proteins Inc - Linville	1	688900.00	4267400.00	1200	38	400	36.61	2	1.815
Valley Proteins Inc - Linville	1	688900.00	4267400.00	1200	38	400	36.61	2	1.815
Valley Proteins Inc - Linville	1	688900.00	4267400.00	1200	38	400	36.61	2	1.815
Howell Metal Co	6	699890.00	4281090.00	1000	45	90	2.12	1	0.005
Howell Metal Co	2	699890.00	4281090.00	1000	10	72	0.003	0.003	0.925
Howell Metal Co	1	699890.00	4281090.00	1000	45	150	0.02	1	0.053
Howell Metal Co	5	699890.00	4281090.00	1000	26	77	35.37	3	0.966
Shenandoah County Sanitary Landfill - Edinburg	1	713320.00	4302760.00	800	10	72	0.003	0.003	1.256
Dominion - Remington CT Station	1	258530.00	4269830.00	270	65	1097	74.8	18	0.648
Dominion - Remington CT Station	8	258530.00	4269830.00		10	72	0.003	0.003	0.007
Dominion - Remington CT Station	4	258530.00	4269830.00	270	65	1097	74.8	18	0.516
Dominion - Remington CT Station	2	258530.00	4269830.00	270	65	1097	74.8	18	0.642
Dominion - Remington CT Station	9	258530.00	4269830.00		10	72	0.003	0.003	0.007
Dominion - Remington CT Station	3	258530.00	4269830.00	270	65	1097	74.8	18	0.484
Dominion - Gordonsville Power Station	3	745000.00	4223290.00	597	150	580	78.18	1.5	0.000
Dominion - Gordonsville Power Station	1	745000.00	4223290.00	597	150	280	92	14.3	1.301

Plant Name	Stack No	UTM E	UTM N	Base Elevation	Stack Height	Stack Temp	Stack Exit Velocity	Stack Diameter	PM2.5
		m	m	ft	ft	°F	fps	ft	lb/hr
Dominion - Gordonsville Power Station	2	745000.00	4223290.00	597	150	280	92	14.3	1.066
Dominion - Gordonsville Power Station	2	745000.00	4223290.00	597	150	280	92	14.3	1.066
Dominion - Gordonsville Power Station	1	745000.00	4223290.00	597	150	280	92	14.3	1.301
Dominion - Gordonsville Power Station	2	745000.00	4223290.00	597	150	280	92	14.3	1.066
Dominion - Gordonsville Power Station	3	745000.00	4223290.00	597	150	580	78.18	1.5	0.000
Dominion - Gordonsville Power Station	1	745000.00	4223290.00	597	150	280	92	14.3	1.301
Old Dominion Electric Cooperative Louisa	4	744000.00	4222400.00	250	56	958	105.95	18	0.402
Old Dominion Electric Cooperative Louisa	3	744000.00	4222400.00	250	56	958	105.95	18	0.402
Old Dominion Electric Cooperative Louisa	8	744000.00	4222400.00	250	20	752	120	0.67	0.005
Old Dominion Electric Cooperative Louisa	5	744000.00	4222400.00	250	90	1058	168.91	18	0.767
Old Dominion Electric Cooperative Louisa	2	744000.00	4222400.00	250	56	958	105.95	18	0.523
Old Dominion Electric Cooperative Louisa	1	744000.00	4222400.00	250	56	958	105.95	18	0.482
Old Dominion Electric Cooperative Louisa	7	744000.00	4222400.00	250	25	775	5.22	2	0.003
Old Dominion Electric Cooperative Louisa	6	744000.00	4222400.00	250	25	775	5.22	2	0.003
Transcontinental Gas Pipeline - Station 180	1	240790.00	4243190.00	321	43	675	117.48	1.7	0.715
Transcontinental Gas Pipeline - Station 180	16	240790.00	4243190.00	321	21	800	80.23	0.69	0.000
Transcontinental Gas Pipeline - Station 180	5	240790.00	4243190.00	321	43	760	130.7	1.7	0.658
Transcontinental Gas Pipeline - Station 180	11	240790.00	4243190.00	321	48	575	93.71	2.5	0.829
Transcontinental Gas Pipeline - Station 180	10	240790.00	4243190.00	321	29	650	194.29	1.5	0.733
Transcontinental Gas Pipeline - Station 180	14	240790.00	4243190.00	321	49	600	124.02	3	2.112
Transcontinental Gas Pipeline - Station 180	21	240790.00	4243190.00	321	14	400	17.7	1.2	0.005
Transcontinental Gas Pipeline - Station 180	15	240790.00	4243190.00	321	21	800	80.23	0.69	0.000
Transcontinental Gas Pipeline - Station 180	20	240790.00	4243190.00	321	9	400	15.29	1.29	0.005
Transcontinental Gas Pipeline - Station 180	2	240790.00	4243190.00	321	43	675	117.48	1.7	0.744
Transcontinental Gas Pipeline - Station 180	13	240790.00	4243190.00	321	40	600	115.44	2.5	1.290
Transcontinental Gas Pipeline - Station 180	12	240790.00	4243190.00	321	39	660	100.84	2.5	1.158
Transcontinental Gas Pipeline - Station 180	8	240790.00	4243190.00	321	29	660	189.57	1.5	0.774
Transcontinental Gas Pipeline - Station 180	6	240790.00	4243190.00	321	43	760	130.7	1.7	0.642
Transcontinental Gas Pipeline - Station 180	7	240790.00	4243190.00	321	43	675	117.48	1.7	0.667
Transcontinental Gas Pipeline - Station 180	4	240790.00	4243190.00	321	43	650	117.48	1.7	0.694
Transcontinental Gas Pipeline - Station 180	9	240790.00	4243190.00	321	29	650	174.48	1.5	0.733
Transcontinental Gas Pipeline - Station 180	3	240790.00	4243190.00	321	43	650	117.48	1.7	0.728
Transcontinental Gas Pipeline - Station 180	18	240790.00	4243190.00	321	19	1032	165.05	0.3	0.002
Transcontinental Gas Pipeline - Station 180	17	240790.00	4243190.00	321	21	800	80.23	0.69	0.001
Transcontinental Gas Pipeline - Station 180	19	240790.00	4243190.00	321	18	1076	151.85	0.3	0.016
Masco Builder Cabinet Group	4	703690.00	4289190.00	925	33	250	31.67	2	0.148
Masco Builder Cabinet Group	3	703690.00	4289190.00	925	30	70	35.28	6.69	0.349
Masco Builder Cabinet Group	1	703690.00	4289190.00	925	40	400	55.68	2.5	1.073
Masco Builder Cabinet Group	4	703690.00	4289190.00	925	33	250	31.67	2	0.148
Masco Builder Cabinet Group	2	703690.00	4289190.00	925	40	325	28.73	2.29	0.000
Masco Builder Cabinet Group	4	703690.00	4289190.00	925	33	250	31.67	2	0.148
Masco Builder Cabinet Group	4	703690.00	4289190.00	925	33	250	31.67	2	0.148
Johns Manville	11	713190.00	4302000.00	880	46	77	57.96	4	0.982

Plant Name	Stack No	UTM E	UTM N	Base Elevation	Stack Height	Stack Temp	Stack Exit Velocity	Stack Diameter	PM2.5
		m	m	ft	ft	°F	fps	ft	lb/hr
Johns Manville	8	713190.00	4302000.00	880	10	72	0.003	0.003	0.002
Johns Manville	10	713190.00	4302000.00	880	50	77	55.17	1	0.014
Johns Manville	15	713190.00	4302000.00	880	60	160	18.84	7	1.824
Johns Manville	14	713190.00	4302000.00	880	52	400	8.6	7	0.352
Johns Manville	13	713190.00	4302000.00	880	55	180	40.58	3.1	0.091
Johns Manville	7	713190.00	4302000.00	880	67	300	42.44	2.5	0.475

Appendix H

Air Quality Impacts-
Contour Map



Map Location

Contour Map

Mitsubishi CO 1 Hour

Dominion

Warren County Plant

Microsoft Virtual Earth Aerials (2008)

0 4 8 Miles

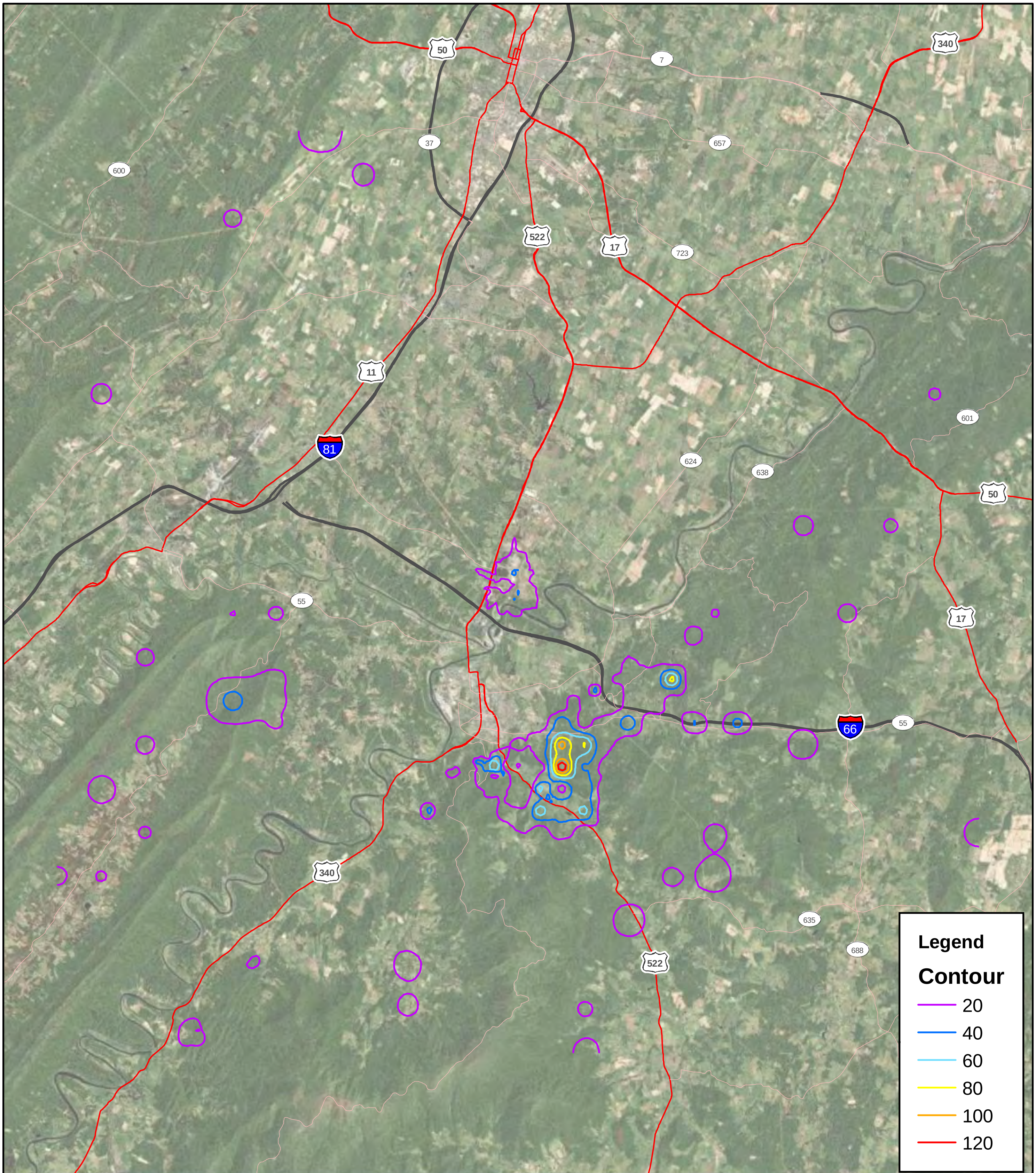
June 2010

1 in = 4 miles

60136907.1740

AECOM

AECOM
8540 Colonnade Center Drive
Suite 306
Raleigh, NC 27615
Phone: (919)872-6600
Fax: (919) 872-7996
www.aecom.com



Legend

Contour

- 20
- 40
- 60
- 80
- 100
- 120

Map Location

Contour Map

Mitsubishi CO 8 Hour

Dominion

Warren County Plant

Microsoft Virtual Earth Aerials (2008)

0 4 8 Miles

June 2010

1 in = 4 miles

60136907.1740

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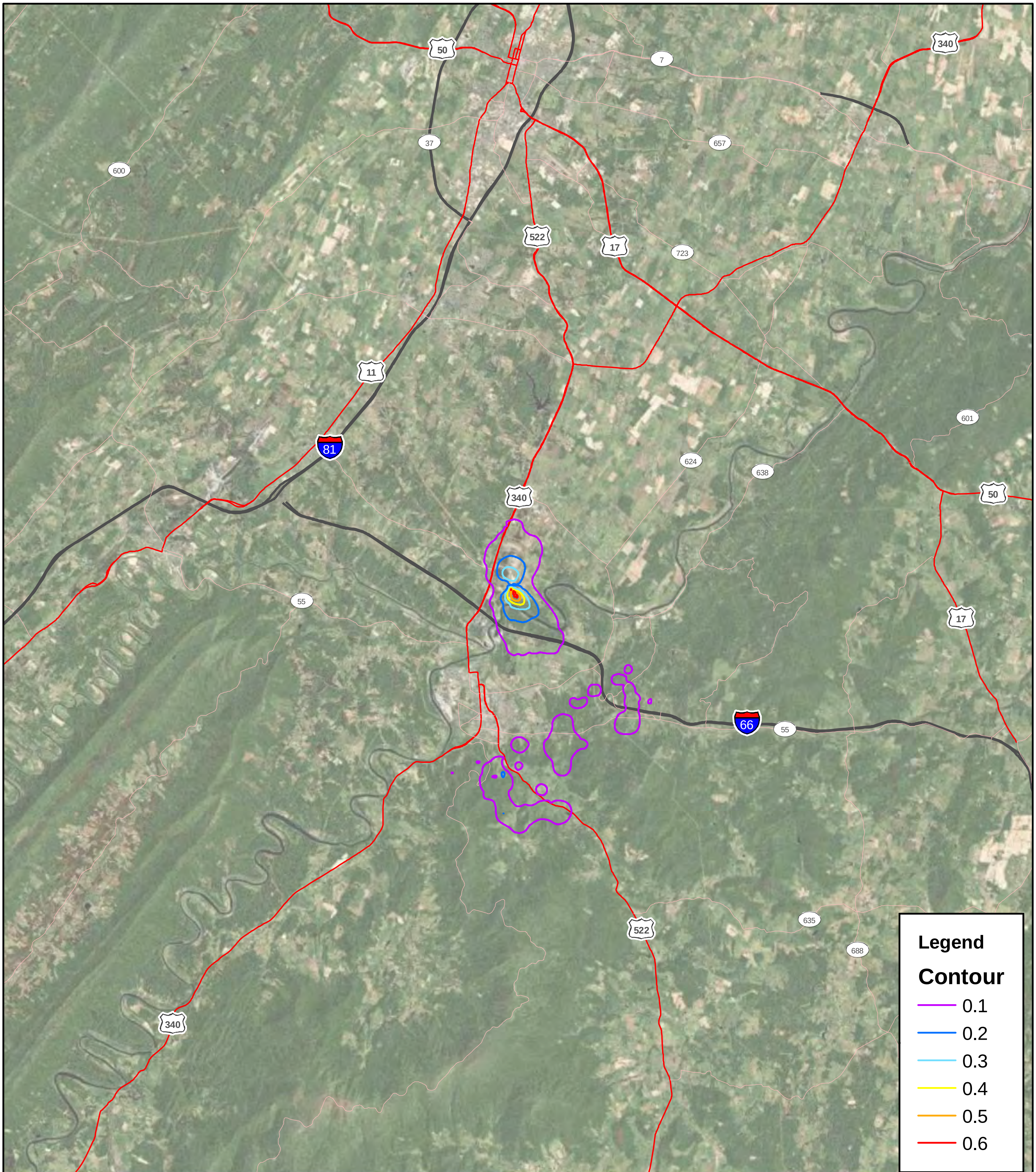

Contour Map

Mitsubishi NOX Annual

Dominion

Warren County Plant

Microsoft Virtual Earth Aerials (2008)

0 4 8 Miles

June 2010

1 in = 4 miles

60136907.1740

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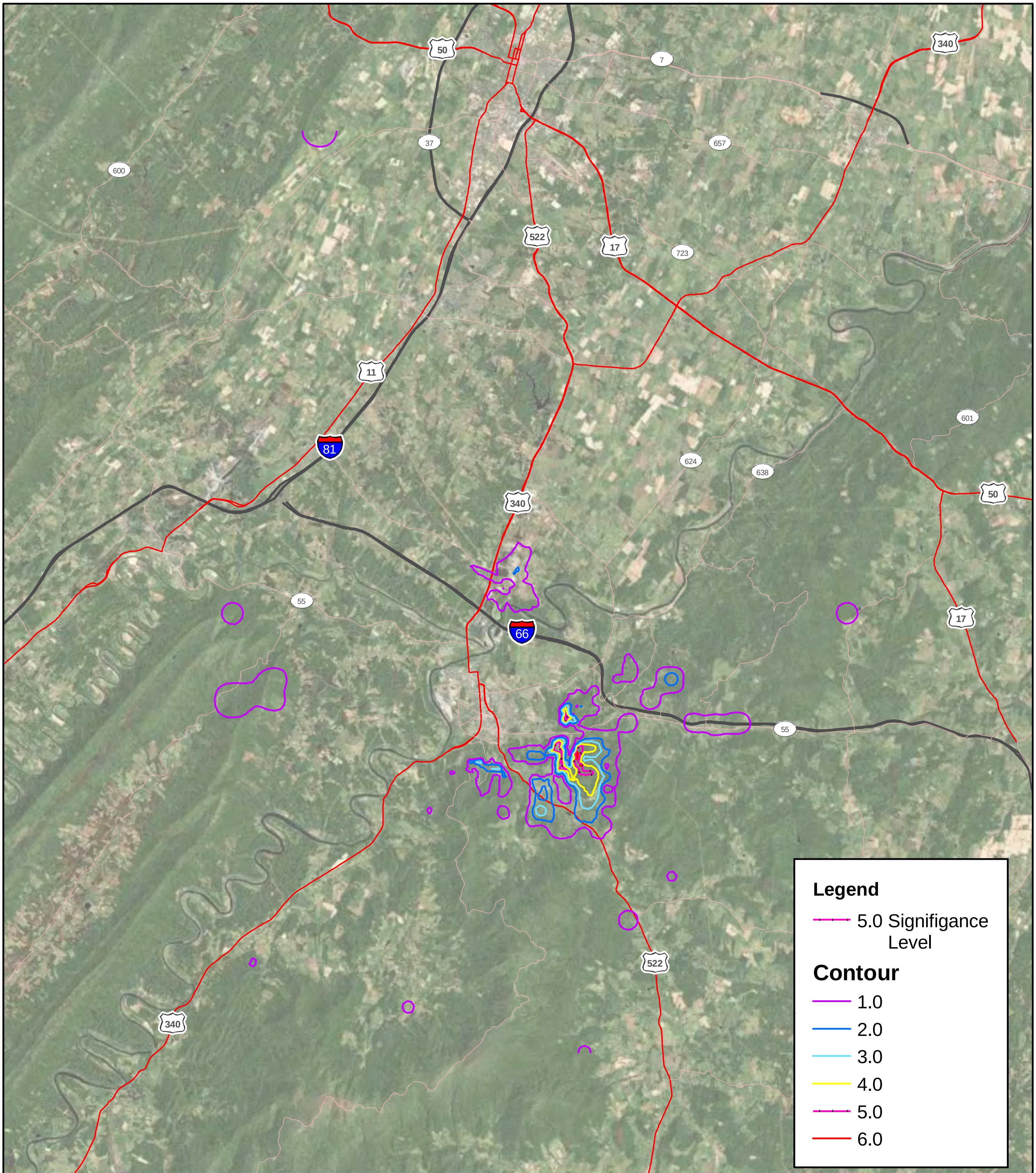

Map Location

Contour Map

Mitsubishi PM_{10} 24 Hour

Dominion

Warren County Plant

Microsoft Virtual Earth Aerials (2008)

0 4 8 Miles

June 2010

1 in = 4 miles

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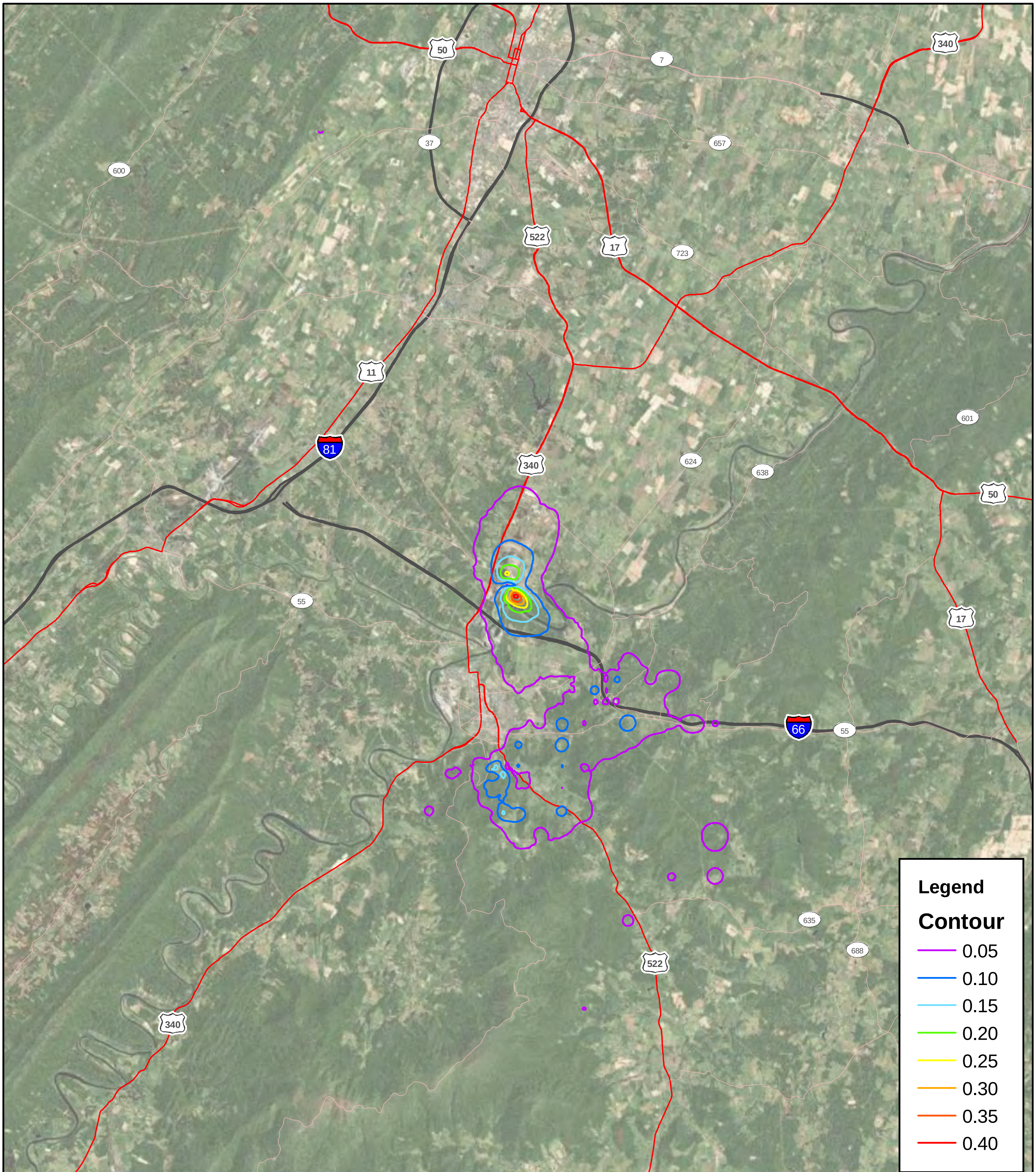
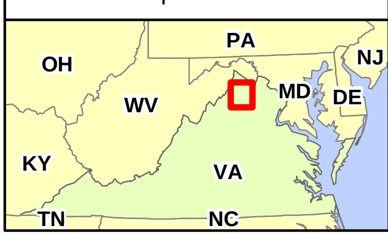


Map Location



Contour Map

Mitsubishi PM_{10} Annual

Dominion
Warren County Plant
Microsoft Virtual Earth Aerials (2008)

0 4 8 Miles

June 2010 — 1 in = 4 miles — 60136907.1740

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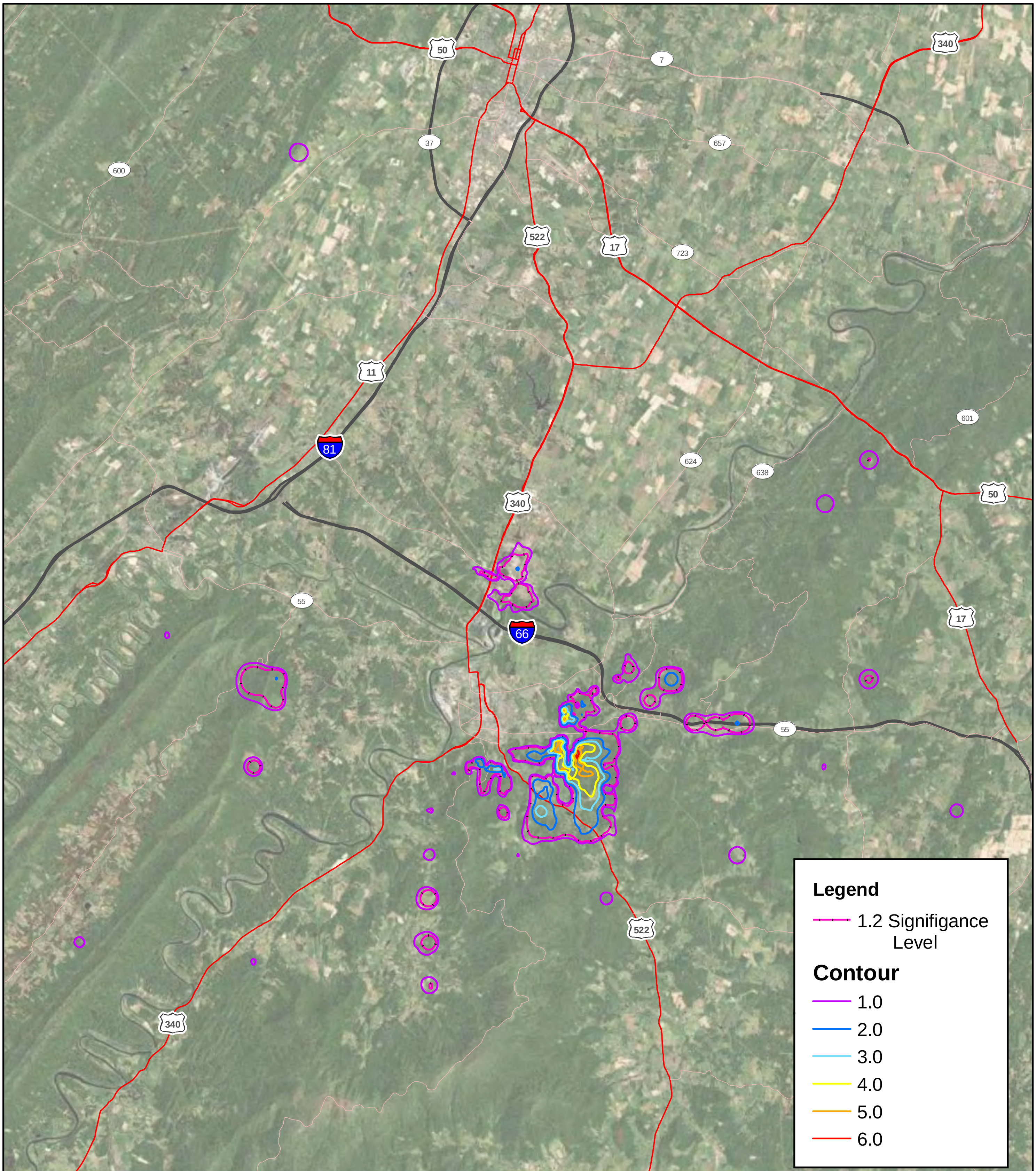

Map Location

Contour Map

Mitsubishi $PM_{2.5}$ 24 Hour

Dominion

Warren County Plant

Microsoft Virtual Earth Aerials (2008)

0 4 8 Miles

June 2010

1 in = 4 miles

60136907.1740

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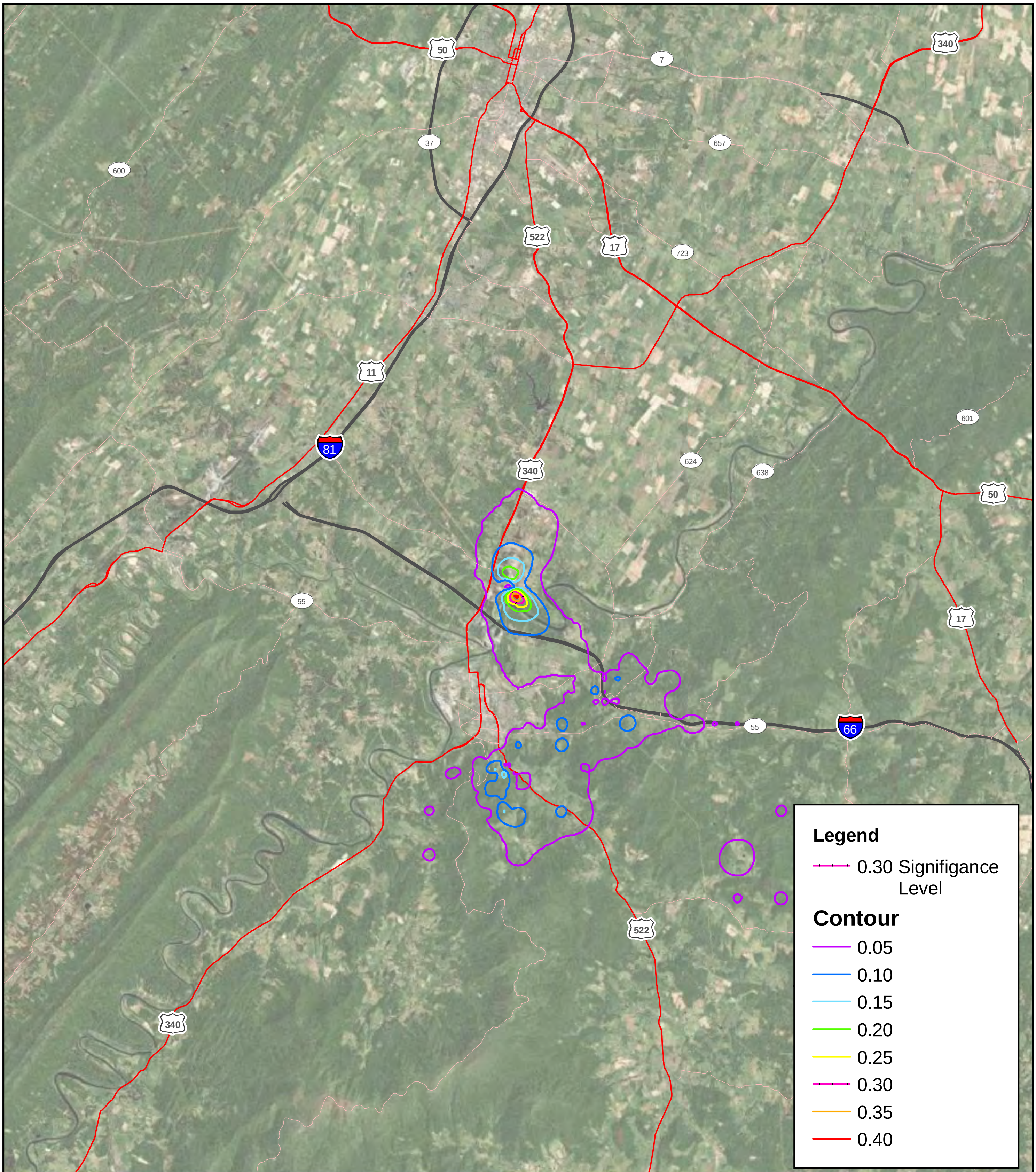

Map Location

Contour Map

Mitsubishi $PM_{2.5}$ Annual

Dominion
Warren County Plant

Microsoft Virtual Earth Aerials (2008)

0 4 8 Miles

June 2010

1 in = 4 miles

60136907.1740

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