AIR QUALITY DISPERSION MODELING PROTOCOL

CPV Smyth Energy Center

Atkins, Virginia

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Appendix A Detailed Emissions and Source Parameter Data
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ACRONYMS AND ABBREVIATIONS

ACC	air cooled condenser
amsl	above mean sea level
AQRV	Air Quality Related Values
ARM2	Ambient Ratio Method 2
BACT	Best Available Control Technology
BPIP	Building Profile Input Program
BHP	brake horsepower
CAA	Clean Air Act
CFR	Code of Federal Regulations
CO	carbon monoxide
CPV	CPV Smyth Generation Company, LLC
CTG	combustion turbine generator
^{o}F	degrees Fahrenheit
FLAG	Federal Land Managers' Air Quality Related Work Group
GEP	Good Engineering Practice
HAP	hazardous air pollutant
HRSG	heat recovery steam generator
H_2S	hydrogen sulfide
H_2SO_4	sulfuric acid
km	kilometers
kV	kilovolts
kW	kilowatts
$\mu g/m^3$	micrograms per cubic meter
MMBtu/hr	million British thermal units per hour
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NAD83	North American Datum of 1983
NCDENR	North Carolina Department of Environment and Natural Resources
NED	National Elevation Data
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NH_3	ammonia
NNSR	Non-attainment New Source Review
NO_2	nitrogen dioxide
NO	nitric oxide
NO_x	nitrogen oxides
NSR	New Source Review
NWA	National Wilderness Area
O_3	ozone
OLM	Ozone Limiting Method
Pb	lead
PM	particulate matter
PM_{10}	particulate matter less than or equal to 10 microns in diameter
$PM_{2.5}$	particulate matter less than or equal to 2.5 microns in diameter
ppm	parts per million
Project	CPV Smyth Energy Center
PSD	Prevention of Significant Deterioration
PVMRM	Plume Volume Molar Ratio Method
SAAC	Significant Ambient Air Concentration

SCR	selective catalytic reduction
SIA	Significant Impact Area
SIL	Significant Impact Level
SMC	Significant Monitoring Concentration
SO_2	sulfur dioxide
STG	steam turbine generator
SU/SD	start-up/shutdown operation
TDEC	Tennessee Department of Environmental Conservation
TLV	Threshold Limit Value
tpy	tons per year
USGS	United States Geological Survey
ULSD	ultra-low sulfur distillate
USEPA	United States Environmental Protection Agency
VAAQS	Virginia Ambient Air Quality Standards
VDEQ	Virginia Department of Environmental Quality
VOC	volatile organic compounds

1.0 INTRODUCTION

CPV Smyth Generation Company, LLC (CPV) proposes to construct and operate a nominal 700-megawatt (MW) natural gas-fired, combined-cycle electric generating facility in Atkins, Virginia. Construction of the CPV Smyth Energy Center (the Project) is scheduled to begin in the fourth quarter of 2015 with commencement of commercial operation by mid-2018. The proposed Project location is a greenfield site with no commercial history.

The proposed Project will include two natural gas-fired combustion turbine generators (CTGs), two supplementary fired heat recovery steam generators (HRSGs) and one steam turbine generator (STG). The Project will be configured as a "2 on 1" power block with steam from the two HRSGs feeding the single STG. The balance of the Project will include an auxiliary boiler, emergency generator engine, emergency fire pump engine, aqueous ammonia (NH_3) storage tank, and an air cooled condenser (ACC).

The Project will have potential emissions above the Prevention of Significant Deterioration (PSD) major source threshold for nitrogen oxides (NO_x) and carbon monoxide (CO). Potential emissions of all size fractions of particulate matter ($PM/PM_{10}/PM_{2.5}$), volatile organic compounds (VOC) and sulfuric acid mist (H_2SO_4) will be above their respective PSD significant emissions threshold. Therefore, CPV is applying for a PSD permit from the Virginia Department of Environmental Quality (VDEQ) for the Project. The Project will not be subject to Nonattainment New Source Review (NNSR) because the site is located in Smyth County, which is designated as unclassified or attainment with respect to the National Ambient Air Quality Standards (NAAQS) for all criteria pollutants.

The purpose of this protocol is to present the proposed methodology for the air dispersion modeling analyses that will be performed in support of the PSD permit application. Modeling methods and assumptions including model selection, model options, meteorological data, receptor information, and source parameters are presented in this document for review by the VDEQ.

To facilitate VDEQ's review of this protocol, individuals familiar with the Project are identified below. The VDEQ should contact these individuals if additional information or clarification is required during the review process. These contacts include the primary contact for the Project developer and consultant who were responsible for the preparation of this application.

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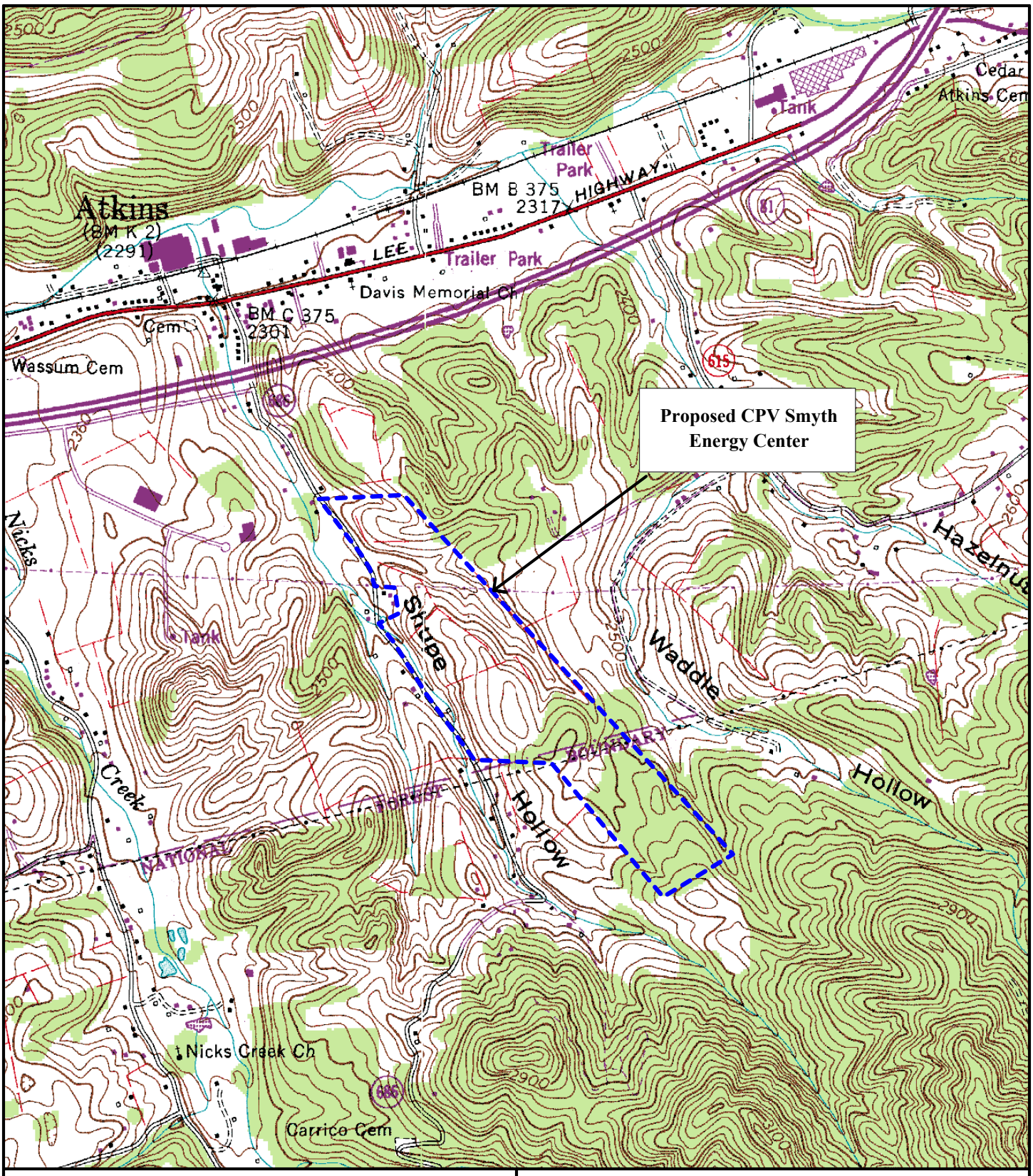
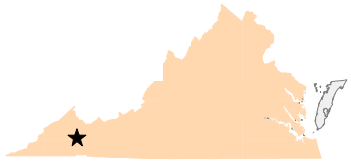
This protocol consists of five sections including this Introduction. Section 2 contains a Project description, including information regarding the Project's location and expected emissions, along with an applicability assessment relative to key regulations related to the air quality impact analysis. Section 3 presents a detailed

description of the modeling approach proposed for evaluating air quality impacts of the proposed Project including: model selection criteria, good engineering practice stack height determination and building dimensions for model input, meteorological data, the receptor grids, and refined modeling techniques for the ambient air quality compliance assessments. Section 4 discusses additional PSD impact analyses such as Class I Area Air Quality Related Values (AQRVs), visibility, growth, and impacts to vegetation and soils. References cited in the document are presented in Section 5. Appendices A and B provide supporting data.

Provided in Figure 1-1 is a General Location Map showing the location of the Project and features of the surrounding area.



approximate quadrangle location



0 0.25 0.5
kilometers

N

Based on USGS 1:24,000 Quadrangle map for Atkins, Virginia, 1991.

CPV Smyth Generation Company, LLC

Figure 1-1
General Location Map

2.0 PROJECT DESCRIPTION

2.1 Site Location

The proposed Project will be constructed on a 108-acre parcel at a greenfield location in Atkins, Virginia. The site is located in east-central Smyth County, approximately 4 miles east-northeast of Marion, Virginia and approximately 0.5 miles south of Interstate 81. The site is in a rural valley at 2,500 feet above mean sea level (amsl) with higher elevation mountains running generally in a southwest to northeast direction and located approximately 2 to 3 miles north and south of the property.

2.2 Facility Description

The proposed nominal 700 MW[1] combined-cycle natural gas-fired facility will be configured as two operating units. The power plant will be configured in a "2 on 1" power block configuration with steam from the two HRSGs feeding the single STG. The HRSGs will be equipped with supplementary firing (duct burners) to provide additional generating capacity during periods of peak demand. The facility is designed to run as a base load plant with both combustion turbines operating concurrently but the facility will have the capability of operating with a single combustion turbine.

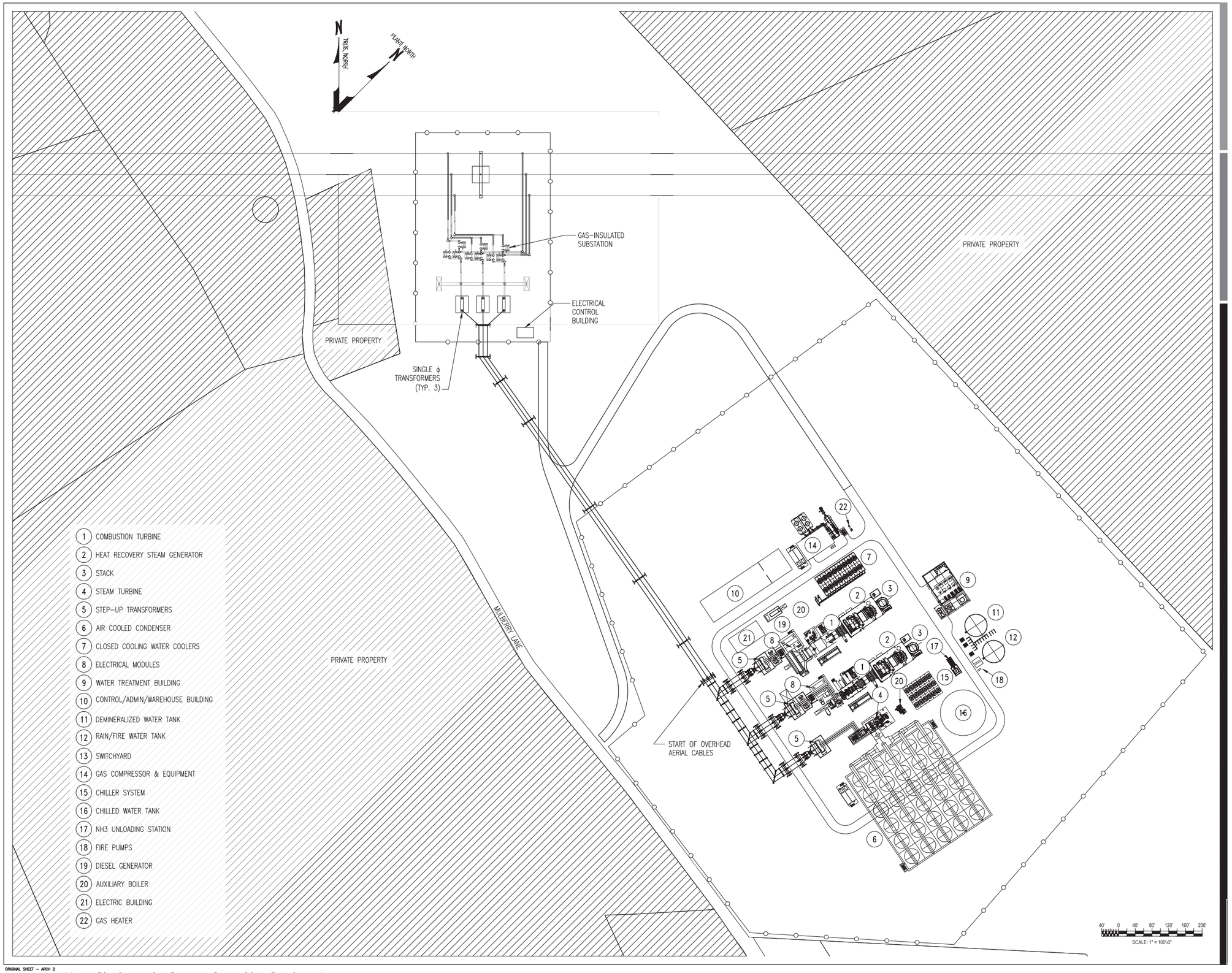
The Project will include a variety of power plant equipment including: two natural gas-fired CTGs; one STG; two HRSGs with selective catalytic reduction (SCR) and oxidation catalyst emissions control equipment; generator step-up transformers; an electrical switchyard; an NH_3 storage tank; water tanks; and an ACC. In addition, the Project will include other buildings for administrative and operating staff; warehousing of parts and consumables; and maintenance shops and equipment servicing. An overview of equipment arrangement on the site is provided as Figure 2-1.

The first stage in the generation process of a combined-cycle power plant is the operation of the CTGs. Thermal energy, in the form of hot exhaust gas, is produced in the CTGs through the combustion of natural gas. The hot exhaust gases are then converted into mechanical energy by a turbine that drives a generator. The exhaust gas temperature exiting the gas turbine is in excess of 1,000 degrees Fahrenheit (°F) and still has remaining a significant amount of recoverable heat energy. This heat energy is recovered in the HRSG by generating steam that is sent to a STG to generate additional electrical energy. The generation of electricity using both a gas turbine and steam turbine defines the combined cycle, which is the most efficient form of electrical generation available. Additional steam, and consequently additional electricity, may be generated when required by the use of supplemental natural gas-fired burners (duct burners) within the HRSGs.

Each CTG will be an Alstom GT24 with a nominal generating capacity of 234 MW (at -10°F ambient conditions). The CTGs will be equipped with inlet air cooling via fogging and evaporative cooling or chillers. The single steam turbine will provide up to an additional 312 MW (at -10°F ambient conditions).

Pollutant emissions from the Project will be minimized through the use of natural gas as the sole fuel to be fired in the CTGs and duct burners. Each HRSG will be equipped with SCR to reduce emissions of NO_x and an oxidation catalyst to reduce emissions of CO and VOC.

[1] Based on 90°F ambient temperature, 50% relative humidity, and duct firing.



Note: Site layout by Stantec Consulting Services, Inc.

Figure 2-1
CPV Smyth Generation Company, LLC
Equipment Arrangement

Ancillary equipment at the proposed Project will include three additional fuel combustion emission units:

- A 93 million British thermal unit per hour (MMBtu/hr) natural gas-fired auxiliary boiler, equipped with ultra-low-NOx burners;
- A 1,500-kilowatt (kW) (standby rating) emergency generator firing 15 parts per million (ppm) ultra-low sulfur distillate (ULSD) oil; and
- A 315-brake horsepower (BHP) emergency fire pump engine firing ULSD oil.

The Project will interconnect with the 765-kilovolt (kV) transmission line that crosses the northern portion of the site via a new switchyard. Natural gas will be delivered from the existing gas pipeline located approximately 1.5 miles north of the site. A pipeline lateral will be installed to bring the gas from the existing pipeline to the site.

2.3 Summary of Annual Potential Emissions

This section presents long-term annual potential emissions from each emission source for the Project. Short-term emission rates are presented in Section 3.2 along with other stack parameter data. Project emissions will be minimized through the application of Best Available Control Technology (BACT). CPV Smyth proposes to use dry-low-NO_x combustion and SCR to minimize NO_x emissions from the combustion turbines. Combustion controls and an oxidation catalyst will be used to minimize CO and VOC emissions from the turbines. Sulfur dioxide (SO_2) and $PM/PM_{10}/PM_{2.5}$ will be controlled through the use of natural gas as the sole fuel for the turbines, duct burners and auxiliary boiler. ULSD oil will be used for the emergency generator and fire pump engines.

The emission sources for the Project will include:

- One combined cycle power generation unit, consisting of two CTGs (Alstom GT24) serving two associated HRSGs with duct burners and one common STG. The combined cycle power generation units will be equipped with: inlet air cooling via high fogging and evaporative cooling or chillers; SCR for NO_x control; and an oxidation catalyst for control of CO and VOC;
- One natural gas-fired auxiliary boiler (Cleaver Brooks "Nebraska" D-type boiler or equivalent) rated at 93 MMBtu/hr, equipped with ultra-low-NOx burners;
- One emergency generator (Caterpillar 3512C or equivalent) rated at 1,500 kW (standby rating), firing ULSD oil;
- One fire-pump engine (Clarke JU6H-UFAD98 or equivalent) rated at approximately 315 BHP, firing ULSD oil; and

The following equipment will not have any potential air emissions under normal operation:

- ACC for condenser cooling; and
- One 20,000 gallon aboveground aqueous NH_3 storage tank.

The facility will also include miscellaneous insignificant sources such as small ULSD and lubricant storage tanks, which will have insignificant emissions.

The proposed potential annual emissions from the Project are summarized in Table 2-1. Potential annual emissions are based on the following operating assumptions:

- For the combustion turbines, 5,760 hours at 100% load, operating at 59°F, with no duct burner firing, and 3,000 hours at 100% load, operating at -10°F, with duct burner firing. The emissions for the combustion turbines also account for startup and shutdown operation (SU/SD).
- For the auxiliary boiler, 4,000 hours at 100% load;
- For the emergency generator and fire pump engines, 500 hours each at maximum rated power;

Table 2-1. Facility-Wide Annual Potential Emissions

Pollutant	Unit 1 (CTG & HRSG) (tpy)	Unit 2 (CTG & HRSG) (tpy)	Auxiliary Boiler (tpy)	Emergency Generator (tpy)	Fire Pump (tpy)	Facility Total (tpy)
NO_x	74.7	74.7	2.02	5.29	0.52	157.2
CO	47.7	47.7	6.83	2.89	0.45	105.6
VOC	22.1	22.1	0.94	1.07	0.06	46.3
SO_2	8.1	8.1	0.15	0.005	0.001	16.3
$PM/PM_{10}/PM_{2.5}$	36.0	36.0	0.92	0.17	0.03	73.1
H_2SO_4	5.1	5.1	0.01	0.0004	0.0001	10.3
Lead (Pb)	4.5E-03	4.5E-03	9.1E-05	2.8E-06	4.2E-07	0.009
NH_3	65.2	65.2	N/A	N/A	N/A	130.3
Total HAPS	4.96	4.96	0.35	0.02	0.004	10.3

2.4 Hazardous Air Pollutant and Virginia Toxics Emissions

Potential annual hazardous air pollutant (HAP) emissions are presented in Table 2-2 for the Project. HAP is defined in Section 112(b) of the Clean Air Act (CAA) Amendments of 1990, and under 9 VAC 5 Chapter 60 for Virginia "air toxics". Section 2.5.3 provides a discussion of the applicability of 9 VAC 5 Chapter 60 to the Project. Total HAP emissions from the Project are 10.3 tons per year (tpy).

Table 2-2. Summary of Potential HAP Emissions

HAP	Potential Annual Emissions (tpy)					TOTALS
	CTGs	HRSGs	Auxiliary Boiler	Emergency Generator	Fire Pump	
Organic Compounds						
Acetaldehyde	6.90E-01			9.11E-05	4.22E-04	6.90E-01
Acrolein	1.10E-01			2.85E-05	5.09E-05	1.10E-01
Benzene	2.07E-01	2.72E-3	3.88E-04	2.81E-03	5.13E-04	2.13E-01
1,3-Butadiene	7.41E-03				2.15E-05	7.43E-03
Dichlorobenzene		1.55E-03	2.22E-04			1.77E-03
Ethylbenzene	5.52E-01					5.52E-01
Formaldehyde	1.90E+00	9.57E-02	1.37E-02	2.85E-04	6.49E-04	2.01E+00
Hexane		2.33E+00	3.33E-01			2.66E+00
Propylene oxide	5.00E-01			1.39E-02	1.96E-03	5.16E-01

HAP	Potential Annual Emissions (tpy)					TOTALS
	CTGs	HRSGs	Auxiliary Boiler	Emergency Generator	Fire Pump	
Toluene	2.24E+00	4.27E-03	6.10E-04	1.02E-03	2.25E-04	2.25E+00
Xylene	1.10E+00			6.98E-04	1.57E-04	1.10E+00
PAHs						
Acenaphthene		2.33E-06	3.33E-07	1.69E-05	7.81E-07	2.04E-05
Acenaphthylene		3.11E-06	4.44E-07	3.34E-05	2.78E-05	6.48E-05
Anthracene		2.33E-06	3.33E-07	4.45E-06	1.03E-06	8.14E-06
Benzo(a)anthracene		2.33E-06	3.33E-07	2.25E-06	9.24E-07	5.83E-06
Benzo(a)pyrene		1.55E-06	2.22E-07	9.29E-07	1.03E-07	2.81E-06
Benzo(b)fluoranthene		2.33E-06	3.33E-07	4.01E-06	5.45E-08	6.73E-06
Benzo(g,h,i)perylene		1.55E-06	2.22E-07	2.01E-06	2.69E-07	4.05E-06
Benzo(k)fluoranthene		2.33E-06	3.33E-07	7.88E-07	8.53E-08	3.54E-06
Chrysene		2.33E-06	3.33E-07	5.53E-06	1.94E-07	8.39E-06
Dibenz(a,h)anthracene		1.55E-06	2.22E-07	1.25E-06	3.21E-07	3.35E-06
7,12-Dimethylbenz(a) anthracene		2.07E-05	2.96E-06			2.37E-05
Fluoranthene		3.75E-06	5.36E-07	1.46E-05	4.19E-06	2.30E-05
Fluorene		3.49E-06	4.99E-07	4.63E-05	1.61E-05	6.63E-05
Indeno(1,2,3-cd)pyrene		2.33E-06	3.33E-07	1.50E-06	2.06E-07	4.36E-06
3-Methylchloranthrene		2.33E-06	3.33E-07			2.66E-06
2-Methylnaphthalene		3.11E-05	4.44E-06			3.55E-05
Naphthalene	2.24E-02	8.02E-04	1.15E-04	4.70E-04	4.66E-05	2.38E-02
Phenanthrene		2.20E-05	3.14E-06	1.48E-04	1.62E-05	1.89E-04
Pyrene		6.34E-06	9.06E-07	1.34E-05	2.63E-06	2.33E-05
TOTAL PAH	3.79E-02	8.80E-04	1.26E-04	7.67E-04	9.24E-05	3.98E-02
Metals						
Arsenic	3.45E-03	2.59E-04	3.70E-05	1.67E-07	2.54E-08	3.74E-03
Beryllium	2.07E-04	1.55E-05	2.22E-06			2.25E-04
Cadmium	1.90E-02	1.42E-03	2.03E-04	1.85E-08	2.82E-09	2.06E-02
Chromium	2.41E-02	1.81E-03	2.59E-04	4.48E-05	6.82E-06	2.63E-02
Chromium VI	4.31E-03	3.23E-04	4.62E-05	8.10E-06	1.23E-06	4.69E-03
Cobalt	1.41E-03	1.06E-04	1.52E-05			1.53E-03
Lead	8.45E-03	6.34E-04	9.06E-05	2.78E-06	4.23E-07	9.18E-03
Manganese	6.38E-03	4.79E-04	6.84E-05	1.02E-06	1.55E-07	6.93E-03
Mercury	4.31E-03	3.23E-04	4.62E-05	3.72E-08	5.67E-09	4.68E-03
Nickel	3.62E-02	2.72E-03	3.88E-04	5.35E-06	8.14E-07	3.93E-02
Selenium	4.14E-04	3.11E-05	4.44E-06	9.26E-07	1.41E-07	4.50E-04
Max. Single HAP						**2.66**
Total All HAPs	**7.48E+00**	**2.44E-00**	**3.49E-01**	**2.04E-02**	**4.22E-03**	**10.3**

2.5 Ambient Air Quality Regulatory Criteria

The United States Environmental Protection Agency (USEPA) has promulgated regulations that establish NAAQS and PSD increments. The VDEQ has promulgated regulations that establish Virginia Ambient Air Quality Standards (VAAQS) and guidelines. These regulations and guidelines provide the bases for an evaluation of the potential impacts of proposed facilities on air quality.

2.5.1 National Ambient Air Quality Standards/Virginia Ambient Air Quality Standards

The USEPA has developed NAAQS for six air contaminants, known as criteria pollutants, for the protection of public health and welfare. These criteria pollutants are SO_2, $PM/PM_{10}/PM_{2.5}$, nitrogen dioxide (NO_2), CO, ozone (O_3), and lead (Pb). The VDEQ also has adopted these limits as VAAQS under 9 VAC 5 Chapter 30. The NAAQS have been developed for short-term periods of 24 hours or less and annual averages. The NAAQS include both "primary" and "secondary" standards where the primary standards are set to protect human health, allowing an adequate margin of safety. Secondary standards are set to protect public welfare from any known or anticipated adverse effects associated with the presence of air pollutants in the ambient air. Provided in Table 2-3 are the NAAQS and VAAQS.

One of the primary goals of federal and state air pollution regulations is to ensure that ambient air quality is in compliance with the NAAQS. Toward this end, every area of the United States has been designated as attainment, unclassifiable, or nonattainment for each criteria pollutant. In areas designated as attainment, the air quality with respect to the pollutant is equal to or better than the NAAQS. These areas are under a mandate to maintain, i.e., prevent significant deterioration of, such air quality. In areas designated as unclassifiable, there is limited air quality data and these areas are treated as attainment areas for regulatory purposes. In areas designated as nonattainment for a particular pollutant, the air quality with respect to that pollutant is worse than the NAAQS. These areas must take actions to improve air quality and attain the NAAQS within a certain period of time.

If a new major source of air pollution is proposed, it must undergo New Source Review (NSR) air permitting. The NSR air permitting regulations contain two distinct programs, one for sources proposed in attainment/unclassifiable areas and one for sources in nonattainment areas. The NSR program for sources in attainment/unclassifiable areas is known as the PSD Program. The NSR program for sources being built in non-attainment areas is known as NNSR. The Project is located in an area classified as "attainment" or "attainment/unclassifiable" for all criteria pollutants. Thus, emissions of criteria pollutants from the Project are evaluated under the PSD program. The requirements of the PSD program are discussed in the following subsection.

Table 2-3. National and Virginia Ambient Air Quality Standards

Pollutant	Averaging Period	NAAQS/VAAQS (µg/m^3)	
		Primary	Secondary
NO_2	Annual[a]	100	Same
	1-hour[b]	188	None
SO_2	Annual[a,c]	None/80	None
	24-hour[c,d]	None/365	None
	3-hour[d]	None	1,300
	1-hour[e]	196	None
$PM_{2.5}$	Annual[g]	12	15
	24-hour[h]	35	Same
PM_{10}	24-hour[f]	150	Same

Pollutant	Averaging Period	NAAQS/VAAQS (µg/m^3)	
		Primary	Secondary
CO	8-hour[d]	10,000	None
	1-hour[d]	40,000	None
O_3	8-hr[i]	0.075 ppm	Same
Pb	3-month[a]	0.15	Same

[a] Not to be exceeded.
[b] To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 100 ppb (188 µg/m^3).
[c] The 24-hour and annual average primary standards for SO_2 have been revoked. However, these standards remain in effect until one year after an area is designated for the new 1-hour standard.
[d] Not to be exceeded more than once per year.
[e] To attain this standard, the 3-year average of 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb (196 µg/m^3).
[f] Not to be exceeded more than once per year on average over 3 years.
[g] To attain this standard, the 3-year average of weighted annual mean $PM_{2.5}$ concentrations at community-oriented monitors must not exceed 12 µg/m^3.
[h] To attain this standard, the 3-year average of 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m^3.
[i] To attain this standard, the 3-year average of the fourth highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm.

2.5.2 Prevention of Significant Deterioration Review

The PSD Air Quality Program, which is implemented by the VDEQ, is a federally mandated program review of major new sources of criteria and other PSD-regulated pollutants primarily designed to maintain attainment with the NAAQS and prevent degradation of air quality in attainment/unclassifiable areas. Under the PSD program, a combined-cycle electric generation facility is considered a major source if emissions of any single criteria pollutant are greater than 100 tpy. The Project will have potential emissions greater than 100 tpy for one or more criteria pollutants. Therefore, the proposed Project will be subject to the requirements of the PSD program.

Once a project exceeds one of the PSD major source thresholds, the PSD regulations also apply to each criteria pollutant that is emitted in excess of its respective defined Significant Emission Rate. Table 2-4 presents a comparison of the Project's potential emissions to the PSD major source and Significant Emission Rate thresholds. As shown in Table 2-4, the facility is subject to PSD review for NO_x, CO, $PM/PM_{10}/PM_{2.5}$, VOC, and H_2SO_4. (See Section 3.2 for the assumptions used in determining annual potential emissions.)

Table 2-4. Prevention of Significant Deterioration Regulatory Threshold Evaluation

Pollutant	Project Potential Annual Emissions (tpy)	PSD Major Source Threshold (tpy)	PSD Significant Emission Rate (tpy)	PSD Review Applies?
CO	105.6	100	100	Yes
NO_x	157.2	100	40	Yes
SO_2	16.3	100	40	No
PM	73.1	100	25	Yes
PM_{10}	73.1	100	15	Yes
$PM_{2.5}$	73.1	100	10	Yes
VOC (O_3 precursor)	46.3	100	40	Yes

Pollutant	Project Potential Annual Emissions (tpy)	PSD Major Source Threshold (tpy)	PSD Significant Emission Rate (tpy)	PSD Review Applies?
H_2SO_4	10.3	100	7	Yes
Pb	0.009	100	0.6	No
Fluorides	Negligible	100	3	No
Hydrogen Sulfide (H_2S)	none expected	100	10	No
Total Reduced Sulfur (including H_2S)	none expected	100	10	No
Reduced Sulfur Compounds (including H_2S)	none expected	100	10	No

The key requirements for obtaining a PSD permit are a demonstration that BACT requirements are satisfied and an air quality impact analysis to document compliance with the NAAQS and PSD increments, which are concentrations of allowable air quality degradation from a baseline ambient concentration. An air dispersion modeling analysis will be conducted in accordance with USEPA and VDEQ guidance as described in this protocol. Refined modeling will be conducted for Project emissions of CO, NO_x, PM_{10}, and $PM_{2.5}$ because these pollutants exceed the annual tons per year modeling thresholds presented in Table 3-1 of the 2012 VDEQ Modeling Guideline. The air quality analysis report for these pollutants will be provided under separate cover to document that the Project will comply with the NAAQS and PSD increments. Project emissions of other criteria pollutants (SO_2 and Pb) are less than the specified modeling thresholds.

2.5.3 Virginia Air Toxics

Articles 1 and 2 of 9 VAC 5 Chapter 60 Part II incorporate by reference all the National Emissions Standards for Hazardous Air Pollutants (NESHAP) standards promulgated by USEPA in 40 Code of Federal Regulations (CFR) 61 and 40 CFR 63. There are no 40 CFR 61 standards (Article 1 of 9 VAC 5 Chapter 60) that apply to the facility. The Project's combustion turbines, HRSGs with duct burners, auxiliary boiler and emergency engines are subject to NESHAP standards under 40 CFR 63. However, Article 5 of 9 VAC 5 Chapter 60 includes additional air toxics regulations for new sources of air toxics emissions. Sources covered by an existing NESHAP standard are exempt from Article 5 in accordance with 5-60-300.C.4. However, the combustion turbine NESHAP, 40 CFR Part 60 Subpart YYYY has been stayed by the USEPA and is not currently in effect. Therefore, the exemption under 5-60-300.C.4 is not applicable to the combustion turbines. However, as specified in 9 VAC 5-60-350, all Project emission sources will be included in the determination of toxic impact concentrations, including those sources exempted under 9 VAC 5-60-300.C.

An analysis of air toxic emissions from all of the Project emission sources was conducted to determine if the potential emissions of any air toxic with a Threshold Limit Value (TLV®) exceeded an exemption threshold as defined under 5-60-300.C.1. Based upon this analysis, the potential emissions of four air toxics from all sources exceeded an exemption threshold as shown in Table 2-5. Sources subject to Article 5 of 9 VAC 5 Chapter 60 must implement BACT for subject pollutants and demonstrate that ambient impacts are less than the respective VDEQ's Significant Ambient Air Concentration (SAAC) as defined under 9 VAC 5-60-330. BACT will be satisfied by the firing of natural gas and the emission controls implemented to satisfy PSD BACT. An evaluation of ambient air impacts for all project emission sources for subject air toxics will be conducted to demonstrate that maximum predicted impacts are below the applicable SAAC, as discussed in Section 3.14 of this Protocol.

Table 2-5. Potential VA Air Toxics Emissions

HAP	CTG	DB	(2) CTG Emission Rates		(2) Duct Burner Emission Rates		Aux Boiler		Em. Gen.		Fire Pump		Total Emission Rates		TLV-TWA	TLV-STEL	Emissions Threshold	Emissions Threshold	Modeling	SAAC 1-Hour	SAAC Annual
	lb/MMBtu	lb/MMBtu	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	(mg/m^3)	(mg/m^3)	(lb/hr)	(tpy)	Required?	(ug/m^3)	(ug/m^3)
Acetaldehyde	4.00E-05		1.82E-01	7.95E-01					2.52E-05	6.30E-06	7.67E-04	1.92E-04	1.82E-01	7.96E-01	180	270	8.91E+00	2.61E+01	N	N/A	N/A
Acrolein	6.40E-06		2.91E-02	1.27E-01					7.88E-06	1.97E-06	9.25E-05	2.31E-05	2.92E-02	1.27E-01	0.23	0.69	2.28E-02	3.34E-02	Y	17.25	0.46
Benzene	1.20E-05	2.10E-06	5.45E-02	2.39E-01	1.81E-03	2.72E-03	2.10E-06	4.20E-06	7.76E-04	1.94E-04	9.33E-04	2.33E-04	5.80E-02	2.42E-01	32		2.11E+00	4.64E+00	N	N/A	N/A
1,3-Butadiene	4.30E-07		1.95E-03	8.55E-03							3.91E-05	9.78E-06	1.99E-03	8.56E-03	22		1.45E+00	3.19E+00	N	N/A	N/A
Dichlorobenzene		1.20E-06			1.04E-03	1.55E-03	1.20E-06	2.40E-06					1.04E-03	1.56E-03	451	661.00	2.18E+01	6.54E+01	N	N/A	N/A
Ethylbenzene	3.20E-05		1.45E-01	6.36E-01									1.45E-01	6.36E-01	434	543	1.79E+01	6.29E+01	N	N/A	N/A
Formaldehyde	1.10E-04	7.40E-05	4.99E-01	2.19E+00	6.38E-02	9.57E-02	7.40E-05	1.48E-04	7.89E-05	1.97E-05	1.18E-03	2.95E-04	5.65E-01	2.28E+00	1.2	2.5	8.25E-02	1.74E-01	Y	62.5	2.4
Hexane		1.80E-03			1.55E+00	2.33E+00	1.80E-03	3.60E-03					1.55E+00	2.33E+00	176		1.16E+01	2.55E+01	N	N/A	N/A
Propylene oxide	2.90E-05		1.32E-01	5.77E-01					3.85E-03	9.63E-04	3.56E-03	8.90E-04	1.39E-01	5.79E-01	48		3.17E+00	6.96E+00	N	N/A	N/A
Toluene	1.30E-04	3.30E-06	5.90E-01	2.59E+00	2.85E-03	4.27E-03	3.30E-06	6.60E-06	2.81E-04	7.03E-05	4.09E-04	1.02E-04	5.94E-01	2.59E+00	377	565.0	1.86E+01	5.47E+01	N	N/A	N/A
Xylene	6.40E-05		2.91E-01	1.27E+00					1.93E-04	4.83E-05	2.85E-04	7.13E-05	2.91E-01	1.27E+00	434	651	2.15E+01	6.30E+01	N	N/A	N/A
Naphthalene	1.30E-06	6.20E-07	5.90E-03	2.59E-02	5.35E-04	8.02E-04	6.20E-07	1.24E-06	1.30E-04	3.25E-05	8.48E-05	2.12E-05	6.65E-03	2.67E-02	52	79	2.61E+00	7.54E+00	N	N/A	N/A
Arsenic	2.00E-07	2.00E-07	9.08E-04	3.98E-03	1.73E-04	2.59E-04	2.00E-07	4.00E-07	4.62E-08	1.16E-08	4.62E-08	1.16E-08	1.08E-03	4.24E-03	0.2		1.32E-02	2.90E-02	N	N/A	N/A
Beryllium	1.20E-08	1.20E-08	5.45E-05	2.39E-04	1.04E-05	1.55E-05	1.20E-08	2.40E-08					6.48E-05	2.54E-04	0.002		1.32E-04	2.90E-04	N	N/A	N/A
Cadmium	1.10E-06	1.10E-06	4.99E-03	2.19E-02	9.49E-04	1.42E-03	1.10E-06	2.20E-06	5.13E-09	1.28E-09	5.13E-09	1.28E-09	5.94E-03	2.33E-02	0.05		3.30E-03	7.25E-03	Y	2.5	0.1
Chromium	1.40E-06	1.40E-06	6.36E-03	2.78E-02	1.21E-03	1.81E-03	1.40E-06	2.80E-06	1.24E-05	3.10E-06	1.24E-05	3.10E-06	7.59E-03	2.97E-02	0.5		3.30E-02	7.25E-02	N	N/A	N/A
Chromium VI	2.50E-07	2.50E-07	1.14E-03	4.97E-03	2.16E-04	3.23E-04	2.50E-07	5.00E-07	2.24E-06	5.60E-07	2.24E-06	5.60E-07	1.36E-03	5.30E-03	0.05		3.30E-03	7.25E-03	N	N/A	N/A
Cobalt	8.20E-08	8.20E-08	3.72E-04	1.63E-03	7.07E-05	1.06E-04	8.20E-08	1.64E-07					4.43E-04	1.74E-03	0.05		3.30E-03	7.25E-03	N	N/A	N/A
Lead	4.90E-07	4.90E-07	2.22E-03	9.74E-03	4.23E-04	6.34E-04	4.90E-07	9.80E-07	7.69E-07	1.92E-07	7.69E-07	1.92E-07	2.65E-03	1.04E-02	0.15		9.90E-03	2.18E-02	N	N/A	N/A
Manganese	3.70E-07	3.70E-07	1.68E-03	7.36E-03	3.19E-04	4.79E-04	3.70E-07	7.40E-07	2.82E-07	7.05E-08	2.82E-07	7.05E-08	2.00E-03	7.84E-03	5		3.30E-01	7.25E-01	N	N/A	N/A
Mercury	2.50E-07	2.50E-07	1.14E-03	4.97E-03	2.16E-04	3.23E-04	2.50E-07	5.00E-07	1.03E-08	2.58E-09	1.03E-08	2.58E-09	1.35E-03	5.30E-03	0.05		3.30E-03	7.25E-03	N	N/A	N/A
Nickel (soluble)	2.10E-06	2.10E-06	9.53E-03	4.18E-02	1.81E-03	2.72E-03	2.10E-06	4.20E-06	1.48E-06	3.70E-07	1.48E-06	3.70E-07	1.14E-02	4.45E-02	0.1		6.60E-03	1.45E-02	Y	5	0.2
Selenium	2.40E-08	2.40E-08	1.09E-04	4.77E-04	2.07E-05	3.11E-05	2.40E-08	4.80E-08	2.56E-07	6.40E-08	2.56E-07	6.40E-08	1.30E-04	5.08E-04	0.2		1.32E-02	2.90E-02	N	N/A	N/A

3.0 AIR QUALITY IMPACT ASSESSMENT METHODOLOGY

3.1 Introduction

The dispersion modeling analyses for the Project will be conducted in accordance with the USEPA's *Guideline on Air Quality Models* (USEPA 2005) and VDEQ's *Virginia Modeling Guideline for Air Quality Permits* (VDEQ 2012), as supplemented by additional agency guidance.

As described in Section 2.5.2, the Project will be a major source subject to PSD, due to the significant emissions of CO, NO_X, VOC, PM, PM_{10}, $PM_{2.5}$, and sulfuric acid mist. As a result, dispersion modeling will be conducted for CO, NO_2, PM_{10} and $PM_{2.5}$ to demonstrate compliance with the NAAQS, VAAQS and PSD increments. In addition, modeling will be conducted for Acrolein, Formaldehyde, Cadmium, and Nickel to demonstrate compliance with SAAC criteria established in Virginia Air Toxics Regulations in Article 5 of 9 VAC 5 Chapter 60 (see Section 3.14).

The dispersion modeling for the Project will evaluate worst-case operating conditions to predict the appropriate maximum ground level concentration for each pollutant and averaging period. The appropriate maximum concentrations from the worst case scenarios will be compared to the Significant Impact Levels (SILs). If the maximum concentration is below the corresponding SILs, then compliance is demonstrated and no additional analysis is necessary. However, if the maximum predicted concentration is equal to or greater than the SILs, a cumulative impact analysis will be conducted with other major emission sources in the area, as identified by the VDEQ. The results of the cumulative modeling will be compared to the NAAQS, VAAQS and PSD Class II increments. Table 3-1 provides the SILs, NAAQS, and PSD Class II increments as well as the modeling rank basis used for the assessment of compliance with the various criteria consistent with the use of one year of on-site meteorological data (as described in Section 3.4).

Table 3-1. SILs, NAAQS/VAAQS, and PSD Increments

Pollutant	Averaging Period	Rank for SIL Assessment	SIL ($\mu g/m^3$)	NAAQS/VAAQS ($\mu g/m^3$)	PSD Class II Increment ($\mu g/m^3$)	Rank for NAAQS/VAAQS/PSD Assessment
NO_2	1-hour	H1H	7.5	188	NA	H8H
	Annual	H1H	1	100	25	H1H
CO	1-hour	H1H	2,000	40,000	NA	H2H
	8-hour	H1H	500	10,000	NA	H2H
PM_{10}	24-hour	H1H	5	150	30	H2H
	Annual	H1H	1	NA	17	H1H
$PM_{2.5}$	24-hour	H1H	1.2	35	NA	H8H
	Annual	H1H	0.3	12	NA	H1H
$PM_{2.5}$	24-hour	H1H	1.2	NA	9	H2H
	Annual	H1H	0.3	NA	4	H1H

The $PM_{2.5}$ SILs were vacated by the January 22, 2013 United States Court of Appeals for the District of Columbia Circuit decision on the Sierra Club v. USEPA case. However, as shown in Section 3.12 of this Protocol, existing ambient monitoring data representative of ambient background for the Project area indicate that there is sufficient margin between the ambient background levels and the NAAQS to allow use of the $PM_{2.5}$ SILs while still protecting the NAAQS. The SIL is 10% or less of this margin for both 24-

hour and annual averages. Predicted Project impacts below the SILs would still allow adequate protection of the NAAQS and, therefore, the $PM_{2.5}$ SILs are proposed to be used for this analysis.

All Comparison with SILs will be evaluated based on the highest first high (H1H) predicted concentrations for all pollutants and averaging periods.

3.2 Source Data and Operating Scenarios

The air dispersion modeling will be conducted for several different operating scenarios, including planned maintenance and SU/SD, to capture worst-case potential impact concentrations from the combustion turbine units, which account for well over 90% of Project annual emissions as shown in Table 2-1. The operating scenarios evaluated will be described in the air quality analysis report. Other equipment is not expected to operate at other than full load under normal conditions and, thus, will only be evaluated at full load. Table 3-2 summarizes the stack characteristics for the combustion turbines and ancillary sources. Individual stack locations are shown on the equipment arrangement drawing shown as Figure 2-1. Detailed emissions and source parameter data are provided in Appendix A for the full range of normal operating loads for the combustion turbines, as well as for SU/SD conditions. In addition, Appendix A provides the emission and stack parameters for the emergency diesel generator, fire pump engine, and the auxiliary boiler. The turbines will first be modeled alone to determine worst-case load conditions for each pollutant and averaging period. The turbines under maximum design load (100%) and worst-case load conditions will then be modeled in combination with the ancillary units to determine total Project impacts.

Additional considerations for the emissions calculations and impact assessment include the following techniques and assumptions:

- If necessary, the conversion of NO_X emission rates to modeled NO_2 emission rates will be done using the Tier 2 NO_X to NO_2 conversion assumptions. Use of Tier 2 and potential use of Tier 3 modeling techniques is discussed in Section 3.9, along with a discussion of intermittent sources and conditions.
- For the turbines, which can operate at part load for an extended period, or in SU/SD mode, an initial air modeling assessment will be conducted to determine the worst-case operating load for each pollutant, and that load condition will be modeled for the source for the Project total cumulative modeling.
- The auxiliary boiler will operate for up to 4,000 hours per year, primarily to provide steam to the plant when the CTGs are not operating. The auxiliary boiler will not operate simultaneously with the CTGs except during brief periods of overlap when the CTGs are in SU/SD mode.
- Since the emergency diesel generator and fire pump engine will be operated for no more than 1 hour per week and 52 hours per year per unit under non-emergency conditions (operation testing), modeled short-term (24-hour and less) and long-term (annual) emission will be normalized to account for 1 hour of operation within the short-term averaging period or 500 hours for the annual averaging period. The normalized emission rates are provided in Appendix A.

Table 3-2. Stack Characteristics

Unit	Stack Location[1]	Stack Height Above Ground	Stack Diameter	Ground-Level Elevation (amsl)
Combustion Turbine 1 & Duct Burner	463138.56, 4078981.57	234.5 feet (71.48 meters)	22 feet (6.71 meters)	2,560 feet (780.29 meters)
Combustion Turbine 2 & Duct Burner	463160.01, 4078948.27	234.5 feet (71.48 meters)	22 feet (6.71 meters)	2,560 feet (780.29 meters)
Auxiliary Boiler	463151.33, 4078902.43	50 feet (15.24 meters)	4.0 feet (1.22 meters)	2,560 feet (780.29 meters)
Emergency Generator	463138.56, 4078948.27	30 feet (9.144 meters)	1.3 feet (0.396 meters)	2,560 feet (780.29 meters)
Fire Pump	463138.56, 4078948.27	10 feet (3.048 meters)	0.417 feet (0.1271 meters)	2,560 feet (780.29 meters)

[1]Stack location coordinates in meters relative to UTM NAD83 zone 17.

3.3 Model Selection

The USEPA-recommended AERMOD modeling system (USEPA 2004) will be used to conduct the dispersion modeling. The current versions of the model (AERMOD version 14134, AERMAP version 11103, and AERMET version 14134) will be used for both criteria pollutants and air toxics.

3.4 Meteorological Data for AERMOD

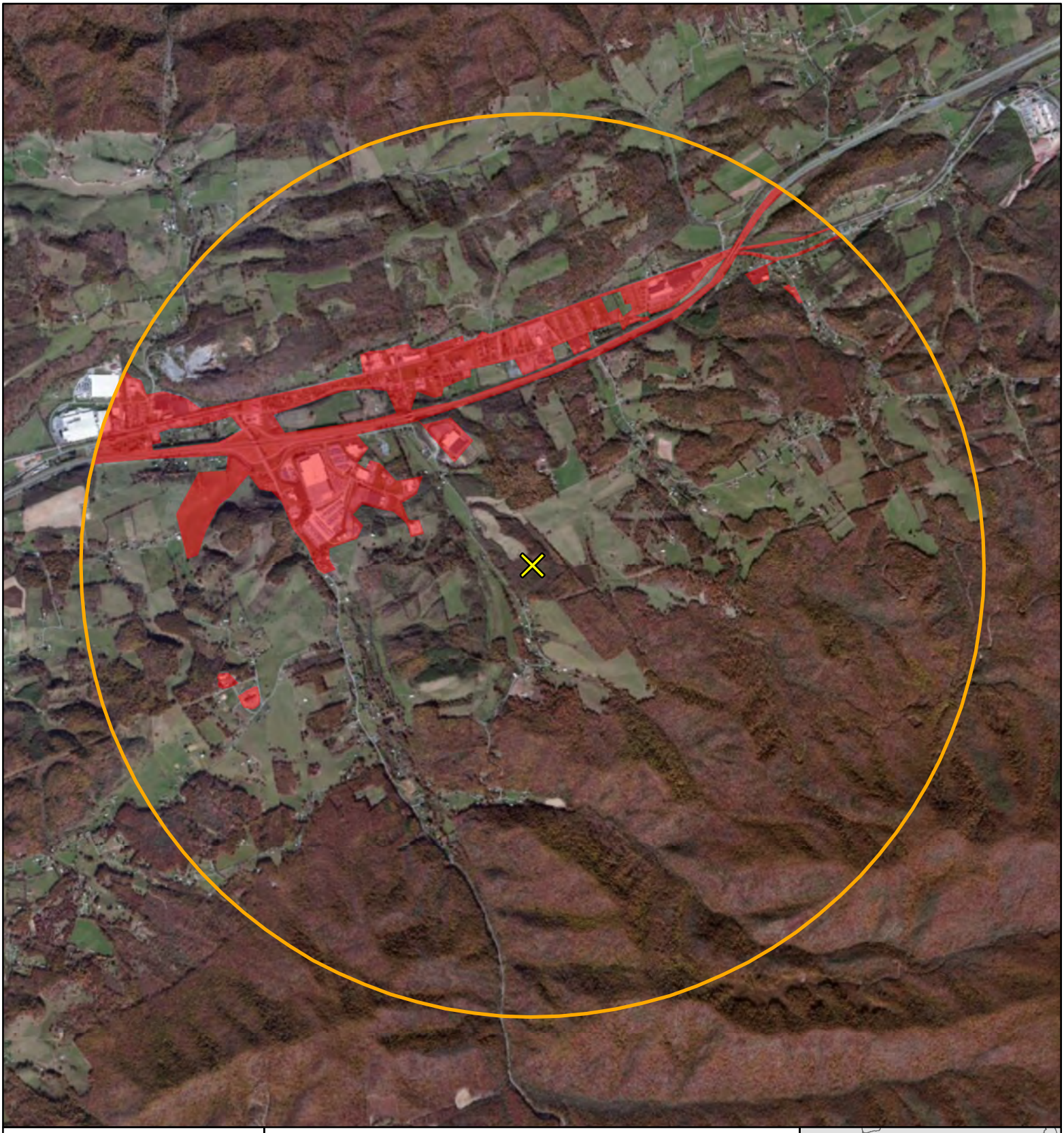
An on-site meteorological data collection program has been conducted for the Project. The program was conducted in accordance with USEPA and VDEQ guidance. Meteorological data were collected on both a 30-meter tower and a sonic detection and ranging (SODAR) system to measure upper-level winds. The measurements began on July 19, 2013 and completed a one-year data set on July 18, 2014. The data will be processed using the most recent version of AERMET (version 14134) and in accordance with USEPA and VDEQ guidance as well as discussions with VDEQ. The one-year of processed on-site meteorological data set will be used to conduct the AERMOD dispersion modeling.

3.5 Land-Use

A land-use determination has been made following the classification technique suggested by Auer in accordance with USEPA/VDEQ modeling guidance (USEPA 2005, VDEQ 2012). The classification determination was conducted by assessing land-use categories within a 3-kilometer (km) radius of the proposed site. Figure 3-1 provides a section of an aerial photograph and the 3-km radius around the proposed Project site. The majority of the 3-km area is characterized as rural. Therefore, rural dispersion coefficients will be used for the air quality modeling.

3.6 Good Engineering Practice Stack Height Analysis

A Good Engineering Practice (GEP) stack height analysis has been performed based on the proposed facility structures to determine the potential for building-induced aerodynamic downwash for the proposed stacks. The analysis procedures described in USEPA's Guidelines for Determination of Good Engineering Practice Stack Height (USEPA 1985) and VDEQ guidance have been used.



N
W E
S

0 250 500 1,000 Meters

0 750 1,500 3,000 Feet

Figure 3-1
Urban/Rural Land Use Determination Map

CPV Smyth Energy Center
Atkins, Virginia

Legend

CPV Smyth Energy Center | 3km Buffer of Facility | Urban Areas

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Document Path: P:\CPV Smyth - Greer Site\GIS\Spatial\MXD\Fig3-1_UrbanRuralLandUseDeterminationMap.mxd

The GEP formula height is based on the observed phenomena of disturbed atmospheric flow in the immediate vicinity of a structure resulting in higher ground-level concentrations at a closer proximity 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 regulation, is calculated as follows:

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

Where:

- H_{GEP} is the calculated GEP formula height;
- H_{BLDG} 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 the plane perpendicular to the direction of the wind. The GEP stack height is based on the plane projection of any structure which results in the greatest calculated height. For the purpose of the GEP analysis, nearby refers to the "sphere of influence" defined as 5 times L (the lesser dimension [height or projected width] of the nearby structure), downwind from the trailing edge of the structure.

The USEPA's Building Profile Input Program (BPIP, Dated: 04274) that is appropriate for use with the PRIME algorithms in AERMOD has been used to evaluate downwash effects in the model. The building dimensions and coordinates for each potentially influencing structure were input in BPIPPRM program to determine direction-specific building data. The PRIME algorithms calculate the dimensions of the structure's wake, from the cavity immediately downwind of the building, to the far wake. BPIP data are provided in Appendix B, along with schematic diagrams depicting the key site structure heights. The controlling building structures for the main turbine stacks are the HRSG structures, which include an upper platform that at 100 feet above grade, and is the tallest structure on site. A schematic diagram showing the HRSG and other facility structures is provided in Appendix B.

3.7 Receptor Grid and AERMAP Processing

Discrete receptors will be placed at 25-meter intervals along the facility fence line. A nested Cartesian grid will be extended out from the fence line at the following receptor intervals and distances:

- At 25-meter intervals along the facility fence line;
- At 50-meter intervals from the fence line to 1,000 meters;
- At 100-meter intervals from 1,000 meters to 3,000 meters;
- At 250-meter intervals from 3,000 to 10,000 meters; and
- At 500-meter intervals from 10,000 to 20,000 meters.

If significant impact concentrations are predicted out to the edge of the receptor grid, then the grid will extended up to 50 km out at 1,000-meter intervals.

Terrain elevations at receptors will be obtained using BEE-Line Software's BEEST program and United States Geological Survey (USGS) digital terrain data. BEEST implements the AERMAP model, which includes processing routines that extract National Elevation Data (NED) at 10-meter spacing based on North American Datum of 1983 (NAD83). The four nearest data points surrounding each receptor will be used to determine receptor terrain elevations (by interpolation) for air quality model input.

If maximum model concentrations are predicted beyond the dense (50-meter interval) portion of the grid, supplemental receptors will placed around the initial maximum location (at 50-meter receptor grid interval spacing) to ensure higher concentrations are not overlooked.

3.8 Modeling Methodology

The modeling analyses will be conducted using AERMOD (USEPA 2004) along with the on-site meteorological data as described in Section 3.4. The analyses will be conducted to demonstrate compliance with the NAAQS/VAAQS and PSD increments. In addition, an air toxics analysis will be conducted to demonstrate that potential toxic pollutant impacts are in compliance with VDEQ guidance (see Section 3.14). Both maximum design load (100%) and worst case load will be evaluated to assess compliance with the NAAQS and PSD increments. If the maximum concentrations from any Project criteria pollutant emissions are predicted to be equal to or greater than their respective SILs shown in Table 3-1, a refined cumulative modeling analysis with additional sources in the region will be conducted to determine compliance with the NAAQS/VAAQS and PSD increments. Compliance with the NAAQS/VAAQS will be based on the sum of modeled impacts attributable to the Project, modeled impacts from "nearby" background sources, and representative ambient background concentrations (described in Section 3.12). Ambient background will be added to all pollutants and averaging periods to assess NAAQS compliance. Compliance with the PSD increments will be based on the sum of the modeled impacts attributable to the Project plus the modeled impacts from "nearby" increment-consuming sources. The Project will request an inventory of background emission sources and increment consuming sources from VDEQ. These will be included in the multi-source modeling analysis. The inventory will be developed for sources in the region in consultation with the VDEQ.

The cumulative analyses will be conducted for the subset of receptor locations where the Project has significant impacts. Predicted cumulative impact concentrations for compliance demonstration will be determined for all time periods for which the Project has a significant impact. For both the NAAQS/VAAQS and PSD analyses, compliance with annual standards will be based on maximum highest first highest (H1H) concentrations. Compliance with short-term standards will be assessed according to the following basis. For CO, the predicted highest second high (H2H) concentration will be reported. For 24-hour PM_{10}, the predicted highest second high (H2H) will be reported. For 24-hour $PM_{2.5}$, the predicted highest eighth high (H8H) concentration will be reported. The modeled value will then be added to the three-year average of the 98th percentile of the annual distribution of the 24-hour monitored background concentrations for comparison to the NAAQS/VAAQS, consistent with USEPA guidance. For annual $PM_{2.5}$, the modeling will be presented as the maximum modeled $PM_{2.5}$ concentrations predicted at each receptor. The modeled value will then be added to the three-year average of the annual monitored background concentrations for comparison to the NAAQS/VAAQS, consistent with USEPA guidance. For 1-hour NO_2, the modeling results will be presented as the 98th percentile of the annual distribution of the maximum daily 1-hour predicted concentrations (the predicted highest eighth high [H8H] concentrations). The modeled values will then be added to the three-year average of the 98th percentile of the annual distribution of the maximum daily 1-hour monitored background concentration for comparison to the NAAQS/VAAQS. For short term PSD increment compliance, the predicted highest of the H2Hs will be reported.

3.9 NO_2 Modeling Methods

The NO_2 impact analysis will be consistent with recent USEPA guidance on 1-hour NO_2 dispersion modeling, "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-

hour NO_2 National Ambient Air Quality Standard" (USEPA 2011) and "Clarification on the Use of AERMOD Dispersion Modeling for Demonstrating Compliance with the NO_2 National Ambient Air Quality Standard" (USEPA 2014).

The March 1, 2011 guidance describes a three-tiered screening approach for modeling 1-hour NO_2. NO_x emissions, in most cases, are released primarily in the form of nitric oxide (NO), and these emissions convert to NO_2 in the atmosphere. Tier 1 in the three-tiered screening approach assumes that all NO_x converts to NO_2 prior to impacting each receptor. Tier 2 approaches assume NO_x converts to NO_2 at a rate consistent with an appropriate NO_2/NO_x ambient ratio. Tier 3 involves use of a detailed refined modeling method on a case-by-case basis, such as the Ozone Limiting Method (OLM) or Plume Volume Molar Ratio Method (PVMRM).

If necessary, default Tier 2 NO_X to NO_2 conversion rates (80% for 1-hour NO_2 and 75% for annual NO_2) will be applied. However, if non-default Tier 2 (Ambient Ratio Method 2 [ARM2]) or Tier 3 (PVMRM) techniques are needed, this protocol will be supplemented with a formal request letter to VDEQ, which will provide justification as well as additional information for PVMRM modeling, including assumptions for ambient ozone data to be utilized, source NO_2/NO_x in-stack ratios, and ambient equilibrium ratios (for PVMRM).

Also consistent with the March 2011 USEPA guidance, the emergency generator engine and emergency fire pump engine will not be included in the modeling analysis for 1-hour NO_2. Since the emergency engines will be operated no more than 1 hour per week for testing (up to 52 hours per year per unit) and no more than 500 hours per year per unit of total usage (non-emergency plus emergency use). These units will not be included for the 1-hour NO_2 analysis since these units are what USEPA refers to as "intermittent" sources that will not impact the probabilistic NAAQS.

SU/SD operations for the combustion turbines can also be considered "intermittent" per EPA guidance. Total hours of SU/SD will be limited to approximately 500 hours per year, however, actual SU/SD time is expected to be significantly less. Therefore, the likelihood is very low that these activities will contribute significantly to the annual distribution of the peak daily 1-hour concentrations for determining compliance with the probabilistic 1-hour NO_2 NAAQS. Therefore, SU/SD will not be considered when assessing compliance with the 1-hour NO_2 NAAQS.

3.10 $PM_{2.5}$ Assessment Methods

The analysis of $PM_{2.5}$ impacts will be consistent with recent USEPA guidance on $PM_{2.5}$ permit modeling (USEPA 2014). Since the Project has an annual potential to emit of direct $PM_{2.5}$ and NO_X, greater than their respective Significant Emission Rate thresholds, air quality impacts from both primary and secondary $PM_{2.5}$ emissions must be assessed. Impacts of the primary $PM_{2.5}$ emissions will be determined with dispersion modeling using AERMOD as described in the previous sections. The guidance indicates that the Project will fall in the Case 3 Assessment category, where secondary $PM_{2.5}$ can be assessed by either a qualitative, hybrid qualitative/quantitative, or full quantitative approach.

A qualitative assessment will be used to assess potential secondary $PM_{2.5}$ impacts from NO_x for the Project. The qualitative approach is analogous to the example qualitative approach described in the recent draft $PM_{2.5}$ guidance. Specific details are summarized below:

1. Preliminary impact predictions indicate primary $PM_{2.5}$ impacts will be located close to the Project (either at the facility fence line or within a few 100 meters of the fence). Secondary $PM_{2.5}$ impacts

from NO_x emissions are expected to be very low (negligible) near where model-predicted primary $PM_{2.5}$ impacts are highest, because there is not enough time for the secondary chemical reactions to occur. Conversely, what limited secondary $PM_{2.5}$ emissions may form will occur far from the Project site, where the primary $PM_{2.5}$ impacts will be lowest. This makes it highly unlikely that maximum $PM_{2.5}$ primary and secondary impacts will occur at the same time and place.

2. Precursor SO_2 emissions from the Project are less than half of the significant emission rate threshold of 40 tons per year.
3. The predominant 30-meter wind directions measured at the Project site are generally south-southwest through west and east-northeast through northeast, generally following the valley in which the site is located. There are few major NO_x sources within approximately 50 km in these directions to contribute secondary $PM_{2.5}$.
4. Preliminary model results indicate that primary $PM_{2.5}$ impact predictions from the Project will be well below the $PM_{2.5}$ SILs at distances where any secondary $PM_{2.5}$ formation could reasonably be expected to occur. As shown in Section 3.12, representative ambient background levels for $PM_{2.5}$ indicate that there is substantial margin between the NAAQS/VAAQS and the background levels. Therefore, the SILs provide an adequate margin of safety for the NAAQS/VAAQS and any additional $PM_{2.5}$ from secondary formation will not jeopardize the NAAQS/VAAQS.
5. The ambient background $PM_{2.5}$ monitoring data is quality assured and accounts for secondary $PM_{2.5}$ from regional emission sources. There is no indication that secondary formation of $PM_{2.5}$ from existing regional sources is causing or contributing to a violation of the NAAQS/VAAQS.

For the reasons stated above, the modeling or detailed quantification of secondary $PM_{2.5}$ is not proposed in order to determine whether emissions of $PM_{2.5}$ precursors from the Project, together with emissions of primary $PM_{2.5}$, will cause or contribute to violations of the $PM_{2.5}$ NAAQS/VAAQS.

3.11 Ozone Ambient Impact Analysis

The USEPA regulates VOC and NO_x as precursors to O_3 formation. However, the VDEQ Modeling Guideline states the following regarding ozone impact analyses, "In general, accurate and cost effective methods for modeling ozone impacts from individual stationary point sources are not available. Therefore, ozone modeling is not routinely requested for construction permits." Consistent with this statement, quantitative O_3 modeling is not proposed for the Project. However, qualitatively the impact of the relatively small emissions of VOC (46.3 tpy) and NO_x (157.2 tpy) would not adversely impact O_3 concentrations to the point of jeopardizing the current attainment status with respect to the O_3 NAAQS/VAAQS at any location in Virginia. In addition, these emissions would not negatively affect the 8-hour nonattainment situation in the Washington DC-MD-VA nonattainment area, the only O_3 nonattainment area in Virginia. To put Project emissions in perspective, Project VOC and NO_x emissions represent less than 0.05% and 0.14% of the VOC and NO_x emissions, respectively, from within this relatively small nonattainment area, located hundreds of km away from the site.[2]

[2] The "Draft 2011 Base Year Emission Inventory for the Washington DC-MD-VA 8-Hour Ozone NAAQS Nonattainment Area" (May 21, 2014) presents the Base Year SIP emission inventory in the nonattainment area to be 95,199 tons per year of VOC emissions and 118,098 tons per year of NO_x emissions.

3.12 Ambient Background Data

As stated above, if AERMOD-predicted maximum impact concentrations are significant (above SILs) for one or more pollutants, multi-source cumulative modeling will be conducted for those pollutants and averaging times with model-predicted impacts above their respective SIL. Representative ambient air quality background concentrations will be added to modeled concentrations, either from the cumulative multi-source modeling, or from the project-only modeling if maximums are less than SILs (i.e., CO), to compare to the NAAQS/VAAQS. VDEQ, Tennessee Department of Environment and Conservation (TDEC), and North Carolina Department of Environment and Natural Resources (NCDENR) monitoring data were reviewed to determine representative monitoring sites and ambient background concentrations for the Project impact area. The monitoring site selections considered the proximity of the monitoring site to the Project area, monitoring site environment relative to the Project site vicinity, and comparative exposure to the prevailing winds. In general, the monitors located closest to the facility are proposed to be used for background. The specific monitoring sites and ambient background concentrations were selected based on the following rationale:

NO_2: The ambient data selected for NO_2 background are from the Eastman Ross N. Robinson monitoring site located in Kingsport, Tennessee (AQS ID # 47-163-0007), approximately 65 miles west southwest of the Project site. This monitoring site is operated by Eastman Chemical Company and is located less than 1.5 miles downwind of the Eastman Complex, a large source of NO_x. This is the closest NO_2 monitoring site to the Project site. The next closest monitoring sites are the Forsyth monitor in Winston Salem, North Carolina, located 84 miles to the southeast of the Project site and the Vinton monitor in Roanoke, Virginia, located 90 miles east-northeast of the Project site. The Eastman Ross monitoring site is located generally upwind and in the same valley and regional air shed as the proposed Project site. Data from this site, while representative, are also considered conservative since it is located downwind of the large NO_x source and concentrations are generally similar to concentrations recorded at monitors located in larger population centers in Virginia. The NO_2 monitoring data were provided by Robert Brawner of the TDEC and his opinion is that the data are valid. The data meet completeness and validity requirements of USEPA. NO_2 data for 2011 through 2013 are summarized in Table 3-4.

$PM_{2.5}$: The monitor selected for $PM_{2.5}$ is operated by the VDEQ at the Highland View Elementary School (AQS ID # 51-520-0006) in a suburban neighborhood northeast of Bristol, Virginia. The monitoring site is located 45 miles west southwest of the Project site and is the closest $PM_{2.5}$ monitoring site to the Project site. The next closest sites are the Virginia City Hybrid Energy Center site in St. Paul, Virginia, located 51 miles west of the Project site and the Oakland Boulevard site in Roanoke, located 86 miles northeast of the Project site. Neither of these alternatives is as representative of the Project site conditions as the Highland View site. The Virginia City monitors are located to the east and to the west of a coal and biomass power plant while the Roanoke monitor is located in a densely populated area adjacent to a busy interstate. The 3-year average of the 98th percentile 24-hour average concentrations is quite consistent at the 14 VDEQ-operated sites in Virginia with concentrations generally in the 18 to 23 micrograms per cubic meter ($\mu g/m^3$) range. The Highland View monitoring data are consistent with this range, whereas the Virginia City monitoring data are lower. $PM_{2.5}$ data for 2011 through 2013 are summarized in Table 3-4.

PM_{10}: The monitor selected for PM_{10} is operated by the VDEQ at the Gladeview Elementary School (AQS ID # 51-035-0001) in a rural setting 3 miles northeast of Galax in Carroll County, Virginia. At 32 miles to the southeast, this is by far the closest monitor to the Project site. The next closest monitor is the Cherry Hill monitor in Roanoke, Virginia located 83 miles northeast of the site. The Cherry Hill monitor is located

in an urban setting, while the Gladeview monitor is located in a rural area similar to the Project area. PM_{10} data for 2011 through 2013 are summarized in Table 3-4.

CO: The ambient data selected for CO are also from the Eastman Ross N. Robinson monitoring site located in Kingsport, Tennessee (AQS ID # 47-163-0007), approximately 65 miles west southwest of the Project site. This monitoring site is operated by Eastman Chemical Company and is located less than 1.5 miles downwind of the Eastman Complex, a large source of CO. This is the closest CO monitoring site to the Project site. The next closest monitoring sites are the Forsyth monitor in Winston Salem, North Carolina, located 84 miles to the southeast of the Project site and the Vinton monitor in Roanoke, Virginia, located 90 miles east northeast of the Project site. The Eastman Ross monitoring site is located generally upwind and in the same valley and regional air shed as the proposed Project site. Data from this site, while representative, are also considered conservative since it is located downwind of the large CO source and concentrations are generally similar to concentrations recorded at monitors located in larger population centers in Virginia. CO data for 2011 through 2013 are summarized in Table 3-4

The monitoring data from these three sites, while representative, are expected to be conservative (i.e., each monitoring site location is expected to experience slightly higher ambient concentrations than the Project site area). The ambient background concentrations that will be used for the air quality compliance assessment are summarized in Table 3-4.

Table 3-4. Proposed Representative Background Ambient Air Quality Concentrations

Pollutant	Averaging Period	Rank	2011	2012	2013	Units	Monitor	Proposed Background
NO_2	Annual	mean	19.3	19.9	21.0	µg/m^3	A	21
	1-hour	98th percentile	81	87	120	µg/m^3	A	96
$PM_{2.5}$	24-hour	98th percentile	21.5	16.5	16.2	µg/m^3	B	18
	Annual	Mean	9.8	8.8	8.5	µg/m^3	B	9.0
PM_{10}	24-hour	2nd high	28	26	22	µg/m^3	C	28
CO	1-hour	2nd high	2862.5	1603	3206	µg/m^3	A	3206
	8-hour	2nd high	1145	1145	1030.5	µg/m^3	A	1145

Monitors:
A - Eastman Ross N. Robinson monitoring site located in Kingsport, TN (AQS ID# 47-163-0007)
B – Highland View Elementary School located in Bristol, VA (AQS ID# 51-520-0006)
C – Gladeview Elementary School located in Galax, VA (AQS ID# 51-035-0001)

3.13 Pre-Construction Monitoring

PSD review may require projects to conduct pre-construction ambient monitoring to characterize existing ambient air quality. However, if dispersion model predicted impacts are less than USEPA's Monitoring *De Minimis* Concentrations (also called Significant Monitoring Concentrations [SMC]), pre-construction monitoring may be waived. Based on preliminary modeling for the Project, final modeling is expected to show impacts that exceed the SMC for $PM_{2.5}$ but no other pollutants.[3]

[3] The $PM_{2.5}$ SMC was vacated on January 22, 2013.

In addition, if existing representative monitoring data are available, these data may be used to satisfy the pre-construction monitoring requirement. Section 5.2.1 of the VDEQ Modeling Guideline states:

PSD does not require that an applicant perform ambient monitoring prior to submittal of an application if adequate monitoring data is already available to perform the required air quality analyses. As stated by EPA in the draft New Source Review Workshop Manual (EPA, 1990), the PSD regulations require an applicant "to provide an ambient air quality analysis that may include pre-construction monitoring data, and in some instances post-construction monitoring data, for any pollutant proposed to be emitted in significant amounts."

As shown in Section 3.12 above, existing representative monitoring data are available for this Project. Therefore, in lieu of gathering pre-construction monitoring data for background ambient air concentrations, the observed concentration data from local and regional ambient air quality monitors presented in Table 3-4 above, are proposed.

3.14 Virginia Air Toxics Analysis

Modeling will also be conducted for air toxic pollutants since potential emissions of acrolein, formaldehyde, cadmium, and nickel from the combustion turbines exceed the emissions thresholds listed in 9 VAC 5 Chapter 60 – see Section 2.5.3 of this protocol. The maximum emissions from all Project emission sources will be modeled using the same procedures described above and will be compared to the 1-hour and annual SAAC concentrations for each of these pollutants listed in Table 2-5 to demonstrate impacts less than these concentrations.

4.0 EVALUATION OF ADDITIONAL IMPACTS

In accordance with PSD regulations, additional impacts must be addressed for projects subject to PSD review. The additional PSD impact analyses involving modeling are discussed below.

4.1 PSD Class I Area Increment Consumption

The nearest PSD Class I areas to the Project site are shown in Figure 4-1 with distances from the site. The Linville Gorge National Wilderness Area (NWA) is the closest Class 1 Area at 109 km from the Project site. An assessment of PSD Class I increment consumption will be conducted for the Linville Gorge NWA. The assessment will initially consist of setting discrete polar receptors at a distance of 50 km from the Project at 1 degree intervals over the range directions toward the Linville George NWA (approximately 195 to 211 degrees from north, including a 5 degree buffer on either side of the sector facing the Linville Gorge NWA). AERMOD will be used to predict impact concentrations at these receptors using the same methods described in Section 3. Maximum predicted impact concentrations will be compared to the Class I Area SILs described in Table 4-2 of the VDEQ Modeling Guideline. If impacts are less than the SILs, no additional modeling will be conducted. If impacts are equal to or greater than the SILs, the Project will consult with the VDEQ to determine proper modeling methods to assess this long-range transport scenario, including potential use of the CALPUFF/CALMET modeling system.

4.2 Class I Area AQRVs

Since the closest PSD Class I areas are located between 100 km and 300 km of the Project site, a screening procedure was conducted to determine potential worst case impacts in the PSD Class I areas and whether a PSD Class I AQRV analysis is required. Specifically, the screening procedure described in FLAG guidance (NPS 2010) was used. This guidance recommends using the Q/D ratio to determine if a PSD Class I AQRV analysis is required, where Q/D is the maximum 24-hour emissions (in tpy based on continuous operation) of PM_{10}, SO_2, NO_x, and H_2SO_4 divided by the site distance in km from the nearest PSD Class I area boundary. If the value of Q/D is less than 10, a Class I AQRV analysis is likely not required. As shown in Table 4-1 below, the calculated Q/D for the Project is only 2.8, so CPV prepared a presentation of this calculation and the Project summary for VDEQ. VDEQ forwarded this presentation to the three Federal Land Managers and received concurrence that a Class I AQRV analysis is not required for this Project.

Table 4-1. Q/D Screening Analysis for PSD Class I Areas

Class I Area	D, Distance to Class I Area	Maximum Continuous Turbine Pollutant Emissions (lb/hr per turbine)				Q, Total Emission for 2 Turbines (tpy)	Q/D
		SO_2	NO_x	PM_{10}	H_2SO_4		
Linville Gorge NWA	109	2.3	19.6	11.9	1.5	309	2.8

4.3 Visibility

As recommended in the VDEQ Modeling Guideline, any sensitive Class II views within the Significant Impact Area (SIA) of the Project will be identified and if such views exist, VDEQ will be consulted with regard to the analysis approach.

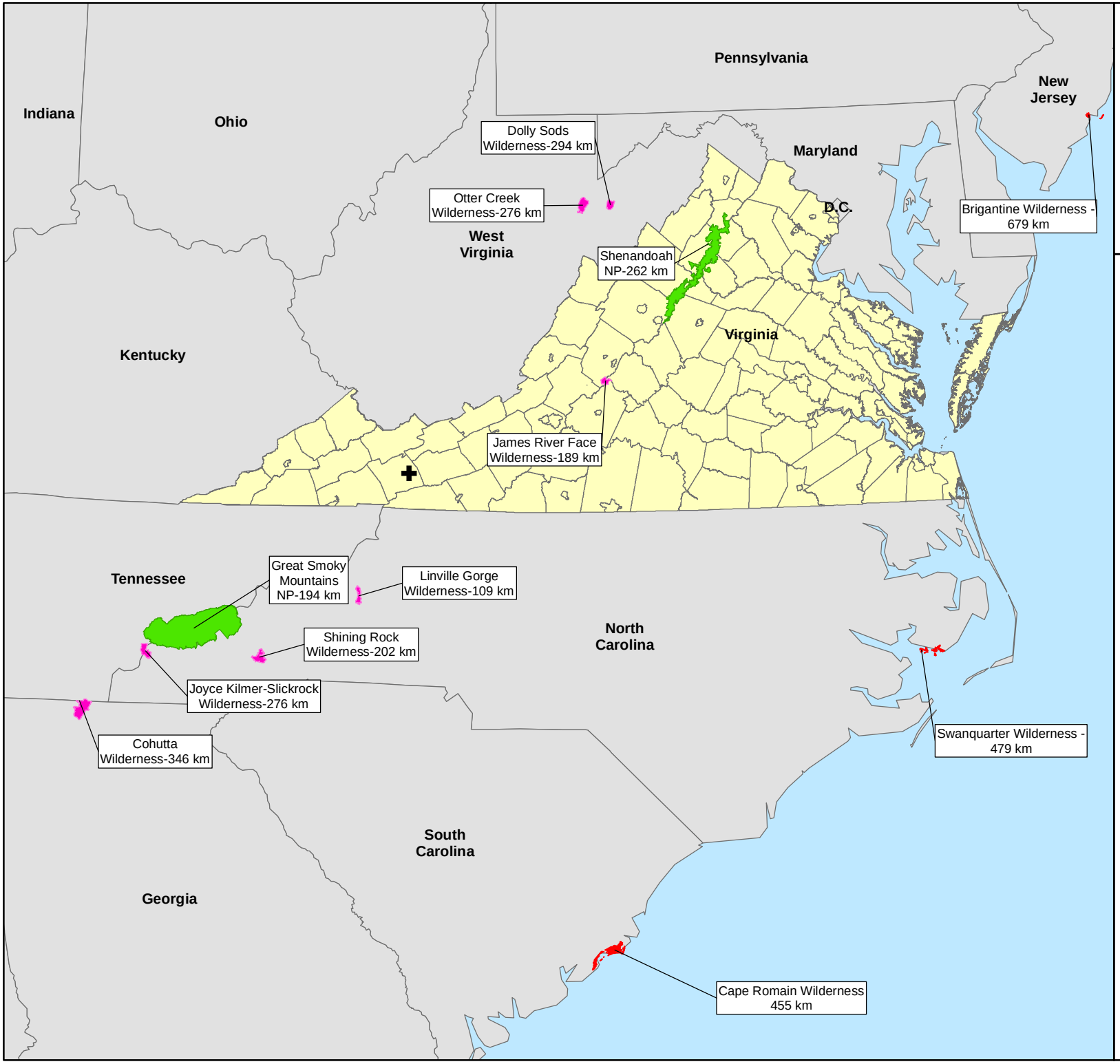


Figure 4-1
Distance to Nearest Class I Areas

CPV Smyth Energy Center
Atkins, VA

TETRA TECH

CPV

Legend

- CPV Smyth Project
- USFWS Class 1 Area
- USNPS Class 1 Area
- USFCS Class 1 Area
- County Boundary
- State Boundary

N
W E
S

1 in = 117 kilometers

0 50 100 150 200

Kilometers

4.4 Soils and Vegetation

The USEPA guidance document for soils and vegetation, "*A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals"* (USEPA 1980) and related technical publications established a screening methodology for comparing air quality modeling impacts to "vegetation sensitivity thresholds."

4.4.1 Vegetation Assessment

A biological survey was conducted of the project site area to determine the vegetative species present. These species are indicative of the species typical of the general area. The dominant vegetation identified in uplands includes, but is not limited to, black cherry (*Prunus serotina*), red maple (*Acer rubrum*), black walnut (*Juglans nigra*), shagbark hickory (*Carya ovate*), white oak (*Quercus alba*), tuliptree (*Liriodendron tulipifera*), Christmas fern (*Polystichum acrostichoides*), American pokeweed (*Phytolacca americana*), Pennsylvania smartweed (*Polygonum pensylvanicum*), common greenbriar (*Smilax rotundifolia*), and Virginia creeper (*Parthenocissus quinquefolia*).

Dominant hydrophytic vegetation within onsite wetlands includes black willow (*Salix nigra*), orange jewelweed (*Impatiens capensis*), New York ironweed (*Vernonia noveboracensis*), wrinkleleaf goldenrod (*Solidago rugosa*), Virginia groundcherry (*Physalis virginiana*), poison ivy (*Toxicodendron radicans*), common boneset (*Eupatorium perfoliatum*), and smallspike false nettle (*Boehmeria cylindrica*).

The Virginia Department of Conservation and Recreation's Division of Natural Heritage determined that the project will not affect any documented state-listed threatened or endangered plant or insect species (VDCR, 2012).

As an indication of whether emissions from the proposed Project will significantly impact (i.e., cause acute or chronic exposure to each evaluated pollutant) any surrounding vegetation with commercial or recreational value, the modeled emission concentrations will be compared against both a range of injury thresholds found in the guidance and appropriate literature, as well as those established by the NAAQS secondary standards. Since the NAAQS secondary standards were set to protect public welfare, including protection against damage to crops and vegetation, comparing modeled emissions to these standards will provide some indication if potential impacts are likely to be significant. Tables 4-2 through 4-4 list the vegetation sensitivity thresholds and NAAQS secondary standards that will be used for comparison to potential pollutant impact concentrations.

Table 4-2. Predicted Air Quality Impacts Compared to NO_2 Vegetation Impact Thresholds

Averaging Period	Predicted Project Impact µg/m³)	Threshold for Impact to Vegetation (µg/m³)	Applicability
1-hour	68.6 (1-hour)	66,000[a]	Leaf Injury to plant
2-hour		1,130[b]	Affects to alfalfa
Annual	0.57	100[c]	Protects all vegetation
		190[d]	Metabolic and growth impact to plants

[a] "Diagnosing Injury Caused by Air Pollution", EPA-68-02-1344, Prepared by Applied Science Associates, Inc. under contract to the Air Pollution Training Institute, Research Triangle Park, North Carolina. 1976.

[b] "Synergistic Inhibition of Apparent Photosynthesis Rate of Alfalfa by Combinations of SO_2 and NO_2" Environmental Science and Technology, vol. 8(6): p.574-576, 1975. The limit is based on a concentration in ambient air of 0.6 ppm NO_2 (U 1,130 µg/m³) which was found to depress the photosynthesis rate of alfalfa during a 2-hour exposure.

[c] "Secondary National Ambient Air Quality Standard (µg/m³) which is a limit set to avoid damage to vegetation resulting in economic losses in commercial crops, aesthetic damage to cultivated trees, shrubs, and other ornamentals, and reductions in productivity, species richness, and diversity in natural ecosystems to protect public welfare (Section 109 of the Clean Air Act). These thresholds are the most stringent of those found in the literature survey.

[d] "Air Quality Criteria for Oxides of Nitrogen," EPA/600/8-91/049aF-cF.3v, Office of Health and Environment Assessment, Environmental Criteria and Assessment Office, USEPA, Research Triangle Park, NC. 1993.

Table 4-3. Predicted Air Quality Impacts Compared to CO Vegetation Impact Thresholds

Averaging Period	Predicted Impact (µg/m³)	Threshold for Impact to Vegetation (µg/m³)	Applicability
1-hour	1,484	40,000[a]	Protects all vegetation
8-hour	343 (8-hour)	10,000[a]	Protects all vegetation
Multiple day		10,000[b]	No known effects to vegetation
1-week		115,000[c]	Effects to some vegetation
Multiple week		115,000[d]	No effect on various plant species

[a] Secondary NAAQS (µg/m³) which is a limit set to avoid damage to vegetation resulting in economic losses in commercial crops, aesthetic damage to cultivated trees, shrubs, and other ornamentals, and reductions in productivity, species richness, and diversity in natural ecosystems to protect public welfare (Section 109 of the CAA). These thresholds are the most stringent of those found in the literature survey.

[b] "Air Quality Criteria for Carbon Monoxide," EPA/600/8-90/045F (NTIS PB93-167492), Office of Health and Environment Assessment, Environmental Criteria and Assessment Office, USEPA, Research Triangle Park, NC. 1991. Various CO concentrations were examined the lowest of these was 10,000 µg/m³. Concentrations this low had no effects to various plant species. For many plant species, concentrations as high as 230,000 µg/m³ caused no effects. The exception was legume seedlings which were found to experience abnormal leaf growth when exposed to CO concentrations of only 27,000 µg/m³. Also related to this family of plants, CO concentrations in the soil of 113,000 µg/m³ were found to inhibit nitrogen fixation. It is clear that ambient CO concentrations as low as 10,000 µg/m³ will not affect vegetation.

[c] "Diagnosing Injury Caused by Air Pollution", EPA-68-02-1344, Prepared by Applied Science Associates, Inc. under contract to the Air Pollution Training Institute, Research Triangle Park, North Carolina. 1976. A CO concentration of 115,000 µg/m³ was found to affect certain plant species.

[d] "Polymorphic Regions in Plant Genomes Detected by an M13 Probe" Zimmerman, P.A., et al. 1989. Genome 32: 824-828. 115,000 µg/m³ was the lowest CO concentration included in this study. This concentration was not found to cause a reduction in growth rate to a variety of plant species.

Table 4-4. Predicted Air Quality Impacts Compared to Formaldehyde Vegetation Impact Thresholds

Averaging Period	Predicted Impact (µg/m³)	Threshold for Impact to Vegetation (µg/m³)	Applicability
Repeated 4.5 hour	0.755 (1-hour)	18[a]	Sensitive species affected
5-hour		840[b]	Signs of injury to sensitive species (alfalfa)
5-hour		367[c]	Signs of injury to pollen tube length (lily)
Repeated 7-hour		78[d]	Stimulated shoot growth (beans)

[a] "Formaldehyde-Contaminated Fog Effects on Plant Growth" Barker J.R. & Shimabuku R.A. (1992). In Proceedings of the 85th Annual Meeting and Exhibition, Air and Waste Management Association, pp. 113. 92150.01. Pittsburgh, PA. The authors examined the effects on vegetation grown in fog with formaldehyde concentrations of 18 and 54 µg/m³. Exposure rates were 4.5 hours per night, 3 nights/week, for 40 days. The growth rate of rapeseed was found to be affected in this study. However, slash pine grown under the same conditions showed a significant increase in needle and stem growth. No effects were observed in wheat or aspen at test concentrations

[b] "Investigation on Injury to Plants from Air Pollution in the Los Angeles Area" Haagen-Smit AJ, Darley EE, Zaitlin M, Hull H, Noble WM (1952). Plant physiology, 27:18–34. The authors found a 5-hour exposure to 700 ppb caused mild atypical signs of injury in alfalfa, but no injury to spinach, beets, or oats.

[c] "Effects of Exposure to Various Injurious Gases on Germination of Lily Pollen" Masaru N, Syozo F, Saburo K (1976). Environmental pollution, 11:181–188. The authors fund a significant reduction of the pollen tube length of lily following a 5-hour exposure to ambient formaldehyde concentrations of 367 ppb.

[d] "Formaldehyde exposure affects growth and metabolism of common bean" Mutters RG, Madore M, Bytnerowicz A (1993). Journal of the Air and Waste Management Association, 43:113–116. The authors found that repeated exposure of sensitive plants to ambient formaldehyde concentrations of 78 µg/m³ could cause plant shoots to grow faster than the roots. It is pointed out that this effect would not be a problem except for crops growing in a water starved condition.

4.4.2 Soils Assessment

The USEPA Screening Procedure also provides a method for assessing impacts to soils. This assessment evaluates trace element contamination of soils. Since plant and animal communities can be affected before noticeable accumulation occur in the soils, the approach used here evaluates the way soil acts as an intermediary in the transfer of a deposited trace element to the plants. For trace elements, the concentration deposited in the soil is calculated from the from the maximum predicted annual ground level concentrations conservatively assuming that all deposited material is soluble and available for uptake by plants. The amount of trace element potentially taken up by plants is calculated using average plant to soil concentration ratios. The calculated soil and plant concentrations will then be compared screening concentrations designed to assess potential adverse effects to soils and plants.

4.5 Growth

A growth analysis will be conducted which will examine the potential emissions from secondary sources associated with the proposed Project. While these activities are not directly involved with Project operations, 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 that come directly from mobile sources, such as emissions from the tailpipe of any on-road motor vehicle (USEPA 1990). They also do not include sources that do not impact the same general area as the Project.

5.0 REFERENCES

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APPENDIX A

Detailed Emissions and Source Parameter Data

CPV Smyth - Combustion Turbine Emissions Data For Modeling

Parameter	Units	Ahlstom Design Cases																		
		#22	#21	#8	#9	#10	#20	#19	#3	#4	#5	#11	#12	#13	#14	#23	#15	#16	#17	#18
Ambient Temperature	°F	100°F	100°F	100°F	100°F	100°F	90°F	90°F	90°F	90°F	90°F	59°F	59°F	59°F	59°F	-10°F	-10°F	-10°F	-10°F	-10°F
Percent Load Rate	%	100%	100%	75%	50%	LLOC	100%	100%	75%	50%	LLOC	100%	75%	50%	LLOC	100%	100%	75%	50%	LLOC
Duct Burner Operation	--	ON	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF
Stack Diameter	feet	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
Stack Height	feet	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240
Stack Temperature	°K	356.9	368.8	354.7	352.2	364.0	354.5	364.0	352.7	350.0	363.0	359.4	351.8	349.9	365.1	348.4	364.7	356.2	350.8	363.4
Stack Flow Rate	m^3/s	490	502	326	266	189	487	495	331	269	191	479	346	279	199	522	542	391	299	206
Stack Exit Velocity	m/s	13.86	14.20	9.23	7.52	5.34	13.77	14.02	9.38	7.61	5.40	13.56	9.80	7.88	5.62	14.79	15.35	11.06	8.46	5.84
NO_x Emission Rate	g/s	2.243	1.852	1.222	0.932	0.365	2.243	1.852	1.260	0.958	0.365	1.802	1.361	1.021	0.391	2.470	2.079	1.550	1.172	0.403
CO Emission Rate	g/s	1.361	1.121	0.743	0.567	0.214	1.361	1.121	0.769	0.580	0.227	1.096	0.832	0.630	0.239	1.499	1.260	0.945	0.718	0.252
$PM_{10}/PM_{2.5}$ Emission Rate	g/s	1.411	0.819	0.529	0.403	0.239	1.411	0.819	0.554	0.416	0.252	0.794	0.592	0.441	0.265	1.499	0.920	0.680	0.504	0.277

CPV Smyth - Ancillary Source Emissions Data For Modeling

Parameter	Units	Auxiliary Boiler	Emergency Generator	Fire Pump
Percent Load Rate	%	100	100	100
Stack Diameter	feet	4.0	1.3	0.417
Stack Height	feet	30	10	10
Stack Temperature	°K	399.8	679.5	789.3
Stack Flow Rate	m^3/s	9.241	5.221	0.661
Stack Exit Velocity	m/s	7.91	45.77	52.14
Emissions Rates:				
NO_x (max hourly rate)	g/s	0.1272	2.6667	0.2610
NOx (annual rate)	g/s	0.0581	0.1522	0.0149
NOx (1-hour normalized)	g/s	0.1272	0.1522	0.0149
CO (max hourly rate)	g/s	0.4304	1.4583	0.2284
CO (8-hour normalized rate)	g/s	0.4304	0.1823	0.0285
$PM_{10}/PM_{2.5}$ Emission Rate	g/s	0.0582	0.08333	0.01305
$PM_{10}/PM_{2.5}$ (24-hour normalized rate)	g/s	0.0582	0.0035	0.00054

Startup/Shutdown Dispersion Modeling Parameters (per turbine)

	Exhaust Flow (lb/hr)	Exhaust Flow (ACFM)	Temp (°F)	Temp (°K)	Stack Diameter (ft)	Exit Velocity (ft/s)
Hot Start	1,840,000	469,634	150	338.6	22	20.59
Warm Start	1,280,000	321,346	140	333.0	22	14.09
Cold Start	1,280,000	310,635	120	321.9	22	13.62
Transition	1,660,000	423,691	150	338.6	22	18.58
Shutdown	1,640,000	439,173	180	355.2	22	19.26

Dispersion Modeling Emissions (g/s/turbine)

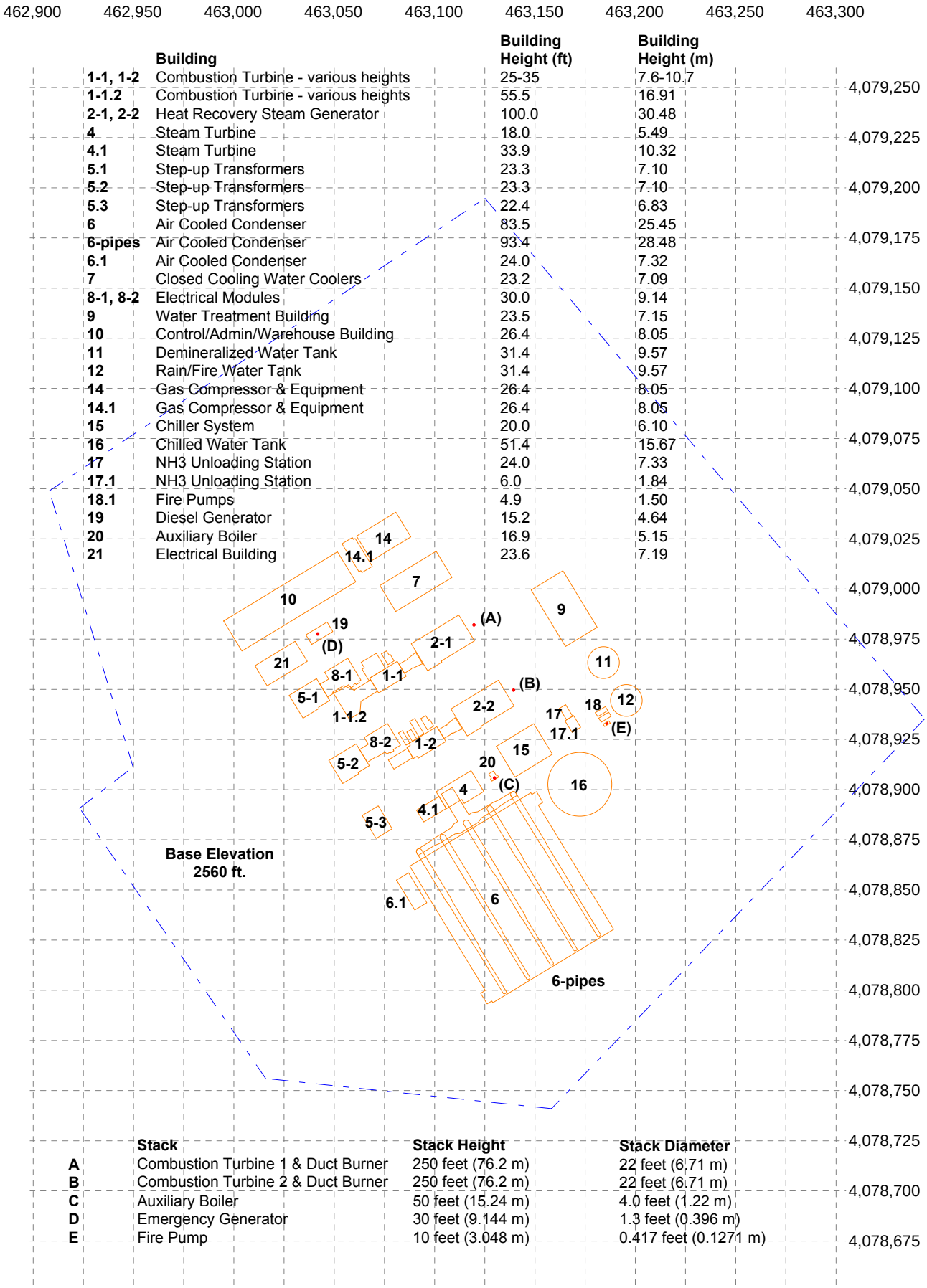
SUSD Type	NOx	CO
Hot Start	6.30	5.92
Warm Start	3.37	4.27
Cold Start	2.57	3.24
Transition	0.37	4.03
Shutdown	0.58	2.14

APPENDIX B

BPIP Analysis Data

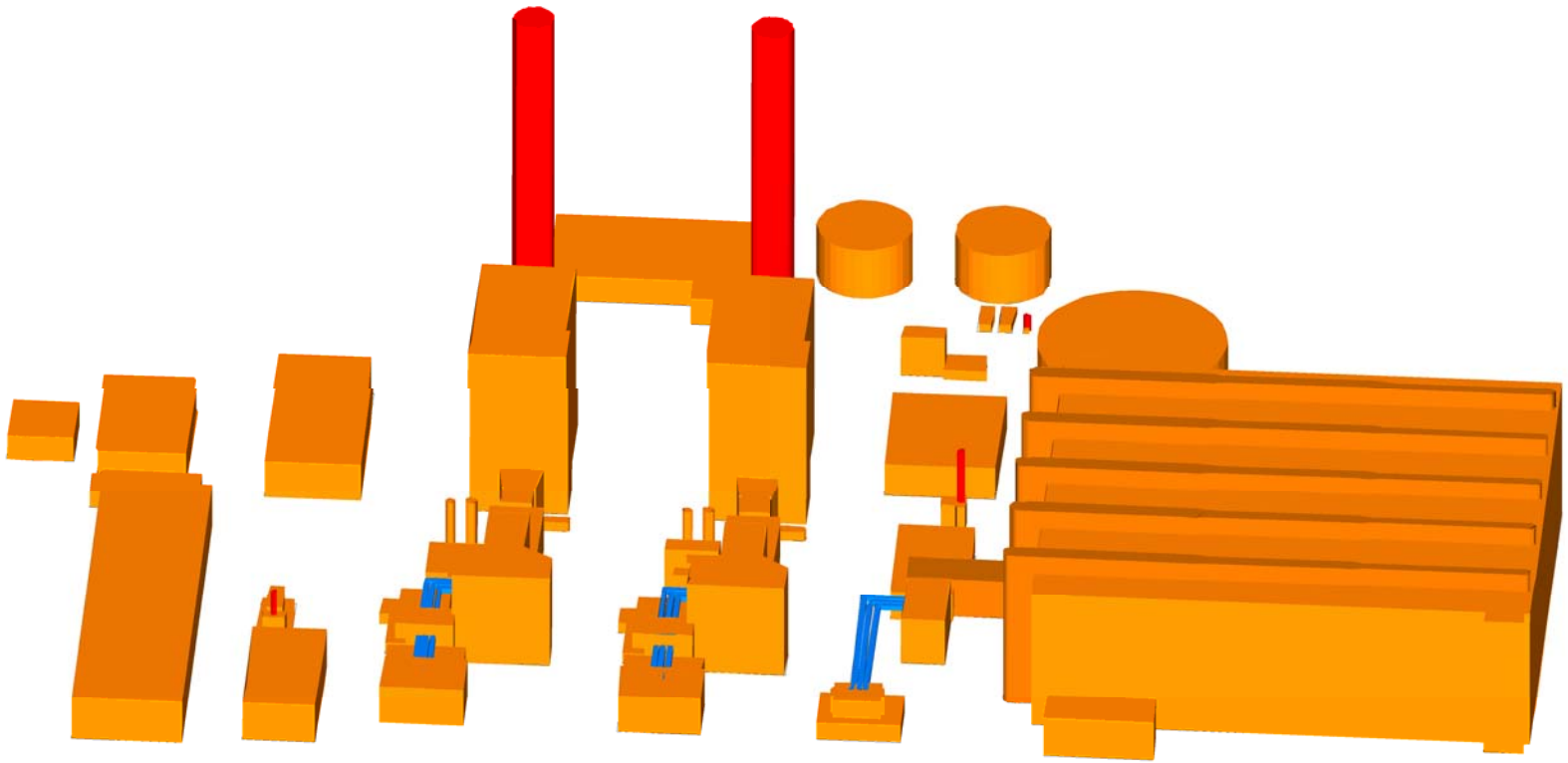
BPIP Facility Layout

	Building	Building Height (ft)	Building Height (m)
1-1, 1-2	Combustion Turbine - various heights	25-35	7.6-10.7
1-1.2	Combustion Turbine - various heights	55.5	16.91
2-1, 2-2	Heat Recovery Steam Generator	100.0	30.48
4	Steam Turbine	18.0	5.49
4.1	Steam Turbine	33.9	10.32
5.1	Step-up Transformers	23.3	7.10
5.2	Step-up Transformers	23.3	7.10
5.3	Step-up Transformers	22.4	6.83
6	Air Cooled Condenser	83.5	25.45
6-pipes	Air Cooled Condenser	93.4	28.48
6.1	Air Cooled Condenser	24.0	7.32
7	Closed Cooling Water Coolers	23.2	7.09
8-1, 8-2	Electrical Modules	30.0	9.14
9	Water Treatment Building	23.5	7.15
10	Control/Admin/Warehouse Building	26.4	8.05
11	Demineralized Water Tank	31.4	9.57
12	Rain/Fire Water Tank	31.4	9.57
14	Gas Compressor & Equipment	26.4	8.05
14.1	Gas Compressor & Equipment	26.4	8.05
15	Chiller System	20.0	6.10
16	Chilled Water Tank	51.4	15.67
17	NH3 Unloading Station	24.0	7.33
17.1	NH3 Unloading Station	6.0	1.84
18.1	Fire Pumps	4.9	1.50
19	Diesel Generator	15.2	4.64
20	Auxiliary Boiler	16.9	5.15
21	Electrical Building	23.6	7.19



	Stack	Stack Height	Stack Diameter
A	Combustion Turbine 1 & Duct Burner	250 feet (76.2 m)	22 feet (6.71 m)
B	Combustion Turbine 2 & Duct Burner	250 feet (76.2 m)	22 feet (6.71 m)
C	Auxiliary Boiler	50 feet (15.24 m)	4.0 feet (1.22 m)
D	Emergency Generator	30 feet (9.144 m)	1.3 feet (0.396 m)
E	Fire Pump	10 feet (3.048 m)	0.417 feet (0.1271 m)

Scale: 1" = 68.6 Meters



BPIP OUTPUT

```
                        BEE-Line Software Version: 10.0

                          Input File - BPIP_schematic.PIP
                         Output File - BPIP_schematic.TAB
                         Output File - BPIP_schematic.SUM
                         Output File - BPIP_schematic.SO


                              BPIP (Dated: 04274)
DATE :  2/ 6/2015
TIME : 14:16:23
T:\Ramos\CPV Smyth\AERMOD\AERMOD5\BPIP Schematic.BST BEESTWin BPIP-Prime Files

============================
BPIP PROCESSING INFORMATION:
============================

  The P  flag has been set for preparing downwash related data
         for a model run utilizing the PRIME algorithm.

  Inputs entered in METERS     will be converted to meters using
   a conversion factor of    1.0000.  Output will be in meters.

  The UTMP variable is set to UTMY.  The input is assumed to be in
    UTM coordinates.  BPIP will move the UTM origin to the first pair of
    UTM coordinates read.  The UTM coordinates of the new origin will
    be subtracted from all the other UTM coordinates entered to form
    this new local coordinate system.

  Plant north is set to   0.00 degrees with respect to True North.


T:\Ramos\CPV Smyth\AERMOD\AERMOD5\BPIP Schematic.BST BEESTWin BPIP-Prime Files
```

PRELIMINARY* GEP STACK HEIGHT RESULTS TABLE
(Output Units: meters)

Stack Name	Stack Height	Stack-Building Base Elevation Differences	GEP** EQN1	Preliminary* GEP Stack Height Value
CT1	76.20	0.00	76.20	76.20
CT2	76.20	0.00	76.20	76.20
AUXBLR	15.24	0.00	76.20	76.20
EGEN	9.14	0.00	76.20	76.20
FIREPUMP	3.05	0.00	76.20	76.20

```
  * Results are based on Determinants 1 & 2 on pages 1 & 2 of the GEP
    Technical Support Document.  Determinant 3 may be investigated for
    additional stack height credit.  Final values result after
    Determinant 3 has been taken into consideration.
 ** Results were derived from Equation 1 on page 6 of GEP Technical
    Support Document.  Values have been adjusted for any stack-building
    base elevation differences.

    Note:  Criteria for determining stack heights for modeling emission
    limitations for a source can be found in Table 3.1 of the
```

BPIP Input

```
'T:\Ramos\CPV Smyth\AERMOD\AERMOD5\BPIP Schematic.BST BEESTWin BPIP-Prime Files 2/6/2015 2:16:03 PM'
'P'
'METERS'      1.0
'UTMY'        0
 75
'9'            1            780.288
 8            5.0048
463167.76     4079000.52
463183.91     4079010.92
463202.48     4078982.05
463186.35     4078971.65
463186.11     4078972.01
463181.15     4078968.78
463175.87     4078976.97
463180.83     4078980.2
'6.1'          1            780.288
 12           25.4508
463108.58     4078855.44
463170.33     4078895.23
463170.88     4078894.38
463173.24     4078895.89
463176.78     4078890.46
463174.43     4078888.93
463215.29     4078825.49
463153.51     4078785.73
463152.92     4078786.54
463150.6      4078785.03
463147.04     4078790.5
463149.43     4078792.04
'15'           1            780.288
 4            6.1204
463151.85     4078918.86
463170.94     4078931.18
463181.02     4078915.51
463161.93     4078903.2
'6.8'          1            780.288
 4            7.3152
463101.95     4078848.03
463108.13     4078851.97
463117.93     4078836.73
463111.78     4078832.77
'2.2'          1            780.288
 6            30.48
463127.74     4078937.65
463151.97     4078953.23
463160.48     4078940.04
463143.48     4078929.05
463143.83     4078928.5
463136.62     4078923.84
'5.1'          1            780.288
 5            7.1628
463043.63     4078942.5
463051.83     4078947.78
463058.97     4078936.69
463059.37     4078936.07
463051.17     4078930.78
'8.1'          1            780.288
 17           2.0117
463061.7      4078954.94
463069.52     4078959.98
463068.77     4078961.15
463072.79     4078963.7
463080.69     4078951.44
463079.56     4078950.71
463079.97     4078950.09
463078.26     4078948.97
463077.85     4078949.6
463076.91     4078948.99
463077.31     4078948.37
463075.6      4078947.27
463075.2      4078947.89
463075.01     4078947.77
463074.34     4078948.84
463068.15     4078945.02
463068.08     4078945.12
'1.1.3'        1            780.288
 10           16.9682
463087.65     4078911.47
463093.12     4078915.01
463098.79     4078912.73
463098.87     4078912.77
463098.79     4078912.88
463107.16     4078918.28
463110.79     4078912.62
463102.31     4078907.09
463102.04     4078901.2
463096.55     4078897.67
'1.1.5'        1            780.288
 10           4.7244
463081.07     4078957.07
463082.27     4078957.84
463080.5      4078960.59
463088.26     4078965.56
463093.3      4078957.76
463085.13     4078952.51
463085.63     4078951.72
463084.93     4078951.27
```

463082.31 4078955.33
463082.23 4078955.28
'1.1.2' 1 780.288
4 7.9248
463085.13 4078952.5
463099.24 4078961.6
463104.12 4078954.02
463090.01 4078944.94
'1.1.1' 1 780.288
16 8.6624
463100.25 4078960.04
463100.85 4078960.49
463103.46 4078962.16
463103.96 4078962.43
463104.05 4078962.28
463104.6 4078962.63
463104.41 4078962.93
463108.92 4078966.87
463112.84 4078960.81
463107.44 4078958.2
463107.27 4078958.47
463106.73 4078958.13
463106.83 4078957.98
463106.49 4078957.73
463103.61 4078955.89
463103.11 4078955.58
'1.2.1' 1 780.288
17 8.6624
463121.73 4078926.75
463122.18 4078927.08
463125.05 4078928.93
463125.42 4078929.13
463125.51 4078928.99
463126.05 4078929.33
463125.86 4078929.63
463130.43 4078933.49
463134.29 4078927.49
463131.45 4078926.08
463128.9 4078924.9
463128.73 4078925.18
463128.19 4078924.83
463128.29 4078924.68
463127.94 4078924.43
463125.1 4078922.6
463124.58 4078922.3
'1.2.2' 1 780.288
4 7.9248
463106.56 4078919.21
463120.72 4078928.32
463125.58 4078920.74
463111.46 4078911.64
'10' 1 780.288
4 8.0772
463008.59 4078980.19
463066.73 4079017.65
463076.64 4079002.29
463018.51 4078964.83
'21' 1 780.288
4 7.2146
463025.47 4078957.37
463045.97 4078970.58
463052.58 4078960.33
463032.08 4078947.13
'19' 1 780.288
4 0.9662
463051.51 4078974.15
463062.27 4078981.08
463065.43 4078976.16
463054.68 4078969.23
'7' 1 780.288
4 7.111
463089.2 4079000.8
463117.9 4079019.27
463126.47 4079005.96
463097.8 4078987.47
'14.1' 1 780.288
4 6.096
463076.4 4079026.08
463096.47 4079039
463104.59 4079026.39
463084.52 4079013.47
'14.2' 1 780.288
8 3.048
463068.98 4079021.88
463074.22 4079025.25
463074.86 4079024.27
463075.77 4079024.85
463084.95 4079010.57
463079.72 4079007.19
463079.08 4079008.18
463078.17 4079007.6
'5.3' 1 780.288
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463083.2 4078881.1
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463112.02 4078862.39

463111.8 4078862.93
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463160.46 4078791.35
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463158.87 4078790.73
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463129.29 4078836.1
463127.98 4078837.63
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463112.48 4078864.46
463119.57 4078869.04
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463153.42 4078890.84
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463161.05 4078895.63
463161.65 4078895.62
463162.17 4078895.39
463162.57 4078894.98
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463155.02 4078888.36
463153.13 4078886.69
463145.07 4078881.5
463143.57 4078879.25
463134.21 4078873.2
463131.53 4078872.76
463123.47 4078867.58
463121.17 4078866.54
463112.81 4078861.16
463112.02 4078862.41
463111.8 4078862.93
463111.81 4078863.52
463112.03 4078864.04
'20' 1 780.288
8 5.1511
463148.29 4078904.45
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463152.19 4078903.75
463152.75 4078904.11
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463149.94 4078900.68
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463149.75 4078902.19
'17.1' 1 780.288
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463191.01 4078935.57
463187.93 4078933.59
'17.2' 1 780.288
4 1.8532
463187.29 4078933.18
463191.52 4078935.91
463195.26 4078929.95
463191.01 4078927.37
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463106.88 4078919.48
463104.94 4078918.22
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4 7.5286
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463107.35 4078926.4
463110.38 4078921.72
463108.18 4078920.31
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4 7.5286
463106.5 4078930.55
463109.07 4078932.21
463114.1 4078924.41
463111.52 4078922.75
'18.1' 1 780.288

```
 4            1.4996
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463209.13     4078938.95
463204.04     4078935.69
'18.2'         1            780.288
 4            1.4996
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 6            30.48
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463130.53     4078986.54
463139.03     4078973.33
463122.03     4078962.35
463122.38     4078961.8
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'6.4'          1            780.288
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463123.82     4078871.27
463124.04     4078871.81
463124.46     4078872.2
463125.01     4078872.42
463125.59     4078872.39
463126.13     4078872.15
463126.51     4078871.73
463142.45     4078847.03
463143.3      4078845.15
463156.97     4078823.94
463157.85     4078822.1
463172.43     4078799.46
463172.46     4078799.1
463172.32     4078798.83
463172.15     4078798.62
463171.97     4078798.48
463171.75     4078798.37
463171.52     4078798.29
463171.18     4078798.28
463170.88     4078798.47
463156.28     4078821.1
463154.98     4078822.62
463141.29     4078843.83
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'6.5'          1            780.288
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463135.83     4078878.43
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463136.07     4078879.55
463136.49     4078879.94
463137.03     4078880.16
463137.62     4078880.13
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463138.54     4078879.48
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463155.33     4078852.9
463169        4078831.68
463169.88     4078829.84
463184.46     4078807.21
463184.49     4078806.85
463184.35     4078806.57
463184.17     4078806.37
463184        4078806.23
463183.78     4078806.11
463183.54     4078806.03
463183.2      4078806.03
463182.9      4078806.2
463168.32     4078828.85
463167        4078830.36
463153.32     4078851.57
463152.02     4078853.12
'6.6'          1            780.288
 26           28.575
463148.08     4078885.62
463147.85     4078886.17
463147.86     4078886.77
463148.09     4078887.29
463148.51     4078887.69
463149.05     4078887.91
463149.64     4078887.88
463150.18     4078887.64
463150.56     4078887.22
463166.5      4078862.52
463167.36     4078860.65
463181.02     4078839.42
463181.89     4078837.59
463196.47     4078814.95
463196.51     4078814.59
463196.37     4078814.32
463196.2      4078814.11
463196.01     4078813.97
463195.8      4078813.86
463195.57     4078813.78
463195.23     4078813.77
463194.93     4078813.96
463180.33     4078836.59
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463179.03     4078838.11
463165.34     4078859.32
463164.03     4078860.86
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463160.08     4078893.36
463159.86     4078893.91
463159.88     4078894.5
463160.1      4078895.03
463160.52     4078895.42
463161.07     4078895.64
463161.65     4078895.61
463162.18     4078895.38
463162.58     4078894.96
463178.51     4078870.25
463179.37     4078868.38
463193.03     4078847.16
463193.91     4078845.32
463208.48     4078822.69
463208.52     4078822.33
463208.38     4078822.05
463208.21     4078821.85
463208.02     4078821.71
463207.81     4078821.6
463207.58     4078821.52
463207.24     4078821.51
463206.94     4078821.69
463192.34     4078844.33
463191.03     4078845.85
463177.36     4078867.07
463176.05     4078868.6
'FIREPUMP'     1            780.288
 4            0.8626
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463208.76     4078932.56
463209.25     4078931.78
463207.35     4078930.54
'1.1.3.0'      1            780.288
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463071.75     4078948.31
463077.42     4078946.03
463077.49     4078946.06
463077.42     4078946.18
463085.78     4078951.57
463089.41     4078945.91
463080.92     4078940.39
463080.67     4078934.5
463075.17     4078930.96
'DRUM1.1'      1            780.288
 16           26.8224
463117.36     4078973.64
463117.33     4078973.95
463117.39     4078974.25
463117.56     4078974.54
463118.07     4078974.87
463118.43     4078974.92
463118.72     4078974.84
463118.99     4078974.69
463124.2      4078966.62
463124.24     4078966.29
463124.14     4078965.92
463123.98     4078965.68
463123.5      4078965.37
463123.19     4078965.34
463122.83     4078965.43
463122.57     4078965.57
'DRUM1.2'      1            780.288
 16           26.0604
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463126.87     4078978.01
463126.92     4078978.21
463127.03     4078978.4
463127.4      4078978.63
463127.61     4078978.67
463127.81     4078978.62
463128        4078978.52
463131.42     4078973.22
463131.43     4078972.97
463131.37     4078972.78
463131.25     4078972.57
463130.98     4078972.4
463130.71     4078972.36
463130.49     4078972.4
463130.3      4078972.51
'DRUM1.3'      1            780.288
 24           26.1113
463129.2      4078979.25
463129.16     4078979.34
463129.16     4078979.44
463129.19     4078979.54
463129.36     4078979.79
463129.43     4078979.84
463129.76     4078980.06
463129.86     4078980.1
463130.16     4078980.16
463130.25     4078980.14
463130.34     4078980.1
463130.42     4078980.02
463133.79     4078974.78
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463133.83     4078974.61
463133.8      4078974.5
463133.63     4078974.25
463133.56     4078974.2
463133.2      4078973.97
463133.11     4078973.93
463132.83     4078973.91
463132.72     4078973.92
463132.64     4078973.95
463132.57     4078974.01
'DRUM2.1'      1            780.288
 16           26.8224
463138.81     4078940.35
463138.78     4078940.66
463138.84     4078940.96
463139.01     4078941.24
463139.52     4078941.58
463139.88     4078941.63
463140.18     4078941.54
463140.44     4078941.4
463145.65     4078933.33
463145.69     4078933
463145.59     4078932.63
463145.43     4078932.38
463144.95     4078932.07
463144.64     4078932.05
463144.28     4078932.14
463144.03     4078932.28
'DRUM2.2'      1            780.288
 16           26.0604
463148.34     4078944.51
463148.33     4078944.72
463148.37     4078944.93
463148.47     4078945.11
463148.85     4078945.34
463149.06     4078945.37
463149.27     4078945.32
463149.45     4078945.22
463152.86     4078939.93
463152.89     4078939.67
463152.83     4078939.47
463152.69     4078939.28
463152.43     4078939.12
463152.15     4078939.06
463151.94     4078939.11
463151.75     4078939.21
'DRUM2.3'      1            780.288
 24           26.1113
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463150.62     4078946.04
463150.6      4078946.13
463150.65     4078946.25
463150.81     4078946.49
463150.89     4078946.55
463151.24     4078946.78
463151.32     4078946.81
463151.61     4078946.88
463151.71     4078946.85
463151.8      4078946.8
463151.86     4078946.73
463155.24     4078941.49
463155.26     4078941.41
463155.29     4078941.32
463155.25     4078941.21
463155.09     4078940.96
463155.02     4078940.91
463154.65     4078940.67
463154.57     4078940.64
463154.29     4078940.62
463154.18     4078940.63
463154.1      4078940.66
463154.02     4078940.72
'8.2'          1            780.288
 16           2.0117
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463090.99     4078926.73
463090.24     4078927.9
463094.26     4078930.45
463102.15     4078918.13
463101.05     4078917.43
463101.45     4078916.83
463099.73     4078915.72
463099.32     4078916.35
463098.36     4078915.69
463098.76     4078915.07
463097.05     4078913.96
463096.66     4078914.58
463096.47     4078914.49
463095.85     4078915.46
463089.71     4078911.52
'8.1.2'        1            780.288
 4            5.0048
463051.83     4078947.79
463057.6      4078951.51
463064.74     4078940.42
463058.97     4078936.69
'1.1.1.1'      1            780.288
 4            9.144
463059.41     4078948.65
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463063.55     4078942.16
'1.1.1.2'      1            780.288
 4            5.0048
463063.94     4078954.48
463073.44     4078960.58
463078.26     4078953.18
463068.7      4078946.99
'PIPE1.1'      1            786.511
 11           0.8382
463072.51     4078908.14
463097.29     4078924.05
463102.81     4078915.48
463102.11     4078915.02
463097.03     4078922.89
463073.01     4078907.35
463072.8      4078907.28
463072.55     4078907.33
463072.37     4078907.5
463072.3      4078907.73
463072.35     4078907.95
'PIPE1.2'      1            786.511
 11           0.8382
463073.11     4078907.2
463096.95     4078922.51
463101.87     4078914.87
463101.17     4078914.42
463096.71     4078921.35
463073.62     4078906.41
463073.39     4078906.34
463073.15     4078906.4
463072.98     4078906.56
463072.9      4078906.78
463072.96     4078907.02
'PIPE1.3'      1            786.511
 11           0.8382
463073.72     4078906.26
463096.62     4078920.96
463100.93     4078914.26
463100.23     4078913.81
463096.37     4078919.81
463074.22     4078905.48
463074        4078905.4
463073.76     4078905.45
463073.57     4078905.62
463073.51     4078905.84
463073.56     4078906.09
'PIPE2.1'      1            786.511
 11           0.8382
463051.04     4078941.45
463075.83     4078957.35
463081.35     4078948.78
463080.65     4078948.32
463075.57     4078956.19
463051.55     4078940.65
463051.33     4078940.58
463051.09     4078940.63
463050.91     4078940.8
463050.84     4078941.02
463050.89     4078941.25
'PIPE2.2'      1            786.511
 11           0.8382
463051.65     4078940.49
463075.49     4078955.8
463080.41     4078948.17
463079.71     4078947.72
463075.25     4078954.64
463052.17     4078939.7
463051.93     4078939.63
463051.69     4078939.69
463051.52     4078939.85
463051.45     4078940.08
463051.5      4078940.31
'PIPE2.3'      1            786.511
 11           0.8382
463052.26     4078939.55
463075.17     4078954.26
463079.48     4078947.55
463078.78     4078947.1
463074.91     4078953.1
463052.77     4078938.78
463052.55     4078938.7
463052.3      4078938.74
463052.11     4078938.91
463052.06     4078939.13
463052.11     4078939.38
'5.2'          1            780.288
 5            7.1628
463065.06     4078909.18
463073.26     4078914.46
463080.4      4078903.37
463080.81     4078902.75
463072.6      4078897.46
'8.2.2'        1            780.288
 4            5.0048
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463079.05     4078918.2
463086.19     4078907.11
463080.41     4078903.38
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463085.38     4078918.22
463089.59     4078911.78
463085.04     4078908.87
'1.2.2.2'      1            780.288
 4            5.0048
463085.39     4078921.16
463094.89     4078927.26
463099.72     4078919.86
463090.15     4078913.67
'PIPE3.1'      1            786.511
 15           0.7864
463090.65     4078880
463115.4      4078895.96
463122.14     4078885.49
463119.04     4078883.5
463118.57     4078884.21
463120.97     4078885.75
463115.14     4078894.77
463091.1      4078879.29
463090.96     4078879.23
463090.78     4078879.23
463090.63     4078879.29
463090.51     4078879.41
463090.45     4078879.57
463090.46     4078879.74
463090.51     4078879.88
'PIPE3.2'      1            786.511
 15           0.7864
463091.24     4078879.06
463114.99     4078894.37
463120.53     4078885.77
463118.43     4078884.42
463117.98     4078885.14
463119.36     4078886.02
463114.74     4078893.19
463091.71     4078878.35
463091.56     4078878.28
463091.39     4078878.29
463091.24     4078878.35
463091.11     4078878.48
463091.06     4078878.63
463091.06     4078878.79
463091.13     4078878.94
'PIPE3.3'      1            786.511
 15           0.7864
463091.86     4078878.13
463114.6      4078892.78
463118.93     4078886.04
463117.84     4078885.35
463117.38     4078886.06
463117.75     4078886.3
463114.34     4078891.59
463092.31     4078877.41
463092.17     4078877.35
463091.98     4078877.36
463091.84     4078877.42
463091.73     4078877.53
463091.66     4078877.69
463091.67     4078877.87
463091.73     4078878.01
'5.3.2'        1            780.288
 12           6.858
463087.03     4078881.07
463089.45     4078882.62
463089.73     4078882.2
463091.01     4078883.02
463095.21     4078876.49
463093.93     4078875.67
463094.22     4078875.23
463091.79     4078873.68
463091.51     4078874.11
463090.22     4078873.28
463086.01     4078879.81
463087.31     4078880.64
'EGEN1.2'      1            780.288
 4            4.6482
463052.77     4078973.64
463054.3      4078974.64
463056.28     4078971.57
463054.76     4078970.57
'EGEN1.3'      1            780.288
 4            4.5202
463055.8      4078975.09
463061.61     4078978.83
463063.02     4078976.64
463057.21     4078972.9
'4.2'          1            780.288
 4            8.4826
463111.28     4078884.64
463122.76     4078892.01
463126.67     4078885.93
463115.2      4078878.54
'4.1'          1            780.288
 6            5.4864
463121.19     4078894.45
463138.99     4078905.91
463145.92     4078895.21
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463135.98     4078888.8
463134.66     4078890.87
463126.77     4078885.79
'14.3'         1            780.288
 4            4.572
463082.76     4079048.51
463088.87     4079039.
463079.27     4079032.82
463073.14     4079042.33
'1drum'        1            780.288
 17           1.8288
463108.76     4078957.09
463108.69     4078957.3
463108.73     4078957.52
463108.91     4078957.81
463109.53     4078958.21
463109.89     4078958.26
463110.09     4078958.21
463110.26     4078958.05
463112.12     4078955.16
463112.19     4078954.96
463112.15     4078954.75
463111.97     4078954.44
463111.68     4078954.19
463111.35     4078954.04
463111.01     4078953.99
463110.79     4078954.05
463110.62     4078954.19
'1drum.2'      1            780.288
 17           1.8288
463130.20955647             4078923.7963757
463130.13955647             4078924.0063757
463130.17955647             4078924.2263757
463130.35955647             4078924.5163757
463130.97955647             4078924.9163757
463131.33955647             4078924.9663757
463131.53955647             4078924.9163757
463131.70955647             4078924.7563757
463133.56955647             4078921.8663757
463133.63955647             4078921.6663757
463133.59955647             4078921.4563757
463133.41955647             4078921.1463757
463133.12955647             4078920.8963757
463132.79955647             4078920.7463757
463132.45955647             4078920.6963757
463132.23955647             4078920.7563757
463132.06955647             4078920.8963757
'11'          1              780.288
 32           9.6012
463214.16     4078963.83
463214.01     4078965.37
463213.56     4078966.85
463212.83     4078968.22
463211.85     4078969.42
463210.65     4078970.4
463209.28     4078971.13
463207.8      4078971.58
463206.26     4078971.73
463204.72     4078971.58
463203.24     4078971.13
463201.87     4078970.4
463200.67     4078969.42
463199.69     4078968.22
463198.96     4078966.85
463198.51     4078965.37
463198.36     4078963.83
463198.51     4078962.29
463198.96     4078960.81
463199.69     4078959.44
463200.67     4078958.24
463201.87     4078957.26
463203.24     4078956.53
463204.72     4078956.08
463206.26     4078955.93
463207.8      4078956.08
463209.28     4078956.53
463210.65     4078957.26
463211.85     4078958.24
463212.83     4078959.44
463213.56     4078960.81
463214.01     4078962.29
'12'          1              780.288
 32           9.6012
463226.58     4078944.48
463226.43     4078946.02
463225.98     4078947.5
463225.25     4078948.87
463224.27     4078950.07
463223.07     4078951.05
463221.7      4078951.78
463220.22     4078952.23
463218.68     4078952.38
463217.14     4078952.23
463215.66     4078951.78
463214.29     4078951.05
463213.09     4078950.07
463212.11     4078948.87
463211.38     4078947.5
463210.93     4078946.02
463210.78     4078944.48
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463215.66     4078937.18
463217.14     4078936.73
463218.68     4078936.58
463220.22     4078936.73
463221.7      4078937.18
463223.07     4078937.91
463224.27     4078938.89
463225.25     4078940.09
463225.98     4078941.46
463226.43     4078942.94
'16'          1             780.288
 32           15.72
463211.55     4078900.34
463211.25     4078903.44
463210.34     4078906.43
463208.87     4078909.18
463206.89     4078911.59
463204.48     4078913.57
463201.73     4078915.04
463198.74     4078915.95
463195.64     4078916.25
463192.54     4078915.95
463189.55     4078915.04
463186.8      4078913.57
463184.39     4078911.59
463182.41     4078909.18
463180.94     4078906.43
463180.03     4078903.44
463179.73     4078900.34
463180.03     4078897.24
463180.94     4078894.25
463182.41     4078891.5
463184.39     4078889.09
463186.8      4078887.11
463189.55     4078885.64
463192.54     4078884.73
463195.64     4078884.43
463198.74     4078884.73
463201.73     4078885.64
463204.48     4078887.11
463206.89     4078889.09
463208.87     4078891.5
463210.34     4078894.25
463211.25     4078897.24
'CT1'         1             780.288
 32           10.668
463093.7      4078964.96
463093.69     4078965.11
463093.64     4078965.25
463093.57     4078965.38
463093.48     4078965.49
463093.37     4078965.58
463093.24     4078965.65
463093.1      4078965.7
463092.95     4078965.71
463092.8      4078965.7
463092.66     4078965.65
463092.53     4078965.58
463092.42     4078965.49
463092.33     4078965.38
463092.26     4078965.25
463092.21     4078965.11
463092.2      4078964.96
463092.21     4078964.81
463092.26     4078964.67
463092.33     4078964.54
463092.42     4078964.43
463092.53     4078964.34
463092.66     4078964.27
463092.8      4078964.22
463092.95     4078964.21
463093.1      4078964.22
463093.24     4078964.27
463093.37     4078964.34
463093.48     4078964.43
463093.57     4078964.54
463093.64     4078964.67
463093.69     4078964.81
'CT1.2'       1             780.288
 32           10.668
463096.04     4078962.29
463096.02     4078962.48
463095.96     4078962.66
463095.87     4078962.83
463095.75     4078962.98
463095.6      4078963.1
463095.43     4078963.19
463095.25     4078963.25
463095.06     4078963.27
463094.87     4078963.25
463094.69     4078963.19
463094.52     4078963.1
463094.37     4078962.98
463094.25     4078962.83
463094.16     4078962.66
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463094.08     4078962.29
463094.1      4078962.1
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463094.37     4078961.6
463094.52     4078961.48
463094.69     4078961.39
463094.87     4078961.33
463095.06     4078961.31
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463095.6      4078961.48
463095.75     4078961.6
463095.87     4078961.75
463095.96     4078961.92
463096.02     4078962.1
'CT2'         1             780.288
 32           10.668
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463115.15     4078931.82
463115.1      4078931.96
463115.03     4078932.09
463114.94     4078932.2
463114.83     4078932.29
463114.7      4078932.36
463114.56     4078932.41
463114.41     4078932.42
463114.26     4078932.41
463114.12     4078932.36
463113.99     4078932.29
463113.88     4078932.2
463113.79     4078932.09
463113.72     4078931.96
463113.67     4078931.82
463113.66     4078931.67
463113.67     4078931.52
463113.72     4078931.38
463113.79     4078931.25
463113.88     4078931.14
463113.99     4078931.05
463114.12     4078930.98
463114.26     4078930.93
463114.41     4078930.92
463114.56     4078930.93
463114.7      4078930.98
463114.83     4078931.05
463114.94     4078931.14
463115.03     4078931.25
463115.1      4078931.38
463115.15     4078931.52
'CT2.2'       1             780.288
 32           10.668
463117.48     4078929.01
463117.46     4078929.2
463117.4      4078929.38
463117.31     4078929.55
463117.19     4078929.7
463117.04     4078929.82
463116.87     4078929.91
463116.69     4078929.97
463116.5      4078929.99
463116.31     4078929.97
463116.13     4078929.91
463115.96     4078929.82
463115.81     4078929.7
463115.69     4078929.55
463115.6      4078929.38
463115.54     4078929.2
463115.52     4078929.01
463115.54     4078928.82
463115.6      4078928.64
463115.69     4078928.47
463115.81     4078928.32
463115.96     4078928.2
463116.13     4078928.11
463116.31     4078928.05
463116.5      4078928.03
463116.69     4078928.05
463116.87     4078928.11
463117.04     4078928.2
463117.19     4078928.32
463117.31     4078928.47
463117.4      4078928.64
463117.46     4078928.82
 5
'CT1          '               780.288       76.2         463138.56     4078981.57
'CT2          '               780.288       76.2         463160.01     4078948.27
'AUXBLR       '               780.288       15.24        463151.33     4078902.43
'EGEN         '               780.288       9.144        463054.55     4078972.64
'FIREPUMP     '               780.288       3.048        463208.09     4078931.58
```

BPIP (Dated: 04274)

DATE : 2/ 6/2015
TIME : 14:16:23

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BPIP output is in meters

SO	BUILDHGT	CT1	30.48	30.48	30.48	30.48	30.48	30.48
SO	BUILDHGT	CT1	30.48	30.48	30.48	30.48	30.48	30.48
SO	BUILDHGT	CT1	30.48	30.48	30.48	30.48	30.48	30.48
SO	BUILDHGT	CT1	30.48	30.48	30.48	30.48	30.48	30.48
SO	BUILDHGT	CT1	30.48	30.48	30.48	30.48	30.48	30.48
SO	BUILDHGT	CT1	30.48	30.48	30.48	30.48	30.48	30.48
SO	BUILDWID	CT1	31.83	61.51	62.40	61.39	19.23	17.77
SO	BUILDWID	CT1	22.36	62.80	62.70	31.61	32.87	33.13
SO	BUILDWID	CT1	32.38	30.65	31.50	31.58	32.66	32.74
SO	BUILDWID	CT1	31.83	61.51	62.40	61.39	19.23	17.77
SO	BUILDWID	CT1	22.36	62.80	62.70	31.61	32.87	33.13
SO	BUILDWID	CT1	32.38	30.65	31.50	31.58	32.66	32.74
SO	BUILDLEN	CT1	31.61	56.84	51.25	44.12	30.66	29.57
SO	BUILDLEN	CT1	31.60	48.02	54.21	31.85	29.97	27.18
SO	BUILDLEN	CT1	23.54	19.21	57.34	22.37	26.28	29.39
SO	BUILDLEN	CT1	31.61	56.84	51.25	44.12	30.66	29.57
SO	BUILDLEN	CT1	31.60	48.02	54.21	31.85	29.97	27.18
SO	BUILDLEN	CT1	23.54	19.21	57.34	22.37	26.28	29.39
SO	XBADJ	CT1	-57.19	-54.91	-50.97	-45.47	-33.61	-33.28
SO	XBADJ	CT1	-33.98	-33.65	-32.29	-29.95	-26.71	-22.65
SO	XBADJ	CT1	19.94	26.69	-8.32	31.22	30.24	28.34
SO	XBADJ	CT1	25.58	-1.92	-0.29	1.35	2.96	3.71
SO	XBADJ	CT1	2.38	-14.38	-21.92	-1.89	-3.26	-4.53
SO	XBADJ	CT1	-43.49	-45.90	-49.03	-53.58	-56.52	-57.73
SO	YBADJ	CT1	-12.88	-4.05	-8.55	-12.79	3.00	-0.57
SO	YBADJ	CT1	-3.77	-25.11	-26.38	-12.31	-14.51	-16.28
SO	YBADJ	CT1	-29.28	-23.27	-17.53	-9.40	-1.95	5.55
SO	YBADJ	CT1	12.88	4.05	8.55	12.79	-3.00	0.57
SO	YBADJ	CT1	3.77	25.11	26.38	12.31	14.51	16.28
SO	YBADJ	CT1	29.28	23.27	17.53	9.40	1.95	-5.55

SO	BUILDHGT	CT2	30.48	30.48	30.48	30.48	30.48	30.48
SO	BUILDHGT	CT2	30.48	30.48	30.48	30.48	30.48	30.48
SO	BUILDHGT	CT2	30.48	30.48	30.48	30.48	30.48	30.48
SO	BUILDHGT	CT2	30.48	30.48	30.48	30.48	30.48	30.48
SO	BUILDHGT	CT2	30.48	30.48	30.48	30.48	30.48	30.48
SO	BUILDHGT	CT2	30.48	30.48	30.48	30.48	30.48	30.48
SO	BUILDWID	CT2	31.83	61.51	62.40	61.39	19.21	17.78
SO	BUILDWID	CT2	22.37	62.80	62.70	31.61	32.87	33.13
SO	BUILDWID	CT2	32.38	30.65	31.50	31.58	32.66	32.74
SO	BUILDWID	CT2	31.83	61.51	62.40	61.39	19.21	17.78
SO	BUILDWID	CT2	22.37	62.80	62.70	31.61	32.87	33.13
SO	BUILDWID	CT2	32.38	30.65	31.50	31.58	32.66	32.74
SO	BUILDLEN	CT2	31.61	56.84	51.25	44.12	30.65	29.55
SO	BUILDLEN	CT2	31.58	48.02	54.21	31.83	29.95	27.16
SO	BUILDLEN	CT2	23.54	19.21	57.34	22.37	26.28	29.39

SO	BUILDLEN	CT2	31.61	56.84	51.25	44.12	30.65	29.55
SO	BUILDLEN	CT2	31.58	48.02	54.21	31.83	29.95	27.16
SO	BUILDLEN	CT2	23.54	19.21	57.34	22.37	26.28	29.39
SO	XBADJ	CT2	-28.12	-30.96	-32.85	-33.75	-33.62	-33.26
SO	XBADJ	CT2	-33.96	-48.99	-53.74	-29.94	-26.69	-22.64
SO	XBADJ	CT2	-17.89	-12.61	-47.88	-7.41	-6.28	-4.96
SO	XBADJ	CT2	-3.49	-25.88	-18.40	-10.37	2.97	3.71
SO	XBADJ	CT2	2.37	0.97	-0.47	-1.89	-3.26	-4.52
SO	XBADJ	CT2	-5.65	-6.61	-9.46	-14.96	-20.00	-24.43
SO	YBADJ	CT2	14.02	27.50	26.68	25.04	3.00	-0.57
SO	YBADJ	CT2	-3.77	11.41	6.92	-12.32	-14.52	-16.29
SO	YBADJ	CT2	-17.56	-18.30	-19.46	-18.16	-17.30	-15.90
SO	YBADJ	CT2	-14.02	-27.50	-26.68	-25.04	-3.00	0.57
SO	YBADJ	CT2	3.77	-11.41	-6.92	12.32	14.52	16.29
SO	YBADJ	CT2	17.56	18.30	19.46	18.16	17.30	15.90
SO	BUILDHGT	AUXBLR	30.48	30.48	30.48	28.57	28.57	28.57
SO	BUILDHGT	AUXBLR	28.57	28.57	28.57	28.57	30.48	30.48
SO	BUILDHGT	AUXBLR	30.48	30.48	30.48	30.48	30.48	30.48
SO	BUILDHGT	AUXBLR	30.48	30.48	30.48	28.57	28.57	28.57
SO	BUILDHGT	AUXBLR	28.57	28.57	28.57	28.57	30.48	30.48
SO	BUILDHGT	AUXBLR	30.48	30.48	30.48	30.48	30.48	30.48
SO	BUILDWID	AUXBLR	31.83	61.51	62.40	83.89	87.01	87.58
SO	BUILDWID	AUXBLR	85.56	81.07	74.13	65.06	32.87	33.13
SO	BUILDWID	AUXBLR	32.38	30.65	31.50	31.58	32.66	32.74
SO	BUILDWID	AUXBLR	31.83	61.51	62.40	83.89	87.01	87.58
SO	BUILDWID	AUXBLR	85.56	81.07	74.13	65.06	32.87	33.13
SO	BUILDWID	AUXBLR	32.38	30.65	31.50	31.58	32.66	32.74
SO	BUILDLEN	AUXBLR	31.61	56.84	51.25	27.68	13.12	6.58
SO	BUILDLEN	AUXBLR	21.33	35.51	48.66	60.43	29.95	27.16
SO	BUILDLEN	AUXBLR	23.54	19.21	57.34	22.37	26.28	29.39
SO	BUILDLEN	AUXBLR	31.61	56.84	51.25	27.68	13.12	6.58
SO	BUILDLEN	AUXBLR	21.33	35.51	48.66	60.43	29.95	27.16
SO	BUILDLEN	AUXBLR	23.54	19.21	57.34	22.37	26.28	29.39
SO	XBADJ	AUXBLR	18.53	15.09	11.19	-39.75	-37.67	-54.06
SO	XBADJ	AUXBLR	5.10	6.92	8.53	9.80	-34.21	-38.04
SO	XBADJ	AUXBLR	-40.71	-42.14	-83.24	-47.52	-49.92	-50.80
SO	XBADJ	AUXBLR	-50.14	-71.92	-62.44	12.07	24.55	47.48
SO	XBADJ	AUXBLR	-26.43	-42.44	-57.19	-70.23	4.27	10.88
SO	XBADJ	AUXBLR	17.17	22.93	25.90	25.15	23.64	21.41
SO	YBADJ	AUXBLR	13.43	35.02	42.08	-49.20	-51.19	-57.25
SO	YBADJ	AUXBLR	-52.49	-48.91	-43.85	-37.45	31.52	27.75
SO	YBADJ	AUXBLR	23.14	17.82	10.98	5.67	-0.79	-7.22
SO	YBADJ	AUXBLR	-13.43	-35.02	-42.08	49.20	51.19	57.25
SO	YBADJ	AUXBLR	52.49	48.91	43.85	37.45	-31.52	-27.75
SO	YBADJ	AUXBLR	-23.14	-17.82	-10.98	-5.67	0.79	7.22
SO	BUILDHGT	EGEN	8.08	8.08	8.08	8.08	7.21	7.21
SO	BUILDHGT	EGEN	7.21	30.48	30.48	30.48	30.48	30.48
SO	BUILDHGT	EGEN	16.97	16.97	16.97	16.97	16.97	8.08
SO	BUILDHGT	EGEN	8.08	8.08	8.08	8.08	7.21	7.21
SO	BUILDHGT	EGEN	7.21	30.48	30.48	30.48	30.48	30.48
SO	BUILDHGT	EGEN	28.57	28.57	25.45	25.45	16.97	8.08
SO	BUILDWID	EGEN	63.18	56.39	47.88	37.92	15.16	13.36
SO	BUILDWID	EGEN	17.29	62.80	62.70	31.61	32.87	51.25
SO	BUILDWID	EGEN	22.61	21.38	20.61	22.14	22.99	68.05
SO	BUILDWID	EGEN	63.18	56.39	47.88	37.92	15.16	13.36
SO	BUILDWID	EGEN	17.29	62.80	62.70	31.61	32.87	33.13
SO	BUILDWID	EGEN	55.00	41.47	77.44	90.03	22.99	68.05
SO	BUILDLEN	EGEN	60.39	66.13	69.85	71.46	25.71	24.96
SO	BUILDLEN	EGEN	26.49	48.02	54.21	31.85	29.97	62.40

SO	BUILDLEN	EGEN	17.63	17.12	16.74	17.47	18.45	52.82
SO	BUILDLEN	EGEN	60.39	66.13	69.85	71.46	25.71	24.96
SO	BUILDLEN	EGEN	26.49	48.02	54.21	31.83	29.95	27.16
SO	BUILDLEN	EGEN	92.35	90.59	91.49	100.70	18.45	52.82
SO	XBADJ	EGEN	-13.95	-19.67	-24.78	-29.15	-33.61	-32.82
SO	XBADJ	EGEN	-32.55	50.64	51.72	51.23	49.18	45.64
SO	XBADJ	EGEN	26.90	28.89	29.67	28.75	26.17	-45.01
SO	XBADJ	EGEN	-46.44	-46.46	-45.07	-42.31	7.90	7.86
SO	XBADJ	EGEN	6.06	-98.66	-105.93	-109.98	-110.69	-108.04
SO	XBADJ	EGEN	-214.64	-210.69	-211.35	-209.48	-44.63	-7.81
SO	YBADJ	EGEN	14.98	17.58	19.64	21.10	-0.58	-4.18
SO	YBADJ	EGEN	-7.64	-30.91	-17.45	11.08	22.61	24.40
SO	YBADJ	EGEN	-7.37	-0.31	6.52	12.55	18.19	-11.94
SO	YBADJ	EGEN	-14.98	-17.58	-19.64	-21.10	0.58	4.18
SO	YBADJ	EGEN	7.64	30.91	17.45	18.00	1.35	-15.34
SO	YBADJ	EGEN	17.50	16.28	-26.91	-55.70	-18.19	11.94

SO	BUILDHGT	FIREPUMP	28.57	28.57	28.57	28.57	28.57	28.57
SO	BUILDHGT	FIREPUMP	9.60	30.48	30.48	30.48	30.48	30.48
SO	BUILDHGT	FIREPUMP	30.48	1.50	1.50	15.72	25.45	28.57
SO	BUILDHGT	FIREPUMP	28.57	28.57	28.57	25.45	25.45	28.57
SO	BUILDHGT	FIREPUMP	9.60	30.48	30.48	30.48	30.48	30.48
SO	BUILDHGT	FIREPUMP	30.48	1.50	1.50	15.72	25.45	28.57
SO	BUILDWID	FIREPUMP	60.43	70.39	78.30	83.89	87.01	87.58
SO	BUILDWID	FIREPUMP	15.79	62.80	62.70	31.61	32.87	33.13
SO	BUILDWID	FIREPUMP	32.39	6.31	6.16	31.79	99.89	48.66
SO	BUILDWID	FIREPUMP	60.43	70.39	78.30	101.00	91.53	87.58
SO	BUILDWID	FIREPUMP	15.79	62.80	62.70	31.61	32.87	33.13
SO	BUILDWID	FIREPUMP	44.12	6.31	6.17	31.79	99.89	48.66
SO	BUILDLEN	FIREPUMP	65.06	54.05	41.45	27.68	13.12	6.58
SO	BUILDLEN	FIREPUMP	15.79	48.02	54.21	31.83	29.95	27.16
SO	BUILDLEN	FIREPUMP	23.56	3.19	2.72	31.79	105.24	74.14
SO	BUILDLEN	FIREPUMP	65.06	54.04	41.44	99.48	88.60	6.58
SO	BUILDLEN	FIREPUMP	15.79	48.02	54.21	31.83	29.95	27.16
SO	BUILDLEN	FIREPUMP	61.39	3.18	2.73	31.79	105.24	74.14
SO	XBADJ	FIREPUMP	-108.55	-137.88	-108.46	-98.56	-99.89	-117.79
SO	XBADJ	FIREPUMP	6.47	-93.44	-101.82	-80.18	-77.58	-72.62
SO	XBADJ	FIREPUMP	-103.30	-8.17	-8.31	9.20	29.10	43.67
SO	XBADJ	FIREPUMP	43.49	49.68	54.31	49.74	49.64	54.11
SO	XBADJ	FIREPUMP	-22.26	45.42	47.61	48.36	47.63	45.46
SO	XBADJ	FIREPUMP	41.91	1.58	2.14	-40.99	-134.34	-117.81
SO	YBADJ	FIREPUMP	10.82	23.37	-9.33	-24.45	-37.04	-54.11
SO	YBADJ	FIREPUMP	8.50	36.19	23.61	-4.23	-15.28	-25.87
SO	YBADJ	FIREPUMP	-23.95	2.69	1.51	-22.38	-61.28	-35.91
SO	YBADJ	FIREPUMP	-10.82	2.57	15.87	23.21	40.13	51.32
SO	YBADJ	FIREPUMP	-8.50	-36.19	-23.61	4.23	15.28	25.87
SO	YBADJ	FIREPUMP	29.81	-2.26	-1.67	22.38	61.28	35.91