Dominion Energy Services, Inc.
5000 Dominion Boulevard
Glen Allen, VA 23060
DominionEnergy.com

August 28, 2017

BY: OVERNIGHT MAIL

Mr. William F. Durham, Director
WV – Division of Air Quality
601 57th Street SE
Charleston, WV 25304

Subject: Mockingbird Hill Compressor Station
Updates to Construction/Major Modification Application
Mockingbird Hill Compressor Station (Facility ID#-17-00003)

Dear Mr. Durham:

Dominion Energy Transmission, Inc. is submitting an update to the proposed Mockingbird Hill Compressor Station air permit application, dated September 16, 2015. The purpose of this update is to reflect the following proposed changes and corrections to the application currently under review:

- Installation of smaller auxiliary generator engine (755 hp instead of 1,416 hp);
- Updated boiler rating (8.72 MMBtu/hr instead of 7.2 MMBtu/hr);
- Revised estimates of startup and shutdown blowdown emissions (based on more accurate information now available); and
- Removal of double-counting of blowdown emissions, which were previously reflected in both the blowdown estimate and the general fugitive emissions estimate.

The above equipment changes do not impact the regulations applicable to this project. Similarly, since the changes only impact equipment sizes and not the types of sources, there are no changes to the previously submitted Best Available Control Technology analysis.

Included with this letter are the relevant updated Permit Application Forms, Facility Plot Plan, Potential to Emit Calculations, and Vendor Specifications (for boiler and auxiliary generator). To reflect both updates to facility layout as well updates to EPA air quality models and related guidance, the modeling submitted with the original application has been updated and a new report is included with this submittal. The appendices are labeled to match those in the original application.

The emission calculations have been revised based on the equipment changes. Overall emissions change by less than 1 ton per year for all pollutants, except for VOCs and GHGs, which are reduced. The changes in annual emissions associated with new equipment proposed for Mockingbird Hill are summarized in the following table.

	Annual Emissions (Tons/Year)					
	NO_X	CO	VOC	PM	SO_2	CO_{2e}
Original Application (2015)	55.5	58.6	29.9	30.6	5.17	208,563
Proposed Update (2017)	55.7	59.0	13.3	30.6	5.18	195,289

If you have questions about this submittal, please do not hesitate to contact Mr. Laurence Labrie at (804) 273-3075 or at laurence.a.labrie@dominionenergy.com.

Sincerely,

Richard B. Gangle, Manager
Environmental
Supply Header Project

Enclosures:

Appendix A – WVDAQ Air Permit Application Forms
Appendix B – Air Modeling Results

Appendix A
WVDAQ Air Permit Application Forms

WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF AIR QUALITY

601 57th Street, SE
Charleston, WV 25304
(304) 926-0475
www.dep.wv.gov/daq

APPLICATION FOR NSR PERMIT AND TITLE V PERMIT REVISION (OPTIONAL)

PLEASE CHECK ALL THAT APPLY TO **NSR (45CSR13)** (IF KNOWN):

☐ **CONSTRUCTION** ☒ **MODIFICATION** ☐ **RELOCATION**
☐ **CLASS I ADMINISTRATIVE UPDATE** ☐ **TEMPORARY**
☐ **CLASS II ADMINISTRATIVE UPDATE** ☐ **AFTER-THE-FACT**

PLEASE CHECK TYPE OF **45CSR30 (TITLE V)** REVISION (IF ANY):

☐ **ADMINISTRATIVE AMENDMENT** ☐ **MINOR MODIFICATION**
☒ **SIGNIFICANT MODIFICATION**

IF ANY BOX ABOVE IS CHECKED, INCLUDE TITLE V REVISION INFORMATION AS **ATTACHMENT S** TO THIS APPLICATION

FOR TITLE V FACILITIES ONLY: Please refer to "Title V Revision Guidance" in order to determine your Title V Revision options (Appendix A, "Title V Permit Revision Flowchart") and ability to operate with the changes requested in this Permit Application.

Section I. General

1. Name of applicant *(as registered with the WV Secretary of State's Office):*
Dominion Energy Transmission, Inc.

2. Federal Employer ID No. ***(FEIN):***
550629203

3. Name of facility *(if different from above):*
Mockingbird Hill Compressor Station

Currently, the Mockingbird Hill Compressor Station Title V Permit aggregates the emissions from the Hastings Compressor Station, Mockingbird Hill Station, and the Lewis Wetzel Compressor Station. This permit application is for a major modification proposed at the Mockingbird Hill Station.

4. The applicant is the:
☐ **OWNER** ☐ **OPERATOR** ☒ **BOTH**

5A. Applicant's mailing address:

707 Main St.
Richmond, VA 23219

5B. Facility's present physical address:

P.O. Box 450, Route 20
Pine Grove, WV 26419

6. **West Virginia Business Registration.** Is the applicant a resident of the State of West Virginia? ☒ **YES** ☐ **NO**

- If **YES,** provide a copy of the **Certificate of Incorporation/Organization/Limited Partnership** (one page) including any name change amendments or other Business Registration Certificate as **Attachment A.**
- If **NO,** provide a copy of the **Certificate of Authority/Authority of L.L.C./Registration** (one page) including any name change amendments or other Business Certificate as **Attachment A.**

7. If applicant is a subsidiary corporation, please provide the name of parent corporation: **Dominion Energy Transmission, Inc.**

8. Does the applicant own, lease, have an option to buy or otherwise have control of the *proposed site?* ☒ **YES** ☐ **NO**

- If **YES,** please explain: **The applicant is the owner of the site.**

- If **NO,** you are not eligible for a permit for this source.

9. Type of plant or facility (stationary source) to be **constructed, modified, relocated, administratively updated** or **temporarily permitted** (e.g., coal preparation plant, primary crusher, etc.): **Natural Gas Transmission Facility (Note: Hastings Compressor operations are considered production equipment with regards to MACT Rules)**	10. North American Industry Classification System **(NAICS)** code for the facility: **486210**

11A. DAQ Plant ID No. (for existing facilities only): **103-00006**	11B. List all current 45CSR13 and 45CSR30 (Title V) permit numbers associated with this process (for existing facilities only): **R30-10300006-2011, Issued July 2011 – Updated Nov. 2012** **R13-2555B, Issued September 2012** **R13-2870, Issued February 2011**

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

12A.

- For **Modifications, Administrative Updates** or **Temporary permits** at an existing facility, please provide directions to the *present location* of the facility from the nearest state road;
- For **Construction** or **Relocation permits,** please provide directions to the *proposed new site location* from the nearest state road. Include a **MAP** as **Attachment B**.

From Clarksburg, take Rt. 20 North for 37 miles to Hastings. The Station entrance is on the left side of the road.

12.B. New site address (if applicable): **N/A**	12C. Nearest city or town: **Pine Grove**	12D. County: **Wetzel**
12.E. UTM Northing (KM): **4,377.66**	12F. UTM Easting (KM): **528.64**	12G. UTM Zone: **17**

13. Briefly describe the proposed change(s) at the facility:

This supplemental information is provided to reflect minor changes to the September 2015 permit application. Specifically, the installation of smaller auxiliary generator engine (755 hp instead of 1,416 hp) and slightly larger boiler rating (8.72 MMBtu/hr instead of 7.2 MMBtu/hr). The updates also reflect revised estimates of startup and shutdown blowdown emissions (based on more accurate information now available); and the removal of double-counting of blowdown emissions, which were previously reflected in both the blowdown estimate and the general fugitive emissions estimate. The overall project scope remains the same as original application - the installation of two (2) Solar Titan 130 Combustion Turbines, one (1) CAT Emergency Generator, one (1) Boiler, three (3) tanks of various sizes, and one (1) emission unit for liquid unloading operations.

14A. Provide the date of anticipated installation or change: **2018** – If this is an **After-The-Fact** permit application, provide the date upon which the proposed change did happen: **N/A**	14B. Date of anticipated Start-Up if a permit is granted: **2018**

14C. Provide a **Schedule** of the planned **Installation** of/**Change** to and **Start-Up** of each of the units proposed in this permit application as **Attachment C** (if more than one unit is involved).

15. Provide maximum projected **Operating Schedule** of activity/activities outlined in this application:

Hours Per Day **24** Days Per Week **7** Weeks Per Year **52**

16. Is demolition or physical renovation at an existing facility involved? ☒ **YES** ☐ **NO**

17**. Risk Management Plans.** If this facility is subject to 112(r) of the 1990 CAAA, or will become subject due to proposed changes (for applicability help see www.epa.gov/ceppo), submit your **Risk Management Plan (RMP)** to U. S. EPA Region III.

18. **Regulatory Discussion.** List all Federal and State air pollution control regulations that you believe are applicable to the proposed process *(if known).* A list of possible applicable requirements is also included in Attachment S of this application (Title V Permit Revision Information). Discuss applicability and proposed demonstration(s) of compliance *(if known).* Provide this information as **Attachment D.**

Section II. Additional attachments and supporting documents.

19. Include a check payable to WVDEP – Division of Air Quality with the appropriate **application fee** (per 45CSR22 and 45CSR13).

20. Include a **Table of Contents** as the first page of your application package.

21. Provide a **Plot Plan,** e.g. scaled map(s) and/or sketch(es) showing the location of the property on which the stationary source(s) is or is to be located as **Attachment E** (Refer to ***Plot Plan Guidance***) **.**

– Indicate the location of the nearest occupied structure (e.g. church, school, business, residence).

22. Provide a **Detailed Process Flow Diagram(s)** showing each proposed or modified emissions unit, emission point and control device as **Attachment F.**

23. Provide a **Process Description** as **Attachment G.**

– Also describe and quantify to the extent possible all changes made to the facility since the last permit review (if applicable).

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

24. Provide **Material Safety Data Sheets (MSDS)** for all materials processed, used or produced as **Attachment H.**

– For chemical processes, provide a MSDS for each compound emitted to the air.

25. Fill out the **Emission Units Table** and provide it as **Attachment I.**

26. Fill out the **Emission Points Data Summary Sheet (Table 1 and Table 2)** and provide it as **Attachment J.**

27. Fill out the **Fugitive Emissions Data Summary Sheet** and provide it as **Attachment K.**

28. Check all applicable **Emissions Unit Data Sheets** listed below:

☐ Bulk Liquid Transfer Operations	☐ Haul Road Emissions	☐ Quarry
☐ Chemical Processes	☐ Hot Mix Asphalt Plant	☐ Solid Materials Sizing, Handling and Storage Facilities
☐ Concrete Batch Plant	☐ Incinerator	
☐ Grey Iron and Steel Foundry	☒ Indirect Heat Exchanger	☐ Storage Tanks

☒ General Emission Unit, specify – **Boiler, emergency generator**

Fill out and provide the **Emissions Unit Data Sheet(s)** as **Attachment L.**

29. Check all applicable **Air Pollution Control Device Sheets** listed below:

☐ Absorption Systems	☐ Baghouse	☐ Flare
☐ Adsorption Systems	☐ Condenser	☐ Mechanical Collector
☐ Afterburner	☐ Electrostatic Precipitator	☐ Wet Collecting System

☐ Other Collectors, specify **N/A**

Fill out and provide the **Air Pollution Control Device Sheet(s)** as **Attachment M.**

30. Provide all **Supporting Emissions Calculations** as **Attachment N,** or attach the calculations directly to the forms listed in Items 28 through 31.

31. **Monitoring, Recordkeeping, Reporting and Testing Plans.** Attach proposed monitoring, recordkeeping, reporting and testing plans in order to demonstrate compliance with the proposed emissions limits and operating parameters in this permit application. Provide this information as **Attachment O.**

➢ Please be aware that all permits must be practically enforceable whether or not the applicant chooses to propose such measures. Additionally, the DAQ may not be able to accept all measures proposed by the applicant. If none of these plans are proposed by the applicant, DAQ will develop such plans and include them in the permit.

32. **Public Notice.** At the time that the application is submitted, place a **Class I Legal Advertisement** in a newspaper of general circulation in the area where the source is or will be located (See 45CSR§13-8.3 through 45CSR§13-8.5 and ***Example Legal Advertisement*** for details). Please submit the **Affidavit of Publication** as **Attachment P** immediately upon receipt.

33. **Business Confidentiality Claims.** Does this application include confidential information (per 45CSR31)?

☐ **YES** ☒ **NO**

➢ If **YES,** identify each segment of information on each page that is submitted as confidential and provide justification for each segment claimed confidential, including the criteria under 45CSR§31-4.1, and in accordance with the DAQ's ***"Precautionary Notice – Claims of Confidentiality"*** guidance found in the ***General Instructions*** as **Attachment Q.**

Section III. Certification of Information

34. **Authority/Delegation of Authority.** Only required when someone other than the responsible official signs the application. Check applicable **Authority Form** below:

☐ Authority of Corporation or Other Business Entity ☐ Authority of Partnership

☐ Authority of Governmental Agency ☐ Authority of Limited Partnership

Submit completed and signed **Authority Form** as **Attachment R.**

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

35A. **Certification of Information.** To certify this permit application, a Responsible Official (per 45CSR§13-2.22 and 45CSR§30-2.28) or Authorized Representative shall check the appropriate box and sign below.

Certification of Truth, Accuracy, and Completeness

I, the undersigned ☒ **Responsible Official** / ☐ **Authorized Representative,** hereby certify that all information contained in this application and any supporting documents appended hereto, is true, accurate, and complete based on information and belief after reasonable inquiry I further agree to assume responsibility for the construction, modification and/or relocation and operation of the stationary source described herein in accordance with this application and any amendments thereto, as well as the Department of Environmental Protection, Division of Air Quality permit issued in accordance with this application, along with all applicable rules and regulations of the West Virginia Division of Air Quality and W.Va. Code § 22-5-1 et seq. (State Air Pollution Control Act). If the business or agency changes its Responsible Official or Authorized Representative, the Director of the Division of Air Quality will be notified in writing within 30 days of the official change.

Compliance Certification

Except for requirements identified in the Title V Application for which compliance is not achieved, I, the undersigned hereby certify that, based on information and belief formed after reasonable inquiry, all air contaminant sources identified in this application are in compliance with all applicable requirements.

SIGNATURE _____ *(Please use blue ink)* DATE: 8/25/17 *(Please use blue ink)*

35B. Printed name of signee: Leslie Hartz		35C. Title: VP Engineering & Construction-Strategic Projects
35D. E-mail: leslie.hartz@dominionenergy.com	36E. Phone: (804) 771-4468	36F. FAX:
36A. Printed name of contact person (if different from above): Laurence Labrie		36B. Title: Environmental Projects Advisor
36C. E-mail: laurence.a.labrie@dominionenergy.com	36D. Phone: (804) 273-3075	36E. FAX:

PLEASE CHECK ALL APPLICABLE ATTACHMENTS INCLUDED WITH THIS PERMIT APPLICATION:

- ☐ **Attachment A: Business Certificate**
- ☐ **Attachment B: Map(s)**
- ☐ **Attachment C: Installation and Start Up Schedule**
- ☐ **Attachment D: Regulatory Discussion**
- ☒ **Attachment E: Plot Plan**
- ☐ **Attachment F: Detailed Process Flow Diagram(s)**
- ☐ **Attachment G: Process Description**
- ☐ **Attachment H: Material Safety Data Sheets (MSDS)**
- ☒ **Attachment I: Emission Units Table**
- ☒ **Attachment J: Emission Points Data Summary Sheet**
- ☒ **Attachment K: Fugitive Emissions Data Summary Sheet**
- ☒ **Attachment L: Emissions Unit Data Sheet(s)**
- ☐ **Attachment M: Air Pollution Control Device Sheet(s)**
- ☒ **Attachment N: Supporting Emissions Calculations**
- ☐ **Attachment O: Monitoring/Recordkeeping/Reporting/Testing Plans**
- ☐ **Attachment P: Public Notice**
- ☐ **Attachment Q: Business Confidential Claims**
- ☐ **Attachment R: Authority Forms**
- ☒ **Attachment S: Title V Permit Revision Information**
- ☐ **Application Fee**

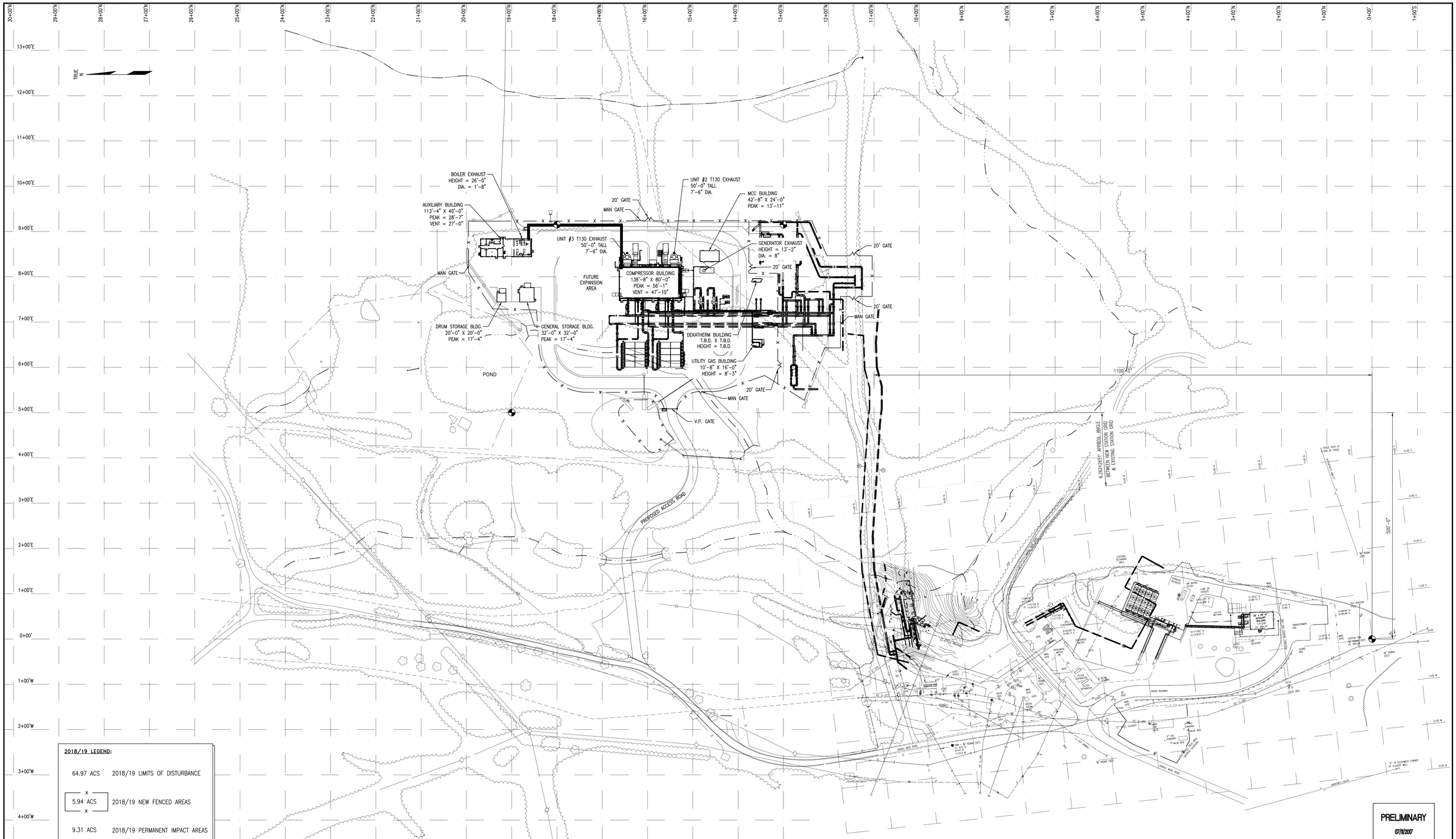
Please mail an original and three (3) copies of the complete permit application with the signature(s) to the DAQ, Permitting Section, at the address listed on the first page of this application. Please DO NOT fax permit applications.

FOR AGENCY USE ONLY – IF THIS IS A TITLE V SOURCE:

- ☐ ***Forward 1 copy of the application to the Title V Permitting Group and:***
- ☐ ***For Title V Administrative Amendments:***
  - ☐ ***NSR permit writer should notify Title V permit writer of draft permit,***
- ☐ ***For Title V Minor Modifications:***
  - ☐ ***Title V permit writer should send appropriate notification to EPA and affected states within 5 days of receipt,***
  - ☐ ***NSR permit writer should notify Title V permit writer of draft permit.***
- ☐ ***For Title V Significant Modifications processed in parallel with NSR Permit revision:***
  - ☐ ***NSR permit writer should notify a Title V permit writer of draft permit,***
  - ☐ ***Public notice should reference both 45CSR13 and Title V permits,***
  - ☐ ***EPA has 45 day review period of a draft permit.***

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

Attachment E



2018/19 LEGEND:

64.97 ACS	2018/19 LIMITS OF DISTURBANCE
x 5.94 ACS x	2018/19 NEW FENCED AREAS
9.31 ACS	2018/19 PERMANENT IMPACT AREAS
	EXISTING INDEX CONTOURS
	EXISTING INTERMEDIATE CONTOURS
	PROPOSED INDEX CONTOURS
	PROPOSED INTERMEDIATE CONTOURS
	EXISTING PIPE LINES
	PROPOSED PIPE LINES

PRELIMINARY
07/11/2017

MON-1 (EXIST.)	MON-2 (EXIST.)	CPT-01 (EXIST.)	CPT-02 (EXIST.)	MON-3 (TIE IN)	MON-4 (NEW)	MON-5 (NEW)	MON-6 (NEW)
(ALUM. MONUMENT) NAD83/NAVD88 WV (North) N383696.67' E1639804.04' EL. 890.65' GEOID12B LAT: N39° 32' 51.34704" LON: W80° 39' 56.43473" LOCAL PLANT N79.32' E82.59' EL. 891.16'	(ALUM. MONUMENT) NAD83/NAVD88 WV (North) N384141.42' E1639873.94' EL. 884.37' GEOID12B LAT: N39° 32' 55.75138" LON: W80° 39' 55.61609" LOCAL PLANT N513.76' E200.40' EL. 884.88' ("HOLD TO")	(Rebar & Cap) NAD83/NAVD88 WV (North) N383688.02' E1639741.86' EL. 891.97' GEOID12B ("HOLD TO") LAT: N39° 32' 51.25" LON: W80° 39' 57.23" LOCAL PLANT N19.84' E77.40' EL. 892.48'	NAD83/NAVD88 WV (North) N384007.51' E1639867.62' EL. 884.00' GEOID12B LAT: N39° 32' 54.43" LON: W80° 39' 55.67" LOCAL PLANT N381.33' E179.57' EL. 884.51'	NAD83/NAVD88 WV (North) N384608.71' E1640230.98' EL. T.B.D. LAT: N39° 32' 51.34704" LON: W80° 39' 56.43473" LOCAL PLANT N1100.00' E500.00' EL. T.B.D.	NAD83/NAVD88 WV (North) N385508.71' E1640231.02' EL. T.B.D. LAT: N39° 32' 55.75138" LON: W80° 39' 55.61609" LOCAL PLANT N1900.00' E500.00' EL. T.B.D.	NAD83/NAVD88 WV (North) N385408.71' E1640646.02' EL. T.B.D. LAT: N39° 33' 08.3747" LON: W80° 39' 45.9693" LOCAL PLANT N1800.00' E950.00' EL. T.B.D.	NAD83/NAVD88 WV (North) N384908.71' E1640646.02' EL. T.B.D. LAT: N39° 33' 03.4333" LON: W80° 39' 45.8867" LOCAL PLANT N1300.00' E950.00' EL. T.B.D.

GENERAL NOTES AND COMMENTS:

SYM.	DATE	BY	REVISION INFORMATION	PROJECT/TASK	APP.
6	07/11/17	JDT	ISSUED PER DTI REQUEST	65346.CS.MBH.1	–
5	06/29/17	DSG	ISSUED FOR 100% REVIEW	65346.CS.MBH.1	–
4	04/27/17	DSG	ISSUED FOR 75% REVIEW	65346.CS.MBH.1	–
3	03/02/17	LMK	ISSUED FOR 50% REVIEW	65346.CS.MBH.1	–
2	02/21/17	HJ	ISSUED FOR 25% REVIEW	65346.CS.MBH.1	–

SEAL

ORIGINAL CONSTRUCTION INFORMATION		
PROJECT/TASK:	65346.CS.MBH.1	
DRAWN:	DPA	02/15/17
CHECKED:		
APP. FOR BID:		
APP. FOR CONST.:		
SCALE:	1" = 80'-0"	

Dominion Transmission, Inc.
925 White Oaks Blvd. Bridgeport, West Virginia 26330 / Phone: (681) 842-3000

FOR: MOCKINGBIRD HILL COMPRESSOR STATION

TITLE: SITE PLOT PLAN

TOWN:	COUNTY:	GROUP	DWG. NO.	REV.
PINE GROVE	WETZEL	PD	E9952A	e

DIR/FILE: I:\1900s\1941\Drawings

Printed: Jul 12, 2017 @16:47, By: djock, Filename: PDE9952A.dwg

Attachment I

Attachment I

Emission Units Table

(includes all emission units and air pollution control devices that will be part of this permit application review, regardless of permitting status)

Emission Unit ID[1]	Emission Point ID[2]	Emission Unit Description	Year Installed/ Modified	Design Capacity	Type[3] and Date of Change	Control Device[4]
CT-01	CT-01	Turbine (Titan 130-20502S)	2018	20,500 bhp (ISO)	New	SoLoNOx, SCR
CT-02	CT-02	Turbine (Titan 130-20502S)	2018	20,500 bhp (ISO)	New	SoLoNOx, SCR
EG-01	EG-01	Emergency Generator (Caterpillar G3412C)	2018	755 bhp	New	None
WH-1	WH-1	Boiler	2018	8.72 MMBtu/hr	New	None
TK-1	TK-1	Accumulator Tank	2018	2,500 gallons	New	None
TK-2	TK-2	Hydrocarbon (Waste Oil) Tank	2018	1,000 gallons	New	None
LR-1	LR-1	Tank Unloading	2018	N/A	New	None

[1] For Emission Units (or Sources) use the following numbering system:1S, 2S, 3S,... or other appropriate designation.
[2] For Emission Points use the following numbering system:1E, 2E, 3E, ... or other appropriate designation.
[3] New, modification, removal
[4] For Control Devices use the following numbering system: 1C, 2C, 3C,... or other appropriate designation.

Attachment J

Attachment J
EMISSION POINTS DATA SUMMARY SHEET

Table 1: Emissions Data

Emission Point ID No. *(Must match Emission Units Table-& Plot Plan)*	Emission Point Type[1]	Emission Unit Vented Through This Point *(Must match Emission Units Table & Plot Plan)*		Air Pollution Control Device *(Must match Emission Units Table & Plot Plan)*		Vent Time for Emission Unit *(chemical processes only)*		All Regulated Pollutants - Chemical Name/CAS[3] *(Speciate VOCs & HAPS)*	Maximum Potential Uncontrolled Emissions [4]		Maximum Potential Controlled Emissions [5]		Emission Form or Phase *(At exit conditions, Solid, Liquid or Gas/Vapor)*	Est. Method Used [6]	Emission Concentration [7] (mg/m^3)
		ID No.	Source	ID No.	Device Type	Short Term[2]	Max (hr/yr)		lb/hr	ton/yr	lb/hr	ton/yr			
CT-01	**Upward Vertical Stack**	**CT-01**	**Turbine**	**NA**	**NA**	**NA**	**NA**	**CO**	**9.84**	**43.09**	**6.36**	**27.84**	**Gas**	**AP-42, Vendor Guarantees**	**NA**
								NO_x	**6.07**	**26.63**	**6.13**	**26.84**			
								SO_2	**0.59**	**2.58**	**0.59**	**2.58**			
								Total VOCs	**0.55**	**2.41**	**0.33**	**1.43**			
								$PM_{Filterable}$	**1.00**	**4.36**	**1.00**	**4.36**			
								$PM_{Condensable}$	**2.46**	**10.80**	**2.46**	**10.80**			
								$PM_{2.5}$	**1.00**	**4.36**	**1.00**	**4.36**			
								PM_{10}	**1.00**	**4.36**	**1.00**	**4.36**			
								Total HAPs	**0.24**	**1.05**	**0.24**	**1.05**			
								CO_2	**20,565**	**90,075**	**20,593**	**90,196**			
								CH_4	**1.49**	**6.52**	**1.69**	**7.40**			
								N_2O	**0.52**	**2.27**	**0.52**	**2.27**			
								CO_2e	**20,756**	**90,915**	**20,790**	**91,059**			
CT-02	**Upward Vertical Stack**	**CT-02**	**Turbine**	**NA**	**NA**	**NA**	**NA**	**CO**	**9.84**	**43.09**	**6.36**	**27.84**	**Gas**	**AP-42, Vendor Guarantees**	**NA**
								NO_x	**6.07**	**26.63**	**6.13**	**26.84**			
								SO_2	**0.59**	**2.58**	**0.59**	**2.58**			
								Total VOCs	**0.55**	**2.41**	**0.33**	**1.43**			
								$PM_{Filterable}$	**1.00**	**4.36**	**1.00**	**4.36**			
								$PM_{Condensable}$	**2.46**	**10.80**	**2.46**	**10.80**			
								$PM_{2.5}$	**1.00**	**4.36**	**1.00**	**4.36**			
								PM_{10}	**1.00**	**4.36**	**1.00**	**4.36**			
								Total HAPs	**0.24**	**1.05**	**0.24**	**1.05**			
								CO_2	**20,565**	**90,075**	**20,593**	**90,196**			
								CH_4	**1.49**	**6.52**	**1.69**	**7.40**			
								N_2O	**0.52**	**2.27**	**0.52**	**2.27**			
								CO_2e	**20,756**	**90,915**	**20,790**	**91,059**			

EG-01	Upward Vertical Stack	EG-01	Emergency Generator	NA	NA	NA	NA	CO NO_x SO_2 Total VOCs $PM_{Filterable}$ $PM_{Condensable}$ $PM_{2.5}$ PM_{10} Total HAPs CO_2 CH_4 CO_2e	2.80 3.33 <0.01 0.77 <0.01 0.05 <0.01 <0.01 1.41 807.05 6.86 978.67	0.14 0.16 <0.01 0.04 <0.01 <0.01 <0.01 <0.01 0.07 40.35 0.34 48.93	2.80 3.33 <0.01 0.77 <0.01 0.05 <0.01 <0.01 1.41 807.05 6.86 978.67	0.14 0.16 <0.01 0.04 <0.01 <0.01 <0.01 <0.01 0.07 40.35 0.34 48.93	Gas	AP-42, Vendor Guarantees	NA
WH-01	Upward Vertical Stack	WH-01	Boiler	NA	NA	NA	NA	CO NO_x SO_2 Total VOCs $PM_{Filterable}$ $PM_{Condensable}$ $PM_{2.5}$ PM_{10} Total HAPs CO_2 CH_4 N_2O CO_2e	0.72 0.43 <0.01 0.05 0.02 0.05 0.02 0.02 <0.01 1,026 0.02 0.02 1,032	3.15 1.87 0.02 0.21 0.07 0.21 0.07 0.07 0.03 4,493 0.09 0.08 4,520	0.72 0.43 <0.01 0.05 0.02 0.05 0.02 0.02 <0.01 1,026 0.02 0.02 1,032	3.15 1.87 0.02 0.21 0.07 0.21 0.07 0.07 0.03 4,493 0.09 0.08 4,520	Gas	AP-42,	NA
LR-01	Upward Vertical Stack	LR-1	Loading Rack	NA	NA	NA	NA	Total VOCs	5.25	0.006	5.25	0.006	Gas	AP-42, Vendor Guarantees	NA
TK-01	Upward Vertical Stack	TK-01	Accumulator Tank	NA	NA	NA	NA	Total VOCs	0.08	0.35	0.08	0.35	Gas	AP-42, Vendor Guarantees	NA
TK-02	Upward Vertical Stack	TK-01	Hydrocarbon (Waste Oil) Tank	NA	NA	NA	NA	Total VOCs	<0.01	<0.01	<0.01	<0.01	Gas	AP-42, Vendor Guarantees	NA

The EMISSION POINTS DATA SUMMARY SHEET provides a summation of emissions by emission unit. Note that uncaptured process emission unit emissions are not typically considered to be fugitive and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSION POINTS DATA SUMMARY SHEET. Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions). Please complete the FUGITIVE EMISSIONS DATA SUMMARY SHEET for fugitive emission activities.

[1] Please add descriptors such as upward vertical stack, downward vertical stack, horizontal stack, relief vent, rain cap, etc.

[2] Indicate by "C" if venting is continuous. Otherwise, specify the average short-term venting rate with units, for intermittent venting (ie., 15 min/hr). Indicate as many rates as needed to clarify frequency of venting (e.g., 5 min/day, 2 days/wk).

[3] List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. **LIST** Acids, CO, CS_2, VOCs, H_2S, Inorganics, Lead, Organics, O_3, NO, NO_2, SO_2, SO_3, all applicable Greenhouse Gases (including CO_2 and methane), etc. **DO NOT LIST** H_2, H_2O, N_2, O_2, and Noble Gases.

[4] Give maximum potential emission rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

[5] Give maximum potential emission rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

[6] Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; O = other (specify).

[7] Provide for all pollutant emissions. Typically, the units of parts per million by volume (ppmv) are used. If the emission is a mineral acid (sulfuric, nitric, hydrochloric or phosphoric) use units of milligram per dry cubic meter (mg/m^3) at standard conditions (68 °F and 29.92 inches Hg) (see 45CSR7). If the pollutant is SO_2, use units of ppmv (See 45CSR10).

Attachment J
EMISSION POINTS DATA SUMMARY SHEET

Table 2: Release Parameter Data								
Emission Point ID No. *(Must match Emission Units Table)*	Inner Diameter (ft.)	Exit Gas			Emission Point Elevation (ft)		UTM Coordinates (km)	
		Temp. (^{0}F)	Volumetric Flow [1] (acfm) *at operating conditions*	Velocity (fps)	Ground Level *(Height above mean sea level)*	Stack Height [2] *(Release height of emissions above ground level)*	Northing	Easting
EG-01	**0.5**	**793**	**3,927**	**187.5**	**283.464**	**13**	**4,378.02**	**528.94**
WH-01	**1.67**	**838**	**6,331**	**48.4**	**283.464**	**26**	**4,378.15**	**528.96**
CT-01	**7.5**	**900**	**254,464**	**96.0**	**283.464**	**50**	**4,378.05**	**528.95**
CT-02	**7.5**	**900**	**254,464**	**96.0**	**283.464**	**50**	**4,348.08**	**528.95**

Attachment K

Attachment K

FUGITIVE EMISSIONS DATA SUMMARY SHEET

The FUGITIVE EMISSIONS SUMMARY SHEET provides a summation of fugitive emissions. Fugitive emissions are those emissions which could not reasonably pass through a stack, chimney, vent or other functionally equivalent opening. Note that uncaptured process emissions are not typically considered to be fugitive, and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSION POINTS DATA SUMMARY SHEET.

Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions).

APPLICATION FORMS CHECKLIST - FUGITIVE EMISSIONS
1.) Will there be haul road activities? ☐ Yes ☒ No ☐ If YES, then complete the HAUL ROAD EMISSIONS UNIT DATA SHEET.
2.) Will there be Storage Piles? ☐ Yes ☒ No ☐ If YES, complete Table 1 of the NONMETALLIC MINERALS PROCESSING EMISSIONS UNIT DATA SHEET.
3.) Will there be Liquid Loading/Unloading Operations? ☐ Yes ☒ No ☐ If YES, complete the BULK LIQUID TRANSFER OPERATIONS EMISSIONS UNIT DATA SHEET.
4.) Will there be emissions of air pollutants from Wastewater Treatment Evaporation? ☐ Yes ☒ No ☐ If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.
5.) Will there be Equipment Leaks (e.g. leaks from pumps, compressors, in-line process valves, pressure relief devices, open-ended valves, sampling connections, flanges, agitators, cooling towers, etc.)? ☒ Yes ☐ No ☐ If YES, complete the LEAK SOURCE DATA SHEET section of the CHEMICAL PROCESSES EMISSIONS UNIT DATA SHEET.
6.) Will there be General Clean-up VOC Operations? ☐ Yes ☒ No ☐ If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.
7.) Will there be any other activities that generate fugitive emissions? ☐ Yes ☒ No ☐ If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET or the most appropriate form.
If you answered "NO" to all of the items above, it is not necessary to complete the following table, "Fugitive Emissions Summary."

FUGITIVE EMISSIONS SUMMARY	All Regulated Pollutants - Chemical Name/CAS [1]	Maximum Potential Uncontrolled Emissions [2]		Maximum Potential Controlled Emissions [3]		Est. Method Used [4]
		lb/hr	ton/yr	lb/hr	ton/yr	
Haul Road/Road Dust Emissions Paved Haul Roads	N/A	N/A	N/A	N/A	N/A	N/A
Unpaved Haul Roads	N/A	N/A	N/A	N/A	N/A	N/.A
Storage Pile Emissions	N/A	N/A	N/A	N/A	N/A	N/A
Loading/Unloading Operations	VOCs	5.25	0.006	5.25	0.006	AP-42 Section 5.2
Wastewater Treatment Evaporation & Operations	N/A	N/A	N/A	N/A	N/A	N/A
Equipment Leaks	VOCs	0.19	0.85	0.19	0.85	EPA-453
General Clean-up VOC Emissions	N/A	N/A	N/A	N/A	N/A	N/A
Other (Blowdown Emissions)	VOCs	153.93	8.95	153.93	8.95	MB

[1] List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. LIST Acids, CO, CS_2, VOCs, H_2S, Inorganics, Lead, Organics, O_3, NO, NO_2, SO_2, SO_3, all applicable Greenhouse Gases (including CO_2 and methane), etc. DO NOT LIST H_2, H_2O, N_2, O_2, and Noble Gases.

[2] Give rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

[3] Give rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

[4] Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; O = other (specify).

Attachment L

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): **WH-01**

1. Name or type and model of proposed affected source:

   Boiler
   8.72 MMBtu/hr

2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.

3. Name(s) and maximum amount of proposed process material(s) charged per hour:

   NA

4. Name(s) and maximum amount of proposed material(s) produced per hour:

   NA

5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants:

   NA

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable):

(a) Type and amount in appropriate units of fuel(s) to be burned:

Natural Gas Fuel – As Required

(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:

NA

(c) Theoretical combustion air requirement (ACF/unit of fuel):

NA @ **NA** °F and **NA** psia.

(d) Percent excess air: **NA**

(e) Type and BTU/hr of burners and all other firing equipment planned to be used:

NA

(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:

NA

(g) Proposed maximum design heat input: **NA** $\times 10^6$ BTU/hr.

7. Projected operating schedule:

Hours/Day	**24**	Days/Week	**7**	Weeks/Year	**52**

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used:

@ **NA** °F and **Ambient** psia

a.	NO_X	**0.43**	lb/hr	**NA**	grains/ACF
b.	SO_2	**<0.01**	lb/hr	**NA**	grains/ACF
c.	CO	**0.72**	lb/hr	**NA**	grains/ACF
d.	$PM/PM_{10}/PM_{2.5}$	**0.02**	lb/hr	**NA**	grains/ACF
e.	Hydrocarbons	**NA**	lb/hr	**NA**	grains/ACF
f.	VOCs	**0.05**	lb/hr	**NA**	grains/ACF
g.	Pb	**NA**	lb/hr	**NA**	grains/ACF
h.	Specify other(s)				
	CO_{2e}	**1,031.98**	lb/hr	**NA**	grains/ACF
	Total HAPs	**<0.01**	lb/hr	**NA**	grains/ACF
	PM Condensable	**0.05**	lb/hr	**NA**	grains/ACF
	PM Filterable	**0.02**	lb/hr	**NA**	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
See Attachment O	**See Attachment O**
REPORTING	TESTING
See Attachment O	**See Attachment O**

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

NA

Attachment L

Affected Sources Data

NATURAL GAS COMPRESSOR/GENERATOR ENGINE DATA SHEET

Source Identification Number[1]		EG-01	
Engine Manufacturer and Model		CATERPILLAR G3412C	
Manufacturer's Rated bhp/rpm		755 BHP @1800 RPM	
Source Status[2]		New Source (NS)	
Date Installed/Modified/Removed[3]		2018	
Engine Manufactured/Reconstruction Date[4]		NA	
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60 Subpart JJJJ? (Yes or No)[5]		Yes	
Engine, Fuel and Combustion Data	Engine Type[6]	LB4S	
	APCD Type[7]	NA	
	Fuel Type[8]	PG	
	H_2S (gr/100 scf)	NA	
	Operating bhp/rpm	755 BHP @1800 RPM	
	BSFC (Btu/bhp-hr)	7,274	
	Fuel throughput (ft^3/hr)	5,384	
	Fuel throughput ($MMft^3$/yr)	2.69	
	Operation (hrs/yr)	500	
Reference[9]	Potential Emissions[10]	lbs/hr	tons/yr
Vendor Guarantee	NO_X	3.33	0.17
Vendor Guarantee	CO	2.80	0.14
Vendor Guarantee	VOC	0.77	0.03
AP-42 Chapter 3.2	SO_2	0.003	<0.001
AP-42 Chapter 3.2	PM_{10}	<0.001	<0.001
Vendor Guarantee	Formaldehyde	0.45	0.02

1. Enter the appropriate Source Identification Number for each natural gas-fueled reciprocating internal combustion compressor/generator engine located at the compressor station. Multiple compressor engines should be designated CE-1, CE-

2, CE-3 etc. Generator engines should be designated GE-1, GE-2, GE-3 etc. If more than three (3) engines exist, please use additional sheets.

2. Enter the Source Status using the following codes:

NS	Construction of New Source (installation)	ES	Existing Source
MS	Modification of Existing Source	RS	Removal of Source

3. Enter the date (or anticipated date) of the engine's installation (construction of source), modification or removal.

4. Enter the date that the engine was manufactured, modified or reconstructed.

5. Is the engine a certified stationary spark ignition internal combustion engine according to 40CFR60 Subpart JJJJ. If so, the engine and control device must be operated and maintained in accordance with the manufacturer's emission-related written instructions. You must keep records of conducted maintenance to demonstrate compliance, but no performance testing is required. If the certified engine is not operated and maintained in accordance with the manufacturer's emission-related written instructions, the engine will be considered a non-certified engine and you must demonstrate compliance according to 40CFR§60.4243a(2)(i) through (iii), as appropriate.

   Provide a manufacturer's data sheet for all engines being registered.

6. Enter the Engine Type designation(s) using the following codes:

LB2S	Lean Burn Two Stroke	RB4S	Rich Burn Four Stroke
LB4S	Lean Burn Four Stroke		

7. Enter the Air Pollution Control Device (APCD) type designation(s) using the following codes:

A/F	Air/Fuel Ratio	IR	Ignition Retard
HEIS	High Energy Ignition System	SIPC	Screw-in Precombustion Chambers
PSC	Prestratified Charge	LEC	Low Emission Combustion
NSCR	Rich Burn & Non-Selective Catalytic Reduction	SCR	Lean Burn & Selective Catalytic Reduction

8. Enter the Fuel Type using the following codes:

PQ	Pipeline Quality Natural Gas	RG	Raw Natural Gas

9. Enter the Potential Emissions Data Reference designation using the following codes. Attach all referenced data to this *Compressor/Generator Data Sheet(s).*

MD	Manufacturer's Data	AP	AP-42	
GR	GRI-HAPCalc™	OT	Other _____	(please list)

10. Enter each engine's Potential to Emit (PTE) for the listed regulated pollutants in pounds per hour and tons per year. PTE shall be calculated at manufacturer's rated brake horsepower and may reflect reduction efficiencies of listed Air Pollution Control Devices. Emergency generator engines may use 500 hours of operation when calculating PTE. PTE data from this data sheet shall be incorporated in the *Emissions Summary Sheet*.

Attachment N

Table N-1 Permit to Construct Application Project Equipment List
SHP Mockingbird Hill Compressor Station - West Virginia

Emission Point ID	Source	Manufacturer	Model/Type	Rated Capacity
CT-01	Compressor Turbine	Solar Turbines	Titan 130-20502S	21,765 hp
CT-02	Compressor Turbine	Solar Turbines	Titan 130-20502S	21,765 hp
EG-01	Emergency Generator	Caterpillar	G3412C	755 hp
WH-01	Boiler	TBD	TBD	8.72 MMBtu/hr
FUG-01	Fugitive Leaks - Blowdowns	-	-	-
FUG-02	Fugitive Leaks - Piping	-	-	-
TK-1	Accumulator Tank	-	-	2,500 gal
TK-2	Hydrocarbon (Waste Oil) Tank	--	--	1,000 gal
LR-01	Truck Loading Rack	--	--	90 gal/min

Table N-2 Potential Emissions From Combustion Sources
SHP Mockingbird Hill Compressor Station - West Virginia

Turbine Operational Parameters:

Normal Hours of Operation:	8,677
Hours at Low Load (<50%)	0
Hours of Low Temp. (< 0 deg. F)	50
Hours of Start-up/Shut-down	33.3
Total Hours of Operation (hr/yr):	8,760

Generator Operational Parameters:

Normal Hours of Operation:	100

Boiler Operational Parameters:

Normal Hours of Operation:	8,760

Pre-Control Potential to Emit

Combustion Sources	Power Rating	Units	Fuel	Criteria Pollutants (tpy)								GHG Emissions (tpy)				HAP (tpy)
				NOx	CO	VOC	SO2	PMF	PMF-10	PMF-2.5	PMC	CO2	CH4	N2O	CO2e	Total HAP
Solar Titan 130 Turbine	21,765	hp	Natural Gas	26.6	43.1	2.41	2.58	4.36	4.36	4.36	10.8	90,075	6.52	2.27	90,915	1.05
Solar Titan 130 Turbine	21,765	hp	Natural Gas	26.6	43.1	2.41	2.58	4.36	4.36	4.36	10.8	90,075	6.52	2.27	90,915	1.05
Caterpillar G3412C Egen	755	hp	Natural Gas	0.166	0.140	0.0383	0.0002	2.12E-05	2.12E-05	2.12E-05	2.72E-03	40.4	0.343	0	48.9	0.0707
Boiler	8.72	MMBtu/hr	Natural Gas	1.87	3.15	0.206	0.0225	0.0711	0.0711	0.0711	0.213	4,493	0.0861	0.0824	4,520	0.0279
Total (tons/yr)				**55.3**	**89.5**	**5.07**	**5.18**	**8.80**	**8.80**	**8.80**	**21.81**	**184,683**	**13.5**	**4.63**	**186,400**	**2.20**

Turbine Control Efficiencies

Control Technology	NOx	CO	VOC
Oxidation Catalyst	-	80%	50%

Post-Control Potential to Emit

Combustion Sources	Power Rating	Units	Fuel	Criteria Pollutants (tpy)								GHG Emissions (tpy)				HAP (tpy)
				NOx	CO	VOC	SO2	PMF	PMF-10	PMF-2.5	PMC	CO2	CH4	N2O	CO2e	Total HAP
Solar Titan 130 Turbine	21,765	hp	Natural Gas	26.6	8.62	1.21	2.58	4.36	4.36	4.36	10.8	90,075	6.52	2.27	90,915	1.05
Solar Titan 130 Turbine	21,765	hp	Natural Gas	26.6	8.62	1.21	2.58	4.36	4.36	4.36	10.8	90,075	6.52	2.27	90,915	1.05
Caterpillar G3412C Egen	755	hp	Natural Gas	0.166	0.140	0.0383	1.61E-04	2.12E-05	2.12E-05	2.12E-05	0.003	40.4	0.343	0	48.9	0.071
Boiler	8.72	MMBtu/hr	Natural Gas	1.87	3.15	0.206	0.0225	0.0711	0.0711	0.0711	0.213	4,493	0.0861	0.0824	4,520	0.028
Total (tons/yr)				**55.3**	**20.5**	**2.66**	**5.18**	**8.80**	**8.80**	**8.80**	**21.81**	**184,683**	**13.5**	**4.63**	**186,400**	**2.20**

Notes:

(1) Turbine emissions are calculated by the following formula: ER * Run Hours / 2000 * (1 - Control Efficiency)
ER = Emission Rate for particular equipment and pollutant (lbs/hr)
2000 = the amount of lbs in a ton
(2) Emergency Generator emissions are calculated by the following formula: Power Rating * Run Hours * EF / 2000
Power Rating = Engine hp rating (hp)
EF = Emission Factor from either manufacturer's data or AP-42 (lb/hp-hr)
2000 = the amount of lbs in a ton
(3) Boiler emissions calculated by the following formula: EF * Power Rating * Run Hours / HHV / 2000
EF = AP-42 Emission Factor (lb/MMSCF)
Power Rating = Boiler Heat Capacity (MMBtu/hr)
HHV = Natural Gas High Heating Value (1020 MMBtu/MMSCF)
(4) Turbines are equipped with oxidation catalyst for control of CO (80%) and VOC (50%)
(5) Emergency generator engine hp taken from manufacturer data
(6) Boiler assumed to have low-NOx burners
(7) See the "HAP Emissions" worksheet for a more detailed breakdown of HAP emissions
(8) See Emissions Factors table for Emissions Factors for each operating scenario.
(9) Each start-up/shut-down event assumed to last 10 minutes

Table N-3 Event Based Potential Emissions From Combustion Sources
SHP Mockingbird Hill Compressor Station - West Virginia

Start-up Emissions

Combustion Sources	Power Rating	Units	Fuel	Start-up Events	Criteria Pollutants (tpy)			GHG Emissions (tpy)		
					NOx	CO	VOC	CO2	CH4	CO2e
Solar Titan 130 Turbine	21,765	hp	Natural Gas	100	0.0950	8.85	0.101	58.1	0.404	68.2
Solar Titan 130 Turbine	21,765	hp	Natural Gas	100	0.0950	8.85	0.101	58.1	0.404	68.2
Total (tons/yr)					**0.190**	**17.7**	**0.202**	**116.1**	**0.808**	**136.3**

Shutdown Emissions

Combustion Sources	Power Rating	Units	Fuel	Shutdown Events	Criteria Pollutants (tpy)			GHG Emissions (tpy)		
					NOx	CO	VOC	CO2	CH4	CO2e
Solar Titan 130 Turbine	21,765	hp	Natural Gas	100	0.120	10.4	0.119	63.6	0.476	75.5
Solar Titan 130 Turbine	21,765	hp	Natural Gas	100	0.120	10.4	0.119	63.6	0.476	75.5
Total (tons/yr)					**0.240**	**20.8**	**0.238**	**127**	**0.952**	**151.0**
Total SUSD Emissions (tons/yr)					**0.430**	**38.5**	**0.440**	**243.3**	**1.760**	**287**

Compressor Blowdown Emissions

Source Designation:	FUG-01

Blowdown Start-up Events

Blowdown from Start-up	1995	scf/event
Volumetric flow rate	385.5	scf-lbmol
Methane Molecular Weight	16	lb-lbmol
Methane Percent Volume	88%	%
Start-up Blowdown (methane)	73	lb/event

Blowdown Shutdown Events

Blowdown from Shutdown	73,800	scf/event
Volumetric flow rate	385.5	scf-lbmol
Methane Molecular Weight	16	lb-lbmol
Methane Percent Volume	88%	%
Shutdown Blowdown (methane)	2701	lb/event

Gas Composition

2774

Pollutant	Molecular Weight (lb/lb-mol)	Original Basis - Molar (Volume) Fraction (mol%)	Original Wt. Fraction[1] (wt. %)	Updated Gas Composition (vol. %)
Total Stream Molecular Weight	16.89			
Non-VOC				
Carbon Dioxide	44.01	*1.041%*	*2.71%*	**0.19%**
Nitrogen	28.01	*0.994%*	*1.65%*	**0.54%**
Methane	16.04	*94.21%*	*89.47%*	**88.18%**
Ethane	30.07	*2.923%*	*5.20%*	**10.30%**
VOC				
Propane	44.10	*0.546%*	*1.43%*	**0.54%**
n-Butane	58.12	*0.084%*	*0.29%*	**0.11%**
IsoButane	58.12	*0.079%*	*0.27%*	**0.05%**
n-Pentane	72.15	*0.022%*	*0.09%*	**0.00%**
IsoPentane	72.15	*0.024%*	*0.10%*	**0.00%**
n-Hexane	78.11	*0.032%*	*0.15%*	**0.09%**
n-Heptane	100.21	*0.049%*	*0.29%*	**0.00%**
Total VOC Fraction		*0.84%*	*2.62%*	**0.79%**
Total HAP Fraction		*0.03%*	*0.15%*	**0.09%**

Blowdown from Startup Events

Combustion Sources	Start-up Events	VOC	GHG Emissions (tpy)			HAPs
			CO2	CH4	CO2e	
Solar Titan 130 Turbine	100	0.104	0.022	3.651	91	0.018
Solar Titan 130 Turbine	100	0.104	0.022	3.651	91	0.018
Total (tons/yr)		**0.208**	**0.044**	**7**	**183**	**0.036**

Blowdown from Shutdown Events

Combustion Sources	Startup Events	VOC	GHG Emissions (tpy)			HAPs
			CO2	CH4	CO2e	
Solar Titan 130 Turbine	100	3.848	0.82	135.04	3,377	0.658
Solar Titan 130 Turbine	100	3.848	0.82	135.04	3,377	0.658
Total (tons/yr)		**7.697**	**1.63**	**270**	**6,754**	**1.316**

Site-Wide Blowdown Events

Site-Wide Blowdown	2,000,000	scf/event
Volumetric flow rate	385	scf-lbmol
Methane Molecular Weight	16	lb-lbmol
Methane Percent Volume	88%	%
Site-Wide Blowdown (methane)	73,288	lb/event

Blowdown from Site Wide Events

Combustion Sources	Startup Events	VOC	GHG Emissions (tpy)			HAPs
			CO2	CH4	CO2e	
SHP-M	1	1.04	0.22	36.6	916	0.1785
Total (tons/yr)		**1.04**	**0.22**	**36.6**	**916**	**0.1785**
Total Blowdown Emissions (tons/yr,		**8.9**	**1.9**	**314**	**7,853**	**1.530**

Table N-4 Combustion Source Criteria Pollutant Emission Factors
SHP Mockingbird Hill Compressor Station - West Virginia

Solar Turbine Normal Operation Emission Factors (lb/hr)														
Equipment Name	**Fuel**	**Units**	**NOx**	**CO**	**VOC**	**SO2**	**PMF**	**PMF-10**	**PMF-2.5**	**PMC**	**CO2**	**CH4**	**N2O**	**CO2e**
Solar Titan 130 Turbine	Natural Gas	lb/hr	5.70	9.60	0.550	0.59	1.00	1.00	1.00	2.46	20,565	1.49	0.52	20,757

Notes
(1) Pre-Control Emission Rates for NOx, CO, VOC, PMF, PMC, and CO2 taken from Solar Turbine Data at 100% load and 0 degrees F
(2) Emission Factors for SO2, CH4, N2O taken from AP-42 in (lbs/MMBtu) and multiplied by turbine fuel throughput by Solar Turbine at 100% load and 0 degree F to get Emission Rates
(3) Assume PMF=PMF-10=PMF-2.5; Filterable and Condensable based on Solar Turbine Emission Factor and ratio of AP-42 Table 3.1 factors
(4) CO2e emission rate calculated by multiplying each GHG (CO2, CH4, N2O) by its Global Warming Potential (GWP) and adding them together
(5) CO2 GWP = 1; CH4 GWP = 25; N2O GWP = 298 [40 CFR Part 98]

Solar Turbine Alternate Operation Emission Factors (lb/hr)								
			< 0 degrees F			**Solar Turbine Low Load F Operation**		
Equipment Name	**Fuel**	**Units**	**NOx**	**CO**	**VOC**	**NOx**	**CO**	**VOC**
Solar Titan 130 Turbine	Natural Gas	lb/hr	76.0	57.6	1.10	44.33	3,840	22.0

Notes
(1) Pre-Control low temperature Emission Rates for NOx, CO, VOC. Conservatively assume 120 ppm NOx, 150 ppm CO, and 5 ppm VOC (10% of UHC) per Table 2 of Solar PIL 167
(2) Pre-Control low load Emission Rates for NOx, CO, VOC. Conservatively assume 70 ppm NOx, 10,000 ppm CO, and 100 ppm VOC (10% of UHC) per Table 4 of Solar PIL 167

Solar Turbine Start-up and Shutdown Emission Factors (lb/event)														
			Start-up EFs						**Shutdown Efs**					
Equipment Name	**Fuel**	**Units**	**NOx**	**CO**	**VOC**	**CO2**	**CH4**	**CO2e**	**NOx**	**CO**	**VOC**	**CO2**	**CH4**	**CO2e**
Solar Titan 130 Turbine	Natural Gas	lb/event	1.90	177	2.02	1,161	8.08	1363	2.40	208	2.38	1,272	9.52	1,510

Notes
(1) Start-up and Shutdown Emissions based on Solar Turbines Incorporated Product Information Letter 170: Emission Estimates at Start-up, Shutdown, and Commissioning for SoLoNOx Combustion Products (13 June 2012). Emission Estimates do not include SO2, PM, N2O, or any HAPs.
(2) VOCs assumed to be 20% of UHC and CH4 assumed to be 80% of UHC.
(3) CO2e emission rate calculated by multiplying each GHG (CO2, CH4) by its Global Warming Potential (GWP) and adding them together
(4) CO2 GWP = 1; CH4 GWP = 25; [40 CFR Part 98]

Engine and Boiler Emission Factors														
Equipment Type	**Fuel**	**Units**	**NOx**	**CO**	**VOC**	**SO2**	**PMF**	**PMF-10**	**PMF-2.5**	**PMC**	**CO2**	**CH4**	**N2O**	**CO2e**
Boiler < 100 MMBtu	Natural Gas	lb/MMscf	50	84	5.5	0.6	1.9	1.9	1.9	5.7	120,000	2.3	2.2	120713
Engine 4 SLB	Natural Gas	lb/MMBtu				0.000588	7.71E-05	7.71E-05	7.71E-05	0.00991	110	1.25	0	141
500 KW Caterpillar Egen	Natural Gas	lb/hp-hr	0.004408	0.003703	0.001014	4.277E-06	5.61E-07	5.61E-07	5.61E-07	7.20853E-05	1.06894	0.009093	0	1

Notes
(1) NOx, CO, VOC, and PMF-10 Emission Factors for Boilers < 100 MMBtu from ETI Combustion Analysis June 2015
(2) All other emission factors for natural gas boilers taken from AP-42 Tables 1.4-1 & 1.4-2
(3) Emission Factors for 4 SLB engine taken from AP-42 Table 3.2-2
(4) NOx, CO, VOC, and CO2 emission factors for Caterpillar Egens taken from Caterpillar Manufacturer data
(5) SO2, PMF, PMF-10, PMF-2.5, PMC, CH4, and N2O Emission factors for Caterpillar Egens taken from AP-42 Table 3.2-1 and converted using manufacturer fuel data
(6) Assume PMF=PMF-10=PMF-2.5
(7) CO2e emission rate calculated by multiplying each GHG (CO2, CH4, N2O) by its Global Warming Potential (GWP) and adding them together
(8) CO2 GWP = 1; CH4 GWP = 25; N2O GWP = 298 [40 CFR 98]

Table N-5 Hazardous Air Pollutant (HAP) Emissions From Combustion Sources

SHP Mockingbird Hill Compressor Station - West Virginia

Annual HAP Emissions (lb/yr)				
Quantity @ SHP-Mockingbird		**2**	**1**	**1**
Pollutant	**HAP?**	**Solar Titan 130 Turbine**	**Boiler < 100 MMBtu**	**500 KW Caterpillar Egen**
		20500	**8.72**	**755**
		hp	**MMBTU/hr**	**bhp**
1,1,2,2-Tetrachloroethane	Yes			0.023
1,1,2-Trichloroethane	Yes			0.018
1,1-Dichloroethane	Yes			0.013
1,2,3-Trimethylbenzene	No			0.013
1,2,4-Trimethylbenzene	No			0.008
1,2-Dichloroethane	Yes			0.013
1,2-Dichloropropane	Yes			0.015
1,3,5-Trimethylbenzene	No			0.019
1,3-Butadiene	Yes			0.150
1,3-Dichloropropene	Yes			0.015
2,2,4-Trimethylpentane	Yes			0.141
2-Methylnaphthalene	No		0.002	0.019
3-Methylchloranthrene	No		0.000	
7,12-Dimethylbenz(a)anthracene	No		0.001	
Acenaphthene	No		0.000	0.001
Acenaphthylene	No		0.000	0.003
Acetaldehyde	Yes			4.707
Acrolein	Yes			2.894
Anthracene	No		0.000	
Benz(a)anthracene	No		0.000	
Benzene	Yes		0.157	0.248
Benzo(a)pyrene	No		0.000	
Benzo(b)fluoranthene	No		0.000	0.000
Benzo(e)pyrene	No			0.000
Benzo(g,h,i)perylene	No		0.000	0.000
Benzo(k)fluoranthene	No		0.000	
Biphenyl	Yes			0.119
Butane	No		157.268	0.305
Butyr/Isobutyraldehyde	No			0.057
Carbon Tetrachloride	Yes			0.021
Chlorobenzene	Yes			0.017
Chloroethane	Yes			0.001
Chloroform	Yes			0.016
Chrysene	No		0.000	0.000
Cyclohexane	No			
Cyclopentane	No			0.128
Dibenzo(a,h)anthracene	No		0.000	
Dichlorobenzene	Yes		0.090	
Ethane	No		232.157	59.119
Ethylbenzene	Yes			0.022
Ethylene Dibromide	Yes			0.025
Fluoranthene	No		0.000	0.001
Fluorene	No		0.000	0.003
Formaldehyde	Yes	1984.624	5.617	44.941
Hexane (or n-Hexane)	Yes		134.801	0.625
Indeno(1,2,3-c,d)pyrene	No		0.000	
Isobutane	No			
Methanol	Yes			1.408
Methylcyclohexane	No			0.693
Methylene Chloride	Yes			0.011
n-Nonane	No			0.062
n-Octane	No			0.198
Naphthalene	Yes		0.046	0.042
PAH	Yes			0.015
Pentane (or n-Pentane)	No		194.712	1.464
Perylene	No			
Phenanthrene	No		0.001	0.006
Phenol	Yes			0.014
Propane	No		119.823	23.591
Propylene Oxide	Yes			
Pyrene	No		0.000	0.001
Styrene	Yes			0.013
Tetrachloroethane	No			0.001
Toluene	Yes		0.255	0.230
Vinyl Chloride	Yes			0.008
Xylene	Yes			0.104

Table N-5 Hazardous Air Pollutant (HAP) Emissions From Combustion Sources

SHP Mockingbird Hill Compressor Station - West Virginia

Annual HAP Emissions (lb/yr)				
Quantity @ SHP-Mockingbird		**2**	**1**	**1**
Pollutant	**HAP?**	**Solar Titan 130 Turbine**	**Boiler < 100 MMBtu**	**500 KW Caterpillar Egen**
		20500	**8.72**	**755**
		hp	**MMBTU/hr**	**bhp**
Arsenic	Yes		0.015	
Barium	No		0.330	
Beryllium	Yes		0.001	
Cadmium	Yes		0.082	
Chromium	Yes		0.105	
Cobalt	Yes		0.006	
Copper	No		0.064	
Manganese	Yes		0.028	
Mercury	Yes		0.019	
Molybdenum	No		0.082	
Nickel	Yes		0.157	
Selenium	Yes		0.002	
Vanadium	No		0.172	
Zinc	No		2.172	
Lead	Yes		0.037	
Total HAPs		2101.771		
Total HAP/unit (lb/yr)		**2,102**	**141**	**56**
Total HAP/unit (TPY)		**1.05**	**0.071**	**0.028**

Hazardous Air Pollutant

(1) Emissions above are on a per unit basis
(2) Calculations for the Caterpillar emergency generator assume 100 hours of operation; all other calculations assume 8,760 hours of operation
(3) Heat rates for Solar Turbines taken from Solar Datasheets
(4) Solar turbines have a 50% HAP control efficiency due to the Oxidation Catalyst

Table N-6 Combustion Source HAP Emission Factors
SHP Mockingbird Hill Compressor Station - West Virginia

Pollutant	HAP?	Emission Factors		
		Solar Titan 130 Turbine	Boiler < 100 MMBtu	500 KW Caterpillar Egen
		lb/MMBtu	lb/MMscf	lb/MMBtu
1,1,2,2-Tetrachloroethane	Yes			4.0E-05
1,1,2-Trichloroethane	Yes			3.2E-05
1,1-Dichloroethane	Yes			2.4E-05
1,2,3-Trimethylbenzene	No			2.3E-05
1,2,4-Trimethylbenzene	No			1.4E-05
1,2-Dichloroethane	Yes			2.4E-05
1,2-Dichloropropane	Yes			2.7E-05
1,3,5-Trimethylbenzene	No			3.4E-05
1,3-Butadiene	Yes			2.7E-04
1,3-Dichloropropene	Yes			2.6E-05
2,2,4-Trimethylpentane	Yes			2.5E-04
2-Methylnaphthalene	No		2.4E-05	3.3E-05
3-Methylchloranthrene	No		1.8E-06	
7,12-Dimethylbenz(a)anthracene	No		1.6E-05	
Acenaphthene	No		1.8E-06	1.3E-06
Acenaphthylene	No		1.8E-06	5.5E-06
Acetaldehyde	Yes			8.4E-03
Acrolein	Yes			5.1E-03
Anthracene	No		2.4E-06	
Benz(a)anthracene	No		1.8E-06	
Benzene	Yes		2.1E-03	4.4E-04
Benzo(a)pyrene	No		1.2E-06	
Benzo(b)fluoranthene	No		1.8E-06	1.7E-07
Benzo(e)pyrene	No			4.2E-07
Benzo(g,h,i)perylene	No		1.2E-06	4.1E-07
Benzo(k)fluoranthene	No		1.8E-06	
Biphenyl	Yes			2.1E-04
Butane	No		2.1E+00	5.4E-04
Butyr/Isobutyraldehyde	No			1.0E-04
Carbon Tetrachloride	Yes			3.7E-05
Chlorobenzene	Yes			3.0E-05
Chloroethane	Yes			1.9E-06
Chloroform	Yes			2.9E-05
Chrysene	No		1.8E-06	6.9E-07
Cyclohexane	No			
Cyclopentane	No			2.3E-04
Dibenzo(a,h)anthracene	No		1.2E-06	
Dichlorobenzene	Yes		1.2E-03	
Ethane	No		3.1E+00	1.1E-01
Ethylbenzene	Yes			4.0E-05
Ethylene Dibromide	Yes			4.4E-05
Fluoranthene	No		3.0E-06	1.1E-06
Fluorene	No		2.8E-06	5.7E-06
Formaldehyde	Yes	2.9E-03	7.5E-02	2.7E-01
Hexane (or n-Hexane)	Yes		1.8E+00	1.1E-03
Indeno(1,2,3-c,d)pyrene	No		1.8E-06	
Isobutane	No			
Methanol	Yes			2.5E-03
Methylcyclohexane	No			1.2E-03
Methylene Chloride	Yes			2.0E-05
n-Nonane	No			1.1E-04
n-Octane	No			3.5E-04
Naphthalene	Yes		6.1E-04	7.4E-05
PAH	Yes			2.7E-05
Pentane (or n-Pentane)	No		2.6E+00	2.6E-03
Perylene	No			
Phenanthrene	No		1.7E-05	1.0E-05
Phenol	Yes			2.4E-05
Propane	No		1.6E+00	4.2E-02
Propylene Oxide	Yes			
Pyrene	No		5.0E-06	1.4E-06
Styrene	Yes			2.4E-05
Tetrachloroethane	No			2.5E-06
Toluene	Yes		3.4E-03	4.1E-04
Vinyl Chloride+A32	Yes			1.5E-05
Xylene	Yes			1.8E-04

Table N-6 Combustion Source HAP Emission Factors
SHP Mockingbird Hill Compressor Station - West Virginia

Pollutant	HAP?	Emission Factors		
		Solar Titan 130 Turbine	Boiler < 100 MMBtu	500 KW Caterpillar Egen
		lb/MMBtu	lb/MMscf	lb/MMBtu
Arsenic	Yes		2.0E-04	
Barium	No		4.4E-03	
Beryllium	Yes		1.2E-05	
Cadmium	Yes		1.1E-03	
Chromium	Yes		1.4E-03	
Cobalt	Yes		8.4E-05	
Copper	No		8.5E-04	
Manganese	Yes		3.8E-04	
Mercury	Yes		2.6E-04	
Molybdenum	No		1.1E-03	
Nickel	Yes		2.1E-03	
Selenium	Yes		2.4E-05	
Vanadium	No		2.3E-03	
Zinc	No		2.9E-02	
Lead	Yes		5.0E-04	
Total Haps		3.1E-03		

Hazardous Air Pollutant

Notes:
(1) Emission factors for Solar and Capstone natural gas turbines from AP-42 Table 3.1-3
(2) Emission factors for natural gas boilers from AP-42 Tables 1.4-2, 1.4-3, and 1.4-4
(3) Emission factors for 4 SLB natural gas engines / Caterpillar natural gas emergency generators taken from AP-42 Table 3.2-1
(4) Emission factors for Solar natural gas turbines converted using 1 KWh = 3412 Btu and 1 kw = 1.341 hp
(5) Emission Factors (lb/MMBtu) for Formaldehyde and Total HAPs for Solar Turbines from Solar PIL 168
(6) Emission factor for Formaldehyde for Caterpillar natural gas emergency generators is in units of g/bhp-hr, based on vendor specifications

Table N-7 Potential Emissions From Fugitive Leaks
SHP Mockingbird Hill Compressor Station - West Virginia

Fugitive Emissions (FUG)

Source Designation:

Operational Parameters:

Annual Hours of Operation (hr/yr):	8,760

Pipeline Natural Gas Fugitive Emissions

Equipment	Service	Emission Factor[1]	Source Count[2]	Total HC Potential Emissions		VOC Weight Fraction	VOC Emissions	CO_2 Weight Fraction	CO_2 Emissions	CH_4 Weight Fraction	CH_4 Emissions	HAP Weight Fraction	HAP Emissions
		kg/hr/source		lb/hr	tpy		tpy		tpy		tpy		tpy
Valves	Gas	4.50E-03	782	7.76	34.0	0.024	0.809	0.0051	0.172	0.837	28.5	4.07E-03	0.138
Pump Seals	Gas	2.40E-03		0.000	0.000	0.024	0.000	0.0051	0.000	0.837	0.000	4.07E-03	0.000
Others (compressors and others)	Gas	8.80E-03	2	0.039	0.170	0.024	0.004	0.0051	0.001	0.837	0.142	4.07E-03	6.92E-04
Connectors	Gas	2.00E-04	1	4.41E-04	0.002	0.024	4.60E-05	0.0051	9.76E-06	0.837	0.002	4.07E-03	7.86E-06
Flanges	Gas	3.90E-04	437	0.376	1.65	0.024	0.039	0.0051	0.008	0.837	1.38	4.07E-03	0.007
Open-ended lines	Gas	2.00E-03		0.000	0.000	0.024	0.000	0.0051	0.000	0.837	0.000	4.07E-03	0.000
			Total	8.17	35.8	-	0.852	-	0.181	-	30.0	-	0.146

1. EPA Protocol for Equipment Leaks Emissions Estimate (EPA-453/R-95-017) Table 2-4: Oil and Gas Production Operations Emission Factors.
2. Component count based on Basic Systems Engineering Estimate.

Equations:

Potential Emissions (lb/hr) = Emission Factor (kg/hr/source) * Source Count * (2.20462 lb/1 kg)

Potential Emissions (tons/yr) = $(lb/hr)_{Potential}$ × Hours of Operation (hr/yr) × (1 ton/2,000 lb)

Table N-8a Tank Emissions
SHP Mockingbird Hill Compressor Station - West Virginia

Source Designation:	TK-1, TK-2

Tank Parameters

Source	Type of Tank	Contents	Capacity	Throughput	Tank Diam.	Tank Length	Paint Color	Paint Condition
			(gal)	gal/yr	ft	ft		
TK-1	Horizontal, fixed	Produced Fluids	2,500	12,500	4.61	20	Light Grey	Good
TK-2	Horizontal, fixed	Lube Oil	1,000	5,000	4.12	10	Light Grey	Good

Total Emissions

Source	VOC Emissions							
	Flashing Losses		Working Losses		Breathing Losses		Total Losses	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
TK-1[1]	--	--	--	--	--	--	0.080	0.350
TK-2[2]	NA	NA	5.14E-07	2.25E-06	1.48E-06	6.50E-06	2.00E-06	8.75E-06

1. Losses were calculated for TK-1 using E&P Tanks Software. See attached for output.
2. Losses were calculated for TK-2 using EPA's TANKS 4.09d software with default breather vent settings.

Table N-8b Pipeline to Truck Liquid Loading Rack Emissions
SHP Mockingbird Hill Compressor Station - West Virginia

Source Designation:	LR-1

Chemical Parameters

Chemical	Vapor Mol. Weight [1] (lb/lb-mol)	Avg. Vapor Pressure [1] (psia)	Avg. Temperature [2] (deg. R)	Saturation Factor [3]	Throughput [4] Mgal/yr
Pipeline Liquids	43.86	7.70	520	0.6	12.50

References:

1. Vapor molecular weight and vapor pressure based on E&P output for Pipeline Liquids Storage Tank TK-1.
2. Based on average ambient temperature data for the area.
3. Saturation Factor based on "Submerged loading: dedicated normal service" in Table 5.2-1 of AP-42, Ch. 5.2.

Total Potential Emissions

Source	Total Loading Losses[1]		Pump Capacity [2]	Max Hourly Losses
	Average (lbs/Mgal)	Annual (tpy)	(gal/min)	lb/hr
Pipeline Liquids Truck Loading	4.86	0.03	90	26.2

References:

1. AP-42, Ch. 5.2, Equation 1 (Loading Loss = 12.46 x (Saturation Factor x TVP x Molecular Weight) / Temp.)
2. Assumed pump rate.

Speciated Potential Emissions

Source	Contents	VOC Weight Fraction[1] (%)	HAP Weight Fraction[1] (%)	Total VOC Emissions		Total HAP Emissions	
				lb/hr	tpy	lb/hr	tpy
Pipeline Liquids Truck Loading	Pipeline Liquids	20%	0.002%	5.25	0.006	4.98E-04	5.77E-07

References:

1. VOC and HAP weight fractions are based on 118-PF-04 tank emissions speciation.

Table N-9 Project Potential Emissions

SHP Mockingbird Hill Compressor Station - West Virginia

Combustion Sources	ID	Criteria Pollutants (tpy)								GHG Emissions (tpy)				HAP (tpy)
		NOx	CO	VOC	SO2	PMF	PMF-10	PMF-2.5	PMC	CO2	CH4	N2O	CO2e	Total HAP
Solar Titan 130 Turbine	CT-01	26.8	27.8	1.43	2.58	4.36	4.36	4.36	10.8	90,196	7.40	2.27	91,059	1.05
Solar Titan 130 Turbine	CT-02	26.8	27.8	1.43	2.58	4.36	4.36	4.36	10.8	90,196	7.40	2.27	91,059	1.05
Caterpillar G3412C Egen	EG-01	0.166	0.140	0.0383	1.61E-04	2.12E-05	2.12E-05	2.12E-05	0.003	40.4	0.343	0	48.93	0.071
Boiler	WH-01	1.87	3.15	0.206	0.0225	0.0711	0.0711	0.0711	0.213	4,493	0.0861	0.0824	4,520	0.028
Fugitive Leaks - Blowdowns	FUG-01	-	-	8.9	-	-	-	-	-	1.9	314		7,853	1.530
Fugitive Leaks - Piping	FUG-02	-	-	0.852	-	-	-	-	-	0.181	30.0	-	750	0.146
Accumulator Tank	TK-1	-	-	0.350	-	-	-	-	-	-	-	-	-	-
Hydrocarbon (Waste Oil) Tank	TK-2	-	-	8.75E-06	-	-	-	-	-	-	-	-	-	-
Truck Loading Track	LR-01	-	-	0.006	-	-	-	-	-	-	-	-	-	5.77E-07
Total (tons/yr)		**55.7**	**59.0**	**13.3**	**5.18**	**8.80**	**8.80**	**8.80**	**21.8**	**184,928**	**359**	**4.63**	**195,289**	**3.88**

Solar Turbines Emissions Estimates

Titan 130-20502S

Assumptions: pipeline natural gas, sea level, 4"/4" inlet/outlet losses, nominal performance

50% load

Temp, F	HP	fuel flow, mmbtu/hr LHV	Thermal Eff, %	NOx (ppm)	NOx (lb/hr)	CO (ppm)	CO (lb/hr)	UHC (ppm)	UHC (lb/hr)	VOC (ppm)	VOC (lb/hr)	CO2 lb/hr	PM10/2.5 lb/mmbtu	PM10/2.5 lb/hr	Exhaust Temp (F)	Exhaust Flow (lb/hr)
0	10883	90.71	30.53	9	3.2	25	5.5	25	3.2	2.5	0.3	11896	0.02	2.0	704	334,570
59	10005	105.64	24.10	9	3.8	25	6.4	25	3.7	2.5	0.4	13738	0.02	2.3	992	312,106
100	8135	96.16	21.52	9	3.4	25	5.7	25	3.3	2.5	0.3	12273	0.02	2.1	1051	272535

75% load

Temp, F	HP	fuel flow, mmbtu/hr LHV	Thermal Eff, %	NOx (ppm)	NOx (lb/hr)	CO (ppm)	CO (lb/hr)	UHC (ppm)	UHC (lb/hr)	VOC (ppm)	VOC (lb/hr)	CO2 lb/hr	PM10/2.5 lb/mmbtu	PM10/2.5 lb/hr	Exhaust Temp (F)	Exhaust Flow (lb/hr)
0	16324	137.74	30.15	9	5.0	25	8.4	25	4.8	2.5	0.5	18019	0.02	3.0	899	412,957
59	15007	124.31	30.72	9	4.4	25	7.5	25	4.3	2.5	0.4	16161	0.02	2.7	955	357,451
100	12202	109.82	28.27	9	3.8	25	6.5	25	3.7	2.5	0.4	14013	0.02	2.4	1019	303557

100% load

Temp, F	HP	fuel flow, mmbtu/hr LHV	Thermal Eff, %	NOx (ppm)	NOx (lb/hr)	CO (ppm)	CO (lb/hr)	UHC (ppm)	UHC (lb/hr)	VOC (ppm)	VOC (lb/hr)	CO2 lb/hr	PM10/2.5 lb/mmbtu	PM10/2.5 lb/hr	Exhaust Temp (F)	Exhaust Flow (lb/hr)
0	21765	157.33	35.20	9	5.7	25	9.6	25	5.5	2.5	0.6	20565	0.02	3.5	900	437,973
59	20010	142.45	35.74	9	5.1	25	8.6	25	4.9	2.5	0.5	18511	0.02	3.1	944	392,270
100	16269	125.42	33.01	9	4.4	25	7.5	25	4.3	2.5	0.4	16001	0.02	2.8	994	339519

G3412C

PACKAGED GENSET APPLICATION

GAS ENGINE SITE SPECIFIC TECHNICAL DATA
Dominion - Mockingbird Hill

CATERPILLAR®

ENGINE SPEED (rpm):	1800	RATING STRATEGY:	STANDARD
COMPRESSION RATIO:	11.4	RATING LEVEL:	STANDBY
AFTERCOOLER TYPE:	SCAC	FUEL SYSTEM:	LPG IMPCO
AFTERCOOLER WATER INLET (°F):	130		WITH AIR FUEL RATIO CONTROL
JACKET WATER OUTLET (°F):	210	**SITE CONDITIONS:**	
ASPIRATION:	TA	FUEL:	Mockingbird Hill
COOLING SYSTEM:	JW+OC, AC	FUEL PRESSURE RANGE(psig): (See note 1)	1.5-5.0
CONTROL SYSTEM:	ADEM4	FUEL METHANE NUMBER:	73.5
EXHAUST MANIFOLD:	WC	FUEL LHV (Btu/scf):	992
COMBUSTION:	LOW EMISSION	ALTITUDE(ft):	930
NOx EMISSION LEVEL (g/bhp-hr NOx):	2.0	MAXIMUM INLET AIR TEMPERATURE(°F):	100
FAN POWER (bhp):	46	STANDARD RATED POWER:	755 bhp@1800rpm
SET POINT TIMING:	19	POWER FACTOR:	0.8
		VOLTAGE(V):	480-600

				MAXIMUM RATING	SITE RATING AT MAXIMUM INLET AIR TEMPERATURE		
RATING		**NOTES**	**LOAD**	**100%**	**100%**	**75%**	**50%**
PACKAGE POWER	(WITH FAN)	(2)(3)	ekW	500	499	374	249
PACKAGE POWER	(WITH FAN)	(2)(3)	kVA	625	623	468	312
ENGINE POWER	(WITHOUT FAN)	(3)	bhp	755	753	576	400
INLET AIR TEMPERATURE			°F	99	100	100	100
GENERATOR EFFICIENCY		(2)	%	94.6	94.6	94.8	94.7
PACKAGE EFFICIENCY	(ISO 3046/1)	(4)	%	31.7	31.6	30.0	27.2
THERMAL EFFICIENCY		(5)	%	44.2	44.2	47.4	52.2
TOTAL EFFICIENCY		(6)	%	75.9	75.8	77.4	79.4
ENGINE DATA							
PACKAGE FUEL CONSUMPTION	(ISO 3046/1)	(7)	Btu/ekW-hr	10779	10783	11385	12547
PACKAGE FUEL CONSUMPTION	(NOMINAL)	(7)	Btu/ekW-hr	10988	10993	11606	12790
ENGINE FUEL CONSUMPTION	(NOMINAL)	(7)	Btu/bhp-hr	7274	7276	7542	7980
AIR FLOW (@inlet air temp, 14.7 psia)	(WET)	(8)(9)	ft3/min	1622	1621	1230	834
AIR FLOW	(WET)	(8)(9)	lb/hr	6908	6893	5229	3545
FUEL FLOW (60ºF, 14.7 psia)			scfm	92	92	73	54
INLET MANIFOLD PRESSURE		(10)	in Hg(abs)	69.2	69.1	53.7	38.8
EXHAUST TEMPERATURE - ENGINE OUTLET		(11)	°F	793	793	761	738
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia)	(WET)	(12)(9)	ft3/min	3927	3918	2905	1942
EXHAUST GAS MASS FLOW	(WET)	(12)(9)	lb/hr	7167	7152	5434	3695
EMISSIONS DATA - ENGINE OUT							
NOx (as NO2)		(13)(14)	g/bhp-hr	2.00	2.00	2.00	2.00
CO		(13)(14)	g/bhp-hr	1.68	1.68	1.84	1.76
THC (mol. wt. of 15.84)		(13)(14)	g/bhp-hr	4.60	4.61	4.80	4.84
NMHC (mol. wt. of 15.84)		(13)(14)	g/bhp-hr	0.97	0.97	1.01	1.02
NMNEHC (VOCs) (mol. wt. of 15.84)		(13)(14)(15)	g/bhp-hr	0.46	0.46	0.48	0.48
HCHO (Formaldehyde)		(13)(14)	g/bhp-hr	0.27	0.27	0.27	0.27
CO2		(13)(14)	g/bhp-hr	485	485	480	469
EXHAUST OXYGEN		(13)(16)	% DRY	8.3	8.3	8.2	7.9
HEAT REJECTION							
LHV INPUT		(17)	Btu/min	91531	91372	72355	53157
HEAT REJ. TO JACKET WATER (JW)		(18)	Btu/min	21332	21329	19903	17671
HEAT REJ. TO ATMOSPHERE		(18)	Btu/min	3661	3655	2894	2126
HEAT REJ. TO LUBE OIL (OC)		(18)	Btu/min	3373	3373	3147	2794
HEAT REJECTION TO EXHAUST (LHV TO 350°F)		(18)	Btu/min	14191	14153	10002	6439
HEAT REJ. TO AFTERCOOLER (AC)		(18)(19)	Btu/min	6452	6427	3946	1645

COOLING SYSTEM SIZING CRITERIA				
TOTAL JACKET WATER CIRCUIT (JW+OC)	(20)	Btu/min	27512	27509
TOTAL AFTERCOOLER CIRCUIT (AC)	(20)	Btu/min	8024	8062
HEAT REJECTION TO EXHAUST (LHV TO 350°F)	(20)	Btu/min	15610	15568
A cooling system safety factor of 0% has been added to the cooling system sizing criteria.				

MINIMUM HEAT RECOVERY				
TOTAL JACKET WATER CIRCUIT (JW+OC)	(21)	Btu/min	21897	21894
TOTAL AFTERCOOLER CIRCUIT (AC)	(21)	Btu/min	6129	6106
HEAT REJECTION TO EXHAUST(LHV TO 350°F)	(21)	Btu/min	11663	11599

CONDITIONS AND DEFINITIONS

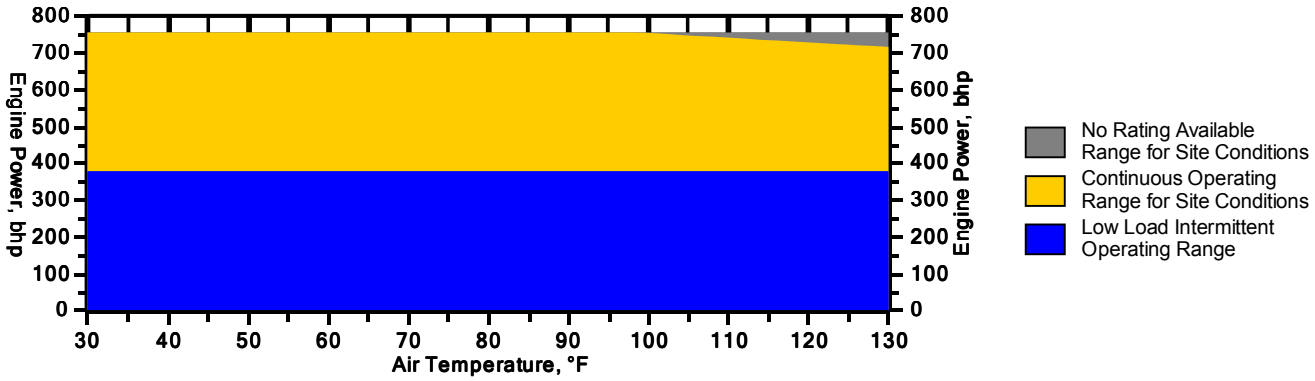
Engine rating obtained and presented in accordance with ISO 3046/1, adjusted for fuel, site altitude and site inlet air temperature. 100% rating at maximum inlet air temperature is the maximum engine capability for the specified fuel at site altitude and maximum site inlet air temperature. Maximum rating is the maximum capability at the specified aftercooler inlet temperature for the specified fuel at site altitude and reduced inlet air temperature. Lowest load point is the lowest continuous duty operating load allowed. No overload permitted at rating shown.

For notes information consult page three.

PREPARED BY: Anthony Fisher, Cleveland Brothers
Data generated by Gas Engine Rating Pro Version 6.04.00
Ref. Data Set EM1888-01-001, Printed 11Apr2017

Engine Power vs. Inlet Air Temperature

Data represents temperature sweep at 930 ft and 1800 rpm



NOTES

1. Fuel pressure range specified is to the engine fuel pressure regulator. Additional fuel train components should be considered in pressure and flow calculations.

2. Generator efficiencies, power factor, and voltage are based on specified generator. [Package Power (ekW) is calculated as: (Engine Power (bkW) - Fan Power (bkW)) x Generator Efficiency], [Package Power (kVA) is calculated as: (Engine Power (bkW) - Fan Power (bkW)) x Generator Efficiency / Power Factor]

3. Rating is with two engine driven water pumps. Tolerance is (+)3, (-)0% of full load.

4. Package Effieciency published in accordance with ISO 3046/1.

5. Thermal Efficiency is calculated based on energy recovery from the jacket water, lube oil, and exhaust to 350ºF with engine operation at ISO 3046/1 Package Efficiency, and assumes unburned fuel is converted in an oxidation catalyst.

6. Total efficiency is calculated as: Package Efficiency + Thermal Efficiency. Tolerance is ±10% of full load data.

7. ISO 3046/1 Package fuel consumption tolerance is (+)5, (-)0% at the specified power factor. Nominal package and engine fuel consumption tolerance is ± 3.0% of full load data at the specified power factor.

8. Air flow value is on a 'wet' basis. Flow is a nominal value with a tolerance of ± 5 %.

9. Inlet and Exhaust Restrictions must not exceed A&I limits based on full load flow rates from the standard technical data sheet.

10. Inlet manifold pressure is a nominal value with a tolerance of ± 5 %.

11. Exhaust temperature is a nominal value with a tolerance of (+)63°F, (-)54°F.

12. Exhaust flow value is on a "wet" basis. Flow is a nominal value with a tolerance of ± 6 %.

13. Emissions data is at engine exhaust flange prior to any after treatment.

14. NOx tolerance's are ± 18% of specified value. All other emission values listed are higher than nominal levels to allow for instrumentation, measurement, and engine-to-engine variations. They indicate the maximum values expected under steady state conditions. Fuel methane number cannot vary more than ± 3. THC, NMHC, and NMNEHC do not include aldehydes

15. VOCs - Volatile organic compounds as defined in US EPA 40 CFR 60, subpart JJJJ

16. Exhaust Oxygen level is the result of adjusting the engine to operate at the specified NOx level. Tolerance is ± 0.5.

17. LHV rate tolerance is ± 3.0%.

18. Heat rejection values are representative of site conditions. Tolerances, based on treated water, are ± 10% for jacket water circuit, ± 50% for atmosphere, ± 20% for lube oil circuit, ± 10% for exhaust, and ± 5% for aftercooler circuit.

19. Aftercooler heat rejection is nominal for site conditions and does not include an aftercooler heat rejection factor. Aftercooler heat rejection values at part load are for reference only.

20. Cooling system sizing criteria represent the expected maximum circuit heat rejection for the ratings at site, with applied plus tolerances. Total circuit heat rejection is calculated using formulas referenced in the notes on the standard tech data sheet with the following qualifications. Aftercooler heat rejection data (AC) is based on the standard rating. Jacket Water (JW) and Oil Cooler (OC) heat rejection values are based on the respective site or maximum column. Aftercooler heat rejection factors (ACHRF) are specific for the site elevation and inlet air temperature specified in the site or maximum column, referenced from the table on the standard data sheet

21. Minimum heat recovery values represent the expected minimum heat recovery for the site, with applied minus tolerances. Do not use these values for cooling system sizing.

Constituent	Abbrev	Mole %	Norm
Water Vapor	H2O	0.0000	0.0000
Methane	CH4	88.1750	88.1750
Ethane	C2H6	10.2990	10.2990
Propane	C3H8	0.5370	0.5370
Isobutane	iso-C4H1O	0.0530	0.0530
Norbutane	nor-C4H1O	0.1130	0.1130
Isopentane	iso-C5H12	0.0000	0.0000
Norpentane	nor-C5H12	0.0000	0.0000
Hexane	C6H14	0.0880	0.0880
Heptane	C7H16	0.0000	0.0000
Nitrogen	N2	0.5410	0.5410
Carbon Dioxide	CO2	0.1940	0.1940
Hydrogen Sulfide	H2S	0.0000	0.0000
Carbon Monoxide	CO	0.0000	0.0000
Hydrogen	H2	0.0000	0.0000
Oxygen	O2	0.0000	0.0000
Helium	HE	0.0000	0.0000
Neopentane	neo-C5H12	0.0000	0.0000
Octane	C8H18	0.0000	0.0000
Nonane	C9H20	0.0000	0.0000
Ethylene	C2H4	0.0000	0.0000
Propylene	C3H6	0.0000	0.0000
TOTAL (Volume %)		100.0000	100.0000

Fuel Makeup:	Mockingbird Hill
Unit of Measure:	English

Calculated Fuel Properties

Caterpillar Methane Number:	73.5
Lower Heating Value (Btu/scf):	992
Higher Heating Value (Btu/scf):	1099
WOBBE Index (Btu/scf):	1263
THC: Free Inert Ratio:	135.05
Total % Inerts (% N2, CO2, He):	0.74%
RPC (%) (To 905 Btu/scf Fuel):	100%
Compressibility Factor:	0.998
Stoich A/F Ratio (Vol/Vol):	10.34
Stoich A/F Ratio (Mass/Mass):	16.74
Specific Gravity (Relative to Air):	0.618
Fuel Specific Heat Ratio (K):	1.300

CONDITIONS AND DEFINITIONS

Caterpillar Methane Number represents the knock resistance of a gaseous fuel. It should be used with the Caterpillar Fuel Usage Guide for the engine and rating to determine the rating for the fuel specified. A Fuel Usage Guide for each rating is included on page 2 of its standard technical data sheet.

RPC always applies to naturally aspirated (NA) engines, and turbocharged (TA or LE) engines only when they are derated for altitude and ambient site conditions.

Project specific technical data sheets generated by the Caterpillar Gas Engine Rating Pro program take the Caterpillar Methane Number and RPC into account when generating a site rating.

Fuel properties for Btu/scf calculations are at 60F and 14.696 psia.

Caterpillar shall have no liability in law or equity, for damages, consequently or otherwise, arising from use of program and related material or any part thereof.

FUEL LIQUIDS

Field gases, well head gases, and associated gases typically contain liquid water and heavy hydrocarbons entrained in the gas. To prevent detonation and severe damage to the engine, hydrocarbon liquids must not be allowed to enter the engine fuel system. To remove liquids, a liquid separator and coalescing filter are recommended, with an automatic drain and collection tank to prevent contamination of the ground in accordance with local codes and standards.

To avoid water condensation in the engine or fuel lines, limit the relative humidity of water in the fuel to 80% at the minimum fuel operating temperature.

P.C. McKENZIE Company

1365 Mc Laughlin Run Road P.O. Box 112638
Pittsburgh, PA 15241
Phone 412-257-8866 Fax 412-257-8890

Mockingbird Hill Station

Boiler Submittal

Hurst Boiler- Model S45-G-207.5-60W

PO # 4500303305

HURST HOT WATER BOILER SALES ORDER ENTRY FORM (R10)

DATE: **06 JUNE '16** SHIP DATE: **HOLD** HBC J.O. NO.: **1600255**

SOLD TO: **P.C. MCKENZIE CO.**
P.O. BOX 112638
PITTSBURGH, PA 15241

END USER (**X**): **DOMINION TRANSMISSION**
MOCKINGBIRD HILL
STATION
PINE GROVE, WV

CONTACT: **PERRY LEAPLINE**

PH: (**412**)-**257**-**8866** FAX: (**412**)-**257**-**8890** P.O. NO. **HUR-20080**

SALES TAX NO. **ON FILE** STATE (**PA**) D&B:

APPROVALS: SALES CREDIT: TYPED BY: **JEP**

PRICING: **HOLD FOR SUBMITTAL APPROVAL**

TERMS OF PAYMENT: (**X**) NET 30 ( )

SHIP TO: **HOLD**

(**X**) PREPAY & ADD
( ) 3RD PARTY
( ) COLLECT
( ) ALLOWED
( )

SHIPPING INSTRUCTIONS:
HOLD

EQUIPMENT DESCRIPTION: **(1) 207.5 HP SERIES 45, 60 PSI HOT WATER NATURAL GAS FIRED FIREBOX**

BOILER SERIES: **45** (**3**) PASS ( ) DRY BACK (**X**) WET BACK ( ) SEMI-WETBACK
( ) SCOTCH (**X**) FIREBOX ( ) LPE ( ) VERTICAL TUBELESS ( ) VERTICAL FIRETUBE ( )
MODEL NO: **S45 – G – 207.5 – 60W** BHP: **207.5** MBH: **6,946**
PRESSURES: **60** PSI DESIGN, **20** PSI OPERATING. ASME SECTION ( ) I (**X**) IV
(**X**) HOT WATER SUPPLY: **180** D/F RETURN: **160** D/F
FIRESIDE HEATING SURFACE: **830** SQ.FT. FURNACE VOLUME: **132** CU. FT.
(**X**) UL LABEL B (**X**) ASME CSD-1 ( ) CRN (**X**) SUBMITTAL DRAWING **REQUIRED**
(**X**) STANDARD PAINT, INSULATION & JACKET (**X***) SPECIAL FINISHING: ****DUPLICATE TRIM AS HBC JOB #1600013****

PRIMARY BOILER OPENINGS: S = SCREWED F = FLANGED * = SPECIAL
(**F**) HOT WATER OUTLET: **8** ″ (**F**) HOT WATER RETURN: **6** ″
(**S**) DRAIN CONNECTION: **2** ″ ( )
STACK OUTLET: **20** ″ (**X**) VERTICAL ( ) HORIZONTAL ( ) "SERIES "B" THERM. 750 D/F
( ) MANUAL DAMPER (**X***) **20" FIELD BAROMETRIC DAMPER, SHIPPED LOOSE***
(**1**) 12" x 16" MANHOLE ( ) 3" x 4" HAND HOLES (**6**) 2" CPLGS. ( ) 1.5" CPLGS.
FRONT DOORS: (**X**) HINGED ( ) DAVITED REAR DOORS: ( ) HINGED ( ) DAVITED
( ) EXPLOSION RELIEF DOORS REQD. ( ) OTHER SPECIAL ITEMS:

PRIMARY LWCO: (**X**) M&M 750-MT-120 ( ) ( ) AUTO RESET (**X**) MR
( ) FEEDER ( ) LWCO DRAIN VALVE, APOLLO
( ) AUDIBLE ALARM ( ) LIGHT MOUNT ON: ( ) LEFT (**X**) RIGHT ( ) M&M TC-4 TEST N CHECK

AUX. LWCO: (**X**) M & M # 750-MT-120 ( ) ( ) AUTO RESET (**X**) MR
( ) FEEDER ( ) LWCO DRAIN VALVE, APOLLO
( ) AUDIBLE ALARM ( ) LIGHT MOUNT ON: ( ) LEFT (**X**) RIGHT ( ) M&M TC-4 TEST N CHECK

SAFETY RELIEF VALVE (S): **KUNKLE 537** SET AT **60** PSI
(**1**) **2" X 2 1/2"** ( ) ( )

BOILER PRESSURE GAUGE: ( ) PRECISION ( ) ( ) ″ - PSI

BOILER TEMP GAUGE: ( ) PRECISION ( ) ( ) ″ DIAL °- °D/F

BOILER COMBINATION PRESSURE/TEMP GAUGE: (**X**) **4** ″ DIAL **70** °- **320** °D/F, **0** - **200** PSI
( ) AUTOMATIC AIR VENT VALVE ( )
(**1**) FLOW SWITCH (**X**) **FS 251, NEMA 1, SHIPPED LOOSE FOR FIELD MOUNTING**

HOT WATER SUPPLY GAUGE (OUTLET) CONNECTIONS: ( ) HBC SUPPLIED (**X**) FIELD SUPPLIED

SUPPLY THERMOMETER: ( ) ″ DIAL °- °D/F
SUPPLY PRESSURE GAUGE: ( ) ″ - PSI
COMBINATION PRESSURE/TEMP GAUGE: ( ) ″ DIAL °- °D/F, - PSI

HOT WATER RETURN GAUGE (INLET) CONNECTIONS: ( ) HBC SUPPLIED (**X**) FIELD SUPPLIED

RETURN THERMOMETER: ( ) ″ DIAL °- °D/F
RETURN PRESSURE GAUGE: ( ) ″ - PSI
COMBINATION PRESSURE/TEMP GAUGE: ( ) ″ DIAL °- °D/F, - PSI

BOILER DRAIN VALVE: ” PSI, ( ) LFT ( ) RT ( ) SCREWED ( ) FLANGED

( ) SLOW OPENING: ( ) APOLLO BALL ( ) UB 226UT ( ) UB 325U ( )
(**X**) FIELD SUPPLIED BY OTHERS

PRESSURE/TEMPERATURE CONTROLS: (**X**) HONEYWELL ( )

(**1**) OPERATING **L6006A 1145** (**1**) PROPORTIONING **T991A 1061**
(**1**) HI LIMIT **L4006E 1000** (**X**) MR ( ) LIGHT ( ) ALARM
(**X**) AUTO LO FIRE HOLD **L6006A 1145** ( ) HIGH PRESSURE WELL (SEC. 1)
( ) LO PRESS. CONTROL, MERCOID DR31-153U, MR, ( ) MR ( ) ALARM ( ) LIGHT
( )

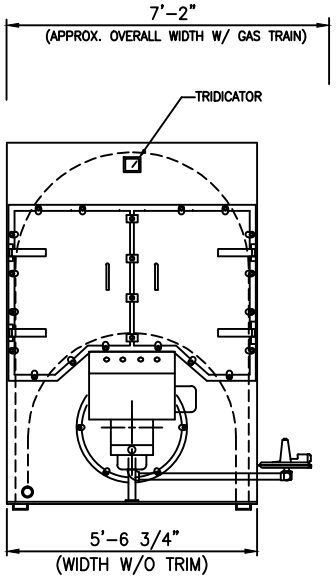
OTHER BOILER TRIM:

(**X**) **(6) SIX HARD COPIES OF O&M MANUALS TO BE PROVIDED (COST NOT INCLUDED IN TOTAL)**
(**X**) SUPPLY ELECTRONIC SUBMITTALS ASAP
( )
( )
(**X**) **BURNER INFO BELOW:**
(**X**) **NEMA 4 "J" BOX W/ NUMBERED TERMINAL STRIP**
(**X**) **RM7840L/UV W/ DISPLAY**
(**X**) **ADDITIONAL RELAYS; SEE SUBMITTALS**

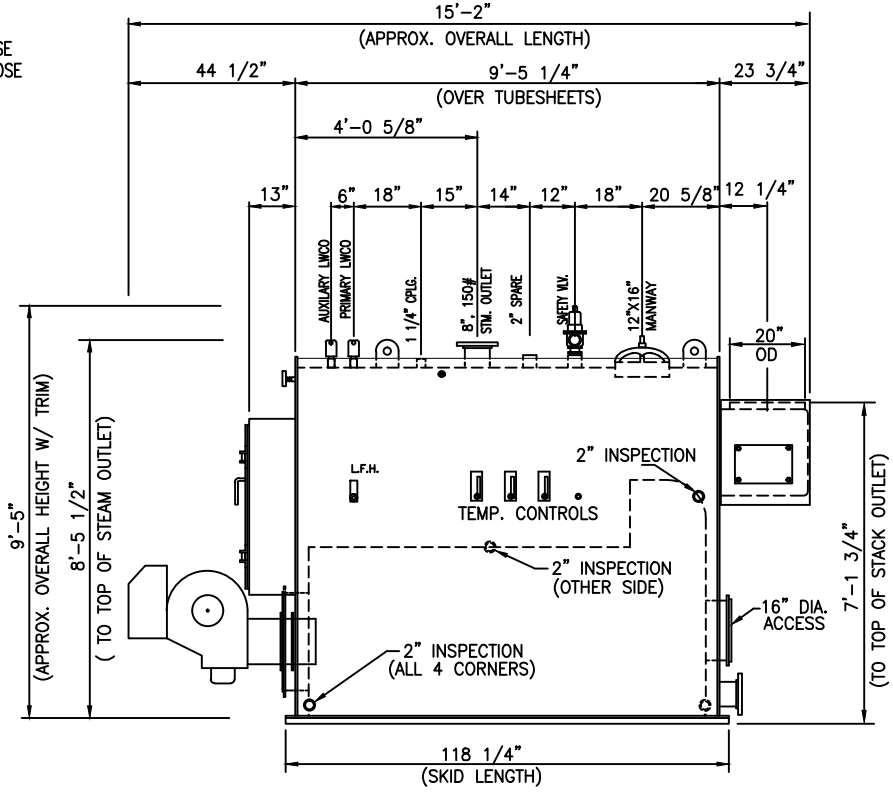
BURNER DATA: ( ) IC (**X**) PF ( ) WEB (**X**) **PF QUOTE #050216-004MJKR1**

FURNISHED BY: (**X**) HBC ( ) (**X**) WE MOUNT ( ) FIELD MOUNT
BURNER MODEL: **CR5-G-30HTD** ( )
AGENCY APPROVALS: (**X**) UL (**X**) CSD-1 ( ) FM ( ) GE GAP ( ) NFPA 85 ( )
FUELS: (**X**) NAT.GAS AT **37"-140" W.C.** ( ) LP AT ( ) #2 OIL
( ) # OIL ( )
IGNITION TYPE: (**X**) GAS PILOT ( ) DIRECT SPARK ( )
ELECTRICAL: MOTORS **480** / **60** / **3** (**X**) CONTROL TRANSFORMER ( )
7.5 HP BLOWER ( ) OIL PUMP MOUNTED:
2 ″ GAS TRAIN ON ( ) LFT (**X**) RT ( ) AIR COMPRESSOR ( ) LFT ( ) RT ( )
CONTROL PANEL: (**X**) ON BURNER ( ) SIDE OF BOILER ( )
PANEL LIGHTS: (**X**) POWER (**X**) FUEL ON (**X**) CFH (**X**) IGNITION (**X***) ALARM (**X***) FF
( ) DRAFT (**X***) **LO FLOW** (**X***) **LO GAS** (**X***) **LO H20** (**X***) **AIR FLOW FAIL** (**X***) **HIGH LIMIT**
ALARM ( ) BELL (**X**) HORN (**X**) AUTO SILENCER (**X***) TO ALARM ON *** ABOVE
OPERATING SEQUENCE: ( ) ON/OFF ( ) LHO ( ) LHO, PLFS ( ) LHL ( ) LHL, PLFS
(**X**) FULL MOD. W/ POT. ( )

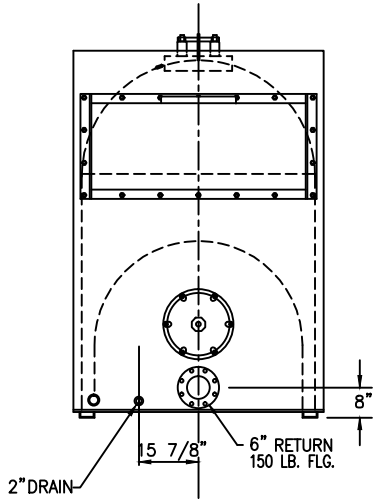
NOTES:
OTHER BOILER TRIM
* FIELD BAROMETRIC DAMPER, SHIPPED LOOSE
* NEMA 1 FS251 FLOW SWITCH, SHIPPED LOOSE FOR FIELD MOUNTING
* RM78-40L/UV W/DISPLAY



FRONT VIEW



RIGHT SIDE VIEW



REAR VIEW

BOILER SPECIFICATION CHART			
BUILT TO ASME CODE SECTION IV FOR: 60 PSI. WTR.		FURNACE VOLUME	129.4 CU. FT.
HEATING SURFACE	830 SQ. FT.	WATER CAPACITY (FLOODED)	1136 GALS.
RADIANT HEATING SURFACE	132 SQ. FT.	SHIPPING WEIGHT	17750 LBS.

R	BY:	DATE:	CHK'D.	REASON FOR CHANGE

HURST BOILER & WELDING CO., INC.
100 BOILERMAKER LANE, COOLIDGE, GA. 31738
PHONE: 229-346-3545 FAX: 229-346-3874

SERIES 45, SECT. 4 HOT WATER, 207.5 HP, 60 PSI
3 PASS FIREBOX BOILER

P.C McKENZIE CO.
DOMINION TRANSMISSION MOCKINGBIRD HILL

SCALE:	DRAWN BY:	DATE:	CHECKED BY:	DRAWING NO:	R
N.T.S.	J.E.H.	06/07/16	J.A.B.	1600255	0

HURST

BOILER & WELDING CO., INC.

AVAILABLE WITH LOW NOX

HURST SERIES 45

3-PASS FIREBOX DESIGN
All Steel Wetback Construction

LOW PRESSURE BOILER

Capacities from 8.5 to 813 BHP.
285 to 27215 MBTU/HR.

STEAM
Pressure 15 max PSI.

HOT WATER
Section IV
30, 60, 100 PSI.

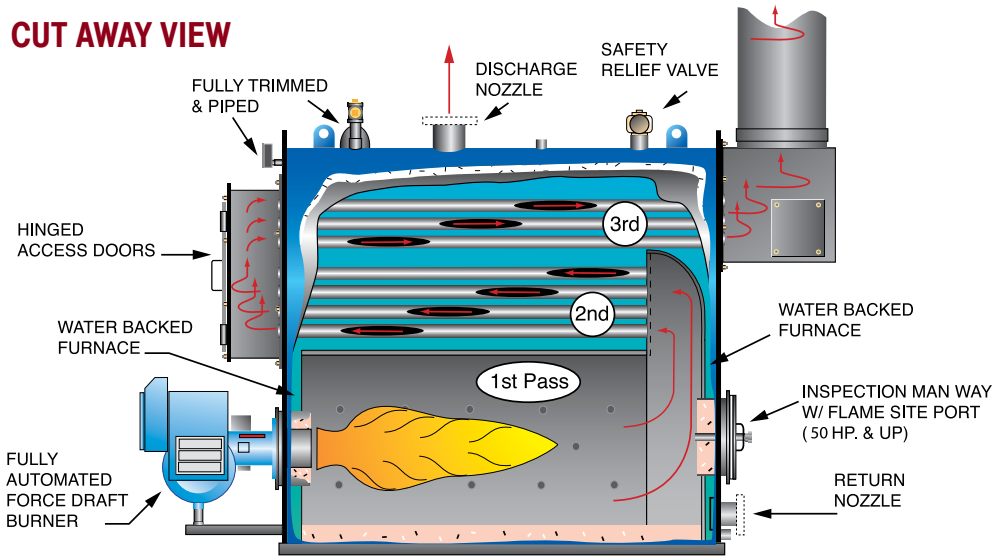
"Large Furnace Volume for Ultimate Combustion Efficiency."

SKID MOUNTED
MODULAR PACKAGED

HURST PERFORMANCE SERIES BOILERS

SERIES 45

CUT AWAY VIEW

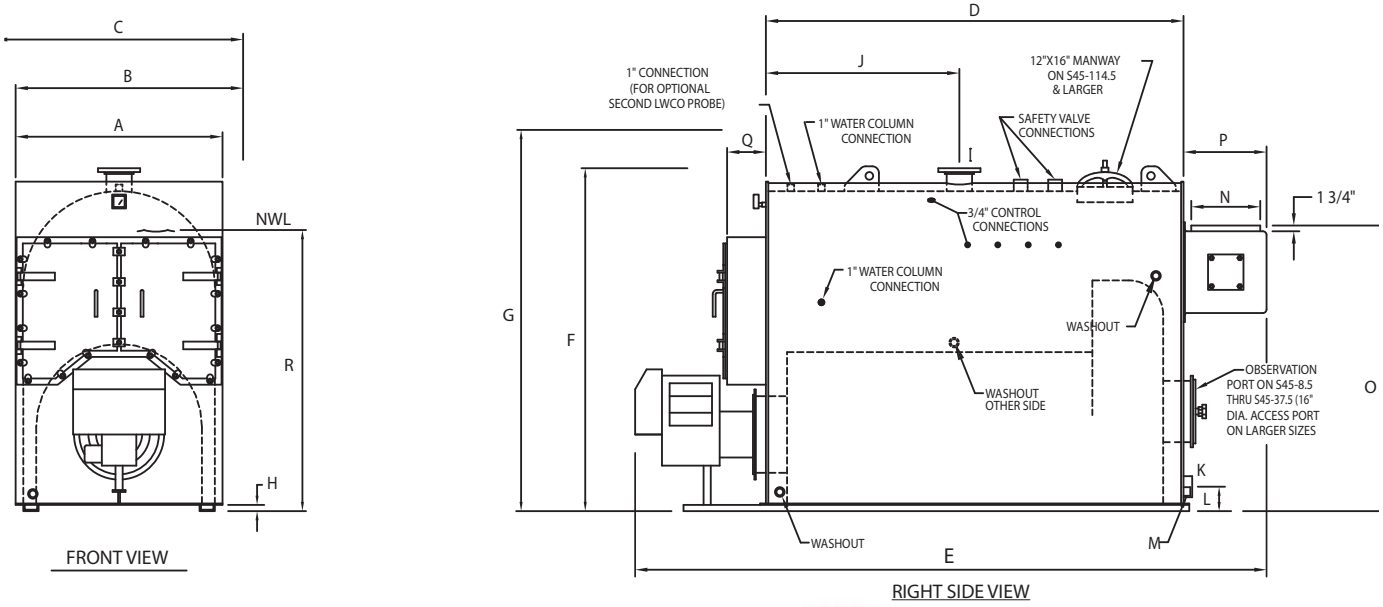


Inspected and registered with the National Board of Boiler & Pressure Vessel Inspectors.

Designed, constructed and stamped in accordance with the requirements of the ASME Boiler Codes.

	SPECIFICATIONS	SERIES 45 MODEL NO.		S45	S45	S45	S45	S45	S45	S45	S45	S45	S45	S45	S45	S45	S45	S45	
	BOILER HORSE POWER			8.5	13.4	16.4	20	25	30	37.5	50	56	62.5	75	87.5	100	114.5	126.3	
	STEAM OUTPUT	FROM & @212° F	LBS/HR	293	462	566	690	863	1035	1294	1725	1932	2156	2588	3019	3450	3950	4357	
	GROSS OUTPUT		MBH	285	449	549	670	837	1004	1255	1674	1875	2092	2511	2929	3348	3833	4228	
	FIRING RATE, GAS	1,000 BTU	CFH	357	563	689	840	1050	1260	1575	2100	2352	2625	3150	3675	4200	4809	5304	
	FIRING RATE, #2 OIL	140,000 BTU	GPH	2.6	4	5	6	7.5	9	11.3	15	17	19	22.5	26	30	34	38	
	FIRING RATE, HEAVY OIL	150,000 BTU	GPH	NA	NA	NA	NA	NA	NA	NA	14	16	17.5	21	25	28	32	35	
	TOTAL HEATING SURFACE	FIRESIDE	SQ.FT.	37	55	67	86	105	125	150	200	225	250	300	350	411	458	505	
	RADIANT HEATING SURFACE	FIRESIDE	SQ.FT.	17.4	22.7	23.5	28.7	32.6	34.2	39.3	48	48.6	55	60	77	87	90.5	92	
	FURNACE VOLUME		CU.FT.	6.8	7.3	9.2	12.4	14.8	18.7	22.5	27.4	30.7	33	40.6	52	67	68	73	
	FURNACE HEAT RELEASE	MBH/CU.FT.		53	77	75	68	71	67	70	77	77	80	78	71	63	71	73	
A	WIDTH WITHOUT TRIM		IN	28	30	30	30	30	36	36	42	42	42	42	48	48	54	54	A
B	WIDTH WITH TRIM	APPROX	IN	35	37	37	37	37	43	43	49	49	49	49	55	55	61	61	B
C	WIDTH WITH GAS TRAIN	APPROX	IN	47	49	49	49	49	55	55	61	61	61	61	67	67	73	73	C
D	LENGTH OVER TUBE SHTS.		IN	31	31	37	49	60	57	68	58	65	70	85	73	85	83	89	D
E	OVERALL LENGTH with/	STD.BURNER	IN	78	78	84	96	107	106	121	113	120	125	145	135	147	148	159	E
F	HEIGHT WITHOUT TRIM		IN	55.75	63.63	63.63	63.63	63.63	63	63	75.5	77.5	77.5	77.5	90	90	90	90	F
G	HEIGHT WITH TRIM	APPROX	IN	60	70	70	70	70	70	70	83	85	85	85	97	97	99	99	G
H	BASE HEIGHT		IN	2	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	H
I	SUPPLY SIZE		IN	3	4	4	4	4	4	4	4	6	6	6	6	6	6	6	I
J	SUPPLY LOCATION		IN	13.5	17	18.5	24.5	24.5	25	30	28.5	30.5	30.5	36.5	31.5	36.5	39.5	42.5	J
K	RETURN SIZE		IN	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	K
L	RETURN LOCATION		IN	6	5	5	5	5	6.25	6.25	6.38	6.38	6.38	6.38	6.38	6.38	6.38	6.38	L
M	DRAIN/ BLWD. SIZE		IN	1	1	1	1	1	1	1.25	1.25	1.25	1.25	1.5	1.5	1.5	1.5	1.5	M
N	EXHAUST STACK DIA.	O.DIA.	IN	6	8	8	8	8	10	10	12	12	12	12	14	14	18	18	N
O	STACK HEIGHT		IN	42.38	52.75	52.75	52.75	52.75	50.5	50.5	62	62	62	62	72.5	72.5	74.63	74.63	O
P	REAR SMOKEBOX DEPTH		IN	10	12	12	12	12	14	14	16	16	16	16	18	18	22	22	P
Q	FRONT SMOKEBOX DEPTH		IN	6.75	7.25	7.25	7.25	7.25	8.25	8.25	10.25	10.25	10.25	10.25	11	11	11	11	Q
R	NORMAL WATER LINE	STEAM	IN	40	51	51	51	51	50.5	50.5	61	61	61	61	71	71	71	71	R
	WATER VOLUME	STEAM	GAL.	50	82	126	143	156	176	217	257	274	289	355	368	454	479	508	
	WATER VOLUME	FLOODED	GAL.	72	102	150	175	195	218	267	312	336	356	436	471	574	608	647	
	SHIPPING WEIGHT APPROX.	STD.TRIM	LBS.	1500	1700	1800	2000	2100	3100	3350	4000	4400	5300	5700	7000	8400	9100	9500	
	BOILER HORSEPOWER			8.5	13.4	16.4	20	25	30	37.5	50	56	62.5	75	87.5	100	114.5	126.3	

NOTE: CONNECTIONS UP TO 4" SIZE ARE NPT. THREAD, CONN'TNS. 6" & ABOVE ARE 150# ANSI FLANGE.
NOTE: 458 SQ.FT. AND LARGER HAS 12" X 16" MANWAY



	S45 152	S45 187.8	S45 207.5	S45 225	S45 250	S45 290	S45 331	S45 415	S45 500	S45 625	S45 769	S45 813	
	5244	6479	7159	7763	8625	10005	11420	14318	17250	21563	26531	28049	
	5088	6287	6946	7532	8369	9708	11080	13892	16738	20922	25742	27215	
	6384	7887	8715	9450	10500	12180	13902	17430	21000	26250	32298	34166	
	45.6	56	62	67.5	75	87	99	124.5	150	187.5	231	244	
	42.5	52.5	58	63	70	81	93	116	140	175	215	228	
	625	750	830	900	1000	1160	1325	1660	2000	2500	3075	3250	
	112	121	132	140	150	166	179	207	233	280	327	342	
	92	116	132	142	155	188.7	210	261	329	407	502	535	
	69	68	66	66.5	67.7	64.5	66	67	64	64.5	64	64	
A	54	66.75	66.75	66.75	66.75	72	72	72	84	84	84	84	A
B	61	74	74	74	74	79	79	79	91	91	91	91	B
C	73	86	86	86	86	93	93	93	105	105	105	105	C
D	109	103	113	121	133	109	121	151	136.5	169.5	209.5	223.5	D
E	179	175	185	193	205	184	196	234	230	268	308	322	E
F	90	102	102	102	102	132.88	132.88	132.88	149.25	149.25	149.25	149.25	F
G	99	113	113	113	113	144.38	144.38	144.38	156	156	156	156	G
H	1.63	1.63	1.63	1.63	1.63	8	8	8	8	8	8	8	H
I	6	8	8	8	8	8	8	10	10	10	12	12	I
J	50.5	36.5	48.5	42.5	57.5	39.5	39.5	42.5	50.75	65.25	82.75	92.75	J
K	4	6	6	6	6	6	6	8	8	8	10	10	K
L	6.38	8	8	8	8	15.75	15.75	15.75	15.75	15.75	16.75	16.75	L
M	2	2	2	2	2	2	2	2	2	2	2	2	M
N	18	20	20	20	20	22	22	22	28	28	28	28	N
O	74.63	85.75	85.75	85.75	85.75	112.38	112.38	112.38	123.88	123.88	123.88	123.88	O
P	22	24	24	24	24	26	26	26	32	32	32	32	P
Q	11	13.25	13.25	13.25	13.25	15.25	15.25	15.25	18	18	18	18	Q
R	71	80.25	80.25	80.25	80.25	107.5	107.5	107.5	122	122	122	122	R
	624	603	858	913	1005	1160	1195	1557	1801	2267	2765	2955	
	794	856	1136	1211	1333	1485	1595	2056	2400	3013	3690	3942	
	10200	12000	13500	14750	16000	19000	21000	24000	29000	38000	45000	49000	
	152	187.8	207.5	225	250	290	331	415	500	625	769	813	

ALL DIMENSIONS ARE IN INCHES
CERTIFIED DRAWING AVAILABLE UPON REQUEST.
DIMENSIONS SUBJECT TO CHANGE WITHOUT NOTICE.

BOILER DESIGN: Three-Pass "FireBox" design with stress relieving *"Wetback"* Firetube construction. Pressure designs for steam are
■ 8.5-813 HP } 15 psi. max.
Built to *Section-IV ASME Code.*
Hot Water pressures models are from
■ 8.5-415 HP } 100 psi. max.
■ 500-813 HP } 60 psi. max.
Built to *Section-IV ASME Code*. Hot water temperature not to exceed 250° degrees F. at or near the outlet of boiler.

STEAM MODEL TRIM: Safety relief valve, operating pressure control, high limit pressure control with manual reset, steam pressure gauge with syphon, combination pump control and low water cut-off with gauge glass assembly and drain valve, auxiliary low water cut-off with manual reset.

HOT WATER MODEL TRIM: Safety relief valve, operating temperature control, high limit temperature control with manual reset, combination pressure & temperature gauge, low water cut-off control with manual reset.

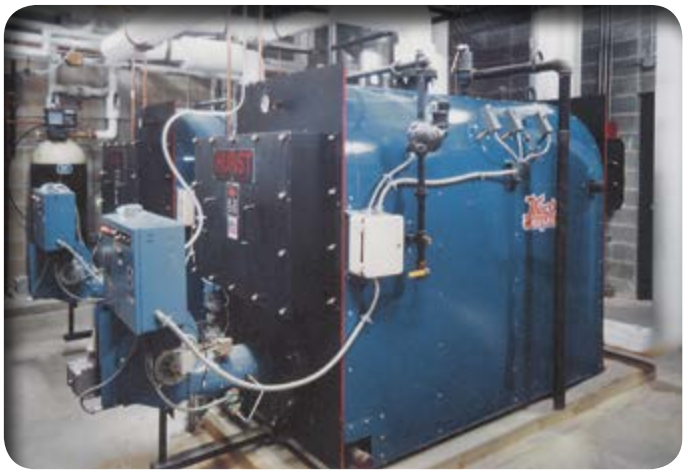
BURNER: Matched UL listed "forced draft" power burners with factory prepiped, wired and tested fuel configurations for natural gas, propane (LP) gas, No. 2 (diesel) oil, or combination of both gas/oil.

HURST

HURST PERFORMANCE SERIES BOILERS

SERIES 45

- Efficient 3-Pass Design
- Flexibility – Gas, Oil, Heavy Oil, and Combination Gas/Oil
- ASME Code Constructed & Stamped for 15 PSI Steam / 30-100 PSI Water
- Registered with the National Board of Boiler Inspectors
- Competitively Priced, Easily Maintained, Designed for Efficiency
- Large Furnace Volume for Ultimate Combustion Efficiency
- Unified Refractory Base Floor
- Steel Skids and Lifting Eyes
- Low Heat Release
- Factory Insulated – 2" Mineral Wool
- Factory Jacketed & Painted
- Easy Access to Fireside Surfaces
- Ample Waterside Clean-Out Openings
- Fully Automatic Operation
- U.L. Listed, Forced Draft Burners
- Wet Back Construction
- U.L. Listed Controls & Trim
- Factory Test Fired
- Flame Observation Ports Front & Rear



All units are factory packaged with operating controls, relief valves, burner and fuel train. Installation is made simple in that only service connections are needed to place in operation. Flexible burner systems are available for firing natural gas, LP gas, #2 oil, heavy oil, or combinations. High density 2" mineral wool insulation assures lower radiant heat loss. In addition to meeting the requirements of U.L., burner systems are optionally available to meet the requirements of FM, IRI, MILITARY and others.

Standard Steam Trim

- Operating & high limit pressure control
- Modulating pressure control (when appl.)
- Water column with gauge glass, combination low water cut-off & pump control
- Probe Aux, L.W.C.O. w/ Manual Reset
  Steam pressure gauge, syphon & test cock
- Water column drain valve
- Safety relief valve(s) per ASME Code

Standard Water Trim

- Operating & high limit temperature control
- Modulating temperature control (when appl.)
- Probe type low water cut-off control w/ Manual Reset
- Combination pressure & temperature gauge
- Hot water return baffle for shock resistance
- Safety relief valve(s) per ASME Code

HBC-09509
07/2014

Hurst BOILER & WELDING COMPANY, INC
hurstboiler.com

HURST BOILER
& Welding Co., Inc.
100 Boilermaker Lane • Coolidge, GA 31738-0530
Tel: (229) 346-3545 • Fax: (229) 346-3874
email: info@hurstboiler.com

Attachment S
Title V Permit Revision Information

Attachment S

Title V Permit Revision Information

1. New Applicable Requirements Summary	
Mark all applicable requirements associated with the changes involved with this permit revision:	
☐ SIP	☐ FIP
☐ Minor source NSR (45CSR13)	☒ PSD (45CSR14)
☒ NESHAP (45CSR15)	☐ Nonattainment NSR (45CSR19)
☒ Section 111 NSPS (Subpart(s)_ JJJJ, KKKK, OOOOa_)	☒ Section 112(d) MACT standards (Subpart(s)_ZZZZ_____)
☐ Section 112(g) Case-by-case MACT	☐ 112(r) RMP
☐ Section 112(i) Early reduction of HAP	☐ Consumer/commercial prod. reqts., section 183(e)
☐ Section 129 Standards/Reqts.	☐ Stratospheric ozone (Title VI)
☐ Tank vessel reqt., section 183(f)	☐ Emissions cap 45CSR§30-2.6.1
☐ NAAQS, increments or visibility (temp. sources)	☐ 45CSR27 State enforceable only rule
☒ 45CSR4 State enforceable only rule	☐ Acid Rain (Title IV, 45CSR33)
☐ Emissions Trading and Banking (45CSR28)	☐ Compliance Assurance Monitoring (40CFR64) [(1)]
☐ NO_x Budget Trading Program Non-EGUs (45CSR1)	☐ NO_x Budget Trading Program EGUs (45CSR26)
[(1)] If this box is checked, please include **Compliance Assurance Monitoring (CAM) Form(s)** for each Pollutants Specific Emission Unit (PSEU) (See Attachment H to Title V Application). If this box is not checked, please explain why **Compliance Assurance Monitoring** is not applicable:	

2. Non Applicability Determinations
List all requirements, which the source has determined not applicable to this permit revision and for which a permit shield is requested. The listing shall also include the rule citation and a rationale for the determination. See Introduction for complete state and federal applicability determination.
☐ **Permit Shield Requested** *(not applicable to Minor Modifications)*

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

3. Suggested Title V Draft Permit Language

Are there any changes involved with this Title V Permit revision outside of the scope of the NSR Permit revision? ☐ Yes ☒ No If Yes, describe the changes below.

Also, please provide **Suggested Title V Draft Permit language** for the proposed Title V Permit revision (including all applicable requirements associated with the permit revision and any associated monitoring /recordkeeping/ reporting requirements), OR attach a marked up pages of current Title V Permit. Please include appropriate citations (Permit or Consent Order number, condition number and/or rule citation (e.g. 45CSR§7-4.1)) for those requirements being added / revised.

4. Active NSR Permits/Permit Determinations/Consent Orders Associated With This Permit Revision

Permit or Consent Order Number	Date of Issuance	Permit/Consent Order Condition Number
R30-10300006-2017	01/10/2017	N/A
R13-2555C	05/02/2016	N/A
	/ /	

5. Inactive NSR Permits/Obsolete Permit or Consent Orders Conditions Associated With This Revision

Permit or Consent Order Number	Date of Issuance	Permit/Consent Order Condition Number
R30-10300006-2011	07/11/2012	N/A
R13-2870	02/2011	N/A
R13-2555B	09/17/2012	N/A

6. Change in Potential Emissions

Pollutant	Change in Potential Emissions (+ or -), TPY
CO	58.58
NO_x	55.54

PM_{FIL}	8.81
PM_{CON}	21.77
SO_2	5.17
Total VOC	29.91
Total HAP	3.49
All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.	

7. Certification For Use Of Minor Modification Procedures *(Required Only for Minor Modification Requests)*

Note:	*This certification must be signed by a responsible official. Applications without a signed certification will be returned as incomplete. The criteria for allowing the use of Minor Modification Procedures are as follows:*

i. Proposed changes do not violate any applicable requirement;

ii. Proposed changes do not involve significant changes to existing monitoring, reporting, or recordkeeping requirements in the permit;

iii. Proposed changes do not require or change a case-by-case determination of an emission limitation or other standard, or a source-specific determination for temporary sources of ambient air quality impacts, or a visibility increment analysis;

iv. Proposed changes do not seek to establish or change a permit term or condition for which there is no underlying applicable requirement and which permit or condition has been used to avoid an applicable requirement to which the source would otherwise be subject (synthetic minor). Such terms and conditions include, but are not limited to a federally enforceable emissions cap used to avoid classification as a modification under any provision of Title I or any alternative emissions limit approved pursuant to regulations promulgated under § 112(j)(5) of the Clean Air Act;

v. Proposed changes do not involve preconstruction review under Title I of the Clean Air Act or 45CSR14 and 45CSR19;

vi. Proposed changes are not required under any rule of the Director to be processed as a significant modification;

Notwithstanding subparagraph 45CSR§30-6.5.a.1.A. (items i through vi above), minor permit modification procedures may be used for permit modifications involving the use of economic incentives, marketable permits, emissions trading, and other similar approaches, to the extent that such minor permit modification procedures are explicitly provided for in rules of the Director which are approved by the U.S. EPA as a part of the State Implementation Plan under the Clean Air Act, or which may be otherwise provided for in the Title V operating permit issued under 45CSR30.

Pursuant to 45CSR§30-6.5.a.2.C., the proposed modification contained herein meets the criteria for use of Minor permit modification procedures as set forth in Section 45CSR§30-6.5.a.1.A. The use of Minor permit modification procedures are hereby requested for processing of this application.

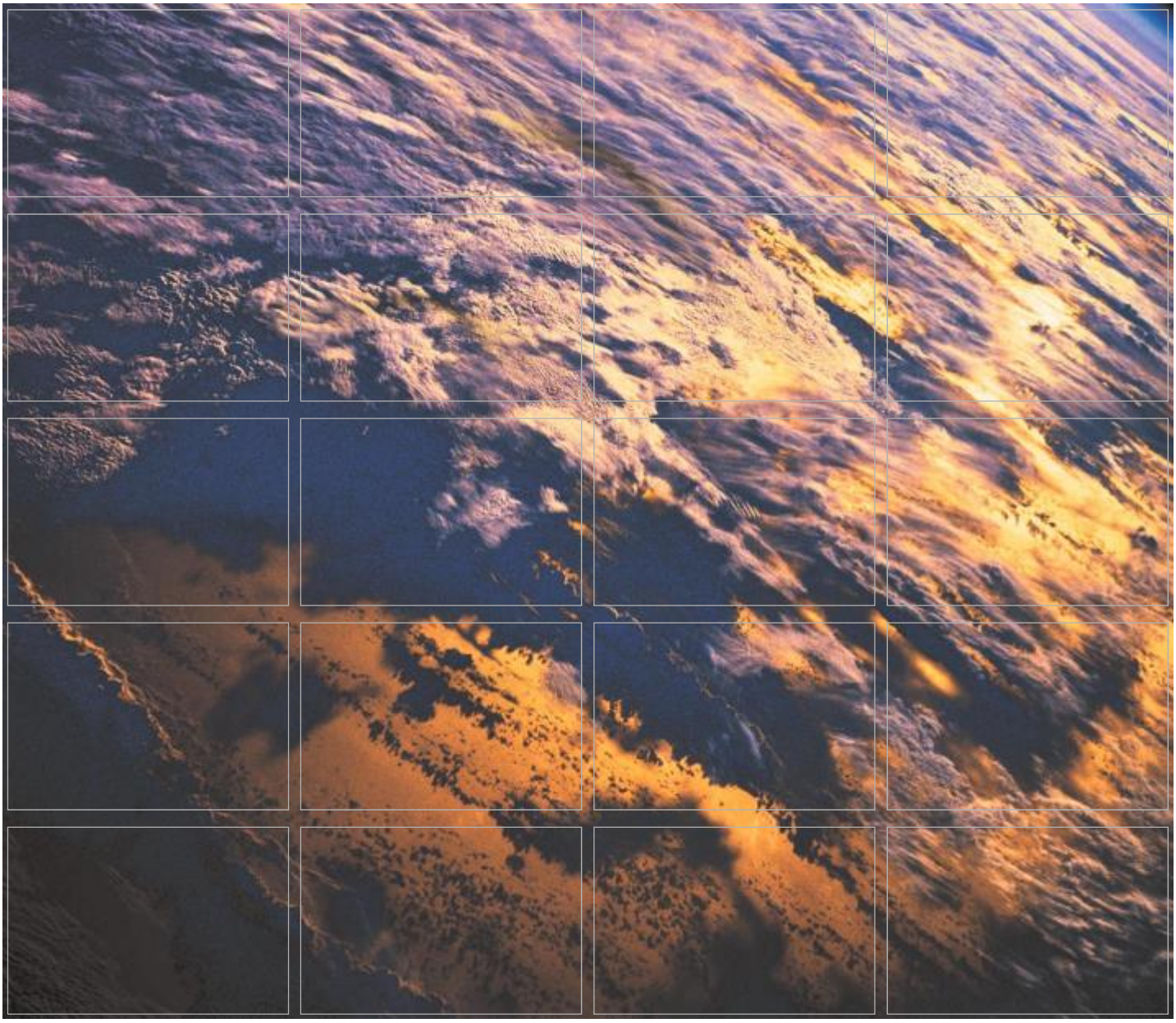
(Signed):	_____ *(Please use blue ink)*	Date:	____ / ____ / ____ *(Please use blue ink)*
Named (typed):		Title:	

Note: Please check if the following included (if applicable):

☐	Compliance Assurance Monitoring Form(s)
☐	Suggested Title V Draft Permit Language

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

Appendix B
Air Modeling Results



Dominion Energy Transmission, Inc.

Mockingbird Compressor Station
Revised Air Quality Modeling Report

Wetzel County, West Virginia

August 2017

Environmental Resources Management
75 Valley Stream Parkway, Suite 200
Malvern, PA 19355
www.erm.com

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APPENDICES

1.0 INTRODUCTION

Dominion Energy Transmission, Inc. (Dominion) submits this air quality modeling report to support an air quality permit application that is being submitted to the West Virginia Department of Environmental Protection (WVDEP). The application is being submitted to authorize the development of an expansion of the existing Mockingbird Hill Compressor Station in Wetzel County, West Virginia. The proposed Mockingbird Hill Expansion is located at approximately 39° 33′ 6″ and 80° 39′ 48″. A general area map showing the proposed location of the facility, as well as the general layout of the existing and proposed facility is provided in Appendix A of this report. An air quality modeling protocol was submitted to WVDEP on July 2, 2015, followed by a revised protocol on September 1, 2015 (September 2015 protocol). The revised protocol described most of the assumptions and procedures that were utilized in the air quality modeling analysis presented in this report. The September 2015 protocol is included as Attachment 1 of this report.

1.1 PROJECT OVERVIEW

Dominion proposes to construct an expansion of the existing Mockingbird Hill Compressor Station located in Wetzel County, WV. This project will involve the installation of two new combustion turbines (CTs), each rated at 20,500 bhp each, that will power the natural gas compressing operation at the proposed facility, and auxiliary boiler, and an emergency generator.

1.2 OVERVIEW OF METHODOLOGY

Table 1-1 provides a summary of the attainment status of Wetzel County, West Virginia. The attainment status determines which regulatory programs new major sources or modifications to existing sources must address in the context of obtaining an air quality construction permit. Table 1-2 provides a summary of the regulatory program(s) that must be addressed for each regulated pollutant that will be emitted by the Project. Pollutants with emission levels that trigger Non-attainment New Source Review (NA-NSR) requirements are subject to additional control (Lowest Achievable Emission Rate, LAER) and emissions offset requirements but are not required to conduct air quality dispersion modeling. Pollutants from this Project do not trigger NA-NSR requirements. In attainment areas, pollutants that trigger the significant emission rate (SER) must address requirements of the Prevention of Significant Deterioration (PSD) program.

Table 1-1 Attainment Status of Wetzel County, West Virginia

Pollutant	Attainment Status of Wetzel County, West Virginia
SO_2 (annual)	Unclassifiable/Attainment
SO_2 (1-hr)	Unclassifiable/Attainment
CO	Unclassifiable/Attainment
Pb	Unclassifiable/Attainment
O_3 (1-hr)	Unclassifiable/Attainment
PM_{10}	Unclassifiable/Attainment

Pollutant	Attainment Status of Wetzel County, West Virginia
NO_2 (annual)	Unclassifiable/Attainment
NO_2 (1-hr)	Unclassifiable/Attainment
O_3 (8-hr)	Unclassifiable/Attainment
$PM_{2.5}$ (annual)	Unclassifiable/Attainment
$PM_{2.5}$ (24-hr)	Unclassifiable/Attainment

Table 1-2 Project-Related Significant Emissions Increases

Pollutant	Project Emissions (tons/yr)	PSD SER
PM_{10}	32.1	15
$PM_{2.5}$	32.1	10

Emissions from the proposed project exceed the PSD SERs for PM_{10} and $PM_{2.5}$, dispersion modeling was performed for PM_{10} and $PM_{2.5}$ to assess the ambient air impacts resulting from the Project emissions increases. A complete assessment of emissions increases for all criteria pollutants with respect to the PSD SERs is included in the September 2015 air quality permit application submitted to WVDEP.

The revised modeling analyses presented in this report addresses compliance with the National Ambient Air Quality Standards (NAAQS) and PSD increments, as applicable. The modeling analyses described in this report conform to Appendix W of 40 CFR Part 51 (Guideline on Air Quality Models). The September 2015 protocol described the assumptions and procedures utilized in the air quality modeling analyses in detail. Updates to the modeling approach and methodology from the September 2015 protocol are noted in this report.. A copy of the September 2015 protocol is included as Attachment 1 of this report. The key elements of the modeling analyses are:

- Use of the latest version of AERMOD (version 16216r, updated from version 15181 from the September 2015 submittal of this analysis);
- Use of input meteorological data from North Central West Virginia Airport (KCKB) from 2012 to 2016, updated from 2010 to 2014 used in the September 2015 submittal of this analysis;
- Use of upper air data from Pittsburgh, PA;
- Application of the latest version of AERSURFACE as recommended in the USEPA AERMOD Implementation Guidance (USEPA 2009);
- Develop a comprehensive receptor grid designed to identify maximum modeled concentrations;
- Conduct air quality modeling to determine the magnitude and location of ambient concentrations due to emissions from the Project;
- In accordance with PSD requirements, determine whether emissions from the Project that are subject to PSD will have an effect on growth, soils, vegetation, and visibility in the vicinity of the Project;

- Compare maximum predicted impacts to relevant Significant Impact Levels (SILs) and Significant Monitoring Concentrations (SMCs) to determine if additional modeling or monitoring is required.

2.0 PROJECT EMISSIONS AND SOURCE CHARACTERIZATION

The Mockingbird Hill Expansion Project will have an increase in emissions of PM_{10} and $PM_{2.5}$ that exceed the significant emission rates (SERs) for PSD applicability. The emissions increase of PM_{10} and $PM_{2.5}$ includes contemporaneous emissions increases from the existing Mockingbird Hill/Lewis Wetzel/Hastings Compressor Station complex. Table 2-1 presents the stack characteristics and emission rates on a source by source basis, including the project sources, contemporaneous sources, and existing sources.

Table 2-1 Emissions and Stack Parameters – Proposed Project Sources and Existing Sources

Source	Facility	Model ID	Stack Height (ft.)	Exit Diameter (ft.)	Exit Gas Velocity (ft./sec)	Exit Gas Flow Rate (acfm)	Exit Gas Temp. (°F)	$PM_{2.5}/PM_{10}$ (lb/hr)	$PM_{2.5}/PM_{10}$ (tpy)
Project Sources									
Solar Titan 130 Turbine	Mockingbird - New	TRB1	50	7.5	96.0	254,464	900	3.46	15.16
Solar Titan 130 Turbine	Mockingbird - New	TRB2	50	7.5	96.0	254,464	900	3.46	15.16
Boiler	Mockingbird - New	AUXB	26	1.7	40.0	5,232	838	0.06	0.28
Caterpillar G3412 Emergency Generator[1,2]	Mockingbird - New	EGEN	13.2	0.7	187.5	3,927	793	0.005	0.003
AJAX DPC-2803LE Engine	Hastings - New	EN01	35	1.4	48.4	4,473	574	0.20	0.88
AJAX DPC-2802LE Engine	Hastings - New	EN02	35	1.4	30.7	2,836	577	0.14	0.61
Cooper GMXE6 Engine 1 - removed[3]	Hastings - Old	XEN01	25	1.0	111.0	5,237	725	-0.18	-0.78
Cooper GMXE6 Engine 2 - removed[3]	Hastings - Old	XEN02	25	1.0	111.0	5,237	725	-0.17	-0.74
Contemporaneous Sources									
Generac Model QT080 Natural Gas-Fired Emergency Generator (002-006)[1]	Hastings	AUX6	5	0.5	61.12	720	840	0.0018	0.0054
CAT 3612 Compressor Engine	Lewis Wetzel	EN03	45	1.0	505.24	23,809	838	0.55	2.43
Cummins KTA19G Aux. Generator	Lewis Wetzel	AZ05	10	1.0	66.21	3,120	1286	0.09	0.38
Bryan Model RV 450W-FDG Boiler	Lewis Wetzel	BLR5	18	0.7	269.97	5,711	838	0.06	0.26
Existing Sources									
Solar Taruus 60 Turbine	Mockingbird	TB02	50	4.0	145.89	110,000	900	2.69	11.78
Capstone C60 Microturbines / Aux. Generator	Mockingbird	AXG2	12	0.7	269.97	5,711	725	0.03	0.13
Capstone C60 Microturbines / Aux. Generator	Mockingbird	AXG3	12	0.7	269.97	5,711	725	0.03	0.13
Capstone C60 Microturbines / Aux. Generator	Mockingbird	AXG4	12	0.7	269.97	5,711	725	0.03	0.13
Boiler	Mockingbird	BLR2	18	0.7	269.97	5,711	838	0.04	0.18
Recip. Engine - Copper GMXE-6 (to be removed)	Hastings	XEN01	25	1.4	45.67	4,473	574	-0.01	-0.04
Recip. Engine - Copper GMXE-6 (to be removed)	Hastings	XEN02	25	1.4	45.67	4,473	574	-0.01	-0.04
Dehydration Unit Flare	Hastings	DEHY	17	0.7	33.09	700	950	0.03	0.13
Heater; Natco 96x30	Hastings	HTR1	24	2.0	42.44	8,000	725	0.08	0.35

Notes:
1 - Emergency Generator PM emissions reflect 2 hours of operation in a 24 hour period
2 - New Emergency Generator equipped and modeled with a stack cap
3 - Two engines, XEN01 and XEN02, were removed and replaced with EN01 and EN02. The removal of these two engines was only included in the SMC and $PM_{2.5}$ Increment analyses.

The primary project sources of emissions of $PM_{2.5}/PM_{10}$ are the two new proposed Solar Titan 130 turbines. The emissions and stack characteristics for these turbines presented in Table 2-1 represent the turbines operating at full load. Typical operation of the proposed turbines will be at full load. The worst case emissions profile for $PM_{2.5}/PM_{10}$ for these units on a 24-hr basis and annual basis will be 24 continuous hours of operation at full load for every day of the year. Accounting for scenarios involving partial loads or startup and shutdown

operations during would not result in higher $PM_{2.5}/PM_{10}$ emissions during any 24-hr or annual operating period, compared to continuous operation at full load. While Solar does acknowledge the potential for higher NO_x, CO, and VOC during startup, shutdown and low-load conditions, the emission rate for $PM_{2.5}/PM_{10}$ does not change during these times. Therefore, the full load scenario is the only scenario that was accounted for in the air quality modeling analysis as this represents the worst case emissions scenario.

Contemporaneous to the Project will be the removal of two engines at the Hastings Compressor Station, which is represented using a negative emission rate in Table 2-1 above. These engines were replaced with the two AJAX engines shown as part of the Project emissions. It is important to note that as a conservative estimate, the removal of the engines were not included in the modeling as a Project source during the SIL analysis. Instead, the removal of the engines was only accounted for in the SMC and $PM_{2.5}$ increment analyses.

3.0 MODELING METHODOLOGY

As stated previously, the methodology and assumptions utilized in the air quality modeling analyses described in this report were included in the September 2015 protocol. This section is provided as part of this report for ease of reference and to explain updates that were made to the modeling methodology. Detailed discussion referred to in this section is provided in the September 2015 protocol in Attachment 1 of this report.

3.1 MODEL SELECTION AND APPLICATION

The latest version of USEPA's AERMOD model (version 16216r) was used for predicting ambient impacts for each modeled pollutant. Regulatory default options were used in the analysis. The highest predicted impacts (H1H) were used as the design concentrations in the SIL analyses.

The design concentrations for the NAAQS and PSD increment modeling analyses followed the form of the NAAQS for each applicable pollutant and averaging period. For the PSD increment, the H2H values will be used for the 24-hr averaging period.

AERMOD was configured with the POINTCAP option to characterize a capped stack for the new emergency generator. This option was not available as part of the regulatory options in AERMOD at the time of the September 2015 modeling protocol submittal.

3.2 AMBIENT AIR QUALITY STANDARDS

Table 3-1 presents a summary of the air quality standards that were addressed for PM_{10} and $PM_{2.5}$. The SILs are presented, along with the SMCs, PSD increments, and NAAQS. If Project impacts are shown to be less than the SILs and SMCs, then no further analysis is required. If the SILs are exceeded,

additional analysis will be necessary including the development of a background source inventory and background measured concentrations.

Table 3-1 Ambient Air Quality Standards

	Averaging Period	SIL	SMC	PSD Increment	NAAQS
PM_{10}	24 Hour	5	10	30	150
	Annual	1	-	17	-
$PM_{2.5}$	24 Hour	1.2	-	9	35
	Annual	0.3	-	4	12
NOTE: All concentrations are shown in micrograms/cubic meter ($\mu g/m^3$)					

The September 2015 protocol included a discussion of the $PM_{2.5}$ SILs. In January 2013, USEPA also remanded the Significant Impact Level (SIL) for $PM_{2.5}$. USEPA intends to revise the approach to how the SIL is implemented. In the interim, widely accepted practice for PSD permitting is to continue to use the $PM_{2.5}$ SILs as benchmarks to determine a project's de-minimis standing with respect to the $PM_{2.5}$ NAAQS, but also to ensure that a project's modeled impacts do not exceed the NAAQS (despite being less than the SIL) when added to an existing representative background value of $PM_{2.5}$. Dominion has used this practice as part of the air quality modeling analysis, specifically, that the project's modeled concentrations of directly emitted $PM_{2.5}$ are both less than the levels of the SIL, but also less than the NAAQS when added to a representative background $PM_{2.5}$ concentration.

The representative $PM_{2.5}$ monitor chosen for the 2010-2014 period was located in Marion County, WV (Monitor ID # 54-049-0006). A discussion of the representativeness of the Marion County $PM_{2.5}$ monitor data to the region of the Mockingbird Hill station was provided in the September 2015 protocol. However, since the meteorology and background data have been updated to the 2012-2016 period as part of this submittal, Dominion has selected the $PM_{2.5}$ monitor located in Harrison County, WV (Monitor ID # 54-033-0003). The Harrison County monitor is the more appropriate monitor for the Project because of its closer proximity to the site than the Marion County monitor. The Harrison County monitor would have been the primary choice for the modeling analysis of the 2010-2014 period, however, the 2012-2014 monitor design value for $PM_{2.5}$ was not valid for the Harrison County monitor. The most recent $PM_{2.5}$ design value for the Harrison County monitor is valid, therefore $PM_{2.5}$ data from this monitor will be used in this modeling analysis. The annual $PM_{2.5}$ design value for the Harrison county monitor is 8.4 $\mu g/m^3$, while the 24-hour design value is 18 $\mu g/m^3$.

3.3 GEOGRAPHIC SETTING

3.3.1 Land Use Characteristics

The Mockingbird Hill station is located in a rural setting. Therefore, AERMOD was used in the default (rural) mode. Dominion has analyzed the land use classifications within an area defined by a 3 km radius from the approximate

center of the site, and has determined that the land use within this area is less than 1% urban classification. This determination was used by analyzing the USGS NLCD 1992 data, where urban classifications were assumed to be category 21 (high intensity residential) and category 23 (commercial/industrial/ transportation). A graphical representation of this land use analysis is presented in Appendix B of this report.

3.3.2 Terrain

Terrain elevations and hill scale heights for each receptor were determined for use in this analysis. The latest version of USEPA's AERMAP program (version 11103) was used to determine the ground elevation and hill scale for each receptor, based on data obtained from the USGS National Elevation Database (NED) at a 10-m resolution.

3.4 RECEPTOR GRID

A comprehensive Cartesian receptor grid extending to approximately 20 kilometers (km) from the new Mockingbird Hill site was used in the air quality modeling analysis to assess maximum ground-level pollutant concentrations. The Cartesian receptor grid consists of the following receptor spacings:

- 50-meter spacing along the fence line and extending to 1.8 km from the facility;
- 100-meter spacing from 1.8 km to 2.5 km from the facility;
- 250-meter spacing from 2.5 km to 4 km from the facility;
- 500-meter spacing from 4 km to 10 km from the facility;
- 1000-meter spacing from 10 km to 20 km from the facility.

As noted previously, AERMAP was used to define ground elevations and hill scales for each receptor. Dominion analyzed isopleths of modeled concentrations due to the proposed project to determine if the proposed receptor grid adequately accounted for the worst case impacts. Dominion did not need to make any adjustments to the receptor grid proposed in the modeling protocol.

3.5 METEOROLOGICAL DATA FOR AIR QUALITY MODELING

Surface meteorological data from North Central West Virginia Airport (KCKB), along with upper air data from Pittsburgh, PA for the years 2012-2016 were used in this air quality modeling analysis. The AERMET (version 16216) meteorological processor and associated programs AERMINUTE and AERSURFACE were used to process the data for use as input into AERMOD. Section 3.7 of the September 2015 protocol contained a detailed description of the methodologies used in the AERMET processing, and a justification for the representativeness of the meteorological data to the area of the Mockingbird Hill Expansion Project. As described in the September 2015 protocol, the KCKB meteorological data were processed using surface roughness values for both the KCKB ASOS site as well as the Mockingbird Hill expansion site. Both sets of

meteorological data were then used in the air quality modeling analyses in order to "bound" the modeling analysis by applying roughness values for both the site and the airport. This method is a reasonable measure to ensure that the most conservative model results are obtained when the comparison of surface roughness values for the airport and application site showed noted discrepancies, as described in the September 2015 protocol.

3.6 BUILDING WAKE EFFECTS

The USEPA's Building Profile Input Program (BPIP), Version 04274, was used to calculate downwash effects for the modeled emission sources. Building locations and heights relative to the modeled sources were determined as input into BPIP. A graphical representation of the building downwash analysis is presented in Appendix C of this report. The new combustion turbine stacks will not exceed the greater of the GEP formula height calculated by BPIP or 65 m (213 feet).

4.0 RESULTS OF AIR QUALITY MODELING ANALYSIS

Two criteria pollutants were modeled, specifically $PM_{2.5}$ and PM_{10}. Maximum ground level model design values were identified for the appropriate averaging periods and assessed against the SILs. The NAAQS and PSD increments were then evaluated as necessary.

As mentioned in Section 3.5, all of the model runs were conducted using two different scenarios: one run using meteorological data with the default approach of surface roughness derived from the 1-km radius surrounding the ASOS site at the KCKB airport, and another run using meteorological data with surface roughness derived from the 1-km radius surrounding the Project site. The results using both of these approaches are presented in the following sections of the report.

4.1 SIGNIFICANCE MODELING RESULTS

The first highest modeled concentration for each pollutant and averaging period was used to assess its significance. Tables 4-1 and 4-2 summarize the results of this analysis. 24-hour and annual $PM_{2.5}$ as well as 24-hour and annual PM_{10} were all modeled above their respective SIL values in both the airport and site surface roughness runs, and therefore will require further assessment with cumulative impact modeling. Plots of the modeled concentrations for the airport surface roughness runs are displayed in Figures 4-1 through 4-3.

In addition to comparison to the SILs, 24-hour PM_{10} was also compared to its SMC. A separate analysis was conducted for the SMC runs that accounted for the effective net emissions increase due to the project. Specifically, negative emissions associated with the shutdown and removal of two engines located at the Hastings site were included in this analysis. Further explanation of the sources that were modeled can be found in Section 2.0. By accounting for emissions from both the old and new engines, the SMC analysis more accurately captures the Project's impacts to the existing air quality. Model results from the

SMC analysis, displayed in Table 4-3 below, show that the total modeled concentration of the Project is less than the SMC limit, and therefore no preconstruction monitoring will be required.

Table 4-1 SIL Modeling Results – Airport Surface Roughness

Pollutant	Averaging Period	Class II SIL	Maximum Modeled Concentration
		µg/m³	µg/m³
$PM_{2.5}$	24-hour	1.2	12.45
	Annual	0.2	2.66
PM_{10}	24-hour	5	14.95
	Annual	1	2.77

Table 4-2 SIL Modeling Results – Site Surface Roughness

Pollutant	Averaging Period	Class II SIL	Maximum Modeled Concentration
		µg/m³	µg/m³
$PM_{2.5}$	24-hour	1.2	12.87
	Annual	0.2	3.08
PM_{10}	24-hour	5	15.10
	Annual	1	3.24

Figure 4-1 PM_{10} 24-hour SIL Concentrations

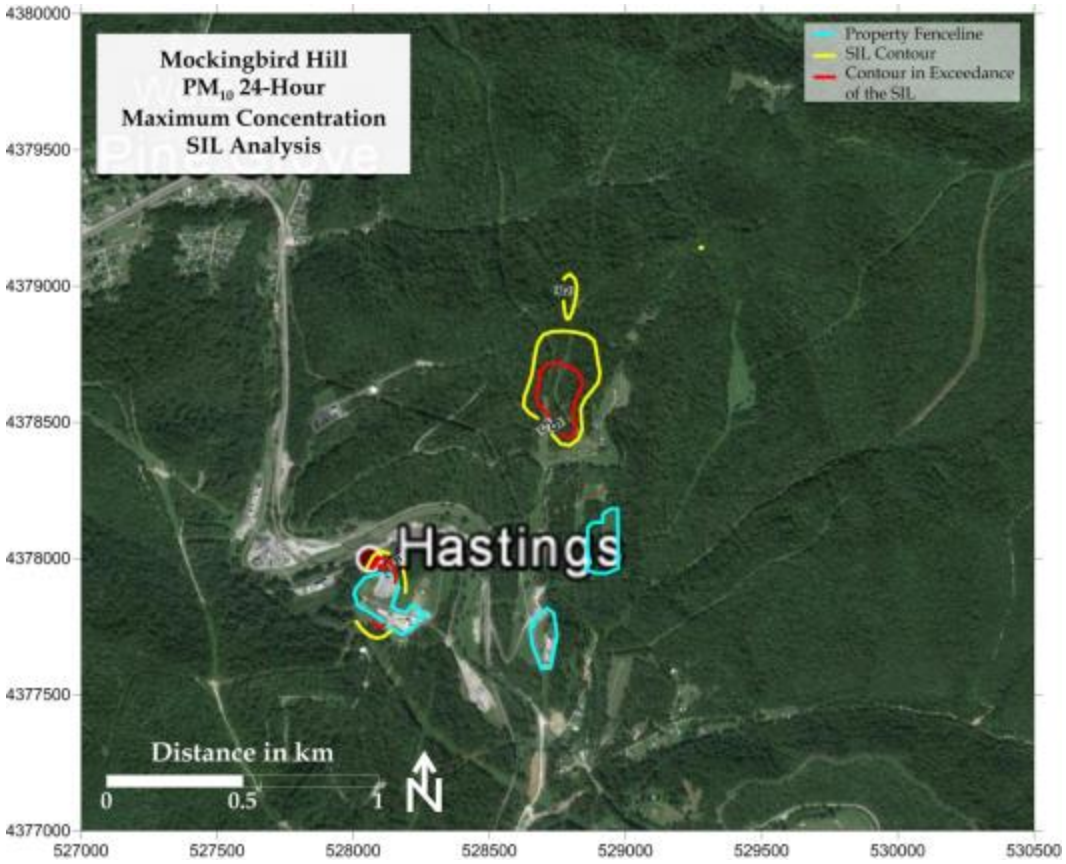

Figure 4-2 $PM_{2.5}$ 24-hour SIL Concentrations

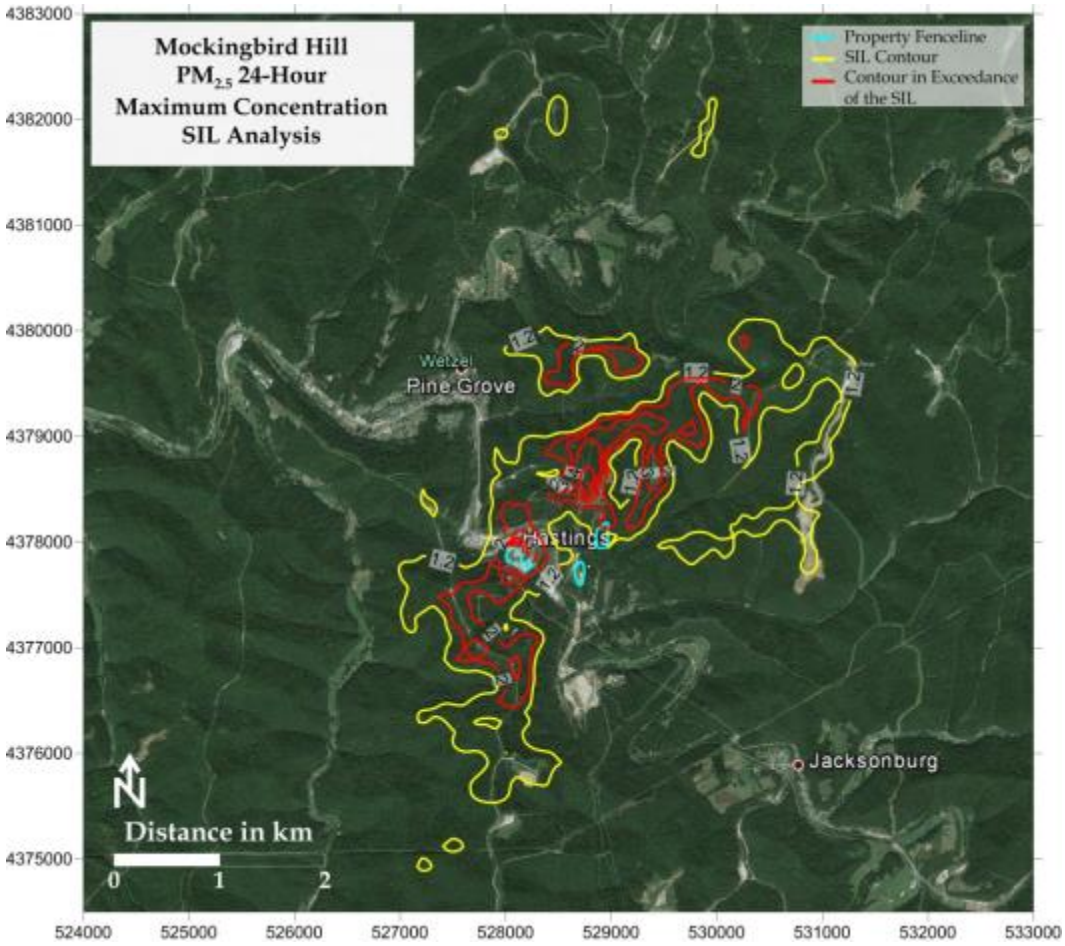

Figure 4-3 $PM_{2.5}$ Annual SIL Concentrations

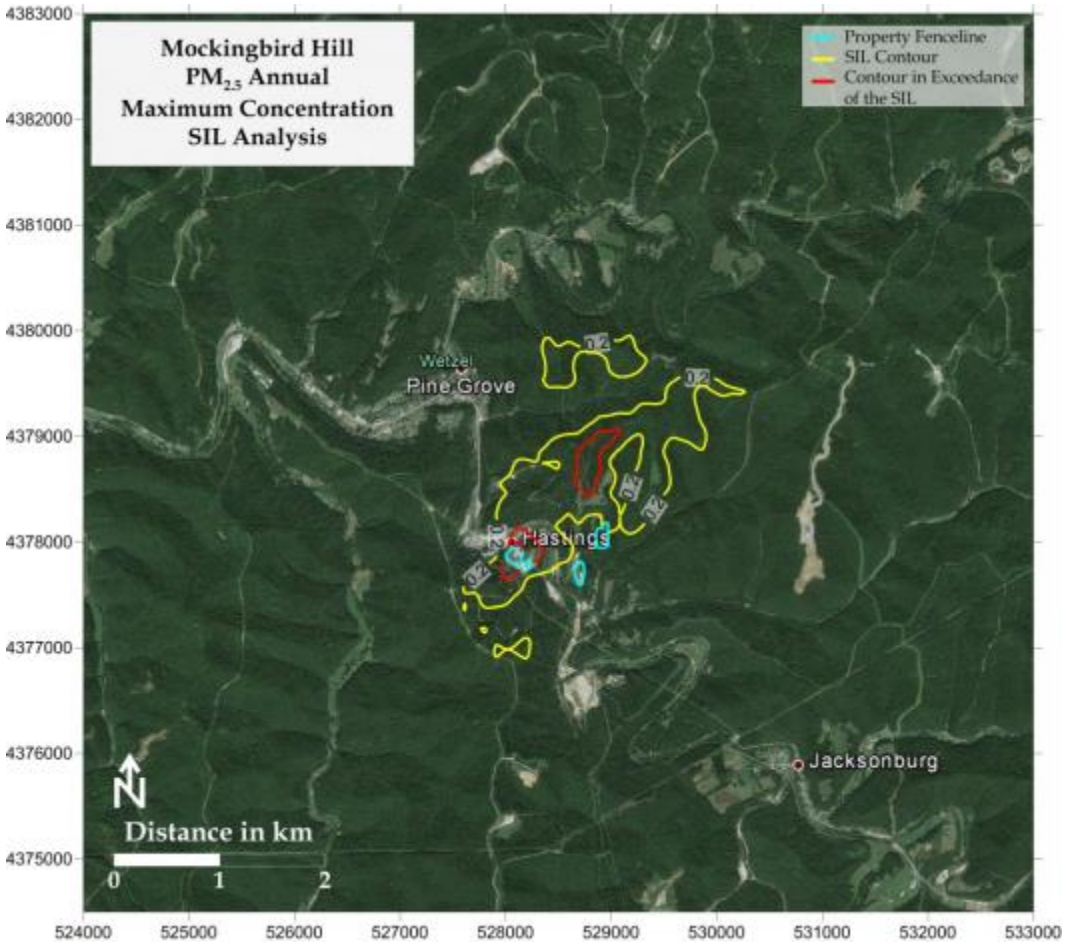

Table 4-3 SMC Modeling Results

Averaging Period / Pollutant	Surface Roughness	SMC	Maximum Modeled Concentration
		µg/m³	µg/m³
24- hour PM_{10}	Airport	10	9.98
	Site	10	7.48

4.2 CUMULATIVE MODELING INVENTORY

Regional major stationary sources (Title V source) within 20-km of the Mockingbird Hill Expansion Site were used to develop a cumulative modeling inventory for $PM_{10}/PM_{2.5}$. The following regional sources have been identified by Dominion for inclusion in the cumulative air quality modeling analysis. Distances noted are from the proposed Mockingbird Hill Expansion Site:

- Dominion Hasting Extraction Plant (Separate Title V from Hastings/Lewis Wetzel/Mockingbird Hill Compressor Station) – 1.27 km
- Equitrans Logansport #49 Compressor Station – 9.8 km
- Columbia Gas Smithfield Compressor Station – 13.4 km
- Wetzel County Sanitary Landfill – 17.5 km

Stack parameters and emission rates for these sources are summarized in Appendix D of this report.

4.3 NAAQS AND PSD INCREMENT MODELING RESULTS

For the cumulative modeling analysis, background concentrations were determined for 24-hour and annual $PM_{2.5}$ and 24-hour PM_{10}. These background values are provided in Table 4-4 below, and were chosen based on their proximity and representativeness with respect to the Project location. A more thorough description of the monitor selection was provided in the September 2015 protocol.

Table 4-4 Background Concentrations

Pollutant	Averaging Period	Monitor ID	Location Name	Monitor County, State	Distance to Site (km)	Background Value (µg/m³)	Design Value Basis
$PM_{2.5}$	24-hour	54-033-0003	Fairmont, WV	Harrison County, WV	41	18	2016 Design Value
$PM_{2.5}$	Annual	54-033-0003	Fairmont, WV	Harrison County, WV	41	8.4	2016 Design Value
PM_{10}	24-hour	39-081-0001	Brilliant, OH	Jefferson County, OH	80	45	Highest of the 2nd Highest (2014-2016)

Project sources were modeled along with existing, contemporaneous, and offsite $PM_{2.5}$ and PM_{10} emissions sources. The cumulative analysis was conducted for only the significant receptors determined from the SIL analysis. The design value of the modeling results were combined with the appropriate background value and then compared to their respective NAAQS. The results of this analysis are provided in Tables 4-5 and 4-6 below.

Table 4-5 NAAQS Modeling Results – Airport Surface Roughness

Pollutant	Averaging Period	Model Design Value µg/m³	Background Concentration µg/m³	Total Concentration µg/m³	NAAQS µg/m³	Maximum Dominion Contribution to any NAAQS Exceedance µg/m³
$PM_{2.5}$	24-hour	9.2	18.0	27.2	35	N/A
	Annual	2.8	8.4	11.2	12	N/A
PM_{10}	24-hour	12.8	45	57.8	150	N/A

Table 4-6 NAAQS Modeling Results – Site Surface Roughness

Pollutant	Averaging Period	Model Design Value µg/m³	Background Concentration µg/m³	Total Concentration µg/m³	NAAQS µg/m³	Maximum Dominion Contribution to any NAAQS Exceedance µg/m³
$PM_{2.5}$	24-hour	9.9	18.0	27.9	35	N/A
	Annual	3.2	8.4	11.6	12	N/A
PM_{10}	24-hour	13.3	45	58.3	150	N/A

The results for all averaging periods of $PM_{2.5}$ and PM_{10} show that the Project will not cause an exceedance of the NAAQS.

The modeled contributions of the Project, new and contemporaneous sources in this instance, were also used in the increment analysis. The $PM_{2.5}$ increment analysis further includes sources that will be removed, explained in greater detail in Section 2.0. The results of the increment analysis are shown below in Tables 4-7 and 4-8. All of the modeled concentrations are below the allowable increment for the Project.

Table 4-7 Increment Modeling Results – Airport Surface Roughness

Pollutant	Averaging Period	Model Design Value µg/m³	Allowable Increment µg/m³	Maximum Dominion Contribution to any Increment Exceedance µg/m³
$PM_{2.5}$	24-hour*	6.33	9	N/A
	Annual	0.92	4	N/A
PM_{10}	24-hour*	12.58	30	N/A
	Annual	2.77	17	N/A

* Highest 2nd Highest

Table 4-8 Increment Modeling Results – Site Surface Roughness

Pollutant	Averaging Period	Model Design Value µg/m³	Allowable Increment µg/m³	Maximum Dominion Contribution to any Increment Exceedance µg/m³
$PM_{2.5}$	24-hour*	5.54	9	N/A
	Annual	0.89	4	N/A
PM_{10}	24-hour*	13.03	30	N/A
	Annual	3.24	17	N/A

* Highest 2nd Highest

4.4 CLASS I ANALYSIS

The proposed Project is located within 300 km of four (4) federally protected Class I areas. All of these Class I areas are located generally to the east and southeast of the Project. A Q/D analysis, provided in Table 4-9, demonstrates that the ratios are below the FLM screening level of 10, therefore no AQRV analysis is required.

Table 4-9 Q/D Analysis

	Q (TPY)	D (km)	Q/D
Otter Creek Wilderness	90.87	102	0.89
Dolly Sods Wilderness		124	0.73
Shenandoah National Park		214	0.42
James River Face Wilderness		240	0.38

Q represents the PTE from the Mockingbord Hill Expansion
Sources: 55.1 tpy NO_X, 5.17 tpy SO_2, 30.6 tpy $PM_{2.5}$

Dominion evaluated the project related increase of PM_{10} and $PM_{2.5}$ against the Class I SILs by applying the AERMOD dispersion model to a ring of receptors defined by a 50-km radius surrounding the Project site. The elevations for these receptors were determined by AERMAP for the receptor locations recommended by the National Park Service for the closest Class I area, Otter Creek. After the elevations for each Class I area receptor were determined with AERMAP, the maximum and minimum elevations were identified (and associated hill scale heights) for all Otter Creek receptors. These maximum and minimum elevations and associated hill scales were used as the elevation and hill scale for each receptor in the 50-km ring. Since both the maximum and minimum elevations were used, 720 total Class I receptors were modeled. The results of the Class I analysis are provided below in Table 4-10.

Table 4-10 Class I Modeling Results

Pollutant	Averaging Period	Class I SIL	Maximum Modeled Concentration
		µg/m³	µg/m³
$PM_{2.5}$	24-hour	0.07	0.018
	Annual	0.06	0.0015
PM_{10}	24-hour	0.3	0.018
	Annual	0.2	0.0015

The maximum modeled concentrations at the 50-km receptors are below the Class I SILs for PM_{10} and $PM_{2.5}$. These results prove that the project would also have maximum potential impacts that would be less than the SILs at the more distant Class I areas. Because the modeled concentrations are below the SILs, the project will have an insignificant impact to any Class I area.

4.5 ADDITIONAL IMPACTS ON GROWTH, SOILS, VEGETATION, AND VISIBILITY

PSD requirements include an evaluation of the effects of growth due to a project, and an evaluation of the effects of the project emissions on soils, vegetation, and visibility.

The impact of the Mockingbird Hill Expansion Project on growth is not expected to be significant. The Project is expected to create approximately eight full time positions once the facility is constructed and operational. There will be no need for additional infrastructure (upgraded roads, housing developments, etc.) to account for these new positions. Therefore, no significant air quality or other environmental impacts are expected due to net population growth associated with this project.

Dominion notes that the results of the SILs and NAAQS analysis presented above demonstrate that the Project will not have a significant impact on air quality in the region. Therefore, the Project's impact on soils, vegetation, and visibility will be minimal. It should also be noted that the Project will comply with the applicable West Virginia visible emissions regulations, which will ensure that emissions from the proposed Project do not have adverse effects on local visibility. An analysis of potential project related visibility impacts for selected Class II areas in the vicinity of the proposed Project is included in Appendix E of this report.

4.6 CONCLUSIONS

The results of the air quality modeling analysis demonstrate that the proposed Mockingbird Hill Expansion Project and existing Dominion sources do not cause

or contribute to any exceedance of NAAQS and/or PSD increments for $PM_{2.5}$ and PM_{10}. The Project has insignificant air quality impacts in Class I areas, and has also demonstrated no adverse impact with respect to impacts on soils, vegetation, and visibility.

All relevant electronic modeling files are contained on CD-ROM in Appendix F of this report. The following summarizes the contents of the CD-ROM:

- AERMOD input and output files for all SIL and NAAQS analyses
- AERMAP input and output
- AERMET input and output, including all raw meteorological data
    - AERSURFACE input and output, including data sources used to derive moisture assumptions
    - Customized surface roughness calculation spreadsheet
- Relevant Title V permits and/or applications used to develop the cumulative NO_X inventory, including materials for regional sources excluded from the analysis
- BPIP input and output

5.0 REFERENCES

U.S. Environmental Protection Agency. (USEPA 2011) USEPA memo entitled "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO2 National Ambient Air Quality Standard", USEPA, Office of Air Quality Planning and Standards, Raleigh, NC. March 1, 2011.

U.S. Environmental Protection Agency. (USEPA 2009) AERMOD Implementation Guide, AERMOD Implementation Workgroup. March 19, 2009.

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U.S. Environmental Protection Agency. (USEPA 2014) Guidance for $PM_{2.5}$ Permit Modeling, Memo from Stephen D. Page to Regional Air Division Directors, Office of Air Quality Planning and Standards, Raleigh, NC. May 20, 2014.

West Virginia Department of Environmental Protection. (WVDEP 2005) 2005 Air Quality Annual Report

West Virginia Department of Environmental Protection. (WVDEP 2008) 2008 Air Quality Annual Report

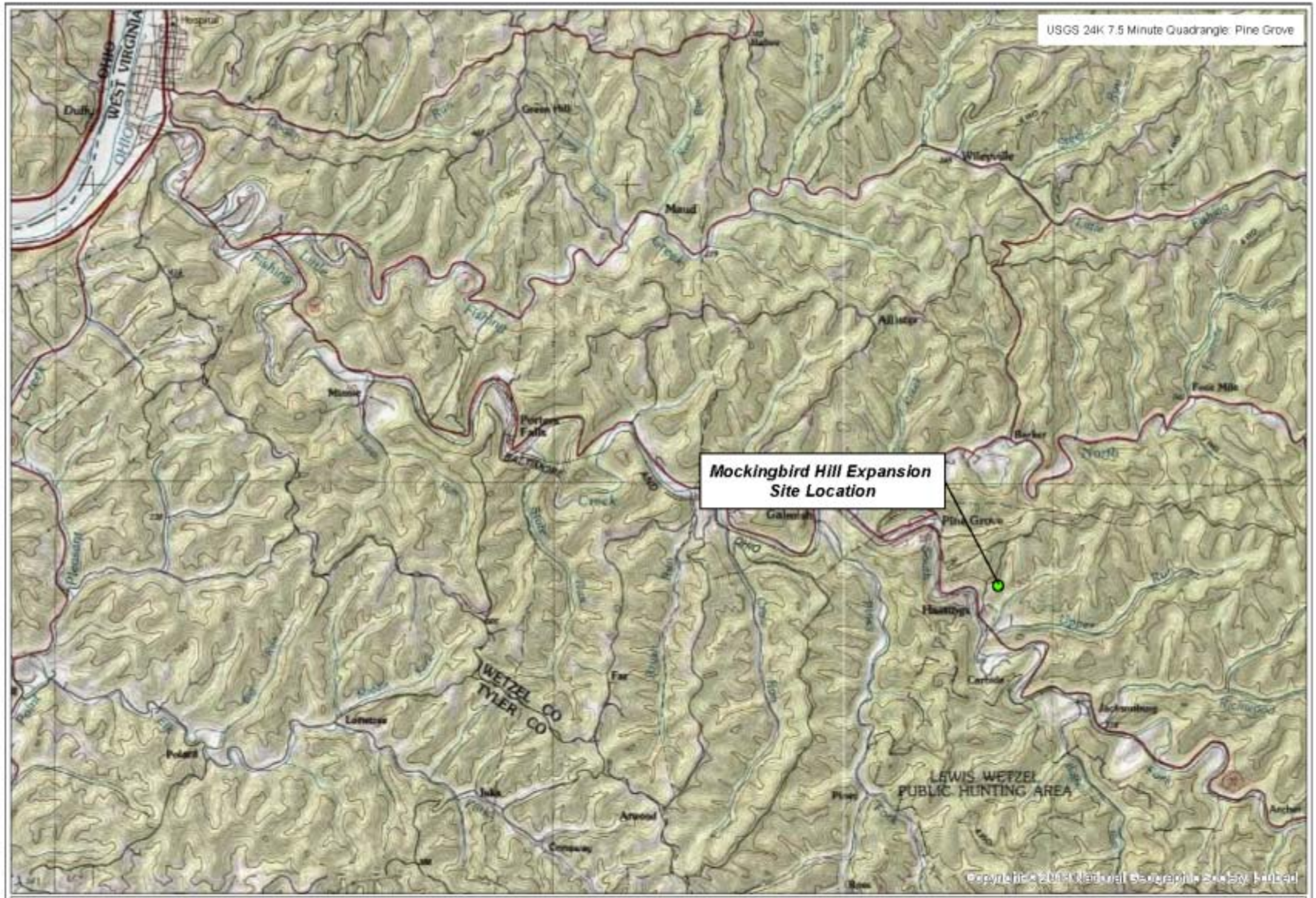
West Virginia Department of Environmental Protection. (WVDEP 2012) Resignation Request and Maintenance Plan for the West Virginia portion of the Wheeling, WV-OH 1997 $PM_{2.5}$ Nonattainment Area, March 2012

Environ International Corporation. (ENVIRON 2008) Technical Support Document for the Association for Southeastern integrated planning (ASIP) Emissions and Air Quality Modeling to Support $PM_{2.5}$ and 8-Hour ozone State Implementation Plans, March 24 2008

West Virginia Department of Environmental Protection. (WVDEP2009) Resignation Request and Maintenance Plan for the West Virginia portion of the Wheeling, WV-OH 1997 $PM_{2.5}$ Nonattainment Area – Appendix B, November 2009

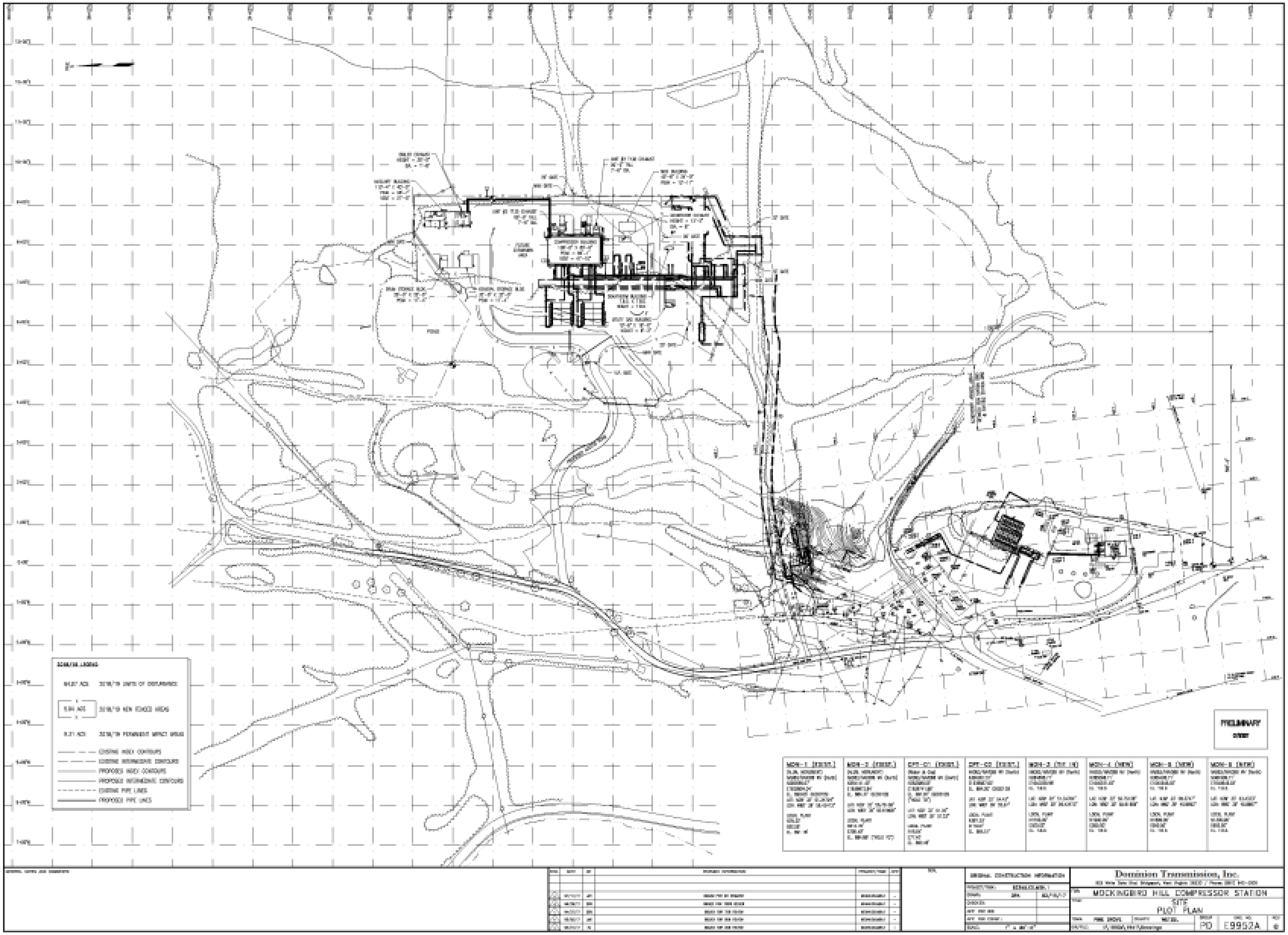
Proposed Facility Location

Appendix A



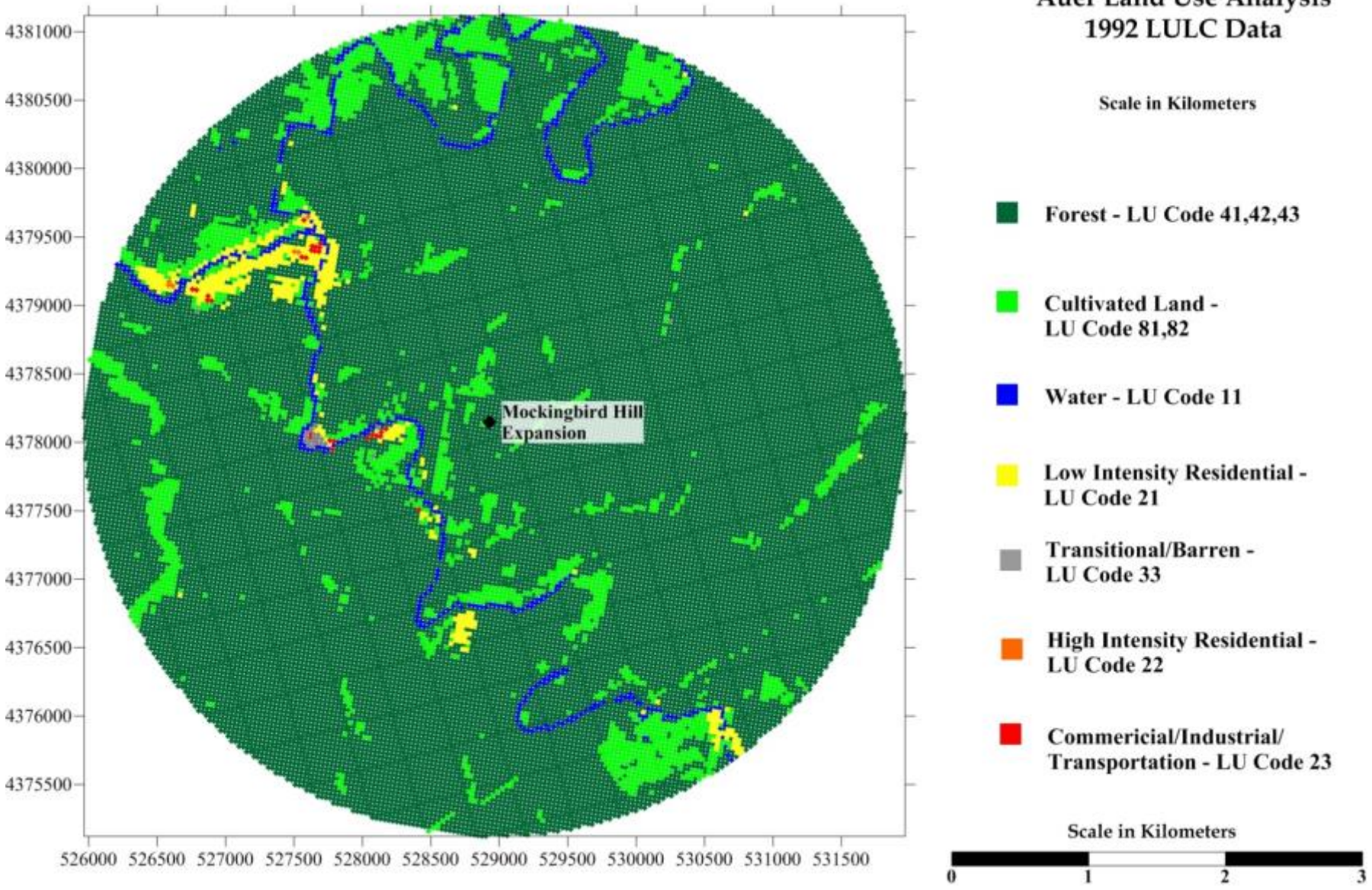
Environmental Resources Management, Inc.
Philadelphia Office
484-913-0300
April 15, 2015

FIGURE A-1
Facility Location
Dominion Transmission, Inc.
Wetzel County, West Virginia


PRELIMINARY
Dominion Transmission, Inc.
MOCKINGBIRD HILL COMPRESSOR STATION
SITE
PLOT PLAN
ORIGINAL CONSTRUCTION INFORMATION
PD
E9952A
COMPRESSOR BUILDING
EXISTING INDEX CONTOURS
EXISTING INTERMEDIATE CONTOURS
PROPOSED INDEX CONTOURS
PROPOSED INTERMEDIATE CONTOURS
EXISTING PIPE LINES
PROPOSED PIPE LINES

Land Use Classifications Surrounding the Project Site

Appendix B


Auer Land Use Analysis
1992 LULC Data
Scale in Kilometers
Forest - LU Code 41,42,43
Cultivated Land - LU Code 81,82
Water - LU Code 11
Low Intensity Residential - LU Code 21
Transitional/Barren - LU Code 33
High Intensity Residential - LU Code 22
Commericial/Industrial/ Transportation - LU Code 23
Mockingbird Hill Expansion
4381000
4380500
4380000
4379500
4379000
4378500
4378000
4377500
4377000
4376500
4376000
4375500
526000 526500 527000 527500 528000 528500 529000 529500 530000 530500 531000 531500
Scale in Kilometers
0 1 2 3

Building Downwash Analysis

Appendix C

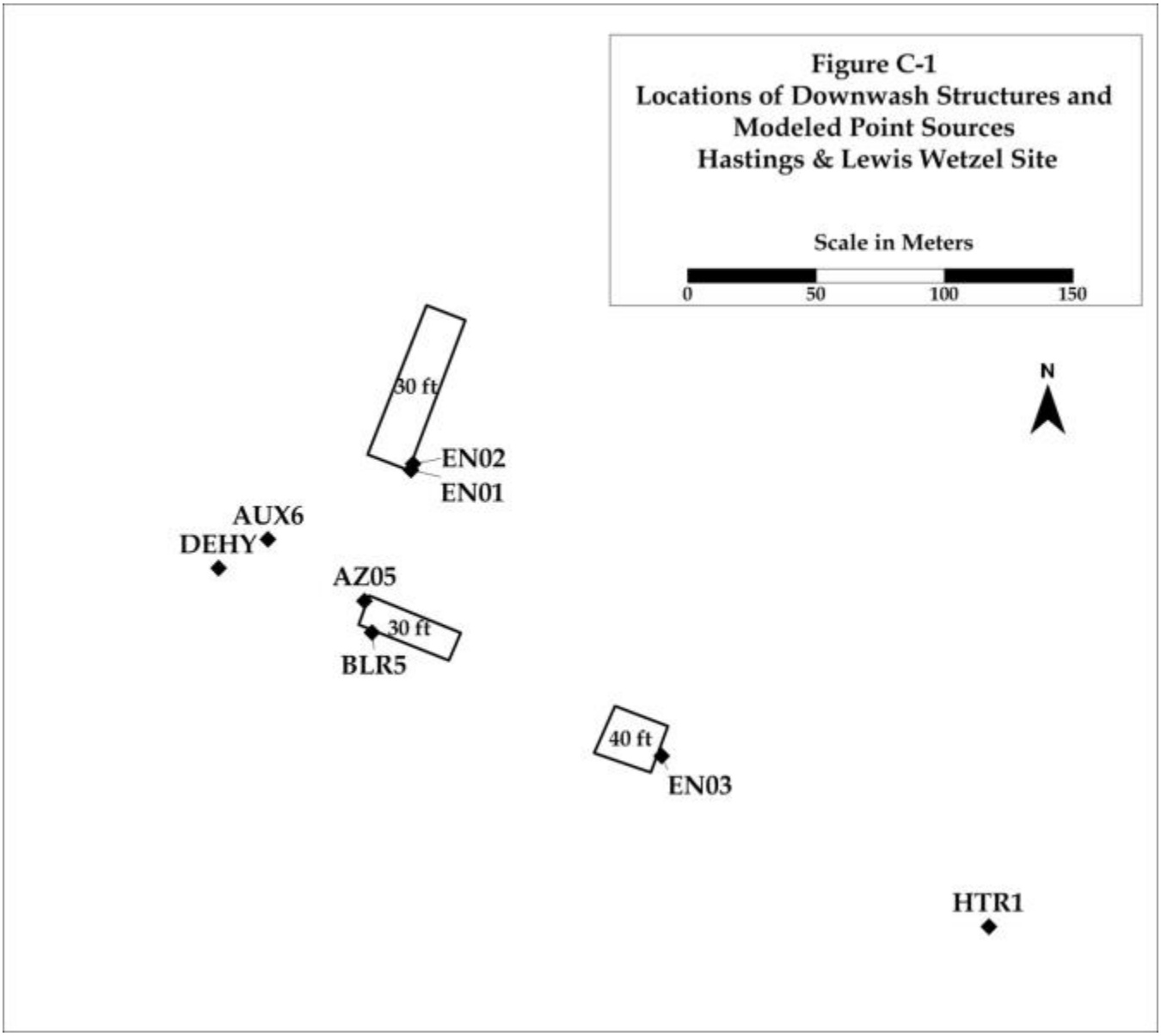
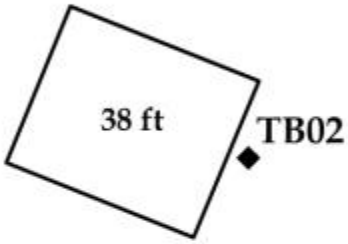


Figure C-1
Locations of Downwash Structures and
Modeled Point Sources
Hastings & Lewis Wetzel Site
Scale in Meters
0
50
100
150
N
30 ft
EN02
EN01
AUX6
DEHY
AZ05
30 ft
BLR5
40 ft
EN03
HTR1

Figure C-2
Locations of Downwash Structures and Modeled Point Sources
Existing Mockingbird Hill Site

Scale in Meters



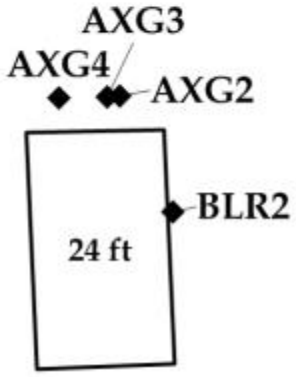
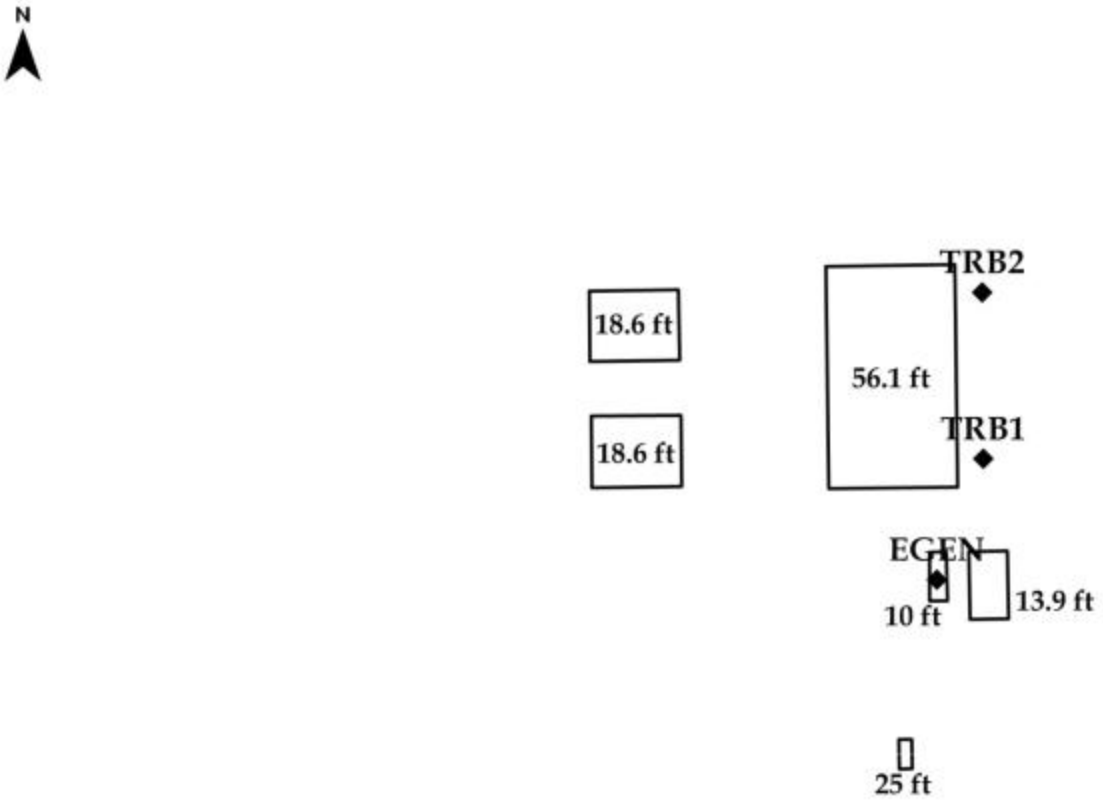


Figure C-3
Locations of Downwash Structures and Modeled Point Sources
Proposed Mockingbird Hill Site

Scale in Meters

0 50 100



Cumulative Modeling Inventory

Appendix D

Plant Name	Stack Description	Model ID	Source Type	UTME (m)	UTMN (m)	Elevation (m)	Stack Height (ft)	Stack Diameter (ft)	Exit Velocity (ft/sec)	Gas Temp (°F)	PM Limit	PM Limit Units	PM Specification	Capacity	Capacity Units	Modeled PM (lb/hr)	Modeled PM (g/s)	Comments/Reference
Dominion Hastings Extraction	Boiler1	BOILR1	POINT	527672.17	4377989.9	218.93	20	1	529.53	400	0.19	lb/hr	PM/PM10/PM2.5	25.1	MMBtu/hr	0.19	0.02394	Permit application, Attachment E
	Boiler2	BOILR2	POINT	527676.32	4377983.38	218.82	20	1	353.35	400	0.13	lb/hr	PM/PM10/PM2.5	16.75	MMBtu/hr	0.13	0.01638	Permit application, Attachment E
	Heater3	HEATR3	POINT	527694	4377971.35	218.37	100	2	369.12	400	0.53	lb/hr	PM	70	MMBtu/hr	0.53	0.06678	permit, page 22
Wetzel County Sanitary Landfill	Area	WETZEL	AREAPOLY	512278.6	4383599.4	334	3.28	-	-	-	1.278	tpy	PM2.5	450700	m^2	6.47E-07	8.157E-08	lb/hr-m^2, Emissions from Attachment E of permit application
											8.52	tpy	PM10	450700	m^2	4.32E-06	5.438E-07	lb/hr-m^2, Emissions from Attachment E of permit application
Equitrans Logansport Compressor	Compressor Engine1	LOGAN1	POINT	538042.5	4378256.3	432.9	25	1.5	9.28	925	0.33	lb/hr	PM/PM10/PM2.5	800	HP	0.33	0.04158	Permit application, Attachment E
	Compressor Engine2	LOGAN2	POINT	538042.5	4378256.3	432.9	25	1.5	9.28	925	0.33	lb/hr	PM/PM10/PM2.5	800	HP	0.33	0.04158	Permit application, Attachment E
	Generator1	LOGAN3	POINT	538042.5	4378256.3	432.9	30	1	4.4	1035	0.04	lb/hr	PM/PM10/PM2.5	265	HP	0.04	0.00504	Permit application, Attachment E
	Generator2	LOGAN4	POINT	538042.5	4378256.3	432.9	30	1	4.4	1035	0.04	lb/hr	PM/PM10/PM2.5	265	HP	0.04	0.00504	Permit application, Attachment E
	Heating Boiler	LOGAN5	POINT	538042.5	4378256.3	432.9	15	0.33	10.07	500	0.019	lb/hr	PM/PM10/PM2.5	2.5	MMBtu/hr	0.019	0.002394	Permit application, Attachment E
	Indirect Line Heater	LOGAN6	POINT	538042.5	4378256.3	432.9	15	0.33	10.07	500	0.011	lb/hr	PM/PM10/PM2.5	1.5	MMBtu/hr	0.011	0.001386	Permit application, Attachment E
	Hot Water Heater	LOGAN7	POINT	538042.5	4378256.3	432.9	4	0.1	10.2	500	0.008	lb/hr	PM/PM10/PM2.5	1	MMBtu/hr	0.008	0.001008	Permit application, Attachment E
	Dehy Boiler	LOGAN8	POINT	538042.5	4378256.3	432.9	15	0.33	10.2	500	0.005	lb/hr	PM/PM10/PM2.5	0.7	MMBtu/hr	0.005	0.00063	Permit application, Attachment E
Columbia Gas Smithfield Compressor	Heating Boiler1	SMITH1	POINT	539754.8	4370190.96	271.3	30	2.5	9.58	350	0.0065	lb/hr	PM10	3.4	MMBtu/hr	0.0065	0.000819	Permit application, PTE Report
	Engine1	SMITH2	POINT	539754.8	4370190.96	271.3	30	1	212.27	750	0.0012	lb/hr	PM10	1500	HP	0.0012	0.0001512	Permit application, PTE Report
	Engine2	SMITH3	POINT	539754.8	4370190.96	271.3	30	1	212.27	750	0.0012	lb/hr	PM10	1500	HP	0.0012	0.0001512	Permit application, PTE Report
	EGEN2	SMITH4	POINT	539754.8	4370190.96	271.3	20	0.5	113.85	1000	0.025	lb/hr	PM10	250	HP	0.025	0.00315	Permit application, PTE Report
	Heater1	SMITH5	POINT	539754.8	4370190.96	271.3	10	0.5	17.59	350	0.0005	lb/hr	PM10	0.25	MMBtu/hr	0.0005	0.000063	Permit application, PTE Report
	Engine5	SMITH6	POINT	539754.8	4370190.96	271.3	57	2.5	241.04	826	0.15	lb/hr	PM10	6736	HP	0.15	0.0189	Permit application, PTE Report
	Heater2	SMITH7	POINT	539754.8	4370190.96	271.3	20	0.82	12.8	350	0.001	lb/hr	PM10	0.5	MMBtu/hr	0.001	0.000126	Permit application, PTE Report
	EGEN3	SMITH8	POINT	539754.8	4370190.96	271.3	20	0.66	150.03	844	-	-	-	530	HP	0.053	0.006678	Emission rate scaled from EGEN2 based on capacity (HP)
	Warehouse Heater3	SMITH9	POINT	539754.8	4370190.96	271.3	28	1.67	15.58	350	-	-	-	0.3	MMBtu/hr	0.0006	0.0000756	Emission rate scaled from Heater2 based on capacity (MMBtu/hr)

Class II Visibility Analysis

Appendix E

Class II Visibility Impairment Analysis

Dominion has conducted a screening modeling analysis to estimate worst case visibility impacts for an observer located 5 km away from the Mockingbird Hill Expansion site. The intent of this analysis is to demonstrate worst case screening impacts in the vicinity of the Project to satisfy the requirement of additional impacts to visibility under the PSD regulations.

A stack plume visibility screening analysis was performed based upon the procedures described in USEPA's Workbook for Plume Visual Impact Screening and Analysis.[1] The screening procedure involves calculation of plume perceptibility (ΔE) and contrast (C) with the USEPA VISCREEN (Version 1.01, dated 13190) model, emissions of NO_x and PM/PM_{10}, worst-case meteorological dispersion conditions, and other default parameters as inputs. The screening procedure determines the light scattering impacts of particulates, including sulfates and nitrates, with a mean diameter of two micrometers (μm) and a standard deviation of two (2) μm. The VISCREEN model evaluates both plume perceptibility and contrast against two backgrounds, sky and terrain.

The VISCREEN model provides three (3) levels of analysis, the first two (2) of which are screening approaches. The Level-1 VISCREEN analysis was selected for the Project. The Level-1 VISCREEN assessment uses a series of default criteria values to assess the visible impacts. If the source passes the criteria defined for a Level-1 VISCREEN assessment (ΔE<2.0 and Cp<0.05), potential for visibility impairment is not expected to be significant and no further analysis is necessary. If a source fails the Level-1 criteria, more refined assumptions would be necessary. The analysis was performed assuming that all emitted particulate from the stacks would be PM_{10}. The emissions of primary NO_2, soot, and SO_4 were set equal to the Level-1 VISCREEN default of 0.00 grams per second (g/s). The emission rates and other VISCREEN input assumptions are summarized in Table D-1.

Table D-1 – VISCREEN Model Input Data

Parameter	Value Used in VISCREEN
Mockingbird Hill Expansion Project Emission Rates (Total Project Emissions, g/sec) • Total NO_x as NO_2 • Primary NO_2 • PM_{10} • Soot (elemental C) • Primary SO_4	 • 63.7 • 0.0 • 32.1 • 0.0 • 0.0
Background visual range (km)	20
Source-observer distance (km)	5.0
Minimum source distance (km)	5.0
Maximum source distance	7.0

The VISCREEN Level-1 model results are summarized in Table D-2. The calculated plume perceptibility and contrast parameters were determined to be below the VISCREEN default criteria for a visibility screening analysis for all screening criteria.

[1] USEPA, Workbook for Plume Visual Impact Screening and Analysis (Revised), EPA-454/R-92-023, 1992.

Table D-2 – VISCREEN Level-1 Analysis Results[a]

Background	Theta[b] (degrees)	Azimuth[c] (degrees)	Distance (km)	Alpha[d] (degrees)	Perceptibility (ΔE)[e]		Contrast (C)[f]	
					Criteria	Plume	Criteria	Plume
Inside Surrounding Area								
Sky	10	144	7	25	2.00	1.360	0.05	0.008
Sky	140	144	7	25	2.00	0.446	0.05	-0.008
Terrain	10	84	5	84	2.24	1.740	0.05	0.013
Terrain	140	84	5	84	2.00	0.242	0.05	0.006

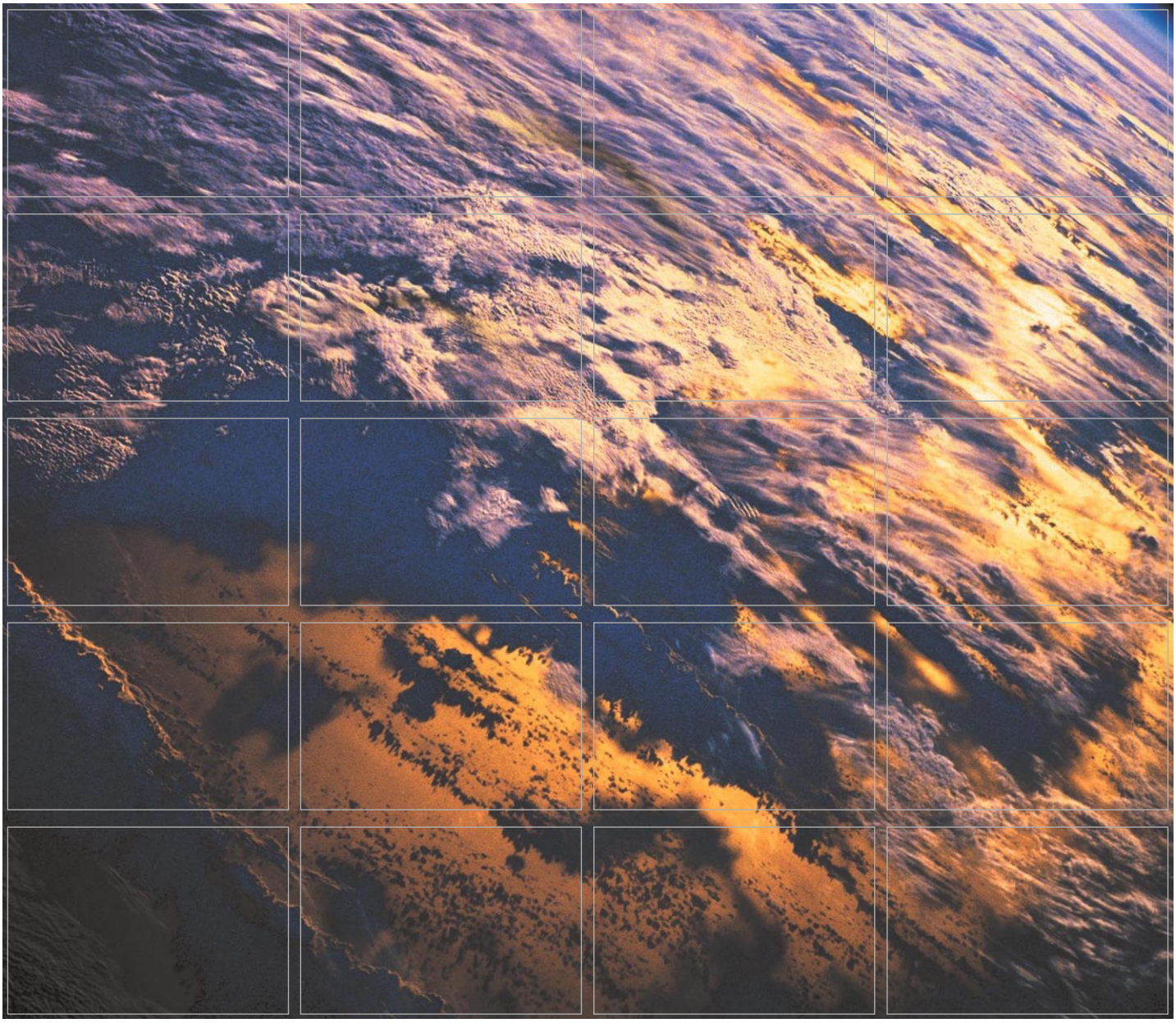
[a] Based on proposed Project emissions
[b] Theta is the vertical angle subtended by the plume
[c] Azimuth is the angle between the line connecting the source, observer and the line of sight
[d] Alpha is the angle between the line of sight and the plume centerline
[e] Plume perceptibility parameter (dimensionless)
[f] Visual contrast against background parameter (dimensionless)

Air Quality Modeling Files (CD-ROM)

Appendix F

September 2015 Air Quality Modeling Protocol

Attachment 1



Dominion Transmission, Inc.

Mockingbird Compressor Station
Air Quality Modeling Protocol

Wetzel County, West Virginia

September 2015

Environmental Resources Management
75 Valley Stream Parkway, Suite 200
Malvern, PA 19355
www.erm.com

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APPENDICES

1.0 INTRODUCTION

Dominion Transmission, Inc. (Dominion) submits this revised air quality modeling protocol to support an air quality permit application that is being submitted to WVDEP. The application is being submitted to authorize the development of an expansion of the existing Mockingbird Hill Compressor Station in Wetzel County, West Virginia. The proposed Mockingbird Hill Expansion is located at approximately 39° 33′ 8″ and 80° 39′ 46″. A general area map showing the proposed location of the facility, as well as the general layout of the existing and proposed facility is provided in Appendix A of this protocol.

1.1 PROJECT OVERVIEW

Dominion proposes to construct an expansion of the existing Mockingbird Hill Compressor Station located in Wetzel County, WV. This project will involve the installation of two new combustion turbines (CTs) that will power the natural gas compressing operation at the proposed facility. Based on current engineering estimates, the CTs will be rated at 20,500 bhp each. The project will also include the installation of a 7.2 MMBtu/hr auxiliary boiler and a 1,416 bhp emergency generator.

1.2 OVERVIEW OF METHODOLOGY

Table 1-1 provides a summary of the attainment status of Wetzel County, West Virginia. The attainment status determines which regulatory programs new major sources or modifications to existing sources must address in the context of obtaining an air quality construction permit. In nonattainment areas, pollutants with emission levels that trigger non-attainment New Source Review (NA-NSR) requirements are subject to additional control (Lowest Achievable Emission Rate, LAER) and emissions offset requirements but are not required to conduct air quality dispersion modeling. Wetzel County is classified as unclassifiable or attainment for all pollutants. Therefore, the requirements of NA-NSR do not apply. In attainment areas such as Wetzel County, pollutants that trigger the significant emission rate (SER) must address requirements of the Prevention of Significant Deterioration (PSD) program. The project-related emissions for the proposed Mockingbird Hill expansion exceed the PSD SERs for PM_{10} and $PM_{2.5}$. The magnitude of the emissions increase for PM_{10} and $PM_{2.5}$ are presented in Table 1-2.

Table 1-1 Attainment Status of Wetzel County, West Virginia

Pollutant	Attainment Status of Wetzel County, West Virginia
SO_2 (annual)	Unclassifiable/Attainment
SO_2 (1-hr)	Unclassifiable/Attainment
CO	Unclassifiable/Attainment
Pb	Unclassifiable/Attainment
O_3 (1-hr)	Unclassifiable/Attainment
PM_{10}	Unclassifiable/Attainment
NO_2 (annual)	Unclassifiable/Attainment
NO_2 (1-hr)	Unclassifiable/Attainment

Pollutant	Attainment Status of Wetzel County, West Virginia
O_3 (8-hr)	Unclassifiable/Attainment
$PM_{2.5}$ (annual)	Unclassifiable/Attainment
$PM_{2.5}$ (24-hr)	Unclassifiable/Attainment

Table 1-2 Project-Related Significant Emissions Increases

Pollutant	Project Emissions (tons/yr)	PSD SER
PM_{10}	30.6	15
$PM_{2.5}$	30.6	10

Dispersion modeling will be performed for PM_{10} and $PM_{2.5}$ to assess the ambient air impacts resulting from the Project emissions increases. The modeling analysis will address compliance with the National Ambient Air Quality Standards (NAAQS) and PSD increments, as applicable. The modeling analyses described in this protocol will conform to Appendix W of 40 CFR Part 51 (Guideline on Air Quality Models). The key elements of the modeling analysis will include:

- Use of the latest version of AERMOD (version 15181);
- Use of input meteorological data from North Central West Virginia Airport (KCKB) from 2010 to 2014;
- Use of upper air data from Pittsburgh, PA;
- Application of the latest version of AERSURFACE as recommended in the USEPA AERMOD Implementation Guidance (USEPA 2009);
- Develop a comprehensive receptor grid designed to identify maximum modeled concentrations;
- Conduct air quality modeling to determine the magnitude and location of ambient concentrations due to emissions from the Project;
- In accordance with PSD requirements, determine whether emissions from the Project that are subject to PSD will have an effect on growth, soils, vegetation, and visibility in the vicinity of the Project;
- Compare maximum predicted impacts to relevant Significant Impact Levels (SILs) and Significant Monitoring Concentrations (SMCs) to determine if additional modeling or monitoring is required.

2.0 PROJECT EMISSIONS AND SOURCE CHARACTERIZATION

The Mockingbird Hill Expansion Project will have an increase in emissions of PM_{10} and $PM_{2.5}$ that exceed the significant emission rates (SERs) for PSD applicability. The emissions increase of PM_{10} and $PM_{2.5}$ includes contemporaneous emissions increases from the existing Mockingbird Hill/Lewis Wetzel/Hastings Compressor Station complex. Table 2-1 presents the stack characteristics and emission rates on a source by source basis, including the project sources, contemporaneous sources, and existing sources.

Table 2-1 Emissions and Stack Parameters – Proposed Project Sources and Existing Sources

Source	Facility	Model ID	Stack Height (ft.)	Exit Diameter (ft.)	Exit Gas Velocity (ft./sec)	Exit Gas Flow Rate (acfm)	Exit Gas Temp. (°F)	$PM_{2.5}/PM_{10}$ (lb/hr)	$PM_{2.5}/PM_{10}$ (tpy)
Project Sources									
Solar Titan 130 Turbine	Mockingbird - New	TURB1	70	11.7	39.60	254,464	750	3.46	15.16
Solar Titan 130 Turbine	Mockingbird - New	TURB2	70	11.7	39.60	254,464	750	3.46	15.16
Boiler	Mockingbird - New	AUX	28	0.7	247.35	5,232	838	0.05	0.23
Caterpillar G3516 Emergency Generator	Mockingbird - New	EGEN	8	0.5	61.12	720	840	0.01	0.03
Contemporaneous Sources									
Generac Model QT080 Natural Gas-Fired Emergency Generator (002-006)	Hastings	AUX06	5	0.5	61.12	720	840	0.0018	0.0054
CAT 3612 Compressor Engine	Lewis Wetzel	EN03	45	1.0	505.24	23,809	838	0.55	2.43
Cummins KTA19G Aux. Generator	Lewis Wetzel	AUZ05	10	1.0	66.21	3,120	1286	0.09	0.38
Bryan Model RV 450W-FDG Boiler	Lewis Wetzel	BLR05	18	0.7	247.35	5,232	838	0.06	0.26
Existing Sources									
Solar Taruus 60 Turbine	Mockingbird	TURBINE2	50	4.0	145.89	110,000	900	2.69	11.78
Capstone C60 Microturbines / Aux. Generator	Mockingbird	AUXGEN02	12	0.7	247.35	5,232	725	0.03	0.13
Capstone C60 Microturbines / Aux. Generator	Mockingbird	AUXGEN03	12	0.7	247.35	5,232	725	0.03	0.13
Capstone C60 Microturbines / Aux. Generator	Mockingbird	AUXGEN04	12	0.7	247.35	5,232	725	0.03	0.13
Boiler	Mockingbird	BOILER02	18	0.7	247.35	5,232	838	0.04	0.18
Recip. Engine - Copper GMXE-6	Hastings	EN01	25	1.4	45.67	4,473	574	0.01	0.04
Recip. Engine - Copper GMXE-6	Hastings	EN02	25	1.4	45.67	4,473	574	0.01	0.04
Dehydration Unit Flare	Hastings	DEHY	17	0.7	33.09	700	950	0.03	0.13
Heater; Natco 96x30	Hastings	HTR01	24	2.0	42.44	8,000	725	0.08	0.35

The primary project sources of emissions of $PM_{2.5}/PM_{10}$ are the two new proposed Solar Titan 130 turbines. The emissions and stack characteristics for these turbines presented in Table 2-1 represent the turbines operating at full load. Typical operation of the proposed turbines will be at full load. The worst case emissions profile for $PM_{2.5}/PM_{10}$ for these units on a 24-hr basis and annual basis will be 24 continuous hours of operation at full load for every day of the year. Accounting for scenarios involving partial loads or startup and shutdown operations during would not result in higher $PM_{2.5}/PM_{10}$ emissions during any 24-hr or annual operating period, compared to continuous operation at full load. While Solar does acknowledge the potential for higher NOx, CO, and VOC during startup, shutdown and low-load conditions, the emission rate for $PM_{2.5}/PM_{10}$ does not change during these times. Therefore, the full load scenario is the only scenario that will be accounted for in the air quality modeling analysis as this represents the worst case emissions scenario.

3.0 MODELING METHODOLOGY

3.1 MODEL SELECTION AND APPLICATION

The latest version of USEPA's AERMOD model (version 15181) will be used for predicting ambient impacts for each modeled pollutant. Regulatory default options will be used in the analysis. The highest predicted impacts (H1H) will be used as the design concentrations in the SIL analyses described in this protocol.

The design concentrations for the NAAQS and PSD increment modeling analyses will follow the form of the NAAQS for each applicable pollutant and averaging period. For the PSD increment, the H2H values will be used for the 24-hr averaging period.

3.2 AMBIENT AIR QUALITY STANDARDS

Table 3-1 presents a summary of the air quality standards that will be addressed for PM_{10} and $PM_{2.5}$. The SILs are presented, along with the SMCs, PSD increments, and NAAQS. If Project impacts are shown to be less than the SILs and SMCs, then no further analysis is required. If the SILs are exceeded, additional analysis will be necessary including the development of a background source inventory and background measured concentrations.

Table 3-1 Ambient Air Quality Standards

	Averaging Period	SIL	SMC	PSD Increment	NAAQS
PM_{10}	24 Hour	5	10	30	150
	Annual	1	-	17	-
$PM_{2.5}$	24 Hour	1.2	-	9	35
	Annual	0.3	-	4	12
NOTE: All concentrations are shown in micrograms/cubic meter ($\mu g/m^3$)					

3.3 $PM_{2.5}$ CONSIDERATIONS

In January 2013, the Significant Monitoring Concentrations (SMCs) for $PM_{2.5}$ were vacated by the DC Circuit Court. The SMCs are concentrations that are used to determine if a project subject to PSD regulations needs to consider preconstruction ambient monitoring to determine existing air quality conditions at the project site. Preconstruction monitoring is typically required when a project's modeled impacts exceed the SMCs and the existing air quality monitoring network in the region is inadequate to characterize existing air quality. There are no $PM_{2.5}$ monitors operating within Wetzel County. However, there are six $PM_{2.5}$ monitors within 100 km of the Mockingbird Hill site. The 2013 monitor design values, location relative to the Mockingbird Hill site, and preliminary 2014 design values for these $PM_{2.5}$ monitoring sites are shown in Table 3-2.

Table 3-2 Regional $PM_{2.5}$ Monitor Values

County	Site ID	Distance (km) from Proposed Mockingbird Hill Expansion		EPA 2011-2013 Annual Design Value ($\mu g/m^3$)	2012 Annual ($\mu g/m^3$)	2013 Annual ($\mu g/m^3$)	2014 Annual ($\mu g/m^3$)	2014 Annual Design Value ($\mu g/m^3$, Estimated)
Harrison	54-033-0003	41.10	SE	Invalid	9.70	8.79	8.75	9.08
Marion	54-049-0006	46.06	ESE	10.3	10.33	9.33	9.60	9.75
Marshall	54-051-1002	40.78	NNW	11.6	11.80	10.35	11.12	11.09
Monongalia	54-061-0003	64.80	ENE	9.5	8.85	8.84	8.67	8.78
Ohio	54-069-0010	63.10	N	10.6	10.44	10.10	10.58	10.37
Wood	54-107-1002	80.10	WSW	10.4	10.31	9.48	9.69	9.83

County	Site ID	Distance (km) from Proposed Mockingbird Hill Expansion		EPA 2011-2013 24-hr Design Value ($\mu g/m^3$)	2012 24-hr ($\mu g/m^3$)	2013 24-hr ($\mu g/m^3$)	2014 24-hr ($\mu g/m^3$)	2014 24-hr Design Value ($\mu g/m^3$, Estimated)
Harrison	54-033-0003	41.10	SE	Invalid	20.30	19.10	17.50	18.97
Marion	54-049-0006	46.06	ESE	22	19.70	18.40	18.40	18.83
Marshall	54-051-1002	40.78	NNW	25	23.60	23.20	22.10	22.97
Monongalia	54-061-0003	64.80	ENE	22	17.70	19.00	17.20	17.97
Ohio	54-069-0010	63.10	N	24	20.00	24.90	21.10	22.00
Wood	54-107-1002	80.10	WSW	22	19.70	20.50	18.10	19.43

Since there are six currently operating $PM_{2.5}$ monitors in the region of the proposed project, and the placement of these monitors are in multiple directions with respect to the project site, Dominion asserts that preconstruction monitoring should not be required. The six monitors shown in Table 3-2 are adequate to determine existing $PM_{2.5}$ background concentrations for the region of the proposed project.

3.3.1 Representative Background Concentrations of $PM_{2.5}$

Dominion will select the $PM_{2.5}$ monitoring data from the Marion County, WV monitor (monitor ID # 54-049-0006) to represent background concentrations for the proposed project. The monitor data from this monitor will be used as representative background values for the cumulative $PM_{2.5}$ air quality modeling analysis, if such an analysis is necessary. Table 3-3 presents county-level and $PM_{2.5}$ emissions for Wetzel County, WV compared to the counties with the closest monitored $PM_{2.5}$ data relative to the project site.

Table 3-3 County-Level Historical $PM_{2.5}$ Emissions

County	2011 NEI $PM_{2.5}$ (tpy)	2011 NEI PM_{10} (tpy)
Wetzel, WV	419.5	967.8
Harrison, WV	2086.4	4702.3
Marion, WV	635.9	2285.3
Marshall, WV	2151.7	3415.4

As shown in Table 3-3, the emissions of $PM_{2.5}$ and PM_{10}, are lowest in Wetzel County, compared to the counties with $PM_{2.5}$ monitoring data. It is overly conservative to select the Marshall County, WV $PM_{2.5}$ monitor (the monitor with the highest design values within 100 km), since historical emissions of $PM_{2.5}$ in Marshall County are over five times higher than Wetzel County. It should be noted that the $PM_{2.5}$ monitor values from Marshall County are notably higher than the $PM_{2.5}$ monitor data from Harrison and Marion Counties. Therefore, it is appropriate to not use the highest regional monitor values to represent background $PM_{2.5}$. The next highest monitor values are from the Marion County monitor, which is the monitor that is proposed to be used to represent background $PM_{2.5}$ for the air quality modeling analysis.

In addition to the SMC vacature in January 2013, USEPA also remanded the Significant Impact Level (SIL) for $PM_{2.5}$. USEPA intends to revise the approach to how the SIL is implemented. In the interim, widely accepted practice for PSD permitting is to continue to use the $PM_{2.5}$ SILs as benchmarks to determine a project's de-minimis standing with respect to the $PM_{2.5}$ NAAQS, but also to ensure that a project's modeled impacts do not exceed the NAAQS (despite being less than the SIL) when added to an existing representative background value of $PM_{2.5}$. Dominion intends to employ this practice as part of the air quality modeling analysis, specifically, that the project's modeled concentrations of directly emitted $PM_{2.5}$ are both less than the levels of the SIL, but also less than the NAAQS when added to a representative background $PM_{2.5}$ concentration, obtained from the $PM_{2.5}$ monitor in Marion County, WV.

3.3.2 Secondary Formation of $PM_{2.5}$

As presented in Table 1-1 of this protocol, the proposed project has an emissions increase of $PM_{2.5}$ that exceeds the PSD SER. However, the emissions increases of $PM_{2.5}$ precursor pollutants, NO_X and SO_2, are less than their respective PSD SERs. USEPA $PM_{2.5}$ modeling guidance (USEPA 2014) suggests that for PSD projects with emissions of $PM_{2.5}$ that exceeds the PSD SERs, yet have precursor emissions that are less than their respective PSD SERs, are not required to conduct an analysis to assess secondary formation of $PM_{2.5}$. Therefore, a secondary $PM_{2.5}$ assessment is not proposed for this air quality modeling analysis.

3.4 REPRESENTATIVE BACKGROUND CONCENTRATION OF PM_{10}

Unlike the $PM_{2.5}$ monitoring network in the region discussed in Section 3.3 of this protocol, the existing network of PM_{10} in the region is sparse. Most of the PM_{10} monitoring sites in West Virginia have been discontinued. However, there are some currently operating PM_{10} monitoring sites in the panhandle region. The closest of these monitors is located approximately 80 km north of the Project site in Brilliant, OH. A summary of the highest and second highest monitor values of PM_{10} for this site is provided in Table 3-4. Dominion proposes to use the three year average of the second high monitor values of PM_{10} from this monitor to represent existing ambient PM_{10} levels in the vicinity of the project. This is a conservative assumption, since the Brilliant, OH monitor is exposed to high levels of emissions (compared to vicinity of the Project) due to its location in close proximity to a large coal fired power plant along the Ohio River, as well as other heavy industries further north of the monitor site.

Table 3-4 Brilliant, OH PM_{10} Monitor Values

Year	First High	Second High
	$\mu g/m^3$	
2012	57	47
2013	40	38
2014	46	41
3-yr Average	**47.7**	**42.0**

3.5 GEOGRAPHIC SETTING

3.5.1 Land Use Characteristics

The proposed facility will be located in a rural setting. Therefore, AERMOD will be used in the default (rural) mode. Dominion has analyzed the land use classifications within an area defined by a 3 km radius from the approximate center of the site, and has determined that the land use within this area is less than 1% urban classification. This determination was used by analyzing the USGS NLCD 1992 data, where urban classifications were assumed to be category 21 (high intensity residential) and category 23 (commercial/industrial/transportation). A graphical representation of this land use analysis will be provided in the modeling report to WVDEP.

3.5.2 Terrain

Terrain elevations and hill scale heights for each receptor will be determined for use in this analysis. The latest version of USEPA's AERMAP program (version 11103) will be used to determine the ground elevation and hill scale for each receptor, based on data obtained from the USGS National Elevation Database (NED). The NED data will be obtained at a horizontal resolution of 1/3 arc-second (10-m) for use in this analysis.

3.5.3 Effects on Growth, Soils, Vegetation, and Visibility

PSD requirements include an evaluation of the effects of growth due to a project, and an evaluation of the effects of project emissions on soils, vegetation, and visibility. Dominion will perform this review as part of the modeling report. The impacts of the Project on regional population growth will not be significant. Dominion further anticipates that the impacts of all criteria pollutants will be below the SILs, and that consequently impacts on soils, vegetation, and visibility will be minimal.

Specifically with regard to visibility, it should be noted that the facility will comply with the applicable West Virginia visible emissions regulations. To further quantify potential visibility impacts, Dominion proposes to utilize the USEPA VISCREEN (Version 1.01, dated 13190) visibility model to assess the proposed project's impact on visibility impairment. Typically, visibility impacts in Class II areas are assessed when a local feature, such as a scenic overlook or state park, has particular public value with respect to visibility. No such areas are known to exist in the vicinity of the Mockingbird Hill Expansion project. Nevertheless, Dominion proposes to use VISCREEN to estimate worst case visibility impacts for an observer located 5 km away from the proposed project. Dominion believes this general visibility assessment, not specifically tied to any known feature such as a scenic overlook or state park, will demonstrate that the proposed project will have minimal impacts with respect to visible emissions.

3.6 RECEPTOR GRID

A comprehensive Cartesian receptor grid extending to approximately 20 kilometers (km) from the new Mockingbird Hill site will be used in the air quality modeling analysis to assess maximum ground-level pollutant concentrations. The Cartesian receptor grid will consist of the following receptor spacings:

- 50-meter spacing along the fence line and extending to 1.8 km from the facility;
- 100-meter spacing from 1.8 km to 2.5 km from the facility;
- 250-meter spacing from 2.5 km to 4 km from the facility;
- 500-meter spacing from 4 km to 10 km from the facility;
- 1000-meter spacing from 10 km to 20 km from the facility.

As noted previously, AERMAP will be used to define ground elevations and hill scales for each receptor. Dominion will analyze isopleths of modeled concentrations due to the proposed project, and determine if the proposed receptor grid adequately accounts for the worst case impacts. For example, if it is determined that the concentration gradient is not decreasing at the edge of the proposed grid, the grid will be expanded to ensure that the gradient is decreasing at the edge of the grid. Also, if it is determined that isolated high impacts from the proposed project appear in elements of the coarse receptor grid (in the 500-m spaced portion) then Dominion will develop fine spaced receptors for that portion of the grid. An example of where this may occur would be isolated areas of terrain in the coarse grid. Dominion will make any adjustments to the proposed grid on a case by case basis, and provide justification for any refinements in the modeling report to WVDEP.

3.7 METEOROLOGICAL DATA FOR AIR QUALITY MODELING

AERMOD requires representative meteorological data as a source of input into the model. The Guideline on Air Quality Models calls for five years of meteorological data to be used in air quality modeling analyses where on-site sources of meteorological data are not available. Since Dominion has not operated a PSD quality meteorological monitoring station in the vicinity of the facility, off-site meteorological data must be utilized. The following sections describe the selection of the offsite meteorological data proposed in the air quality modeling analysis for the proposed project.

The facility is located in rural Wetzel County, WV. The closest airport with available hourly and one-minute meteorological data suitable for AERMET is the North Central West Virginia Airport (KCKB), located approximately 47 km to the southeast of the proposed Dominion facility. KCKB is situated at approximately 1,203 ft. elevation, compared to the proposed facility which is located at approximately 935 ft. elevation. The terrain in the vicinity of the site, as well as the vicinity of CKB is comprised of significantly varying elevation, typical of the region as a whole. Appendix B of this protocol contains topographic maps for both the airport and project site. Both maps show hilly terrain in the vicinity of each site. Meteorological data representativeness considerations are discussed in detail in the following sections of the protocol.

3.7.1 Meteorological Data Representativeness - Land Use

The Automated Surface Observation System (ASOS) station at North Central West Virginia Airport (KCKB) is located approximately 47 km to the southeast of the proposed Mockingbird Hill Expansion Project. Differences in land use characteristics between KCKB and the project site were investigated to determine if these differences could significantly affect AERMOD modeled concentrations. The AERMET land use processor AERSURFACE was used to summarize the Bowen ratio and albedo associated with KCKB and the proposed project site. A general comparison of these values is provided in Table 3-5. It should be noted

that these values were determined for comparison purposes only, the procedures used in AERSURFACE to support the actual AERMET processing are described in Section 3.7.3 of this protocol.

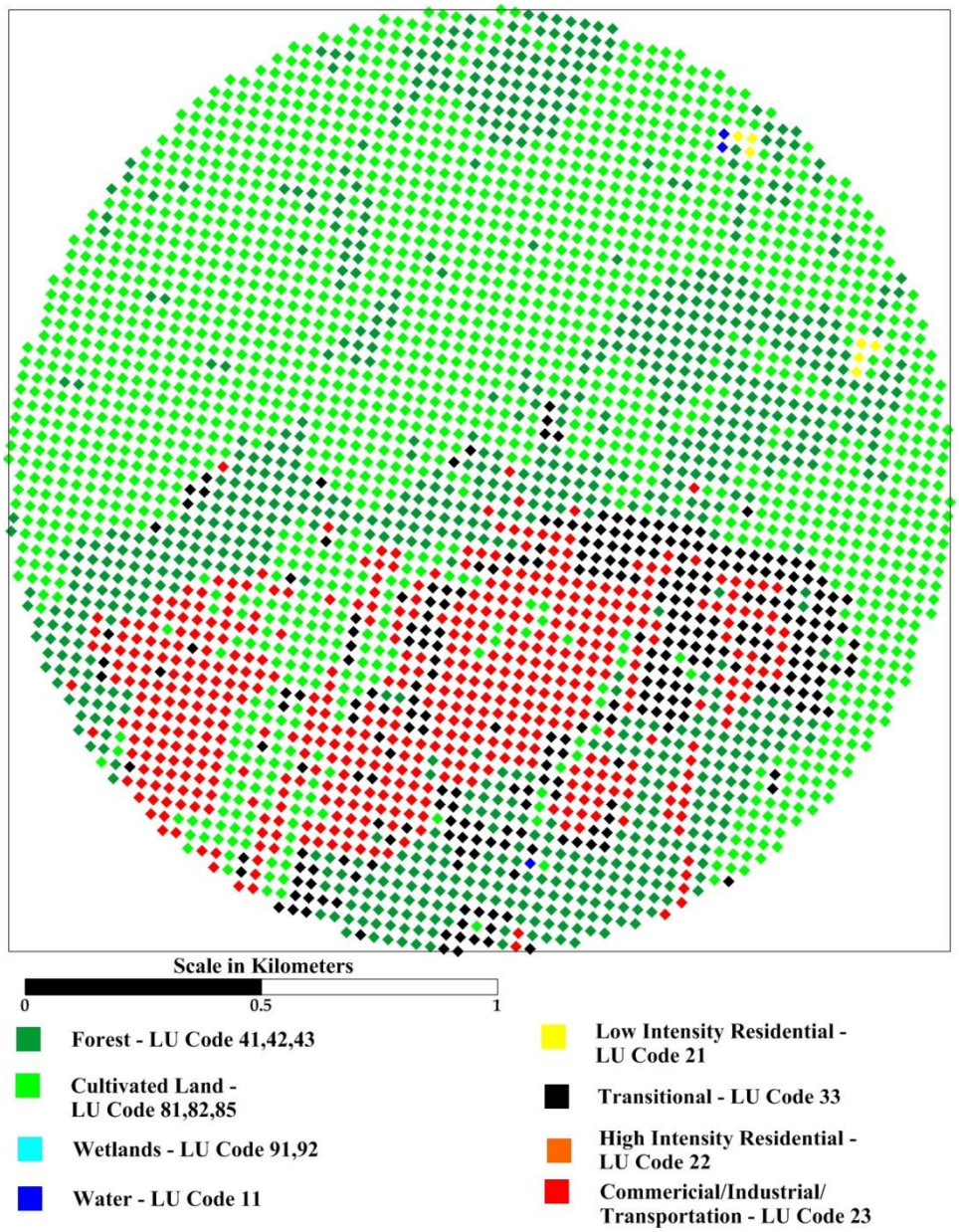
Table 3-5 Micrometeorological Variables Comparison

	Airport - KCKB		Project Site	
Month	Albedo	Bowen Ratio	Albedo	Bowen Ratio
1	0.52	0.5	0.5	0.49
2	0.52	0.5	0.5	0.49
3	0.15	0.54	0.16	0.65
4	0.15	0.54	0.16	0.65
5	0.15	0.54	0.16	0.65
6	0.17	0.42	0.16	0.31
7	0.17	0.42	0.16	0.31
8	0.17	0.42	0.16	0.31
9	0.17	0.88	0.16	0.95
10	0.17	0.88	0.16	0.95
11	0.17	0.88	0.16	0.95
12	0.52	0.5	0.5	0.49

As shown in Table 3-4, AERSURFACE calculates very similar values of Bowen ratio and Albedo for both KCKB and the proposed project site. However, the AERSURFACE output for KCKB indicates a high prevalence of "transitional" land use codes within 1-km of the KCKB ASOS station. When the NLCD 1992 land use data was plotted for the 1-km radius surrounding the KCKB ASOS station, in addition to the unusual amount of transitional land use, it is apparent that the NLCD 1992 data in general are of questionable quality. Figure 3-1 presents an aerial image of KCKB. Figure 3-2 presents the corresponding NLCD 1992 land use classifications for a 1-km radius around the KCKB ASOS.

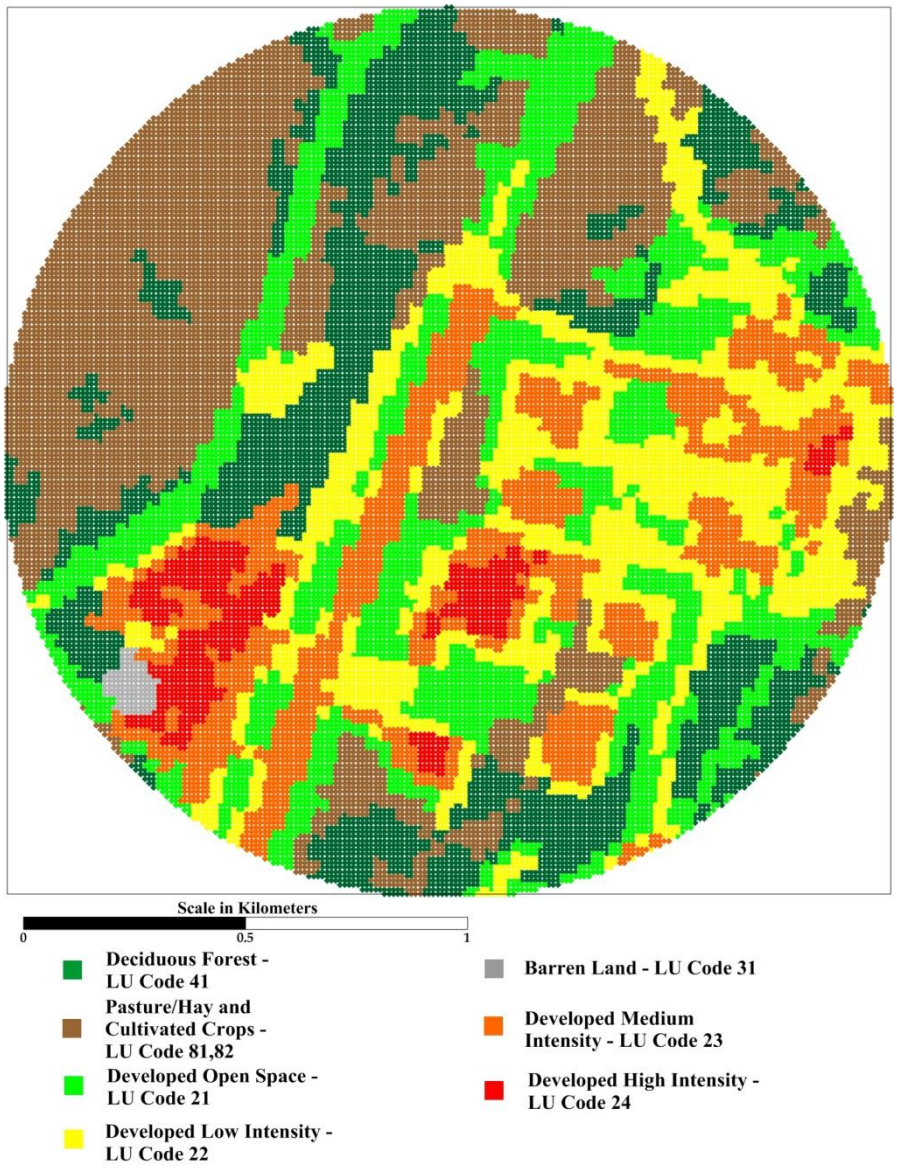
Figure 3-1 KCKB Aerial Image

Figure 3-2 KCKB NLCD 1992 Land Use Classifications



As shown in Figures 3-1 and 3-2, the land use classifications from the NLCD 1992 data for the area surrounding KCKB do not appear to accurately capture the footprint of the airport itself. This appears to be largely due to an expansion of KCKB since 1992 that is not reflected in the NLCD 1992 data. Therefore, the ability of AERSURFACE to utilize the NLCD 1992 data to characterize surface roughness for the 1-km radius surrounding KCKB is limited. To investigate whether an alternate source of land use data could be utilized to characterize surface roughness, the USGS NLCD 2006 land use data were reviewed. Figure 3-3 presents the land use classifications for the 1-km radius around the KCKB ASOS station from the NLCD 2006 data.

Figure 3-3 KCKB NLCD 2006 Land Use Classifications



The NLCD 2006 data appear to represent the KCKB much more accurately than the NLCD 1992 data. The airport runways and facilities as represented in the NLCD 2006 data seem to agree with the current aerial imagery. Also, there does not appear to be extraneous barren or transitional classifications. Since the NLCD 2006 data appear to be more representative of the actual land use surrounding KCKB, Dominion proposed to utilize these data to develop direction specific surface roughness values that can be input into AERMET along with the Bowen ratio and albedo values derived from AERSURFACE. Specifically, Dominion will utilize ArcGIS to extract a land use value within the area defined by the 1-km radius at every 10 m, and apply a known surface roughness value to each of these extracted points based on the recommendations found in Table A-3 of the USEPA AERSURFACE User's Guide (USEPA 2013). The land use values associated with each NLCD 2006 land use classification found within 1-km of the KCKB ASOS station are shown in Table 3-6.

Table 3-6 Proposed Surface Roughness Values – NLCD 2006 Land Use Data

NLCD 2006 Land Use Code	Land Use Code Description	Winter w/Snow	Winter w/o Snow	Spring	Summer	Fall
21[a]	Developed, Open Space	0.07	0.07	0.07	0.07	0.07
22[a]	Developed, Low Intensity	0.07	0.07	0.07	0.07	0.07
23[a]	Developed, Medium Intensity	0.07	0.07	0.07	0.07	0.07
24[a]	Developed, High Intensity	0.07	0.07	0.07	0.07	0.07
41[b]	Deciduous Forest	0.5	0.6	1	1.3	1.3
81[c]	Pasture/Hay	0.01	0.02	0.03	0.15	0.15
82[d]	Cultivated Crops	0.01	0.02	0.03	0.2	0.2
31[e]	Barren Land (Rock/Sand/Clay)	0.07	0.07	0.07	0.07	0.07

[a] - Surface roughness values for all developed areas were assumed to be equivalent to the values specified for NLCD 1992 land use code 23 (site at airport) in Table A-3 of the AERSURFACE User's Guide.

[b] - Surface roughness values for deciduous forest assumed equal to the values specified for NLCD 1992 land use code 41 in Table A-3 of the AERSURFACE User's Guide.

[c] - Surface roughness values for deciduous forest assumed equal to the values specified for NLCD 1992 land use code 81 in Table A-3 of the AERSURFACE User's Guide.

[d] - Surface roughness values for deciduous forest assumed equal to the values specified for NLCD 1992 land use code 82 in Table A-3 of the AERSURFACE User's Guide.

[e] - The barren land identified in the NLCD 2006 data are confined to an area in the southwest corner of the 1-km radius shown in Figure 3-3. After review of aerial imagery, it was determined that this area is a parking lot associated with the airport operations. Therefore, surface roughness for this land use code was assumed to be equivalent to values specified for NLCD 1992 land use code 23 (site at airport) in Table A-3 of the AERSURFACE User's Guide.

After the land use value for each extracted point was determined using the surface roughness values shown in Table 3-5, a sector specific surface roughness value was calculated per season. Dominion performed these calculations for 12 30-degree sectors (0-30°, 30-60°, etc.) using inverse distance weighted averaging based on the location of the ASOS station. The calculated values for surface roughness, based on the NLCD 2006 land use data that Dominion proposes to use as input into AERMET are shown in Table 3-7.

Table 3-7 Calculated Seasonal Surface Roughness Values based on NLCD 2006 Land Use Data

Sector	Average Winter w/Snow	Average Winter w/o Snow	Average Spring	Average Summer	Average Fall
1	0.032	0.044	0.053	0.109	0.109
2	0.050	0.065	0.082	0.149	0.149
3	0.063	0.067	0.070	0.080	0.080
4	0.056	0.061	0.064	0.077	0.077
5	0.068	0.079	0.091	0.122	0.122
6	0.060	0.072	0.086	0.128	0.128
7	0.052	0.062	0.072	0.110	0.110
8	0.061	0.065	0.067	0.077	0.077
9	0.094	0.107	0.129	0.170	0.170
10	0.044	0.062	0.083	0.183	0.183
11	0.037	0.054	0.073	0.174	0.174
12	0.079	0.103	0.137	0.238	0.238

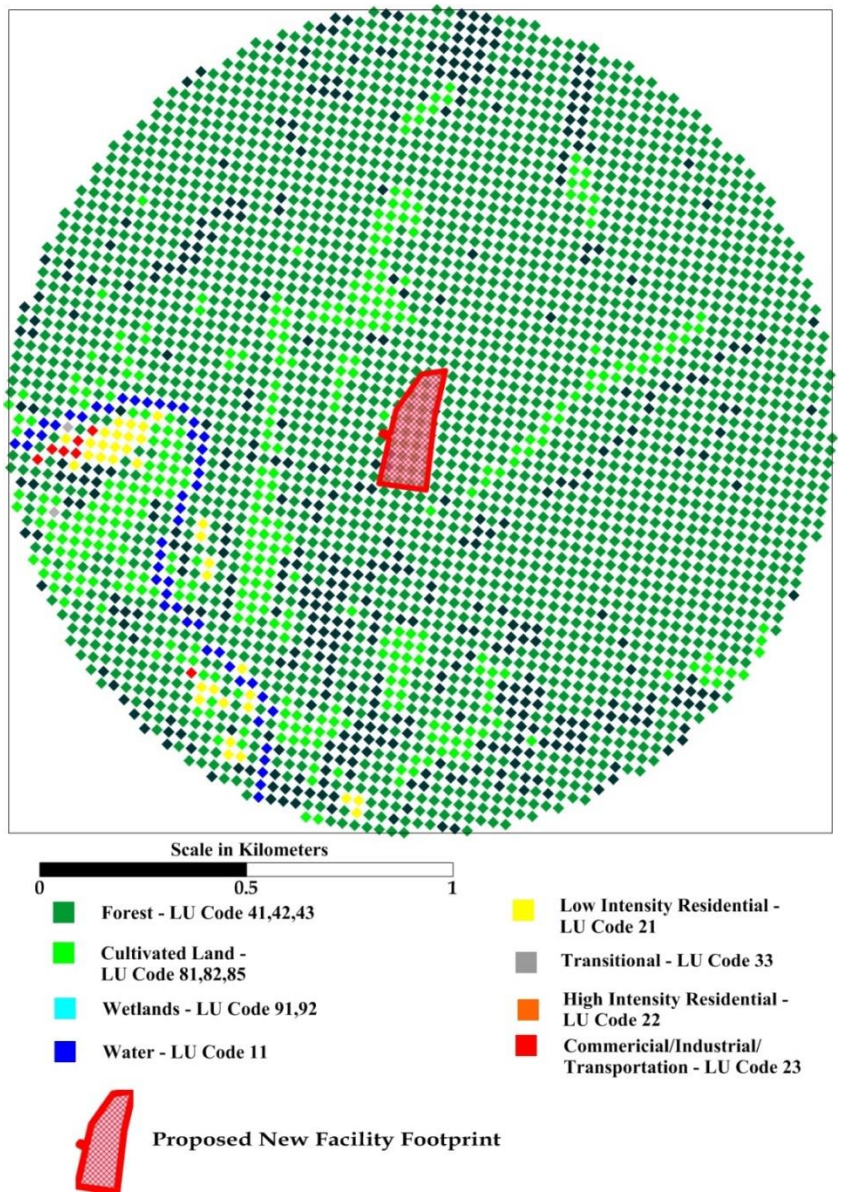
The surface roughness values presented above appear reasonable based on review of the aerial imagery and NLCD 2006 land use data. In order to compare the surface roughness for KCKB with the project site, AERSURFACE was executed for the proposed site of the Mockingbird Hill Expansion, using the location for the source NEWTURB1 as the center point. Table 3-8 presents the surface roughness values produced for AERSURFACE for the proposed site.

Table 3-8 Seasonal Surface Roughness Values for Proposed Site from AERSURFACE

Sector	Average Winter w/Snow	Average Winter w/o Snow	Average Spring	Average Summer	Average Fall
1	0.483	0.582	0.938	1.242	1.242
2	0.459	0.558	0.917	1.231	1.231
3	0.382	0.475	0.768	1.104	1.104
4	0.453	0.550	0.897	1.214	1.214
5	0.426	0.522	0.846	1.168	1.168
6	0.418	0.513	0.800	1.120	1.120
7	0.333	0.412	0.620	0.903	0.903
8	0.239	0.305	0.463	0.726	0.726
9	0.154	0.202	0.297	0.506	0.506
10	0.262	0.334	0.533	0.822	0.822
11	0.344	0.434	0.701	1.045	1.045
12	0.268	0.348	0.555	0.901	0.901

The surface roughness values for the proposed site derived from AERSURFACE are notably higher than the values derived for KCKB. The NLCD 1992 land use data for the proposed site are shown in Figure 3-4. As shown in Figure 3-4, the land use surrounding the proposed site is heavily forested. While a small area will be cleared for the installation of the Mockingbird Hill Expansion project, the land within 1-km of the site will remain largely forested. The difference in surface roughness between the project site and the KCKB airport site as it relates to meteorological data representativeness is discussed in the following paragraphs.

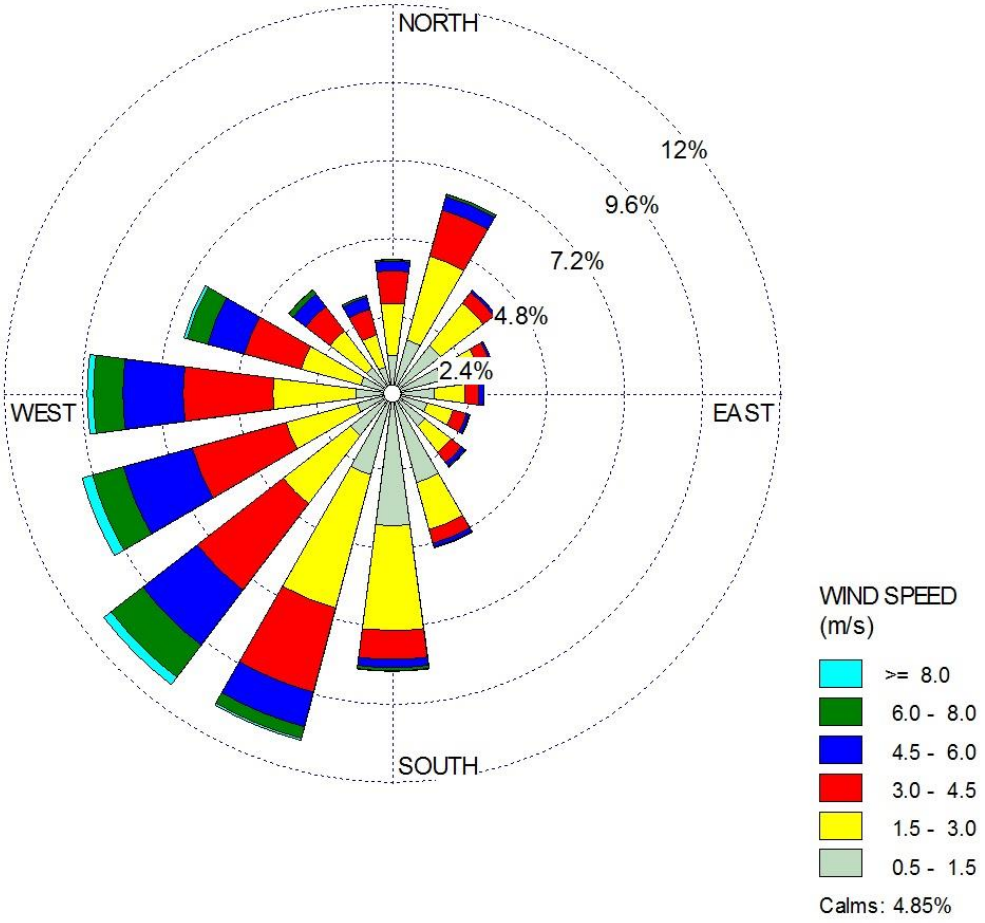
Figure 3-4 ***NLCD 1992 Land Use Classifications for the Proposed Mockingbird Hill Expansion Site***



3.7.2 Meteorological Data Representativeness - Winds

As stated at the beginning of Section 3.7 of this protocol, the North Central West Virginia Airport (KCKB) is located approximately 47 km to the southeast of the proposed Mockingbird Hill Expansion Project. A wind rose for KCKB for the proposed period that will be used in the air quality modeling analysis, 2010 to 2014, is shown in Figure 3-5 below.

Figure 3-5 5-year Wind Rose (2010-2014): North Central West Virginia Airport (KCKB)



Both the Mockingbird Hill Expansion site (as well as the existing Hastings, Lewis Wetzel, and Mockingbird Hill Compressor Stations) and KCKB are situated in local environments with significant complex terrain. Rolling hills surround both sites, which is the typical topographical characteristic found in the Allegheny Plateau region of West Virginia. Appendix B of this protocol includes scaled topographic maps showing the vicinity of KCKB as well as the Project site. Review of the topographic maps shows elevations ranging from approximately 1,000 ft. to peaks and ridges at 1,300 ft. in the vicinity of the airport, with the

airport itself situated at 1,200 ft. The Project site is in elevated terrain at approximately 900 ft., with peaks and ridges that reach 1,300 to 1,400 ft. in the vicinity. The lowest elevations in the vicinity of the Project site are approximately 700 ft., along the river bank of the South Fork of the Fishing Creek.

The ridges closest to the Project site (the Lowman ridge and the ridge just to its southeast) north of the South Fork of the Fishing Creek appear to generally be oriented in a northeast/southwest direction. The ridges in the vicinity of the airport also appear to be oriented to the southwest and northeast. There does not appear to be any topographical feature in the vicinity of the Project site that would cause wind directions to be markedly different than the winds measured at KCKB.

In order to further assess wind characteristics for the region as a whole, Dominion has employed a three dimensional meteorological model to generate gridded wind roses across the region. Dominion used the Weather Research and Forecasting (WRF) model for this purpose. The following sections provide a brief description of the assumptions used to execute WRF.

3.7.2.1 WRF Domain & Geophysical Data

The process of developing WRF data for this project was through an iterative process. WRF simulations were run using identical grid meshes of 36-12-4-1.33 km one-way nested model domains, although with different initial guess and boundary fields suited for these models. Initially, a broader geographical domain was selected at a horizontal grid resolution (spacing) of 36 kilometers. The next three iterations of the WRF modeling were conducted to reduce the horizontal resolution to 12 km, 4 km and 1.33 km. The final iteration was based on WRF data covering a limited geographical extent (70 km in north-south and east-west directions) and at a grid resolution of 1.33 km. The simulation was prepared for the year 2010. A Lambert conformal map projection was used to deal with curvature (degree of distortion) of the earth at the mid-latitudes. The inputs to the WRF models were obtained from global publicly available resources. The WRF model was set up with 40 vertical layers and the lowest model level at about 10 meters above the surface. Topographic information for the WRF modeling was developed using the standard WRF terrain databases available from the National Center for Atmospheric Research (NCAR). The 36-km CONUS domain was based on the 10 min. (~18 km) global data. The 12-km domain was based on the 2 min. (~4 km) data. The 4-km & 1.33-km domains were based on the 30 sec. (~900 m) data. In addition, land use category and other terrain features available from the UCAR user ftp were used in the prognostic modeling. Vegetation type and land use data were developed

using the USGS 24-category land use database from the most recently released WRF databases provided with the WRF distribution.

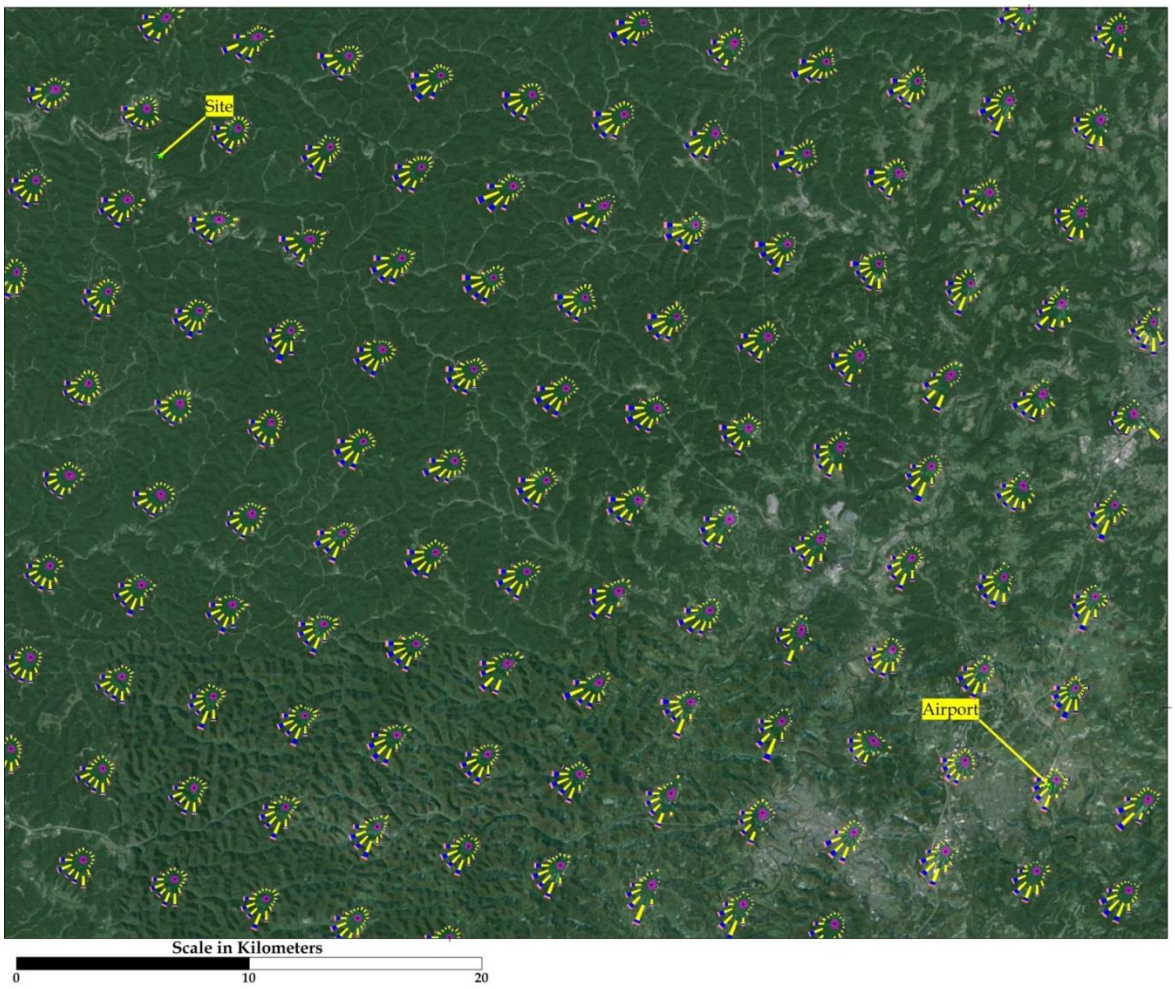
3.7.2.2 *Global analyses data (Initial and boundary conditions)*

WRF uses the pre-processed wind fields from global weather simulations to obtain the initial time boundary condition at t=0 and at other times as well. The boundary and initial conditions are prescribed using NCEP NARR (North America Regional Reanalysis) model analyses data. The NARR model uses the very high resolution NCEP Eta Model (32km/45 layers) together with the Regional Data Assimilation System (RDAS) which assimilates precipitation along with other variables. NARR data are available at three hour intervals.

3.7.2.3 *WRF Output and Representativeness Assessment*

The WRF data were evaluated by placing regularly spaced (approximately 4-km) extraction intervals across the domain. This analysis is presented in Figure 3-6, for the 10 m level in WRF.

Figure 3-6 WRF-Derived Regional Windroses – 10 m Level



The windroses based on WRF data for the region encompassing the proposed project site and KCKB presented in Figure 3-6 indicate that the overall wind pattern at the surface (10 m) is generally dominated by winds in the southwest quadrant. The prevailing wind pattern is also noted in the 5 year windrose based on the measured data at KCKB presented in Figure 3-5. Dominion believes that this analysis utilizing WRF data demonstrates that the overall wind pattern across this area is generally similar, despite the significant complex terrain that exists across the entire area. Dominion believes that this illustration of the regional wind patterns obtained from the WRF meteorological model supports the use of KCKB as the source of input meteorological data in the air quality modeling analysis, with regard to the representativeness of the wind observations. The review of topographical features described previously, in conjunction with the WRF wind fields suggests that the project site is not exposed to dramatically biased winds that are not accounted for in the KCKB observations.

3.7.3 Meteorological Data Representativeness - Proposed Sensitivity Approach

Considering the surface roughness discrepancies discussed in Section 3.7.1, it is important to qualify how the differences in surface roughness can affect modeled concentrations. The AERMOD implementation guidance (USEPA 2009) states the following with regard to representativeness of surface characteristics:

> *"If the reviewing agency is uncertain as to the representativeness of a meteorological measurement site, a site-specific sensitivity analysis may be needed in order to quantify, in terms of expected changes in the design concentration, the significance of the differences in each of the surface characteristics."*

Preliminary analyses conducted by Dominion have shown that model design values, especially for the proposed Solar Titan 130 turbines, are biased towards higher concentrations for the 24-hr and annual averaging periods when using the lower surface roughness values associated with KCKB as opposed to the project site. Dominion proposes to process the KCKB meteorological data through AERMET using both the surface roughness values associated with KCKB, using the customized approach described in Section 3.7.1, as well as the surface roughness values associated with the project site using AERSURFACE. AERMOD will then be executed using each meteorological data set, and the highest model design values will be used to assess the project impacts with respect to the relevant air quality standards. Dominion believes this approach will "bound" the model results to capture the worst case modeled results, given the noted differences in surface roughness between the airport and the project site, and is supported by the language in the AERMOD implementation guide referenced above that describes the need to analyze the sensitivity of the difference in surface characteristics.

Appendix C of this protocol contains 10-m level windroses derived from the 2010 WRF run extracted for the nearest 1.3-km cell for both the KCKB airport site and the project site. In addition to the general agreement of the dominant wind directions, the average annual wind speeds should be noted. The average annual wind speeds are 2.8 m/s for the airport and 2.6 m/s for the project site. These similar average wind speeds are realized despite the surface roughness differences between the two sites, characterized on an average basis by WRF as 0.2 m for the airport and 0.5 m for the project site. This suggests that the project site can be assumed to be exposed to similar wind speeds as the airport site, despite the differences in surface roughnesses that can affect wind speeds close to the ground. Dominion believes this provides further support for the assertion that the KCKB site is adequately representative of the meteorological conditions at the project site, and that the approach to "bound" the modeling analysis by applying roughness values for both the site and the airport is a reasonable measure to ensure that the most conservative model results are obtained.

3.7.4 AERMET Processing

AERMET (version 15181) will be executed using EPA recommended settings to produce the meteorological data needed for AERMOD. The five year period from 2010-2014is proposed for use in this analysis. The AERMET analysis will include the use of both the AERMINUTE and AERSURFACE preprocessors. The AERMINUTE (version 14337) meteorological data processor will be used to produce wind speed and direction data based on archived 1-minute ASOS data for KCKB, for input into AERMET Stage 2. A 0.5 m/s wind speed threshold will be applied to the 1-minute ASOS derived wind speeds in AERMET.

In addition to the surface meteorological data from KCKB, Dominion will utilize upper air data from Pittsburgh, PA (KPIT) in this analysis. Upper air data is used in AERMET to determine an initial potential temperature distribution from a morning sounding. AERMET assumes the 12Z sounding is to be nearly equivalent to a morning sounding. The initial potential temperature distribution is used by AERMET to characterize the growth of the daytime convective boundary layer. It is important to use upper air data that is representative of the model application site. KPIT is the closest upper air collection station to the proposed project site, located in the same geographical region as the project (the Allegheny plateau). Therefore, upper air data collected at KPIT should be considered regionally representative and adequate for use in the air quality modeling analysis.

The AERSURFACE (version 13016) run was based on USGS NLCD 1992 land use data for albedo and Bowen ratio, as described in Section 3.7.1 of this protocol. Also, the surface roughness values were determined by evaluating NLCD 2006

land use data, as described in Section 3.7.1. AERSURFACE was configured assuming 12 wind direction sectors and a monthly temporal resolution. The following additional settings were used to implement AERSURFACE:

- Center Latitude (decimal degrees): 39.302220
- Center Longitude (decimal degrees): -80.223893
- Datum: NAD83
- Study radius (km) for surface roughness: 1.0
- Airport? Y, Continuous snow cover? **Variable**
- Surface moisture? **Variable**, Arid region? N
- Month/Season assignments? Default
- Late autumn after frost and harvest, or winter with no snow: **Variable**
- Winter with continuous snow on the ground: **Variable**
- Transitional spring (partial green coverage, short annuals): 3 4 5
- Midsummer with lush vegetation: 6 7 8
- Autumn with unharvested cropland: 9 10 11

To specify whether continuous snow cover should be assumed for any of the winter months over the five year modeled period, the month by month snowfall records available from the Annual Climatological Summary product available from the National Climatic Data Center (NCDC) for KCKB were reviewed. Table 3-9 presents the snowfall data for each month of the five year modeled period and identifies which months were selected as representative of continuous snow cover in AERSURFACE.

Table 3-9 KCKB Monthly Snowfall and Maximum Snow Depth (Inches)

Monthly Snowfall and Maximum Snowth Depth(Inches) - Clarksburg

	2010		2011		2012		2013		2014	
Month	**Snowfall**	**Depth**	**Snowfall**	**Depth**	**Snowfall**	**Depth**	**Snowfall**	**Depth**	**Snowfall**	**Depth**
1	18.5	7	17.9	9	3.0X	2	2.1X	2	11.0X	8
2	38.2	14	3.5X	2	2.0X	2	8.4X	4	--	10
3	--	8	2.0X	1	T	T	2.6X	1X	8.3	4
4	--	0	1.0X	1	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--			0	0
11	--	--	--	--	--	--	1	1	--	--
12	13.2X	7	0.2X	0	3.0X	2	0.7X	1X	--	--

Highlighted cells - Continuous snow cover option in AERSURFACE selected

The surface moisture indicator in AERSURFACE (a choice of wet, dry, or average) was determined on a month by month basis per EPA guidance (EPA 2008). The guidance suggests that the 30-year rainfall record be examined, and the period in question be compared to the 30 year record to determine the appropriate moisture description. Dry moisture is assumed if the month is in the lower 30th percentile of that particular month over the 30 year record. Similarly, average moisture is assumed for the 30th to 70th percentile, and wet moisture is assumed for the 70th percentile and greater. The percentile values for each month, and an indication of whether the month fell in the dry, average or wet categories in presented in Table 3-10. The complete 30 year rainfall record for Clarksburg, WV, supplemented with data from Fairmont, WV to fill-in missing values, is included in Appendix D of this protocol.

Table 3-10 KCKB Monthly Surface Moisture Assignments

Month	2010	2011	2012	2013	2014
1	72.4%	17.2%	34.4%	17.2%	3.4%
2	62.0%	68.9%	3.4%	24.1%	51.7%
3	20.6%	79.3%	89.6%	41.3%	6.8%
4	10.3%	100.0%	0.0%	6.8%	13.7%
5	37.9%	58.6%	31.0%	44.8%	51.7%
6	65.5%	93.1%	17.2%	86.2%	44.8%
7	44.8%	51.7%	72.4%	82.7%	41.3%
8	10.7%	92.8%	0.0%	100.0%	74.8%
9	58.6%	100.0%	72.4%	20.6%	24.1%
10	41.3%	100.0%	82.7%	27.5%	86.2%
11	37.9%	86.2%	0.0%	41.3%	17.2%
12	65.5%	75.8%	93.1%	82.7%	34.4%

Dry
Average
Wet

3.8 BUILDING WAKE EFFECTS

The USEPA's Building Profile Input Program (BPIP), Version 04274, will be used to calculate downwash effects for the modeled emission sources. Building locations and heights relative to the modeled sources will be obtained from Dominion. The new combustion turbine stacks will not exceed the greater of the GEP formula height calculated by BPIP or 65 m (213 feet).

3.9 REGIONAL INVENTORY FOR CUMULATIVE MODELING ANALYSES

If the results of the air quality modeling analyses indicate that emissions associated with the proposed project exceed either the PM_{10} or $PM_{2.5}$ SILs, Dominion will compile a cumulative emissions inventory for these pollutants.

Dominion proposes to focus on regional major (Title V) stationary sources within 20-km of the Mockingbird Hill Expansion Site to develop this inventory. The following regional sources have been identified by Dominion for possible inclusion in a cumulative air quality modeling analysis. Distances noted are from the proposed Mockingbird Hill Expansion Site:

- Dominion Hasting Extraction Plant (Separate Title V from Hastings/Lewis Wetzel/Mockingbird Hill Compressor Station) – 1.27 km
- Equitrans Logansport #49 Compressor Station – 9.8 km
- Columbia Gas Smithfield Compressor Station – 13.4 km
- Wetzel County Sanitary Landfill – 17.5 km
- Equitrans Curtisville #50 Compressor Station – 20.7 km

Emissions of PM_{10} and/or $PM_{2.5}$, depending on the results of the SIL analyses will be evaluated and input into AERMOD if it is determined that emissions from the offsite source could produce a significant modeled concentration gradient in the vicinity of the significant impact area of the proposed project. The Title V permits and applications for the offsite facilities, as available, as well as stack inventory information from WVDEP, will be used to produce the cumulative modeling inventory. Dominion will use the Title V permits and applications to determine potentials to emit for the off-site sources. If the Title V permits and applications do not specifically outline potentials to emit, Dominion will make conservative assumptions using unit size, types, and other information available along with AP-42 or other accepted emissions factors. Dominion will engage with WVDEP during the process of creating the cumulative emissions inventory for the initial stack inventory information, as well as for concurrence with the final inventory developed by Dominion. Appendix E of this protocol presents the locations of the regional major sources identified above in relation to the proposed project.

3.10 CLASS I IMPACTS

The proposed Project is located within 300 km of four (4) federally protected Class I areas. All of these Class I areas are located generally to the east and southeast of the Project. The Class I areas and distances from the Project site are as follows:

- Otter Creek Wilderness – 102 km, managed by the US Forest Service (USFS),
- Dolly Sods Wilderness – 124 km, managed by USFS
- Shenandoah National Park – 214 km, managed by the National Park Service (NPS)
- James River Face Wilderness – 240 km, managed by USFS

Dominion anticipates that Q/D ratios for each Class I area will be below the FLM screening level of 10, therefore no AQRV analysis is proposed. It should be noted that preliminary Q/D values for all four Class I areas are less than 1. . Dominion proposes to evaluate the project related increase of PM_{10} and $PM_{2.5}$ against the Class I increments by applying the AERMOD dispersion model to a

ring of receptors defined by a 50-km radius surrounding the Project site. The receptors will be placed at 1° intervals around the ring, for 360 receptors total. This proposed analysis represents the maximum spatial extent (50 km from source to receptor) for regulatory applications of AERMOD. If maximum modeled concentrations at the 50-km receptors are less than the Class I SILs for PM_{10} and $PM_{2.5}$, then it can be assumed that the project would also have maximum potential impacts that would be less than the SILs at the more distant Class I areas.

To determine elevations for the 50-km ring of receptors, Dominion proposes to use AERMAP to determine the elevations for the receptor locations recommended by the National Park Service for the closest Class I area, Otter Creek. After the elevations for each Class I area receptor has been determined with AERMAP, Dominion will identify the maximum and minimum elevations (and associated hill scale heights) for all Otter Creek receptors, and use these elevations and associated hill scales as the elevation and hill scale for each receptor in the 50-km ring. Since both the maximum and minimum elevations are proposed, the total number of receptors modeled will be 720 receptors.

4.0 MODEL RESULTS PRESENTATION

Two criteria pollutants will be modeled, specifically $PM_{2.5}$ and PM_{10}. Maximum ground level model design values will be identified for the appropriate averaging periods and assessed against the SILs. Once the project's modeled impact is determined relative to the relevant SILs, the NAAQS and PSD increments will be evaluated as necessary. Results will be presented in a tabular and graphical format. All model related input and output files will be made available to WVDEP in an electronic format.

As discussed in Section 3.7.2, two sets of meteorological data will be used in the air quality modeling analysis. The worst case between the modeled AERMOD results using AERMET data processed with KCKB roughness values and the modeled AERMOD results using AERMET data processed using project site surface roughness values will be used as the model design values for the SILs and NAAQS/PSD Increment analyses.

5.0 REFERENCES

U.S. Environmental Protection Agency. (USEPA 2011) USEPA memo entitled "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO2 National Ambient Air Quality Standard", USEPA, Office of Air Quality Planning and Standards, Raleigh, NC. March 1, 2011.

U.S. Environmental Protection Agency. (USEPA 2009) AERMOD Implementation Guide, AERMOD Implementation Workgroup. March 19, 2009.

U.S. Environmental Protection Agency. (USEPA 2013) AERSURFACE User's Guide, Office of Air Quality Planning and Standards, Raleigh, NC. January 2008, Revised 01/16/2013.

U.S. Environmental Protection Agency. (USEPA 2014) Guidance for PM2.5 Permit Modeling, Memo from Stephen D. Page to Regional Air Division Directors, Office of Air Quality Planning and Standards, Raleigh, NC. May 20, 2014.

West Virginia Department of Environmental Protection. (WVDEP 2005) 2005 Air Quality Annual Report

West Virginia Department of Environmental Protection. (WVDEP 2008) 2008 Air Quality Annual Report

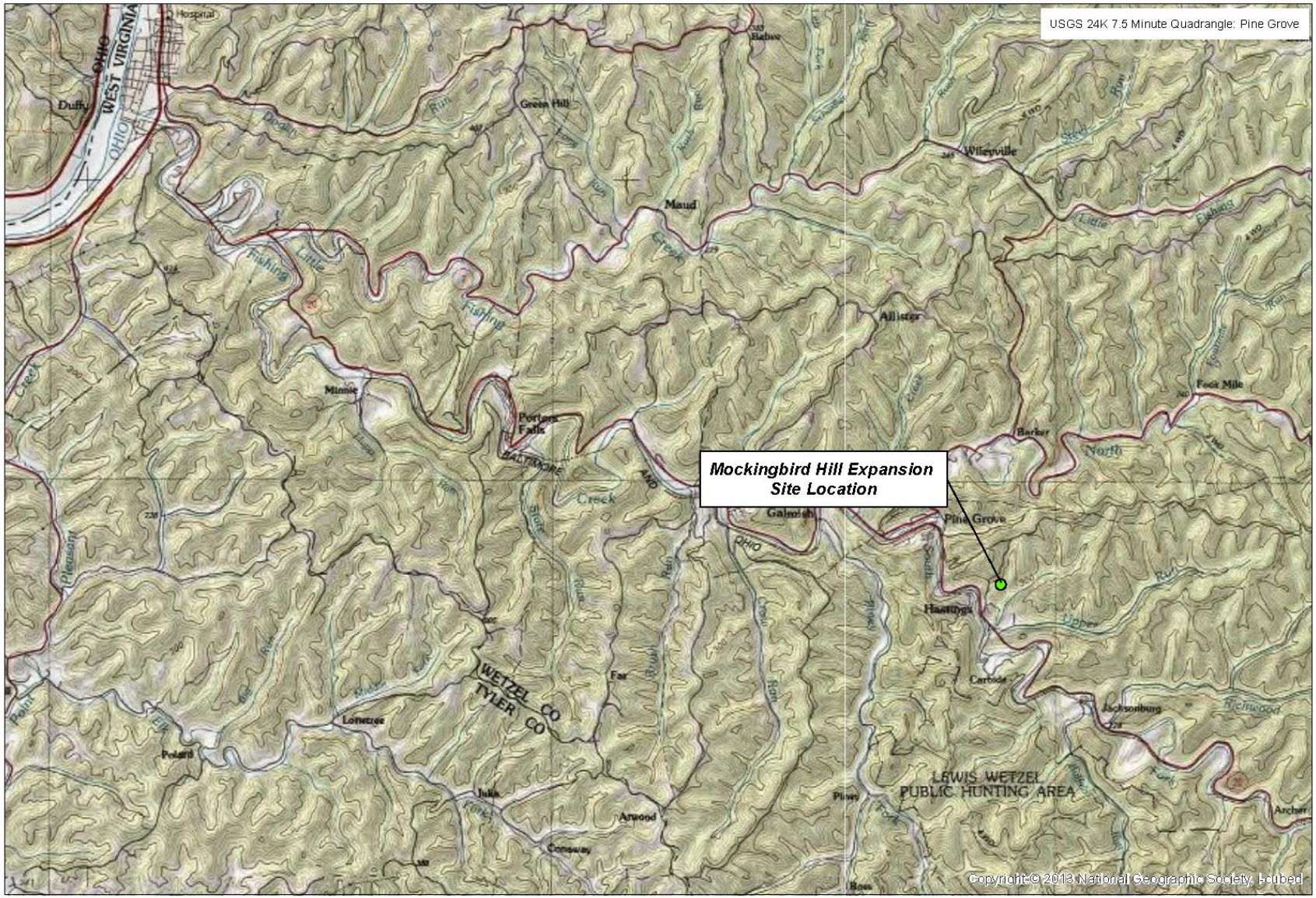
West Virginia Department of Environmental Protection. (WVDEP 2012) Resignation Request and Maintenance Plan for the West Virginia portion of the Wheeling, WV-OH 1997 PM2.5 Nonattainment Area, March 2012

Environ International Corporation. (ENVIRON 2008) Technical Support Document for the Association for Southeastern integrated planning (ASIP) Emissions and Air Quality Modeling to Support $PM_{2.5}$ and 8-Hour ozone State Implementation Plans, March 24 2008

West Virginia Department of Environmental Protection. (WVDEP2009) Resignation Request and Maintenance Plan for the West Virginia portion of the Wheeling, WV-OH 1997 $PM_{2.5}$ Nonattainment Area – Appendix B, November 2009

Proposed Facility Location

Appendix A

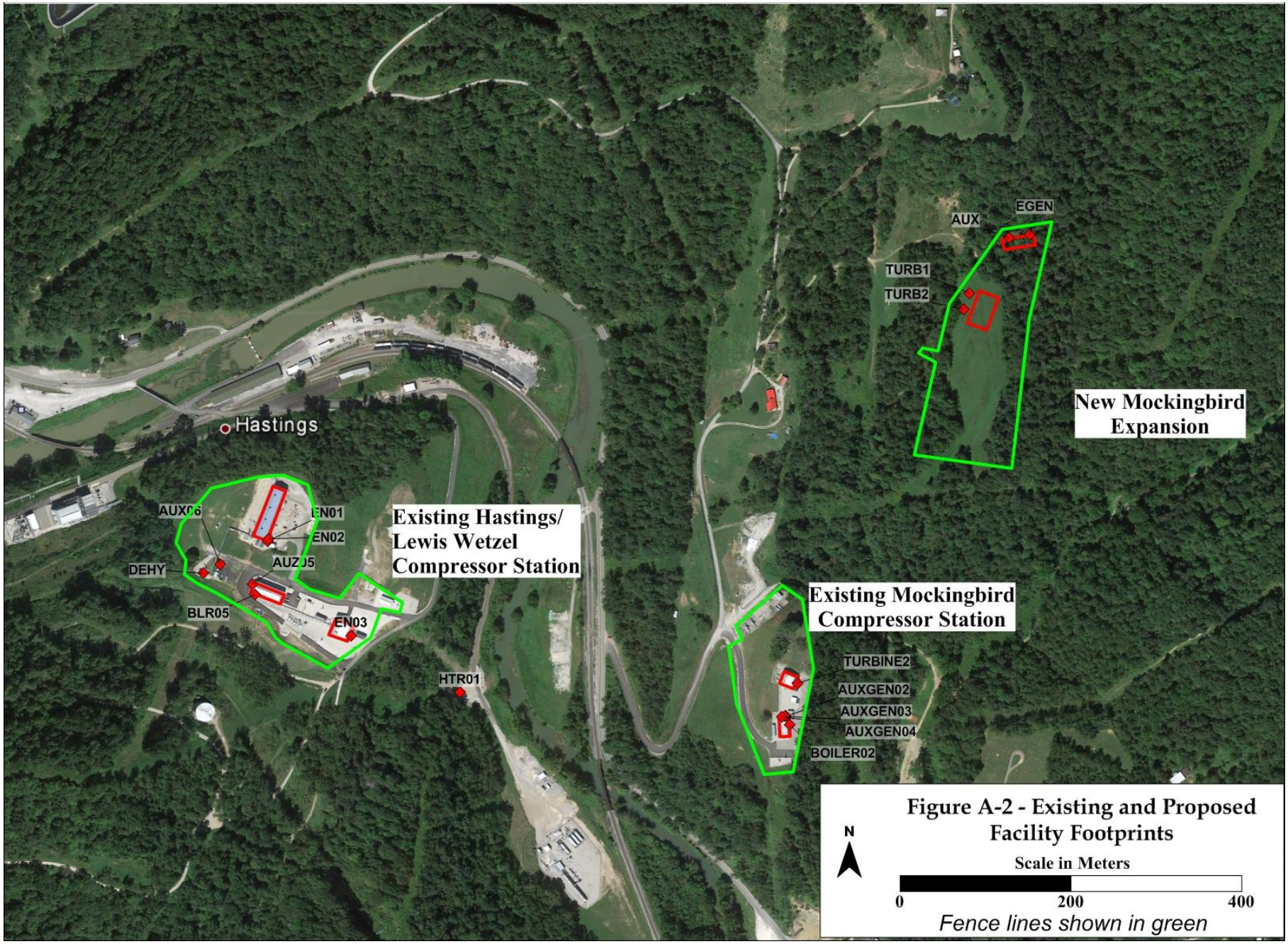


Environmental Resources Management, Inc.
Philadelphia Office
484-913-0300
April 15, 2015

N
W E
S

Scale in Miles
0 0.5 1 2 3
Miles

FIGURE A-1
Facility Location
Dominion Transmission, Inc.
Wetzel County, West Virginia


Hastings
EGEN
AUX
TURB1
TURB2
New Mockingbird Expansion
Existing Hastings/ Lewis Wetzel Compressor Station
EN01
EN02
DEHY
BLR05
EN03
HTR01
Existing Mockingbird Compressor Station
TURBINE2
AUXGEN02
AUXGEN03
AUXGEN04
BOILER02
N
Figure A-2 - Existing and Proposed Facility Footprints
Scale in Meters
0
200
400
Fence lines shown in green

Project Site and Airport Topographic Maps

Appendix B

Figure B-1 Mockingbird Hill Expansion Project Topographic Map

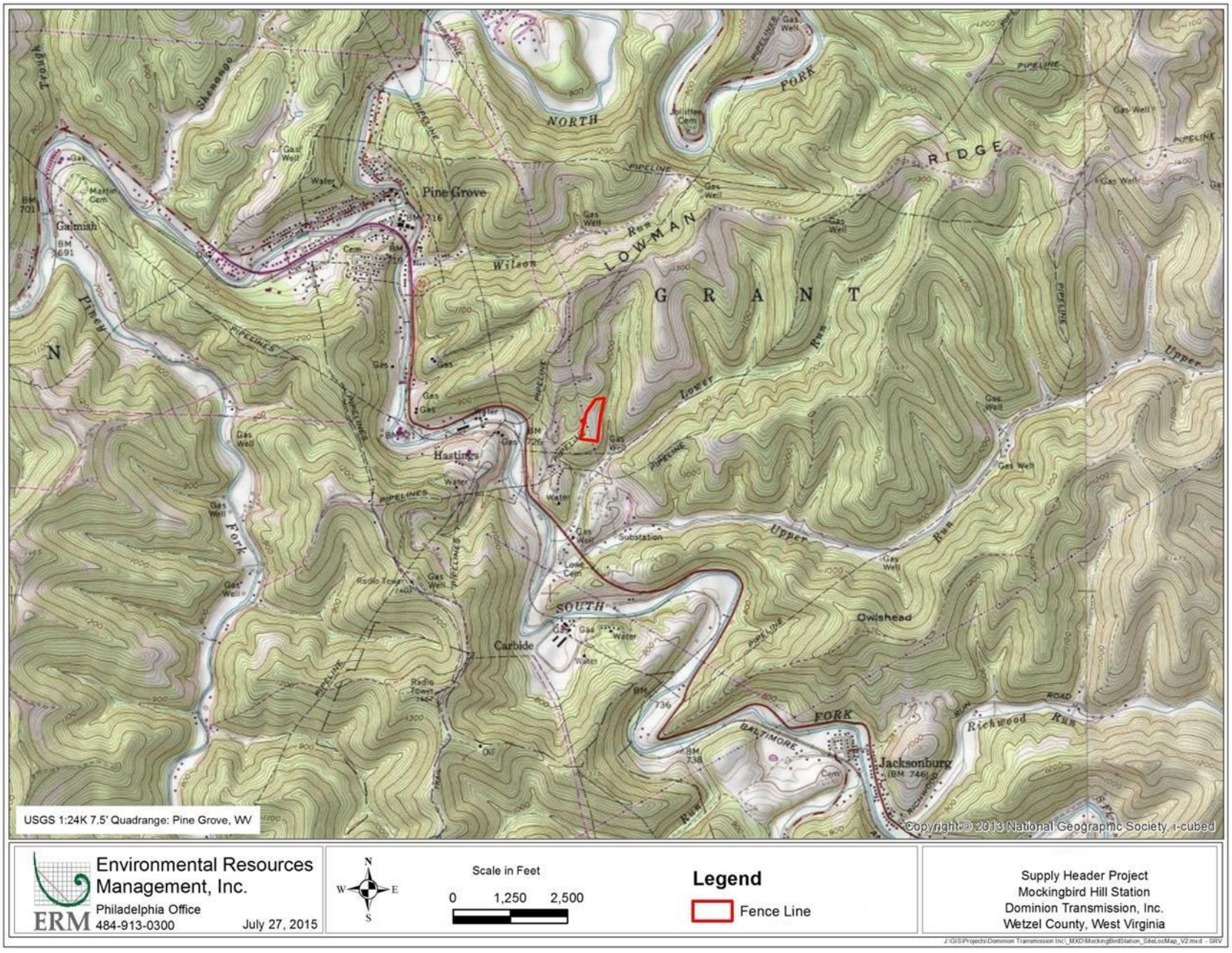
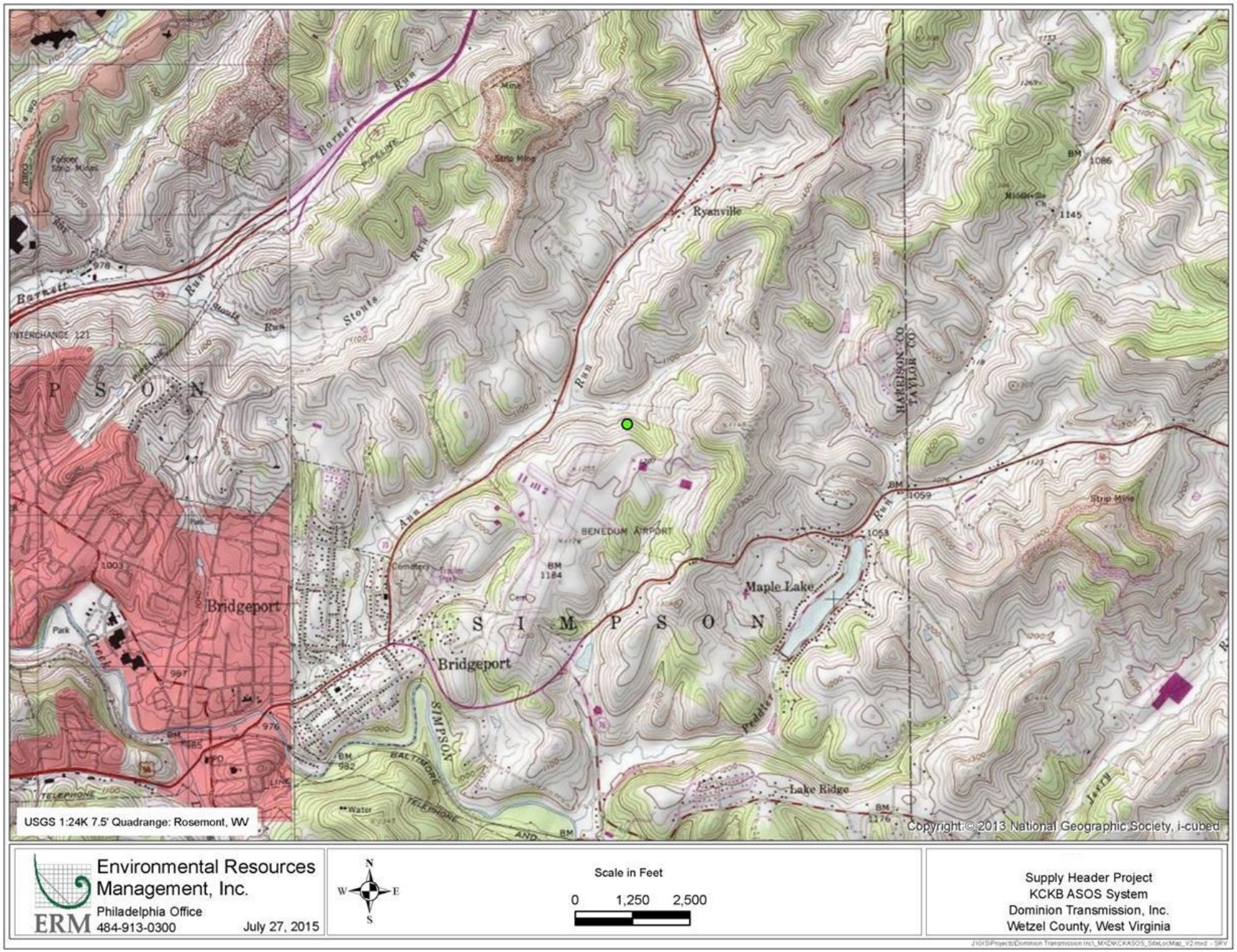
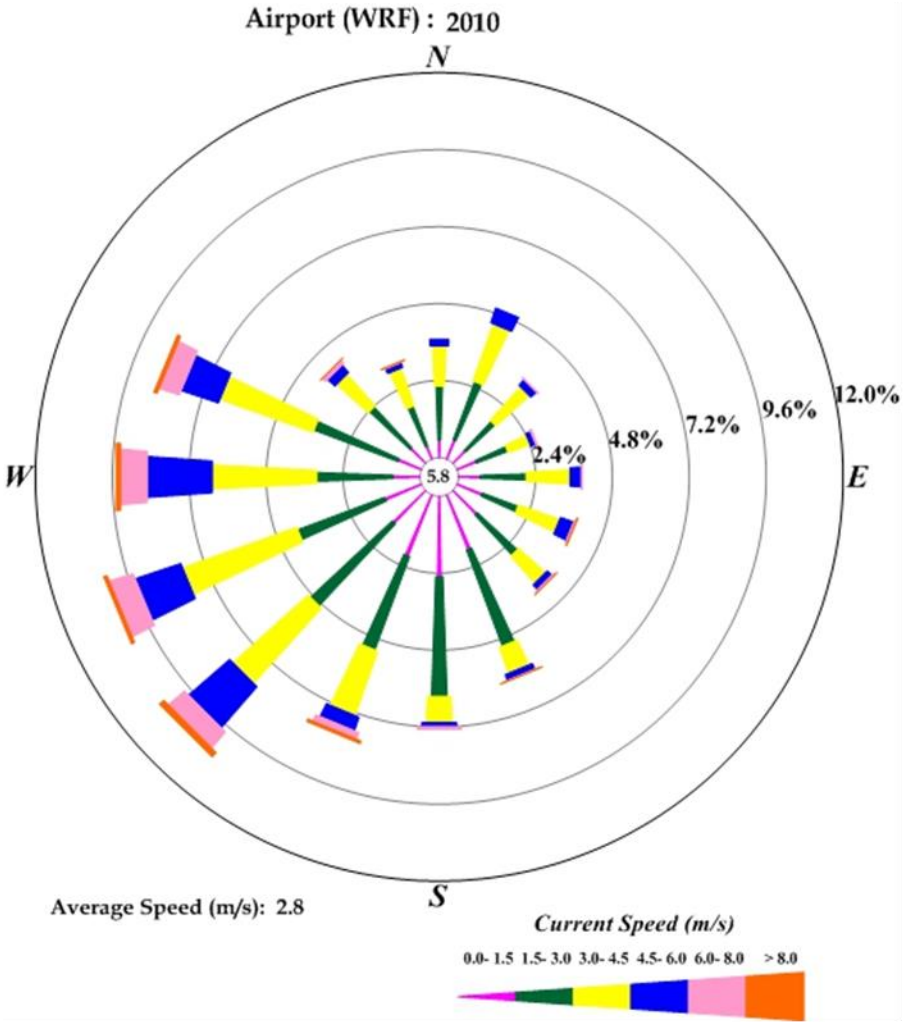


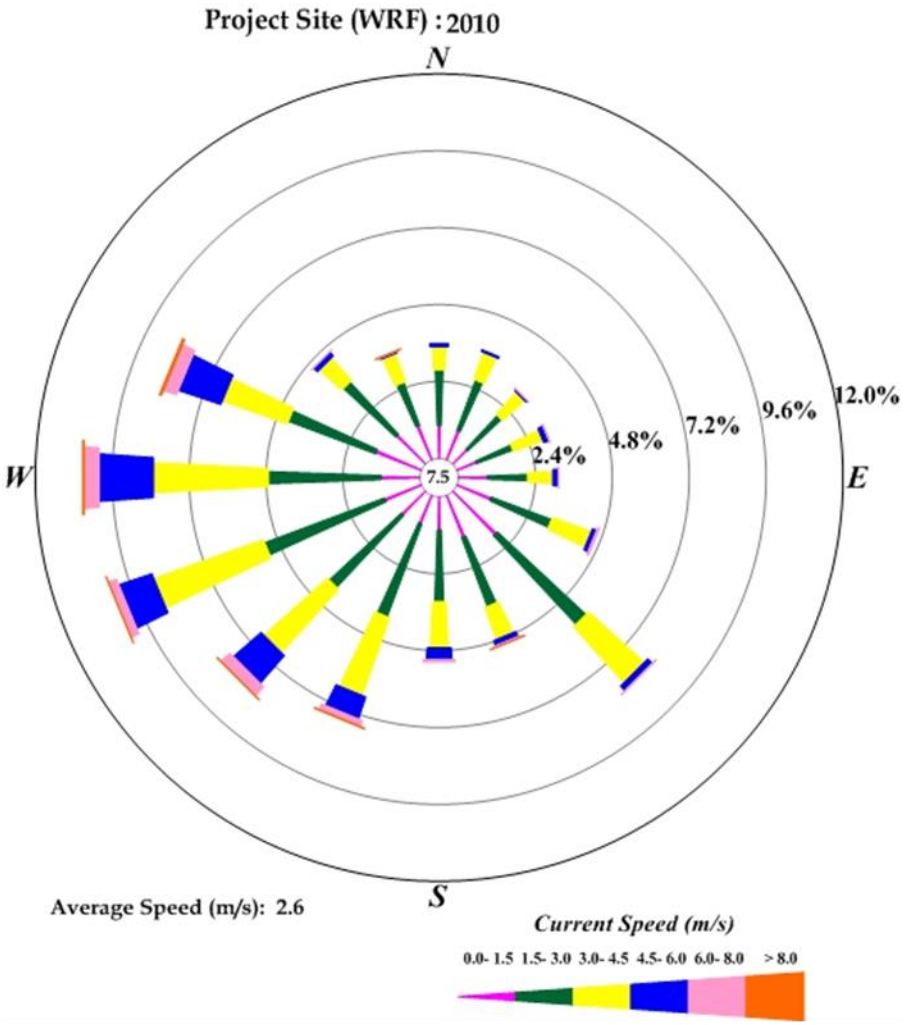
Figure B-2 KCKB Airport Topographic Map



2010 WRF Windroses
Project Site and KCKB Airport
Appendix C

2010 WRF Data KCKB and Site





Average Airport Zo from WRF: 0.2 m

Average Site Zo from WRF: 0.5 m

30 Year Rainfall Record
Clarksburg, WV
Appendix D

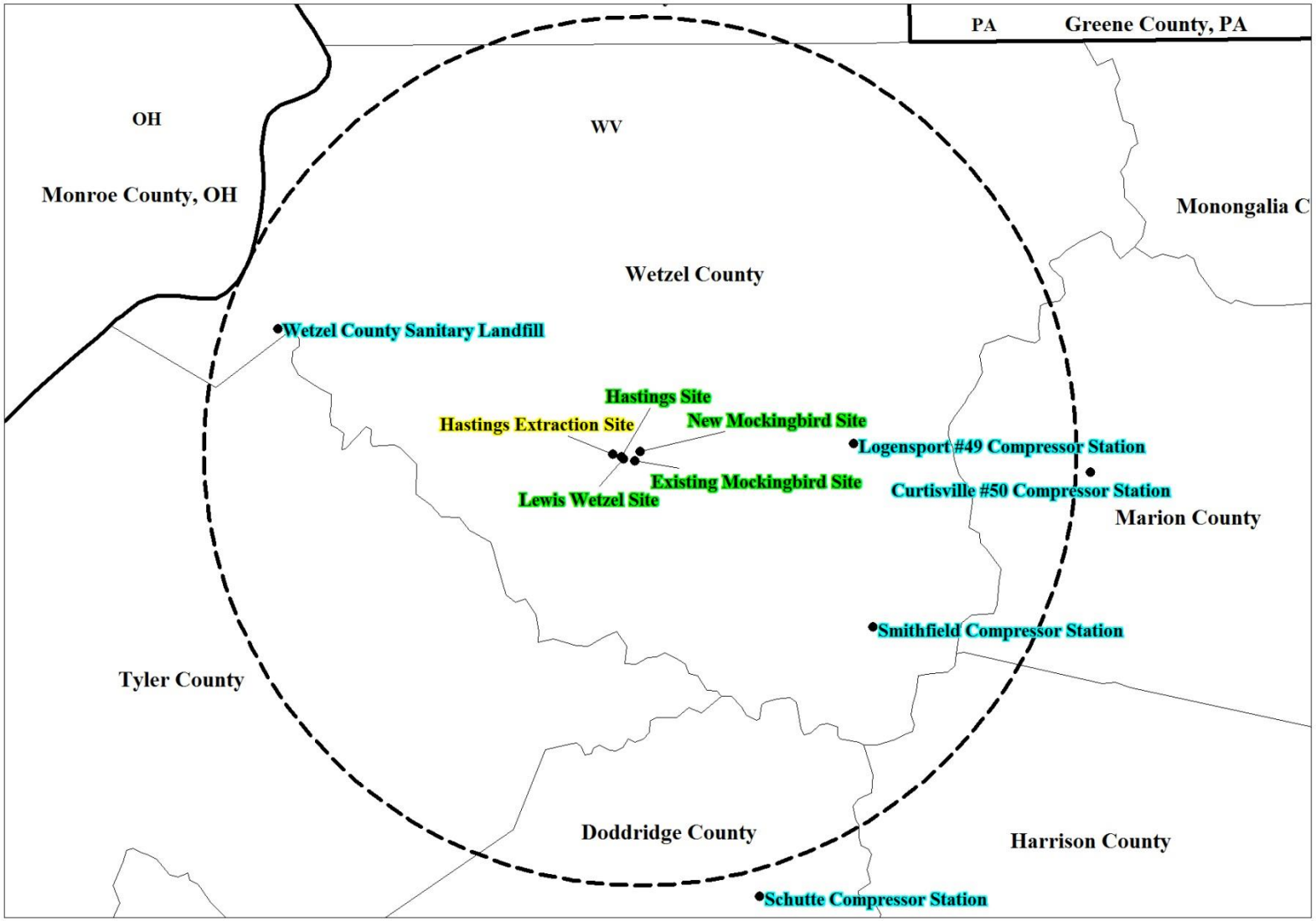
30 Year Period of Record Rainfall (Inches) by Month - Clarksburg, WV

Month	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1	2.39	1.69	2.79	2.36	4.63	3.54	3.36	2.91	2.06	7	5.27	6.48	1.71	4.59	5.91
2	1.73	5.48	1.6	3.48	5.43	3.98	3.9	2.24	2.43	6.11	2.51	4.4	1.96	4.46	2.48
3	4.06	2.68	2.18	2.51	6.1	1.97	5.9	4.51	6.22	8.89	2.52	4.4	6.86	4.04	5
4	2.22	2.71	4.28	2.68	3.47	3.01	3.89	2.25	4.1	4.16	2.37	3.2	1.62	4.17	3.49
5	5.09	1.93	2.14	1.82	5.58	6.39	1.67	3.48	1.79	6.04	6.99	11.26	6.27	3.72	4.84
6	2.47	2.81	4.55	1.82	6.58	4.24	2.63	2.55	2.37	4.49	4.16	3.34	2.55	10.47	2.36
7	4.83	5.1	1.11	2.99	5.04	4.7	3.95	5.36	2.44	4.39	2.08	9.85	5.07	2.53	3.23
8	2.89	3.27	3.82	4.36	6.08	7.66	2.28	5.17	2.96	6.12	4.08	4.44	6.16	3.2	2.73
9	0.67	3.3	1.93	5.38	3.69	5.69	3.05	2.79	5.83	3.22	2.18	6.44	3.1	2.89	3.43
10	4.59	3.18	1.37	2.15	4.51	4.01	1.9	1.23	3.32	0.67	4.19	2	1.22	1.31	3.19
11	11.2	7.09	3.11	4.62	3.44	2.23	4.21	3.95	5.32	3.14	3.52	4.26	3.85	1	4.63
12	1.75	3.87	3.36	2.52	1.44	8.41	4.69	3.91	3.62	3.15	2.87	3.13	2.75	1.65	2.84

Month	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
1	1.47	3.25	3.5	2.34	4	6.24	4.96	3.83	3	3.99	4.03	2.1	2.52	2.1	1.69
2	5.03	1.9	1.13	5.78	2.56	2.18	0.8	3.12	5.52	2.4	3.79	3.92	0.95	2.11	2.99
3	3.12	3.62	4.42	1.93	4.75	4.52	2.32	3.14	4.71	2.27	2.47	5.9	6.13	3.23	2.08
4	4.56	3.38	5.84	2.53	5.51	3.51	4.95	4.42	3.64	5.16	2.01	8.11	1.27	1.93	2.12
5	4.12	5.43	3.38	6.18	7.98	5.02	3.01	1.92	5.37	6.96	4	5.08	3.67	4.34	4.99
6	5.12	4.21	5.51	5.91	5.2	1.48	5.71	2.74	9.09	3.7	4.62	6.71	2.52	6.13	4.01
7	5.28	7.64	4.24	7.32	4.17	6.12	4.58	6.92	5.19	2.52	4.64	4.76	5.24	6.01	4.63
8	3.25	5.24	2.59	4.09	4.31	3.19	1.94	4.37	2.99	3.71	2.36	7.15	1.89	8.85	5.14
9	4.41	3.61	3.84	4.87	5.31	0.7	4.85	1.43	1.34	1.88	3.69	6.98	4.66	1.94	1.99
10	1.48	1.38	5.5	2.96	3.98	5.21	5.22	3.44	1.49	4.18	2.53	6.7	4.94	1.51	5.17
11	1.76	1.56	3.08	7.71	3.95	4.39	3.81	4.19	2.87	1.09	3.17	5.08	0.8	3.28	2.08
12	2.34	1.95	3.58	3.6	2.47	2.66	1.63	8.8	5.84	4.44	3.78	4.25	6.14	4.61	2.8

Location of Regional Major (Title V) Sources

Appendix E



Green Highlight - Dominion Hastings/Lewis Wetzel/Mockingbird Sites, Including Expansion

Yellow Highlight - Dominion Hastings Extraction Plant

Blue Highlight - Non-Dominion Regional Major Sources

- 20-km Buffer from New Mockingbird Site