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west virginia department of environmental protection

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Jim Justice, Governor  
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Pursuant to 45 CSR §14-17.2

PRELIMINARY DETERMINATION/FACT SHEET

*for the*

MAJOR MODIFICATION

Knauf Insulation, Inc.

Inwood Facility

*located in*

Inwood, Berkeley County, West Virginia

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Permit Application Number: R14-0015M

Facility Identification Number 003-00012

Date: August 10, 2017

## Table of Contents

SUMMARY .....	4
BACKGROUND INFORMATION .....	5
Public Review Procedures .....	5
Action Taken at Application Submittal .....	5
FACILITY DESCRIPTION .....	6
Process Description.....	6
Proposed Changes .....	6
SITE INSPECTION .....	8
ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER .....	10
REGULATORY APPLICABILITY .....	14
West Virginia State Implementation Program (SIP) Rules.....	14
Federal Regulations .....	19
TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS .....	23
REVIEW of the PSD REQUIRMENTS .....	23
Best Available Control Technology (BACT) Evaluation .....	23
SELECTED BACT SUMMARY .....	26
NO <sub>x</sub> BEST AVAILABLE CONTROL TECHNOLOGY .....	28
NO <sub>x</sub> BACT Melt and Refining Handling Operations .....	28
NO <sub>x</sub> BACT - Forming and Collecting Operations .....	31
NO <sub>x</sub> BACT Curing and Cooling Operations.....	32
PM/PM <sub>10</sub> /PM <sub>2.5</sub> BACT TECHNOLOGY .....	34
PM/PM <sub>10</sub> /PM <sub>2.5</sub> BACT Raw Material Handling Operations & Facing, Sizing, and Packaging.....	34
PM PM/PM <sub>10</sub> /PM <sub>2.5</sub> BACT Forming and Collecting Operations .....	38
PM PM/PM <sub>10</sub> /PM <sub>2.5</sub> BACT Curing and Cooling Operations.....	40
PM PM/PM <sub>10</sub> /PM <sub>2.5</sub> BACT Cooling Tower .....	41
NO <sub>x</sub> & PM/PM <sub>10</sub> /PM <sub>2.5</sub> BACT EMERGENCY GENERATOR .....	43
AIR QUALITY IMPACT ANALYSIS .....	44
Class I Area SIL Analysis .....	44
Class II Area SIL Analysis .....	45
NAAQS Analysis .....	45
Class I Area Air Quality Related Values Analysis .....	49
Additional Impacts Analysis.....	50
MONITORING OF OPERATIONS.....	51
PREFORMANCE TESTING .....	52

CHANGES TO PERMIT R14-0015L ..... 53

RECOMMENDATION TO DIRECTOR..... 54

APPENDIX A DAQ’s Review of Knauf Insulaion Class II Air Quality Modeling Report.....

APPENDIX B Recommend Draft Permit.....

## SUMMARY

Knauf Insulation Inc. applied for a Major Modification Permit for restarting Line 2 (ML2INW), which includes replacing the existing electric glass-melting furnace with a gas oxygen fuel furnace with the capacity to pull 6.67 tons of glass per hour. The existing Line 2 was permitted under R14-0015L for a pull rate of 4 tons of glass per hour.

Prior to the installation of Line 2, Lines 1 and 2 at the Inwood Facility underwent New Source Review (NSR) that triggered the Significant Emission Rates (SER) as defined in 45 CSR 14, West Virginia's major source permitting program. The project is subject to Prevention of Significant Deterioration (PSD) permitting requirements for particulate matter (PM), particulate matter less than 10 microns, and ozone (which includes both precursors of ozone: nitrogen oxides (NO<sub>x</sub>), and volatile organic compounds (VOCs).

A summary of the original BACT review for Line 2 is presented in the following table. It should be noted that at the time of the original review, PM<sub>2.5</sub> had not be added as a New Source Review (NSR) Pollutant.

<b>Table #1 – Summary of Original BACT Analysis for Line 2</b>			
<b>Pollutant</b>	<b>Melter</b>	<b>Forming</b>	<b>Curing/Cooling</b>
PM/PM <sub>10</sub>	Fabric Filter	Venturi Scrubber	Wet Scrubber/RTO
NO <sub>x</sub>	Process Control	Combustion Controls	Combustion Controls
CO	Process Control	Combustion Controls	Combustion Controls
VOCs	Process Control	None	RTO

The process control for the glass-melting furnace was the electric arc melter with a cold top. Since the start-up of both manufacturing lines at Inwood, both electric arc melters have experienced thermal shock issues from interruptions of electricity service to the facility.

Line 2 ceased operations in 2007. The proposed changes to be made to Line 2 prior to restart are considered "physical changes" which require applicability review under 45 CSR 14 to determine if the changes warrant a major modification. Knauf determined that the proposed changes prior to the restart will result in a "significant increase and net significant increase" of NO<sub>x</sub>, PM, PM<sub>10</sub>, and particulate matter less than 2.5 microns (PM<sub>2.5</sub>).

Therefore, Knauf has proposed the following controls as BACT for these proposed changes to the emission units.

<b>Table #2 – Summary of Proposed Technologies as BACT for the restarting of Line 2</b>			
<b>Pollutant</b>	<b>Melter</b>	<b>Forming</b>	<b>Curing/Cooling</b>
PM/PM <sub>10</sub> /PM <sub>2.5</sub>	Fabric Filter	Wet Scrubbing	Wet Scrubbing/RTO
NO <sub>x</sub>	Gas Oxygen Fuel Furnace	Good Combustion Practices	Low NO <sub>x</sub> burners with integrated FGR

FGR – flue gas recirculating.

The choice of BACT is nearly the same as the previous BACT determination except for oxides of nitrogen from the glass-melting furnace.

## BACKGROUND INFORMATION

Application No.: R14-0015M  
 Plant ID No.: 003-00012  
 Applicant: Knauf Insulation, Inc.  
 Facility Name: Inwood Facility  
 Location: Inwood  
 NAICS Code: 327993  
 Application Type: Major Modification  
 Received Date: November 3, 2016  
 Engineer Assigned: Edward S. Andrews, P.E.  
 Fee Amount: \$7,000.00  
 Fee Deposit Date: November 4, 2016  
 Complete Date: March 3, 2017  
 Due Date: August 30, 2017  
 Applicant Ad Date: November 7, 2016  
 Newspaper: *The Journal*  
 UTM's: Easting: 756.55 km      Northing: 4,365.50 km      Zone: 17  
 Description: The application is for the restart of Line 2 at the Inwood Facility. As part of this restart, the electric melter is being replaced with a larger gas oxygen fuel glass-melting furnace.

## PUBLIC REVIEW PROCEDURES

### *Action Taken at Application Submittal*

Pursuant to §45-13-8.3 and §45-14-17. 1, Knauf Insulation, Inc. placed a Class I legal advertisement in *The Journal* on November 7, 2016, notifying the public of the submission of a permit application.

The DAQ notified the Federal Land Managers (U.S. Forest Service) for the Dolly Sods, Otter Creek, and James River Face Class I Areas by email on November 16, 2016 and provided a

Preliminary Determination for R14-0015M  
 Knauf Insulation, Inc  
 Inwood Facility  
 Non-confidential

link to the submitted application on the WV DAQ's webpage in accordance with 45 CSR §14-13.2.

The DAQ notified the Federal Land Manager (National Park Service) of the Shenandoah National Park Class I Area by email on November 16, 2016 and provided a link to the submitted application on the WV DAQ's webpage in accordance with 45 CSR §14-13.2.

Upon receipt of the application a copy was posted for public review on the DAQ's webpage at <http://www.dep.wv.gov/daq/Pages/NSRPermitsforReview.aspx>, and made available for review at the DAQ Headquarters in Charleston (Kanawha City), West Virginia.

## **FACILITY DESCRIPTION**

The Inwood facility is a wool fiberglass manufacturing facility covered under Standard Industrial Classification (SIC) Code 3296 and North America Industry Classification (NAICS) Code 327993. The facility has the potential to operate 24 hours per day, 7 days per week. The current facility consists of a raw material receiving area and batch mixing point, electric arc glass-melting furnaces, a series of natural gas fueled heaters, rotary spun glass forming units, binder sprayers, curing ovens, and storage tanks. The facility is configured into two production lines: Line 1 and Line 2.

Both production lines are covered under Permit R14-0015L to manufacture a combined total of 74,460 tpy of wool fiberglass insulation products.

## **PROCESS DESCRIPTION**

Knauf Insulation, Inc.'s (Knauf) Inwood, West Virginia Facility manufactures fiberglass roll and batt insulation. As part of this application, Knauf is proposing to modify and upgrade an existing wool fiberglass insulation line (Line 2). The facility receives raw materials (variety of natural minerals and manufacturing chemicals, such as silica sand, limestone, and soda ash) that are mixed into batches. Each batch of natural minerals is then fed into a furnace for melting. Knauf is proposing a new gas oxygen glass-melting furnace as part of this project. Once the molten glass flows out of the furnace tank into the canal, it is transferred to the forming equipment via a channel (forehearth) located at the end of the furnace canal. After the forehearth, glass fiber is spun into glass strands by the means of fiber forming units (fiberizers). Knauf produces bonded fiberglass products at the Inwood facility. Binder (water, wax, and ECOSE binder) is added to the fine glass fibers in the forming section and are collected to form a blanket on a moving conveying system. This conveying system moves the blanket of glass fibers into a curing oven, which cures the binder that gets the individual fiber to stay together. Upon exiting the curing oven, the blanket is cooled via a "cooling table". The cooled blanket is then cut to size in rolls and batts of insulation per customer demand and packaged for shipment offsite.

## **PROPOSED CHANGES**

Knauf has proposed to make several changes to the Line 2 (ML2INW) prior to resuming manufacturing operations:

Preliminary Determination for R14-0015M  
Knauf Insulation, Inc  
Inwood Facility  
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## **Raw Material Handling Operations**

The raw material operations consist of several storage bins for sand, aplite, borax, soda ash, cullet, batch houses which receive and mix the raw materials, and several miscellaneous binder mixing tanks. In addition to the increase in production on Line 2, Knauf is also replacing two (2) day bins, with dedicated bin vents (CD11A and CD11B), adding new cullet silos and replacing some of the conveyance equipment within the process.

## **Melt and Refining Line 2**

Knauf will install a new gas oxygen fueled melting furnace (ESS22) with a glass pull rate of 13,333 lb/hr (58,400 tons per year). The proposed equipment is considered a continuous furnace with a melting tank, a superstructure (combustion chamber), a throat (connection between the melting end and the riser that brings the molten glass in the refiner, working end or distributor), a working chamber, and different heat exchangers.

Particulate matter from the new melting furnace will be controlled by a new baghouse (CD22B) and the exhaust gas will ultimately pass to the new EP23 stack. Knauf proposes to use fabric filters made from polytetrafluoroethylene fibers. PTFE fabric filters can withstand continuous temperatures up to 500 degrees Fahrenheit (°F).

Knauf is also planning to upgrade the forehearth in the refining line to handle the new capacity and throughput of the production line. The forehearth is going to be upgraded to handle the increased capacity of the new furnace and switch from gas fired to electrically heated.

## **Forming and Collecting Line 2 (Group 005)**

The existing forming/collection section (ES23) on Line 2 will be modified as a result of this project. There will be four forming/fan zones and multiple cured product fiberizers fired with natural gas (Total heat input rating of 20 MMBtu/hr). The forming and collecting section will be controlled with a fiber collection chamber that includes wet collection.

## **Curing and Cooling Line 2 (Group 007)**

As part of this project, Knauf will be modifying the Line 2 curing oven as well as increasing the potential throughput for the process. The resulting curing oven (part of ES24) will have five (5) zones and will have 2 oven vestibule burners. The maximum total heat input rating for the process will be 25.2 MMBtu/hr. No changes to the cooling section are envisioned at this time apart from the increase in production. The process will be primarily controlled by a wet (i.e., venturi) scrubber for particulate matter. Note that the current permit also includes a regenerative thermal oxidizer (RTO) on Line 2 curing and cooling. The RTO is used primarily for control of volatile organic compounds (VOCs). However, due to process changes, including formulation changes, Knauf anticipates being able to meet the proposed lower VOC limits without use of the RTO. As such, Knauf is requesting the preservation of the RTO in the permit, but anticipates

only operating the device in the event that it is deemed necessary to meet process emission limits.

### **Facing, Sizing, and Packaging for Line 2 (Group 008)**

Knauf is proposing to upgrade its existing packaging and product handling operations for Line 2. These upgrades include the installation of two 15,000 acfm cyclones and cartridge filters. This will replace the existing 20,000 acfm unit.

### **Additional Support Facilities**

In addition to the changes to the existing processes at the facility, Knauf is also proposing installation of the following new equipment:

- One (1) 900 brake horsepower (bhp) Caterpillar C18 emergency generator; and
- Three (3) cooling towers each with a water recirculation rate of approximately 2,412 gallons per minute (gpm).

## **SITE INSPECTION**

This facility is an existing major source operating under Operating Permit R30-00300012-2013, which includes Permit R14-0015L. Thus, this facility is routinely inspected at least once every two years by members of the Compliance and Enforcement Section of the DAQ. The Inwood Facility was last inspected on February 12, 2016 by Mr. Joseph Kreger, an inspector assigned to the Eastern Panhandle Regional Office of the Compliance & Enforcement Section. Based on Mr. Kreger's findings during the inspection, a compliance status code "30", facility operating in compliance, was issued.

In addition to routine inspections performed by the Compliance & Enforcement Section, the writer has visited the facility several times since its original construction, with the most recent visit occurring on March 31, 2014.



*Figure 1 Google Earth Screenshot of 4812 Tabler Station Road*



*Figure 2 Aerial Photograph of the Inwood Facility*

### **ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER**

The proposed emissions rates for the forming and curing processes were based on emissions data from Knauf's facilities located at Inwood, WV; Lanett, AL; and Albion, MI. The emissions data has been collected for emissions compliance demonstrations. The applicant broke the emissions down by process, emission units or support activities.

**Table #3 – Hourly Emissions from Line #2 (ML2INW)**

<b>Pollutant</b>	<b>Furnace (lb/hr)</b>	<b>Forming (lb/hr)</b>	<b>Curing &amp; Cooling (lb/hr)</b>	<b>Facing/Sizing. Packaging (lb/hr)</b>
PM/PM <sub>10</sub> /PM <sub>2.5</sub> (Filterable)	1.67	17.14	5.87	0.68
PM Condensable Fraction	0	4.27	1.47	0.00
Total PM <sub>10</sub> /PM <sub>2.5</sub>	1.67	21.41	7.33	0.68
Sulfur Dioxide (SO <sub>2</sub> )	5.20	0.17	0.17	0.00
Oxides of Nitrogen (NO <sub>x</sub> )	20.00	1.40	3.93	0.00
Carbon Monoxide (CO)	3.47	7.45	8.15	0.00
Volatile Organic Compounds (VOCs)	1.30	3.21	2.60	3.53
Total Hazardous Air Pollutants (HAPs)	0.05	0.04	0.05	0.00
Carbon Dioxide Equivalent* (CO <sub>2</sub> e)	3,752	2,342	2,951	0.00

**Table #4 – Annual Emissions from Line #2 (ML2INW)**

<b>Pollutant</b>	<b>Furnace (tpy)</b>	<b>Forming (tpy)</b>	<b>Curing &amp; Cooling (tpy)</b>	<b>Facing/Sizing. Packaging (tpy)</b>
Filterable PM/PM <sub>10</sub> /PM <sub>2.5</sub>	7.30	74.99	25.70	2.96
PM Condensable Fraction	0		6.42	0.00
Total PM	7.30	93.73	32.12	2.96
Sulfur Dioxide (SO <sub>2</sub> )	22.78	0.76	0.76	0.00
Oxides of Nitrogen (NO <sub>x</sub> )	87.60	6.13	17.23	0.00
Carbon Monoxide (CO)	15.18	32.65	35.68	0.00
Volatile Organic Compounds (VOCs)	5.69	14.05	11.39	15.46
Total Hazardous Air Pollutants (HAPs)	0.22	0.18	0.22	0.00
Carbon Dioxide Equivalent* (CO <sub>2</sub> e)	16,436 <sup>1</sup>	10,258	12,925	0.00

\* The six greenhouse gas pollutants were converted into terms of CO<sub>2</sub> equivalent emissions based on the global warming potential as defined in 40 CFR 98, Subpart A.

1 – CO<sub>2</sub> emissions release from raw materials (i.e. limestone and soda ash) were combined under the furnace emissions.

After the cooling table for Line 2, the facing, sizing and packaging operations have the potential to generate emissions in the form of particulate matter and VOCs. The sizing (trimming) and packaging activities have the potential to generate fugitive particulate matter

Preliminary Determination for R14-0015M  
Knauf Insulation, Inc  
Inwood Facility  
Non-confidential

(PM). Knauf proposes to create a draft to capture the fugitive PM from these stations and route it to a cyclone in series with a cartridge style duct collector. Knauf used an emission factor published by U.S EPA in 450—3-82-022a “Wool Fiberglass Insulation Manufacturing – Background Information for Proposed Standards” to determine the potential PM rate before controls. After these controls, Knauf applied a 90% overall efficiency rating to account for capture and removal of the PM/PM<sub>10</sub>/PM<sub>2.5</sub>. The potential from these sources, after controls, was determined to be 0.03 pounds per hour and 0.15 tons per year.

During the facing step of the manufacturing process (applying the kraft paper to the insulation), Knauf used an emission factor from EPA’s FIRE database for the asphalt blowing coating process. The VOCs from the application of facing is 0.56 pounds per hour and 2.44 tons per year.

Other emission sources that are associated with the fiberglass manufacturing process are the raw material handling and the new cooling towers. Potential emissions from these two types of sources are in the form of particulate matter.

The raw material handling estimates for emission point FP-11 included unloading and conveying, storage, and mixing/weighing sources. The throughput of raw materials used in the estimation is a function of Line 2 maximum production multiplied by 111%, which equated to 15,333 lb per hour and 67,160 tons per year of raw materials, to account for material/reject losses and ensure availability of batch material for the glass-melter to achieve the maximum production rate of 6.67 tons of glass pulled per hour. Knauf proposed to install two additional storage bins, which is identified as ES11a and ES11b.

The potential release points associated with these sources are fully enclosed and routed to a fabric filter duct collector. Knauf used a 99% removal efficiency for PM to account for these fabric filter control devices. These control devices release inside of the manufacturing building. The manufacturing building is operating under slight negative pressure due to the forming section which is released to the atmosphere from Emission Point EP23 (Forming Stack). Thus, these emissions, after the fabric filters, are entrained in the exhaust going to the forming section wet scrubbers. Knauf estimated an additional level of control of 50% for these particulate matter emissions.

The controlled emissions from these sources are presented in the following table.

<b>Table 5 – Emissions from the Raw Materials Area</b>						
Source	PM		PM <sub>10</sub>		PM <sub>2.5</sub>	
	(lb/hr)	tpy	(lb/hr)	tpy	(lb/hr)	tpy
Unloading & Conveying	0.12	0.50	0.06	0.25	0.06	0.25
Storage Bins	0.00	0.03	0.00	0.02	0.00	0.02
Mixing & Weighing	0.15	0.64	0.07	0.32	0.07	0.32

Knauf estimated the particulate matter emissions from the cooling towers using water drop size distribution data published in “Calculating Realistic PM<sub>10</sub> Emissions from Cooling Towers” by Reisman and Frisbie. The source of the make-up water for the cooling towers is the local public water system. Thus, the total dissolved solids (TDS) in the cooling water was assumed to be the same as the standard allowed for public water systems in West Virginia (750 ppm by weight). No limitation of operations was used in determining the potential emissions from the new cooling towers.

**Table 6 – Emissions from the New Cooling Towers**

Source	PM		PM <sub>10</sub>		PM <sub>2.5</sub>	
	(lb/hr)	tpy	(lb/hr)	tpy	(lb/hr)	tpy
Cooling Tower 3	0.05	0.20	0.04	0.17	0.04	0.17
Cooling Tower 4	0.05	0.20	0.04	0.17	0.04	0.17
Cooling Tower 5	0.05	0.20	0.04	0.17	0.04	0.17
Total	0.15	0.60	0.12	0.51	0.12	0.51

#### Other Proposed Emission Sources

Knauf proposed only one other emission source that is not directly or in-directly associated with Line 2, which is a 900 bhp, diesel fired, compression ignition engine used to provide emergency electrical power in the event of interruption of the local service. Knauf based the annual operation of this emission source on 500 hours per year. This approach is consistent with U.S. EPA guidance on determining the potential to emit of sources used in the event of an emergency.

**Table #7 – Emissions from Engine for the Emergency Generator (EP26)**

Pollutant\Sources	Caterpillar C18 Generator Set	
	lb/hr	tpy
Oxides of Nitrogen (NO <sub>x</sub> )	12.32	3.08
Carbon Monoxide (CO)	1.73	0.43
Sulfur Dioxide (SO <sub>2</sub> )	0.36	0.090
Particulate Matter (PM)/ PM less than 10 microns (PM <sub>10</sub> )/ PM less than 2.5 microns (PM <sub>2.5</sub> )	0.18	0.05
Volatile Organic Compounds (VOCs)	0.14	0.04
Carbon Dioxide Equivalent (CO <sub>2</sub> e)	933.61	233.40
Total Hazardous Air Pollutants (HAPs)	0.01	0.003

## **REGULATORY APPLICABILITY**

The Inwood facility as proposed in the submittal of this application is classified as an existing major source under Prevention of Significant Deterioration (PSD) and WV DAQ's major source permitting program (45 CSR 14) and an Area Source for Hazardous Air Pollutants (HAPs).

### **West Virginia State Implementation Program (SIP) Rules**

There are four West Virginia State Rules that apply to this proposed project.

**45 CSR 7 - TO PREVENT AND CONTROL PARTICULATE MATTER AIR POLLUTION FROM MANUFACTURING PROCESSES AND ASSOCIATED OPERATIONS**

**45 CSR 10 - TO PREVENT AND CONTROL AIR POLLUTION FROM THE EMISSION OF SULFUR OXIDES**

**45 CSR 13 - PERMITS FOR CONSTRUCTION, MODIFICATION, RELOCATION AND OPERATION OF STATIONARY SOURCES OF AIR POLLUTANTS, NOTIFICATION REQUIREMENTS, ADMINISTRATIVE UPDATES, TEMPORARY PERMITS, GENERAL PERMITS, PERMISSION TO COMMENCE CONSTRUCTION, AND PROCEDURES FOR EVALUATION**

**45 CSR 14 - PERMITS FOR CONSTRUCTION AND MAJOR MODIFICATION OF MAJOR STATIONARY SOURCES FOR THE PREVENTION OF SIGNIFICANT DETERIORATION OF AIR QUALITY**

45 CSR 7 and 45 CSR 10 (Rules 7 & 10) establish emission standards and applicable requirements for certain types of stationary sources located in West Virginia. Rule 7 establishes an allowable PM (Total Suspended Particulate – TSP) emission rate from manufacturing sources and a corresponding visible emission standard. Rule 10 sets an allowable SO<sub>2</sub> emission rate for fuel burning (boilers) units, manufacturing processes, and other process gas streams.

Section 4 of Rule 7 establishes an allowable PM emission limit for manufacturing process based on the weight of materials into the process, per type of source operation. Knauf's process is classified as a type 'a' source due to the glass-melting operation. For 13,333 pounds of glass being produced per hour, the wool fiberglass process requires 285,617 pounds of materials used in the manufacturing process. At the maximum process rate, the allowable PM rate under 45 CSR 7-4.1. would be 39.57 pounds per hour. Line 2 has a controlled potential to emit for PM of 4.56 pounds per ton of glass pull, which equates to 30.40 pounds of PM per hour. Thus, Line 2 would have a margin of compliance with the Rule 7 allowable of nearly 24% at the maximum permitted production rate.

Preliminary Determination for R14-0015M  
Knauf Insulation, Inc  
Inwood Facility  
Non-confidential

Knauf's selection of PM control devices should minimize visible emissions below the 20% opacity limit. Compliance with both of the allowables should be attained for Line 2.

Under Rule 10, manufacturing processes such as Knauf's wool fiberglass insulation process has an in-stack allowable concentration of 2,000 ppm by volume of SO<sub>2</sub>. Knauf predicted an SO<sub>2</sub> emission rate of 5.37 pounds per hour, which equates to a SO<sub>2</sub> concentration of less than 2 ppm by volume at standard temperature. SO<sub>2</sub> emissions from the curing and cooling stack are understood to be generated from the combustion of pipeline quality natural gas. SO<sub>2</sub> emissions from these sources were estimated to be 0.17 pounds per hour, which equates to a concentration of less than 5 ppm by volume at standard temperature. Regarding the SO<sub>2</sub> emissions from the engine used in the emergency generator, the Director has determined that internal combustion engines do not meet the definition of a fuel burning unit, manufacturing process, or other process gas stream under Rule 10 and therefore are not affected emission units under Rule 10. The proposed sources in the application will meet the allowable SO<sub>2</sub> emission standard without the use of any add-on control device or other control measures other than using low sulfur fuel such as natural gas.

45 CSR 13 and 45 CSR 14 are West Virginia's minor and major stationary source permitting rules. A modification under Rule 13 is defined as an increase in the permitted emission rate greater than 6 pounds per hour and 10 tons per year of any criteria pollutant. The following table illustrates which pollutant triggers the Rule 13 definition of modification.

<b>Pollutant</b>	<b>Units</b>	<b>Permitted Rate for Line 2</b>	<b>New Line 2 Plus Addition Sources</b>	<b>Change In Permitted Emissions</b>	<b>Is Modification Triggered (Yes/No)</b>
PM/	lb/hr	17.00	28.08	11.08	Yes
	TPY	74.46	115.56	41.10	
PM10/PM2.5	lb/hr	17.00	32.02	15.02	Yes
	TPY	74.46	137.82	63.36	
SO <sub>2</sub>	lb/hr		5.91	5.91	No
	TPY		24.39	24.39	
NO <sub>x</sub>	lb/hr	16.4	37.65	21.25	Yes
	TPY	71.83	114.04	42.21	
CO	lb/hr	33.53	20.79	-12.74	No
	TPY	146.86	83.94	-62.92	
VOCs	lb/hr	11.44	10.78	-0.66	No
	TPY	50.10	46.63	-3.47	

The proposed project triggers modification under Rule 13 for PM, PM10, PM2.5, and NO<sub>x</sub>. Even though modification is not triggered for the other pollutants, the change in emission rates needs to be addressed to reflect the potential emissions from the line and additional sources at the facility within the permit (R14-0015M).

Preliminary Determination for R14-0015M  
Knauf Insulation, Inc  
Inwood Facility  
Non-confidential

The applicant submitted a complete application, paid the Rule 13 permit application filing fee, which includes the New Source Performance Standard and the major modification fees, and published a legal ad in the Journal (local newspaper in Martinsburg, WV) on November 7, 2016.

West Virginia adopted the U.S. EPA Prevention of Significant Deterioration (PSD) program by establishing 45 CSR 14. The main function of this program is to allow economic growth while ensuring that the local ambient air quality and Class I Areas (Wilderness Areas and National Parks) are not adversely affected from major sources of air pollution. Under the Clean Air Act, a Class I Area is one in which visibility is protected more stringently than under the National Ambient Air Quality Standards; includes national parks, wilderness areas, monuments, and other areas of special national and cultural significance.

This program requires construction of major sources and major modifications of major sources to undergo review to ensure that the Best Available Control Technology (BACT) is installed, and used to limit emissions of criteria pollutants, as well as to conduct a scientific analysis to ensure that the impact from such growth does not adversely affect the subjected areas.

Rule 14 defines a “major modification” as a “physical change” or “change in method of operation” that results in a “significant emissions increase and significant net emission increase” of a major source.

In 2008, the former owner and operator, Guardian Fiberglass Inc., ceased manufacturing operations on Line 2. Knauf Insulation Inc. acquired Guardian Fiberglass Inc. on May 30, 2014, which included the Inwood Facility.

The proposed changes that Knauf has outlined in this application (i.e. replacement the glass-melting furnace, increase the line capacity) are classified as a “physical change” under Rule 14. Therefore, the rule required Knauf to determine if the potential emissions represent a “significant emissions increase and a significant net emission increase” of a regulated pollutant under the rule.

The emissions increase for existing emissions sources is determined by the difference between the baseline actual emissions and the expected new level of emissions, which considers demand growth exclusion (DGE).

The project emissions increase (PEI) in the format of a formula is then:

$$PEI = (PAE - DGE) - BAE$$

Where:

PEI = Net Emission Increase

PAE = Projected Actual Emissions

DGE = Demand Growth Exclusion

BAE = Baseline Actual Emission Rates

Preliminary Determination for R14-0015M  
Knauf Insulation, Inc  
Inwood Facility  
Non-confidential

As discussed previously, for new emissions sources future emissions are based on potential to emit and baseline actual emissions are set equal to zero. As such, the project increase for new emission units is equal to the proposed potential to emit.

A summary of the analysis, compared to the PSD significant emission rates (SERs) is presented as Table 9 – Projected Emission Increases. Emission increases for the proposed project are above the applicable NSR major threshold for nitrogen oxides (NO<sub>x</sub>), particulate matter (PM), particulate matter with a diameter less than 10 microns (PM<sub>10</sub>), and particulate matter with diameter less than 2.5 microns (PM<sub>2.5</sub>). As such, PSD permitting is triggered by the proposed project for these pollutants only.

### Table 9 - Project Emissions Increases (tpy)

Knauf's Inwood facility is considered an existing major source. The proposed project will result in a major modification due to the significant net emissions increase for NO<sub>x</sub>, PM, PM<sub>2.5</sub> and PM<sub>10</sub>. As such, an analysis to ensure implementation of the Best Available Control Technology (BACT) is required for each pollutant with a significant net emissions increase. A technical review has been performed to investigate BACT decisions for the SER pollutants that have been determined by various permitting authorities across the U.S. to satisfy BACT requirements.

## **Federal Regulations**

### **New Source Performance Standards (NSPS)**

Section 111 of the Clean Air Act allows the EPA to develop New Source Performance Standards (NSPS) under 40 CFR 60 for new, modified, or reconstructed stationary sources. Moreover, any source subject to an NSPS is also subject to the general provisions of Subpart A of the part, except where expressly noted in the specific subpart. Line 2, in its existing configuration, is subject to Subpart PPP. Knauf's proposed changes does not affect the line's applicability under Subpart PPP. The proposed new emergency generator will be equipped with a compression ignition engine that is subject to Subpart IIII. The following is a summary of applicability and non-applicability determinations for the NSPS regulations of relevance to the proposed project.

#### ***NSPS Subpart CC - Standards of Performance for Glass Manufacturing Plants***

New Source Performance Standards 40 CFR Part 60, Subpart CC (NSPS CC) affects owners and operators of glass melting furnaces that commence construction or modification after June 15, 1979. Knauf is planning to install a new gas oxygen-fueled (gas-oxy) glass melting furnace on Line 2 at the Inwood facility that does not have a refractory brick lining. This regulation defines a glass melting furnace as a unit comprising a refractory vessel in which raw materials are charged, melted at high temperature, refined, and conditioned to produce molten glass. The unit includes foundations, superstructure and retaining walls, raw material charger systems, heat exchangers, melter cooling system, exhaust system, refractory brick work, fuel supply and electrical boosting equipment, integral control systems and instrumentation, and appendages for conditioning and distributing molten glass to forming apparatuses.

The proposed design that Knauf has selected does not utilize a refractory brick vessel. Thus, the proposed melter is not subject to the emission standard of this regulation. Regardless of this applicability discussion. Knauf's proposed control device for the melter and PM emission limit will be no less stringent than if this melter was subject to the standard.

### ***NSPS Subpart PPP - Standards of Performance for Wool Fiberglass Insulation Manufacturing Plants***

New Source Performance Standards 40 CFR Part 60 Subpart PPP (NSPS PPP) affects owners and operators of rotary spin wool fiberglass insulation manufacturing lines that commence construction, modification, or reconstruction after February 7, 1984. The regulation limits affected facilities to discharge any gas which contains particulate matter in excess of 11 lb per ton of glass pulled. Furthermore, if a wet scrubber control device is used to comply with the emission standard, the owner or operator shall calibrate, maintain, and operate monitoring devices which measure the pressure drop across each scrubber and the scrubbing liquid flow rate to each scrubber. Line 2 at the Inwood facility is currently subject to the requirements of this subpart, and will continue to comply with the conditions, as incorporated into the Title V Permit, after the completion of the proposed project. Knauf will demonstrate compliance and establish the operating parameters of the line and control devices by conducting a performance test for PM. The required test measures the front (filterable PM) and back half (condensable PM) of PM using U.S. EPA Method 5E.

### ***NSPS Subpart IIII — Standards of Performance for Compression Ignition Internal Combustion Engines***

40 CFR Part 60 Subpart IIII (NSPS IIII) affects owners and operators of stationary compression ignition internal combustion engines (CI ICE) that commence construction, reconstruction or modification after June 11, 2005, and manufactured after April 1, 2005. Applicability dates are based on the date the engine was ordered by the operator.

The proposed Caterpillar C18 emergency generator engine to be installed at the Inwood facility will be subject to Subpart IIII based on its order and manufacture dates. Knauf proposed to follow the certified compliance engine option. As such, the following requirements pertain to the proposed new emergency generator engine.

- The engine must be certified to meet the applicable, Tier 2 requirements contained in 40 CFR §89.112 per 40 CFR §60.4202. Note that the emission calculations in the application are based on worst-case estimates on load testing. The engine is certified to meet Tier 2 limits, which are listed in the following table.

Preliminary Determination for R14-0015M  
Knauf Insulation, Inc  
Inwood Facility  
Non-confidential

<b>Table10 - Tier 2 Limitation (Engines &gt; 560 kW)</b>			
<b>NMHC+NO<sub>x</sub></b> g/kW-hr (g/HP-hr)	<b>CO</b> g/kW-hr (g/HP-hr)	<b>PM</b> g/kW-hr (g/HP-hr)	<b>Opacity</b>
6.4 (4.77)	3.5 (2.61)	0.20 (0.15)	20% during acceleration mode, 15% during the lugging mode, and 50% during the peaks in either the acceleration or lugging modes

- Knauf will meet the fuel sulfur requirements contained in 40 CFR 60.4207 (15 ppm sulfur content and either a minimum cetane index of 40 or a maximum aromatic content of 35% by volume).
- Knauf will operate and maintain the engine according to the manufacturer's emission-related written instructions and change only those emission-related settings that are allowed by the manufacturer.
- The engine must be installed and configured according to the manufacturer's emission-related specifications, except as allowed in 40 CFR §60.4211(g).
- As an emergency stationary ICE, the engine is limited to 100 hours per year for maintenance and testing of which the engine may be operated for up to 50 hours in non-emergency situations.
- As an emergency stationary ICE, the engine may be operated for periods where there is a deviation of voltage or frequency of 5 percent or greater below standard voltage or frequency.
- Knauf will keep records of the operation of the engine that are recorded through the non-resettable hour meter. The time of operation of the engine and the reason the engine was in operation will be recorded

### ***National Emissions Standards for Hazardous Air Pollutants (NESHAPS)***

Part 63 NESHAP allowable emission limits are established on the basis of a maximum achievable control technology (MACT) determination for a particular major source. A HAP major source is defined as having potential emissions in excess of 25 tpy for total HAP and/or potential emissions in excess of 10 tpy for any individual HAP. The Inwood facility is an Area (minor) source of HAP since its potential emissions of HAP are less than the 10/25 major source thresholds. The potentially applicable NESHAP to the proposed project at the facility are Subparts NN, NNN, and ZZZZ, which are discussed below.

***40 CFR 63 Subpart NN – National Emission Standards for Hazardous Air Pollutants for Wool Fiberglass Manufacturing at an Area Sources***

Subpart NN applies to each wool fiberglass manufacturing facility that is an area source. The requirements apply to each new and existing gas-fired melting furnace, where a gas-fired glass melting furnace is defined as:

“a unit comprising a refractory vessel in which raw materials are charged, melted at high temperature using natural gas and other fuels, refined, and conditioned to produce molten glass. The unit includes foundations, superstructure and retaining walls, raw material charger systems, heat exchangers, exhaust system, refractory brick work, fuel supply and electrical boosting equipment, integral control systems and instrumentation, and appendages for conditioning and distributing molten glass to forming processes. The forming apparatus, including flow channels, is not considered part of the gas-fired glass-melting furnace. Cold-top electric furnaces as defined in this subpart are not gas-fired glass-melting furnaces.”

Like the NSPS CC, Knauf proposed a melter that will not utilize refractory brick and therefore does not meet the definition of a gas-fired melting furnace in this regulation. Thus, the unit is not subject to the subpart.

Knauf has proposed to use a fabric filter bag house that is monitored with a bag leak detection system, which would satisfy the monitoring requirements of this subpart, if were applicable.

***40 CFR 63 Subpart NNN – National Emission Standards for Hazardous Air Pollutants for Wool Fiberglass Manufacturing***

Pursuant to 40 CFR §63.1381, 40 CFR 63 Subpart NNN regulates HAP emissions from various emission units at new and existing major source wool fiberglass manufacturing facilities, including: glass melting furnaces, rotary spin wool fiberglass manufacturing lines producing a bonded wool fiberglass insulation product using a phenol/formaldehyde binder. Knauf made a process change in 2016 to eliminate the use of phenol/formaldehyde resins in their binder formula as part of their ECOS system. The proposed changes for Line 2 does not include switching the binder formula back to a phenol/formaldehyde formulation. Therefore, the requirements of 40 CFR 63, Subpart NNN will not apply to Line 2.

***40 CFR 63 Subpart ZZZZ – National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Engines***

This rule affects reciprocating internal combustion engines (RICE) located at major and area sources of HAPs. 40 CFR §63.6590(c) states that a new or reconstructed stationary RICE located at an area HAP source must meet the requirements of NESHAP Subpart ZZZZ by meeting the requirements of NSPS Subpart IIII. No further requirements apply for such engines under NESHAP Subpart ZZZZ. The Inwood facility is a minor (area) source of hazardous air pollutants and the emergency generator engine is considered a new stationary RICE. Therefore, the requirements contained in §63.6590(c) are applicable. Knauf will show compliance with the

Preliminary Determination for R14-0015M  
Knauf Insulation, Inc  
Inwood Facility  
Non-confidential

applicable requirements of 40 CFR 63 Subpart ZZZZ by meeting the applicable requirements of 40 CFR 60 Subpart IIII.

## **TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS**

The majority of non-criteria regulated pollutants fall under the definition of HAPs which, with some revision since, were 188 compounds identified under Section 112(b) of the Clean Air Act (CAA) as pollutants or groups of pollutants that EPA knows or suspects may cause cancer or other serious human health effects.

Knauf's Inwood facility was classified as a major source of HAPs prior to July 14, 2015. On July 14, 2015, Knauf was issued Permit R14-0015L to implement the process change to eliminate the use of formaldehyde-phenol based resin from the binder used in the manufacturing process, which has nearly eliminated the facility's release of formaldehyde, methanol, and phenol. Of these three HAPs, the facility reported emitting 6.46 tons in 2015. 2016 was the first entire year after the binder switch that the facility has reported emitting none of these HAPs in 2016.

Line 2 will be restarted using the same resin/binder formulation that Line 1 switched to in 2015 (Knauf's ECOS). Thus, this proposed modification should not generate HAPs other than as products of incomplete combustion, which will be minimal. Therefore, no toxicologically information on the proposed HAPs to be emitted is present in this evaluation.

## **REVIEW OF THE PSD REQUIREMENTS**

45 CSR 14 (PSD) requires applicants to determine the Best Available Control Technology (BACT) for each process and pollutant for which the project is major. These applicants have to demonstrate that the increase in emissions of the pollutant will not cause or contribute to an exceedance of the National Ambient Air Quality Standard (NAAQS) and will not exceed the increment threshold of the pollutant for which the project is major. In addition to these requirements, the applicant has to prepare an additional impact analysis which must include a visibility impact analysis. These requirements ensure that the project in question is implementing the BACT level of control technology for each pollutant for which the project is major and that projected impacts associated with such increases would have minimal effects on the environment.

### **Best Available Control Technology (BACT) Evaluation**

Knauf's Inwood facility is considered an existing major source. The proposed project will result in a major modification due to the significant net emissions increase for NO<sub>x</sub>, PM, PM<sub>2.5</sub> and PM<sub>10</sub>. As such, an analysis to ensure implementation of the Best Available Control Technology (BACT) is required for each pollutant with a significant net emissions increase. Knauf conducted a technical review to investigate BACT decisions for the SER pollutants that have recently been determined by various permitting authorities across the U.S. to satisfy BACT requirements.

Preliminary Determination for R14-0015M  
Knauf Insulation, Inc  
Inwood Facility  
Non-confidential

## **METHODOLOGY**

In the 1977 Amendments to the federal Clean Air Act (CAA), Congress enacted a program for the PSD regulations defining the requirements that a state must meet if that state chooses to adopt and obtain U.S. EPA approval of a PSD program (42 U.S.C. §§7410(a)(2)(D), 7471). Among the PSD requirements imposed, the state must require any proposed major emitting facility subject to the PSD program to apply BACT for each pollutant subject to regulation under the CAA that the source emits in a significant amount (42 U.S.C. §§7475(a)(4)). Under the CAA, BACT limits are to be determined on a case-by-case basis after taking into account energy, environmental, and economic impacts (42 U.S.C. §§7479(3)). West Virginia has an approved PSD program, pursuant to a U.S. EPA approved State Implementation Plan (SIP).

45 CSR 14 requires that BACT be applied to major modifications for each pollutant with a significant net emissions increase. The definition of “significant” is pollutant specific and is found in West Virginia regulations as summarized under §45-14-2.74.a. The net emissions increase for NO<sub>x</sub>, PM, PM<sub>2.5</sub> and PM<sub>10</sub> exceeds the SERs as noted in previous sections, thereby triggering the requirement for BACT review.

In a memorandum dated December 1, 1987, U.S. EPA stated its preference for a “top-down” analysis for BACT review. The first step in this approach is to determine, for the emission unit in question, the most stringent control available for a similar or identical source or source category. If it can be shown that this level of control is technically, environmentally, or economically infeasible for the unit in question, then the next most stringent level of control is determined and similarly evaluated. This process continues until the BACT level under consideration cannot be eliminated by any substantial or unique technical, environmental, or economic objections. Presented below are the five basic steps of a top-down BACT review as identified by the U.S. EPA.

- **Step 1 – Identify All Control Technologies**

Available control technologies with the practical potential for application to the emission unit and regulated air pollutant in question are identified. Available control options include the application of alternate production processes and control methods, systems, and techniques including fuel cleaning and innovative fuel combustion, when applicable. The application of demonstrated control technologies in other similar source categories to the emission unit in question can also be considered. Technologies may be eliminated in subsequent steps in the analysis based on technical and economic infeasibility or environmental and energy impacts, control technologies with potential application to the emission unit under review are identified.

The following resources are typically consulted when identifying potential technologies:

1. EPA’s Reasonably Available Control Technology (RACT)/Best Available Control Technology (BACT)/Lowest Achievable Emission Reduction (LAER) Clearinghouse (RBLC) database;

Preliminary Determination for R14-0015M  
Knauf Insulation, Inc  
Inwood Facility  
Non-confidential

2. Determinations of BACT by regulatory agencies for other similar sources or air permits and permit files from federal or state agencies;
3. Previous engineering experience with similar control applications;
4. Information provided by air pollution control equipment vendors with significant market share in the industry; and/or
5. Review of literature from industrial, technical, or trade organizations.

- **Step 2 – Eliminate Technically Infeasible Options**

After the available control technologies have been identified, each technology is evaluated with respect to its technical feasibility in controlling the PSD-triggering pollutant emissions from the purposed source. An undemonstrated technology is only technically feasible if it is “available” and “applicable.” A control technology is only considered available if it has reached the licensing and commercial sales phase of development. Control technologies in the R&D and pilot scale phases are not considered available. Based on EPA guidance, an available control technology is presumed applicable if it has been permitted or actually implemented by a similar source. Decisions about technical feasibility of a control option consider the physical or chemical properties of the emissions stream in comparison to emissions streams from similar sources successfully implementing the control alternative.

- **Step 3 – Rank Remaining Control Technologies by Control Effectiveness**

Once technically infeasible options are removed from consideration, the remaining options are ranked based on their control effectiveness. If there is only one remaining option or if all of the remaining technologies could achieve equivalent control efficiencies, ranking based on control efficiency is not required.

- **Step 4 – Evaluate Most Effective Controls and Document Results**

Beginning with the most efficient control option in the ranking, detailed economic, energy, and environmental impact evaluations are performed. If a control option is determined to be economically feasible without adverse energy or environmental impacts, it is not necessary to evaluate the remaining options with lower control efficiencies.

- **Step 5 – Select BACT**

In the final step, the BACT emission limit is determined for each emission unit under review based on evaluations from the previous step.

Although the first four steps of the top-down BACT process involve technical and economic evaluations of potential control options (i.e., defining the appropriate

technology), the selection of BACT in the fifth step involves an evaluation of emission rates achievable with the selected control technology. BACT is an emission limit unless technological or economic limitations of the measurement methodology would make the imposition of an emissions standard infeasible, in which case a work practice or operating standard can be imposed.

## **SELECTED BACT SUMMARY**

Table 11 below lists the selected best available control technology per emission unit and pollutant, the corresponding emission or operating limits, and the method that will be used to determine compliance with the specified limit. The BACT emission limits are per emission unit.

Note that melting furnace startup and shutdown occurrences will occur on an infrequent basis and will not typically have an impact on emissions above normal production emissions. The startup will involve a pre-heat stage where only natural gas combustion is exhausting through a bypass, then through the baghouse fan and out the stack. Once operational temperatures are reached and raw materials (batching) are fed into the melter, the bypass will be isolated and the baghouse will be online. Once the glass-melting furnace is online and batches are fed into the melter, the other processes (i.e. forming & collection sections, curing oven, cooling table) will initiate operations. Controls for these emission units will be online prior to operation of these processes.

Knauf reviewed the current RBLC database. It is worth noting that in the past 10 years, no new entries have been made in the fiberglass insulation category. Additionally, previous entries have been based on an older, phenol-formaldehyde resin based technology. This technology is being replaced at the Inwood facility with newer and lower VOC/HAP emitting technology. Knauf is proposing to install controls that meet or exceed established industry performance standards based on the new technology.

**Table 11-- Knauf's Selected BACT Summary**

<b>Group</b>	<b>Pollutant</b>	<b>Selected Control</b>	<b>BACT Emission/ Operating Limit</b>	<b>Proposed Compliance Method</b>
Raw Material and Handling Operations (Common Stack EP23)	PM <sub>10</sub> /PM <sub>2.5</sub>	Baghouse	0.07 lb/hr (Line 2 portion)	Vendor Guarantee
	PM	Baghouse	0.15 lb/hr (Line 2 portion)	Vendor Guarantee
Facing, Sizing and Packaging (Common Stack EP23)	PM/PM <sub>10</sub> /PM <sub>2.5</sub>	Baghouse	0.64 lb/hr (for baghouse)	Vendor Guarantee
Melt and Refining Line 2 Operations (Common Stack EP23)	NO <sub>x</sub>	Good Combustion Practices	3.00 lb/TGP	Method 7 or 7E
	PM <sub>10</sub> /PM <sub>2.5</sub> + CPM	Baghouse (for filterable)	0.25 lb/TGP	Method 201 or 201A and Method 202
	PM filterable	Baghouse	0.25 lb/TGP	Method 5
Forming and Collecting Line 2 Operations (Common Stack EP23)	NO <sub>x</sub>	Good Combustion Practices	0.21 lb/TGP	Method 7 or 7E
	PM <sub>10</sub> /PM <sub>2.5</sub> + CPM	Design + Wet	3.21 lb/TGP	Method 5E
	PM filterable	Collection Design +	2.57 lb/TGP	Method 5
Curing and Cooling Line 2 Operations	NO <sub>x</sub>	Good Combustion Practices and Low NO <sub>x</sub> Burners	0.59 lb/TGP	Method 7 or 7E
	PM <sub>10</sub> /PM <sub>2.5</sub> + CPM	Wet Scrubber +	1.1 lb/TGP	Method 5E
	PM filterable	Design Wet	0.88 lb/TGP	Method 5
New Emergency Generator	NO <sub>x</sub>	Tier II engine + Limit on Hours of Operation	Tier II standards + 500 hours of operation	Manufacture info and Records of hours of operation
	PM <sub>10</sub> /PM <sub>2.5</sub> + CPM			
	PM filterable			
Cooling Towers	PM <sub>2.5</sub>	Drift Eliminator	0.005 % drift	Manufacturer info
	PM <sub>10</sub>	Drift Eliminator	0.005 % drift	Manufacturer info
	PM	Drift Eliminator	0.005 % drift	Manufacturer info

TGP – ton of glass pulled

## NO<sub>x</sub> BEST AVAILABLE CONTROL TECHNOLOGY

There are three types of chemical kinetic processes that form NO<sub>x</sub> emissions from processes such as fiberglass production. The NO<sub>x</sub> emissions from these chemical mechanisms are referred to as: 1) thermal NO<sub>x</sub>, 2) fuel NO<sub>x</sub>, and 3) prompt NO<sub>x</sub>. For all practical purposes, prompt NO<sub>x</sub> is not important in the fiberglass process, since prompt NO<sub>x</sub> forms mainly in low-temperature, fuel rich conditions. Thermal NO<sub>x</sub> is generated by the oxidation of nitrogen (N<sub>2</sub>) in the air as it passes through the flames. This reaction requires high temperatures, hence the name thermal NO<sub>x</sub>. The formation of nitrogen oxide (NO) from oxygen (O<sub>2</sub>) and N<sub>2</sub> in air at high temperatures is described by the well-known Zeldovich mechanism. Fuel NO<sub>x</sub> is the result of the conversion of nitrogen contained in fuels to NO<sub>x</sub> during fuel combustion. In the fiberglass production operations, due to the high temperatures involved, thermal NO<sub>x</sub> is the predominant mechanism of NO<sub>x</sub> formation from the fiberglass manufacturing process. For this fiberglass facility, the units subject to BACT review are melt and refining Line 2, forming and collecting Line 2, curing and cooling Line 2, and the emergency generator.

### *NO<sub>x</sub> BACT Melt and Refining Handling Operations*

#### **Identification of Potential Control Technologies (Step 1)**

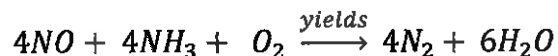
Candidate control options identified from the RBLC search and the literature review include those classified as add-on controls and pollution reduction techniques. NO<sub>x</sub> reduction options include:

- Selective Catalytic Reduction (SCR)
- Selective Non-Catalytic Reduction (SNCR)
- Non-Selective Non-Catalytic Reduction (NSNCR)
- Gas-Oxy Burner
- Indirect Firing Low-NO<sub>x</sub> Burner (LNB)
- Good Combustion Techniques

These control technologies are briefly discussed below.

#### *Selective Catalytic Reduction*

Selective catalytic reduction (SCR) is a post-combustion gas treatment process in which ammonia (NH<sub>3</sub>) is injected into the exhaust gas upstream of a catalyst bed. On the catalyst surface, ammonia and nitric oxide react to form diatomic nitrogen and water vapor. The overall chemical reaction can be expressed as:



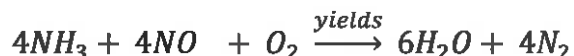
When operated within the optimum temperature range (approximately 480 to 800°F), the reaction can result in removal efficiencies between 70 to 90 percent. SCR units can function effectively under fluctuating temperature conditions although fluctuation in exhaust gas

Preliminary Determination for R14-0015M  
Knauf Insulation, Inc  
Inwood Facility  
Non-confidential

temperature reduces removal efficiency slightly by disturbing the NH<sub>3</sub>/NO<sub>x</sub> molar ratio. SCR can be used to reduce NO<sub>x</sub> emissions from combustion of natural gas and light oils (e.g., distillate). Combustion of heavier oils can produce high levels of particulate, which may foul the catalyst surface, reducing the NO<sub>x</sub> removal efficiency.

#### *Selective Non-Catalytic Reduction*

SNCR uses ammonia (NH<sub>3</sub>) or a urea solution, injected into the gas stream, to chemically reduce NO<sub>x</sub> to form N<sub>2</sub> and water. High temperatures, optimally between 1,600 to 2,400°F for urea injection NH<sub>3</sub>, promote the reaction via the following equation:



#### *Gas-Oxy Burner*

Gas-oxy burners increase furnace efficiency by improving thermal efficiency and heat transfer, while reducing NO<sub>x</sub> emissions through a reduction in nitrogen entering the combustion process. It is estimated that gas-oxy burners reduce the available amount of nitrogen for NO<sub>x</sub> conversion by about 70%.

#### *Low-NO<sub>x</sub> Burner (LNB)*

Low-NO<sub>x</sub> Burner is a multi-channel burner that creates primary and secondary combustion zones. The primary zone is fuel rich and oxygen deficient creating less NO<sub>x</sub>. The secondary zone is oxygen rich and operates at a lower temperature where combustion is completed. The design reduces the concentration of NO<sub>x</sub> by improving mixing of the primary air-fuel stream.

#### *Good Combustion Techniques*

Good combustion techniques include oxygen control, process design, and optimized process control. Examples include homogenization of fuel and raw materials, heating rate, less excess air, flame position, length, and temperature. Computer-based automated controls and gravimetric solid fuel feed systems also optimize combustion parameters, allowing for less fuel use and thermal NO<sub>x</sub> production.

#### *Elimination of Technically Infeasible Control Options (Step 2)*

Some control options have specific operating conditions that are required for the control technique to properly reduce NO<sub>x</sub> emissions. For a given type of process, some of the operating conditions are not present and would either require additional equipment or cannot be achieved. If the operating conditions cannot be achieved, then the control technology is considered technically infeasible and is removed from the BACT analysis. The following is a feasibility discussion on the aforementioned technologies for the melting furnace equipment.

The proposed gas oxygen fueled melting furnace is a direct fired unit whose exhaust is directed to EP23. The temperature of the exhaust at this point is 140°F. These operating conditions limit the viability to implement certain control technologies. SNCR is technically infeasible since the exhaust temperature is significantly lower than the required operating temperature of the control devices (1,600-2,400°F) and as such, has not been demonstrated in the industry. Even if the temperature of the exhaust was raised with a large boiler, the emissions of the boiler unit would surpass the NO<sub>x</sub> emission savings.

SCR has the same technological challenge but with a lower operating temperature (~700°F). As such, SCR could be technically feasible with the addition of a boiler. However, it is important to note that this technology has not been demonstrated in this industry.

LNBs are technically feasible for glass melting furnaces; however, the proposed melter has proposed use of more efficient gas-oxy burners. The glass melting process is energy intense. LNB are designed to limit or quench the flame temperature which would be counterproductive for a glass melting process. Thus, additional heat input would be required to offset the inefficiency.

SNCR has been eliminated as technically infeasible. The remaining technologies (SCR, gas-oxy firing, LNB, and good combustion techniques) are technically feasible for the proposed furnace.

#### *Ranking of Remaining Control Options (Step 3)*

The remaining control technologies are ranked in Table 3-2 in order of highest to lowest control efficiency.

<b>Table 12 - Technically Feasible Control Technologies – Melter</b>		
<b>Pollutant</b>	<b>Control Technologies</b>	<b>Potential Control Efficiency (%)</b>
<b>NO<sub>x</sub></b>	Selective Catalytic Reduction	50 - 90%
	Gas-oxy firing	Case-by-case basis
	Low NO <sub>x</sub> burner	Case-by-case basis
	Good Combustion Techniques	Case by case basis

#### *Evaluation of Most Stringent Controls (Step 4)*

Knauf determined that the top control technology, SCR, is economically infeasible. Application of SCR would first require heating the exhaust gas in stack EP23, which includes the melter and forming/collection emissions, from 140°F to 700°F at a cost of approximately \$59,800 per ton of NO<sub>x</sub> emissions. It is important to note that this amount does not include the actual direct and operating cost of the selective catalytic reduction. After eliminating SCR, the next highest ranked

control technologies that are both technically and economically feasible are gas-oxy firing and good combustion techniques. Use of LNBs is eliminated based on the selection of the higher ranked gas-oxy firing.

#### *Selection of BACT (Step 5)*

Knauf has selected gas-oxy firing and good combustion techniques as the BACT for the gas oxygen fuel melting furnace. These techniques have been widely used in the fiberglass manufacturing industry as BACT. Knauf is proposing an emission limit of 3.0 lb/ton of glass pulled, which is an estimation of NO<sub>x</sub> emissions from stack testing at similar sources. Furthermore, Knauf will demonstrate compliance with this limit by periodic stack testing using EPA Method 7 or 7E.

#### *BACT Conclusion*

The most recent BACT for a glass-melting furnace was made by the State of Georgia's Environmental Protection Division (EPD), which determined that BACT was good combustion practices with a NO<sub>x</sub> limit of 13.5 lb/TGP for Owens Corning's Cordele Facility. A 70 percent reduction of the Owens Corning BACT limit would be 4.05 lb/TGP. The DAQ has determined that Knauf's proposed use of oxygen enrichment for a gas-oxy firing with good combustion techniques constitutes as BACT. NO<sub>x</sub> BACT limit is established at 4.00 lb/TGP for the glass-melting furnace.

#### *NO<sub>x</sub> BACT - Forming and Collecting Operations*

#### *Identification of Potential Control Techniques (Step 1)*

Forming and collecting candidate NO<sub>x</sub> control options identified from the RBLC search and the literature review include those classified as pollution reduction techniques - no add-on NO<sub>x</sub> controls were identified. NO<sub>x</sub> reduction options include:

- > Selective Catalytic Reduction (SCR)
- > Selective Non-Catalytic Reduction (SNCR)
- > Low-NO<sub>x</sub> Burner (LNB)
- > Good Combustion Techniques
- > Natural gas / propane fuel

These control technologies have been explained in the above section.

#### *Elimination of Technically Infeasible Control Options (Step 2)*

As forming and melting share a combined exhaust stack, the technical SNCR infeasibility discussion for the melter also applies to the forming operations. SCR was already demonstrated

as economically infeasible for the combined exhaust. Additionally, LNBs have not been demonstrated as BACT for a forming section as proposed for this project. As such, LNBs are not available to be considered technically feasible. The only available technology to reduce NO<sub>x</sub> will be to have good combustion techniques and use of natural gas as fuel.

#### *Ranking of Remaining Control Options (Step 3)*

Since the proposed BACT includes both of the technically feasible control technologies, there is no need for a ranking table comparing technologies.

#### *Evaluation of Most Stringent Controls (Step 4)*

There is only one feasible control technology. As such, no further analysis has to be completed.

#### *Selection of BACT (Step 5)*

Knauf has selected good combustion techniques and use of natural gas as fuel as BACT for the forming and collecting equipment. These techniques have been widely used in similar industries where no add-on control devices are feasible. Knauf is proposing an emission limit of 0.21 lb of NO<sub>x</sub> per ton of glass pulled, which is an estimation of NO<sub>x</sub> emissions from stack testing at similar sources. Furthermore, Knauf will demonstrate compliance with this limit by EPA Method 7 or 7E.

#### *BACT Conclusion*

The most recent BACT for a fiberglass forming and collection section was made by the State of Georgia's EPD, which determine that BACT was good combustion practices with a NO<sub>x</sub> limit of 1.76 lb/TGP for Owens Corning's Cordele Facility. The DAQ has determined that Knauf's proposed good combustion techniques constitutes BACT. NO<sub>x</sub> BACT limit is established at 0.21 lb/TGP for the glass-melting furnace.

#### *NO<sub>x</sub> BACT Curing and Cooling Operations*

#### *Identification of Potential Control Techniques (Step 1)*

Curing and cooling candidate control options identified from the RBLC search and the literature review include those classified as pollution reduction techniques. NO<sub>x</sub> reduction options include:

- > Selective Catalytic Reduction (SCR)
- > Selective Non-Catalytic Reduction (SNCR)
- > Low-NO<sub>x</sub> Burner (LNB)
- > Good Combustion Techniques

These control technologies have been explained in the above sections for the NO<sub>x</sub> BACT for the Melt and Refining Sections.

#### *Elimination of Technically Infeasible Control Options (Step 2)*

The proposed curing and cooling equipment consists of direct fired units with exhaust gases around 350°F. Similar to the melting furnace, these operating conditions limit the viability to implement certain control technologies. SNCR is technically infeasible since the exhaust temperature for the proposed equipment (350°F) is significantly lower than the required operating temperature of the control devices (1,600-2,400°F) and has not been demonstrated in the industry. Even if the temperature of the exhaust was raised with a large boiler, the emissions of the boiler unit would surpass the NO<sub>x</sub> emission savings.

SCR has the same technological challenge with the operating conditions, but with a lower operating temperature (~700°F). As such, SCR could be technically feasible with the addition of a boiler. However, SCR has not been demonstrated as BACT for a curing oven. SCR is not available to be considered technically feasible.

The remaining technologies (LNB in the curing oven burners, and good combustion techniques) are technically feasible for the proposed curing and cooling equipment.

#### *Ranking of Remaining Control Options (Step 3)*

A ranking of point source control technologies is included in Table 13.

<b>Table 13 - Technically Feasible Control Technologies – Curing and Cooling</b>		
<b>Pollutant</b>	<b>Control Technologies</b>	<b>Potential Control Efficiency (%)</b>
NO <sub>x</sub>	Low NO <sub>x</sub> burner Good Combustion Techniques	Case-by-case basis Case by case basis

#### *Evaluation of Most Stringent Controls (Step 4)*

The only control technologies that are both technically and economically feasible are LNBs in the curing ovens and good combustion techniques.

#### *Selection of BACT (Step 5)*

Knauf has selected good combustion techniques and LNBs as the best available control technology for the curing and cooling equipment. These techniques have been widely used in similar industries where there are no more stringent control devices. Knauf is proposing an emission limit of 0.59 lb/ton of glass pulled, which is an estimation of NO<sub>x</sub> emissions from stack testing at similar sources. Furthermore, Knauf will demonstrate compliance with this limit by EPA's Method 7 or 7E.

## *BACT Conclusion*

The most recent BACT for a curing and cooling section was made by the State of Georgia's EPD, which determined that BACT was good combustion practices with a NO<sub>x</sub> limit of 1.24 lb/TGP for Owens Corning's Cordele Facility. The actual burners for the curing oven that Knauf selected are a LNB design with an integrated flue gas recirculation system. This burner manufacture design allows the furnace atmosphere, which has an oxygen content of 2 to 3%, to be entrained with the combustion air. The design allows combustion to occur in 2 stages, which reduces the peak flame temperature. Thus, the formation of NO<sub>x</sub> is reduced. The DAQ has determined that LNB with integrated flue gas recirculation and good combustion techniques constitutes BACT. The NO<sub>x</sub> BACT limit is established at 0.59 lb/TGP for the glass-melting furnace.

## **PM/PM<sub>10</sub>/PM<sub>2.5</sub> BACT TECHNOLOGY**

This BACT discussion consolidates each individual pollutant (PM, PM<sub>10</sub>, and PM<sub>2.5</sub>) BACT evaluation into a single section as the formation and control technologies for each are similar. Any differences in final BACT determination or specific technical considerations are highlighted. With respect to precursor pollutants, the previous section addresses NO<sub>x</sub> BACT for one precursor pollutant. The other potential precursor pollutant is SO<sub>2</sub>, which is emitted in significantly lower quantities, such that any controls to reduce condensable PM formation related to SO<sub>2</sub> emissions would not be cost effective.

### *PM/PM<sub>10</sub>/PM<sub>2.5</sub> BACT Raw Material Handling Operations & Facing, Sizing, and Packaging*

The proposed project includes changes that affect the handling sources, such as enclosed transfer points, screens, and storage bins that result in PM/PM<sub>10</sub>/PM<sub>2.5</sub> emissions. For the proposed project, particulate emissions are primarily from raw material transfer points. Such a point would be where sand pours from a conveyor belt into a storage silo. Note that raw material handling also includes the three (3) new proposed cullet silos. Additional particulate emissions are generated during facing, sizing and packaging.

### *Identification of Potential Control Techniques (Step 1)*

Candidate control options identified from the RBLC search and the literature review include those classified as pollution reduction techniques. Application of a control technology differs for point sources and fugitive sources. PM reduction options from point sources include:

- Baghouse
- Electrostatic Precipitator
- Wet Scrubbing

These control technologies are briefly discussed in the following sections.

## Baghouse

A baghouse consists of several fabric filters, typically configured in long, vertically suspended sock-like configurations. Dirty gas enters from one side, often from the outside of the bag, passing through the filter media and forming a particulate cake. The cake is removed by shaking or pulsing the fabric, which loosens the cake from the filter, allowing it to fall into a bin at the bottom of the baghouse. The air cleaning process stops once the pressure drop across the filter reaches an economically unacceptable level. Typically, the trade-off to frequent cleaning and maintaining lower pressure drops is the wear and tear on the bags produced in the cleaning process. A baghouse can generally achieve approximately 99-99.9% reduction efficiency for PM emissions.

## Electrostatic Precipitator (ESP)

An ESP removes particles from an air stream by electrically charging the particles then passing them through a force field that causes them to migrate to an oppositely charged collector plate. After the particles are collected, the plates are knocked ("rapped"), and the accumulated particles fall into a collection hopper at the bottom of the ESP. The collection efficiency of an ESP depends on particle diameter, electrical field strength, gas flow rate, and plate dimensions. An ESP can be designed for either dry or wet applications. An ESP can generally achieve approximately 99-99.9% reduction efficiency for PM emissions.

## Wet Scrubbing

Wet scrubbers remove PM by impacting the exhaust gas with the scrubbing solution. This technology generates wastewater and sludge disposal problems along with substantial energy requirements for pumping water and exhausting the cooled air stream out the stack. The control efficiency offered by wet scrubbing is not as high as the baghouse or ESP. A wet scrubber can generally achieve approximately 80-99% reduction efficiency for PM emissions.

### *Elimination of Technically Infeasible Control Options (Step 2)*

All of the above-mentioned options are technically feasible for control of PM from the raw material handling and facing, sizing and packaging operations for a fiberglass facility.

### *Ranking of Remaining Control Options (Step 3)*

The control technologies are ranked in Table 14 in order of highest to lowest control efficiency.

<b>Table 14. Technically Feasible Control Technologies</b>		
<b>Pollutant</b>	<b>Control Technologies</b>	<b>Potential Control Efficiency (%)</b>
PM/PM <sub>10</sub> /PM <sub>2.5</sub>	Baghouse & ESP Wet Scrubbing	> 99% 99%

#### *Evaluation of Most Stringent Controls (Step 4)*

Knauf determined that the top control technology, a baghouse, is economically feasible. Since Knauf has choosing the top-level control, no further economic analysis is necessary. Note that condensable PM is not expected from these operations.

#### *Selection of BACT (Step 5)*

Since baghouses offer the highest control of PM emissions and are widely accepted as BACT for control of PM emissions from point sources, Knauf has determined that the baghouses are BACT for proposed material handling equipment. Knauf is proposing a PM<sub>10</sub>/PM<sub>2.5</sub> limit of 0.07 lb/hr and a PM emission limit of 0.15 lb/hr for raw material handling and PM<sub>10</sub>/PM<sub>2.5</sub> limit of 0.01 lb/hr and a PM emission limit of 0.02 lb/hr for the new day bin vents. These emissions are based on EPA AP-42 emissions factors. Compliance will be demonstrated based on manufacturer guarantees. Note that these emissions are ultimately routed to EP23 (forming stack).

Knauf has also determined that the baghouse is BACT for the proposed sizing and packaging area. Knauf is proposing a PM/PM<sub>10</sub>/PM<sub>2.5</sub> limit of 0.64 lb/hr for the baghouse and 0.15 lb/hr emission limit for PM/PM<sub>10</sub>/PM<sub>2.5</sub> from the facing application. Compliance will be demonstrated based on manufacturer guarantees for the individual pieces of equipment. These emissions are ultimately routed to EP23 (forming stack).

#### *BACT Conclusion*

The DAQ has determined that fabric filters for controlling raw material handling operations & facing, sizing and packaging constitute BACT. A PM/PM<sub>10</sub>/PM<sub>2.5</sub> BACT limit is established at 0.64 lb/hr for the baghouse and 0.15 lb/hr for the facing.

#### *PM PM/PM<sub>10</sub>/PM<sub>2.5</sub> BACT Melt and Refining Operations*

#### *Background and Pollutant Formation*

PM/PM<sub>10</sub>/PM<sub>2.5</sub> emissions are generated from raw materials particles entrained in the furnace flue gas, and from the combustion product due to the natural gas fueled furnace. The furnace is a point source of particulate emissions.

### *Identification of Potential Control Techniques (Step 1)*

Candidate control options identified from the RBLC search and the literature review include those classified as pollution reduction techniques. Application of a control technology differs for point sources and fugitive sources. PM reduction options from point sources include:

- > Baghouse
- > Electrostatic Precipitator (ESP)
- > Wet Scrubbing

The point source PM control technologies are briefly discussed in the above section

### *Elimination of Technically Infeasible Control Options (Step 2)*

All of the above-mentioned options are technically feasible for control of PM from the gas-oxy melter furnace and the refiner.

### *Ranking of Remaining Control Options (Step 3)*

A ranking of point source control technologies is included in Table 14.

### *Evaluation of Most Stringent Controls (Step 4)*

Knauf determined that the top control technology, a baghouse, is economically feasible. Since Knauf has choosing the top-level control, no economic analysis is necessary. A baghouse will be installed at the exhaust stream of the glass-melting furnace to control PM emissions. Although wet scrubbing may also control condensable PM to a small degree, the majority of uncontrolled emissions from the melter are filterable, such that selecting a less efficient filterable control device to reduce condensable PM emissions would result in an overall increase in emissions.

### *Selection of BACT (Step 5)*

Since baghouses offer the highest control of PM emissions and are widely accepted as BACT for control of PM emissions from point sources, Knauf has determined that the baghouses are BACT for the proposed melt and refining operation. Knauf is proposing a PM filterable limit of 1.67 lb/hr and a PM<sub>10</sub>/PM<sub>2.5</sub> (filterable and condensable) emission limit of 1.67 lb/hr. Compliance will be demonstrated based on initial performance testing per Method 5 for filterable PM and Methods 201 or 201A and Method 202 for PM<sub>10</sub>/PM<sub>2.5</sub> (filterable and condensable).

### *BACT Conclusion*

A reviewed of the RBLC database did not identify any natural gas-fired glass-melting furnaces with a lower BACT limit than what Knauf proposed in the application. In 2002, the DAQ determined that PM/PM<sub>10</sub> BACT was fabric filters for electric melting furnaces. NSPS CC limits PM emissions from gas fired glass-melting furnaces to 0.50 lb/TGP. In 2012, EPA revised

Preliminary Determination for R14-0015M  
Knauf Insulation, Inc  
Inwood Facility  
Non-confidential

Subpart NNN to Part 63 to limit PM from glass-melting furnaces to 0.33 lb/TGP. These two rules do not address the condensable portion of PM in the standards.

Knauf's proposed BACT limit is lower than both of the allowable limits established in these regulations. The BACT limit cannot be above any applicable NSPS. Also, the proposed limit includes the condensable portion. The DAQ made the determination for the BACT limit to be set at 0.07 lb/TGP for the two electric arc glass-melting units in Permit R14-0015. The type of furnace proposed in this action is significantly different than the ones that the DAQ review for BACT at 0.07 lb/TGP. The focus of this determination was filterable PM and PM<sub>10</sub>.

The control technology that Knauf has proposed is the same control technology that the DAQ had determined in Permit R14-0015, which is fabric filter controls. Taking the type of furnace and fuel into consideration, the DAQ has established BACT for the gas-oxy glass-melting furnace at 0.25 lb/TGP for PM/PM<sub>10</sub>/PM<sub>2.5</sub>, which includes the condensable portion for PM<sub>10</sub> & PM<sub>2.5</sub>.

#### *PM PM/PM<sub>10</sub>/PM<sub>2.5</sub> BACT Forming and Collecting Operations*

##### *Background and Pollutant Formation*

Particulate matter emissions generated during the manufacture of wool fiberglass insulation include solid particles of glass and binder resin, droplets of binder, and components of the binder that have vaporized.

##### *Identification of Potential Control Techniques (Step 1)*

Candidate control options identified from the RBLC search and the literature review include those classified as pollution reduction techniques. Application of a control technology differs for point sources and fugitive sources. PM reduction options from point sources include:

- > Baghouse
- > Electrostatic Precipitator (ESP)
- > Wet Scrubbing and Design. For this equipment, the project design includes the use of a fiber collection chamber with wet collection (base case)

All the aforementioned sources have been explained in detail in above sections.

##### *Elimination of Technically Infeasible Control Options (Step 2)*

The forming and collecting exhaust stream contains a significant amount of moisture and fiberglass particles that could potentially block the filters for the baghouse, making the control device unsuitable. As such, this type of technology is infeasible for the proposed equipment/process and has not been demonstrated in the industry. The remaining technologies are all feasible to control PM emissions.

Preliminary Determination for R14-0015M  
Knauf Insulation, Inc  
Inwood Facility  
Non-confidential

### *Ranking of Remaining Control Options (Step 3)*

The remaining control technologies are ranked in Table 15 in order of highest to lowest control efficiency. Note that the control efficiencies are for both condensable and filterable PM combined and are based on engineering testing performed by Knauf at other facilities.

<b>Table 15. Technically Feasible Control Technologies – Forming and Collecting</b>		
<b>Pollutant</b>	<b>Control Technologies</b>	<b>Potential Control Efficiency (%)</b>
PM/PM <sub>10</sub> /PM <sub>2.5</sub>	ESP Design + Wet Collection	50% (beyond base) Base

### *Evaluation of Most Stringent Controls (Step 4)*

Knauf determined that the top control technology, an ESP, is economically infeasible since the total capital and operating cost of the equipment would be equivalent to approximately \$16,000 per each ton of PM emissions. A detailed cost analysis is under Attachment N of the application. Since the top technology is not economically feasible, Knauf has chosen the base case (design and wet collection) as BACT.

### *Selection of BACT (Step 5)*

Knauf selected design and wet collection as the best available control technology. Knauf is proposing a PM<sub>10</sub>/PM<sub>2.5</sub> (filterable and condensable) emission limit of 21.40 lb/hr and a PM (filterable) limit of 17.12 lb/hr. Compliance will be demonstrated based on manufacturer guarantees for the individual pieces of equipment and initial performance testing per Method 5 for filterable PM and Method 5E for PM<sub>10</sub>/PM<sub>2.5</sub> (filterable and condensable).

### *BACT Conclusion*

The writer reviewed the RBLC database which identified one determination that specified BACT as venturi scrubber and wet electric static precipitators (WESP), which was for Knauf Insulation's Shasta Lake facility is located in Shasta County, California. In this determination, the BACT limit for the forming section was 3.03 lb of filterable PM/TGP.

Knauf justified that it is not cost effective of adding a WESP in addition to a venturi scrubber. To compare the proposed BACT to the Shasta Lake determination, Knauf proposed a filterable PM BACT limit of 2.57 lb/TGP, which is lower than as determined to be BACT for the Shasta Lake facility using venturi scrubber in-line with a WESP.

The control technology that Knauf has proposed in this application is the same that the DAQ had determined in Permit R14-0015 to be BACT for the forming section, which is a venturi scrubber. The BACT limit for Permit R14-0015 was 3.25 lb of PM/PM<sub>10</sub> per TGP, which is higher than

what Knauf has proposed. Therefore, the DAQ has determined the BACT limit for the forming section is 3.21 lb/TGP.

#### *PM PM/PM<sub>10</sub>/PM<sub>2.5</sub> BACT Curing and Cooling Operations*

Particulate matter emissions generated during the manufacture of wool fiberglass curing and cooling operations include glass particles entrained in the exhaust gas stream.

#### *Identification of Potential Control Techniques (Step 1)*

Candidate control options identified from the RBLC search and the literature review, include those classified as pollution reduction techniques. Application of a control technology differs for point sources and fugitive sources. PM reduction options from point sources include:

- > Baghouse
- > Electrostatic Precipitator (ESP)
- > Wet Scrubbing

The point source PM control technologies are briefly discussed in above sections.

#### *Elimination of Technically Infeasible Control Options (Step 2)*

Based on the same premise as the forming and collecting operations, a baghouse would be technically infeasible as a control device since there are still fiberglass particles and moisture in the exhaust stream that could potentially block the filter and damage the device. Furthermore, this type of technology has not been demonstrated in similar industries/processes with fiberglass. The remaining control technologies are technically feasible.

#### *Ranking of Remaining Control Options (Step 3)*

A ranking of point source control technologies is included in Table 15.

#### *Evaluation of Most Stringent Controls (Step 4)*

Knauf determined that the top control technology, an ESP, is economically infeasible since the total capital and operating cost of the equipment would result in cost effectiveness that exceeds the \$16,000 per each ton of PM emissions outlined in above section for the Forming and Collecting (relatively same capital costs and less pollutant removed). Since the top technology is not economically feasible, Knauf has chosen the base case (wet scrubbing) as BACT.

### *Selection of BACT (Step 5)*

Knauf selected the wet scrubbing and existing design parameters as the best available control technology. Knauf is proposing a PM<sub>10</sub>/PM<sub>2.5</sub> (filterable and condensable) emission limit of 7.33 lb/hr and a PM (filterable) limit of 5.87 lb/hr. Compliance will be demonstrated based on manufacturer guarantees for the individual pieces of equipment and Method 5/5E.

### *BACT Conclusion*

Most of the past determination identified in the search of RBLC did not specifically note if the determination was for the cooling table or cooling section or included other parts of the process (i.e. forming & curing). Only the Owens Corning determination for the Cordele Facility in Crisp County Georgia noted the BACT for the cooling section, which was for a low pressure drop scrubber with a limit of 0.95 lb of PM/TGP.

Knauf's proposed BACT is consistent with the Owens Corning Determination when one notes that Knauf is including the PM from the curing oven.

The BACT determination for R14-0015 set the control technology for the cooling table using a venturi scrubber, which had a limit of 0.58 lb/TGP that was driven by the allowable set in 45 CSR 7. The combined limit for the curing and cooling section for Line 2 was revised to 0.93 lb/TGP. Therefore, the DAQ has determined that BACT for the curing and cooling section be set at 1.10 lb/TGP that includes filterable and condensation fractions.

### *PM PM/PM<sub>10</sub>/PM<sub>2.5</sub> BACT Cooling Tower*

The proposed new cooling towers (towers 3, 4, and 5) are mechanical induced draft cooling towers. Particulate matter is emitted from wet cooling towers because the water circulating in the tower contains small amounts of dissolved solids (e.g., calcium, magnesium, etc.) that crystallize and form airborne particles as the water drift leaves the cooling tower and evaporates.

### *Identification of Potential Control Techniques (Step 1)*

Candidate control options identified from the RBLC search and the literature review include those classified as pollution reduction techniques. PM and PM<sub>10</sub>/PM<sub>2.5</sub> reduction options for cooling towers include:

- > Drift/Mist Eliminator
- > Minimize Total Dissolved Solids by Good Operating Practices

### *Drift Eliminator*

Drift eliminators control the undesired loss of liquid water to the environment via small droplets that become entrained in the exiting air stream. These water droplets, known as drift, carry with them particles that are emitted to the surrounding environment. Drift eliminators are designed to

capture large water droplets caught in the cooling tower air stream. The eliminators prevent the water droplets and mist from escaping the cooling tower. Eliminators do this by causing the droplets to change the direction and lose velocity at impact on the blade walls and fall back into the tower.

#### Minimize Total Dissolved Solids by Good Operating Practices

Minimizing total dissolved solids consists of improving the cooling water system techniques by good engineering practices, such as maintaining clean water in the pipes and reducing contact with the surrounding environment. This is considered the base case for preventing the solid emissions.

#### Elimination of Technically Infeasible Control Options (Step 2)

Drift eliminators and minimizing total dissolved solids in the water are technically feasible and commonly employed for wet cooling towers.

#### Ranking of Remaining Control Options (Step 3)

The control technologies are ranked in Table 16 in order of highest to lowest control efficiency.

Table 16 - Technically Feasible Control Technologies – Cooling Towers		
Pollutant	Control Technologies	Potential Control Efficiency (%)
PM/PM <sub>10</sub> /PM <sub>2.5</sub>	Drift Eliminator Minimized Dissolved Solids	> 99% Case by case

#### *Evaluation of Most Stringent Controls (Step 4)*

Knauf determined that the top control technology, a drift eliminator, is economically feasible. Since Knauf has chosen the top-level control, no further economic analysis is necessary. A drift eliminator will be installed at each cooling tower on site.

#### *Selection of BACT (Step 5)*

Proposed BACT is the installation of drift eliminators for the proposed cooling towers. Drift eliminators reduce drift formation which in turn reduces all size fractions of PM emissions. U.S. EPA has not promulgated an approved test method for measuring PM emissions in cooling tower drift. Knauf proposes compliance with the BACT be installation and operation of the cooling towers and drift eliminators in accordance with the manufacturer's emissions related instructions.

Knauf is proposing to utilize drift eliminators for the proposed mechanical cooling towers to achieve compliance with a BACT limit of 0.005 percent drift rate. This drift rate is within the range of other recent BACT determinations for equipment of this size.

Preliminary Determination for R14-0015M  
Knauf Insulation, Inc  
Inwood Facility  
Non-confidential

### *BACT Conclusion*

Searching for PSD Determinations for cooling towers in the RBLC revealed numerous entries that determined BACT was drift eliminators. Of these entries using drift eliminators, there was none more stringent than 0.0005%, which is what Knauf has proposed. To be exact, there were 35 entries that set the PM BACT as the use of drift eliminators with a drift rate of 0.0005%. Therefore, the DAQ has determined BACT for the cooling towers (CT3, CT4, & CT5) as using drift eliminators with a drift rate of 0.0005%, which equates to a 0.05 lb/hr.

### *NO<sub>x</sub> & PM/PM<sub>10</sub>/PM<sub>2.5</sub> BACT EMERGENCY GENERATOR*

The proposed engine is diesel fired and conforms to all requirements of NSPS Subpart IIII. Due to the limited operation, emissions from the proposed engine, are less than 5 tpy of each criteria pollutant. EPA determined in the development of NSPS Subpart IIII that add-on controls are economically infeasible for emergency-use internal combustion engines (ICE).

“The EPA also evaluated the Best Demonstrated Technology (BDT) for emergency stationary CI ICE. The use of add-on controls such as CDPF, oxidation catalyst, and NO<sub>x</sub> absorber could not be justified as BDT due to the cost of the technology relative to the emission reduction that would be obtained. This is discussed in more detail later in this preamble and in the documents supporting the proposal. The EPA, therefore, determined that the engine technologies developed by engine manufacturers to meet the Tier 2 and Tier 3 nonroad diesel engine standards, and those Tier 4 standards that do not require after treatment, are the BDT for 2007 model year and later emergency stationary CI ICE with a displacement of less than 10 liters per cylinder.”

Based on EPA’s economic analysis, Knauf has determined that add-on controls are not BACT for NO<sub>x</sub>, PM, PM<sub>2.5</sub> or PM<sub>10</sub>. EPA’s cost information is found in the supporting documents for the proposed NSPS. Since the units will be operated during periods of power interruption, diesel fuel is the only technically feasible option due to the interruptible nature of natural gas supply.

To comply with the proposed BACT limits, Knauf will purchase an ICE certified by the manufacturer to meet NSPS Subpart IIII emission levels and will use fuel complying with NSPS Subpart IIII requirements. Operation of the ICE for the purposes of maintenance checks and readiness testing (per recommendations from the government, manufacturer/vendor, or insurance) will be limited to 100 hours per year. Knauf will also monitor diesel fuel usage.

### *BACT Conclusion*

Knauf did not identify any potential add-on controls for NO<sub>x</sub>, PM, PM<sub>10</sub>, or PM<sub>2.5</sub> for the new emergency generator. This justification was based on EPA’s inability to justify a New Source Performance Standard for the emergency engine that would require the use of add-on controls for Subpart IIII. Given this emission unit is proposed to be a limited use (100 hours per years + during emergencies where there is interruption of local electricity service), setting the BACT based on the applicable standard for a new engine under Subpart IIII to Part 60 is reasonable to the DAQ.

Preliminary Determination for R14-0015M  
Knauf Insulation, Inc  
Inwood Facility  
Non-confidential

## AIR QUALITY IMPACT ANALYSIS

The applicant provided a Class II Air Quality Modeling report to demonstrate this proposal will not exceed the Class II Area increment thresholds as listed in 45 CSR §14-4.1. and the National Ambient Air Quality Standards (NAAQS). In addition to this report, Knauf conducted a Class I Significant Impact Analysis to satisfy the requirements of the rule and ensure that the emissions from the project would not cause any adverse impacts in any of the near-by Class I areas, which include: Dolly Sods, James River Face, Otter Creek Wilderness Areas and the Shenandoah National Park.

The Inwood Facility is in Berkeley County, which is designated by U.S. EPA as “unclassifiable” and/or “attainment” for the NAAQS for ozone, PM<sub>10</sub>, PM<sub>2.5</sub>, and NO<sub>2</sub>. To demonstrate compliance with the NAAQS, Knauf conducted an air quality analysis for these pollutants. Note that since there is no NAAQS standard for PM, modeling of this pollutant was not required to be performed.

### *Class I Area SIL Analysis*

In order to ensure that the emissions from the project will not contribute to exceedances of the Class I Increment standards at any of the Class I areas located within 200 km of the facility, Knauf performed a screening analysis for Class I Increments. Knauf initially built an arc of receptors located approximately 50 km from the Project location (i.e., 50 km is the maximum recommended range for use of AERMOD). As the distance of 50 km is closer to the project location than all Class I areas, the model output concentrations should be over-predicted compared to those expected at the actual distances.

The following table is a summary of the results of this screening analysis.

Table 17 - Class I Area Screening Analysis								
Pollutant	Averaging Period	Concentration at 50 km (µg/m <sup>3</sup> )					Max Concentration (µg/m <sup>3</sup> )	SIL (µg/m <sup>3</sup> )
		2011	2012	2013	2014	2015		
NO <sub>2</sub>	Annual	0.0016	0.0014	0.0016	0.0013	0.0016	0.0016	0.1
PM <sub>2.5</sub>	24-Hour	0.041	0.026	0.041	0.030	0.033	0.041	0.27
	Annual	0.0023	0.0021	0.0025	0.0019	0.0025	0.0025	0.05
PM <sub>10</sub>	24-Hour	0.041	0.026	0.041	0.030	0.033	0.041	0.32
	Annual	0.0023	0.0021	0.0025	0.0019	0.0025	0.0025	0.2

This analysis indicates that PM<sub>2.5</sub>, PM<sub>10</sub>, and NO<sub>2</sub> emissions from the project have predicted concentrations far below the corresponding Class I Area SILs at the nearest Class I Area. Moreover, even at a distance of 50 km from the Inwood Facility (nearer than the nearest Class I area which is 58 km distance) the results are below the Class I Area SIL. Hence, the

Preliminary Determination for R14-0015M  
Knauf Insulation, Inc  
Inwood Facility  
Non-confidential

concentrations would be expected to be even lower than those shown in the above table. As such, the project should not cause or contribute to an exceedance of the PSD Class I Increment levels for PM<sub>2.5</sub>, PM<sub>10</sub>, and NO<sub>2</sub>. Therefore, the requirements of 45 CSR 14-9. are satisfied with respect to the four Class I areas.

#### *Class II Area SIL Analysis*

The applicant conducted a Significant Impact Level (SIL) Analysis for Class II AREA Increment and NAAQS. This type of analysis is used as a screening tool to eliminate the need to preform additional in-depth analysis that require the modeling to include emissions from background and increment consuming sources in the local area to satisfy the requirements of 45 CSR 14. The results of this screening analysis indicated that emissions from Knauf's project are above the significant levels for PM<sub>2.5</sub> & NO<sub>2</sub> annual levels, the one-hour level for NO<sub>2</sub> and the 24-hour level for PM<sub>10</sub> and PM<sub>2.5</sub>. Therefore, Knauf conducted further analysis which included emissions from near-by sources and emissions from the existing sources at the Inwood facility to demonstrated that the emissions associated with the project would not cause or contribute to an exceedance of the increment threshold under 45 CSR 14 and a violation of the NAAQS for NO<sub>2</sub>, PM<sub>10</sub>, and PM<sub>2.5</sub>. A summary of these results is presented in the following table.

<b>Table 18 – Summary of the Class II Screening Analysis</b>						
<b>Pollutant</b>	<b>Averaging Period</b>	<b>Class II Area Maximum Modeled Concentration (µg/m<sup>3</sup>)</b>		<b>Location of Max Conc. from Knauf</b>		
		<b>SIL</b>	<b>Max Modeled Conc.</b>	<b>Easting (m)</b>	<b>Northing (m)</b>	<b>Elevation (m)</b>
PM <sub>10</sub>	24-hour	5	7.79	756260.1	4365402.8	178.46
	Annual	1	0.39	756174.4	4365987.1	186.55
NO <sub>2</sub>	1-hour	7.5	35.42	751624.4	4368987.1	296.81
	Annual	1	2.30	756244.8	4365392.4	178.68
PM <sub>2.5</sub>	24-hour	1.2	6.51	756244.8	4365392.4	178.68
	Annual	0.2	0.33	756174.4	4365987.1	186.55

These maximum predicted impacts are fairly close to the facility except for the 1-hour NO<sub>2</sub> impacts, which were 6 km away from the facility. Therefore, Knauf conducted a NAAQS analysis and Increment Analysis to satisfy the requirements of 45 CSR §14-9.1. and 45 CSR §14-4.1.

#### *NAAQS Analysis*

Knauf conducted a NAAQS analysis which included emissions from the Inwood facility (i.e. Line 1) and from 10 other nearby facilities, which stretch as far south as Winchester,

Preliminary Determination for R14-0015M  
Knauf Insulation, Inc  
Inwood Facility  
Non-confidential

Virginia and east to Halltown in Jefferson County, West Virginia. These 10 background facilities consisted of 158 emission points that were entered into the model in addition to the emission points at the Inwood Facility.

Knauf had to address the formation of secondary PM<sub>2.5</sub> that could be created from the NO<sub>x</sub> emissions due to the project. The model used in the NAAQS and Increment Analysis cannot account or predict the secondary formation of PM<sub>2.5</sub> that could be created from NO<sub>x</sub> emissions. Therefore, Knauf used a Hybrid Qualitative/Quantitative Approach to account for the secondary formation of PM<sub>2.5</sub>. This analysis determined that the theoretical maximum concentration due to secondary formation of PM<sub>2.5</sub> from the project would be 0.006 µg/m<sup>3</sup>.

The results of the Knauf NAAQS analysis requires additional justification due to predicted exceedances at six receptors (locations in the local area). Knauf showed that the Inwood facility with the projected increase due the project, does not cause nor contribute to these exceedances.

<b>Table 19 NAAQS Analysis Results</b>					
<b>Pollutant</b>	<b>Averaged Period</b>	<b>Modeled Max. Rank</b>	<b>Background Conc. (µg/m<sup>3</sup>)</b>	<b>NAAQS (µg/m<sup>3</sup>)</b>	<b>Knauf Contribution at the location of Model Max. (µg/m<sup>3</sup>)</b>
PM <sub>2.5</sub>	24-Hour	H8H Avg. over 5 yr	26.0	35	0.08
PM <sub>2.5</sub>	Annual	1 <sup>st</sup> High Avg. over 5 yr	10.3	12	0.05
PM <sub>10</sub>	24-Hour	H6H over 5 yr	23.0	150	0.55
NO <sub>2</sub>	1-Hour	H8H Avg over 5 yr	77.5	188	0.01
NO <sub>2</sub>	Annual	Max over 5 yr	16.7	100	0.03

H8H – High 8<sup>th</sup> High (form of the standard for the pollutant)

H6H - High 6<sup>th</sup> High (form of the standard for the pollutant)

The results NAAQS Analysis predicted exceedances of the 24-hour PM<sub>10</sub> and PM<sub>2.5</sub> standards, annual standard for PM<sub>2.5</sub>, and the 1-hour NO<sub>2</sub> standard. However, Knauf's contributions to these exceedances are below the corresponding "significant impact level", which means that Knauf's Inwood Facility with the proposed project is not causing or contributing to the predicted NAAQS exceedances. The intent of the NAAQS demonstration requirement in 45 CSR §14-9.1.a. is to ensure that the major modification (project) would not cause or contribute to any violation the NAAQS.

To properly ensure that there is no other exceedance at Knauf's predicted maximum impacts, the following table was prepared that provides the total predicted concentration from all the sources with the background concentration added to this total predicted concentration.

<b>Table 20 NAAQS Analysis at Knauf's Predicted Maximum Impacts</b>					
<b>Pollutant</b>	<b>Averaged Period</b>	<b>Modeled Max. Rank</b>	<b>Knauf Modeled Max Conc. (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Total Predicted Conc. + BG. (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>NAAQS (<math>\mu\text{g}/\text{m}^3</math>)</b>
PM <sub>2.5</sub>	24-Hour	H8H Avg. over 5 yr	10.0	33.6	35
PM <sub>2.5</sub>	Annual	1 <sup>st</sup> H Avg. over 5 yr	1.0	11.7	12
PM <sub>10</sub>	24-Hour	H6H over 5 yr	11.5	74.2	150
NO <sub>2</sub>	1-Hour	H8H Avg over 5 yr	72.4	168.1	188
NO <sub>2</sub>	Annual	Max over 5 yr	5.2	22.4	100

BG. – Background concentration

H8H – High 8<sup>th</sup> High (form of the standard for the pollutant)

H6H - High 6<sup>th</sup> High (form of the standard for the pollutant)

45 CSR §14-9.1.b. required Knauf to demonstrate that the project does not represent an impact above the applicable increment threshold established in 45 CSR §14-4.1. over Baseline concentrations.

*“Baseline Concentration” is defined as the ambient concentration level which exists in the baseline area at the time of the applicable minor source baseline date. A baseline concentration is determined for each pollutant for which a minor source baseline date is established and includes:*

*The allowable emissions of major stationary sources which commenced construction before the major source baseline date, but were not in operation by the applicable minor source baseline date.*

Basically, the sources that began emitting emissions or made changes that affect the emissions after the Baseline date of the applicable pollutant are increment consuming sources and must be accounted for in the Increment Analysis. Like the NAAQS Analysis, Knauf's Increment Analysis identified exceedances of applicable Increment Levels. The following table notes the maximum concentration of increment consumed and the Knauf's corresponding portion.

**Table 21 - Increment Analysis Results**

Pollutant	Averaging Period	Modeled Max. Rank (year occurred)	Allowable Increment ( $\mu\text{g}/\text{m}^3$ )	Knauf Contribution at the location of Model Max. ( $\mu\text{g}/\text{m}^3$ )	SIL ( $\mu\text{g}/\text{m}^3$ )
PM <sub>2.5</sub>	24-Hour	H2H Avg. over 5 yr (2011)	9	0.4	1.2
PM <sub>2.5</sub>	Annual	Max Avg. over 5 yr (2013)	4	0.04	0.2
PM <sub>10</sub>	24-Hour	H2H over 5 yr (2013)	30	0.35	5
PM <sub>10</sub>	Annual	Max over 5 yr (2011)	17	0.04	1.0
NO <sub>2</sub>	Annual	Max over 5 yr (2013)	25	0.1	1.0

H2H - High 2<sup>nd</sup> High

SIL – Significant Impact Level

There were predicted exceedances of the allowable increment levels for PM<sub>10</sub> and PM<sub>2.5</sub> standards. Knauf demonstrated that the project and facility's contribution did not cause or contribute to the exceedance. The following table was prepared to illustrate that there are no exceedances at Knauf's maximum impacts.

**Table 22 Knauf's Maximum Consumption of Increment Analysis**

Pollutant	Averaging Period	Knauf Max Rank (year of worst case)	Total Max. Rank (year of worst case))	Knauf's Maximum Concentration ( $\mu\text{g}/\text{m}^3$ )	Total Modeled Conc. ( $\mu\text{g}/\text{m}^3$ )	Allowable Increment ( $\mu\text{g}/\text{m}^3$ )
PM <sub>2.5</sub>	24-Hour	H2H Avg. over 5 yr (2013)	H2H Avg. over 5 yr (2013)	7.0	7.1	9
PM <sub>2.5</sub>	Annual	Max Avg. over 5 yr (2015)	Max Avg. over 5 yr (2015)	0.5	0.6	4
PM <sub>10</sub>	24-Hour	H1H over 5 years (2015)	H2H over 5 yr (2015)	11.3	11.3	30
PM <sub>10</sub>	Annual	Max Annual Avg. (2015)	Max over 5 yr (2015)	1.2	1.9	17
NO <sub>2</sub>	Annual	Max Annual Avg. (2015)	Max over 5 yr (2015)	5.2	5.6	25

H1H – Highest 1<sup>st</sup> HighH2H - Highest 2<sup>nd</sup> High

Preliminary Determination for R14-0015M  
Knauf Insulation, Inc  
Inwood Facility  
Non-confidential

Knauf reviewed the increment modeling results by reviewing the receptors that were modeled in excess of the allowable increment level. For these locations, the Knauf concentration at that receptor and for the specified Knauf rank is provided. Note that since there were no increment exceedances for Annual NO<sub>2</sub> or Annual PM<sub>2.5</sub> Increment those averaging periods were not included.

<b>Table 23 Knauf's Maximum Consumption of Increment Analysis</b>					
<b>Pollutant</b>	<b>Averaging Period</b>	<b>Knauf Max Rank (year of worst case)</b>	<b>Total Max. Rank (year of worst case)</b>	<b>Knauf's Maximum Concentration (µg/m<sup>3</sup>)</b>	<b>Allowable Increment (µg/m<sup>3</sup>)</b>
PM <sub>2.5</sub>	24-Hour	H2H Avg. over 5 yr (2011)	H2H Avg. over 5 yr (2011)	0.4	9
PM <sub>10</sub>	24-Hour	H1H over 5 years (2012)	H2H over 5 yr (2012)	1.6	30
PM <sub>10</sub>	Annual	Max Annual Avg. (2015)	Max Annual over 5 yr (2015)	0.04	17

H1H – Highest 1<sup>st</sup> High

H2H - Highest 2<sup>nd</sup> High

Knauf's NAAQS and Increment Analysis demonstrated that the project should not cause or contribute to an exceedance of the any NAAQS and allowable Increment level.

#### *Class I Area Air Quality Related Values Analysis*

45 CSR 14—13.6 allows applicants to make a demonstration to the Federal Land Manager(s) (FLMs) of the potentially affected Class I that the emissions from the project would have no adverse impact on the air quality related values (AQRVs) of the lands in the Class I Area.

The Clean Air Act states that the FLMs are responsible for determining if an AQRV analysis for a Class I Area is necessary for permit application that is subject to PSD (45 CSR14). To make such a determination, a "Q/d" analysis is typically used and accepted where "Q" is the emissions from the projected net increase from the project of NO<sub>x</sub>, PM<sub>10</sub>, SO<sub>2</sub>, and sulfuric acid mist (H<sub>2</sub>SO<sub>4</sub>) in terms of tons per year. "Q" must be calculated using the maximum emission rate possible in any 24-hour operating period. 'd' is the distance to the nearest Class I Area in terms of kilometers.

Knauf determined that the maximum emission rate on a 24-hour basis annualized from the project as follows:

- NO<sub>x</sub> – 102 tpy
- PM<sub>10</sub> (which includes condensable PM) – 110 tpy
- SO<sub>2</sub> – 24 tpy
- Total “Q” – 237 tpy

Shenandoah National Park is the closest Class I Area to the Inwood Facility, is at 58 km. Thus, the “Q/d” for this project is 4.1.

The corresponding FLMs of the four potentially affected Class I Areas was notified of pertinent details of this project on November 16, 2016. The DAQ was subsequently notified that no further analysis of AQRV for this project is necessary on November 22, 2016, from the U.S. Forest Service, and December 14, 2016 from the National Park Service.

#### *Additional Impacts Analysis*

First, an assessment will be made regarding the amount of residential growth the proposed project will bring to the area. The amount of residential growth will depend on the size of the available work force, the number of new employees, and the availability of housing in the area. Associated commercial and industrial growth consists of new sources providing goods and services to the new employees and to the modified source itself.

Knauf noted that this proposed modification of the Line 2 is not expected to cause an appreciable increase in population. Line 2 will be staffed either with existing employees or additional employees from the current population. In addition, there are no anticipated increases in industrial, commercial, and residential growth as a result of the proposed project.

The U.S. EPA developed the secondary NAAQS in order to protect certain air quality-related values (i.e., soil and vegetation) that may not be sufficiently protected by the primary NAAQS. The secondary NAAQS represent levels below which most types of soil and vegetation are unaffected by criteria pollutants. If ambient concentrations are found to be less than the secondary NAAQS, emissions from a proposed modification will not result in significant harmful effects to either soils or vegetation. Modeled concentrations resulting from the proposed project will be compared with the secondary NAAQS to demonstrate insignificant impacts upon local soils and vegetation.

As required by the DAQ, Knauf used the U.S. EPA VISCREEN model to determine potential impact of the nearest state park (Fort Frederick State Park, Washington County, Maryland) to ensure no adverse impacts would result from the project. The Level 1 screening analysis compared the modeled output to the Class I screening criteria (e.g., 2.0 for color difference index and 0.05 for contrast), which are more conservative than similar criteria for Class II areas. The predicted plume in the model did not exceed the Class I screening criteria

for color difference index and contrast for any of the backgrounds. Thus, no further visible analysis for this project is necessary.

Knauf evaluated the potential impact from the project with respect to ozone concentrations. The design value of near-by monitors (one in Martinsburg, WV and one in Frederick County, MD) for 2013 through 2015, indicates compliance with the 70 parts per billion 8-hour Ozone Standard. The 8-hour Ozone Design Value for Berkley County is 63 parts per billion based on 2014-2016 monitored data from the Martinsburg Site.

## **MONITORING OF OPERATIONS**

Knauf proposed to use the existing monitoring as permitted in R14-0015L with regard to monitoring the process and the corresponding control devices (i.e. continuous pull rate monitors, measuring the product loss on ignition (LOI), pressure drop across the scrubber, bag leak detector system (BLDS), etc.). The writer believes that areas of additional monitoring should focus on ensuring good combustion practices are being employed and the alternative operating mode.

The writer recommends monitoring the ratio of oxygen enrichment to combustion air for the oxygen-gas melting furnace to ensure the NO<sub>x</sub> BACT limit is being maintained. For the glass-forming units and curing oven, Knauf shall develop and implement a means to verify, that the combustion controls are minimizing the flame temperature [at least four times per operating day], which would be used as a means to ensure that the NO<sub>x</sub> BACT is being maintained.

Also, the writer recommends annual tune-ups of the burners associated with the canal of the furnace, forming section, and the curing oven for optimizing the formation of NO<sub>x</sub> (limit the generation of thermal NO<sub>x</sub>) while minimizing CO emissions. Most low NO<sub>x</sub> burners (LNB) can be adjusted to limit one or the other of these two pollutants, but not both. Thus, the tune-up requirements ensure that the permittee checks the burners annually and adjusts them to achieve compliance with both pollutants.

Knauf proposed a limit of 0.81 lb of SO<sub>2</sub> per ton of glass pull for Emission Point EP23. Knauf claims the emission factor is based on emission data from units operating in Europe. The writer recommended performance testing and tracking sulfur containing materials. Knauf agreed to these requirements, if testing results indicate that the SO<sub>2</sub> emissions from Emission Point EP23 is greater than 50% of the limit.

Knauf proposed to follow the monitoring as required for a certified compliant engine under Subpart IIII. This limits the engine to using only Ultra Low Sulfur Diesel and tracking operating hours & perform maintenance in accordance with manufacturer's written procedures.

For the cooling tower, the writer believes the source of PM would be the total dissolved solids in the cooling water, which would be the source of the make-up water. Knauf proposed to use the local public water utility as the source of the make-up water, which would be acceptable.

Preliminary Determination for R14-0015M  
Knauf Insulation, Inc  
Inwood Facility  
Non-confidential

The writer also developed monitoring for the permit if Knauf elects to use another source for the make-up water, which entails measuring the total dissolved solids.

To represent PM<sub>10</sub> and PM<sub>2.5</sub> emissions in the modeling analysis for the two-new bin vents a emission rate of 0.011 pounds of hour was entered for both emission points. A condition was created in the permit was created (Condition 5.1.2.) to limit PM<sub>10</sub> and PM<sub>2.5</sub>. To ensure that permitted emissions are representative of the averaging period of the corresponding NAAQS standards, a daily throughput and 12-month throughput limits were established. Condition 5.2.3. was created to require monitoring of the actual operation of the emission units for each operating day.

## **PREFORMANCE TESTING**

As part of the application, Knauf proposed to conduct performance testing to determine the emissions from the glass-melting furnace, forming section, curing oven/cooling table. The proposed testing was based on the glass-melting furnace being subject to NSPS CC and NESHAP NN. These two rules establish PM and chromium emissions standards. Knauf proposed appropriate testing for purposes of demonstrating compliance with these emission standards.

Knauf's proposed layout of the exhaust has the furnace exhaust and forming exhaust merging downstream of the control to form Emission Point EP23. The production rate of the line is dependent on all of the sections operating at steady state conditions. The writer believes that, for permitting purposes, it is best that one emission limit be established for the corresponding emission point with one compliance method. The furnace exhaust would measure the speciated PM to include the condensable fraction using Methods 201/201A and 202. The residual binder that passes through the venturi scrubber will prohibit the use of these methods. Instead, EPA created Method 5E specifically for measuring PM from wool fiberglass insulation manufacturing sources.

Method 5E measures the filter PM mass and condensed PM, with the reported emission as Total PM. Based on the performance testing of the Line 1 Melter, the Total PM (filterable and condensable fractions) from the furnace will be significantly less than the total PM generated from the Forming Section after controls. The only new element added is the combustion of natural gas in the furnace, which does generate some additional condensable PM. Additional testing is not necessary for this new glass-melting furnace other than measuring the combined emissions at Emission Point 24. However, Knauf requested individual emission limits for the furnace.

The permittee plans to locate sampling ports that would allow for the testing of the glass-melting furnace as an individual emission unit. Using Method 201/201A and 202 would be appropriate for the furnace. These methods were included in Condition 4.3.5. for PM<sub>10</sub> and PM<sub>2.5</sub> testing.

The testing schedule in Permit R14-0015L is once every 5 years for CO and NO<sub>x</sub>; once every 5 years or when the product contains a LOI greater than 1% the previous compliance test that demonstrated compliance for Total PM. A new initial compliance demonstration will be required within 180 days after restarting Line 2 for CO, NO<sub>x</sub>, SO<sub>2</sub>, PM, PM<sub>10</sub>, PM<sub>2.5</sub>, visible emissions (opacity), and VOC emission limits.

Free ammonia in the exhaust stream is known to interfere with the standard method used to measure SO<sub>2</sub> emissions, (Method 6). Ammonia is emitted from the manufacturing process. A assessment of the exhaust stream is necessary to determine an acceptable alternative method. Knauf is required to submit a testing protocol to measure SO<sub>2</sub> for the Director to review and approve.

The additional sources proposed are not subject to any regulatory requirement to conduct a performance test. Knauf proposes to purchase a certified compliant engine. The engine manufacturer conducts engine testing of a similar model engine and has to submit these results to EPA to obtain a certification for that particular model engine. Given the certification process and that the engine will be operating as a “emergency engine” per the definition in NSPS IIII, there is no need to conduct initial or follow-up testing for the engine.

Cooling towers in general are not typically identified as emission units in air permits. The magnitude of potential PM emissions from the cooling tower is significantly less than from the other sources associated with Line 2. The cooling towers account for less than 1% of the Total PM from Line 2. No initial performance testing is proposed for the cooling towers.

### **CHANGES TO PERMIT R14-0015L**

The changes to Permit R14-0015L are fairly limited to updating the equipment table in Section 1.0., Condition 4.1.2. (Specific Emission Limits for the Line 2), and corresponding changes in Section 4.2., 4.3., & 4.4. The cooling towers, and emergency engine were addressed in Section 5.1. and 5.2.

The changes that are clearly unique to the Line 2 are subdivided into the furnace limits for Emission Point EP24, alternative operation mode for the glass-melting furnace, and allowing the thermal oxidizer not to be operated unless needed to meet the VOC limit for EP24.

The process is a continuous line operating at a steady state and steady flow conditions. Thus, measuring emissions from common points (Emission Points EP24 & 25) would be best in obtaining representative data for the whole line rather than measuring separate sources at different times and line speeds.

Knauf proposed to have the limits for the glass-melting furnace subdivided in Table 4.1.2.c. That would allow the ability to test the furnace as a individual source if the need arises.

Knauf requested to by-pass the furnace baghouse during start-ups and to perform bag replacement while the furnace is in hot idle condition (melter is drained of molten glass while the

Preliminary Determination for R14-0015M  
Knauf Insulation, Inc  
Inwood Facility  
Non-confidential

burner(s) are fired to maintain operating temperature of the furnace) to allow for maintenance of the baghouse. PM emissions from natural gas combustion would be 0.15 pounds per hour without controls. These are reasonable requests that do not require creation of an alternative emission limit to accommodate. Condition 4.1.2.e. was established to address by-passing the baghouse. Knauf will be required to develop a means to monitor the by-passing and integrate it with the continuous pull rate monitoring system.


Knauf made a process change in 2015 that included the elimination of the formaldehyde and phenol resins from the binder formulation. The VOCs generated from the curing oven have significantly decreased due to the formulation change. Knauf has provided additional information which was the basis of proposing a VOC reduction of nearly one pound per ton of glass pull, that support the proposed limit of 0.39 lb of VOC per ton of glass pulled at Emission Point EP24. A benefit of not operating the RTO is the reduction of NO<sub>x</sub> emissions (fuel & thermal NO<sub>x</sub>) generated by the RTO.

The writer recommends removing specific language requiring the use of the RTO to comply with the VOC limit for Emission Point EP24.

Other changes to the permit stem from requiring initial performance testing within 180 days after restarting of Line 2 and testing for SO<sub>2</sub>.

#### **RECOMMENDATION TO DIRECTOR**

The information provided in the permit application indicates that Line 2 and the associated emissions units should meet applicable requirements of state rules and federal regulations. It is recommended that Knauf Insulation Inc. be granted a 45CSR14 Major Modification permit for the proposed modification and restart of the Line 2 at the Inwood Facility.

  
Edward S. Andrews, P.E.  
Engineer

August 10, 2017  
Date

Preliminary Determination for R14-0015M  
Knauf Insulation, Inc  
Inwood Facility  
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**APPENDIX A**  
**The Division of Air Quality Review**  
**Of**  
**Knauf Insulation, Inc.**  
**Class II Air Quality Modeling Report**  
**To Support Permit Application R14-0015M**

## MEMO

To: Ed Andrews  
From: Jon McClung *JDM*  
CC: Laura Crowder, Bev McKeone, Joe Kessler, Steve Pursley  
Date: June 28, 2017  
Re: Knauf Insulation, LLC Modeling Review - PSD Application R14-0015M  
Facility ID: 003-00012

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I have completed my review and replication of the air dispersion modeling analysis submitted in support of the PSD permit application (R14-0015M) for the proposed modification of the Knauf Insulation, LLC (Knauf) facility located in Inwood, West Virginia, within Berkeley County. Review and replication of components of the modeling analysis were also performed by Ed Andrews, Joe Kessler, Steve Pursley, and Fadi Qutaish. The protocol for this modeling analysis was submitted by Knauf on October 13, 2016 and approved by West Virginia Division of Air Quality (DAQ) on November 13, 2016. The PSD permit application was received on November 3, 2016 and the modeling report was received on December 19, 2016. Additional modeling information was received from Knauf on February 22 and March 1, 2017. This dispersion modeling analysis is required pursuant to §45-14-9 (Requirements Relating to the Source's Impact on Air Quality).

As part of the review process, an applicant for a PSD permit performs the air quality impact analysis and submits the results to the DAQ. The DAQ then reviews and replicates the modeling runs to confirm the modeling inputs, procedures, and results. This memo contains a synopsis of the modeling analysis. For a complete technical description of the modeling analysis, please consult the protocol and modeling analysis report submitted by the applicant.

Knauf owns and operates an existing fiberglass insulation manufacturing facility and is proposing to modify Line 2. The Line 2 project will include installation of a new gas oxygen-fueled melting furnace, a new canal/channel and forehearth, new fiber forming equipment, and new packaging equipment. The project also involves modification of the existing curing oven and glass raw material handling and storage facilities and installation of a new emergency generator.

This review is for the Class II area surrounding the proposed project site. Class I areas within 300 km of the project site are: Dolly Sods Wilderness (WV), Otter Creek Wilderness (WV), James River Face Wilderness (Virginia), and Shenandoah National Park (Virginia). The Federal Land Managers (FLMs) responsible for evaluating potential effects on Air Quality Related Values (AQRVs) for federally protected Class I areas were consulted. Based on the emissions from the proposed project and the distances to the Class I areas the FLMs did not request an AQRV Class I analysis for this project. Attachment 1 contains the determinations by the Federal Land Managers of no anticipated significant impacts to any AQRVs at Class I areas.

Berkeley County, WV is in attainment or unclassifiable/attainment status for all criteria pollutants. Project emissions of CO, SO<sub>2</sub>, VOC, and GHG are below the significant emission rate (SER), therefore these pollutants are not subject to new source review. Pollutants emitted in excess of the significant emission rate are subject to PSD review in unclassifiable/attainment areas. The criteria pollutants that exceed the SER associated with the proposed project are in Table 1 (highlighted in bold).

**Table 1. Project Emission Rates**

Pollutant	Project Emissions (tons/yr)	PSD Significance Level (tons/yr)
NO <sub>x</sub>	<b>102.2</b>	40
CO	<b>48.2</b>	100
SO <sub>2</sub>	24.4	40
PM <sub>10</sub>	<b>110.2</b>	15
PM <sub>2.5</sub>	<b>109.0</b>	10
VOC	33.7	40
GHG (CO <sub>2</sub> e)	26,459	75,000

Dispersion modeling was conducted for NO<sub>x</sub>, PM<sub>10</sub>, and PM<sub>2.5</sub>. Potential ozone impacts as a result of NO<sub>2</sub> emissions are addressed by the applicant in the modeling protocol and modeling report.

The Line 2 Project at Knauf consists of the emission points described in Table 2.

**Table 2. Line 2 Project Emission Point Descriptions**

Emission Point ID	Description
EP23	Line 2 Gas Oxy Melter; Line 2 Forehearth, Forming, Collection; Line 2 Facing, Sizing, Packaging; Line 2 Raw Material Handling
EP11a	New Line 2 Day Bin
EP11b	New Line 2 Day Bin
EP24	Line 2 Curing Cooling
NEWGEN	Caterpillar C18 Emergency Generator
CT3-5	Cooling Towers 3, 4, 5

Modeled emission rates are included in Tables 3, 4 and 5 and stack parameters are included in Table 6.

**Table 3. Line 2 Project PM<sub>2.5</sub> Modeled Emission Rates**

Emission Point ID	PM <sub>2.5</sub> Modeled Emission Rates			
	Annual		24-hour	
	lb/hr	g/s	lb/hr	g/s
EP23	23.88	3.01	23.88	3.01
EP11a	3.66E-03	4.62E-04	0.011	1.39E-03
EP11b	3.66E-03	4.62E-04	0.011	1.39E-03
EP24	7.33	9.24E-01	7.33	9.24E-01
NEWGEN	0.010	1.28E-03	0.178	2.25E-02
CT3-5	1.77E-04	2.24E-05	1.77E-04	2.24E-05

**Table 4. Line 2 Project PM<sub>10</sub> Modeled Emission Rates**

Emission Point ID	PM <sub>10</sub> Modeled Emission Rates			
	Annual		24-hour	
	lb/hr	g/s	lb/hr	g/s
EP23	20.47	2.58	23.88	3.01
EP11a	3.66E-03	4.62E-04	3.66E-03	4.62E-04
EP11b	3.66E-03	4.62E-04	3.66E-03	4.62E-04
EP24	7.03	8.87E-01	7.33	9.24E-01
NEWGEN	0.010	1.28E-03	0.178	2.25E-02
CT3-5	1.77E-04	2.24E-05	3.88E-02	4.90E-03

**Table 5. Line 2 Project NO<sub>2</sub> Modeled Emission Rates**

Emission Point ID	NO <sub>2</sub> Modeled Emission Rates			
	Annual		1-hour	
	lb/hr	g/s	lb/hr	g/s
EP23	21.42	2.7	21.42	2.7
EP11a	0	0	0	0
EP11b	0	0	0	0
EP24	3.93	4.96E-01	3.93	4.96E-01
NEWGEN	0.70	8.86E-02	0	0
CT3-5	0	0	0	0

**Table 6. Line 2 Project Release Parameters**

Emission Point ID	Stack Height	Stack Inner Diameter	Stack Exit Temperature	Stack Exit Velocity
	(feet)	(feet)	(°F)	(feet/second)
EP23	199	9.5	140	67.7
EP11a	83.5	0.33	70	191.0
EP11b	83.5	0.33	70	191.0
EP24	120	4.75	350	65.6
NEWGEN	14	0.33	994	914.0
CT3	29	6	85	64.8
CT4	26	8	85	49.7
CT5	26	8	85	49.7

Table 7 presents a summary of the air quality standards that were addressed for NO<sub>2</sub>, PM<sub>10</sub>, and PM<sub>2.5</sub>. The pollutants, averaging times, increments, significant impact levels (SILs) and National Ambient Air Quality Standards (NAAQS) are listed. The SIL for 1-hour NO<sub>2</sub> represents the value the Division of Air Quality has implemented as described in the memorandum included in Attachment 2.

**Table 7. Ambient Air Quality Standards, SILs, and PSD Increments (All concentrations in  $\mu\text{g}/\text{m}^3$ )**

Pollutant	Averaging Period	SIL	PSD Increments	NAAQS
$\text{NO}_2$	1-Hour	7.5	-	188
	Annual	1	25	100
$\text{PM}_{10}$	24-Hour	5	30	150
	Annual	1	17	-
$\text{PM}_{2.5}$	24-Hour	1.2	9	35
	Annual	0.2	4	12

An air quality impact analysis, as a part of the PSD review process, is a two tiered process. First, a proposed facility is modeled by itself, on a pollutant-by-pollutant and averaging-time basis, to determine if ambient air concentrations predicted by the model exceed the significant impact level (SIL). If ambient impacts are below the SIL then the proposed source is deemed to not have a significant impact and no further modeling is needed. If ambient impacts exceed the SIL then the modeling analysis proceeds to the second tier of cumulative modeling. The cumulative modeling analysis consists of modeling the proposed facility with existing off-site sources and adding representative background concentrations and comparing the results to PSD increments (increment consuming and expanding sources only, no background concentration) and NAAQS. In order to receive a PSD permit, the proposed source must not cause or contribute to an exceedance of the NAAQS or PSD increments. In cases where the PSD increments or NAAQS are predicted to be exceeded in the cumulative analysis, the proposed source would not be considered to cause or contribute to the exceedance if the project-only impacts are less than the SIL.

On January 22, 2013, the U.S. Court of Appeals for the District of Columbia Circuit vacated two provisions in EPA's PSD regulations containing SILs for  $\text{PM}_{2.5}$ . The court granted the EPA's request to remand and vacate the SIL provisions in Sections 51.166(k)(2) and 52.21(k)(2) of the regulations so that EPA could address corrections. EPA's position remains that the court decision does not preclude the use of SILs for  $\text{PM}_{2.5}$  but special care should be taken in applying the SILs for  $\text{PM}_{2.5}$ . This special care involves ensuring that the difference between the NAAQS and the representative measured background concentration is greater than the SIL. If this difference is greater than the SIL, then it is appropriate to use the SIL as a screening tool to inform the decision as to whether to require a cumulative air quality impact analysis. As shown in Table 8, for both the 24-hr and annual averaging time for  $\text{PM}_{2.5}$ , this difference is greater than the SIL and it is appropriate to use the SIL as a screening tool. Included in Attachment 3 are the WV  $\text{PM}_{2.5}$  Design Values, Final and Certified.

**Table 8. PM<sub>2.5</sub> NAAQS, Monitor Design Values, and Significant Impact Levels (All concentrations in  $\mu\text{g}/\text{m}^3$ )**

PM <sub>2.5</sub> Averaging Period	NAAQS	Martinsburg Monitor Design Value (54-003- 0003)	Difference between NAAQS and Monitored Value	Significant Impact Level (SIL)
		2014-2016		
24-hr	35	27	8	1.2
Annual	12	9.9	2.1	0.2

### **Modeling Basis**

The modeling system used conforms to 40 CFR 51 Appendix W, applicable guidance, and the approved protocol and is summarized below:

- Knauf used the latest version of AERMOD available at the time of the application submittal (version 15181) in default mode. WV DAQ also replicated the modeling analysis with AERMOD 16216r and obtained practically identical results. The AERMOD modeling system (AERMOD, AERMET, AERMAP) is the regulatory default modeling system for near-field (<50km) regulatory dispersion modeling.
- AERMET (version 15181) was used to process five years of surface meteorological data from the Eastern West Virginia Regional Airport (Station ID 13734). Upper air data from Dulles International Airport (Station ID 93734) were used. WV DAQ also replicated the meteorological processing with AERMET 16216 and obtained practically identical results.
- The latest version of AERSURFACE (13016) was used to develop appropriate surface characteristic (albedo, bowen ratio, surface roughness) inputs to AERMET.
- A nested receptor grid was developed and AERMAP (11103) was used to determine terrain heights and hill height scales for use by AERMOD.
- Background NO<sub>2</sub> monitoring data for the cumulative analysis for the 1-hr and annual NO<sub>2</sub> standards are from the monitor in Rockingham County, VA (ID # 51-165-0003).
- Background 24-hour and annual PM<sub>2.5</sub> monitoring data were obtained from the Martinsburg, WV monitor (54-003-0003).
- Background concentrations for the 24-hour PM<sub>10</sub> standard are from the Tucker Elementary School monitor located in Fairfax County, VA (ID# 51-510-0020).
- The U.S. EPA Building Profile Input Program (BPIP), Version 04274 with PRIME, was used to calculate downwash effects for the project emissions sources.
- AERMOD was used to model direct emissions of PM<sub>2.5</sub>. Secondary formation of PM<sub>2.5</sub> resulting from precursor emissions of NO<sub>x</sub> was addressed quantitatively/qualitatively by the applicant in the modeling protocol.

### **Modeling Operating Scenarios**

Line 2 Gas Oxy Melter (EP23), Line 2 Curing Cooling (EP24), and Cooling Towers 3, 4, and 5 (CT3-5) were modeled at full capacity for 8760 hr/yr as described in the permit application for the entire meteorological record. New Line 2 Day Bin (EP11a and EP11b) were modeled at 8 hr/day operating capacity. Based on the operating nature of this equipment, it is not anticipated that the equipment associated with the Line 2 Project will operate at partial loads.

The Gas Oxy Melter startup and shutdown occurrences will occur on an infrequent basis and are considered to be intermittent emissions scenarios and excluded from 1-hr NO<sub>2</sub> modeling. Also, the Caterpillar C18 Emergency Generator (NEWGEN) is considered an intermittent emissions scenario source and is excluded from the 1-hr NO<sub>2</sub> modeling. For the annual standards, the C18 Emergency Generator was modeled at 500 hr/yr operating capacity.

### **SIL Analysis Results (Tier I)**

The results of the Significant Impact Analysis for the Knauf Line 2 project sources are included in Table 9. All pollutant modeled concentrations except for annual PM<sub>10</sub> exceed their respective SIL and a cumulative analysis is required for these pollutants. No further modeling analysis is necessary for annual PM<sub>10</sub>.

**Table 9. SIL Analysis Results**

Pollutant	Averaging Period	Maximum Modeled Concentration (µg/m <sup>3</sup> )	Significant Impact Level (SIL) (µg/m <sup>3</sup> )
NO <sub>2</sub>	Annual	2.30	1
	1-hour	35.42	7.5
PM <sub>10</sub>	Annual	0.39	1
	24-hour	7.79	5
PM <sub>2.5</sub>	Annual	0.33	0.2
	24-hour	6.51	1.2

### **Cumulative Analysis Results (Tier II)**

The cumulative analysis includes the modeled impacts from the Knauf Line 2 Project sources, Knauf non-PSD-project existing sources, off-site existing sources, and representative background concentrations. For off-site existing sources, the impacts represent maximum hourly potential emissions, as determined from applicable permits. The background concentration data is as summarized above with detailed information in the applicant's modeling report.

The cumulative analysis evaluated impacts at all receptors above the SIL in the SIL analysis. The SIL analysis is based on the highest-first-high concentration. The cumulative analysis is based on the form of the 1-hr NO<sub>2</sub> standard, which is the 98th percentile of the yearly distribution of 1-hour daily maximum concentrations, which is equivalent to the 8th highest rank of daily maximum concentrations.

The output options from AERMOD allow the determination of contribution of all sources to modeled concentrations. These options were used to determine Knauf's contribution to the total modeled concentration at all modeled receptors for all hours in the meteorological record.

Table 10 shows the maximum modeled concentrations for all the receptors modeled in the cumulative analysis. Knauf's contribution is less than the SIL, paired in time and space. EPA's and DAQ's longstanding use of the SIL as a permitting tool is that a facility does not cause or contribute to an exceedance of the NAAQS if it's contribution is less than the SIL and may still receive a permit as long as all other criteria are met. For all modeled exceedances of the NAAQS, Knauf's contribution is below the SIL for all modeled pollutants.

**Table 10. NAAQS Analysis Results - Maximum Modeled Concentrations**

Pollutant and Averaging Period		Maximum Modeled Conc.	Background Conc.	Total Conc.	NAAQS	Knauf Contribution	SIL
		(µg/m <sup>3</sup> )					
PM <sub>2.5</sub>	24-hour	102.1	26.0	128.1	35	0.08	1.2
PM <sub>2.5</sub>	Annual	13.50	10.3	23.8	12	0.05	0.2
PM <sub>10</sub>	24-hour	3018.1	23.0	3041.1	150	0.55	5
NO <sub>2</sub>	1-hour	259.8	77.5	337.3	188	0.01	7.5
NO <sub>2</sub>	Annual	7.7	16.7	24.4	100	0.03	1

Table 11 shows the maximum modeled Class II Increment concentrations. Knauf's contribution to the maximum increment exceedance, and all increment exceedances at all modeled receptors, remains below the SIL. An increment analysis was not performed for 1-hr NO<sub>2</sub> since an increment level has not been established.

**Table 11. Class II Increment Analysis Results**

Pollutant and Averaging Period		Maximum Modeled Conc.	Increment	Knauf Contribution	SIL
		(µg/m3)			
PM <sub>2.5</sub>	24-hour	17.2	9	0.4	1.2
PM <sub>2.5</sub>	Annual	1.0	4	0.04	0.2
PM <sub>10</sub>	24-hour	659.0	30	0.35	5
PM <sub>10</sub>	Annual	89.4	17	0.04	1
NO <sub>2</sub>	Annual	6.7	25	0.1	1

**Summary**

The air quality impact analysis prepared and submitted by Knauf to the DAQ has been reviewed and replicated and conforms to 40 CFR 51 Appendix W, applicable guidance, and the modeling protocol. The cumulative modeling analysis demonstrates that Knauf's contribution to the modeled NAAQS exceedances and modeled Class II increment exceedances are less than the SIL and Knauf does not cause or contribute to the modeled exceedances.

# **ATTACHMENT 1**

**Federal Land Manager AQRV Determinations**

## McClung, Jon D

---

**From:** Andrews, Edward S  
**Sent:** Wednesday, June 7, 2017 1:46 PM  
**To:** McClung, Jon D; Qutaish, Fadi  
**Subject:** FW: WV PSD Permit Application Notification

**From:** Kessler, Joseph R  
**Sent:** Tuesday, November 22, 2016 5:13 PM  
**To:** Andrews, Edward S <Edward.S.Andrews@wv.gov>  
**Subject:** FW: WV PSD Permit Application Notification

Forest Service no AQRV needed for Knauf. Waiting on NPS.

Joe

**From:** Sams, Charles E -FS [<mailto:csams@fs.fed.us>]  
**Sent:** Tuesday, November 22, 2016 5:06 PM  
**To:** Kessler, Joseph R <[Joseph.R.Kessler@wv.gov](mailto:Joseph.R.Kessler@wv.gov)>  
**Cc:** Pitrolo, Melanie -FS <[mpitrolo@fs.fed.us](mailto:mpitrolo@fs.fed.us)>  
**Subject:** WV PSD Permit Application Notification

Mr. Kessler,

Thank you for sending the USDA Forest Service information regarding the Knauf Insulation Inc.'s proposed project in Berkeley County, WV (39.40279° N -78.02167°W). Based on the emission rates and distances from the Class I areas listed below (distances modified by our analysis from that provided in your documentation), the United States Department of Agriculture (USDA) anticipates that modeling would not show any significant additional impacts to air quality related values (AQRV) at the Class I area(s) administered by the US Forest Service. Therefore, we are not requesting that a Class I AQRV analysis be included in the PSD permit application. Our screening of this analysis does not indicate agreement with any AQRV analysis protocols or conclusions applicants may make independent of Federal Land Manager review. Please note that we are specifically addressing the need for an AQRV analysis for Class I areas managed by the USDA Forest Service.

Class I Area	Distance to Facility in kilometers	Annual Emissions in tpy <sup>1/</sup>
Dolly Sods Wilderness, WV	117	245.9
Otter Creek Wilderness, WV	141	245.9
James River Face Wilderness, VA	233	245.9

1/ Sulfur dioxide, nitrogen oxides, total fine particulate matter and sulfuric acid mist.

The state and/or EPA may have a different opinion regarding the need for a Class I increment analysis. Should the emissions or the nature of the project change significantly, please contact Chuck Sams ([csams@fs.fed.us](mailto:csams@fs.fed.us) and 404-347-4083) of the USDA Forest Service so that we might re-evaluate the project proposal.

Thank you for keeping us informed and involving the USDA Forest Service in the project review.

Chuck Sams



**Charles Sams, QEP, ARA**  
**R8 & R9 Air Quality Program Manager**  
**Forest Service**  
**Southern Region Biological and Physical Resources**

**p: 404-347-4083**

**c: 404-290-4794**

**[csams@fs.fed.us](mailto:csams@fs.fed.us)**

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**Atlanta, GA 30309**

**[www.fs.fed.us](http://www.fs.fed.us)**



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## McClung, Jon D

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**From:** Andrews, Edward S  
**Sent:** Tuesday, December 20, 2016 10:51 AM  
**To:** McClung, Jon D; Qutaish, Fadi  
**Subject:** FW: WV PSD Permit Application Notification

FYI regarding the Knauf PSD Application.

Ed

**From:** Stacy, Andrea [mailto:[andrea\\_stacy@nps.gov](mailto:andrea_stacy@nps.gov)]  
**Sent:** Wednesday, December 14, 2016 1:19 PM  
**To:** Kessler, Joseph R <[Joseph.R.Kessler@wv.gov](mailto:Joseph.R.Kessler@wv.gov)>; Andrews, Edward S <[Edward.S.Andrews@wv.gov](mailto:Edward.S.Andrews@wv.gov)>  
**Cc:** Don Shepherd <[don\\_shepherd@nps.gov](mailto:don_shepherd@nps.gov)>; John Notar <[john\\_notar@nps.gov](mailto:john_notar@nps.gov)>; Salazer, Holly <[holly\\_salazer@nps.gov](mailto:holly_salazer@nps.gov)>; Jalyn Cummings <[jalyn\\_cummings@nps.gov](mailto:jalyn_cummings@nps.gov)>; Melanie Pitrolo <[mpitrolo@fs.fed.us](mailto:mpitrolo@fs.fed.us)>  
**Subject:** Fwd: WV PSD Permit Application Notification

Joe and Ed,

Thank you for providing the additional information. We've determined that a class I analysis for Shenandoah NP is not necessary for this proposed facility modification (even the total future actual emissions are well below the Q/d). Please notify us if the proposal changes in any substantial way.

Regards,  
Andrea

----- Forwarded message -----

**From:** Notar, John <[john\\_notar@nps.gov](mailto:john_notar@nps.gov)>  
**Date:** Fri, Dec 2, 2016 at 11:18 AM  
**Subject:** Fwd: WV PSD Permit Application Notification  
**To:** Don Shepherd <[Don\\_Shepherd@nps.gov](mailto:Don_Shepherd@nps.gov)>, Andrea Stacy <[andrea\\_stacy@nps.gov](mailto:andrea_stacy@nps.gov)>, "Salazer, Holly" <[holly\\_salazer@nps.gov](mailto:holly_salazer@nps.gov)>, John Notar <[john\\_notar@nps.gov](mailto:john_notar@nps.gov)>  
**Cc:** John Notar <[jtar52@yahoo.com](mailto:jtar52@yahoo.com)>

----- Forwarded message -----

**From:** Andrews, Edward S <[Edward.S.Andrews@wv.gov](mailto:Edward.S.Andrews@wv.gov)>  
**Date:** Fri, Dec 2, 2016 at 8:12 AM  
**Subject:** RE: WV PSD Permit Application Notification  
**To:** "Notar, John" <[john\\_notar@nps.gov](mailto:john_notar@nps.gov)>  
**Cc:** "Kessler, Joseph R" <[Joseph.R.Kessler@wv.gov](mailto:Joseph.R.Kessler@wv.gov)>, "McKeone, Beverly D" <[Beverly.D.Mckeone@wv.gov](mailto:Beverly.D.Mckeone@wv.gov)>

John,

Joe had forwarded your email to me concerning how Knauf calculated the Q/d in their PSD application.

I think I figured out how Knauf has did to calculate a lower Q/d. Knauf used the outcome from the Actual-to-projected actual applicability test for Line 2. Knauf deducted their baseline emissions (BE) and capable of accommodating emissions excluding demand growth emissions from their new PTE (actual emissions test), which is how they came up with 110 tpy for PM10; 102 tpy for NOx; and 24 tpy for SO2.

PM10 using as a example.

Projected Actual Emissions (PAE) for Line 2 of 137.8 tpy

Baseline Emissions (BE) for Line 2 of 15.8 tpy

Emissions that could be accommodated (ECA) of 27.6 tpy minus emissions from Demand Growth Exclusion Emission of 11.8 tpy, which equates to 15.8 tpy of ECA,

$PA - BE - ECA = 137.8 - 15.8 - 11.8 = 110.0$  tpy for PM10.

Knauf used this approach for SO2, and NOx as well in determining the increase in emissions from this project.

Thanks,

Ed

Edward S. Andrews, P.E.

Engineer

West Virginia Department of Environmental Protection

Division of Air Quality

601 57th Street, SE

Charleston, WV 25304

304.926.0499 ext. 1214

**From:** Kessler, Joseph R  
**Sent:** Thursday, December 1, 2016 5:19 PM  
**To:** Notar, John <[john\\_notar@nps.gov](mailto:john_notar@nps.gov)>  
**Cc:** Andrews, Edward S <[Edward.S.Andrews@wv.gov](mailto:Edward.S.Andrews@wv.gov)>  
**Subject:** RE: WV PSD Permit Application Notification

John, here is what I wrote in my notification e-mail:

*The emissions listed on the attached form represent maximum hourly increases and as-limited annual PTE. We are somewhat confused by the particulate matter emission numbers they provided (and are included on the attached form) as the total PM is less than the other species. We believe at this time PM10 number is correct and reflects filterable and condensable. We will be reviewing the calculations as part of the permitting process. But, based on the numbers provided, and calculating the maximum annual increases according to FLAG guidance for NOx, SO2, PM, and H2SO4 (in this case calculating the maximum annual emissions based on operation of 8760 hours/year) gives an aggregate increase (Q) of 331 TPY. Based on the closest Class 1 area (Shenandoah) of 65 km, the Q/D is 5.09. The Q/D provided by Knauf in a draft modeling protocol was 3.60 (we are requesting additional information on how this number was calculated).*

The 331 TPY does reflect my attempt to capture the maximum annual emissions based on the FLAG guidance of scaling up the worst case 24-hour emission rates. However, the underlying hourly number were taken from the permit application and have not yet been verified. That will happen as the permit application is reviewed. Also, according to the Forest Service, the distances they gave in the application may have been off. Ed Andrews (contact information on the FLM document) is the reviewing engineer and may be able to answer specific questions on how the hourly increases were calculated in the permit application. I am out of the office until Monday, and will take a look at it again then.

Thanks,

Joe

**From:** Notar, John [[mailto:john\\_notar@nps.gov](mailto:john_notar@nps.gov)]  
**Sent:** Thursday, December 1, 2016 4:43 PM  
**To:** Kessler, Joseph R <[Joseph.R.Kessler@wv.gov](mailto:Joseph.R.Kessler@wv.gov)>  
**Cc:** John Notar <[john\\_notar@nps.gov](mailto:john_notar@nps.gov)>; Andrea Stacy <[andrea\\_stacy@nps.gov](mailto:andrea_stacy@nps.gov)>; Salazer, Holly <[holly\\_salazer@nps.gov](mailto:holly_salazer@nps.gov)>; Don Shepherd <[Don\\_Shepherd@nps.gov](mailto:Don_Shepherd@nps.gov)>  
**Subject:** Fwd: WV PSD Permit Application Notification

Joe: Hello, I just left you a brief phone message regarding the Knauf Fiberglass permit. In you e-mail below you state that the proposed emissions increase for SO<sub>2</sub>, NO<sub>x</sub>, PM<sub>10</sub>, PM<sub>2.5</sub> and H<sub>2</sub>SO<sub>4</sub> is 331 TPY. Is the 331 TPY total based on the proposed Annual permit emission rate or the proposed maximum 24-hour emission rate. (see page 18 of the FLAG 2010 report). The Q in the (Q/D) calculation is based on the maximum 24-hour permitted emission rate and not the annual rates. I have briefly reviewed the attached proposed permit, and I cannot determine how the calculation was performed. I see the proposed hourly emission rates but I cannot determine if these were used in the calculation. Can you please get back to me regarding this.

You can give me a call at 303-969-2079 or send me an e-mail.

thank you

John Notar

John Notar  
National Park Service  
Air Resources Division  
12795 W. Alameda Pkwy.  
Lakewood, CO 80228  
Phone: 303-969-2079  
Fax: 303-969-2822  
E-Mail: [john\\_notar@nps.gov](mailto:john_notar@nps.gov)

----- Forwarded message -----

From: Kessler, Joseph R <[Joseph.R.Kessler@wv.gov](mailto:Joseph.R.Kessler@wv.gov)>

Date: Wed, Nov 16, 2016 at 3:10 PM

Subject: WV PSD Permit Application Notification

To: "Andrea Stacy ([andrea\\_stacy@nps.gov](mailto:andrea_stacy@nps.gov))" <[andrea\\_stacy@nps.gov](mailto:andrea_stacy@nps.gov)>, "Claire O'Dea ([cbodea@fs.fed.us](mailto:cbodea@fs.fed.us))" <[cbodea@fs.fed.us](mailto:cbodea@fs.fed.us)>, "Jalyn Cummings ([jalyn\\_cummings@nps.gov](mailto:jalyn_cummings@nps.gov))" <[jalyn\\_cummings@nps.gov](mailto:jalyn_cummings@nps.gov)>, "Holly Salazer ([holly\\_salazer@nps.gov](mailto:holly_salazer@nps.gov))" <[holly\\_salazer@nps.gov](mailto:holly_salazer@nps.gov)>, "Jackson, Bill -FS ([bjackson02@fs.fed.us](mailto:bjackson02@fs.fed.us))" <[bjackson02@fs.fed.us](mailto:bjackson02@fs.fed.us)>, "Pitrolo, Melanie -FS ([mpitrolo@fs.fed.us](mailto:mpitrolo@fs.fed.us))" <[mpitrolo@fs.fed.us](mailto:mpitrolo@fs.fed.us)>, "Tedd Hoffman ([elhuffman@fs.fed.us](mailto:elhuffman@fs.fed.us))" <[elhuffman@fs.fed.us](mailto:elhuffman@fs.fed.us)>

Cc: "Andrews, Edward S" <[Edward.S.Andrews@wv.gov](mailto:Edward.S.Andrews@wv.gov)>, "Kessler, Joseph R" <[Joseph.R.Kessler@wv.gov](mailto:Joseph.R.Kessler@wv.gov)>, "McKeone, Beverly D" <[Beverly.D.Mckeone@wv.gov](mailto:Beverly.D.Mckeone@wv.gov)>

Attached is the FLM Notification Form for the following PSD Permit Application submitted on November 3, 2016:

Permit Number: R14-0036  
Applicant: Knauf Insulation, LLC  
Location: Inwood Facility  
Facility ID Number: 003-00012

The permit application is available online at:

[http://www.dep.wv.gov/daq/Documents/November%202016%20Applications/003-00012\\_APPL\\_R14-0015M.pdf](http://www.dep.wv.gov/daq/Documents/November%202016%20Applications/003-00012_APPL_R14-0015M.pdf)

The emissions listed on the attached form represent maximum hourly increases and as-limited annual PTE. We are somewhat confused by the particulate matter emission numbers they provided (and are included on the attached form) as the total PM is less than the other species. We believe at this time PM<sub>10</sub> number is correct and reflects filterable and condensable. We will be reviewing the calculations as part of the permitting process. But, based on the numbers provided, and calculating the maximum annual increases according to FLAG guidance for NO<sub>x</sub>, SO<sub>2</sub>, PM, and H<sub>2</sub>SO<sub>4</sub> (in this case calculating the maximum annual emissions based on operation of 8760 hours/year) gives an aggregate increase (Q) of 331 TPY. Based on the closest Class I area (Shenandoah) of 65 km, the Q/D is 5.09. The Q/D provided by Knauf in a draft modeling protocol was 3.60 (we are requesting additional information on how this number was calculated).

Let me know if you have any questions or comments.

Thank You,

Joe Kessler, PE

Engineer

West Virginia Division of Air Quality

601-57th St., SE

Charleston, WV 25304

Phone: (304) 926-0499 x1219

Fax: (304) 926-0478

[Joseph.r.kessler@wv.gov](mailto:Joseph.r.kessler@wv.gov)

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**Holly Sharpless Salazer**

**Air Resources Coordinator**

**Natural Resources Program**

**Northeast Region**

**National Park Service**

**Phone: (814) 865-3100**

**Fax: (814) 863-7217**

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**ATTACHMENT 2**

**Division of Air Quality Memorandum regarding Interim 1-Hour Significant  
Impact Levels for Nitrogen Dioxide and Sulfur Dioxide**



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west virginia department of environmental protection

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Division of Air Quality  
601 57<sup>th</sup> Street SE  
Charleston, WV 25304

Earl Ray Tomblin, Governor  
Randy C. Huffman, Cabinet Secretary  
dep.wv.gov

**MEMORANDUM**

**To:** Jay Fedezak  
Fred Durham

**Cc:** John Benedict  
Bev McKeone  
Joe Kessler  
Steve Pursley

**From:** Jon McClung *JDM*

**Date:** January 28, 2014

**Subject:** Interim 1-Hour Significant Impact Levels for Nitrogen Dioxide and Sulfur Dioxide

**Summary**

As a follow-up to our discussions regarding the use of interim significant impact levels (SILs) for the 1-hour nitrogen dioxide (NO<sub>2</sub>) and 1-hour sulfur dioxide (SO<sub>2</sub>) National Ambient Air Quality Standards (NAAQS), I have conducted a detailed review of EPA's relevant guidance concerning their recommended SILs. EPA's guidance provides recommended SILs for 1-hr NO<sub>2</sub> and 1-hr SO<sub>2</sub> to serve as a useful screening tool for implementing the PSD requirements for an air quality analysis. EPA has provided recommended interim SILs since they have not yet codified final SILs through rulemaking. I have confirmed via discussions with the EPA Region 3 Modeler, Timothy A. Leon Guerrero, that the recommended SILs are consistent for use with EPA's PSD permitting program, as codified in 40 CFR 51. We have reviewed EPA's recommended interim SILs for 1-hr NO<sub>2</sub> and 1-hr SO<sub>2</sub> and concur with EPA's finding that an applicant for a PSD permit demonstrating an air quality impact at or below the SIL is *de minimis* in nature and would not cause a violation of the NAAQS. The interim SILs should be used in air quality impact assessments for PSD permit applications until EPA issues a final rule establishing SILs for 1-hr NO<sub>2</sub> and 1-hr SO<sub>2</sub>.

**Discussion**

On February 9, 2010, EPA published a final rule, which became effective on April 12, 2010, establishing a new 1-hour NO<sub>2</sub> NAAQS at 100 ppb (188 µg/m<sup>3</sup> at 25 °C and 760 mm Hg), based

on the 3-year average of the 98<sup>th</sup>-percentile of the annual distribution of the daily maximum 1-hour concentrations.

On June 22, 2010, EPA published a final rule, which became effective on August 23, 2010, establishing a new 1-hour SO<sub>2</sub> NAAQS at 75 ppb (196 µg/m<sup>3</sup> at 25 °C and 760 mm Hg), based on the 3-year average of the 99<sup>th</sup>-percentile of the annual distribution of the daily maximum 1-hour concentrations.

EPA guidance establishes that an air quality assessment for a PSD application begins with the applicant estimating the potential air quality impacts from the project source alone. If a source demonstrates an impact above a SIL then a cumulative impact analysis and PSD increment analysis is required. If modeled impacts do not exceed the SIL, the permitting authority may conclude that the project would not cause or contribute to a violation of the NAAQS and EPA would not consider it necessary to conduct a more comprehensive cumulative impact assessment. Establishing an appropriate SIL is an integral part of the PSD air quality analysis process since without it a permitting authority may not conclude that impacts below a SIL are *de minimis* and further analyses that may not be necessary to demonstrate compliance would automatically be required.

#### **Interim 1-Hour NO<sub>2</sub> and 1-Hour SO<sub>2</sub> SILs**

This memo documents the establishment, for the West Virginia PSD program, of an interim 1-hour NO<sub>2</sub> SIL of 4 ppb (7.5 µg/m<sup>3</sup>), which is the same as that recommended by EPA in the June 29, 2010 memorandum from Stephen D. Page, *Guidance Concerning the Implementation of the 1-hour NO<sub>2</sub> NAAQS for the Prevention of Significant Deterioration Program*. This memorandum, which contains the technical analysis to determine the SIL, is appended as Attachment 1.

This memo also documents the establishment, for the West Virginia PSD program, an interim 1-hour SO<sub>2</sub> SIL of 3 ppb (7.8 µg/m<sup>3</sup>), which is the same as that recommended by EPA in the August 23, 2010 memorandum from Stephen D. Page, *Guidance Concerning the Implementation of the 1-hour SO<sub>2</sub> NAAQS for the Prevention of Significant Deterioration Program*. This memorandum, which contains the technical analysis to determine the SIL, is appended as Attachment 2.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
RESEARCH TRIANGLE PARK, NC 27711

JUN 29 2010

OFFICE OF  
AIR QUALITY PLANNING  
AND STANDARDS

**MEMORANDUM**

**SUBJECT:** Guidance Concerning the Implementation of the 1-hour NO<sub>2</sub> NAAQS for the Prevention of Significant Deterioration Program

**FROM:** Stephen D. Page, Director *Stephen D. Page*  
Office of Air Quality Planning and Standards

**TO:** Regional Air Division Directors

On January 22, 2010, the Environmental Protection Agency (EPA) announced a new 1-hour nitrogen dioxide (NO<sub>2</sub>) National Ambient Air Quality Standard (hereinafter, either the 1-hour NO<sub>2</sub> NAAQS or 1-hour NO<sub>2</sub> standard) of 100 parts per billion (ppb), which is attained when the 3-year average of the 98th-percentile of the annual distribution of daily maximum 1-hour concentrations does not exceed 100 ppb at each monitor within an area. EPA revised the primary NO<sub>2</sub> NAAQS to provide the requisite protection of public health. The final rule for the new 1-hour NO<sub>2</sub> NAAQS was published in the Federal Register on February 9, 2010 (75 FR 6474), and the standard became effective on April 12, 2010. EPA policy provides that any federal Prevention of Significant Deterioration (PSD) permit issued under 40 CFR 52.21 on or after that effective date must contain a demonstration of source compliance with the new 1-hour NO<sub>2</sub> standard.

EPA is aware of reports from stakeholders indicating that some sources—both existing and proposed—are modeling potential violations of the 1-hour NO<sub>2</sub> standard. In many cases, the affected units are emergency electric generators and pump stations, where short stacks and limited property rights exist. However, larger sources, including coal-fired and natural gas-fired power plants, refineries, and paper mills, could also model potential violations of the new NO<sub>2</sub> NAAQS.

To respond to these reports and facilitate the PSD permitting of new and modified major stationary sources, we are issuing the attached guidance, in the form of two memoranda, for implementing the new 1-hour NO<sub>2</sub> NAAQS under the PSD permit program. The guidance contained in the attached memoranda addresses two areas. The first memorandum, titled, "General Guidance for Implementing the 1-hour NO<sub>2</sub> National Ambient Air Quality Standard in Prevention of Significant Deterioration Permits, Including an Interim 1-hour NO<sub>2</sub> Significant Impact Level," includes guidance for the preparation and review of PSD permits with respect to the new 1-hour NO<sub>2</sub> standard. This guidance memorandum sets forth a recommended interim 1-hour NO<sub>2</sub> significant impact level (SIL) that states may consider when carrying out the required

PSD air quality analysis for NO<sub>2</sub>, until EPA promulgates a 1-hour NO<sub>2</sub> SIL via rulemaking. The second memorandum, titled "Applicability of Appendix W Modeling Guidance for the 1-hour NO<sub>2</sub> National Ambient Air Quality Standard," includes specific modeling guidance for estimating ambient NO<sub>2</sub> concentrations and determining compliance with the new 1-hour NO<sub>2</sub> standard.

This guidance does not bind state and local governments and the public as a matter of law. Nevertheless, we believe that state and local air agencies and industry will find this guidance useful when carrying out the PSD permit process. We believe it will provide a consistent approach for estimating NO<sub>2</sub> air quality impacts from proposed construction or modification of NO<sub>x</sub> emissions sources. For the most part, the attached guidance reiterates existing policy and guidance, but focuses on how this information is relevant to implementation of the new 1-hour NO<sub>2</sub> NAAQS.

Please review the guidance included in the two attached memoranda. If you have questions regarding the general implementation guidance contained in the first memorandum, please contact Raj Rao ([rao.raj@epa.gov](mailto:rao.raj@epa.gov)). If you have questions regarding the modeling guidance in the second memorandum, please contact Tyler Fox ([fox.tyler@epa.gov](mailto:fox.tyler@epa.gov)). We are continuing our efforts to address permitting issues related to NO<sub>2</sub> and other NAAQS including the recently-signed 1-hour sulfur dioxide NAAQS. We plan to issue additional guidance to address these new 1-hour standards in the near future.

**Attachments:**

1. Memorandum from Anna Marie Wood, Air Quality Policy Division, to EPA Regional Air Division Directors, "General Guidance for Implementing the 1-hour NO<sub>2</sub> National Ambient Air Quality Standard in Prevention of Significant Deterioration Permits, Including an Interim 1-hour NO<sub>2</sub> Significant Impact Level" (June 28, 2010).
2. Memorandum from Tyler Fox, Air Quality Modeling Group, to EPA Regional Air Division Directors, "Applicability of Appendix W Modeling Guidance for the 1-hour NO<sub>2</sub> National Ambient Air Quality Standard" (June 28, 2010).

cc: Anna Marie Wood  
Richard Wayland  
Raj Rao  
Tyler Fox  
Dan deRoeck  
Roger Brode  
Rich Ossias  
Elliott Zenick  
Brian Doster

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**  
**Office of Air Quality Planning and Standards**  
**Research Triangle Park, North Carolina 27711**

**June 28, 2010**

**MEMORANDUM**

**SUBJECT:** General Guidance for Implementing the 1-hour NO<sub>2</sub> National Ambient Air Quality Standard in Prevention of Significant Deterioration Permits, Including an Interim 1-hour NO<sub>2</sub> Significant Impact Level

**FROM:** Anna Marie Wood, Acting Director /s/  
Air Quality Policy Division

**TO:** Regional Air Division Directors

**INTRODUCTION**

We are issuing the following guidance to explain and clarify the procedures that may be followed by applicants for Prevention of Significant Deterioration (PSD) permits and permitting authorities reviewing such applications to properly demonstrate that proposed construction will not cause or contribute to a violation of the new 1-hour nitrogen dioxide (NO<sub>2</sub>) National Ambient Air Quality Standard (hereinafter, either the 1-hour NO<sub>2</sub> NAAQS or 1-hour NO<sub>2</sub> standard) that became effective on April 12, 2010. EPA revised the primary NO<sub>2</sub> NAAQS by promulgating a 1-hour NO<sub>2</sub> NAAQS to provide the requisite protection of public health. Under section 165(a)(3) of the Clean Air Act (the Act) and sections 52.21(k) and 51.166(k) of EPA's PSD regulations, to obtain a permit, a source must demonstrate that its proposed emissions increase will not cause or contribute to a violation of any NAAQS.

This guidance is intended to: (1) explain the recommended procedures for stakeholders to follow to properly address concerns over high preliminary modeled estimates of ambient NO<sub>2</sub> concentrations that suggest potential violations of the new 1-hour NO<sub>2</sub> standard under some modeling and permitting scenarios; (2) help reduce the burden of modeling for the hourly NO<sub>2</sub> standard where it can be properly demonstrated that a source will not have a significant impact on ambient 1-hour NO<sub>2</sub> concentrations; and (3) identify approaches that allow sources and permitting authorities to mitigate, in a manner consistent with existing regulatory requirements, potential modeled violations of the 1-hour NO<sub>2</sub> NAAQS, where appropriate. Accordingly, the techniques described in this memorandum may be used by permit applicants and permitting authorities to configure projects and permit conditions in order to reasonably conclude that a proposed source's emissions do not cause or contribute to modeled 1-hour NO<sub>2</sub> NAAQS violations so that permits can be issued in accordance with the applicable PSD program requirements.

This guidance discusses existing provisions in EPA regulations and previous guidance for applying those provisions but focuses on the relevancy of this information for implementing the

new NAAQS for NO<sub>2</sub>. Importantly, however, this guidance also sets forth a recommended interim 1-hour NO<sub>2</sub> significant impact level (SIL) that EPA will use for implementing the federal PSD program, and that states may choose to rely upon to implement their PSD programs for NO<sub>x</sub> if they agree that these values represent *de minimis* impact levels and incorporate into each permit record a rationale supporting this conclusion. This interim SIL is a useful screening tool that can be used to determine whether or not the emissions from a proposed source will significantly impact hourly NO<sub>2</sub> concentrations, and, if significant impacts are predicted to occur, whether the source's emissions "cause or contribute to" any modeled violations of the new 1-hour NO<sub>2</sub> NAAQS.

## BACKGROUND

On April 12, 2010, the new 1-hour NO<sub>2</sub> NAAQS became effective. EPA interprets its regulations at 40 CFR 52.21 (the federal PSD program) to require permit applicants to demonstrate compliance with "any" NAAQS that is in effect on the date a PSD permit is issued. (See, e.g., EPA memo dated April 1, 2010, titled "Applicability of the Federal Prevention of Significant Deterioration Permit Requirements to New and Revised National Ambient Air Quality Standards.") Due to the introduction of a short-term averaging period for the 1-hour NO<sub>2</sub> NAAQS, we anticipate that some stationary sources with relatively short stacks may experience increased difficulty demonstrating that emissions from new construction or modifications will not cause or contribute to a violation of the 1-hour NO<sub>2</sub> NAAQS.

We are responding to reports from stakeholders which indicate that some sources, existing and proposed, are modeling high hourly NO<sub>2</sub> concentrations showing violations of the 1-hour NO<sub>2</sub> NAAQS—based only on the source's projected emissions of NO<sub>x</sub> under some modeling and permitting scenarios. We find that, in many cases, the modeled violations are resulting from emissions at emergency electric generators and pump stations, where short stacks and limited property rights exist. In other cases, the problem may occur during periods of unit startup, particularly where controls may initially not be in operation. Finally, certain larger sources, including coal-fired and natural gas-fired power plants, refineries, and paper mills could also experience problems in meeting the new 1-hour NO<sub>2</sub> NAAQS using particular modeling assumptions and permit conditions.

We believe that, in some instances, the projected violations result from the use of maximum modeled concentrations that do not adequately take into account the form of the 1-hour standard, and are based on the conservative assumption of 100% NO<sub>x</sub>-to-NO<sub>2</sub> conversion in the ambient air. To the extent that this is the case, it may be possible to provide more accurate projections of ambient NO<sub>2</sub> concentrations by applying current procedures which account for the statistical form of the 1-hour NO<sub>2</sub> standard, as well as more realistic estimates of the rate of conversion of NO<sub>x</sub> emissions to ambient NO<sub>2</sub> concentrations. See EPA Memorandum from Tyler Fox, Air Quality Modeling Group, to EPA Regional Air Division Directors, "Applicability of Appendix W Modeling Guidance for the 1-hour NO<sub>2</sub> National Ambient Air Quality Standard" (June 28, 2010) for specific modeling guidance for estimating ambient NO<sub>2</sub> concentrations consistent with the new 1-hour NO<sub>2</sub> NAAQS. In addition, where short stacks are currently being used, or are under design, it may be possible to lessen the source's air quality impacts without improper dispersion by implementing "good engineering practice" (GEP) stack heights to

increase the height of existing or designed stacks to avoid excessive concentrations due to downwash, as described in the guidance below.

It is EPA's expectation that the guidance in this memorandum and available modeling guidance for NO<sub>2</sub> assist in resolving some of the issues arising from preliminary analyses that are reportedly showing potential exceedances of the new 1-hour NO<sub>2</sub> NAAQS that would not be present under more refined modeling applications. In addition, the techniques described in this memorandum may also help avoid violations of the standard through design of the proposed source or permit conditions, consistent with existing regulatory requirements, which enable the source to demonstrate that its proposed emissions increase will not cause or contribute to a modeled violation of the 1-hour NO<sub>2</sub> standard. Moreover, the interim 1-hour NO<sub>2</sub> SIL that is included in this guidance will provide a reasonable screening tool for efficiently implementing the PSD requirements for an air quality impact analysis.

The following discussion provides guidance concerning demonstrating compliance with the new NAAQS and mitigating modeled violations using air quality-based permit limits more stringent than what the Best Available Control Technology provisions may otherwise require, air quality offsets, the use of GEP stack heights, possible permit conditions for emergency generators, and an interim 1-hour NO<sub>2</sub> SIL.

## **AIR-QUALITY BASED EMISSIONS LIMITATIONS**

Once a level of control required by the Best Available Control Technology provisions is proposed by the PSD applicant, the proposed source's emissions must be modeled at the BACT emissions rate(s) to demonstrate that those emissions will not cause or contribute to a violation of any NAAQS or PSD increment. EPA's 1990 Workshop Manual (page B.54) describes circumstances where a source's emissions based on levels proposed through the top-down process may not be sufficiently controlled to prevent modeled violations of an increment or NAAQS. In such cases, it may be appropriate for PSD applicants to propose a more stringent control option (that is, beyond the level identified via the top-down process) as a result of an adverse impact on the NAAQS or PSD increments.

## **DEMONSTRATING COMPLIANCE WITH THE NEW NAAQS & MITIGATING MODELED VIOLATIONS WITH AIR QUALITY OFFSETS**

A 1988 EPA memorandum provides procedures to follow when a modeled violation is identified during the PSD permitting process. See Memorandum from Gerald A. Emison, EPA OAQPS, to Thomas J. Maslany, EPA Air Management Division, "Air Quality Analysis for Prevention of Significant Deterioration (PSD)." (July 5, 1988). In brief, a reviewing authority may issue a proposed new source or modification a PSD permit only if it can be shown that the proposed project's emissions will not "cause or contribute to" any modeled violations.

To clarify the above statement, in cases where modeled violations of the 1-hour NO<sub>2</sub> NAAQS are predicted, but the permit applicant can show that the NO<sub>x</sub> emissions increase from the proposed source will not have a significant impact *at the point and time of any modeled violation*, the permitting authority has discretion to conclude that the source's emissions will not

contribute to the modeled violation. As provided in the July 5, 1988, guidance memo, in such instances, because of the proposed source's *de minimis* contribution to any modeled violation, the source's impact will not be considered to cause or contribute to such modeled violations, and the permit could be issued. This concept continues to apply, and the significant impact level (described further below) may be used as part of this analysis. A 2006 decision by the EPA Environmental Appeals Board (EAB) provides detailed reasoning that demonstrates the permissibility of finding that a PSD source would not be considered to cause or contribute to a modeled NAAQS violation because its estimated air quality impact was insignificant at the time and place of the modeled violations.<sup>1</sup> See *In re Prairie State Gen. Co.*, 13 E.A.D. \_\_\_, \_\_\_, PSD Appeal No. 05-05, Slip. Op. at 137-144 (EAB 2006).

However, where it is determined that a source's impact does cause or contribute to a modeled violation, a permit cannot be issued without some action taken to mitigate the source's impact. In accordance with 40 CFR 51.165(b)<sup>2</sup>, a major stationary source or major modification (as defined at §51.165(a)(1)(iv) and (v)) that locates in an NO<sub>2</sub> attainment area, but would cause or contribute to a violation of the 1-hour NO<sub>2</sub> NAAQS anywhere may "reduce the impact of its emissions upon air quality by obtaining sufficient emission reductions to, at a minimum, compensate for its adverse ambient [NO<sub>2</sub>] impact where the major source or major modification would otherwise cause or contribute to a violation ...." An applicant can meet this requirement for obtaining additional emissions reductions by either reducing its emissions at the source, e.g., promoting more efficient production methodologies and energy efficiency, or by obtaining air quality offsets (see below). See, e.g., *In re Interpower of New York, Inc.*, 5 E.A.D. 130, 141 (EAB 1994).<sup>3</sup> A State may also provide the necessary emissions reductions by imposing emissions limitations on other sources through an approved State Implementation Plan (SIP) revision. These approaches may also be combined as necessary to demonstrate that a source will not cause or contribute to a violation of the NAAQS.

Unlike emissions offset requirements in nonattainment areas, in addressing the air quality offset concept, it may not be necessary for a permit applicant to fully offset the proposed emissions increase if an emissions reduction of lesser quantity will mitigate the adverse air quality impact on a modeled violation. ("Although full emission offsets are not required, such a source must obtain emission offsets sufficient to compensate for its air quality impact where the violation occurs." 44 FR 3274, January 16, 1979, at 3278.) To clarify this, the 1988 guidance memo referred to above states that:

offsets sufficient to compensate for the source's significant impact must be obtained pursuant to an approved State offset program consistent with State Implementation Plan (SIP) requirements under 40 CFR 51.165(b). Where the source is contributing to an

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<sup>1</sup> While there is no 1-hour NO<sub>2</sub> significant impact level (SIL) currently defined in the PSD regulations, we believe that states may adopt interim values, with the appropriate justification for such values, to use for permitting purposes. In addition, we are recommending an interim SIL as part of this guidance for implementing the NO<sub>2</sub> requirements in the federal PSD program, and in state programs where states choose to use it.

<sup>2</sup> The same provision is contained in EPA's Interpretative Ruling at 40 CFR part 51 Appendix S, section III.

<sup>3</sup> In contrast to Nonattainment New Source Review permits, offsets are not mandatory requirements in PSD permits if it can otherwise be demonstrated that a source will not cause or contribute to a violation of the NAAQS. See, *In re Knauf Fiber Glass, GMBH*, 8 E.A.D. 121, 168 (EAB 1999).

existing violation, the required offset may not correct the violation. Such existing violations must be addressed [through the SIP].

In addition, in order to determine the appropriate emissions reductions, the applicant and permitting authority should take into account modeling procedures for the form of the 1-hour standard and for the appropriate NO<sub>x</sub>-NO<sub>2</sub> conversion rate that applies in the area of concern. As part of this process, existing ambient ozone concentrations and other meteorological conditions in the area of concern may need to be considered. Note that additional guidance for this and other aspects of the modeling analysis for the impacts of NO<sub>x</sub> emissions on ambient concentrations of NO<sub>2</sub> are addressed in EPA modeling guidance, including the June 28, 2010, Memorandum titled, "Applicability of Appendix W Modeling Guidance for the 1-hour NO<sub>2</sub> National Ambient Air Quality Standard."

### **"GOOD ENGINEERING PRACTICE" STACK HEIGHT & DISPERSION TECHNIQUES**

If a permit applicant is unable to show that the source's proposed emissions increase will not cause or contribute to a modeled violation of the new 1-hour NO<sub>2</sub> NAAQS, the problem could be the result of plume downwash effects which may cause high ambient concentrations near the source. In such cases, a source may be able to raise the height of its existing stacks (or designed stacks if not yet constructed) to a GEP stack height of at least 65 meters, measured from the ground-level elevation at the base of the stack.

While not necessarily totally eliminating the effects of downwash in all cases, raising stacks to GEP height may provide substantial air quality benefits in a manner consistent with statutory provisions (section 123 of the Act) governing acceptable stack heights to minimize extensive concentrations due to atmospheric downwash, eddies or wakes. Permit applicants should also be aware of the regulatory restrictions on stack heights for the purpose of modeling for compliance with NAAQS and increments. Section 52.21(h) of the PSD regulations currently prohibits the use of dispersion techniques, such as stack heights above GEP, merged gas streams, or intermittent controls for setting NO<sub>x</sub> emissions limits or to meet the annual and 1-hour NAAQS and annual NO<sub>2</sub> increments. However, stack heights in existence before December 31, 1970, and dispersion techniques implemented before then, are not affected by these limitations. EPA's general stack height regulations are promulgated at 40 CFR 51.100(ff), (gg), (hh), (ii), (jj), (kk) and (nn), and 40 CFR 51.118.

a. *Stack heights*: A source cannot take credit for that portion of a stack height in excess of the GEP height when modeling to develop the NO<sub>x</sub> emissions limitations or to determine source compliance with the annual and 1-hour NO<sub>2</sub> NAAQS. It should be noted, however, that this limitation does not limit the actual height of any stack constructed by a new source or modification.

The following limitations apply in accordance with §52.21(h):

- For a stack height less than GEP, the actual stack height must be used in the source impact analysis for NO<sub>x</sub> emissions;

- For a stack height equal to or greater than 65 meters, the impact on NO<sub>x</sub> emission limits may be modeled using the greater of:
  - A *de minimis* stack height equal to 65 meters, as measured from the ground-level elevation at the base of the stack, without demonstration or calculation (40 CFR 51.100(ii)(1));
  - The refined formula height calculated using the dimensions of nearby structures in accordance with the following equation:

$GEP = H + 1.5L$ , where H is the height of the nearby structure and L is the lesser dimension of the height or projected width of the nearby structure (40 CFR 51.100(ii)(2)(ii)).<sup>4</sup>

- A GEP stack height exceeding the refined formula height may be approved when it can be demonstrated to be necessary to avoid “excessive concentrations” of NO<sub>2</sub> caused by atmospheric downwash, wakes, or eddy effects by the source, nearby structures, or nearby terrain features. (40 CFR 51.100(ii)(3), (jj), (kk));
- For purposes of PSD (and NO<sub>x</sub>/NO<sub>2</sub>), “excessive concentrations” means a maximum ground-level concentration of NO<sub>2</sub> due to NO<sub>x</sub> emissions from a stack due in whole or in part to downwash, wakes, and eddy effects produced by nearby structures or nearby terrain features which individually is at least 40 percent in excess of the maximum NO<sub>2</sub> concentration experienced in the absence of such effects and (a) which contributes to a total NO<sub>2</sub> concentration due to emissions from all sources that is greater than the annual or 1-hour NO<sub>2</sub> NAAQS or (b) greater than the PSD (annual) increment for NO<sub>2</sub>. (40 CFR 51.100(kk)(1)).

Reportedly, for economic and other reasons, many existing source stacks have been constructed at heights less than 65 meters, and source impact analyses may show that the source’s emissions will cause or contribute to a modeled violation of the annual or 1-hour NO<sub>2</sub> NAAQS. Where this is the case, sources should be aware that they can increase their stack heights up to 65 meters without a GEP demonstration.

- b. *Other dispersion techniques*: The term “dispersion technique” includes any practice carried out to increase final plume rise, subject to certain exceptions (40 CFR 51.100(hh)(1)(iii), (2)(i) – (v)). Beyond the noted exceptions, such techniques are not allowed for getting credit for modeling source compliance with the annual and 1-hour NO<sub>2</sub> NAAQS and annual NO<sub>2</sub> increment.

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<sup>4</sup> For stacks in existence on January 12, 1979, the GEP equation is  $GEP = 2.5 H$  (provided the owner or operator produces evidence that this equation was actually relied on in establishing an emission limitation for NO<sub>x</sub> (40 CFR 51.100(ii)(2)(i))

## **OPERATION OF EMERGENCY EQUIPMENT & GENERAL STARTUP CONDITIONS**

In determining an emergency generator's potential to emit, existing guidance (EPA memo titled "Calculating Potential to Emit (PTE) for Emergency Generators," September 6, 1995) allows a default value of 500 hours "for estimating the number of hours that an emergency generator could be expected to operate under worst-case conditions." The guidance also allows for alternative estimates to be made on a case-by-case basis for individual emergency generators. This time period must also consider operating time for both testing/maintenance as well as for emergency utilization. Likewise, existing EPA policy does not allow NO<sub>x</sub> emissions to be excluded from the source impact analysis (NAAQS and increments) when the emergency equipment is operating during an emergency. EPA provides no exemption from compliance with the NAAQS during periods of emergency operation. Thus, it is not sufficient to consider only emissions generated during periods of testing/maintenance in the source impact analysis.

If during an emergency, emergency equipment is never operated simultaneously with other emissions units at the source that the emergency equipment will back up, a worst-case hourly impact analysis may very well occur during periods of normal source operation when other emissions units at the facility are likely to be operating simultaneously with the scheduled testing of emergency equipment. To avoid such worst-case modeling situations, a permit applicant may commit to scheduling the testing of emergency equipment during times when the source is not otherwise operating, or during known off-peak operating periods. This could provide a basis to justify not modeling the 1-hour impacts of the emergency equipment under conditions that would include simultaneous operation with other onsite emissions units. Accordingly, permits for emergency equipment may include enforceable conditions that specifically limit the testing/maintenance of emergency equipment to certain periods of time (seasons, days of the week, hours of the day, etc.) as long as these limitations do not constitute dispersion techniques under 40 CFR 51.1(hh)(1)(ii).

We also note that similar problems associated with the modeling of high 1-hour NO<sub>2</sub> concentrations have been reported to occur during startup periods for certain kinds of emissions units—often because control equipment cannot function during all or a portion of the startup process. EPA currently has no provisions for exempting emissions occurring during equipment startups from the air quality analysis to demonstrate compliance with the NAAQS. Startup emissions may occur during only a relatively small portion of the unit's total annual operating schedule; however, they must be included in the required PSD air quality analysis for the NAAQS. Sources may be willing to accept enforceable permit conditions limiting equipment startups to certain hours of the day when impacts are expected to be lower than normal. Such permit limitations can be accounted for in the modeling of such emissions. Applicants should direct other questions arising concerning procedures for modeling startup emissions to the applicable permitting authority to determine the most current modeling guidance.

## **SCREENING VALUES**

In the final rule establishing the hourly NO<sub>2</sub> standard, EPA discussed various implementation considerations for the PSD permitting program. 75 FR.6474, 6524 (Feb. 9, 2010). This discussion included the following statements regarding particular screening values that have historically been used on a widespread basis to facilitate implementation of the PSD permitting program:

We also believe that there may be a need to revise the screening tools currently used under the NSR/PSD program for completing NO<sub>2</sub> analyses. These screening tools include the significant impact levels (SILs), as mentioned by one commenter, but also include the significant emissions rate for emissions of NO<sub>x</sub> and the significant monitoring concentration (SMC) for NO<sub>2</sub>. EPA intends to evaluate the need for possible changes or additions to each of these important screening tools for NO<sub>x</sub>/NO<sub>2</sub> due to the addition of a 1-hour NO<sub>2</sub> NAAQS. If changes or additions are deemed necessary, EPA will propose any such changes for public notice and comment in a separate action. 75 FR 6525.

EPA intends to conduct an evaluation of these issues and submit our findings in the form of revised significance levels under notice and comment rulemaking if any revisions are deemed appropriate. In the interim, for the reasons provided below, we recommend the continued use of the existing significant emissions rates (SER) for NO<sub>x</sub> emissions as well as an interim 1-hour NO<sub>2</sub> SIL that we are setting forth today for conducting air quality impact analyses for the 1-hour NO<sub>2</sub> NAAQS. As described in the section titled Introduction, EPA intends to implement the interim 1-hour NO<sub>2</sub> SIL contained herein under the federal PSD program and offers states the opportunity to use it in their PSD programs if they choose to do so. EPA is not addressing the significant monitoring concentrations in this memorandum.

## **SIGNIFICANT EMISSIONS RATE**

Under the terms of existing EPA regulations, the applicable significant emissions rate for nitrogen oxides is 40 tons per year. 40 CFR 52.21(b)(23); 40 CFR 51.166(b)(23). The significant emissions rates defined in those regulations are specific to individual pollutants but are not differentiated by the averaging times of the air quality standards applicable to some of the listed pollutants. Although EPA has not previously promulgated a NO<sub>2</sub> standard using an averaging time of less than one year, the NAAQS for SO<sub>2</sub> have included standards with 3-hour and 24-hour averaging times for many years. EPA has applied the 40 tons per year significant emissions rate for SO<sub>2</sub> across all of these averaging times. Until the evaluation described above and any associated rulemaking is completed, EPA does not believe it has cause to apply the NO<sub>2</sub> significant emissions rate any differently than EPA has historically applied the SO<sub>2</sub> significant emissions rate and others that apply to standards with averaging times less than 1 year.

Under existing regulations, an ambient air quality impact analysis is required for "each pollutant that [a source] would have the potential to emit in significant amounts." 40 CFR 52.21(m)(1)(i)(a); 40 CFR. 51.166(m)(1)(i)(a). For modifications, these regulations require this analysis for "each pollutant for which [the modification] would result in a significant net

emissions increase.” 40 CFR.52.21(m)(1)(i)(b); 40 CFR.51.166(m)(1)(i)(b). EPA construes this regulation to mean that an ambient impact analysis is not necessary for pollutants with emissions rates below the significant emissions rates in paragraph (b)(23) of the regulations. No additional action by EPA or permitting authorities is necessary at this time to apply the 40 tpy significant emissions rate in existing regulations to the hourly NO<sub>2</sub> standard.

## **INTERIM 1-HOUR NO<sub>2</sub> SIGNIFICANT IMPACT LEVEL**

A significant impact level (SIL) serves as a useful screening tool for implementing the PSD requirements for an air quality analysis. The primary purpose of the SIL is to serve as a screening tool to identify a level of ambient impact that is sufficiently low relative to the NAAQS or PSD increments such that the impact can be considered trivial or *de minimis*. Hence, the EPA considers a source whose individual impact falls below a SIL to have a *de minimis* impact on air quality concentrations that already exist. Accordingly, a source that demonstrates that the projected ambient impact of its proposed emissions increase does not exceed the SIL for that pollutant at a location where a NAAQS or increment violation occurs is not considered to cause or contribute to that violation. In the same way, a source with a proposed emissions increase of a particular pollutant that will have a significant impact at some locations is not required to model at distances beyond the point where the impact of its proposed emissions is below the SILs for that pollutant. When a proposed source’s impact by itself is not considered to be “significant,” EPA has long maintained that any further effort on the part of the applicant to complete a cumulative source impact analysis involving other source impacts would only yield information of trivial or no value with respect to the required evaluation of the proposed source or modification. The concept of a SIL is grounded on the *de minimis* principles described by the court in *Alabama Power Co. v. Costle*, 636 F.2d 323, 360 (D.C. Cir. 1980); See also *Sur Contra La Contaminacion v. EPA*, 202 F.3d 443, 448-49 (1<sup>st</sup> Cir. 2000) (upholding EPA’s use of SIL to allow permit applicant to avoid full impact analysis); *In re: Prairie State Gen. Co.*, PSD Appeal No. 05-05, Slip. Op. at 139 (EAB 2006)

EPA has codified several SILs into regulations at 40 CFR 51.165(b). EPA plans to undertake rulemaking to develop a 1-hour NO<sub>2</sub> SIL for the new NAAQS for NO<sub>2</sub>. However, EPA has recognized that the absence of an EPA-promulgated SIL does not preclude permitting authorities from developing interim SILs for use in demonstrating that a cumulative air quality analysis would yield trivial gain. Response to Comments, Implementation of New Source Review (NSR) Program for Particulate Matter Less Than 2.5 Micrometers in Diameter (PM<sub>2.5</sub>), pg. 82 (March 2008) [EPA-HQ-OAR-2003-0062-0278].

Until such time as a 1-hour NO<sub>2</sub> SIL is defined in the PSD regulations, we are herein providing a recommended interim SIL that we intend to use as a screening tool for completing the required air quality analyses for the new 1-hour NO<sub>2</sub> under the federal PSD program at 40 CFR 52.21. To support the application of this interim SIL in each instance, a permitting authority that utilizes this SIL as part of an ambient air quality analysis should include in the permit record the analysis reflected in this memorandum and the referenced documents to demonstrate that an air quality impact at or below the SIL is *de minimis* in nature and would not cause a violation of the NAAQS.

Using the interim 1-hour NO<sub>2</sub> SIL, the permit applicant and permitting authority can determine: (1) whether, based on the proposed increase in NO<sub>x</sub> emissions, a cumulative air quality analysis is required; (2) the area of impact within which a cumulative air quality analysis should focus; and (3) whether, as part of a cumulative air quality analysis, the proposed source's NO<sub>x</sub> emissions will cause or contribute to a modeled violation of the 1-hour NO<sub>2</sub> NAAQS.

In this guidance, EPA recommends an interim 1-hour NO<sub>2</sub> SIL value of 4 ppb. To determine initially whether a proposed project's emissions increase will have a significant impact (resulting in the need for a cumulative air quality analysis), this interim SIL should be compared to either of the following:

- The highest of the 5-year averages of the maximum modeled 1-hour NO<sub>2</sub> concentrations predicted each year at each receptor, based on 5 years of National Weather Service data; or
- The highest modeled 1-hour NO<sub>2</sub> concentration predicted across all receptors based on 1 year of site-specific meteorological data, or the highest of the multi-year averages of the maximum modeled 1-hour NO<sub>2</sub> concentrations predicted each year at each receptor, based on 2 or more, up to 5 complete years of available site-specific meteorological data.

Additional guidance will be forthcoming for the purpose of comparing a proposed source's modeled impacts to the interim 1-hour NO<sub>2</sub> SIL in order to make a determination about whether that source's contribution is significant when a cumulative air quality analysis identifies violations of the 1-hour NO<sub>2</sub> NAAQS (i.e., "causes or contributes to" a modeled violation).

We derived this interim 1-hour NO<sub>2</sub> SIL by using an impact equal to 4% of the 1-hour NO<sub>2</sub> NAAQS (which is 100 ppb). We have chosen this approach because we believe it is reasonable to base the interim 1-hour NO<sub>2</sub> SIL directly on consideration of impacts relative to the 1-hour NO<sub>2</sub> NAAQS. In 1980, we defined SER for each pollutant subject to PSD. 45 FR 52676, August 7, 1980 at 52705-52710. For PM and SO<sub>2</sub>, we defined the SER as the emissions rate that resulted in an ambient impact equal to 4% of the applicable short-term NAAQS. The 1980 analysis focused on levels no higher than 5% of the primary standard because of concerns that higher levels were found to result in unreasonably large amounts of increment being consumed by a single source. Within the range of impacts analyzed, we considered two factors that had an important influence on the choice of *de minimis* emissions levels: (1) cumulative effect on increment consumption of multiple sources in an area, each making the maximum *de minimis* emissions increase; and (2) the projected consequence of a given *de minimis* level on administrative burden. As explained in the preamble to the 1980 rulemaking and the supporting documentation,<sup>5</sup> EPA decided to use 4% of the 24-hour primary NAAQS for PM and SO<sub>2</sub> to define the significant emissions rates (SERs) for those pollutants. It was noted that, at the time, only an annual NO<sub>2</sub> NAAQS existed. Thus, for reasons explained in the 1980 preamble, to define the SER for NO<sub>x</sub> emissions we used a design value of 2% of the annual NO<sub>2</sub> NAAQS. See 45 FR 52708. Looking now at a short-term NAAQS for NO<sub>2</sub>, we believe that it is reasonable as an interim approach to use a SIL value that represents 4% of the 1-hour NO<sub>2</sub>

<sup>5</sup> EPA evaluated *de minimis* levels for pollutants for which NAAQS had been established in a document titled "Impact of Proposed and Alternative De Minimis Levels for Criteria Pollutants"; EPA-450/2-80-072, June 1980.

NAAQS. EPA will consider other possible alternatives for developing a 1-hour NO<sub>2</sub> SIL in a future rulemaking that will provide an opportunity for public participation in the development of a SIL as part of the PSD regulations.

Several state programs have already adopted interim 1-hour NO<sub>2</sub> SILs that differ (both higher and lower) from the interim value being recommended herein. The EPA-recommended interim 1-hour NO<sub>2</sub> SIL is not intended to supersede any interim SIL that is now or may be relied upon to implement a state PSD program that is part of an approved SIP, or to impose the use of the SIL concept on any state that chooses to implement the PSD program—in particular the ambient air quality analysis—without using a SIL as a screening tool. Accordingly, states that implement the PSD program under an EPA-approved SIP may choose to use this interim SIL, another value that may be deemed more appropriate for PSD permitting purposes in the state of concern, or no SIL at all. The application of any SIL that is not reflected in a promulgated regulation should be supported by a record in each instance that shows the value represents a *de minimis* impact on the 1-hour NO<sub>2</sub> standard, as described above.

In the event of questions regarding the general implementation guidance contained in this memorandum, please contact Raj Rao ([rao.raj@epa.gov](mailto:rao.raj@epa.gov)).

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**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
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**June 28, 2010**

**MEMORANDUM**

**SUBJECT:** Applicability of Appendix W Modeling Guidance for the 1-hour NO<sub>2</sub> National Ambient Air Quality Standard

**FROM:** Tyler Fox, Leader  
Air Quality Modeling Group, C439-01

**TO:** Regional Air Division Directors

**INTRODUCTION**

On January 22, 2010, EPA announced a new 1-hour nitrogen dioxide (NO<sub>2</sub>) National Ambient Air Quality Standard (1-hour NO<sub>2</sub> NAAQS or 1-hour NO<sub>2</sub> standard) which is attained when the 3-year average of the 98th-percentile of the annual distribution of daily maximum 1-hour concentrations does not exceed 100 ppb at each monitor within an area. The final rule for the new 1-hour NO<sub>2</sub> NAAQS was published in the Federal Register on February 9, 2010 (75 FR 6474-6537), and the standard became effective on April 12, 2010 (EPA, 2010a). This memorandum clarifies the applicability of current guidance in the *Guideline on Air Quality Models* (40 CFR Part 51, Appendix W) for modeling NO<sub>2</sub> impacts in accordance with the Prevention of Significant Deterioration (PSD) permit requirements to demonstrate compliance with the new 1-hour NO<sub>2</sub> standard.

**SUMMARY OF CURRENT GUIDANCE**

While the new 1-hour NAAQS is defined relative to ambient concentrations of NO<sub>2</sub>, the majority of nitrogen oxides (NO<sub>x</sub>) emissions for stationary and mobile sources are in the form of nitric oxide (NO) rather than NO<sub>2</sub>. Appendix W notes that the impact of an individual source on ambient NO<sub>2</sub> depends, in part, "on the chemical environment into which the source's plume is to be emitted" (see Section 5.1.j). Given the role of NO<sub>x</sub> chemistry in determining ambient impact levels of NO<sub>2</sub> based on modeled NO<sub>x</sub> emissions, Section 5.2.4 of Appendix W recommends the following three-tiered screening approach for NO<sub>2</sub> modeling for annual averages:

- Tier 1 - assume full conversion of NO to NO<sub>2</sub> based on application of an appropriate refined modeling technique under Section 4.2.2 of Appendix W to estimate ambient NO<sub>x</sub> concentrations;
- Tier 2 - multiply Tier 1 result by empirically-derived NO<sub>2</sub>/NO<sub>x</sub> ratio, with 0.75 as the annual national default ratio (Chu and Meyer, 1991); and

- Tier 3 - detailed screening methods may be considered on a case-by-case basis, with the Ozone Limiting Method (OLM) identified as a detailed screening technique for point sources (Cole and Summerhays, 1979).

Tier 2 is often referred to as the Ambient Ratio Method, or ARM. Site-specific ambient NO<sub>2</sub>/NO<sub>x</sub> ratios derived from appropriate ambient monitoring data may also be considered as detailed screening methods on a case-by-case basis, with proper justification. Consistent with Section 4.2.2, AERMOD is the current preferred model for “a wide range of regulatory applications in all types of terrain” for purposes of estimating ambient concentrations of NO<sub>2</sub>, based on NO<sub>x</sub> emissions, under Tiers 1 and 2 above. We discuss the role of AERMOD for Tier 3 applications in more detail below.

## APPLICABILITY OF CURRENT GUIDANCE TO 1-HOUR NO<sub>2</sub> NAAQS

In general, the Appendix W recommendations regarding the annual NO<sub>2</sub> standard are also applicable to the new 1-hour NO<sub>2</sub> standard, but additional issues may need to be considered in the context of a 1-hour standard, depending on the characteristics of the emission sources, and depending on which tier is used, as summarized below:

- Tier 1 applies to the 1-hour NO<sub>2</sub> standard without any additional justification;
- Tier 2 may also apply to the 1-hour NO<sub>2</sub> standard in many cases, but some additional consideration will be needed in relation to an appropriate ambient ratio for peak hourly impacts since the current default ambient ratio is considered to be representative of “area wide quasi-equilibrium conditions”; and
- Tier 3 “detailed screening methods” will continue to be considered on a case-by-case basis for the 1-hour NO<sub>2</sub> standard. However, certain input data requirements and assumptions for Tier 3 applications may be of greater importance for the 1-hour standard than for the annual standard given the more localized nature of peak hourly vs. annual impacts. In addition, use of site-specific ambient NO<sub>2</sub>/NO<sub>x</sub> ratios based on ambient monitoring data will generally be more difficult to justify for the 1-hour NO<sub>2</sub> standard than for the annual standard.

While Appendix W specifically mentions OLM as a detailed screening method under Tier 3, we also consider the Plume Volume Molar Ratio Method (PVMRM) (Hanrahan, 1999a) discussed under Section 5.1.j of Appendix W to be in this category at this time. Both of these options account for ambient conversion of NO to NO<sub>2</sub> in the presence of ozone, based on the following basic chemical mechanism, known as titration, although there are important differences between these methods:



As noted in Section 5.1.j, EPA is currently testing the PVMRM option to determine its suitability as a refined method. Limited evaluations of PVMRM have been completed, which show encouraging results, but the amount of data currently available is too limited to justify a designation of PVMRM as a refined method for NO<sub>2</sub> (Hanrahan, 1999b; MACTEC, 2005). EPA is currently updating and extending these evaluations to examine model performance for

predicting hourly NO<sub>2</sub> concentrations, including both the OLM and PVMRM options, and results of these additional evaluations will be provided at a later date. A sensitivity analysis of the OLM and PVMRM options in AERMOD has been conducted that compares modeled concentrations based on OLM and PVMRM with Tiers 1 and 2 for a range of source characteristics (MACTEC, 2004). This analysis serves as a useful reference to understand how ambient NO<sub>2</sub> concentrations may be impacted by application of this three-tiered screening approach, and includes comparisons for both annual average and maximum 1-hour NO<sub>2</sub> concentrations.

Key model inputs for both the OLM and PVMRM options are the in-stack ratios of NO<sub>2</sub>/NO<sub>x</sub> emissions and background ozone concentrations. While the representativeness of these key inputs is important in the context of the annual NO<sub>2</sub> standard, they will generally take on even greater importance for the new 1-hour NO<sub>2</sub> standard, as explained in more detail below. Recognizing the potential importance of the in-stack NO<sub>2</sub>/NO<sub>x</sub> ratio for hourly NO<sub>2</sub> compliance demonstrations, we recommend that in-stack ratios used with either the OLM or PVMRM options be justified based on the specific application, i.e., there is no “default” in-stack NO<sub>2</sub>/NO<sub>x</sub> ratio for either OLM or PVMRM.

The OLM and PVMRM methods are both available as non-regulatory-default options within the EPA-preferred AERMOD dispersion model (Cimorelli, *et al.*, 2004; EPA, 2004; EPA, 2009). As a result of their non-regulatory-default status, pursuant to Sections 3.1.2.c, 3.2.2.a, and A.1.a(2) of Appendix W, application of AERMOD with the OLM or PVMRM option is no longer considered a “preferred model” and, therefore, requires justification and approval by the Regional Office on a case-by-case basis. While EPA is continuing to evaluate the PVMRM and OLM options within AERMOD for use in compliance demonstrations for the 1-hour NO<sub>2</sub> standard, as long as they are considered to be non-regulatory-default options, their use as alternative modeling techniques under Appendix W should be justified in accordance with Section 3.2.2, paragraph (e), as follows:

- “e. Finally, for condition (3) in paragraph (b) of this subsection [preferred model is less appropriate for the specific application, or there is no preferred model], an alternative refined model may be used provided that:
- i. The model has received a scientific peer review;
  - ii. The model can be demonstrated to be applicable to the problem on a theoretical basis;
  - iii. The data bases which are necessary to perform the analysis are available and adequate;
  - iv. Appropriate performance evaluations of the model have shown that the model is not biased toward underestimates; and
  - v. A protocol on methods and procedures to be followed has been established.”

Since AERMOD is the preferred model for dispersion for a wide range of application, the focus of the alternative model demonstration for use of the OLM and PVMRM options within AERMOD is on the treatment of NO<sub>x</sub> chemistry within the model, and does not need to address basic dispersion algorithms within AERMOD. Furthermore, items i and iv of the alternative

model demonstration for these options can be fulfilled in part based on existing documentation (Cole and Summerhays, 1979; Hanrahan, 1999a; Hanrahan, 1999b; MACTEC, 2005), and the remaining items should be routinely addressed as part of the modeling protocol, irrespective of the regulatory status of these options. The issue of applicability to the problem on a theoretical basis (item ii) is a case-by-case determination based on an assessment of the adequacy of the ozone titration mechanism utilized by these options to account for NO<sub>x</sub> chemistry within the AERMOD model based on “the chemical environment into which the source’s plume is to be emitted” (Appendix W, Section 5.1.j). The adequacy of available data bases needed for application of OLM and PVMRM (item iii), including in-stack NO<sub>2</sub>/NO<sub>x</sub> ratios and background ozone concentrations, is a critical aspect of the demonstration which we discuss in more detail below. It should also be noted that application of the OLM or PVMRM methods with other Appendix W models or alternative models, whether as a separate post-processor or integrated within the model, would require additional documentation and demonstration that the methods have been implemented and applied appropriately within that context, including model-specific performance evaluations which satisfy item iv under Section 3.2.2.e.

Given the form of the new 1-hour NO<sub>2</sub> standard, some clarification is needed regarding the appropriate data periods for modeling demonstrations of compliance with the NAAQS vs. demonstrations of attainment of the NAAQS through ambient monitoring. While monitored design values for the 1-hour NO<sub>2</sub> standard are based on a 3-year average (in accordance with Section 1(c)(2) of Appendix S to 40 CFR Part 50), Section 8.3.1.2 of Appendix W addresses the length of the meteorological data record for dispersion modeling, stating that “[T]he use of 5 years of NWS [National Weather Service] meteorological data or at least 1 year of site specific data is required.” Section 8.3.1.2.b further states that “one year or more (including partial years), up to five years, of site specific data . . . are preferred for use in air quality analyses.” Although the monitored design value for the 1-hour NO<sub>2</sub> standard is defined in terms of the 3-year average, this definition does not preempt or alter the Appendix W requirement for use of 5 years of NWS meteorological data or at least 1 year of site specific data. The 5-year average based on use of NWS data, or an average across one or more years of available site specific data, serves as an unbiased estimate of the 3-year average for purposes of modeling demonstrations of compliance with the NAAQS. Modeling of “rolling 3-year averages,” using years 1 through 3, years 2 through 4, and years 3 through 5, is not required. Furthermore, since modeled results for NO<sub>2</sub> are averaged across the number of years modeled for comparison to the new 1-hour NO<sub>2</sub> standard, the meteorological data period should include complete years of data to avoid introducing a seasonal bias to the averaged impacts. In order to comply with Appendix W recommendations in cases where partial years of site specific meteorological data are available, while avoiding any seasonal bias in the averaged impacts, an approach that utilizes the most conservative modeling result based on the first complete-year period of the available data record vs. results based on the last complete-year period of available data may be appropriate, subject to approval by the appropriate reviewing authority. Such an approach would ensure that all available site specific data are accounted for in the modeling analysis without imposing an undue burden on the applicant and avoiding arbitrary choices in the selection of a single complete-year data period.

The form of the new 1-hour NO<sub>2</sub> standard also has implications regarding appropriate methods for combining modeled ambient concentrations with monitored background

concentrations for comparison to the NAAQS in a cumulative modeling analysis. As noted in the March 23, 2010 memorandum regarding “Modeling Procedures for Demonstrating Compliance with PM<sub>2.5</sub> NAAQS” (EPA, 2010b), combining the 98<sup>th</sup> percentile monitored value with the 98<sup>th</sup> percentile modeled concentrations for a cumulative impact assessment could result in a value that is below the 98<sup>th</sup> percentile of the combined cumulative distribution and would, therefore, not be protective of the NAAQS. However, unlike the recommendations presented for PM<sub>2.5</sub>, the modeled contribution to the cumulative ambient impact assessment for the 1-hour NO<sub>2</sub> standard should follow the form of the standard based on the 98<sup>th</sup> percentile of the annual distribution of daily maximum 1-hour concentrations averaged across the number of years modeled. A “first tier” assumption that may be applied without further justification is to add the overall highest hourly background NO<sub>2</sub> concentration from a representative monitor to the modeled design value, based on the form of the standard, for comparison to the NAAQS. Additional refinements to this “first tier” approach based on some level of temporal pairing of modeled and monitored values may be considered on a case-by-case basis, with adequate justification and documentation.

## **DISCUSSION OF TECHNICAL ISSUES**

While many of the same technical issues related to application of Appendix W guidance for an annual NO<sub>2</sub> standard would also apply in the context of the new 1-hour NO<sub>2</sub> standard, there are some important differences that may also need to be considered depending on the specific application. This section discusses several aspects of these technical issues related to the new 1-hour NO<sub>2</sub> NAAQS, including a discussion of source emission inventories required for modeling demonstrations of compliance with the NAAQS and other issues specific to each of the three tiers identified in Section 5.2.4 of Appendix W for NO<sub>2</sub> modeling.

### **Emission Inventories**

The source emissions data are a key input for all modeling analyses and one that may require additional considerations under the new 1-hour NO<sub>2</sub> standard is the source emissions data. Section 8.1 of Appendix W provides guidance regarding source emission input data for dispersion modeling and Table 8-2 summarizes the recommendations for emission input data that should be followed for NAAQS compliance demonstrations. Although existing NO<sub>x</sub> emission inventories used to support modeling for compliance with the annual NO<sub>2</sub> standard should serve as a useful starting point, such inventories may not always be adequate for use in assessing compliance with the new 1-hour NO<sub>2</sub> standard since some aspects of the guidance in Section 8.1 differs for long-term (annual and quarterly) standards vs. short-term ( $\leq 24$  hours) standards. In particular, since maximum ground-level concentrations may be more sensitive to operating levels and startup/shutdown conditions for an hourly standard than for an annual standard, emission rates and stack parameters associated with the maximum ground-level concentrations for the annual standard may underestimate maximum concentrations for the new 1-hour NO<sub>2</sub> standard. Due to the importance of in-stack NO<sub>2</sub>/NO<sub>x</sub> ratios required for application of the OLM and PVMRM options within AERMOD discussed above, consideration should also be given to the potential variability of in-stack NO<sub>2</sub>/NO<sub>x</sub> ratios under different operating conditions when those non-regulatory-default options are applied. We also note that source emission input data recommendations in Table 8-2 of Appendix W for “nearby sources” and “other sources” that

may be needed to conduct a cumulative impact assessment include further differences between emission data for long-term vs. short-term standards which could also affect the adequacy of existing annual NO<sub>x</sub> emission inventories for the new 1-hour NO<sub>2</sub> standard. The terms “nearby sources” and “other sources” used in this context are defined in Section 8.2.3 of Appendix W. Attachment A provides a more detailed discussion on determining NO<sub>x</sub> emissions for permit modeling.

While Section 8.2.3 of Appendix W emphasizes the importance of professional judgment by the reviewing authority in the identification of nearby and other sources to be included in the modeled emission inventory, Appendix W establishes “a significant concentration gradient in the vicinity of the source” under consideration as the main criterion for this selection. Appendix W also indicates that “the number of such [nearby] sources is expected to be small except in unusual situations.” See Section 8.2.3.b. Since concentration gradients will vary somewhat depending on the averaging period being modeled, especially for an annual vs. 1-hour standard, the criteria for selection of “nearby” and “other” sources for inclusion in the modeled inventory may need to be reassessed for the 1-hour NO<sub>2</sub> standard.

The representativeness of available ambient air quality data also plays an important role in determining which nearby sources should be included in the modeled emission inventory. Key issues to consider in this regard are the extent to which ambient air impacts of emissions from nearby sources are reflected in the available ambient measurements, and the degree to which emissions from those background sources during the monitoring period are representative of allowable emission levels under the existing permits. The professional judgments that are required in developing an appropriate inventory of background sources should strive toward the proper balance between adequately characterizing the potential for cumulative impacts of emission sources within the study area to cause or contribute to violations of the NAAQS, while minimizing the potential to overestimate impacts by double-counting of modeled source impacts that are also reflected in the ambient monitoring data. We would also caution against the literal and uncritical application of very prescriptive procedures for identifying which background sources should be included in the modeled emission inventory for NAAQS compliance demonstrations, such as those described in Chapter C, Section IV.C.1 of the draft *New Source Review Workshop Manual* (EPA, 1990), noting again that Appendix W emphasizes the importance of professional judgment in this process. While the draft workshop manual serves as a useful general reference regarding New Source Review (NSR) and PSD programs, and such procedures may play a useful role in defining the spatial extent of sources whose emissions may need to be considered, it should be recognized that “[i]t is not intended to be an official statement of policy and standards and does not establish binding regulatory requirements.” See, Preface.

Given the range of issues involved in the determination of an appropriate inventory of emissions to include in a cumulative impact assessment, the appropriate reviewing authority should be consulted early in the process regarding the selection and proper application of appropriate monitored background concentrations and the selection and appropriate characterization of modeled background source emission inventories for use in demonstrating compliance with the new 1-hour NO<sub>2</sub> standard.

### **Tier-specific Technical Issues**

This section discusses technical issues related to application of each tier in the three-tiered screening approach for NO<sub>2</sub> modeling recommended in Section 5.2.4 Appendix W. A basic understanding of NO<sub>x</sub> chemistry and “of the chemical environment into which the source’s plume is to be emitted” (Appendix W, Section 5.1.j) will be helpful for addressing these issues based on the specific application.

#### Tier 1:

Since the assumption of full conversion of NO to NO<sub>2</sub> will provide the most conservative treatment of NO<sub>x</sub> chemistry in assessing ambient impacts, there are no technical issues associated with treatment of NO<sub>x</sub> chemistry for this tier. However, the general issues related to emission inventories for the 1-hour NO<sub>2</sub> standard discussed above and in Attachment A apply to Tier 1.

#### Tier 2:

As noted above, the 0.75 national default ratio for ARM is considered to be representative of “area wide quasi-equilibrium conditions” and, therefore, may not be as appropriate for use with the 1-hour NO<sub>2</sub> standard. The appropriateness of this default ambient ratio will depend somewhat on the characteristics of the sources, and as such application of Tier 2 for 1-hour NO<sub>2</sub> compliance demonstrations may need to be considered on a source-by-source basis in some cases. The key technical issue to address in relation to this tier requires an understanding of the meteorological conditions that are likely to be associated with peak hourly impacts from the source(s) being modeled. In general, for low-level releases with limited plume rise, peak hourly NO<sub>x</sub> impacts are likely to be associated with nighttime stable/light wind conditions. Since ambient ozone concentrations are likely to be relatively low for these conditions, and since low wind speeds and stable atmospheric conditions will further limit the conversion of NO to NO<sub>2</sub> by limiting the rate of entrainment of ozone into the plume, the 0.75 national default ratio will likely be conservative for these cases. A similar rationale may apply for elevated sources where plume impaction on nearby complex terrain under stable atmospheric conditions is expected to determine the peak hourly NO<sub>x</sub> concentrations. By contrast, for elevated sources in relatively flat terrain, the peak hourly NO<sub>x</sub> concentrations are likely to occur during daytime convective conditions, when ambient ozone concentrations are likely to be relatively high and entrainment of ozone within the plume is more rapid due to the vigorous vertical mixing during such conditions. For these sources, the 0.75 default ratio may not be conservative, and some caution may be needed in applying Tier 2 for such sources. We also note that the default equilibrium ratio employed within the PVMRM algorithm as an upper bound on an hourly basis is 0.9.

#### Tier 3:

This tier represents a general category of “detailed screening methods” which may be considered on a case-by-case basis. Section 5.2.4(b) of Appendix W cites two specific examples of Tier 3 methods, namely OLM and the use of site-specific ambient NO<sub>2</sub>/NO<sub>x</sub> ratios supported by ambient measurements. As noted above, we also believe it is appropriate to consider the

PVMMRM option as a Tier 3 detailed screening method at this time. The discussion here focuses primarily on the OLM and PVMMRM methods, but we also note that the use of site-specific ambient  $\text{NO}_2/\text{NO}_x$  ratios will be subject to the same issues discussed above in relation to the Tier 2 default ARM, and as a result it will generally be much more difficult to determine an appropriate ambient  $\text{NO}_2/\text{NO}_x$  ratio based on monitoring data for the new 1-hour  $\text{NO}_2$  standard than for the annual standard.

While OLM and PVMMRM are both based on the same simple chemical mechanism of titration to account for the conversion of NO emissions to  $\text{NO}_2$  (see Eq. 1) and therefore entail similar technical issues and considerations, there are some important differences that also need to be considered when assessing the appropriateness of these methods for specific applications. While the titration mechanism may capture the most important aspects of NO-to- $\text{NO}_2$  conversion in many applications, both methods will suffer from the same limitations for applications in which other mechanisms, such as photosynthesis, contribute significantly to the overall process of chemical transformation. Sources located in areas with high levels of VOC emissions may be subject to these limitations of OLM and PVMMRM. Titration is generally a much faster mechanism for converting NO to  $\text{NO}_2$  than photosynthesis, and as such is likely to be appropriate for characterizing peak 1-hour  $\text{NO}_2$  impacts in many cases.

Both OLM and PVMMRM rely on the same key inputs of in-stack  $\text{NO}_2/\text{NO}_x$  ratios and hourly ambient ozone concentrations. Although both methods can be applied within the AERMOD model using a single "representative" background ozone concentration, it is likely that use of a single value would result in very conservative estimates of peak hourly ambient concentrations since its use for the 1-hour  $\text{NO}_2$  standard would be contingent on a demonstration of conservatism for all hours modeled. Furthermore, hourly monitored ozone concentrations used with the OLM and PVMMRM options must be concurrent with the meteorological data period used in the modeling analysis, and thus the temporal representativeness of the ozone data for estimating ambient  $\text{NO}_2$  concentrations could be a factor in determining the appropriateness of the meteorological data period for a particular application. As noted above, the representativeness of these key inputs takes on somewhat greater importance in the context of a 1-hour  $\text{NO}_2$  standard than for an annual standard, for obvious reasons. In the case of hourly background ozone concentrations, methods used to substitute for periods of missing data may play a more significant role in determining the 1-hour  $\text{NO}_2$  modeled design value, and should therefore be given greater scrutiny, especially for data periods that are likely to be associated with peak hourly concentrations based on meteorological conditions and source characteristics. In other words, ozone data substitution methods that may have been deemed appropriate in prior applications for the annual standard may not be appropriate to use for the new 1-hour standard.

While these technical issues and considerations generally apply to both OLM and PVMMRM, the importance of the in-stack  $\text{NO}_2/\text{NO}_x$  ratios may be more important for PVMMRM than for OLM in some cases, due to differences between the two methods. The key difference between the two methods is that the amount of ozone available for conversion of NO to  $\text{NO}_2$  is based simply on the ambient ozone concentration and is independent of source characteristics for OLM, whereas the amount of ozone available for conversion in PVMMRM is based on the amount of ozone within the volume of the plume for an individual source or group of sources. The plume volume used in PVMMRM is calculated on an hourly basis for each source/receptor

combination, taking into account the dispersive properties of the atmosphere for that hour. For a low-level release where peak hourly NO<sub>x</sub> impacts occur close to the source under stable/light wind conditions, the plume volume will be relatively small and the ambient NO<sub>2</sub> impact for such cases will be largely determined by the in-stack NO<sub>2</sub>/NO<sub>x</sub> ratio, especially for sources with relatively close fence-line or ambient air boundaries. This example also highlights the fact that the relative importance of the in-stack NO<sub>2</sub>/NO<sub>x</sub> ratios may be greater for some applications than others, depending on the source characteristics and other factors. Assumptions regarding in-stack NO<sub>2</sub>/NO<sub>x</sub> ratios that may have been deemed appropriate in the context of the annual standard may not be appropriate to use for the new 1-hour standard. In particular, it is worth reiterating that the 0.1 in-stack ratio often cited as the "default" ratio for OLM should not be treated as a default value for hourly NO<sub>2</sub> compliance demonstrations.

Another difference between OLM and PVMRM that is worth noting here is the treatment of the titration mechanism for multiple sources of NO<sub>x</sub>. There are two possible modes that can be used for applying OLM to multiple source scenarios within AERMOD: (1) apply OLM to each source separately and assume that each source has all of the ambient ozone available for conversion of NO to NO<sub>2</sub>; and (2) assume that sources whose plumes overlap compete for the available ozone and apply OLM on a combined plume basis. The latter option can be applied selectively to subsets of sources within the modeled inventory or to all modeled sources using the OLMGROUP keyword within AERMOD, and is likely to result in lower ambient NO<sub>2</sub> concentrations in most cases since the ambient NO<sub>2</sub> levels will be more ozone-limited. One of the potential refinements in application of the titration method incorporated in PVMRM is a technique for dynamically determining which sources should compete for the available ozone based on the relative locations of the plumes from individual sources, both laterally and vertically, on an hourly basis, taking into account wind direction and plume rise. While this approach addresses one of the implementation issues associated with OLM by making the decision of which sources should compete for ozone, there is only very limited field study data available to evaluate the methodology.

Given the importance of the issue of whether to combine plumes for the OLM option, EPA has addressed the issue in the past through the Model Clearinghouse process. The general guidance that has emerged in those cases is that the OLM option should be applied on a source-by-source basis in most cases and that combining plumes for application of OLM would require a clear demonstration that the plumes will overlap to such a degree that they can be considered as "merged" plumes. However, much of that guidance was provided in the context of applying the OLM method outside the dispersion model in a post-processing mode on an annual basis. The past guidance on this issue is still appropriate in that context since there is no realistic method to account for the degree of plume merging on an hourly basis throughout the modeling analysis when applied as a post-processor. However, the implementation of the OLM option within the AERMOD model applies the method on a source-by-source, receptor-by-receptor, and hour-by-hour basis. As a result, the application of the OLMGROUP option within AERMOD is such that the sources only compete for the available ozone to the extent that each source contributes to the cumulative NO<sub>x</sub> concentration at each receptor for that hour. Sources which contribute significantly to the ambient NO<sub>x</sub> concentration at the receptor will compete for available ozone in proportion to their contribution, while sources that do not contribute significantly to the ambient NO<sub>x</sub> concentration will not compete for the ozone. Thus, the OLMGROUP option

implemented in AERMOD will tend to be “self-correcting” with respect to concerns that combining plumes for OLM will overestimate the degree of ozone limiting potential (and therefore underestimate ambient NO<sub>2</sub> concentrations). As a result of these considerations, we recommend that use of the “OLMGROUP ALL” option, which specifies that all sources will potentially compete for the available ozone, be routinely applied and accepted for all approved applications of the OLM option in AERMOD. This recommendation is supported by model-to-monitor comparisons of hourly NO<sub>2</sub> concentrations from the application of AERMOD for the Atlanta NO<sub>2</sub> risk and exposure assessment (EPA, 2008), and recent re-evaluations of hourly NO<sub>2</sub> impacts from the two field studies (New Mexico and Palau) that were used in the evaluation of PVMRM (MACTEC, 2005). These model-to-monitor comparisons of hourly NO<sub>2</sub> concentrations show reasonably good performance using the “OLMGROUP ALL” option within AERMOD, with no indication of any bias to underestimate hourly NO<sub>2</sub> concentrations with OLMGROUP ALL. Furthermore, model-to-monitor comparisons based on OLM without the OLMGROUP option do exhibit a bias to overestimate hourly NO<sub>2</sub> concentrations. We will provide further details regarding these recent hourly NO<sub>2</sub> model-to-monitor comparisons at a later date.

## SUMMARY

To summarize, we emphasize the following points:

1. The 3-tiered screening approach recommended in Section 5.2.4 of Appendix W for annual NO<sub>2</sub> assessments generally applies to the new 1-hour NO<sub>2</sub> standard.
2. While generally applicable, application of the 3-tiered screening approach for assessments of the new 1-hour NO<sub>2</sub> standard may entail additional considerations, such as the importance of key input data, including appropriate emission rates for the 1-hour standard vs. the annual standard for all tiers, and the representativeness of in-stack NO<sub>2</sub>/NO<sub>x</sub> ratios and hourly background ozone concentrations for Tier 3 detailed screening methods.
3. Since the OLM and PVMRM methods in AERMOD are currently considered non-regulatory-default options, application of these options requires justification and approval by the Regional Office on a case-by-case basis as alternative modeling techniques, in accordance with Section 3.2.2, paragraph (e), of Appendix W.
4. Applications of the OLM option in AERMOD, subject to approval under Section 3.2.2.c of Appendix W, should routinely utilize the “OLMGROUP ALL” option for combining plumes.
5. While the 1-hour NAAQS for NO<sub>2</sub> is defined in terms of the 3-year average for monitored design values to determine attainment of the NAAQS, this definition does not preempt or alter the Appendix W requirement for use of 5 years of NWS meteorological data or at least 1 year of site specific data.

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## **ATTACHMENT A**

### **Background on Hourly NO<sub>x</sub> Emissions for Permit Modeling for the 1-hour NO<sub>2</sub> NAAQS**

#### **Introduction**

The purpose of this attachment is to address questions about availability of hourly NO<sub>x</sub> emissions for permit modeling under the new NO<sub>2</sub> NAAQS. It summarizes existing guidance regarding emission input data requirements for NAAQS compliance modeling, and provides background on the historical approach to development of inventories for NO<sub>2</sub> permit modeling and computation of hourly emissions appropriate for assessing the new 1-hour NO<sub>2</sub> standard. Although the NAAQS is defined in terms of ambient NO<sub>2</sub> concentrations, source emission estimates for modeling are based on NO<sub>x</sub>.

Under the PSD program, the owner or operator of the source is required to demonstrate that the source does not cause or contribute to a violation of a NAAQS (40 CFR 51.166 (k)(1) and 40 CFR 52.21 (k)(1)) and/or PSD increments (40 CFR 51.166 (k)(2) and 52.21 (k)(2)). However, estimation of the necessary emission input data for NAAQS compliance modeling entails consideration of numerous factors, and the appropriate reviewing authority should be consulted early in the process to determine the appropriate emissions data for use in specific modeling applications (see 40 CFR 51, Appendix W, 8.1.1.b and 8.2.3.b)

#### **Summary of Current Guidance**

Section 8.1 of the *Guideline on Air Quality Models*, Appendix W to 40 CFR Part 51, provides recommendations regarding source emission input data needed to support dispersion modeling for NAAQS compliance demonstrations. Table 8-2 of Appendix W provides detailed guidance regarding the specific components of the emission input data, including the appropriate emission limits (pounds/MMBtu), operating level (MMBtu/hr), and operating factor (e.g., hr/yr or hr/day), depending on the averaging time of the standard. Table 8-2 also distinguishes between the emission input data needed for the new or modified sources being assessed, and "nearby" and "other" background sources included in the modeled emission inventory.

Based on Table 8-2, emission input data for new or modified sources for annual and quarterly standards are essentially the same as for short-term standards ( $\leq 24$  hours), based on maximum allowable or federally enforceable emission limits, design capacity or federally enforceable permit conditions, and the assumption of continuous operation. However, there are a few additional considerations cited in Appendix W that could result in different emission input data for the 1-hour vs. annual NO<sub>2</sub> NAAQS. For example, while design capacity is listed as the recommended operating level for the emission calculation, peak hourly ground-level concentrations may be more sensitive than annual average concentrations to changes in stack parameters (effluent exit temperature and exit velocity) under different operating capacities. Table 8-2 specifically recommends modeling other operating levels, such as 50 percent or 75 percent of capacity, for short-term standards (see footnote 3). Another factor that may affect maximum ground-level concentrations differently between the 1-hour vs. annual standard is

restrictions on operating factors based on federally enforceable permit conditions. While federally enforceable operating factors other than continuous operation may be accounted for in the emission input data (e.g., if operation is limited to 8 am to 4 pm each day), Appendix W also states that modeled emissions should not be averaged across non-operating time periods (see footnote 2 of Table 8-2).

While emission input data recommendations for “nearby” and “other” background sources included in the modeled emission inventory are similar to the new or modified source emission inputs in many respects, there is an important difference in the operating factor between annual and short-term standards. Emission input data for nearby and other sources may reflect actual operating factors (averaged over the most recent 2 years) for the annual standard, while continuous operation should be assumed for short-term standards. This could result in important differences in emission input data for modeled background sources for the 1-hour NO<sub>2</sub> NAAQS relative to emissions used for the annual standard.

### **Model Emission Inventory for NO<sub>2</sub> Modeling**

For the existing annual NO<sub>2</sub> NAAQS, the permit modeling inventory has generally been compiled from the annual state emission inventory questionnaire (EIQ) or Title V permit applications on file with the relevant permitting authority (state or local air program). Since a state uses the annual EIQ for Title V fee assessment, the state EIQ typically requires reporting of unit capacity, total fuel combusted, and/or hours of operation to help verify annual emissions calculations for fee accuracy purposes. Likewise, Title V operating permit applications contain all of the same relevant information for calculating emissions. While these emission inventories are important resources for gathering emission input data on background sources for NAAQS compliance modeling, inventories which are based on actual operations may not be sufficient for short-term standards, such as the new 1-hour NO<sub>2</sub> NAAQS. However, appropriate estimates of emissions from background sources for the 1-hour NO<sub>2</sub> standard may be derived in many cases from information in these inventories regarding permitted emission limits and operating capacity.

Historically, it has not been a typical practice for an applicant to use the EPA’s national emission inventory (NEI) as the primary source for compiling the permit modeling inventory. Since the emission data submitted to the NEI represents annual emission totals, it may not be suitable for use in NAAQS compliance modeling for short-term standards since modeling should be based on continuous operation, even for modeled background sources. Although the NEI may provide emission data for background sources that are more appropriate for the annual NO<sub>2</sub> standard, the utility of the NEI for purposes of NAAQS compliance modeling is further limited due to the fact that additional information regarding stack parameters and operating rates required for modeling may not be available from the NEI. While records exist in the NEI for reporting stack data necessary for point source modeling (i.e., stack coordinates, stack heights, exit temperatures, exit velocities), some states do not report such information to the NEI, or there may be errors in the location data submitted to the NEI. Under such conditions, default stack information based upon SIC is substituted and use of such data could invalidate modeling results. Building locations and dimensions, which may be required to account for building downwash influences in the modeling analysis, may also be missing or incomplete in many cases.

A common and relatively straightforward approach for compiling the necessary information to develop an inventory of emissions from background sources for a permit modeling demonstration is as follows, patterned after the draft *New Source Review Workshop Manual* (EPA, 1990). The applicant completes initial modeling of allowable emission increases associated with the proposed project and determines the radii of impact (ROI) for each pollutant and averaging period, based on the maximum distance at which the modeled ambient concentration exceeds the Significant Impact Level (SIL) for each pollutant and averaging period. Typically, the largest ROI is selected and then a list of potential background sources within the ROI plus a screening distance beyond the ROI is compiled by the permitting authority and supplied to the applicant. The applicant typically requests permit applications or EIQ submittals from the records department of the permitting authority to gather stack data and source operating data necessary to compute emissions for the modeled inventory. Once the applicant has gathered the relevant data from the permitting authorities, model emission rates are calculated. While this approach is fairly common, it should be noted that the draft workshop manual "is not intended to be an official statement of policy and standards and does not establish binding regulatory requirements" (see, Preface), and the appropriate reviewing authority should be consulted early in the process regarding the selection of appropriate background source emission inventories for the 1-hour NO<sub>2</sub> standard. We also note that Appendix W establishes "a significant concentration gradient in the vicinity of the source" under consideration as the main criterion for selection of nearby sources for inclusion in the modeled inventory, and further indicates that "the number of such [nearby] sources is expected to be small except in unusual situations." See Section 8.2.3.b.

As mentioned previously, modeled emission rates for short-term NAAQS are computed consistent with the recommendations of Section 8.1 of Appendix W, summarized in Table 8-2. The maximum allowable (SIP-approved process weight rate limits) or federally enforceable permit limit emission rates assuming design capacity or federally enforceable capacity limitation are used to compute hourly emissions for dispersion modeling against short-term NAAQS such as the new 1-hour NO<sub>2</sub> NAAQS. If a source assumes an enforceable limit on the hourly firing capacity of a boiler, this is reflected in the calculations. Otherwise, the design capacity of the source is used to compute the model emission rate. A load analysis is typically necessary to determine the load or operating condition that causes the maximum ground-level concentrations. In addition to 100 percent load, loads such as 50 percent and 75 percent are commonly assessed. As noted above, the load analysis is generally more important for short-term standards than for annual standards. For an hourly standard, other operating scenarios of relatively short duration such as "startup" and "shutdown" should be assessed since these conditions may result in maximum hourly ground-level concentrations, and the control efficiency of emission control devices during these operating conditions may also need to be considered in the emission estimation.

### **Emission Calculation Example**

The hourly emissions are most commonly computed from AP-42 emission factors based on unit design capacity. For a combustion unit, the source typically reports both the unit capacity and the actual total amount of fuel combusted annually (gallons, millions of cubic feet

of gas, etc.) to the permitting authority for the EIQ. Likewise, Title V operating permit applications will contain similar information that can be used to compute hourly emissions.

For example, assume you are modeling an uncontrolled natural gas package boiler with a design firing rate of 30 MMBtu/hr. The AP-42 emission factor for an uncontrolled natural gas external combustion source (AP-42, Section 1.4) for firing rates less than 100 MMBtu/hr is 100 lbs. NO<sub>x</sub>/10<sup>6</sup> SCF natural gas combusted. The hourly emission rate is derived by converting the emission factor expressed in terms of lbs. NO<sub>x</sub>/10<sup>6</sup> SCF to lbs. NO<sub>x</sub>/MMBtu. The conversion is done by dividing the 100 lbs. NO<sub>x</sub>/10<sup>6</sup> SCF by 1,020 to convert the AP-42 factor to lbs. NO<sub>x</sub>/MMBtu. The new emission factor is now 0.098 lbs. NO<sub>x</sub>/MMBtu.

For this example, the source has no limit on the hourly firing rate of the boiler; therefore, the maximum hourly emissions are computed by multiplying the design firing rate of the boiler by the new emission factor.

$$E_{\text{hourly}} = 0.098 \text{ lbs/MMBtu} \times 30 \text{ MMBtu/hr} = 2.94 \text{ lbs/hr}$$

Thus 2.94 lbs/hr represents the emission rate that would be input into the dispersion model for modeling against the 1-hour NO<sub>2</sub> NAAQS to comport with emission rate recommendations of Section 8.1 of Appendix W.

It is important to note that data derived for the annual state emission inventory (EI) is based on actual levels of fuel combusted for the year, and is therefore different than how allowable emissions are computed for near-field dispersion modeling. For the annual EI report, a source computes their annual emissions based upon the AP-42 emission factor multiplied by the actual total annual throughput or total fuel combusted.

In the 30 MMBtu/hr boiler example, the annual NO<sub>x</sub> emissions reported to the NEI is computed by:

$$E_{\text{annual}} = (\text{AP-42 emission factor}) \times (\text{total annual fuel combusted})$$

$$E_{\text{annual}} = (100 \text{ lbs}/10^6 \text{ SCF}) \times (100 \times 10^6 \text{ SCF/yr}) = 10,000 \text{ lbs. NO}_x/\text{yr or } 5 \text{ tons NO}_x/\text{yr}$$

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**  
**Office of Air Quality Planning and Standards**  
**Research Triangle Park, North Carolina 27711**

**AUG 23 2010**

**MEMORANDUM**

**SUBJECT:** Guidance Concerning the Implementation of the 1-hour SO<sub>2</sub> NAAQS for the Prevention of Significant Deterioration Program

**FROM:**  Stephen D. Page, Director  
Office of Air Quality Planning and Standards

**TO:** Regional Air Division Directors

On June 2, 2010, the U.S. Environmental Protection Agency (EPA) announced a new 1-hour sulfur dioxide (SO<sub>2</sub>) National Ambient Air Quality Standard (hereinafter, either the 1-hour SO<sub>2</sub> NAAQS or 1-hour SO<sub>2</sub> standard) of 75 ppb, which is attained when the 3-year average of the annual 99th-percentile of 1-hour daily maximum concentrations does not exceed 75 ppb at each monitor within an area. EPA revised the primary SO<sub>2</sub> NAAQS to provide the requisite protection of public health. The final rule for the new 1-hour SO<sub>2</sub> NAAQS was published in the Federal Register on June 22, 2010 (75 FR 35520), and the standard becomes effective on August 23, 2010. In the same notice, we also announced that we are revoking both the existing 24-hour and annual primary SO<sub>2</sub> standards. However, as explained in this guidance, those SO<sub>2</sub> standards, as well as the 24-hour and annual increments for SO<sub>2</sub>, remain in effect for a while further and must continue to be protected.

EPA interprets the Prevention of Significant Deterioration (PSD) provisions of the Clean Air Act and EPA regulations to require that any federal permit issued under 40 CFR 52.21 on or after that effective date must contain a demonstration of source compliance with the new 1-hour SO<sub>2</sub> NAAQS. We anticipate that some new major stationary sources or major modifications, especially those involving relatively short stacks, may experience difficulty demonstrating that emissions from proposed projects will not cause or contribute to a modeled violation of the new 1-hour SO<sub>2</sub> NAAQS. We also anticipate problems that sources may have interpreting the modeled 1-hour SO<sub>2</sub> impacts if the form of the hourly standard is not properly addressed. To respond to these and other related issues, we are providing the attached guidance, in the form of two memoranda, for implementing the new 1-hour SO<sub>2</sub> NAAQS under the PSD permit program.

The first memorandum, titled "General Guidance for Implementing the 1-hour SO<sub>2</sub> National Ambient Air Quality Standard in Prevention of Significant Deterioration Permits, Including an Interim 1-hour SO<sub>2</sub> Significant Impact Level," includes guidance for the preparation and review of PSD permits with respect to the new 1-hour SO<sub>2</sub> standard. That

guidance memorandum sets forth a recommended interim 1-hour SO<sub>2</sub> significant impact level (SIL) that states may consider for carrying out the required PSD air quality analysis for SO<sub>2</sub>, until EPA promulgates a 1-hour SO<sub>2</sub> SIL via rulemaking, and addresses the continued use of the existing SO<sub>2</sub> Significant Emissions Rate (SER) and Significant Monitoring Concentration (SMC) to implement the new 1-hour SO<sub>2</sub> standard.. The second memorandum, titled "Applicability of Appendix W Modeling Guidance for the 1-hour SO<sub>2</sub> National Ambient Air Quality Standard," includes specific modeling guidance for estimating ambient SO<sub>2</sub> concentrations and determining compliance with the new 1-hour SO<sub>2</sub> standard.

This guidance does not bind state and local governments and permit applicants as a matter of law. Nevertheless, we believe that state and local air agencies and industry will find this guidance useful for carrying out the PSD permit process and it will provide a consistent approach for estimating SO<sub>2</sub> air quality impacts from proposed construction or modification of SO<sub>2</sub> emissions sources. For the most part, the attached guidance focuses on how existing policy and guidance is relevant to and should be used for implementing the new 1-hour SO<sub>2</sub> NAAQS.

Please review the guidance included in the two attached memoranda. In the event of questions regarding the general implementation guidance contained in the first memorandum, please contact Raj Rao ([rao.raj@epa.gov](mailto:rao.raj@epa.gov)). For questions pertaining to the modeling guidance in the second memorandum, please contact Tyler Fox ([fox.tyler@epa.gov](mailto:fox.tyler@epa.gov)). We are continuing our efforts to address permitting issues related to the implementation of new and revised NAAQS, and will issue additional guidance to address the NAAQS as appropriate.

**Attachments:**

1. Memorandum from Anna Marie Wood, Air Quality Policy Division, to EPA Regional Air Division Directors, "General Guidance for Implementing the 1-hour SO<sub>2</sub> National Ambient Air Quality Standard in Prevention of Significant Deterioration Permits, Including an Interim 1-hour SO<sub>2</sub> Significant Impact Level" (August 23, 2010).
2. Memorandum from Tyler Fox, Air Quality Modeling Group, to EPA Regional Air Division Directors, "Applicability of Appendix W Modeling Guidance for the 1-hour SO<sub>2</sub> National Ambient Air Quality Standard" (August 23, 2010).

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**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**  
**Office of Air Quality Planning and Standards**  
**Research Triangle Park, North Carolina 27711**

**August 23, 2010**

**MEMORANDUM**

**SUBJECT:** General Guidance for Implementing the 1-hour SO<sub>2</sub> National Ambient Air Quality Standard in Prevention of Significant Deterioration Permits, Including an Interim 1-hour SO<sub>2</sub> Significant Impact Level

**FROM:** Anna Marie Wood, Acting Director /s/  
Air Quality Policy Division

**TO:** Regional Air Division Directors

**INTRODUCTION**

We are issuing the following guidance to explain and clarify the procedures that may be followed by applicants for Prevention of Significant Deterioration (PSD) permits, and permitting authorities reviewing such applications, to properly demonstrate that proposed projects to construct and operate will not cause or contribute to a modeled violation of the new 1-hour sulfur dioxide (SO<sub>2</sub>) National Ambient Air Quality Standard (hereinafter, either the 1-hour SO<sub>2</sub> NAAQS or 1-hour SO<sub>2</sub> standard) that becomes effective on August 23, 2010. The EPA revised the primary SO<sub>2</sub> NAAQS by promulgating a 1-hour SO<sub>2</sub> NAAQS to provide the requisite protection of public health. Under section 165(a)(3) of the Clean Air Act (the Act) and sections 52.21(k) and 51.166(k) of EPA's PSD regulations, to obtain a permit, a source must demonstrate that its proposed emissions increase will not cause or contribute to a violation of "any NAAQS."

This guidance is intended to (1) highlight the importance of a 1-hour averaging period for setting an emissions limitation for SO<sub>2</sub> in the PSD permit (2) reduce the modeling burden to implement the 1-hour SO<sub>2</sub> standard where it can be properly demonstrated that a source will not have a significant impact on ambient 1-hour SO<sub>2</sub> concentrations, and (3) identify approaches that allow sources and permitting authorities to mitigate, in a manner consistent with existing regulatory requirements, potential modeled violations of the 1-hour SO<sub>2</sub> NAAQS, where appropriate. Accordingly, the techniques described in this memorandum may be used by permit applicants and permitting authorities to perform an acceptable 1-hour SO<sub>2</sub> NAAQS compliance modeling assessment and/or properly configure projects and permit conditions in order that a proposed source's emissions do not cause or contribute to modeled 1-hour SO<sub>2</sub> NAAQS violations, so that permits can be issued in accordance with the applicable PSD program requirements.

This guidance discusses existing provisions in EPA regulations and guidance, and focuses on the relevancy of this information for implementing the new NAAQS for SO<sub>2</sub>. Importantly, however, this guidance also sets forth a recommended interim 1-hour SO<sub>2</sub> significant impact level (SIL) that EPA will use when it evaluates applications and issues permits under the federal PSD program, and that states may choose to rely upon to implement their PSD programs for SO<sub>2</sub> if they agree that the value represents a reasonable threshold for determining a significant ambient impact, and they incorporate into each permit record a rationale supporting this conclusion. This interim SIL is a useful screening tool that can be used to determine whether or not the predicted ambient impacts caused by a proposed source's emissions increase will be significant and, if so whether the source's emissions should be considered to "cause or contribute to" modeled violations of the new 1-hour SO<sub>2</sub> NAAQS.

## **BACKGROUND**

On August 23, 2010, the new 1-hour SO<sub>2</sub> NAAQS will become effective. Regulations at 40 CFR 52.21 (the federal PSD program) require permit applicants to demonstrate compliance with "any" NAAQS that is in effect on the date a PSD permit is issued. (See, e.g., EPA memo dated April 1, 2010, titled "Applicability of the Federal Prevention of Significant Deterioration Permit Requirements to New and Revised National Ambient Air Quality Standards.") Due to the promulgation of this short-term averaging period (1-hour) for the SO<sub>2</sub> NAAQS, we anticipate that some new major stationary sources or major modifications, especially those involving relatively short stacks may experience increased difficulty demonstrating that emissions from proposed project will not cause or contribute to a modeled violation.

We believe that, in some instances, preliminary predictions of violations could result from the use of maximum modeled concentrations that do not adequately take into account the form of the 1-hour standard. To the extent that is the case, ambient SO<sub>2</sub> concentrations in the form of the new 1-hour NAAQS should be estimated by applying the recommended procedures that account for the statistical form of the standard. See EPA Memorandum from Tyler Fox, Air Quality Modeling Group, to EPA Regional Air Division Directors, "Applicability of Appendix W Modeling Guidance for the 1-hour SO<sub>2</sub> National Ambient Air Quality Standard" (August 23, 2010) for specific modeling guidance for estimating ambient SO<sub>2</sub> concentrations consistent with the new 1-hour SO<sub>2</sub> NAAQS.

It is EPA's expectation that currently available SO<sub>2</sub> guidance, including the guidance presented in this memorandum, will assist in resolving some of the issues arising from preliminary analyses that show potential exceedances of the new 1-hour SO<sub>2</sub> NAAQS that would not be present under more refined modeling applications. In addition, the techniques described in this memorandum may also help avoid violations of the standard through design of the proposed source or permit conditions, consistent with existing regulatory requirements. Moreover, the interim 1-hour SO<sub>2</sub> SIL that is included in this guidance will provide a reasonable screening tool for effectively implementing the PSD requirements for an air quality impact analysis.

The following discussion provides guidance for establishing a 1-hour emissions limitation to demonstrate compliance with the new NAAQS, and for possibly mitigating

modeled violations using any of the following: air quality-based permit limits more stringent than what the Best Available Control Technology provisions may otherwise require, air quality offsets, “good engineering practice” (GEP) stack heights, and an interim 1-hour SO<sub>2</sub> SIL. The continued use of the existing SO<sub>2</sub> Significant Emissions Rate (SER) and Significant Monitoring Concentration (SMC) to implement the new 1-hour SO<sub>2</sub> standard is also discussed.

## **SCREENING VALUES**

In the final rule establishing the 1-hour SO<sub>2</sub> standard, EPA discussed various implementation considerations for the PSD permitting program. 75 FR.35520 (June 22, 2010). That discussion included the following statements regarding particular screening values that have historically been used on a widespread basis to facilitate implementation of the PSD permitting program:

We agree with the commenters that there may be a need for EPA to provide additional screening tools or to revise existing screening tools that are frequently used under the NSR/PSD program for reducing the burden of completing SO<sub>2</sub> ambient air impact analyses. These screening tools include the SILs, as mentioned by the commenter, but also include the SER for emissions of SO<sub>2</sub> and the SMC for SO<sub>2</sub>. The existing screening tools apply to the periods used to define the existing NAAQS for SO<sub>2</sub>, including the annual, 24-hour, and 3-hour averaging periods. EPA intends to evaluate the need for possible changes or additions to each of these useful screening tools for SO<sub>2</sub> due to the revision of the SO<sub>2</sub> NAAQS to provide for a 1-hour standard. We believe it is highly likely that in order to be most effective for implementing the new 1-hour averaging period for NSR purposes, new 1-hour screening values will be appropriate.

75 FR 35579. EPA intends to conduct an evaluation of these issues and submit our findings in the form of revised significance levels under notice and comment rulemaking if any revisions are deemed appropriate. In the interim, for the reasons provided below, we recommend the continued use of the existing SER for SO<sub>2</sub> emissions as well as an interim 1-hour SO<sub>2</sub> SIL that we are setting forth today for conducting air quality impact analyses for the 1-hour SO<sub>2</sub> NAAQS. As described in the section titled Introduction, EPA intends to implement the interim 1-hour SO<sub>2</sub> SIL contained herein under the federal PSD program and offers states the opportunity to use it in their PSD programs if they choose to do so. EPA is not addressing the significant monitoring concentration (SMC) for SO<sub>2</sub> in this memorandum; the existing SMC for SO<sub>2</sub>, at 40 CFR 52.21(i)(5)(i) should continue to be used.

## **SIGNIFICANT EMISSIONS RATE**

The PSD regulations define SER for various regulated NSR pollutants. When a proposed new source’s potential to emit a pollutant, or a modified source’s net emissions increase of a pollutant, would be less than the SER, the source is not required to undergo the requisite PSD analyses (BACT and air quality) for that particular emissions increase. Under the terms of existing EPA regulations, the applicable SER for SO<sub>2</sub> is 40 tons per year (tpy). 40 CFR 52.21(b)(23); 40 CFR 51.166(b)(23). Each of the significant emissions rates defined in those regulations is specific to an individual pollutant with no differentiation by averaging time with

regard to NAAQS. The NAAQS for SO<sub>2</sub> have included standards with 3-hour and 24-hour and annual averaging times for many years. The EPA has applied the 40 tpy SER for SO<sub>2</sub> across all of these averaging times, and we are aware of no reason why it should not be used for the 1-hour averaging period for the present time. Therefore, until the evaluation described above and any associated rulemaking are completed, we will use 40 tpy as the SER for the 1-hour standard.

Under existing regulations, an ambient air quality impact analysis is required for “each pollutant that [a source] would have the potential to emit in significant amounts.” [40 CFR 52.21(m)(1)(i)(a); 40 CFR. 51.166(m)(1)(i)(a)]. For modifications, these regulations require this analysis for “each pollutant for which [the modification] would result in a significant net emissions increase.” 40 CFR.52.21(m)(1)(i)(b); 40 CFR.51.166(m)(1)(i)(b). EPA construes this regulation to mean that an ambient impact analysis is not necessary for pollutants with emissions rates below the significant emissions rates in paragraph (b)(23) of the regulations. No additional action by EPA or permitting authorities is necessary at this time to apply the 40 tpy significant emissions rate in existing regulations to the hourly SO<sub>2</sub> standard.

### INTERIM 1-HOUR SO<sub>2</sub> SIGNIFICANT IMPACT LEVEL

Under the PSD program, a proposed new major stationary source or major modification must, among other things, complete an air quality impact analysis that involves performing an analysis of air quality modeling and ambient monitoring data, where appropriate, to demonstrate compliance with applicable NAAQS. In order to implement this requirement, EPA traditionally has provided a screening tool known as the Significant Impact Level (SIL) to help applicants and permitting authorities determine whether a source’s modeled ambient impact is significant so as to warrant a comprehensive, cumulative air quality analysis to demonstrate compliance with the NAAQS. Accordingly, where a proposed source’s modeled impact is deemed insignificant, or *de minimis*, using the SIL as a threshold for significance, the applicant is not required to model anything besides its own proposed emissions increase to show that the proposed source or modification will not cause or contribute to a violation of the NAAQS.<sup>1</sup>

If, on the other hand, the source’s modeled impact is found to be significant, based on the SIL, the applicant will need to complete a comprehensive, cumulative air quality impact analysis to demonstrate that the source’s emissions will not cause or contribute to a modeled violation of any NAAQS. To make this demonstration, EPA has recommended that a cumulative analysis cover a circular area measuring out from the source to the maximum distance where the source’s impact is equal to the SIL. Within this modeling area, the source should also model the impacts of other sources (existing and newly permitted), including applicable SO<sub>2</sub> sources located outside the circular area described above, to account for the cumulative hourly SO<sub>2</sub> air quality impacts

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<sup>1</sup> When a proposed source’s impact by itself is not considered to be “significant,” EPA has long maintained that any further effort on the part of the applicant to complete a cumulative source impact analysis involving other source impacts would only yield information of trivial or no value with respect to the required evaluation of the proposed source or modification. The concept of a SIL is grounded on the *de minimis* principles described by the court in *Alabama Power Co. v. Costle*, 636 F.2d 323, 360 (D.C. Cir. 1980); See also *Sur Contra La Contaminacion v. EPA*, 202 F.3d 443, 448-49 (1<sup>st</sup> Cir. 2000) (upholding EPA’s use of SIL to allow permit applicant to avoid full impact analysis); *In re: Prairie State Gen. Co.*, PSD Appeal No. 05-05, Slip. Op. at 139 (EAB 2006).

that are predicted to occur. The applicant may also have to gather ambient monitoring data as part of the total air quality analysis that is required for demonstrating compliance with the NAAQS.<sup>2</sup> Accordingly, the source will evaluate its contribution to any modeled violation of the 1-hour SO<sub>2</sub> NAAQS to determine whether the source's emissions contribution will cause or contribute to the modeled violation at any receptor. Note that in the accompanying modeling guidance memorandum we are providing recommended procedures and guidance for completing the modeling analysis to demonstrate compliance with the new 1-hour SO<sub>2</sub> NAAQS.

We plan to undertake rulemaking to adopt a 1-hour SO<sub>2</sub> SIL value. However, until such time as a 1-hour SO<sub>2</sub> SIL is defined in the PSD regulations, we are providing an interim SIL of 3 ppb, which we intend to use as a screening tool for completing the required air quality analyses for the new 1-hour SO<sub>2</sub> NAAQS under the federal PSD program at 40 CFR 52.21. We are also making the interim SIL available to States with EPA-approved implementation plans containing a PSD program to use at their discretion. To support the application of this interim 1-hour SO<sub>2</sub> SIL in each instance, a permitting authority that utilizes it as part of an ambient air quality analysis should include in the permit record the analysis reflected in this memorandum and the referenced documents to demonstrate that a modeled air quality impact is *de minimis*, and thereby would not be considered to cause or contribute to a modeled violation of the NAAQS.<sup>3</sup>

States may also elect to choose another value that they believe represents a significant air quality impact relative to the 1-hour SO<sub>2</sub> NAAQS. The EPA-recommended interim 1-hour SO<sub>2</sub> SIL is not intended to supersede any interim SIL that any state chooses to rely upon to implement a state PSD program that is part of an approved SIP, or to impose the use of the SIL concept on any state that chooses to implement the PSD program—in particular the ambient air quality analysis—without using a SIL as a screening tool. Accordingly, states that implement the PSD program under an EPA-approved SIP may choose to use this interim SIL, another value that may be deemed more appropriate for PSD permitting purposes in the state of concern, or no SIL at all. The application of any SIL that is not reflected in a promulgated regulation should be supported by a record in each instance that shows the value represents a *de minimis* impact on the 1-hour SO<sub>2</sub> standard, as described above.

As indicated above, using the interim 1-hour SO<sub>2</sub> SIL, the permit applicant and permitting authority can determine: (1) whether, based on the proposed increase in SO<sub>2</sub> emissions, a cumulative air quality analysis is required; (2) the area of impact within which a cumulative air quality analysis should focus; and (3) whether, as part of a cumulative air quality analysis, the proposed source's SO<sub>2</sub> emissions will cause or contribute to any modeled violation of the 1-hour SO<sub>2</sub> NAAQS.

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<sup>2</sup> A screening tool known as the Significant Monitoring Concentration (SMC) for SO<sub>2</sub> already exists in the PSD regulations. EPA plans to evaluate the existing SMC in light of the new 1-hour SO<sub>2</sub> NAAQS; however, the existing value of 13 µg/m<sup>3</sup>, 24-hour average, should continue to be used until and unless a revised value is issued through rulemaking.

<sup>3</sup> Where the cumulative air quality analysis identifies a modeled violation of the NAAQS or increments, and the proposed source is issued its permit by virtue of the fact that its proposed emissions increase is not considered to cause or contribute to the modeled violation, it is still the permitting authority's responsibility to address such modeled violations independently from the PSD permitting process to determine the nature of the problem and to mitigate it accordingly,

As mentioned above, we are providing an interim 1-hour SO<sub>2</sub> SIL value of 3 ppb to implement the federal PSD program. To determine initially whether a proposed project's emissions increase will have a significant impact (resulting in the need for a cumulative air quality analysis), this interim SIL should be compared to either of the following:

- The highest of the 5-year averages of the maximum modeled 1-hour SO<sub>2</sub> concentrations predicted each year at each receptor, based on 5 years of National Weather Service data; or
- The highest modeled 1-hour SO<sub>2</sub> concentration predicted across all receptors based on 1 year of site-specific meteorological data, or the highest of the multi-year averages of the maximum modeled 1-hour SO<sub>2</sub> concentrations predicted each year at each receptor, based on 2 or more, up to 5 complete years of available site-specific meteorological data.

Additional guidance will be forthcoming for the purpose of comparing a proposed source's modeled impacts to the interim 1-hour SO<sub>2</sub> SIL in order to make a determination about whether that source's contribution is significant when a cumulative air quality analysis identifies violations of the 1-hour SO<sub>2</sub> NAAQS (i.e., "causes or contributes to" a modeled violation).

We derived this interim 1-hour SO<sub>2</sub> SIL by using an impact equal to 4% of the 1-hour SO<sub>2</sub> NAAQS (which is 75 ppb). On June 29, 2010, we issued an interim 1-hour NO<sub>2</sub> SIL that used an impact equal to 4% of the 1-hour NO<sub>2</sub> standard. As explained in the June memorandum, we have chosen this approach because we believe it is reasonable to base the interim 1-hour SIL directly on consideration of impacts relative to the corresponding 1-hour NAAQS. In 1980, we defined SER for each pollutant subject to PSD. 45 FR 52676 (August 7, 1980) at 52705-52710. For PM and SO<sub>2</sub>, we defined the SER as the emissions rate that resulted in an ambient impact equal to 4% of the applicable short-term NAAQS. The 1980 analysis focused on levels no higher than 5% of the primary standard because of concerns that higher levels were found to result in unreasonably large amounts of increment being consumed by a single source. Within the range of impacts analyzed, we considered two factors that had an important influence on the choice of the significant impact levels: (1) cumulative effect on increment consumption of multiple sources in an area, each making the maximum *de minimis* emissions increase; and (2) the projected consequence of a given significant impact level on administrative burden. As explained in the preamble to the 1980 rulemaking and the supporting documentation,<sup>4</sup> EPA decided to use 4% of the 24-hour primary NAAQS for PM and SO<sub>2</sub> to define the significant emissions rates (SERs) for those pollutants. See 45 FR 52708. Looking now at a 1-hour NAAQS for SO<sub>2</sub>, we believe that it is reasonable as an interim approach to use a SIL value that represents 4% of the 1-hour SO<sub>2</sub> NAAQS. EPA will consider other possible alternatives for developing a 1-hour SO<sub>2</sub> SIL in a future rulemaking that will provide an opportunity for public participation in the development of a SIL as part of the PSD regulations.

## AIR-QUALITY BASED EMISSIONS LIMITATIONS

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<sup>4</sup> EPA evaluated *de minimis* levels for pollutants for which NAAQS had been established in a document titled "Impact of Proposed and Alternative *De Minimis* Levels for Criteria Pollutants"; EPA-450/2-80-072, June 1980.

Once a level of control is determined by the PSD applicant via the Best Available Control Technology (BACT) top-down process, the applicant must model the proposed source's emissions at the BACT emissions rate(s) to demonstrate that those emissions will not cause or contribute to a violation of any NAAQS or PSD increment. However, the EPA 1990 Workshop Manual (page B.54) describes circumstances where a proposed source's emissions based on levels determined via the top-down process may not be sufficiently controlled to prevent modeled violations of an increment or NAAQS. In such cases, it may be appropriate for PSD applicants to propose a more stringent control option (that is, beyond the level identified via the top-down process) as a result of an adverse impact on the NAAQS or PSD increments. In addition, the use of certain dispersion techniques is permissible for certain proposed projects for SO<sub>2</sub> that may need to be considered where emissions limitations alone may not enable the source to demonstrate compliance with the new 1-hour SO<sub>2</sub> NAAQS. This is discussed in greater detail below in the section addressing GEP stack height requirements.

Because compliance with the new SO<sub>2</sub> NAAQS must be demonstrated on the basis of a 1-hour averaging period, the reviewing authority should ensure that the source's PSD permit defines a maximum allowable hourly emissions limitation for SO<sub>2</sub>, regardless of whether it is derived from the BACT top-down approach or it is the result of an air-quality based emissions rate. Hourly limits are important because they are the foundation of the air quality modeling demonstration relative to the 1-hour SO<sub>2</sub> NAAQS. For estimating the impacts of existing sources, if necessary, existing SO<sub>2</sub> emission inventories used to support modeling for compliance with the 3-hour and 24-hour SO<sub>2</sub> standards should serve as a useful starting point, and may be adequate in many cases for use in assessing compliance with the new 1-hour SO<sub>2</sub> standard. The PSD applicant's coordination with the reviewing authority is important in this matter to obtain the most appropriate estimates of maximum allowable hourly SO<sub>2</sub> emissions.

## **DEMONSTRATING COMPLIANCE WITH THE NAAQS AND INCREMENTS & MITIGATING MODELED VIOLATIONS WITH AIR QUALITY OFFSETS**

A 1988 EPA memorandum provides procedures to follow when a modeled violation is identified during the PSD permitting process. [See Memorandum from Gerald A. Emison, EPA OAQPS, to Thomas J. Maslany, EPA Air Management Division, "Air Quality Analysis for Prevention of Significant Deterioration (PSD)." (July 5, 1988.)] In cases where the air quality analysis predicts violations of the 1-hour SO<sub>2</sub> NAAQS, but the permit applicant can show that the SO<sub>2</sub> emissions increase from the proposed source will not have a significant impact *at the point and time of any modeled violation*, the permitting authority has discretion to conclude that the source's emissions will not contribute to the modeled violation. As provided in the July 5, 1988 guidance memo, because the proposed source only has a *de minimis* contribution to the modeled violation, the source's impact will not be considered to cause or contribute to such modeled violations, and the permit could be issued. This concept continues to apply, and the significant impact level (described further below) may be used as part of this analysis. A 2006 decision by the EPA Environmental Appeals Board (EAB) provides detailed reasoning that demonstrates the permissibility of a finding that a PSD source would not be considered to cause or contribute to a modeled NAAQS violation because its estimated air quality impact was

insignificant at the time and place of the modeled violations.<sup>5</sup> [See *In re Prairie State Gen. Co.*, 13 E.A.D. \_\_\_, \_\_\_, PSD Appeal No. 05-05, Slip. Op. at 137-144 (EAB 2006)]

However, where it is determined that a source's impact does cause or contribute to a modeled violation, a permit cannot be issued without some action to mitigate the source's impact. In accordance with 40 CFR 51.165(b)<sup>6</sup>, a major stationary source or major modification (as defined at §51.165(a)(1)(iv) and (v)) that locates in a SO<sub>2</sub> attainment area for the 1-hour SO<sub>2</sub> NAAQS and would cause or contribute to a violation of the 1-hour SO<sub>2</sub> NAAQS may "reduce the impact of its emissions upon air quality by obtaining sufficient emission reductions to, at a minimum, compensate for its adverse ambient [SO<sub>2</sub>] impact where the major source or major modification would otherwise cause or contribute to a violation ...." An applicant can meet this requirement for obtaining additional emissions reductions either by reducing its emissions at the source (e.g., promoting more efficient production methodologies and energy efficiency) or by obtaining air quality offsets (see below). [See, e.g., *In re Interpower of New York, Inc.*, 5 E.A.D. 130, 141 (EAB 1994)].<sup>7</sup> A State may also provide the necessary emissions reductions by imposing emissions limitations on other sources through an approved SIP revision. These approaches may also be combined as necessary to demonstrate that a source will not cause or contribute to a violation of the NAAQS.

Unlike emissions offset requirements in areas designated as nonattainment, in addressing the air quality offset concept, it may not be necessary for a permit applicant to fully offset the proposed emissions increase if an emissions reduction of lesser quantity will mitigate the adverse air quality impact where the modeled violation was originally identified. ("Although full emission offsets are not required, such a source must obtain emission offsets sufficient to compensate for its air quality impact where the violation occurs." 44 FR 3274, January 16, 1979, at 3278.) To clarify this, the 1988 guidance memo referred to above states that:

offsets sufficient to compensate for the source's significant impact must be obtained pursuant to an approved State offset program consistent with State Implementation Plan (SIP) requirements under 40 CFR 51.165(b). Where the source is contributing to an existing violation, the required offset may not correct the violation. Such existing violations must be addressed [through the SIP].

Note that additional guidance for this and other aspects of the modeling analysis for the impacts of SO<sub>2</sub> emissions on ambient concentrations of SO<sub>2</sub> are addressed in EPA modeling guidance, including the attached August 23, 2010 Memorandum titled "Applicability of Appendix W Modeling Guidance for the 1-hour SO<sub>2</sub> National Ambient Air Quality Standard."

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<sup>5</sup> While there is no 1-hour SO<sub>2</sub> significant impact level (SIL) currently defined in the PSD regulations, we believe that states may adopt interim values, with the appropriate justification for such values, to use for permitting purposes. In addition, we are recommending an interim SIL as part of this guidance for implementing the SO<sub>2</sub> requirements in the federal PSD program, and in state programs where states choose to use it.

<sup>6</sup> The same provision is contained in EPA's Interpretative Ruling at 40 CFR part 51 Appendix S, section III.

<sup>7</sup> In contrast to Nonattainment New Source Review permits, offsets are not mandatory requirements in PSD permits if it can otherwise be demonstrated that a source will not cause or contribute to a violation of the NAAQS. See, *In re Knauf Fiber Glass, GMBH*, 8 E.A.D. 121, 168 (EAB 1999).

Although EPA announced that it is revoking the annual and 24-hour SO<sub>2</sub> NAAQS, the June 22, 2010 preamble to the final rule announcing the new 1-hour SO<sub>2</sub> NAAQS explained that those standards will remain in effect for a limited period of time as follows: for current SO<sub>2</sub> nonattainment areas and SIP call areas, until attainment and maintenance SIPs are approved by EPA for the new 1-hour SO<sub>2</sub> NAAQS; for all other areas, for one year following the effective date of the initial designations under section 107(d)(1) for the new 1-hour SO<sub>2</sub> NAAQS. Accordingly, the annual and 24-hour SO<sub>2</sub> NAAQS must continue to be protected under the PSD program for as long as they remain in effect for a PSD area. There is a more detailed discussion of the transition from the existing SO<sub>2</sub> NAAQS to a revised SO<sub>2</sub> NAAQS in that preamble. Also, the same preamble includes a footnote listing the current nonattainment areas and SIP call areas. 75 FR 35520, at 35580-2.

In addition, the existing SO<sub>2</sub> increments (class I, II and III) for the annual and 24-hour averaging periods will not be revoked in conjunction with our decision to revoke the corresponding SO<sub>2</sub> NAAQS. Instead, the annual and 24-hour SO<sub>2</sub> increments (Class I, II and III increments) will remain in effect because they are defined in the Clean Air Act at title I, part C, section 163. The annual and 24-hour SO<sub>2</sub> increments in section 163 are considered part of the suite of statutory increments applicable to sulfur dioxide that Congress expressly included in the statutory provisions for PSD. As such, those increments cannot be revoked simply because we have decided to revoke the annual and 24-hour SO<sub>2</sub> NAAQS, upon which the SO<sub>2</sub> increments are based. Consequently, sources must continue to demonstrate that their proposed emissions increases of SO<sub>2</sub> emissions will not cause or contribute to any modeled violation of the existing annual and 24-hour SO<sub>2</sub> increments for as long as those statutory increments remain in effect. Increments for the 1-hour averaging period do not yet exist; the Act provides a specific schedule for the promulgation of additional regulations, which may include new increments, following the promulgation of new or revised NAAQS. EPA plans to begin that rulemaking process in the near future to consider the need for such increments.

## **“GOOD ENGINEERING PRACTICE” STACK HEIGHT AND DISPERSION TECHNIQUES**

If a permit applicant is unable to show that the source’s proposed emissions increase will not cause or contribute to a modeled violation of the new 1-hour SO<sub>2</sub> NAAQS, the problem could be the result of plume downwash effects causing high ambient concentrations near the source. In such cases, a source may be able to raise the height of its existing stacks (or designed stacks if not yet constructed) to a “good engineering practice” (GEP) stack height, or at least 65 meters, measured from the ground-level elevation at the base of the stack.

While not necessarily eliminating the full effect of downwash in all cases, raising stacks to GEP height may provide substantial air quality benefits in a manner consistent with statutory provisions (section 123 of the Act) governing acceptable stack heights to minimize excessive concentrations due to atmospheric downwash, eddies or wakes. Permit applicants should also be aware of the regulatory restrictions on stack heights for the purpose of modeling for compliance with NAAQS and increments. Section 52.21(h) of the PSD regulations currently prohibits the use of dispersion techniques, such as stack heights above GEP, merged gas streams, or intermittent controls for setting SO<sub>2</sub> emissions limits to meet the NAAQS and PSD increments.

However, stack heights in existence before December 31, 1970, and dispersion techniques implemented before then, are not affected by these limitations. EPA's general stack height regulations are promulgated at 40 CFR 51.100(ff), (gg), (hh), (ii), (jj), (kk) and (nn), and 40 CFR 51.118.

a. *Stack heights*: A source can include only the actual stack height up to GEP height when modeling to develop the SO<sub>2</sub> emissions limitations or to determine source compliance with the SO<sub>2</sub> NAAQS and increments. This is not a limit on the actual height of any stack constructed by a new source or modification, however, and there may be circumstances where a source owner elects to build a stack higher than GEP height. However, such additional height may not be considered when determining an emissions limitation or demonstrating compliance with an applicable NAAQS or PSD increment. Thus, when modeling, the following limitations apply in accordance with §52.21(h):

- For a stack height less than GEP, the actual stack height must be used in the source impact analysis for emissions;
- For a stack height equal to or greater than 65 meters the impact may be modeled using the greater of:
  - A *de minimis* stack height equal to 65 meters, as measured from the ground-level elevation at the base of the stack, without demonstration or calculation (40 CFR 51.100(ii)(1));
  - The refined formula height calculated using the dimensions of nearby structures in accordance with the following equation:

$GEP = H + 1.5L$ , where H is the height of the nearby structure and L is the lesser dimension of the height or projected width of the nearby structure (40 CFR 51.100(ii)(2)(ii)).<sup>8</sup>

- A GEP stack height exceeding the refined formula height may be approved when it can be demonstrated to be necessary to avoid "excessive concentrations" of SO<sub>2</sub> caused by atmospheric downwash, wakes, or eddy effects by the source, nearby structures, or nearby terrain features. (40 CFR 51.100(ii)(3), (jj), (kk));
- For purposes of PSD, "excessive concentrations" means a maximum ground-level concentration from a stack due in whole or in part to downwash, wakes, and eddy effects produced by nearby structures or nearby terrain features which individually is at least 40 percent in excess of the maximum concentration experienced in the absence of such effects and (a) which contributes to a total concentration due to emissions from all sources that is greater than the applicable NAAQS or (b) greater than the applicable PSD increments. (40 CFR 51.100(kk)(1)).

<sup>8</sup> For stacks in existence on January 12, 1979, the GEP equation is  $GEP = 2.5 H$  (provided the owner or operator produces evidence that this equation was actually relied on in establishing an emission limitation for SO<sub>2</sub> (40 CFR 51.100(ii)(2)(i))

Reportedly, for economic and other reasons, many existing source stacks have been constructed at heights less than 65 meters, and source impact analyses may show that the source's emissions will cause or contribute to a modeled violation of the 1-hour SO<sub>2</sub> NAAQS. Where this is the case, sources should be aware that it is permissible for them to increase their stack heights up to 65 meters without a GEP demonstration.

b. *Other dispersion techniques*: The term "dispersion technique" includes any practice carried out to increase final plume rise, subject to certain exceptions (40 CFR 51.100(hh)(1), (2)(i) – (v)). Beyond the noted exceptions, such techniques are not allowed for getting credit for modeling source compliance with the NAAQS and PSD increments. One such exception is for sources of SO<sub>2</sub>. Section 51.100(hh)(2)(v) provides that identified techniques that increase final exhaust gas plume rise are not considered prohibited dispersion techniques pursuant to section 51.100(hh)(1)(iii) "where the resulting allowable emissions of sulfur dioxide from the facility do not exceed 5,000 tons per year." Thus, proposed modifications that experience difficulty modeling compliance with the new 1-hour SO<sub>2</sub> NAAQS when relying on BACT or an air quality-based emissions limit alone may permissibly consider techniques to increase their final exhaust gas plume rise consistent with these provisions.

The definition of "dispersion technique" at 40 CFR 51.100(hh)(1)(iii) describes techniques that are generally prohibited, but which do not apply with respect to the exemption for SO<sub>2</sub>. Accordingly, it is permissible for eligible SO<sub>2</sub> sources to make adjustments to source process parameters, exhaust gas parameters, stack parameters, or to combine exhaust gases from several existing stacks into one stack, so as to increase the exhaust gas plume rise. It is important to remember that the exemption applies to sources that have facility-wide allowable SO<sub>2</sub> emissions of less than 5,000 tpy resulting from the increase in final exhaust gas plume rise. Thus, proposed modifications should not base their eligibility to use dispersion on the amount of the proposed net emissions increase, but on the total source emissions of SO<sub>2</sub>.

The EPA does not recommend or encourage sources to rely on dispersion to demonstrate compliance with the NAAQS; however, we acknowledge the fact that certain SO<sub>2</sub> sources may legally do so. For example, while increasing stack height is a method of dispersion, EPA's rules allow use of that approach to the extent the resulting height meets EPA's requirements defining "good engineering practice (GEP)" stack height. See 40 CFR 50.100(hh)(1)(i), 50.100(ii)(1)-(3). Nevertheless, EPA encourages PSD applicants to seek other remedies, including the use of the most stringent controls (beyond top-down BACT) feasible or the acquisition of emissions reductions (offsets) from other existing sources, to address situations where proposed emissions increases would result in modeled violations of the SO<sub>2</sub> NAAQS.

## **GENERAL START-UP CONDITIONS**

We do not anticipate widespread problems associated with high short-term SO<sub>2</sub> emissions resulting from start-up/shutdown conditions. Many sources are capable of starting a unit with natural gas or low-sulfur fuel to avoid significant start-up emissions problems. However, some sources could experience short-term peaks of SO<sub>2</sub> during start-up or shutdown that could adversely affect the new 1-hour SO<sub>2</sub> NAAQS. The EPA currently has no provisions for exempting emissions occurring during equipment start-up/shutdown from the BACT

requirements or for air quality analyses to demonstrate compliance with the SO<sub>2</sub> NAAQS and increments. Therefore, such emissions should be addressed in the required BACT and air quality analyses.

There are approaches to addressing issues related to start-up/shutdown emissions. For example, sources may be willing to accept enforceable permit conditions limiting equipment start-up/shutdown to certain hours of the day when impacts are expected to be lower than normal. Such permit limitations can be accounted for in the modeling of such emissions. Applicants should direct other questions arising concerning procedures for modeling start-up/shutdown emissions to the applicable permitting authority to determine the most current modeling guidance.

In the event of questions regarding the general implementation guidance contained in this memorandum, please contact Raj Rao ([rao.raj@epa.gov](mailto:rao.raj@epa.gov)).

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**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**  
**Office of Air Quality Planning and Standards**  
**Research Triangle Park, North Carolina 27711**

**August 23, 2010**

**MEMORANDUM**

**SUBJECT:** Applicability of Appendix W Modeling Guidance for the 1-hour SO<sub>2</sub>  
National Ambient Air Quality Standard

**FROM:** Tyler Fox, Leader /s/  
Air Quality Modeling Group, C439-01

**TO:** Regional Air Division Directors

**INTRODUCTION**

On June 2, 2010, EPA announced a new 1-hour sulfur dioxide (SO<sub>2</sub>) National Ambient Air Quality Standard (1-hour SO<sub>2</sub> NAAQS or 1-hour SO<sub>2</sub> standard) which is attained when the 3-year average of the 99th-percentile of the annual distribution of daily maximum 1-hour concentrations does not exceed 75 ppb at each monitor within an area. The final rule for the new 1-hour SO<sub>2</sub> NAAQS was published in the Federal Register on June 22, 2010 (75 FR 35520-35603), and the standard becomes effective on August 23, 2010 (EPA, 2010a). This memorandum clarifies the applicability of current guidance in the *Guideline on Air Quality Models* (40 CFR Part 51, Appendix W) for modeling SO<sub>2</sub> impacts in accordance with the Prevention of Significant Deterioration (PSD) permit requirements to demonstrate compliance with the new 1-hour SO<sub>2</sub> standard.

**SUMMARY OF CURRENT GUIDANCE**

Current modeling guidance for estimating ambient impacts of SO<sub>2</sub> for comparison with applicable NAAQS is presented in Section 4 of Appendix W under the general heading of "Traditional Stationary Source Models." This guidance acknowledges the fact that ambient SO<sub>2</sub> impacts are largely a result of emissions from stationary sources. Section 4.2.2 provides specific recommendations regarding "Refined Analytical Techniques," stating that "For a wide range of regulatory applications in all types of terrain, the recommended model is AERMOD" (see Section 4.2.2.b). As described in Section 4.1.d, the AERMOD dispersion model "employs best state-of-practice parameterizations for characterizing the meteorological influences and dispersion" (Cimorelli, *et al.*, 2004; EPA, 2004; EPA, 2009).

Section 7.2.6 of Appendix W addresses the issue of chemical transformation for modeling SO<sub>2</sub> emissions, stating that:

The chemical transformation of SO<sub>2</sub> emitted from point sources or single industrial plants in rural areas is generally assumed to be relatively unimportant to the estimation of maximum concentrations when travel time is limited to a few hours. However, in urban areas, where synergistic effects among pollutants are of considerable consequence, chemical transformation rates may be of concern. In urban area applications, a half-life of 4 hours may be applied to the analysis of SO<sub>2</sub> emissions. Calculations of transformation coefficients from site specific studies can be used to define a "half-life" to be used in a steady-state Gaussian plume model with any travel time, or in any application, if appropriate documentation is provided. Such conversion factors for pollutant half-life should not be used with screening analyses.

The AERMOD model incorporates the 4 hour half-life for modeling ambient SO<sub>2</sub> concentrations in urban areas under the regulatory default option.

General guidance regarding source emission input data requirements for modeling ambient SO<sub>2</sub> impacts is provided in Section 8.1 of Appendix W and guidance regarding determination of background concentrations for purposes of a cumulative ambient air quality impact analysis is provided in Section 8.2.

## **APPLICABILITY OF CURRENT GUIDANCE TO 1-HOUR SO<sub>2</sub> NAAQS**

The current guidance in Appendix W regarding SO<sub>2</sub> modeling in the context of the previous 24-hour and annual primary SO<sub>2</sub> NAAQS and the 3-hour secondary SO<sub>2</sub> NAAQS is generally applicable to the new 1-hour SO<sub>2</sub> standard. Since short-term SO<sub>2</sub> standards ( $\leq 24$  hours) have been in existence for decades, existing SO<sub>2</sub> emission inventories used to support modeling for compliance with the 3-hour and 24-hour SO<sub>2</sub> standards should serve as a useful starting point, and may be adequate in many cases for use in assessing compliance with the new 1-hour SO<sub>2</sub> standard, since issues identified in Table 8-2 of Appendix W related to short-term vs. long-term emission estimates may have already been addressed. However, the PSD applicant and reviewing authority may need to reassess emission estimates for very short-term emission scenarios, such as start-up and shut-down operations, for purposes of estimating source impacts on the 1-hour SO<sub>2</sub> standard. This is especially true if existing emission estimates for 3-hour or 24-hour periods are based on averages that include zero (0) or reduced emissions for some of the hours.

Given the form of the new 1-hour SO<sub>2</sub> standard, we are providing clarification regarding the appropriate data periods for modeling demonstrations of compliance with the NAAQS vs. demonstrations of attainment of the NAAQS through ambient monitoring. While monitored design values for the 1-hour SO<sub>2</sub> standard are based on a 3-year average (in accordance with Section 1(c) of Appendix T to 40 CFR Part 50), Section 8.3.1.2 of Appendix W addresses the length of the meteorological data record for dispersion modeling, stating that "[T]he use of 5 years of NWS [National Weather Service] meteorological data or at least 1 year of site specific data is required." Section 8.3.1.2.b further states that "one year or more (including partial years), up to five years, of site specific data . . . are preferred for use in air quality analyses." Although the monitored design value for the 1-hour SO<sub>2</sub> standard is defined in terms of the 3-year average, this definition does not preempt or alter the Appendix W requirement for use of 5 years of NWS

meteorological data or at least 1 year of site specific data. The 5-year average based on use of NWS data, or an average across one or more years of available site specific data, serves as an unbiased estimate of the 3-year average for purposes of modeling demonstrations of compliance with the NAAQS. Modeling of “rolling 3-year averages,” using years 1 through 3, years 2 through 4, and years 3 through 5, is not required. Furthermore, since modeled results for SO<sub>2</sub> are averaged across the number of years modeled for comparison to the new 1-hour SO<sub>2</sub> standard, the meteorological data period should include complete years of data to avoid introducing a seasonal bias to the averaged impacts. In order to comply with Appendix W recommendations in cases where partial years of site specific meteorological data are available, while avoiding any seasonal bias in the averaged impacts, an approach that utilizes the most conservative modeling result based on the first complete-year period of the available data record vs. results based on the last complete-year period of available data may be appropriate, subject to approval by the appropriate reviewing authority. Such an approach would ensure that all available site specific data are accounted for in the modeling analysis without imposing an undue burden on the applicant and avoiding arbitrary choices in the selection of a single complete-year data period.

The form of the new 1-hour SO<sub>2</sub> standard also has implications regarding appropriate methods for combining modeled ambient concentrations with monitored background concentrations for comparison to the NAAQS in a cumulative modeling analysis. As noted in the March 23, 2010 memorandum regarding “Modeling Procedures for Demonstrating Compliance with PM<sub>2.5</sub> NAAQS” (EPA, 2010b), combining the 98<sup>th</sup> percentile monitored value with the 98<sup>th</sup> percentile modeled concentrations for a cumulative impact assessment could result in a value that is below the 98<sup>th</sup> percentile of the combined cumulative distribution and would, therefore, not be protective of the NAAQS. However, unlike the recommendations presented for PM<sub>2.5</sub>, the modeled contribution to the cumulative ambient impact assessment for the 1-hour SO<sub>2</sub> standard should follow the form of the standard based on the 99<sup>th</sup> percentile of the annual distribution of daily maximum 1-hour concentrations averaged across the number of years modeled. A “first tier” assumption that may be applied without further justification is to add the overall highest hourly background SO<sub>2</sub> concentration from a representative monitor to the modeled design value, based on the form of the standard, for comparison to the NAAQS. Additional refinements to this “first tier” approach based on some level of temporal pairing of modeled and monitored values may be considered on a case-by-case basis, subject to approval by the reviewing authority, with adequate justification and documentation.

Section 8.2.3 of Appendix W provides recommendations regarding the determination of background concentrations for multi-source areas. That section emphasizes the importance of professional judgment by the reviewing authority in the identification of nearby and other sources to be included in the modeled emission inventory, and establishes “a significant concentration gradient in the vicinity of the source” under consideration as the main criterion for this selection. Appendix W also indicates that “the number of such [nearby] sources is expected to be small except in unusual situations.” See Section 8.2.3.b.

The representativeness of available ambient air quality data also plays an important role in determining which nearby sources should be included in the modeled emission inventory. Key issues to consider in this regard are the extent to which ambient air impacts of emissions from nearby sources are reflected in the available ambient measurements, and the degree to

which emissions from those background sources during the monitoring period are representative of allowable emission levels under the existing permits. The professional judgments that are required in developing an appropriate inventory of background sources should strive toward the proper balance between adequately characterizing the potential for cumulative impacts of emission sources within the study area to cause or contribute to violations of the NAAQS, while minimizing the potential to overestimate impacts by double counting modeled source impacts that are also reflected in the ambient monitoring data.

We would also caution against the literal and uncritical application of very prescriptive procedures for identifying which background sources should be included in the modeled emission inventory for NAAQS compliance demonstrations, including those described in Chapter C, Section IV.C.1 of the draft *New Source Review Workshop Manual* (EPA, 1990), noting again that Appendix W emphasizes the importance of professional judgment in this process. While the draft workshop manual serves as a useful general reference that provides potential approaches for meeting the requirements of New Source Review (NSR) and PSD programs, it is not the only source of EPA modeling guidance. The procedures described in the manual may be appropriate in some circumstances for defining the spatial extent of sources whose emissions may need to be considered, but not in others. While the procedures described in the NSR Workshop Manual may appear very prescriptive, it should be recognized that “[i]t is not intended to be an official statement of policy and standards and does not establish binding regulatory requirements.” See, Preface.

Given the range of issues involved in the determination of an appropriate inventory of emissions to include in a cumulative impact assessment, the PSD applicant should consult with the appropriate reviewing authority early in the process regarding the selection and proper application of appropriate monitored background concentrations and the selection and appropriate characterization of modeled background source emission inventories for use in demonstrating compliance with the new 1-hour SO<sub>2</sub> standard.

## SUMMARY

To summarize, we emphasize the following points:

1. Current guidance in Appendix W for modeling to demonstrate compliance with the previous 24-hour and annual primary SO<sub>2</sub> standards, and 3-hour secondary SO<sub>2</sub> standard, is generally applicable for the new 1-hour SO<sub>2</sub> NAAQS.
2. While the 1-hour NAAQS for SO<sub>2</sub> is defined in terms of the 3-year average for monitored design values to determine attainment of the NAAQS, this definition does not preempt or alter the Appendix W requirement for use of 5 years of NWS meteorological data or at least 1 year of site specific data.

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**ATTACHMENT 3**  
**Division of Air Quality PM<sub>2.5</sub> Design Values Report**

# West Virginia PM2.5

## Design Values

data final and certified through 12/31/2016

County	Site	(NAAQS 24 hr 2 yr 95% = 35 µg/m³)													(Annual NAAQS <= 12.0 µg/m³)												
		02-04	03-05	04-06	05-07	06-08	07-09	08-10	09-11	10-12	11-13	12-14	13-15	14-16	02-04	03-05	04-06	05-07	06-08	07-09	08-10	09-11	10-12	11-13	12-14	13-15	14-16
Berkeley	Martinsburg	37	36	34	33	31	29	31	30	31	26	27	26	27	16.1	16.2	15.8	16.0	14.9	14.0	12.9	11.8	11.6	10.7	10.4	10.3	9.9
Brooke	Pollansbee	44	43	40	37	37	34	31	27	27	26	24	23	22	16.5	16.8	16.4	16.4	14.4	13.7	13.0	12.7	11.8	11.1	11.2	10.8	10.5
	Weirton-Natl. Hgts	47	49	43	44	41	37	31	29	27	28	24	24	23	15.5	16.4	16.7	16.1	14.9	14.0	13.1	11.6	11.1	10.1	10.4	10.3	9.8
Cabell	Huntington	37	36	34	37	32	30	28	26	24	21	21	21	20	15.8	16.3	16.1	16.5	14.5	13.1	12.1	11.6	10.4	9.8	9.2	8.7	
Hancock	Weirton-Summit Circle																										
	Weirton-Oak St.	44	41	40	41	39	35	31	28	27	26	23	22	21	17.0	16.6	16.4	16.2	14.3	13.4	12.4	11.7	11.3	10.5	10.0	10.0	9.6
Harrison	Clarksburg	34	32	35	34	31	26	23	21	21	20	19	19	18	13.8	13.9	13.9	14.2	13.4	12.5	11.5	10.6	10.2	9.2	9.1	8.8	8.4
Kanawha	Charleston	34	34	35	36	34	29	25	24	23	21	18	18		14.8	15.1	15.0	15.4	14.2	13.1	11.8	11.0	10.7	9.7	9.1	8.6	8.5
	Charleston NCore												14														7.6
	So. Charleston	36	36	37	38	36	32	28	26	24	22	20	20	19	16.4	16.6	16.4	16.6	15.4	14.4	13.2	12.5	11.9	10.8	10.2	9.5	9.0
Marion	Fairmont	35	34	34	34	32	28	26	25	23	22	19	19	18	14.8	15.0	14.9	15.3	14.5	13.6	12.9	12.1	11.6	10.3	9.7	9.4	8.9
Marshall	Moundsville	38	33	34	35	34	31	29	29	28	26	23	23	22	18.1	18.3	18.0	18.2	17.4	16.2	15.1	13.9	12.5	11.6	11.1	10.7	10.2
Monongalia	Morgantown	39	36	34	36	34	30	28	28	24	22	18	19	18	14.5	14.5	14.1	14.4	13.5	12.7	11.8	10.9	10.3	9.5	8.8	8.5	8.1
Ohio	Wheeling	35	32	31	32	31	29	26	26	25	24	22	23	20	14.7	14.9	14.2	14.6	13.7	13.2	12.4	11.9	11.5	10.6	10.4	10.3	9.5
Raleigh	Beckley	32	31	31	30	28	24	21	20	20	19	14	11		12.5	12.9	12.8	13.0	11.9	11.0	10.1	9.8	9.3	8.3	6.8	6.9	6.1
Wood	Vienna	35	34	36	37	34	31	26	27	24	22	19	21	19	18.2	18.4	18.3	18.4	14.5	13.7	13.1	12.3	11.8	10.4	9.8	9.4	8.9

\* Summit Circle sampling started 1/1/2016; therefore 3 yr 95% not complete  
Charleston NCore sampling started 1/1/2016; therefore 3 yr 95% not complete  
Oak Street site shut-down 12/31/2014  
Charleston site shut-down 12/31/2015

## **APPENDIX B**

Recommend Draft

For

Permit Application R14-0015M

*West Virginia Department of Environmental Protection*  
*Jim Justice*  
*Governor*

*Division of Air Quality*

*Austin Caperton*  
*Cabinet Secretary*

# Major Modification Permit



**R14-0015M**

*This permit is issued in accordance with the West Virginia Air Pollution Control Act (West Virginia Code §§22-5-1 et seq.) and 45 C.S.R. 13 – Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Temporary Permits, General Permits and Procedures for Evaluation. The permittee identified at the above-referenced facility is authorized to construct the stationary sources of air pollutants identified herein in accordance with all terms and conditions of this permit.*

*Issued to:*  
**Knauf Insulation, Inc.**  
**Inwood Facility**  
**003-00012**

---

*William F. Durham*  
*Director*

*Issued: DRAFT*

This permit will supercede and replace Permit R14-0015L.

Facility Location: 4812 Tabler Station Road  
Inwood, Berkeley County, West Virginia 25428  
Mailing Address: Same as Above  
Facility Description: Wool Fiberglass Manufacturing Facility  
NAICS Codes: 327993  
UTM Coordinates: 756.55 km Easting • 4,365.50 km Northing • Zone 17  
Permit Type: Major Modification of a Major Source  
Description of Change: This action is for replacing the electric arc glass-melting furnace with gas oxygen fueled furnace and associated changes to the line to account for the increase in melting capacity for Line 2 which will be restarted to resume operations.

*Any person whose interest may be affected, including, but not necessarily limited to, the applicant and any person who participated in the public comment process, by a permit issued, modified or denied by the Secretary may appeal such action of the Secretary to the Air Quality Board pursuant to article one [§§22B-1-1 et seq.], Chapter 22B of the Code of West Virginia. West Virginia Code §§22-5-14.*

*As a result of the granting of this permit, the source is subject to 45CSR30. The Title V (45CSR30) application will be due within twelve (12) months after the date of the commencement of the operation or activity (activities) authorized by this permit, unless granted a deferral or exemption by the Director from such filing deadline pursuant to a request from the permittee.*

## Table of Contents

<b>1.0.</b>	<b>Emission Units.....</b>	<b>4</b>
<b>1.1.</b>	<b>Control Devices .....</b>	<b>8</b>
<b>2.0.</b>	<b>General Conditions.....</b>	<b>11</b>
2.1.	Definitions .....	11
2.2.	Acronyms .....	11
2.3.	Authority .....	11
2.4.	Term and Renewal.....	12
2.5.	Duty to Comply .....	12
2.6.	Duty to Provide Information.....	12
2.7.	Duty to Supplement and Correct Information .....	13
2.8.	Administrative Update.....	13
2.9.	Permit Modification.....	13
2.10.	Major Permit Modification.....	13
2.11.	Inspection and Entry.....	13
2.12.	Emergency.....	13
2.13.	Need to Halt or Reduce Activity Not a Defense.....	14
2.14.	Suspension of Activities .....	14
2.15.	Property Rights.....	14
2.16.	Severability.....	15
2.17.	Transferability .....	15
2.18.	Notification Requirements.....	15
2.19.	Credible Evidence .....	15
<b>3.0.</b>	<b>Facility-Wide Requirements .....</b>	<b>16</b>
3.1.	Limitations and Standards .....	16
3.2.	Monitoring Requirements.....	16
3.3.	Testing Requirements .....	16
3.4.	Recordkeeping Requirements.....	17
3.5.	Reporting Requirements .....	18
<b>4.0.</b>	<b>Fiberglass Production Lines Specific Requirements .....</b>	<b>20</b>
4.1.	Limitations and Standards .....	20
4.2.	Monitoring Requirements.....	23
4.3.	Testing Requirements .....	24
4.4.	Recordkeeping Requirements.....	26
4.5.	Reporting Requirements .....	27
<b>5.0.</b>	<b>Material Handling and Other Sources Specific Requirements .....</b>	<b>28</b>
5.1.	Limitations and Standards .....	28
5.2.	Monitoring Requirements.....	31
5.3.	Testing Requirements .....	32
5.4.	Recordkeeping Requirements.....	32
5.5.	Reporting Requirements .....	33
<b>CERTIFICATION OF DATA ACCURACY .....</b>		<b>34</b>

## 1.0. Emission Units

Emission Unit ID	Emission Point ID	Emission Unit Description	Year Installed	Design Capacity	Control Device
<b>RAW MATERIAL HANDLING OPERATIONS (GROUP 001)</b>					
ES1A	FP23	Raw Material Storage Bin for Sand	07/25/1998	178.35 Tons	CD1A
ES1B	FP23	Raw Material Storage Bin for Borax	07/25/1998	137.45 tons	CD1B
ES1C	FP23	Raw Material Storage Bin for Borax	07/25/1998	137.45 tons	CD1B
ES1D	FP23	Raw Material Storage Bin for Soda Ash	07/25/1998	137.45 tons	CD1D
ES1E	FP23	Raw Material Storage Bin for Soda Ash	07/25/1998	137.45 tons	CD1D
ES1F	FP23	Raw Material Storage Bin for Aplite	07/25/1998	137.45 tons	CD1F
ES1G	FP23	Raw Material Storage Bin for Lime	07/25/1998	109.5 tons	CD1G
ES1H	FP23	Raw Material Storage Bin for Cullet	07/25/1998	108.50 Tons	CD1I
ES1I	FP23	Raw Material Storage Bin for Cullet	07/25/1998	108.50 Tons	CD1I
ES1J	FP23	Raw Material Storage Bin for Cullet	07/25/1998	137.45 tons	CD1F
ES1L	FP23	Raw Material Storage Bin for Cullet	2017	137.45 tons	CD1F
ES1M	FP23	Raw Material Storage Bin for Cullet	2017	137.45 tons	CD1F
ES1N	FP23	Raw Material Storage Bin for Cullet	2017	137.45 tons	CD1F
ES1K	FP23	Raw Material Storage Bin for Baghouse Dust	07/25/1998	75.00 tons	CD1K
ES22A	FP23	Batch Mixer's Receiving Bin for 2nd Line	2004	8,000 lbs.	CD12A
ES22B	FP23	Mixed Batch Storage Backup Day Bin for 2nd Line	2004	8,000 lbs.	CD22C
ES12B	FP11	Mixed Batch Storage backup day bin for 1st Line	07/25/1998	21.72 tons	CD12D
ES12D	FP11	Mixed Batch Storage Day Bin for 1st Line	07/25/1998	39.0 tons	CD12C
ES12Db	FP11	Mixed Batch Storage Silo for 1st Line	07/25/1998	1.31 tons	CD12Cb
ES11a	EP11a	Line 2 Day Bin A	2017		CD11a
ES11b	EP11b	Line 2 Day Bin B	2017		CD11b
<b>TANKS (Group 001)</b>					
T3	FP11	ECOSE Storage Tank	07/25/1998	4,500 gallons	NA
T4	FP11	ECOSE Storage Tank	07/25/1998	4,500 gallons	NA
T5	FP11	ECOSE Storage Tank	07/25/1998	4,500 gallons	NA
T6	FP11	ECOSE Storage Tank	07/25/1998	4,500 gallons	NA

Emission Unit ID	Emission Point ID	Emission Unit Description	Year Installed	Design Capacity	Control Device
T7A	FP11	Wax Storage Tank	2014	5,000 gallons	NA
T7B	FP11	Wax Storage Tank	2014	5,000gallons	NA
T8	FP11	Ammonia (aqueous) Storage Tank	07/25/1998	6,000 gallons	NA
M1	FP11	Ammonia Sulfate Mix Tank	2015	1,200 gallons	N/A
M2	FP11	Ammonia Sulfate Holding Tank	2015	1,700 gallons	NA
M3	FP11	Spare Holding Tank	2015	1,700 gallons	NA
M4	FP11	Filtered Water Hold Tank	2015	3,200 gallons	NA
M5	FP11	Binder Mix Tank	2015	750 gallons	NA
M6	FP11	Binder Hold Tank	2015	1,700 gallons	NA
<b>MELTING &amp; REFINING LINE 1 (Group 002) [9,000 lbs/hr or 39,420 TPY Production Rate]</b>					
ES12C	EP12	Melter Hood for 1st Line	07/25/1998	4.50 TPH of melted glass	CD12B & CD12Bb
ES12E	EP12 and EP13	Forehearth for 1st Line Natural Gas Fired Brick Holding Process Heater Tank Max Heat Input Rate: 5.5 MMBtu/hr	07/25/1998	9,000 lbs of Glass per hour	CD13A & CD13B
<b>FORMING &amp; COLLECTING 1 (Group 004)</b>					
ES13A	EP13	Glass Fiber Forming Units	07/25/1998	9,000 lbs/hr	CD13A, CD13B & CD13C
<b>CURING &amp; COOLING LINE 1 (Group 006)</b>					
ES14A	EP14	3 Zone Curing Oven Manufacturer: B&M Steel of New Castle Indiana; Natural Gas Fired Max Heat Input Rate: 18.0 MMBtu/hr	07/25/1998	9,000 lbs/hr	CD14A
ES14B	EP14	Cooling Table for 1st Line	07/25/1998	9,000 lbs/hr	CD14A
<b>FACING SIZING &amp; PACKAGING FOR LINE 1 (Group 008)</b>					
ES15A	FP15	Hot Roll – Facing Application	07/25/1998	50-400°F @ 180 GPM	None
ES15Aa	FP15	Infrared Radiation – Facing Application	2004	50-400°F @ 200 amps	CD15A
ES15B	FP15	Slitter Saw	07/25/1998	NA	CD15A
ES15C	FP15	EdgeTrimmer and Dicers (or Cubes)	07/25/1998	NA	CD15C and CD15D

Emission Unit ID	Emission Point ID	Emission Unit Description	Year Installed	Design Capacity	Control Device
ES15D	FP15	Choppers	07/25/1998	NA	CD15A
ES15E	FP15	Roll Up	07/25/1998	NA	CD15A
ES15F	FP15	Batt Folder	07/25/1998	NA	CD15A
ES15G	FP15	Batt Packers	07/25/1998	NA	CD15A
ES15H	FP15	Dicers or Cubers	07/25/1998	NA	CD15C and CD15D
ES15I	FP15	Blowing Wool Bagger	07/25/1998	NA	CD15A, CD15C, and CD15D
ES15J	FP15	Ring Wrapper	07/25/1998	NA	CD15A
CD15D	FP15	Screen Rooms (2)	2007/2012	Total 20,000 cfm	None
ES25J	FP15	Dicers	2004	NA	CD25A
ES25K	FP15	Silicone & De-Dusting Oil Application	2004	NA	CD25C and CD25D
ES25L	FP15	Blowing Wool Bagger	2004	NA	CD25C and CD25D
<b>MELTING &amp; REFINING LINE 2 (Group 003) [13,333 lbs/hr Production Rate]</b>					
ES22	EP23	ML2INW King Melter Gas (natural gas- NG) oxygen fuel furnace Includes Electric Gas fired canal and electric forehearth	2017	6.67 tons of glass pulled (TGP)/hr	CD22B
<b>FORMING &amp; COLLECTING 2 (Group 005)</b>					
ES22E	EP23	ML2INW Forming Includes forming units (fiberizers), and collection plenum Design Total Heat Input of 20 MMBtu/hr of NG	2017	6.67 TGP/hr	CD23A, CD23B, CD23C CD23D
<b>CURING &amp; COOLING LINE 2 (Group 006)</b>					
ES24A	EP24	5 Zone Curing Oven with two vestibule burners Natural Gas Fired with Max Heat Input Rate: 25.2 MMBtu/hr	2017	6.67 TGP/hr	CD24A
ES24B	EP24	Cooling Table	2017	6.67 TGP/hr	CD24B
<b>FACING SIZING &amp; PACKAGING FOR LINE 2 (Group 008)</b>					
ES25A	FP23	Infrared Radiation – Facing Application Manufacturer: Solartronics IRT Model No.: IRT-MiniFlex Type: Electric	2004		None
ES25B	FP23	Slitter Saw	2004	NA	CD25A

Emission Unit ID	Emission Point ID	Emission Unit Description	Year Installed	Design Capacity	Control Device
CD25A		Water Venturi Scrubbers Manufacturer: Fisher-Klosterman, Inc. Model: MS-650H Removal Efficiency: 85 % Scrubbing Liquid: Water	2004	20,000 cfm	None
ES25C	FP23	Edge Trimmer and Dicers (or Cubes) Manufacturer:	2004		CD25A
ES25D	FP23	Choppers Manufacturer: United Tool Model No.: UX-431	2004		CD25A
ES25F	FP23	Batt Folder	2004		CD25A
ES25G	FP23	Batt Packers	2004		CD25C and CD25D
ES25H	FP23	Dicers or Cubers	2004	NA	CD25C and CD25D
ES25I	FP23	Blowing Wool Bagger	2004	NA	CD25C and CD25D
ES25J	FP23	Ring Wrapper	2004	NA	CD25A
ES25K	FP23	Silicone & Dedusting Oil Application	2004	N/A	CD25C and CD25D
ES25L	FP23	Blowing Wool Bagger	2004	N/A	CD25C and CD25D
CD25C	FP15	Dual Cyclone and Condenser Manufacturer: Van Dommele	2004	NA	CD25D
CD25D	FP15	Screen Room	2007/2012	10,000 cfm	None
		8' x 8' x 16'			
		Woven Polyester			
		Capture efficiency 95%			
ES25J	FP15	Dicers	2004	NA	CD25A
		Manufacturer: Custom Design			
		Model No.: NA			
		Type: NA			
ES25K	FP15	Silicone & De-Dusting Oil Application	2004	NA	CD25C and CD25D
ES25L	FP15	Blowing Wool Bagger Manufacturer: Custom Design	2004	NA	CD25C and CD25D
<b>SUPPORT FACILITIES (Group 009)</b>					
ESDG12	EP16	Emergency Generator Manufacture: Caterpillar Model No 3406 Diesel Fired Compression Ignition Engine	07/25/1998	587-bhp	None

Emission Unit ID	Emission Point ID	Emission Unit Description	Year Installed	Design Capacity	Control Device
ESDG13	EP17	Emergency Backup Generator Manufacture: Caterpillar Model No.: 3456 Diesel Fired, Compression Ignition Engine	2004	610-bhp	None
ESFW11	EP18	Emergency Fire Water Manufacturer: Cummins Model NT-855-F1 Diesel Fired Compression Ignition Engine	07/25/1998	255 hp	None
ESDG14	NewGEN	Emergency Generator Set Caterpillar C18 Diesel Fired Compression Ignition Engine	2017	900 bhp	None
ESSH15	EP19	Air Handling Unit: Rapid Engineering, Model: 4089 Fuel: Pipeline Quality Natural Gas	07/25/1998	8.525 MMBtu/hr	
ESSH16	EP22	Air Handling Unit; Rapid Engineering, Model 4089	2004	7.875 MMBtu/hr	
CT3	CT3	Cooling Tower	2017		Drift Eliminator
CT4	CT4	Cooling Tower	2017		Drift Eliminator
CT5	CT5	Cooling Tower	2017		Drift Eliminator

### 1.1. Control Devices

Control Device ID	Emission Point ID	Emission Unit Description	Year Installed	Design Capacity	
CD1A	FP11	Whirl-Air Flow Bin Vent DC Model: 195-42	07/25/1998	585 acfm	None
CD1B	FP11	Whirl-Air Flow Bin Vent DC Model: 195-42	07/25/1998	585 acfm	None
CD1D	FP11	Whirl-Air Flow Bin Vent DC Model: 195-42	07/25/1998	585 acfm	None
CD1D	FP11	Whirl-Air Flow Bin Vent DC Model: 195-42	07/25/1998	585 acfm	None
CD1F	FP11	Whirl-Air Flow Bin Vent DC Model: 195-42	07/25/1998	585 acfm	None
CD1G	FP11	Whirl-Air Flow Bin Vent DC 2 Model: 195-42	07/25/1998	585 acfm	None
CD1I	FP11	Whirl-Air Flow Bin Vent DC Model: 195-42	07/25/1998	585 acfm	None

Control Device ID	Emission Point ID	Emission Unit Description	Year Installed	Design Capacity	
CD1K	FP11	Whirl-Air Flow Bin Vent DC Model: 55-30	07/25/1998	165 acfm	None
CD12A	FP11	Whirl-Air Flow Bin Vent DC Model: 345-56	07/25/1998	1,035 acfm	None
CD22A	FP11	IAC Bin-Vent Model: 96TB-FRIP	07/25/1998	2,917 acfm	None
CD12D	FP11	Whirl-Air Flow Bin Vent DC Model: 130-42	07/25/1998	390 acfm	None
CD11a	EP11a	TBD	2017	TBD	None
CD11b	EP11b	TBD	2017	TBD	None
CD12C	FP11	Whirl-Air Flow Bin Vent DC Model: 230-56	07/25/1998	690 acfm	None
CD12Cb	FP11	Whirl-Air Flow Bin Vent DC Model: 265-42	07/25/1998	795 acfm	None
CD12B	EP12	Mactiflo Cartridge Dust Collector Filter Model: MAC 4 – MTF96 Configuration: Closed Pressure Filter Material: Polyester Cartridge Filter Cleaning Method: Pulse Air Removal Efficiency: 99% Filter Area: 28,320 ft	07/25/1998	15,000 acfm	None
CD12Bb (Backup)	EP12	Mactiflo Cartridge Dust Collector Model: MactFlo 4MTF32 Filter Configuration: Closed Pressure Filter Material: Polyester cartridge filter Cleaning Method: Pulse Air Removal Efficiency: 99% Filter Area: 3,520 ft <sup>2</sup>	07/25/1998	10,000 acfm	None
CD13A	EP13	Venturi Wet Scrubber Removal Efficiency: 99% for PM	2015	53,000 acfm	None
CD13B	EP13	Venturi Wet Scrubber Removal Efficiency: 99% for PM	2015	53,000 acfm	None
CB13C	EP13	Venturi Wet Scrubber Removal Efficiency: 99% for PM	2015	53,000 acfm	None

Control Device ID	Emission Point ID	Emission Unit Description	Year Installed	Design Capacity	
CD14A	EP14	McGill AirClean RTO Thermal Oxidizer Manufacturer: United McGill Model No.: 2-151C306 Destruction Efficiency: 95 % for VOC	07/25/1998	1,785 MMft <sup>3</sup> / hr at 250.0 °F	None
CD15A	FP15	Wet Collection System (Dynamic Separator)	07/25/1998	20,000 cfm	None
CD15C	FP15	Dual Cyclone and Condenser	2006	NA	CD15D
CD23A	EP23	Water Venturi Scrubbers Manufacturer: Fisher-Klosterman, Inc Model: MS-1300 Removal Efficiency: 98% for PM Scrubbing Liquid: Water	2017	65,000 cfm	None
CD23B	EP23	Water Venturi Scrubbers Manufacturer: Fisher-Klosterman, Inc Model: MS-1300 Removal Efficiency: 98 % Scrubbing Liquid: Water	2017	65,000 cfm	None
CD23C	EP23	Water Venturi Scrubbers Manufacturer: Fisher-Klosterman, Inc. Model: MS-1300 Removal Efficiency: 98 % Scrubbing Liquid: Water Custom Design	2017	65,000 cfm	None
CD23C	EP23	Water Venturi Scrubbers Manufacturer: Fisher-Klosterman, Inc. Model: MS-1300 Removal Efficiency: 98 % Scrubbing Liquid: Water	2017	65,000 cfm	None
CD24A	EP24	McGill Air Clean MCT 30.0 Regentive Thermal Oxidizer Destruction Efficiency: 95 % for VOC	2004		
CD24B	EP24	Water Venturi Scrubbers Manufacturer: Fisher-Klosterman, Inc.			
CD25A	FP23	Dust Collectector (cyclone) -Device vents to CD25Ab	2017	NA	
CD25Ab	FP23	Secondary dust collector (cartridge filter)	2017	NA	

## 2.0. General Conditions

### 2.1. Definitions

- 2.1.1. All references to the “West Virginia Air Pollution Control Act” or the “Air Pollution Control Act” mean those provisions contained in W.Va. Code §§ 22-5-1 to 22-5-18.
- 2.1.2. The “Clean Air Act” means those provisions contained in 42 U.S.C. §§ 7401 to 7671q, and regulations promulgated thereunder.
- 2.1.3. “Secretary” means the Secretary of the Department of Environmental Protection or such other person to whom the Secretary has delegated authority or duties pursuant to W.Va. Code §§ 22-1-6 or 22-1-8 (45CSR§30-2.12.). The Director of the Division of Air Quality is the Secretary’s designated representative for the purposes of this permit.

### 2.2. Acronyms

<b>CAAA</b>	Clean Air Act Amendments	<b>NO<sub>x</sub></b>	Nitrogen Oxides
<b>CBI</b>	Confidential Business Information	<b>NSPS</b>	New Source Performance Standards
<b>CEM</b>	Continuous Emission Monitor	<b>PM</b>	Particulate Matter
<b>CES</b>	Certified Emission Statement	<b>PM<sub>2.5</sub></b>	Particulate Matter less than 2.5 µm in diameter
<b>C.F.R. or CFR</b>	Code of Federal Regulations	<b>PM<sub>10</sub></b>	Particulate Matter less than 10µm in diameter
<b>CO</b>	Carbon Monoxide	<b>Ppb</b>	Pounds per Batch
<b>C.S.R. or CSR</b>	Codes of State Rules	<b>Pph</b>	Pounds per Hour
<b>DAQ</b>	Division of Air Quality	<b>Ppm</b>	Parts per Million
<b>DEP</b>	Department of Environmental Protection	<b>Ppmv or ppmv</b>	Parts per Million by Volume
<b>dscm</b>	Dry Standard Cubic Meter	<b>PSD</b>	Prevention of Significant Deterioration
<b>FOIA</b>	Freedom of Information Act	<b>Psi</b>	Pounds per Square Inch
<b>HAP</b>	Hazardous Air Pollutant	<b>SIC</b>	Standard Industrial Classification
<b>HON</b>	Hazardous Organic NESHAP	<b>SIP</b>	State Implementation Plan
<b>HP</b>	Horsepower	<b>SO<sub>2</sub></b>	Sulfur Dioxide
<b>lbs/hr</b>	Pounds per Hour	<b>TAP</b>	Toxic Air Pollutant
<b>LDAR</b>	Leak Detection and Repair	<b>TGP</b>	Ton of Glass Pulled
<b>M</b>	Thousand	<b>TPY</b>	Tons per Year
<b>MACT</b>	Maximum Achievable Control Technology	<b>TRS</b>	Total Reduced Sulfur
<b>MDHI</b>	Maximum Design Heat Input	<b>TSP</b>	Total Suspended Particulate
<b>MM</b>	Million	<b>USEPA</b>	United States Environmental Protection Agency
<b>MMBtu/hr or mmbtu/hr</b>	Million British Thermal Units per Hour	<b>UTM</b>	Universal Transverse Mercator
<b>MMCF/hr or mmcf/hr</b>	Million Cubic Feet per Hour	<b>VEE</b>	Visual Emissions Evaluation
<b>NA</b>	Not Applicable	<b>VOC</b>	Volatile Organic Compounds
<b>NAAQS</b>	National Ambient Air Quality Standards	<b>VOL</b>	Volatile Organic Liquids
<b>NESHAPS</b>	National Emissions Standards for Hazardous Air Pollutants		

### 2.3. Authority

This permit is issued in accordance with West Virginia Air Pollution Control Act W.Va. Code §§ 22-5-1, et seq. and the following Legislative Rules promulgated thereunder:

- 2.3.1. 45CSR13 – *Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Temporary Permits, General Permits and Procedures for Evaluation;*
- 2.3.2. 45CSR14 – *Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution for the Prevention of Significant Deterioration;*

## **2.4. Term and Renewal**

- 2.4.1. This permit supersedes and replaces previously issued Permit R14-0015L. This Permit shall remain valid, continuous and in effect unless it is revised, suspended, revoked or otherwise changed under an applicable provision of 45CSR13 or any other applicable legislative rule;

## **2.5. Duty to Comply**

- 2.5.1. The permitted facility shall be constructed and operated in accordance with the plans and specifications filed in Permit Application R14-0015, R14-0015A, R14-0015B, R14-0015C, R14-0015D, R14-0015E, R14-0015F, R14-0015G, R14-0015H, R14-0015I, R14-0015J, R14-0015K, R14-0015L, R14-0015M, and any modifications, administrative updates, or amendments thereto. The Secretary may suspend or revoke a permit if the plans and specifications upon which the approval was based are not adhered to;  
[45CSR§§13-5.11 and 10.3.]
- 2.5.2. The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the West Virginia Code and the Clean Air Act and is grounds for enforcement action by the Secretary or USEPA;
- 2.5.3. Violations of any of the conditions contained in this permit, or incorporated herein by reference, may subject the permittee to civil and/or criminal penalties for each violation and further action or remedies as provided by West Virginia Code 22-5-6 and 22-5-7;
- 2.5.4. Approval of this permit does not relieve the permittee herein of the responsibility to apply for and obtain all other permits, licenses, and/or approvals from other agencies; i.e., local, state, and federal, which may have jurisdiction over the construction and/or operation of the source(s) and/or facility herein permitted.

## **2.6. Duty to Provide Information**

The permittee shall furnish to the Secretary within a reasonable time any information the Secretary may request in writing to determine whether cause exists for administratively updating, modifying, revoking, or terminating the permit or to determine compliance with the permit. Upon request, the permittee shall also furnish to the Secretary copies of records to be kept by the permittee. For information claimed to be confidential, the permittee shall furnish such records to the Secretary along with a claim of confidentiality in accordance with 45CSR31. If confidential information is to be sent to USEPA, the permittee shall directly provide such information to USEPA along with a claim of confidentiality in accordance with 40 C.F.R. Part 2.

## **2.7. Duty to Supplement and Correct Information**

Upon becoming aware of a failure to submit any relevant facts or a submittal of incorrect information in any permit application, the permittee shall promptly submit to the Secretary such supplemental facts or corrected information.

## **2.8. Administrative Update**

The permittee may request an administrative update to this permit as defined in and according to the procedures specified in 45CSR13.  
[45CSR§13-4.]

## **2.9. Permit Modification**

The permittee may request a minor modification to this permit as defined in and according to the procedures specified in 45CSR13.  
[45CSR§13-5.4.]

## **2.10 Major Permit Modification**

The permittee may request a major modification as defined in and according to the procedures specified in 45CSR14 or 45CSR19, as appropriate.  
[45CSR§13-5.1]

## **2.11. Inspection and Entry**

The permittee shall allow any authorized representative of the Secretary, upon the presentation of credentials and other documents as may be required by law, to perform the following:

- a. At all reasonable times (including all times in which the facility is in operation) enter upon the permittee's premises where a source is located or emissions related activity is conducted, or where records must be kept under the conditions of this permit;
- b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
- c. Inspect at reasonable times (including all times in which the facility is in operation) any facilities, equipment (including monitoring and air pollution control equipment), practices, or operations regulated or required under the permit; and
- d. Sample or monitor at reasonable times substances or parameters to determine compliance with the permit or applicable requirements or ascertain the amounts and types of air pollutants discharged.

## **2.12. Emergency**

- 2.12.1. An "emergency" means any situation arising from sudden and reasonable unforeseeable events beyond the control of the source, including acts of God, which situation requires immediate corrective action to restore normal operation, and that causes the source to exceed a technology-based emission limitation under the permit, due to unavoidable increases in emissions attributable to the emergency. An emergency shall not include noncompliance to the extent caused by

improperly designed equipment, lack of preventative maintenance, careless or improper operation, or operator error.

- 2.12.2. Effect of any emergency. An emergency constitutes an affirmative defense to an action brought for noncompliance with such technology-based emission limitations if the conditions of Section 2.12.3 are met.
- 2.12.3. The affirmative defense of emergency shall be demonstrated through properly signed, contemporaneous operating logs, or other relevant evidence that:
- a. An emergency occurred and that the permittee can identify the cause(s) of the emergency;
  - b. The permitted facility was at the time being properly operated;
  - c. During the period of the emergency the permittee took all reasonable steps to minimize levels of emissions that exceeded the emission standards, or other requirements in the permit; and
  - d. The permittee submitted notice of the emergency to the Secretary within one (1) working day of the time when emission limitations were exceeded due to the emergency and made a request for variance, and as applicable rules provide. This notice must contain a detailed description of the emergency, any steps taken to mitigate emissions, and corrective actions taken.
- 2.12.4. In any enforcement proceeding, the permittee seeking to establish the occurrence of an emergency has the burden of proof.
- 2.12.5. The provisions of this section are in addition to any emergency or upset provision contained in any applicable requirement.

### **2.13. Need to Halt or Reduce Activity Not a Defense**

It shall not be a defense for a permittee in an enforcement action that it should have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit. However, nothing in this paragraph shall be construed as precluding consideration of a need to halt or reduce activity as a mitigating factor in determining penalties for noncompliance if the health, safety, or environmental impacts of halting or reducing operations would be more serious than the impacts of continued operations.

### **2.14. Suspension of Activities**

In the event the permittee should deem it necessary to suspend, for a period in excess of sixty (60) consecutive calendar days, the operations authorized by this permit, the permittee shall notify the Secretary, in writing, within two (2) calendar weeks of the passing of the sixtieth (60) day of the suspension period.

### **2.15. Property Rights**

This permit does not convey any property rights of any sort or any exclusive privilege.

**2.16. Severability**

The provisions of this permit are severable and should any provision(s) be declared by a court of competent jurisdiction to be invalid or unenforceable, all other provisions shall remain in full force and effect.

**2.17. Transferability**

This permit is transferable in accordance with the requirements outlined in Section 10.1 of 45CSR13. [45CSR§13-10.1.]

**2.18. Notification Requirements**

The permittee shall notify the Secretary, in writing, no later than thirty (30) calendar days after the actual startup of the operations authorized under this permit.

**2.19. Credible Evidence**

Nothing in this permit shall alter or affect the ability of any person to establish compliance with, or a violation of, any applicable requirement through the use of credible evidence to the extent authorized by law. Nothing in this permit shall be construed to waive any defense otherwise available to the permittee including, but not limited to, any challenge to the credible evidence rule in the context of any future proceeding.

### 3.0. Facility-Wide Requirements

#### 3.1. Limitations and Standards

- 3.1.1. **Open burning.** The open burning of refuse by any person, firm, corporation, association or public agency is prohibited except as noted in 45CSR§6-3.1.  
[45CSR§6-3.1.]
- 3.1.2. **Open burning exemptions.** The exemptions listed in 45CSR§6-3.1 are subject to the following stipulation: Upon notification by the Secretary, no person shall cause, suffer, allow or permit any form of open burning during existing or predicted periods of atmospheric stagnation. Notification shall be made by such means as the Secretary may deem necessary and feasible.  
[45CSR§6-3.2.]
- 3.1.3. **Asbestos.** The permittee is responsible for thoroughly inspecting the facility, or part of the facility, prior to commencement of demolition or renovation for the presence of asbestos and complying with 40 C.F.R. § 61.145, 40 C.F.R. § 61.148, and 40 C.F.R. § 61.150. The permittee, owner, or operator must notify the Secretary at least ten (10) working days prior to the commencement of any asbestos removal on the forms prescribed by the Secretary if the permittee is subject to the notification requirements of 40 C.F.R. § 61.145(b)(3)(i). The USEPA, the Division of Waste Management, and the Bureau for Public Health - Environmental Health require a copy of this notice to be sent to them.  
[40CFR§61.145(b) and 45CSR§34]
- 3.1.4. **Odor.** No person shall cause, suffer, allow or permit the discharge of air pollutants which cause or contribute to an objectionable odor at any location occupied by the public.  
[45CSR§4-3.1] *[State Enforceable Only]*
- 3.1.5. **Permanent shutdown.** A source which has not operated at least 500 hours in one 12-month period within the previous five (5) year time period may be considered permanently shutdown, unless such source can provide to the Secretary, with reasonable specificity, information to the contrary. All permits may be modified or revoked and/or reapplication or application for new permits may be required for any source determined to be permanently shutdown.  
[45CSR§13-10.5.]
- 3.1.6. **Standby plan for reducing emissions.** When requested by the Secretary, the permittee shall prepare standby plans for reducing the emissions of air pollutants in accordance with the objectives set forth in Tables I, II, and III of 45CSR11.  
[45CSR§11-5.2.]

#### 3.2. Monitoring Requirements

*[Reserved]*

#### 3.3. Testing Requirements

- 3.3.1. **Stack testing.** As per provisions set forth in this permit or as otherwise required by the Secretary, in accordance with the West Virginia Code, underlying regulations, permits and orders, the permittee shall conduct test(s) to determine compliance with the emission limitations set forth in this permit and/or established or set forth in underlying documents. The Secretary, or his duly authorized representative, may at his option witness or conduct such test(s). Should the Secretary exercise his option to conduct such test(s), the operator shall provide all necessary sampling

connections and sampling ports to be located in such manner as the Secretary may require, power for test equipment and the required safety equipment, such as scaffolding, railings and ladders, to comply with generally accepted good safety practices. Such tests shall be conducted in accordance with the methods and procedures set forth in this permit or as otherwise approved or specified by the Secretary in accordance with the following:

- a. The Secretary may on a source-specific basis approve or specify additional testing or alternative testing to the test methods specified in the permit for demonstrating compliance with 40 C.F.R. Parts 60, 61, and 63 in accordance with the Secretary's delegated authority and any established equivalency determination methods which are applicable. If a testing method is specified or approved which effectively replaces a test method specified in the permit, the permit may be revised in accordance with 45CSR§13-4. or 45CSR§13-5.4 as applicable.
- b. The Secretary may on a source-specific basis approve or specify additional testing or alternative testing to the test methods specified in the permit for demonstrating compliance with applicable requirements which do not involve federal delegation. In specifying or approving such alternative testing to the test methods, the Secretary, to the extent possible, shall utilize the same equivalency criteria as would be used in approving such changes under Section 3.3.1.a. of this permit. If a testing method is specified or approved which effectively replaces a test method specified in the permit, the permit may be revised in accordance with 45CSR§13-4. or 45CSR§13-5.4 as applicable.
- c. All periodic tests to determine mass emission limits from or air pollutant concentrations in discharge stacks and such other tests as specified in this permit shall be conducted in accordance with an approved test protocol. Unless previously approved, such protocols shall be submitted to the Secretary in writing at least thirty (30) days prior to any testing and shall contain the information set forth by the Secretary. In addition, the permittee shall notify the Secretary at least fifteen (15) days prior to any testing so the Secretary may have the opportunity to observe such tests. This notification shall include the actual date and time during which the test will be conducted and, if appropriate, verification that the tests will fully conform to a referenced protocol previously approved by the Secretary.
- d. The permittee shall submit a report of the results of the stack test within sixty (60) days of completion of the test. The test report shall provide the information necessary to document the objectives of the test and to determine whether proper procedures were used to accomplish these objectives. The report shall include the following: the certification described in paragraph 3.5.1.; a statement of compliance status, also signed by a responsible official; and, a summary of conditions which form the basis for the compliance status evaluation. The summary of conditions shall include the following:
  1. The permit or rule evaluated, with the citation number and language;
  2. The result of the test for each permit or rule condition; and,
  3. A statement of compliance or noncompliance with each permit or rule condition.

[WV Code § 22-5-4(a)(14-15) and 45CSR13]

### **3.4. Recordkeeping Requirements**

- 3.4.1. **Retention of records.** The permittee shall maintain records of all information (including monitoring data, support information, reports, and notifications) required by this permit recorded in a form suitable and readily available for expeditious inspection and review. Support information

includes all calibration and maintenance records and all original strip-chart recordings for continuous monitoring instrumentation. The files shall be maintained for at least five (5) years following the date of each occurrence, measurement, maintenance, corrective action, report, or record. At a minimum, the most recent two (2) years of data shall be maintained on site. The remaining three (3) years of data may be maintained off site, but must remain accessible within a reasonable time. Where appropriate, the permittee may maintain records electronically (on a computer, on computer floppy disks, CDs, DVDs, or magnetic tape disks), on microfilm, or on microfiche.

- 3.4.2. **Odors.** For the purposes of 45CSR4, the permittee shall maintain a record of all odor complaints received, any investigation performed in response to such a complaint, and any responsive action(s) taken.

**[45CSR§4. State Enforceable Only.]**

### 3.5. Reporting Requirements

- 3.5.1. **Responsible official.** Any application form, report, or compliance certification required by this permit to be submitted to the DAQ and/or USEPA shall contain a certification by the responsible official that states that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.
- 3.5.2. **Confidential information.** A permittee may request confidential treatment for the submission of reporting required by this permit pursuant to the limitations and procedures of W.Va. Code § 22-5-10 and 45CSR31.
- 3.5.3. **Correspondence.** All notices, requests, demands, submissions and other communications required or permitted to be made to the Secretary of DEP and/or USEPA shall be made in writing and shall be deemed to have been duly given when delivered by hand, or mailed first class or by private carrier with postage prepaid to the address(es), or submitted in electronic format by email as set forth below or to such other person or address as the Secretary of the Department of Environmental Protection may designate:

**DAQ:**  
Director  
WVDEP  
Division of Air Quality  
601 57<sup>th</sup> Street  
Charleston, WV 25304-2345

**DAQ Compliance and Enforcement<sup>1</sup>:**  
[DEPAirQualityReports@wv.gov](mailto:DEPAirQualityReports@wv.gov)

**US EPA:**  
Associate Director  
Office of Air Enforcement and Compliance Assistance  
(3AP20)  
U.S. Environmental Protection Agency  
Region III  
1650 Arch Street  
Philadelphia, PA 19103-2029

<sup>1</sup>For all self-monitoring reports (MACT, GACT, NSPS, etc.), stack tests and protocols, Notice of Compliance Status Reports, Initial Notifications, etc.

#### 3.5.4. Operating Fee

- 3.5.4.1. In accordance with 45CSR30 – Operating Permit Program, the permittee shall submit a certified emissions statement and pay fees on an annual basis in accordance with the submittal requirements of the Division of Air Quality. A receipt for the appropriate fee shall be

maintained on the premises for which the receipt has been issued, and shall be made immediately available for inspection by the Secretary or his/her duly authorized representative.

- 3.5.5. **Emission inventory.** At such time(s) as the Secretary may designate, the permittee herein shall prepare and submit an emission inventory for the previous year, addressing the emissions from the facility and/or process(es) authorized herein, in accordance with the emission inventory submittal requirements of the Division of Air Quality. After the initial submittal, the Secretary may, based upon the type and quantity of the pollutants emitted, establish a frequency other than on an annual basis.

## 4.0. Fiberglass Production Lines Specific Requirements

### 4.1. Limitations and Standards

4.1.1. The permittee shall operate a resinated fiberglass insulation line identified as 1<sup>st</sup> line with associated emission EP12 (melter stack), EP13 (collection stack), and EP14 (incinerator stack). This line shall be operated and maintained in accordance with the following operational and emission limitations after the Knauf Technology change is implemented:

- a. The production line shall not use a phenol-formaldehyde binder in manufacturing resinated wool fiberglass insulation.
- b. Production of fiberglass insulation from this line shall not exceed 9,000 pounds of glass pulled per hour or 39,420 TPY. Compliance with these limits shall be based on a 12-month rolling total;
- c. Once the production line has been converted to the Knauf technology, the emissions from the line shall not exceed the following limits with respect to the corresponding emission point and pollutant;

Table 4.1.1.c. Emission Limits for the 1 <sup>st</sup> Line						
Emission Point	CO lb/TGP	NO <sub>x</sub> lb/TGP	PM lb/TGP	PM <sub>10</sub> lb/TGP	VOC* lb/TGP	NH <sub>3</sub> lb/ TGP
EP12	0.73	0.03	0.07	0.07		
EP13	3.60 <sup>1</sup>	3.61	3.49	3.49	2.54 <sup>1</sup>	4.64 <sup>1</sup>
EP14						

lb/TGP - pounds of pollutant per ton of glass pulled.

\* - VOC emissions shall not include methane and ethane.

<sup>1</sup> - Compliance with the emission limit be the sum of the respective pollutant of both emission points.

- d. Exhaust from the electric melter shall be vented into a closed vent system that routes this stream directly to either one of identified baghouses (CD12B or CD12Bb) at all times when the line is operating;
- e. The exhaust from the forehearth and fiberizers of this line shall be vented into a closed vent system that routes this stream directly to either one of identified wet scrubbers CD13A, CD13B, or CD13C at all times when the line is operating.
- f. Exhaust from the curing oven shall be vented into a closed vent system that routes this stream directly to the United McGill Thermal Oxidizer identified as CD14A at all times when the line is operating. The oxidizer shall be operated and maintained in accordance with the following:
  - i. The temperature of combustion chamber shall not fall below 1,500°F or the average temperature recorded during the most recent performance testing that demonstrated compliance with the VOC emissions limits. Compliance with this limit shall be based on rolling three hour average.
  - ii. The oxidizer shall not consume more than 5,000 cubic feet of natural gas per hour or 43.8 MMscf per year.

- 4.1.2. The permittee shall operate a fiberglass insulation line identified as 2<sup>nd</sup> line with associated emission points, EP23 (melter/collection stack), and EP24 (curing & cooling stack). This line shall be operated and maintained in accordance with the following operational and emission limitations:
- The production line shall not use a phenol-formaldehyde binder in manufacturing resinated wool fiberglass insulation.
  - Production fiberglass insulation from this line shall not exceed 13,333 pounds of glass pulled per hour and 58,400 TPY. Compliance with this annual limit shall be based on a 12-month rolling total;
  - Emissions from the line shall not exceed the following limits with respect to the corresponding emission point and pollutant:

Table 4.1.2.c. Emission Limits for the 2 <sup>nd</sup> Line									
Emission Unit	Emission Point	CO lb/TGP	NO <sub>x</sub> lb/TGP	SO <sub>2</sub> lb/TGP	PM <sup>2</sup> lb/TGP	PM <sub>10</sub> <sup>1</sup> lb/TGP	PM <sub>2.5</sub> <sup>1</sup> lb/TGP	VOC* lb/TGP	NH <sub>3</sub> lb/TGP
ES22	EP23	0.52	3.00	0.78	0.25	0.25	0.25	0.20	
Total	EP23	1.64	3.21	0.81	2.92	3.58	3.58	1.21	4.29
ES22E, ES24A, ES24B	EP23/EP24	2.34	0.80	0.05	3.45	4.31	4.31	0.87	4.73
Total	EP24	1.22	0.59	0.03	0.88	1.10	1.10	0.39	0.44

1 – The limit includes the corresponding filterable portion and condensable particulate matter fraction.

2 – These limits satisfy the allowable under 45 CSR §7-3.1. and the standard in 40 CFR §60.682.

lb/TGP - pounds of pollutant per ton of glass pulled.

\* - VOC emissions shall not include methane and ethane.

- Visible emissions from Emission Points EP23 and EP24, excluding condensed water vapor, shall not exceed 20 percent based on a six (6) minute average and shall apply at all times.
- Exhaust from the gas oxygen glass-melting furnace, which includes the canal and forehearth, shall be vented into a closed vent system that routes this stream directly to the control device identified baghouses CD22B at all times when the furnace is operating except during startup operations or when the melter is drained of molten glass but is operated to maintain temperature to preform maintenance on CD22B;
  - The startup operations shall begin when any raw materials are added and reaches 50 percent of its typical operating temperature. Startup ends when molten glass begins to flow from the wool fiberglass glass-melting furnace.
  - Only during startup operations or when the melter is completely drain of molten glass to allow for maintenance on control device CD22B, the permittee may by-pass control device CD22B.
  - During startup, the permittee shall only use natural gas.
  - The permittee shall install and maintain a system that indicates and records when Control Device CD22B is by-passed. Such recording system shall be integrated with the data system for the glass pull rate system.

- f. For the purpose of maximizing the collection of filterable PM using the wet scrubbers associated with 2<sup>nd</sup> Line (CD23A, CD23B, CD23C, CD23D, and CD24B), the permittee shall operate the wet scrubbing device with a pressure drop of at least 3 inches of water column and a liquor flow rate of no less than 50 gpm until operating parameters for the associated device is established through performance testing as required in Condition 4.3.5.
- g. For minimizing fugitive PM from the trimming and packaging sections of the line, exhaust from the trimming and packing operations shall be routed to a closed vent system to Control Devices CD25A and CD25B.
- h. For minimizing the formation of oxides of nitrogen emissions from the glass-melting furnace, the permittee shall use a ratio of oxygen enrichment to combustion air equal to or greater than the ratio determined during the initial compliance determination used to establish the minimum oxygen enrichment to combustion air ratio. The permittee shall develop and implement a monitoring plan to continuously monitor the ratio of oxygen enrichment to combustion air or a surrogate parameter that was measured and is linked to the minimum oxygen enrichment to combustion air ratio during the compliance demonstration.  
[45 CSR 14-8.3.]
- i. For minimizing the formation of oxides of nitrogen emissions from the burner(s) associated with the canal section of the glass-melting furnace, the permittee shall tune-up the burner(s) at least once per year for optimizing the formation of oxides of nitrogen while minimizing the formation of carbon monoxide.  
[45 CSR 14-8.3.]
- j. For minimizing the formation of oxides of nitrogen from the forming section, the permittee shall install and thereafter continuously whenever fiberglass is being produced, and maintain the use of combustion controls which minimize peak flame temperatures in the fiber forming process.  
[45 CSR 14-8.3.]
- k. Exhaust from the forming section (ML2INW Forming) of this line will be vented into a closed vent system that routes this stream directly to one of four venturi scrubbers (CD23A, CD23B, CD23C, or CD23D).  
[45 CSR 14-8.3.]
- l. For minimizing the formation of oxides of nitrogen from the curing oven, the permittee shall install, maintain, and thereafter continuously whenever fiberglass is being produced, and maintain the use of low NO<sub>x</sub> burners with integrated flue gas recirculation and combustion controls which minimize peak flame temperatures in the fiberglass curing process. The permittee shall tune-up the burner(s) at least once per year for the purpose of optimizing the formation of oxides of nitrogen while minimizing the formation of carbon monoxide.  
[45 CSR 14-8.3.]
- m. If the exhaust from the curing oven contains VOCs greater than the permitted rate in Table 4.1.2.c., the permittee shall vent the exhaust into a closed vent system that routes this stream directly to the McGill AirClean Thermal Oxidizer identified as CD24A at all times when the line is operating. The oxidizer shall be operated and maintained in accordance with the following:
  - i. The temperature of combustion chamber shall not fall below 1,500°F or the average temperature recorded during the most recent performance testing that demonstrated compliance with the VOC emissions limits. Compliance with this limit shall be based on rolling three-hour average.

- ii. The oxidizer is permitted to use natural gas as a supplemental fuel in order to maintain the minimum temperature in the combustion chamber.
  - n. A continuous pull rate monitor shall be installed, calibrated, and maintained that measures and records the glass pull rate of the line on an hourly basis; and
  - o. Exhaust from the cooling table of this line shall be vented into a closed vent system that routes this stream directly to a venturi scrubber (CD24B) at all times when the line is operating.
- 4.1.3. The following conditions applies to both production lines.
- a. A bag leak detection system (BLDS) shall be installed and operated on the fabric filter baghouses identified as CD12B, CD12Bb, and CD22B. Each BLDS shall be installed, maintained, and operated in accordance with U.S. EPA guidance document, "Fabric Filter Bag Leak Detection Guidance" (EPA-454/R-98-015, September 1997);
  - b. A device that continuously measures and records the pressure drop across the scrubber shall be installed, calibrated, maintained, and operated for each venturi scrubber (CD13A, CD13B, CD13C, CD23A, CD23B, CD23C, CD23D and CD24B). Such device is to be certified by its manufacturer to be accurate within  $\pm 250$  pascals ( $\pm 1$  inch water gauge) over its operating range.  
[40 CFR §60.683(a) and 40 CFR §60.13(b)]
  - c. A device that continuously measures and records the scrubbing liquid flow to each wet scrubber shall be installed, calibrated, maintained, and operated for each venturi scrubber (CD13A, CD13B, CD13C, CD23A, CD23B, CD23C, CD23D, and CD24B). Such device is to be certified by its manufacturer to be accurate within  $\pm 5$  percent over its operating range.  
[40 CFR §60.683(a) and 40 CFR §60.13(b)]
  - d. A device that continuously measures and records the temperature of the combustion chamber for each thermal oxidizer (CD15 & CD25) shall be installed, calibrated, maintained, and continuously operated. Such device shall be certified by the manufacturer to be accurate within  $\pm$  one (1) degrees Fahrenheit.
  - e. All monitoring devices required in items b and c of this condition shall be recalibrated quarterly in accordance with procedures under 40 CFR §60.13(b).  
[40 CFR 60.683(c)]
- 4.1.4. **Operation and Maintenance of Air Pollution Control Equipment.** The permittee shall, to the extent practicable, install, maintain, and operate all pollution control equipment listed in Section 1.0 and associated monitoring equipment in a manner consistent with safety and good air pollution control practices for minimizing emissions, or comply with any more stringent limits set forth in this permit or as set forth by any State rule, Federal regulation, or alternative control plan approved by the Secretary.  
[45CSR§13-5.11.]

## **4.2. Monitoring Requirements**

- 4.2.1. The permittee shall monitor and record the hourly production rate on a daily basis for each line. These records shall include the monthly total and the 12-month rolling total for each line respectively. Such records shall be maintained in accordance with condition 3.4.1. For the Line 2, the permittee shall record the date and time start-up began and ended for the gas oxygen glass melting furnace and any time period that Control Device CD22B was being by-passed while the gas

oxygen glass melting furnace was operating. Such records shall be maintained in accordance with Condition 3.4.1.

- 4.2.2. The permittee shall maintain records of the recorded data from the stipulated control devices in condition 4.1.3.b. through e. in accordance with condition 3.4.1.
- 4.2.3. The permittee shall monitor and record the product LOI of the each resinated product manufactured. The frequency of such monitoring shall not be no less than once every eight hours. The LOI shall be determined using ASTM D2584-68 (Reapproved 1985) or 94. Such records shall be maintained in accordance with Condition 3.4.1.
- 4.2.4. The permittee shall monitor the ratio of oxygen enrichment to combustion air for the gas oxygen glass-melting furnace on a continuous basis while the glass is being melted. Such records shall be maintained in accordance with Condition 3.4.1.
- 4.2.5. The permittee shall develop and implement a verification means to ensure the combustion controls or controller used to minimize the flame temperature of the burners used in the glass forming units and curing oven of the 2<sup>nd</sup> Line is maintaining the minimum flame temperature. The frequency of the monitoring shall be at least four times or measurements per operating day. Records of such monitoring shall be maintained in accordance with Condition 3.4.1.
- 4.2.6. Should the measured sulfur dioxide emission as required in Condition 4.3.5. is greater than 50 percent of the permitted SO<sub>2</sub> in Table 4.1.2.c., then the permittee shall monitor and record the amount of raw materials or feedstock that contains sulfur compounds consumed each month. Such records shall be maintained in accordance with Condition 3.4.1.

### **4.3. Testing Requirements**

- 4.3.1. For the purposes of demonstrating compliance with operational and emission limitation in Conditions 4.1.1., and 4.1.2., the permittee shall conduct performance testing as required by the following conditions in this section. This testing shall establish and/or verify the operating parameters for the respective control devices of the production line and operating parameters of the line. This testing shall be conducted as outlined in the following:
  - a. General Testing Requirements:
    - i. This testing shall consist of three test runs. Each test run must last at least one hour unless the otherwise specified;
    - ii. Each test run must be conducted with the production line operating at no less 90 percent capacity;
    - iii. During each test run, sampling of the collection and incinerator must occur simultaneously to each other;
    - iv. The line must be producing a product with a highest LOI expected to be produced by this line;
    - v. Test(s) shall not be conducted during periods of startup, shutdown, or malfunctions as specified in 40 CFR §60.8(c);
    - vi. During such testing, the permittee shall measure and record the, the binder formulation used, and the product LOI;

- vii. During such testing, the permittee shall monitor and record all of the operating parameters respective to the production line as noted in condition 4.3.1. in thirty (30) minute intervals. The arithmetic average shall be calculated for each parameter using all of recorded measurements. Such measurements and arithmetic averages shall be included with the testing report;
  - b. Demonstrating compliance with the VOC emission limit shall be conducted with a method(s) approved by the Director. The permittee may propose a testing method as part of the required protocol of condition 3.4.1.
  - c. Compliance with the VOC limits shall be determined by taking the sum of the arithmetic average from the collection stack and incinerator stack for the 1<sup>st</sup> line. The reported emission rates shall be in terms of pounds per ton of glass pulled.
  - d. Such testing shall be conducted in accordance with 3.3.1.
- 4.3.2. Within 180 days after re-starting of the 1<sup>st</sup> line from completing the Knauf Technology project, the permittee shall conduct performance testing to demonstrate compliance with the CO, NO<sub>x</sub>, PM, and VOC emission limits of Condition 4.1.1.c. Such testing shall be conducted as prescribed in condition 4.3.1. for CO, NO<sub>x</sub>, and VOC. For PM, such testing shall be conducted as outlined in condition 4.3.4. For carbon monoxide, such testing shall be conducted in accordance with U.S. EPA Method 10. This testing shall establish and/or verify the operating parameters for the respective control devices of the production line.
- 4.3.3. Once every five years, the permittee shall conduct emission testing to demonstrate compliance with the permitted CO and NO<sub>x</sub> emission limits in 4.1.1.c. and 4.1.2.c. for the collection stack (EP13 and EP23) and incinerator stack (EP14 and EP 24) of each production line and to verify and/or establish operating parameters for the process. This testing shall be conducted as outlined in 3.3.1., 4.3.1.a. and as follows:
- a. Demonstrating compliance with the carbon monoxide limits shall be conducted in accordance with U.S. EPA Method 10; and
  - b. Demonstrating compliance with the oxides of nitrogen limits shall be conducted in accordance with U.S. EPA Method 7E.
- 4.3.4. Once every 5 years or within 180 days of when the production line will be producing a product with a specified LOI of 1 % greater than the previous compliance test that demonstrated compliance with the permitted PM visible emission limits of this permit, the permittee shall conduct performance testing to determine the PM emission rate of the collection and incinerator stacks of the respective production line. Such testing shall be conducted as outlined in Condition 4.3.1.a. and U.S. EPA Method 5E. Method 9 shall be utilized to determine the visible emissions exhibit for the emission point. The sampling time and sample volume shall be at least 120 minutes and 2.55 dscm (90.1 dscf). This testing shall establish and/or verify the operating parameters for the respective control devices of the production line. At 30-minute intervals during each 2-hour test run of each performance test of a wet scrubber control device, the permittee shall record the measurements required by Condition 4.1.3.b & c. (40 CFR §60.683(a)), LOI of the glass fiber produced, and production rate.  
[40 CFR §60.685]
- 4.3.5. Within 180 days after initial re-starting of Line 2 from completing production upgrade project (i.e. installing the oxy-gas glass -melting furnace) as proposed in Permit Application R14-0015M, the permittee shall conduct performance testing to demonstrate compliance with the CO, NO<sub>x</sub>, SO<sub>2</sub>, PM, PM<sub>10</sub>, PM<sub>2.5</sub>, visible emissions (opacity), and VOC emission limits of Condition 4.1.2.c and d. Such testing shall be conducted as prescribed in condition 4.3.1. for CO, NO<sub>x</sub>, and VOC. For PM/PM<sub>10</sub>PM<sub>2.5</sub>, such testing shall be conducted as outlined in condition 4.3.4. For oxides of

nitrogen and carbon monoxide, such testing shall be conducted using test methods outlined in Condition 4.3.3. For SO<sub>2</sub>, the permittee shall conduct testing using a method approved by the Director. This testing shall establish and/or verify the operating parameters for the respective control devices of the production line, parameter(s) used to verify the controller used to minimum flame temperature, minimum operating temperature of CD24A, and establish the maximum daily average LOI operating parameter.

If the permittee elects to demonstrate compliance with the limits in Table 4.1.2.c. based on the individual limits for the glass-melting furnace, then the permittee shall use test Method 201 or 201A for the filterable portion and Method 202 for the condensable portion and report the total of these two fractions as for PM<sub>10</sub> and PM<sub>2.5</sub>.

- 4.3.6. For the purpose of demonstrating that Control Device CD24A is not required to meet the VOC limit in Condition 4.1.2.c., the permittee shall conduct a performance test before the inlet of Control Device CD24A in accordance with the procedures and methods outline in Condition 4.3.1. A satisfactory demonstration shall be defined as the average VOC emission rate of the three runs is less than 80% of the permitted limit in Table 4.1.2.c. with no individual runs above the permitted limit. As results of a satisfactory demonstration, compliance with the permitted VOC limit shall be based on operating the line with a daily average LOI at or less than as measured during the satisfactory demonstration. Such records shall be maintained in accordance with Condition 3.4.1.

#### **4.4. Recordkeeping Requirements**

- 4.4.1. **Record of Monitoring.** The permittee shall keep records of monitoring information that include the following:
- a. The date, place as defined in this permit, and time of sampling or measurements;
  - b. The date(s) analyses were performed;
  - c. The company or entity that performed the analyses;
  - d. The analytical techniques or methods used;
  - e. The results of the analyses; and
  - f. The operating conditions existing at the time of sampling or measurement.
- 4.4.2. **Record of Maintenance of Air Pollution Control Equipment.** For all pollution control equipment listed in Section 1.0, the permittee shall maintain accurate records of all required pollution control equipment inspection and/or preventative maintenance procedures.
- 4.4.3. **Record of Malfunctions of Air Pollution Control Equipment.** For all air pollution control equipment listed in Section 1.0, the permittee shall maintain records of the occurrence and duration of any malfunction or operational shutdown of the air pollution control equipment during which excess emissions occur. For each such case, the following information shall be recorded:
- a. The equipment involved.
  - b. Steps taken to minimize emissions during the event.
  - c. The duration of the event.

- d. The estimated increase in emissions during the event.

For each such case associated with an equipment malfunction, the additional information shall also be recorded:

- e. The cause of the malfunction.
- f. Steps taken to correct the malfunction.
- g. Any changes or modifications to equipment or procedures that would help prevent future recurrences of the malfunction.

- 4.4.4. The permittee shall maintain records of the any and all testing conducted as required in Section 4.3. in accordance with Condition 3.4.1.

- 4.4.5. The permittee shall record the date and time of any bag leak detection system alarm. Such record shall include when corrective actions were initiated, the cause of the alarm, an explanation of the corrective actions taken, and when the cause as the alarm was corrected and be maintained in accordance with Condition 3.4.1.

- 4.4.6. The permittee shall maintain records of the annual tune-ups as required in Condition 4.1.2.h., i., and k. Such records shall be maintained in accordance with Condition 3.4.1.

#### **4.5. Reporting Requirements**

- 4.5.1 The permittee shall submit semiannual reports of exceedances of the venturi scrubbers (CD13A, CD13B, CD13C, CD23A, CD23B, CD 23C, CD23D, and CD24B) operating parameters as established through testing as required in this permit and 40 CFR §60.684(a). Exceedances under this condition is defined as any monitoring data that are less than 70 percent of lowest value or 130% of the highest value of each operating parameter recorded during the most recent performance test. Such reports shall be written and include the corrective action as result of, and records of the quarterly calibration of the monitoring devices for the mentioned control devices. These reports shall be submitted as part of the facility semiannual and annual compliance [40 CFR §60.684(d)]

## 5.0. Material Handling and Other Sources Specific Requirements

### 5.1. Limitations and Standards

5.1.1. The following storage devices shall be equipped and operated with the corresponding control devices:

Equipment Number	Description	Control Equipment	Control Number
ES1A	Raw Material Storage Bin (sand)	Whirl-Air Flow Bin-Vent Model 195-42	CD1A
ES1B	Raw Material Storage Bin (borax)	Whirl-Air Flow Bin-Vent Model 195-42	CD1B
ES1C	Raw Material Storage Bin (borax)	Whirl-Air Flow Bin-Vent Model 195-42	CD1B
ES1D	Raw Material Storage Bin (soda ash)	Whirl-Air Flow Bin-Vent Model 195-42	CD1D
ES1E	Raw Material Storage Bin (soda ash)	Whirl-Air Flow Bin-Vent Model 195-42	CD1D
ES1F	Raw Material Storage Bin (aplite)	Whirl-Air Flow Bin-Vent Model 195-42	CD1F
ES1G	Raw Material Storage Bin (lime)	Whirl-Air Flow Bin-Vent Model 195-42	CD1G
ES1H	Raw Material Storage Bin (cullet)	Whirl-Air Flow Bin-Vent Model 195-42	CD1I
ES1I	Raw Material Storage Bin (cullet)	Whirl-Air Flow Bin-Vent Model 195-42	CD1I
ES1J	Raw Material Storage Bin (cullet)	Whirl-Air Flow Bin-Vent Model 195-42	CD1F
ES1K	Raw Material Storage Bin (baghouse dust)	Whirl-Air Flow Bin-Vent Model 55-30	CD1K
ES12A	Batch Mixer Receiving Hopper (1 <sup>st</sup> & 2 <sup>nd</sup> Lines)	Whirl-Air Flow Bin-Vent Model 345-56	CD12A
ES22A	Batch Mixers' Receiving Bin (2 <sup>nd</sup> Line)	IAC Bin-Vent Model No. 96TB-FRIP-48:56 Style 3	CD22A
ES12B	Mixed Batch Backup Storage Day Bin (1 <sup>st</sup> Line)	Whirl-Air Flow Bin-Vent Model 130-42	CD12D
ES12D	Mixed Batch Storage Day Bin (1 <sup>st</sup> Line)	Whirl-Air Flow Bin-Vent Model 230-56	CD12C
ES12Db	Mixed Batch Storage Day Bin (1 <sup>st</sup> Line)	Whirl-Air Flow Bin-Vent Model 265-42	CD12Cb
ES11a	Line 2 Day Bin	TBD	CD11a
ES11b	Line 2 Day Bin	TBD	CD11b

The permittee shall select, install the control devices for Day Bins ES11a and ES11b that has manufacturer's removal efficiency of no less than 99.9% for filterable PM.

[45 CSR 14-8-8.3.]

- 5.1.2. Emission of PM, PM10, and PM2.5 from Emission Points EP11a and EP11b shall not exceed 0.016 tons per year from each point. Compliance is satisfied with these limits through maintaining the respective control device and receiving raw materials into bins ES11a and ES11b at a total raw material throughput for both bin of no more than 184 tons per day.
- 5.1.3. The permittee shall install, maintain, and operate the Quentin Keeney Air Tumblers (CD15A), the Fisher Klosterman Scrubber (CD25A) and the bag filter dust collector (CD25B) in such a way that the PM and PM-10 emissions from FP15 do not exceed 0.25 pounds per hour and/or 1.1 tons per year.
- 5.1.4. Emissions of the following pollutants to the atmosphere from the associated emission points shall not exceed the following:

<b>Caterpillar 3406 (Emission Point EP16 )</b>		
<b>Pollutant</b>	<b>Maximum Allowable Emission Rate</b>	
	<b>lb/hr</b>	<b>TPY</b>
Particulate Matter	0.58	0.15
Sulfur Dioxide	3.80	0.90
Nitrogen Oxides	9.13	2.3
Carbon Monoxide	4.16	1.0
VOCs	0.10	0.03

<b>Caterpillar 3456 (Emission Point EP17 )</b>		
<b>Pollutant</b>	<b>Maximum Allowable Emission Rate</b>	
	<b>lb/hr</b>	<b>TPY</b>
Particulate Matter	0.09	0.03
Sulfur Dioxide	3.80	0.9
Nitrogen Oxides	10.96	2.74
Carbon Monoxide	0.64	0.16
VOCs	0.14	0.04

<b>Cummins NT-855-F1 (Emission Point EP18)</b>		
<b>Pollutant</b>	<b>Maximum Allowable Emission Rate</b>	
	<b>lb/hr</b>	<b>TPY</b>
Particulate Matter	0.60	0.2
Sulfur Dioxide	0.56	0.14
Nitrogen Oxides	8.5	2.10
Carbon Monoxide	1.82	0.50
Volatile Organic Compounds	0.69	0.20

- 5.1.5. The two Caterpillar 3406 (ID. No. ESDG12 and ESDG13) and Cummins NT-855-F1 (ID. No. ESW11) internal combustion engines shall not operate more than 500 hours per year, calculated as the sum during a consecutive 12-month period.
- 5.1.6. The two Caterpillar 3406 and Cummins NT-855-F1 internal combustion engines shall not consume a fuel with a sulfur content of greater than 0.5 percent by weight
- 5.1.7. The 8.5 MMBTU/hr makeup air handling unit (ID. No. ESSH15), and 7.875 MMBTU/hr air handling unit (ID No. ESSH16) shall only be fired with pipeline quality natural gas.
- 5.1.8. Emissions of the following pollutants to the atmosphere from the 8.5 MMBTU/hr makeup air handling unit (ID. No. ESSH15) shall not exceed the following:

<b>Pollutant</b>	<b>Hourly Emission Rate</b>	<b>Annual Emission Rate</b>
	<b>lb/hr</b>	<b>TPY</b>
Particulate Matter	0.03	0.1
Particulate Matter-10	0.03	0.1
Nitrogen Oxides	0.85	3.7
Carbon Monoxide	0.17	0.8
VOCs	0.05	0.2

- 5.1.9. The following conditions and requirements are specific to generator set identified as ESDG14:
- The generator set shall be used as an emergency stationary generator and be limited to non-emergency operation of no more than 100 hours per year. Non-emergency operation shall include maintenance checks and readiness tests. Emergency operation is defined when electric power from the local utility is interrupted.  
[40 CFR §60.4211(f)]
  - The generator set shall be equipped with an engine or engine configuration that has been certified by the manufacturer with a NO<sub>x</sub> emission rate not to exceed 6.21 grams per brake

horsepower at 100% load, and to comply or conform with either 40 CFR §60.4205(b)(2), which referred to 40 CFR §§89.111 and 112 or 40 CFR Part 60.  
[40 CFR §§60.4211(a)(3) and (c)(1)]

- c. The permittee shall maintain the engine of the generator set according to the manufacturer's emission-related written instructions.  
[40 CFR §60.4211(a)(1)]
- d. The permittee shall only change those emission-related settings of the generator sets that are permitted by the manufacturer.  
[40 CFR §60.4211(a)(2)]
- e. The maximum name plate power output of the engine for each generator set shall not be greater than listed in Table 1.0.
- f. The engine will be equipped with a non-resettable hour meter.
- g. The engine shall be fueled only with diesel fuel that has a maximum sulfur content no greater than 15 ppm (ultra-low sulfur diesel) and with either a minimum centane index of 40 or a maximum aromatic content of 35 volume percent. Diesel meeting the specifications of Nonroad diesel under 40 CFR §80.510(b) is recognized as acceptable diesel fuel with regards to this fuel specification.  
[40 CFR §§60.42c(d), 40 CFR §10-3.3.f., 40 CFR §60.4207(b), 45 CFR 14-8-8.3.]

5.1.10. The conditions and requirements in the following subdivisions are specific to the mechanical draft cooling towers (ID #CT3, CT4, and CT5):

- a. Emissions of PM, PM<sub>10</sub>, and PM<sub>2.5</sub> shall be controlled with a 0.005% drift eliminator or an equivalent control technology.  
[45 CFR 14-8-8.3.]
- b. PM emissions emitted to the atmosphere from each cooling tower shall not exceed 0.05 lb/hr and 0.20 TPY.
- c. PM<sub>10</sub> and PM<sub>2.5</sub> emissions emitted to the atmosphere from each cooling tower shall not exceed 0.04 lb/hr and 0.17 TPY.
- d. Make-up water for the cooling system shall be supplied by the local public water system. If water from any other source than the local public water system is added to the cooling system, the permittee shall annually sample and determine the total dissolved solids content less than 750 ppm by weight.

5.1.11. The permittee shall install and maintain an industrial fence around this permitted facility as outlined in the December 19, 2016 submittal of the Prevention of Significant Deterioration Air Quality Dispersion Modeling Report. This industrial fence shall construct in such a manner to prevent the general public from accessing this permitted facility.

5.1.12. The permittee shall, to the extent practicable, install, maintain, and operate all pollution control equipment listed in Section 1.0 and associated monitoring equipment in a manner consistent with safety and good air pollution control practices for minimizing emissions, or comply with any more stringent limits set forth in this permit or as set forth by any State rule, Federal regulation, or alternative control plan approved by the Secretary.  
[45CFR§13-5.11.]

## **5.2. Monitoring Requirements**

- 5.2.1. For the purpose of demonstrating compliance with the hours of operation limits in Condition 5.1.5 and 5.1.9., the permittee shall record the number of hours each generator set is operated during the calendar month and the reason for such operation. Such records shall be maintained in accordance with Condition 3.4.1.  
[40 CFR §60.4211(f)]
- 5.2.2. Records of water sampling from the cooling system, if required to be sampled by Condition 5.1.10.d. shall be maintained in accordance with Condition 3.4.1.
- 5.2.3. The permittee shall maintain daily records of the amount of raw material received into storage bins ES11a and ES11b for the purpose of demonstrating compliance with Condition 5.1.2. Such records shall be maintained in accordance with Condition 3.4.1.

### **5.3. Testing Requirements**

*[Reserved]*

### **5.4. Recordkeeping Requirements**

- 5.4.1. **Record of Monitoring.** The permittee shall keep records of monitoring information that include the following:
  - a. The date, place as defined in this permit, and time of sampling or measurements;
  - b. The date(s) analyses were performed;
  - c. The company or entity that performed the analyses;
  - d. The analytical techniques or methods used;
  - e. The results of the analyses; and
  - f. The operating conditions existing at the time of sampling or measurement.
- 5.4.2. **Record of Maintenance of Air Pollution Control Equipment.** For all pollution control equipment listed in Section 1.0, the permittee shall maintain accurate records of all required pollution control equipment inspection and/or preventative maintenance procedures.
- 5.4.3. **Record of Malfunctions of Air Pollution Control Equipment.** For all air pollution control equipment listed in Section 1.0, the permittee shall maintain records of the occurrence and duration of any malfunction or operational shutdown of the air pollution control equipment during which excess emissions occur. For each such case, the following information shall be recorded:
  - a. The equipment involved.
  - b. Steps taken to minimize emissions during the event.
  - c. The duration of the event.
  - d. The estimated increase in emissions during the event.

For each such case associated with an equipment malfunction, the additional information shall also be recorded:

- e. The cause of the malfunction.
  - f. Steps taken to correct the malfunction.
  - g. Any changes or modifications to equipment or procedures that would help prevent future recurrences of the malfunction.
- 5.4.4. The permittee shall maintain records of sulfur content of the fuel oil received and/or vendors contractual sulfur specifications for the fuel oil.

## **5.5. Reporting Requirements**

*[Reversed]*

## CERTIFICATION OF DATA ACCURACY

I, the undersigned, hereby certify that, based on information and belief formed after reasonable inquiry, all information contained in the attached \_\_\_\_\_, representing the period beginning \_\_\_\_\_ and ending \_\_\_\_\_, and any supporting documents appended hereto, is true, accurate, and complete.

Signature<sup>1</sup>

(please use blue ink)

\_\_\_\_\_  
Responsible Official or Authorized Representative

\_\_\_\_\_  
Date

Name & Title

(please print or type)

\_\_\_\_\_  
Name

\_\_\_\_\_  
Title

Telephone No. \_\_\_\_\_

Fax No. \_\_\_\_\_

<sup>1</sup> This form shall be signed by a "Responsible Official." "Responsible Official" means one of the following:

- a. For a corporation: The president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation, or a duly authorized representative of such person if the representative is responsible for the overall operation of one or more manufacturing, production, or operating facilities applying for or subject to a permit and either:
  - (i) the facilities employ more than 250 persons or have a gross annual sales or expenditures exceeding \$25 million (in second quarter 1980 dollars), or
  - (ii) the delegation of authority to such representative is approved in advance by the Director;
- b. For a partnership or sole proprietorship: a general partner or the proprietor, respectively;
- c. For a municipality, State, Federal, or other public entity: either a principal executive officer or ranking elected official. For the purposes of this part, a principal executive officer of a Federal agency includes the chief executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., a Regional Administrator of U.S. EPA); or
- d. The designated representative delegated with such authority and approved in advance by the Director.