

MEMO

To: Joe Kessler
From: Jon McClung *JDM*
CC: Laura Crowder, Bev McKeone, Ed Andrews, Steve Pursley, Lee Yuchniuk
Date: March 2, 2018
Re: Air Quality Impact Analysis Review - Roxul USA, Inc.
PSD Application R14-0037 - Facility ID# 037-00108

I have completed my review and replication of the air quality impact analysis submitted by Roxul USA Inc. (Roxul) in support of the PSD permit application (R14-0037) for the proposed construction of a new mineral wool production facility to be located in Ranson, West Virginia, within Jefferson County. Review and replication of components of the modeling analysis were also performed by Ed Andrews, Joe Kessler, Steve Pursley, and Lee Yuchniuk. The protocol for the modeling analysis was submitted by Roxul on September 8, 2017, revised on November 2, 2017, and approved by West Virginia Division of Air Quality (DAQ) on November 3, 2017. The PSD permit application was received in November 2017 (dated November 20, 2017). A modeling report was submitted on December 21, 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.

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 affects 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 National Park Service and U.S. Forest Service have stated a Class I analysis relating to Shenandoah National Park for this project is not required. Attachment A contains the communications by the Federal Land Managers.

Roxul proposes to construct a mineral wool insulation manufacturing facility (Project) to produce building insulation, customized solutions for industrial applications, acoustic ceilings, and other applications. The emission sources associated with the Project are:

- One Mineral Wool Line including:
 - Raw Material Handling Sources (e.g. material unloading, storage silos, conveyor transfer points, portable crusher)

- One Melting Furnace, Spinning Chamber, Curing Oven, and Cooling Zone,
 - Dust control baghouses, and
 - Storage tanks
- Coal Milling operations;
- One Rockfon Line including paint application, drying ovens, and dust control baghouse.

Attachment B contains flow diagrams with emission points for the Mineral Wool Line, Rockfon line, and coal milling.

Jefferson County, WV is in attainment or unclassifiable/attainment status for all criteria pollutants. 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 Significant Emission Rate (tons/yr)
NO _x	238.96	40
CO	71.40	100
VOC	471.41	40
SO ₂	147.45	40
PM ₁₀	153.19	15
PM _{2.5}	133.41	Primary PM _{2.5} : 10 NO _x : 40 SO ₂ : 40
O ₃	NO_x: 238.96 VOC: 471.41	NO _x : 40 VOC: 40

Dispersion modeling was conducted for NO_x, SO₂, PM₁₀, and PM_{2.5}. Secondary formation of PM_{2.5} as a result of NO_x and SO₂ emissions was addressed by Roxul and is discussed below. Also, formation of ozone from NO_x and VOC emissions was addressed by the applicant and is discussed below. Attachment C contains modeled Project source parameters and emission rates.

Table 2 presents a summary of the air quality standards that were addressed for SO₂, NO₂, PM₁₀, and PM_{2.5}. The pollutants, averaging times, increments, significant impact levels (SILs) and

National Ambient Air Quality Standards (NAAQS) are listed. The SILs for 1-hour SO₂ and 1-hour NO₂ represent the values the Division of Air Quality has implemented as described in the memorandum included in Attachment D.

Table 2. Ambient Air Quality Standards, SILs, and PSD Increments (All concentrations in µg/m³)

Pollutant	Averaging Period	SIL	PSD Increments	NAAQS
SO ₂	1-Hour	7.8	-	196
	3-Hour	25	512	1300
	24-Hour	5	91	365
	Annual	1	20	80
NO ₂	1-Hour	7.5	-	188
	Annual	1	25	100
PM ₁₀	24-Hour	5	30	150
	Annual	1	17	-
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 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 PM_{2.5} but special care should be taken in applying the SILs for 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 3, for both the 24-hr and annual averaging time for 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 E are the WV PM_{2.5} Design Values, Final and Certified.

Table 3. PM_{2.5} NAAQS, Monitor Design Values, and Significant Impact Levels (All concentrations in µg/m³)

PM _{2.5} Averaging Period	NAAQS	Martinsburg Monitor Design Value (54-003-0003)	Difference between NAAQS and Monitored Design 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:

- Roxul used the latest version of the regulatory dispersion model and supporting programs: AERMOD (version 16216r), AERMET (version 16216), AERMINUTE (version 15272), AERMAP (version 11103), AERSURFACE (version 13016), and BPIPPRM (version 04274). The AERMOD modeling system (AERMOD, AERMET, AERMAP) is the regulatory default modeling system for near-field (<50km) regulatory dispersion modeling.
- AERMET was used to process five years of surface meteorological data from the EMV Regional Airport (ICAO code: KMRB; WBAN Station ID 13734). Upper air data from Dulles Airport, MD (WBAN Station ID 93743) were used.
- AERSURFACE was used to develop appropriate surface characteristic (albedo, Bowen ratio, surface roughness) inputs to AERMET.
- A nested receptor grid was developed and AERMAP was used to determine terrain heights and hill height scales for use by AERMOD and to determine maximum modeled concentrations.
- Background NO₂ monitoring data for the cumulative analysis for the 1-hr and

annual NO₂ standards are from a monitor in Washington County, PA (ID #42-125-0005).

- Background 24-hour and annual PM_{2.5} monitoring data were obtained from the Clarksburg, WV monitor (54-033-0003).
- Background concentrations for the 24-hour PM₁₀ standard are from a monitor in Washington County, PA (ID #42-125-0005).
- The Plume Volume Molar Ratio Method (PVMRM) option in AERMOD was used to characterize NO₂ from modeled concentrations of NO_x.
- The surface friction velocity adjustment (ADJ_U*) option was utilized in AERMET.

Ozone Analysis and Secondary Formation of PM_{2.5}

In December 2016, EPA released a draft guidance memorandum¹ (MERP Memorandum) that describes how modeled emission rates of precursors (MERPs) could be calculated as part of a Tier 1 ozone and secondary PM_{2.5} formation analysis to assess a project's emissions of precursor pollutants. The MERPs may be used to describe an emission rate of a precursor that is expected to result in ambient ozone (O₃) or fine particulate matter (PM_{2.5}) that would be less than a specific air quality concentration threshold for O₃ or PM_{2.5} that a permitting authority chooses to use to determine whether an impact causes or contributes to a violation of the NAAQS for O₃ or PM_{2.5}. Based on this guidance, Roxul has calculated a MERP for ozone and quantified the potential secondary formation of PM_{2.5}.

The MERP Memorandum defines a MERP as:

$$\text{MERP} = \text{Critical Air Quality Threshold} * (\text{Modeled emission rate from hypothetical source} / \text{Modeled air quality impact from hypothetical source})$$

For ozone, EPA has proposed a Significant Impact Level (SIL) of 1 ppb and this value can be used to represent the critical air quality threshold. Using EPA Source 8 located in Southern Pennsylvania, approximately 75 km northeast of the project, from the MERP Memo results in a NO_x MERP of 301 tpy and a VOC MERP of 3125 tpy. Roxul's potential emissions from the Project are 238.96 tpy NO_x and 471.41 tpy VOC, both below the respective MERP for each precursor. The precursors can be cumulatively evaluated showing the Project cumulative MERP consumption. A cumulative MERP consumption less than 100% indicates that a project would not cause an ozone concentration exceeding the SIL.

The cumulative consumption for the Roxul Project can be calculated as:

$$(\text{Roxul NO}_x \text{ emissions (238.96 tpy)} / \text{NO}_x \text{ MERP (301 tpy)}) + (\text{Roxul VOC emissions}$$

¹Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and PM_{2.5} under the PSD Permitting Program (12/02/16)

$(471.4 \text{ tpy}) / \text{VOC MERP (3125 tpy)} * 100 = 94\%$.

Where project sources emit both primary $\text{PM}_{2.5}$ and precursors of secondary $\text{PM}_{2.5}$, EPA guidance indicates that applicants need to combine primary and secondary impacts to determine total $\text{PM}_{2.5}$ impacts as part of the PSD compliance demonstration. The Roxul Project proposed sources will emit both primary $\text{PM}_{2.5}$ and precursors of secondary $\text{PM}_{2.5}$. The primary $\text{PM}_{2.5}$ impacts have been evaluated by Roxul through dispersion modeling using AERMOD. The secondary formation of $\text{PM}_{2.5}$ from the precursor emissions of NO_x and SO_2 have been evaluated by Roxul using the relationships between emissions and impacts provided by EPA using photochemical modeling in the MERP Memorandum. The total secondary $\text{PM}_{2.5}$ (24-hr) impact from the project is $0.064 \mu\text{g}/\text{m}^3$. The total secondary $\text{PM}_{2.5}$ (annual) impact from the project is $0.0034 \mu\text{g}/\text{m}^3$. These concentrations represent a very small fraction of the SIL values - approximately 5.4% of the 24-hour SIL and 1.7% of the annual SIL. Based on this analysis, Roxul's impacts from secondarily formed $\text{PM}_{2.5}$ are considered insignificant and further analysis is not required.

Modeling Operating Scenarios

Roxul uses mineral wool production technology processes that have a linear relationship between the amount of processed material and the mass of generated pollutants. This linear mass-based relationship can be expressed with proportionality between operational loads and pollutant emission rates - higher loads generate higher emission rates. The flow rate of gases through the furnace is maintained at constant airflow and temperature regardless of the load. Roxul modeled maximum emissions at maximum load with constant, consistent, stack parameters to determine maximum ambient concentrations. Transient operations for the Roxul production processes, such as startup and shutdown, occur infrequently and for short periods of time and are not separately modeled.

The Emergency Fire Water Pump assumes 100 hours of operation per year for testing and readiness purposes and is an intermittent emissions scenario source. EPA guidance provides for the exclusion of intermittent emissions scenario sources from 1-hr NO_2 modeling since the brief periods of emissions from these units would be unlikely to significantly contribute to NAAQS exceedances considering the probabilistic form of the 1-hr NO_2 standard.

For the 24-hr $\text{PM}_{10}/\text{PM}_{2.5}$ analyses, the Emergency Fire Water Pump was modeled assuming maximum potential emission rates for (1/2) one-half hour per day.

SIL Analysis Results (Tier I)

The results of the Significant Impact Analysis for the Roxul Project sources are included in Table 4. All pollutant modeled concentrations except for 3-hr, 24-hr, Annual SO_2 exceed their respective SIL and a cumulative analysis is required for these pollutants. No further modeling analysis is necessary for 3-hr, 24-hr, or Annual SO_2 .

Table 4. SIL Analysis Results

Pollutant	Avg. Period	Maximum Modeled Conc. ($\mu\text{g}/\text{m}^3$)	Significant Impact Level (SIL) ($\mu\text{g}/\text{m}^3$)
NO ₂	1-hour	31.63	7.5
	Annual	1.5	1
PM _{2.5} (NAAQS)	24-hour	8.44	1.2
	Annual	1.58	0.2
PM _{2.5} (PSDI)*	24-hour	9.75	1.2
	Annual	1.77	0.2
PM ₁₀	24-hour	23.82	5
	Annual	4.04	1
SO ₂	1-hour	26.79	7.8
	3-hour	17.52	25
	24-hour	4.57	5
	Annual	0.53	1

*PSDI: PSD Increment

Cumulative Analysis Results (Tier II)

The cumulative analysis includes the modeled impacts from the Roxul Project 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 NO₂ 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. Table 5 shows the maximum total concentrations for all the receptors modeled in the cumulative analysis. For all modeled exceedances of the 1-hour SO₂ NAAQS, Roxul does not cause or contribute to the modeled exceedances.

Table 5. NAAQS Analysis Results - Maximum Total Concentrations

Pollutant	Averaging Period	Modeled Concentration ($\mu\text{g}/\text{m}^3$)	Background Concentration ($\mu\text{g}/\text{m}^3$)	Total Concentration ($\mu\text{g}/\text{m}^3$)	NAAQS ($\mu\text{g}/\text{m}^3$)
NO ₂	1-hour	93.95	33.20	127	188
	Annual	2.5	9.40	12	100
PM _{2.5}	24-hour	8.53	14.3	23	35
	Annual	1.79	5.7	7	12
PM ₁₀	24-hour	31.77	24	56	150
SO ₂	1-hour	204.66	39.5	244	196

Table 6 shows the maximum total Class II Increment concentrations, which include maximum modeled concentrations from increment consuming sources and. An increment analysis was not performed for 1-hr NO₂ since an increment level has not been established.

Table 6. Class II Increment Analysis Results

Pollutant	Averaging Period	Modeled Concentration ($\mu\text{g}/\text{m}^3$)	PSD Increment ($\mu\text{g}/\text{m}^3$)
NO ₂	Annual	1.5	25
PM _{2.5}	24-hour	8.7	9
	Annual	1.83	4
PM ₁₀	24-hour	21.5	30
	Annual	4.1	17

Summary

The air quality impact analysis prepared and submitted by Roxul 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 no modeled exceedances of the Class II Increments are predicted. Roxul does not cause or contribute to the modeled exceedances of the 1-hour SO₂ NAAQS.

ATTACHMENT A

Federal Land Manager AQRV Determinations

McClung, Jon D

From: Stacy, Andrea <andrea_stacy@nps.gov>
Sent: Thursday, January 18, 2018 12:33 PM
To: Kessler, Joseph R
Cc: Jalyn Cummings (jalyn_cummings@nps.gov); Holly Salazer (holly_salazer@nps.gov); Jackson, Bill -FS (bjackson02@fs.fed.us); Pitrolo, Melanie -FS (mpitrolo@fs.fed.us); Ash, Jeremy - FS; McClung, Jon D; McKeone, Beverly D; Don Shepherd
Subject: Re: WV PSD Application Notification (R14-0037 ROXUL USA, Inc.)

Thanks for the quick response Joe.

I want to confirm that a Class I analysis will not be necessary for Shenandoah NP, as it is unlikely this facility would result in any adverse impacts in the Park. Thank you for notifying the NPS of the proposed ROXUL, US facility. Please feel free to contact me if you have any questions.

Regards,
Andrea

On Wed, Jan 17, 2018 at 1:23 PM, Kessler, Joseph R <Joseph.R.Kessler@wv.gov> wrote:

OK, let me attempt to clarify. The hourly and annual emissions I put on the form are not the hourly or annual emissions that were used as the basis for calculating the Q/D. As I send out the notification as soon as I can after receiving the app, I grab the given facility-wide PTE (and if they include a facility-wide hourly emission number I use that as well) and put it into the form. As there was no facility-wide hourly emission number given, I just calculated the hourly emissions for the form based on 8,760 hours of operation. But, for this facility, as most annual PTE were calculated at 8,760, the numbers should be pretty close to those used for the Q/D calculation (and, in fact, the PTE on the form gives a q/d of 9.26 as opposed to the official q/d of 9.40).

As for IMF01 and HE01, the PTE and the annual emissions used for Q/D calculation are the same. They are both based on the maximum hourly emissions and the unit operation 8,760 hrs/year. These short-term limits are given in the application on page 65.

I will see if I can get a copy of the excel spreadsheet, but I think the only formula in it will be the summing of the pollutants.

Let me know if you have any other questions or need further clarification.

Thanks,

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

From: Stacy, Andrea [mailto:andrea_stacy@nps.gov]

Sent: Wednesday, January 17, 2018 2:23 PM

To: Kessler, Joseph R <Joseph.R.Kessler@wv.gov>

Cc: Jalyn Cummings (jalyn_cummings@nps.gov) <jalyn_cummings@nps.gov>; Holly Salazer (holly_salazer@nps.gov) <holly_salazer@nps.gov>; Jackson, Bill -FS (bjackson02@fs.fed.us) <bjackson02@fs.fed.us>; Pitrolo, Melanie -FS (mpitrolo@fs.fed.us) <mpitrolo@fs.fed.us>; Ash, Jeremy - FS <jash@fs.fed.us>; McClung, Jon D <Jon.D.McClung@wv.gov>; McKeone, Beverly D <Beverly.D.Mckeone@wv.gov>; Don Shepherd <don_shepherd@nps.gov>

Subject: Re: WV PSD Application Notification (R14-0037 ROXUL USA, Inc.)

Hi Joe,

I wanted to follow up with this permit & ensure I understand how the Q/d was calculated, particularly for the facility's larger sources such as the melting furnace (source ID IMF01). In your email you note that "the maximum facility-wide hourly emissions given in the FLM Information Form **are calculated from the annual emissions and averaged over 8,760 hours**. This method was used as there was no aggregate facility-wide hourly emission numbers given in the permit application."

The attached pdf of the emissions spreadsheet indicates that there is "no difference in maximum 24-hr and annual for TPY basis" for the melting furnace. Can we have a copy of the excel version of this pdf spreadsheet?

Also, I understand that not all sources at the facility will have short-term limits, which is why facility-wide annual limits for Q were calculated in this way, however, can you please clarify what the maximum short-term emissions (in lb/hr) for emission sources IMF01 and HE01 are likely to be?

Thanks!

On Wed, Nov 29, 2017 at 9:43 AM, Kessler, Joseph R <Joseph.R.Kessler@wv.gov> wrote:

Attached is the FLM Notification Form for the following PSD Permit Application submitted on November 21, 2017:

Permit Number: **R14-0037**
Applicant: **ROXUL USA, Inc.**
Facility: **Ran Facility**
Location: **Ranson, Jefferson County, WV**
Facility ID Number: **037-00108**

The permit application is available online at:

http://dep.wv.gov/daq/Documents/November%202017%20Applications/037-00108_APPL_R14-0037.pdf

The WV DAQ is providing notification that a PSD application has been filed for construction of a new major source in Jefferson County, WV. The proposed facility is a stone wool manufacturing facility. The application was submitted on November 21, 2017 and has not yet been deemed complete. The applicant has stated the highest Q/D (based on Shenandoah NP) has been calculated to be 9.6. In Appendix A of the permit application, the applicant provides individual emission unit Q/D TPY calculations where the annual emissions were not based on operating 8,760 hours. See the attached spreadsheet for a summary of the Q/D calculations. Additionally, due to late changes to the design of the facility, CO is still listed as a PSD pollutant when in fact the proposed PTE of CO has fallen below 100 TPY. A revision to the application removing CO as a PSD pollutant will be submitted in the coming weeks. As a final note, the maximum facility-wide hourly emissions given in the FLM Information Form are calculated from the annual emissions and averaged over 8,760 hours. This method was used as there was no aggregate facility-wide hourly emission numbers given in the permit application.

Let me know if you have any questions or comments.

Thank You,

Joe Kessler, PE

Engineer

West Virginia Division of Air Quality

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[Charleston, WV 25304](#)

Phone: (304) 926-0499 x1219

Fax: (304) 926-0478

Joseph.r.kessler@wv.gov

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Andrea Stacy

National Park Service

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Denver, CO 80225

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Andrea Stacy

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Subject: RE: WV PSD Application Notification (R14-0037 ROXUL USA, Inc.)

Hello Joe,

Similar to NPS, we anticipate no significant impacts to any air quality related values (AQRVs) at Class I Areas administered by the Forest Service (based on the estimated emissions and the FLM information form you provided).

Should the nature of this project change such that maximum emissions increase, please let us know so that we can re-evaluate the proposal. Also, please send us a copy of the draft permit when it becomes available.

Thank you again for keeping the Forest Service informed about permit applications for facilities that may impact Forest Service Class I Areas. Should you have any questions about this determination, please let me know.

Best,
Jeremy



Jeremy Ash
Air Resource Specialist

Forest Service
Eastern Region (R9)

p: 414-297-1902
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Milwaukee, WI 53202

www.fs.fed.us



Caring for the land and serving people

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Thanks!

On Wed, Nov 29, 2017 at 9:43 AM, Kessler, Joseph R <Joseph.R.Kessler@wv.gov> wrote:

Attached is the FLM Notification Form for the following PSD Permit Application submitted on November 21, 2017:

Permit Number: **R14-0037**

Applicant: **ROXUL USA, Inc.**

Facility: **Ran Facility**
Location: **Ranson, Jefferson County, WV**
Facility ID Number: **037-00108**

The permit application is available online at:

http://dep.wv.gov/daq/Documents/November%202017%20Applications/037-00108_APPL_R14-0037.pdf

The WV DAQ is providing notification that a PSD application has been filed for construction of a new major source in Jefferson County, WV. The proposed facility is a stone wool manufacturing facility. The application was submitted on November 21, 2017 and has not yet been deemed complete. The applicant has stated the highest Q/D (based on Shenandoah NP) has been calculated to be 9.6. In Appendix A of the permit application, the applicant provides individual emission unit Q/D TPY calculations where the annual emissions were not based on operating 8,760 hours. See the attached spreadsheet for a summary of the Q/D calculations. Additionally, due to late changes to the design of the facility, CO is still listed as a PSD pollutant when in fact the proposed PTE of CO has fallen below 100 TPY. A revision to the application removing CO as a PSD pollutant will be submitted in the coming weeks. As a final note, the maximum facility-wide hourly emissions given in the FLM Information Form are calculated from the annual emissions and averaged over 8,760 hours. This method was used as there was no aggregate facility-wide hourly emission numbers given in the permit application.

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

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ATTACHMENT B

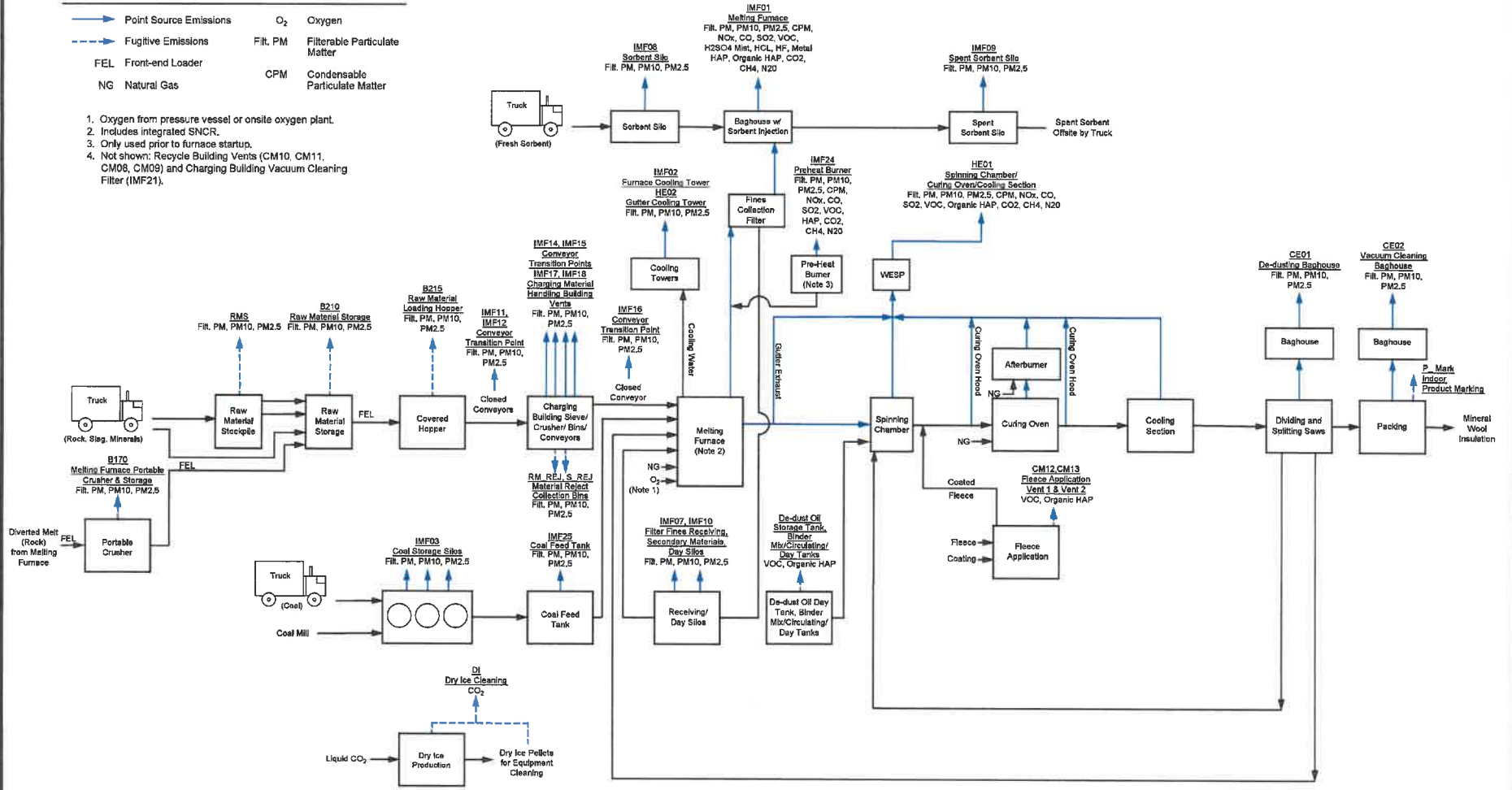
Flow Diagrams

1. Mineral Wool Line
2. Rockfon Line
3. Coal Milling

KEY/ NOTES

	Point Source Emissions	O ₂ Oxygen
	Fugitive Emissions	FIL, PM Filterable Particulate Matter
	FEL Front-end Loader	CPM Condensable Particulate Matter
	NG Natural Gas	

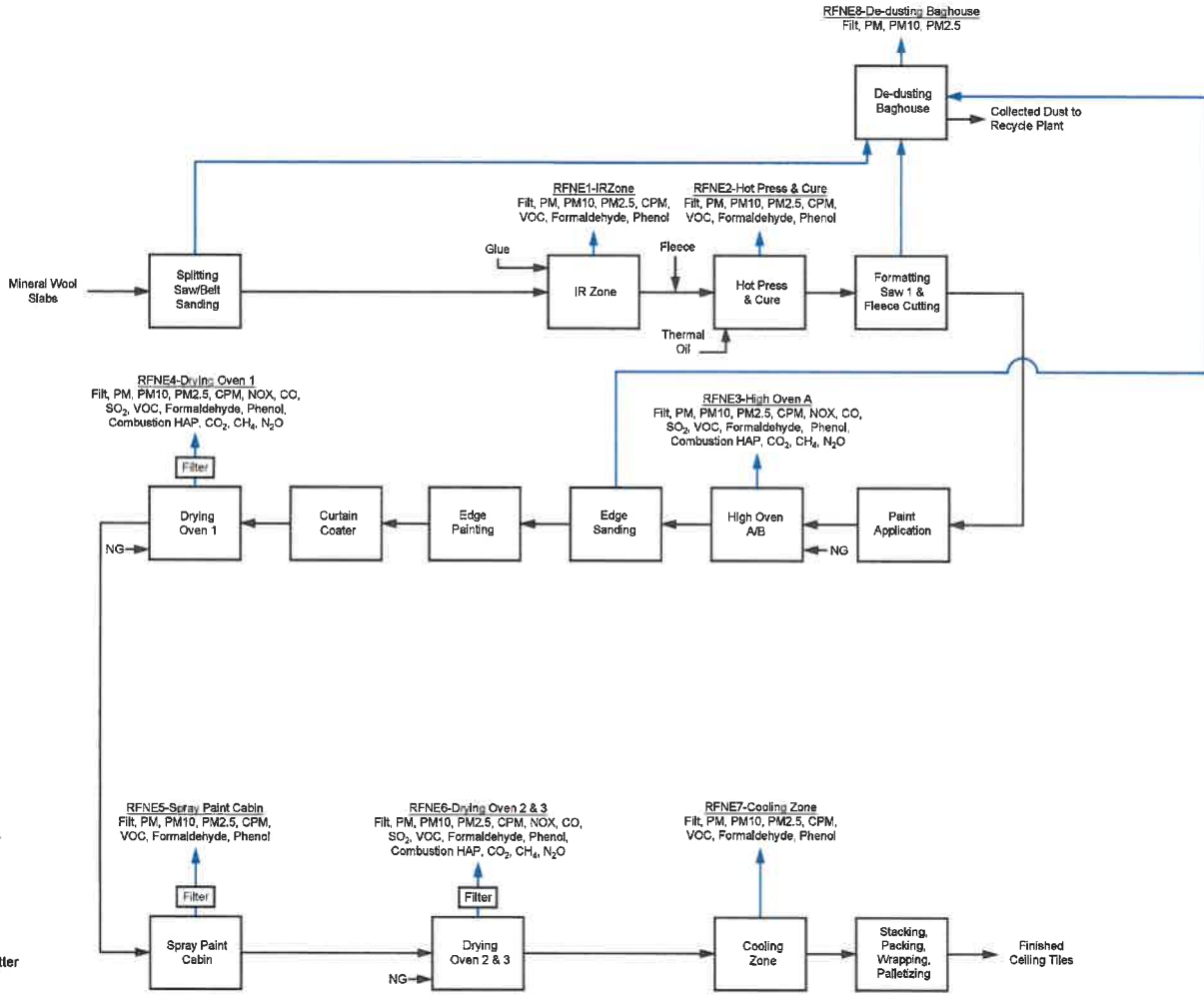
1. Oxygen from pressure vessel or onsite oxygen plant.
2. Includes integrated SNCR.
3. Only used prior to furnace startup.
4. Not shown: Recycle Building Vents (CM10, CM11, CM08, CM09) and Charging Building Vacuum Cleaning Filter (IMF21).



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Environmental Resources Management	<p align="center">MINERAL WOOL LINE PROCESS FLOW DIAGRAM ROXUL USA INC. RANSON, WEST VIRGINIA</p>	<p align="center">FIGURE 3-1</p>
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I:\SDB\A\CCD2\T\0\ING\A\CCD\A\060803\060803_FlowSheet\FDS3_RED_A_VERSION R1.dwg, 11/14/2017 4:03:10 PM



KEY

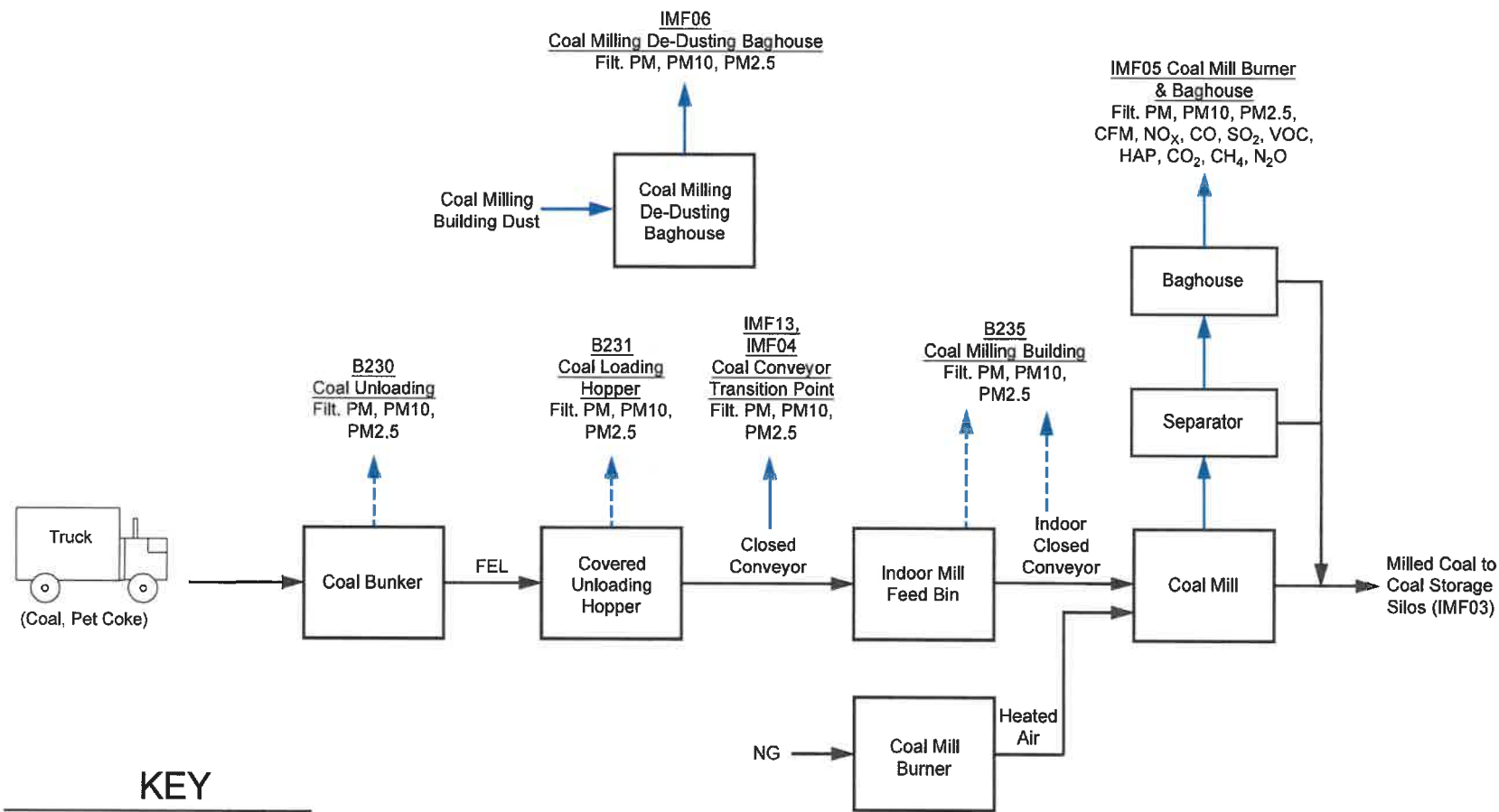
- Point Source Emissions
- Fugitive Emissions
- Filt. PM Filterable Particulate Matter
- CPM Condensable Particulate Matter
- NG Natural Gas

 Environmental Resources Management

ROCKFON LINE
 PROCESS FLOW DIAGRAM
 ROXUL USA INC.
 RANSON, WEST VIRGINIA

FIGURE
3-2

(SDBNADC02) T:\DWG\AutoCAD\dwg\0408003\0408003_RED_A VERSION R1.dwg, 11/14/2017 4:03:10 PM



KEY

- Point Source Emissions
- - - Fugitive Emissions
- Filt. PM Filterable Particulate Matter
- CPM Condensable Particulate Matter
- NG Natural Gas
- FEL Front End Loader



Environmental Resources Management

COAL MILLING
 PROCESS FLOW DIAGRAM
 ROXUL USA INC.
 RANSON, WEST VIRGINIA

FIGURE
3-3

ATTACHMENT C

Modeled Source Parameters and Emission Rates

Attachment 1

Table A1-1 Roxul Modeled Source Parameters

Source ID	Description	Source Type	X Coord. [m]	Y Coord. [m]	Base Elevation [m]	Release Height [m]	Gas Exit Temperature [K]	Gas Exit Velocity [m/s]	Inside Diameter [m]
IMF11	Conveyor Transition Point (B215 to B220)	Point	252100.4	4362712	177.18	5	293	21.1	0.18
IMF12	Conveyor Transition Point (B210 to B220)	Point	252096.1	4362712	177.18	15	293	21.1	0.18
IMF14	Conveyor Transition Point (B220 No. 1)	Point	252060.1	4362679	177.18	15	293	21.1	0.18
IMF15	Conveyor Transition Point (B220 No. 2)	Point	252094.8	4362677	177.18	8	293	21.1	0.18
IMF16	Conveyor Transition Point (B220 to B300)	Point	252084.7	4362658	177.18	24	293	21.1	0.18
IMF17	Charging Material Handling Building Vent 1	Point	252081.9	4362687	177.18	26.88	293	0.001	0.25
IMF18	Charging Material Handling Building Vent 2	Point	252055.3	4362688	177.18	18	293	0.001	0.25
IMF21	Charging Building Vacuum Cleaning Filter	Point	252073.3	4362678	177.18	3	313	9	0.15
IMF03	Three (3) Coal Storage Silos	Point	252153.8	4362601	177.18	22	293	2.85	0.4
IMF25	Coal Feed Tank	Point	252083.2	4362624	177.18	22	293	20.25	0.15
IMF24	Pre-heat Burner	Point	252086.8	4362618	177.18	37	330	15.01	0.35
IMF01	Melting Furnace	Point	252093.5	4362645	177	65	423	20.59	0.95
IMF07	Two (2) Storage Silos	Point	252100.7	4362629	177.18	22	293	2.97	0.4
IMF10	Filter Fines Receiving Silo	Point	252108.2	4362608	177.18	22	293	2.85	0.4
IMF08	Sorbent Silo	Point	252108	4362603	177.18	22	293	2.85	0.4
IMF09	Spent Sorbent Silo	Point	252107.7	4362598	177.18	22	293	2.85	0.4
IMF02	Melting Furnace Cooling Tower	Point	252090.7	4362611	177.18	25	293.15	0.001	0.4
HE02	Gutter Cooling Tower	Point	252073.1	4362661	177.18	25	293.15	0.001	0.4
HE01	WESP	Point	252120.6	4362546	176.38	65	313	15.21	3.95
CE01	De-dusting Baghouse	Point	252076.2	4362535	177.18	35	313	21.47	1.15
CE02	Vacuum Cleaning Baghouse	Point	252061.9	4362515	177.18	30	313	16.56	0.7
CM10	Recycle Plant Building Vent 1	Point	252095.1	4362573	177.18	15	313	12.17	1
CM11	Recycle Plant Building Vent 2	Point	252069.2	4362574	177.18	15	313	12.17	1
CM08	Recycle Plant Building Vent 3	Point	252095.2	4362557	177.18	15	313	16.23	0.25
CM09	Recycle Plant Building Vent 4	Point	252098.3	4362586	177.18	15	313	16.23	0.25
RFNE1	IR Zone	Point	252016	4362291	177.18	13	328	12.85	0.32
RFNE2	Hot Press and Cure	Point	252016.9	4362332	177.18	13	313	12.27	0.32
RFNE3	High Oven A	Point	251985.3	4362307	177.18	12	373	15.47	0.5
RFNE9	High Oven B	Point	251981.6	4362202	177.18	12	373	15.47	0.5
RFNE4	Drying Oven 1	Point	251966.8	4362292	177.18	12	433	11.22	0.5

Attachment 1

Table A1-1 Roxul Modeled Source Parameters (Continued)

Source ID	Description	Source Type	X Coord. [m]	Y Coord. [m]	Base Elevation [m]	Release Height [m]	Gas Exit Temperature [K]	Gas Exit Velocity [m/s]	Inside Diameter [m]
RFNE6	Drying Oven 2 & 3	Point	251964.6	4362250	177.18	15	433	10.52	0.8
RFNE5	Spray Paint Cabin	Point	251965.6	4362269	177.18	33	313	16.23	0.5
RFNE7	Cooling Zone	Point	251978.5	4362280	177.18	14	313	15.85	0.8
RFNE8	De-dusting Baghouse	Point	252039.9	4362259	177.18	30	313	19.64	1.56
CM03	Natural Gas Boiler 1	Point	252062.7	4362638	177.18	15	330	15.01	0.35
CM04	Natural Gas Boiler 2	Point	252055.5	4362639	177.18	15	330	15.01	0.35
RFN10	RFN Building Heat	Point	251989.3	4362356	177.18	15	330	15.01	0.35
EFP1	Emergency Fire Pump Engine	Point	252183.5	4362590	177.18	7.2	478	48.27	0.12
IMF05	Coal Mill Burner & Baghouse	Point	252166.7	4362612	177.18	20	355.37	20.45	0.32
IMF06	Coal Milling De-Dusting Baghouse	Point	252166.7	4362613	177.18	20	293	19.62	0.44
IMF04	Coal Conveyor Transition Point (B231 to B235)	Point	252180.1	4362656	177.18	12	293	18.94	0.19
IMF13	Coal Conveyor Transition Point (B231 to B235)	Point	252181.5	4362668	177.18	2	293	18.94	0.19

Attachment 1

Table A1-1 Roxul Modeled Source Parameters (Continued)

Source ID	Description	Source Type	X Coord. [m]	Y Coord. [m]	Base Elevation [m]	Release Height [m]	Side Length [m]	Initial Lateral Dimension	Initial Vertical Dimension
B210	Raw Material Storage (B210)	Volume	252121.4	4362704	177.18	3.05	27.219	6.33	1.42
B215	Raw Material Loading Hopper (B215)	Volume	252100.3	4362711	177.18	3.05	2.365	0.55	0.71
RM_REJ	Raw Material Reject Collection Bin	Volume	252052	4362680	177.18	0.9	2.322	0.54	0.84
S_REJ	Sieve Reject Collection Bin	Volume	252084.1	4362690	177.18	0.9	2.322	0.54	0.84
P_MARK	Product Marking	Volume	252044.9	4362492	177.18	3.05	9.159	2.13	1.42
RMS	Raw Material Outdoor Stockpile	Volume	251995.1	4362700	177.18	2.4	22.36	5.2	1.12
B170	Melting Furnace Portable Crusher & St	Volume	252052.1	4362733	177.18	2.4	42.441	9.87	2.23
B231	Coal Loading Hopper	Volume	252181.5	4362668	177.18	3.05	4.171	0.97	0.71
B235	Coal Milling Building	Volume	252167.8	4362632	177.18	6	28.982	6.74	5.58
B230	Coal Unloading	Volume	252164.8	4362654	177.18	3.05	13.889	3.23	1.42
RD_RM1	Raw Material Paved Haul Road	Volume	252321.1	4362561	177.18	2.55	31.992	7.44	2.37
RD_RM2	Raw Material Paved Haul Road	Volume	252289.2	4362561	177.18	2.55	31.992	7.44	2.37
RD_RM3	Raw Material Paved Haul Road	Volume	252257.5	4362559	177.18	2.55	31.992	7.44	2.37
RD_RM4	Raw Material Paved Haul Road	Volume	252225.6	4362560	177.18	2.55	31.992	7.44	2.37
RD_RM5	Raw Material Paved Haul Road	Volume	252193.6	4362561	177.18	2.55	31.992	7.44	2.37
RD_RM6	Raw Material Paved Haul Road	Volume	252161.6	4362563	177.18	2.55	31.992	7.44	2.37
RD_RM7	Raw Material Paved Haul Road	Volume	252135.9	4362569	177.18	2.55	31.992	7.44	2.37
RD_RM8	Raw Material Paved Haul Road	Volume	252141.2	4362600	177.18	2.55	31.992	7.44	2.37
RD_RM9	Raw Material Paved Haul Road	Volume	252143.7	4362631	177.18	2.55	31.992	7.44	2.37
RD_RM10	Raw Material Paved Haul Road	Volume	252148.2	4362664	177.18	2.55	31.992	7.44	2.37
RD_RM11	Raw Material Paved Haul Road	Volume	252149.5	4362695	177.18	2.55	31.992	7.44	2.37
RD_RM12	Raw Material Paved Haul Road	Volume	252150.3	4362725	177.18	2.55	31.992	7.44	2.37
RD_RM13	Raw Material Paved Haul Road	Volume	252158.6	4362744	177.18	2.55	31.992	7.44	2.37
RD_RM14	Raw Material Paved Haul Road	Volume	252190.5	4362742	177.18	2.55	31.992	7.44	2.37
RD_RM15	Raw Material Paved Haul Road	Volume	252211.2	4362719	177.18	2.55	31.992	7.44	2.37
RD_RM16	Raw Material Paved Haul Road	Volume	252211.2	4362688	177.18	2.55	31.992	7.44	2.37
RD_RM17	Raw Material Paved Haul Road	Volume	252209.6	4362656	177.18	2.55	31.992	7.44	2.37
RD_RM18	Raw Material Paved Haul Road	Volume	252208	4362624	177.18	2.55	31.992	7.44	2.37
RD_RM19	Raw Material Paved Haul Road	Volume	252208.3	4362592	177.18	2.55	31.992	7.44	2.37

Attachment 1

Table A1-1 Roxul Modeled Source Parameters (Continued)

Source ID	Description	Source Type	X Coord. [m]	Y Coord. [m]	Base Elevation [m]	Release Height [m]	Side Length [m]	Initial Lateral Dimension	Initial Vertical Dimension
RD_RM20	Raw Material Paved Haul Road	Volume	252229.9	4362571	177.18	2.55	31.992	7.44	2.37
RD_RM21	Raw Material Paved Haul Road	Volume	252125.8	4362746	177.18	2.55	31.992	7.44	2.37
RD_RM22	Raw Material Paved Haul Road	Volume	252093.6	4362748	177.18	2.55	31.992	7.44	2.37
RD_RM23	Raw Material Paved Haul Road	Volume	252074.6	4362702	177.18	2.55	31.992	7.44	2.37
RD_RM24	Raw Material Paved Haul Road	Volume	252043.5	4362703	177.18	2.55	31.992	7.44	2.37
RD_RM25	Raw Material Paved Haul Road	Volume	252012.9	4362704	177.18	2.55	31.992	7.44	2.37
RD_RM26	Raw Material Paved Haul Road	Volume	252076.2	4362733	177.18	2.55	31.992	7.44	2.37
RD_RM27	Raw Material Paved Haul Road	Volume	252120.6	4362695	177.18	2.55	31.992	7.44	2.37
RD_RM28	Raw Material Paved Haul Road	Volume	252113.5	4362629	177.18	2.55	31.992	7.44	2.37
RD_RM29	Raw Material Paved Haul Road	Volume	252105.5	4362708	177.18	2.55	31.992	7.44	2.37
RD_RM30	Raw Material Paved Haul Road	Volume	252011.1	4362687	177.18	2.55	31.992	7.44	2.37
RD_RM31	Raw Material Paved Haul Road	Volume	252332	4362561	177.18	2.55	31.992	7.44	2.37
RD_FP1	Finished Product Paved Haul Road	Volume	252285.2	4362055	177.18	2.55	31.992	7.44	2.37
RD_FP2	Finished Product Paved Haul Road	Volume	252253.2	4362056	177.18	2.55	31.992	7.44	2.37
RD_FP3	Finished Product Paved Haul Road	Volume	252228	4362074	177.18	2.55	31.992	7.44	2.37
RD_FP4	Finished Product Paved Haul Road	Volume	252222.5	4362104	177.18	2.55	31.992	7.44	2.37
RD_FP5	Finished Product Paved Haul Road	Volume	252223	4362136	177.18	2.55	31.992	7.44	2.37
RD_FP6	Finished Product Paved Haul Road	Volume	252225.8	4362166	177.18	2.55	31.992	7.44	2.37
RD_FP7	Finished Product Paved Haul Road	Volume	252256.1	4362172	177.18	2.55	31.992	7.44	2.37
RD_FP8	Finished Product Paved Haul Road	Volume	252274	4362196	177.18	2.55	31.992	7.44	2.37
RD_FP9	Finished Product Paved Haul Road	Volume	252275.4	4362228	177.18	2.55	31.992	7.44	2.37
RD_FP10	Finished Product Paved Haul Road	Volume	252276.7	4362260	177.18	2.55	31.992	7.44	2.37
RD_FP11	Finished Product Paved Haul Road	Volume	252278	4362292	177.18	2.55	31.992	7.44	2.37
RD_FP12	Finished Product Paved Haul Road	Volume	252279.3	4362324	177.18	2.55	31.992	7.44	2.37
RD_FP13	Finished Product Paved Haul Road	Volume	252269.9	4362354	177.18	2.55	31.992	7.44	2.37
RD_FP14	Finished Product Paved Haul Road	Volume	252238.9	4362361	177.18	2.55	31.992	7.44	2.37
RD_FP15	Finished Product Paved Haul Road	Volume	252206.9	4362362	177.18	2.55	31.992	7.44	2.37
RD_FP16	Finished Product Paved Haul Road	Volume	252176.7	4362356	177.18	2.55	31.992	7.44	2.37
RD_FP17	Finished Product Paved Haul Road	Volume	252156.3	4362338	177.18	2.55	31.992	7.44	2.37

Attachment 1

Table A1-1 Roxul Modeled Source Parameters (Continued)

Source ID	Description	Source Type	X Coord. [m]	Y Coord. [m]	Base Elevation [m]	Release Height [m]	Side Length [m]	Initial Lateral Dimension	Initial Vertical Dimension
RD_FP18	Finished Product Paved Haul Road	Volume	252156	4362306	177.18	2.55	31.992	7.44	2.37
RD_FP19	Finished Product Paved Haul Road	Volume	252152.6	4362274	177.18	2.55	31.992	7.44	2.37
RD_FP20	Finished Product Paved Haul Road	Volume	252143.6	4362246	177.18	2.55	31.992	7.44	2.37
RD_FP21	Finished Product Paved Haul Road	Volume	252111.6	4362248	177.18	2.55	31.992	7.44	2.37
RD_FP22	Finished Product Paved Haul Road	Volume	252079.7	4362249	177.18	2.55	31.992	7.44	2.37
RD_FP23	Finished Product Paved Haul Road	Volume	252047.8	4362250	177.18	2.55	31.992	7.44	2.37
RD_FP24	Finished Product Paved Haul Road	Volume	252033	4362228	177.18	2.55	31.992	7.44	2.37
RD_FP25	Finished Product Paved Haul Road	Volume	252056.5	4362216	177.18	2.55	31.992	7.44	2.37
RD_FP26	Finished Product Paved Haul Road	Volume	252088.5	4362215	177.18	2.55	31.992	7.44	2.37
RD_FP27	Finished Product Paved Haul Road	Volume	252120.5	4362215	177.18	2.55	31.992	7.44	2.37
RD_FP28	Finished Product Paved Haul Road	Volume	252152.5	4362214	177.18	2.55	31.992	7.44	2.37
RD_FP29	Finished Product Paved Haul Road	Volume	252158.8	4362184	177.18	2.55	31.992	7.44	2.37
RD_FP30	Finished Product Paved Haul Road	Volume	252180.9	4362161	177.18	2.55	31.992	7.44	2.37
RD_FP31	Finished Product Paved Haul Road	Volume	252212.3	4362157	177.18	2.55	31.992	7.44	2.37
RD_FP32	Finished Product Paved Haul Road	Volume	252214.5	4362127	177.18	2.55	31.992	7.44	2.37
RD_FP33	Finished Product Paved Haul Road	Volume	252214.5	4362095	177.18	2.55	31.992	7.44	2.37
RD_FP34	Finished Product Paved Haul Road	Volume	252224.7	4362068	177.18	2.55	31.992	7.44	2.37
RD_FP35	Finished Product Paved Haul Road	Volume	252305.2	4362055	177.18	2.55	31.992	7.44	2.37
RD_CM	FEL - Coal/PET Coke from Bunker to Feed Hopper (for Milling)	Volume	252173	4362661	177.18	2.55	31.992	7.44	2.37

Attachment 1

Table A1-2 Roxul Modeled Source Emission Rates

Source ID	Description	NO ₂		SO ₂		CO	PM ₁₀		PM _{2.5}	
		1-Hour (g/s)	Annual (g/s)	1-Hour (g/s)	3HR-24HR- Annual (g/s)	1-HR- 8-HR (g/s)	24-Hour (g/s)	Annual (g/s)	24-Hour (g/s)	Annual (g/s)
IMF11	Conveyor Transition Point (B215 to B220)	-	-	-	-	-	2.50E-03	2.50E-03	1.25E-03	1.25E-03
IMF12	Conveyor Transition Point (B210 to B220)	-	-	-	-	-	2.50E-03	2.50E-03	1.25E-03	1.25E-03
IMF14	Conveyor Transition Point (B220 No. 1)	-	-	-	-	-	2.50E-03	2.50E-03	1.25E-03	1.25E-03
IMF15	Conveyor Transition Point (B220 No. 2)	-	-	-	-	-	2.50E-03	2.50E-03	1.25E-03	1.25E-03
IMF16	Conveyor Transition Point (B220 to B300)	-	-	-	-	-	2.50E-03	2.50E-03	1.25E-03	1.25E-03
IMF17	Charging Material Handling Building Vent 1	-	-	-	-	-	2.43E-03	2.43E-03	1.22E-03	1.22E-03
IMF18	Charging Material Handling Building Vent 2	-	-	-	-	-	2.43E-03	2.43E-03	1.22E-03	1.22E-03
IMF21	Charging Building Vacuum Cleaning Filter	-	-	-	-	-	6.94E-04	6.94E-04	3.47E-04	3.47E-04
IMF03	Three (3) Coal Storage Silos	-	-	-	-	-	5.00E-03	5.00E-03	2.50E-03	2.50E-03
IMF25	Coal Feed Tank	-	-	-	-	-	1.67E-03	1.67E-03	8.33E-04	8.33E-04
IMF24	Pre-heat Burner	4.56E-02	4.56E-02	3.77E-04	3.77E-04	5.28E-02	4.78E-03	4.78E-03	4.78E-03	4.78E-03
IMF01	Melting Furnace	4.71E+00	4.71E+00	4.24E+00	4.24E+00	1.41E+00	1.04E+00	1.04E+00	9.42E-01	9.42E-01
IMF07	Two (2) Storage Silos	-	-	-	-	-	3.47E-03	3.47E-03	1.74E-03	1.74E-03
IMF10	Filter Fines Receiving Silo	-	-	-	-	-	1.67E-03	1.67E-03	8.33E-04	8.33E-04
IMF08	Sorbent Silo	-	-	-	-	-	1.67E-03	1.67E-03	8.33E-04	8.33E-04
IMF09	Spent Sorbent Silo	-	-	-	-	-	1.67E-03	1.67E-03	8.33E-04	8.33E-04
IMF02	Melting Furnace Cooling Tower	-	-	-	-	-	1.25E-03	1.25E-03	6.25E-04	6.25E-04
HE02	Gutter Cooling Tower	-	-	-	-	-	2.91E-04	2.91E-04	1.46E-04	1.46E-04
HE01	WESP	1.83E+00	1.83E+00	1.36E-03	1.36E-03	2.29E-01	2.67E+00	2.67E+00	2.42E+00	2.42E+00
CE01	De-dusting Baghouse	-	-	-	-	-	9.72E-02	9.72E-02	9.72E-02	9.72E-02
CE02	Vacuum Cleaning Baghouse	-	-	-	-	-	2.78E-02	2.78E-02	2.78E-02	2.78E-02
CM10	Recycle Plant Building Vent 1	-	-	-	-	-	8.33E-02	8.33E-02	4.17E-02	4.17E-02
CM11	Recycle Plant Building Vent 2	-	-	-	-	-	8.33E-02	8.33E-02	4.17E-02	4.17E-02
CM08	Recycle Plant Building Vent 3	-	-	-	-	-	6.94E-03	6.94E-03	3.47E-03	3.47E-03
CM09	Recycle Plant Building Vent 4	-	-	-	-	-	6.94E-03	6.94E-03	3.47E-03	3.47E-03
RFNE1	IR Zone	-	-	-	-	-	2.33E-03	2.33E-03	1.75E-03	1.75E-03
RFNE2	Hot Press and Cure	-	-	-	-	-	2.33E-03	2.33E-03	1.75E-03	1.75E-03
RFNE3	High Oven A	3.35E-02	3.35E-02	2.01E-04	2.01E-04	2.82E-02	1.47E-02	1.47E-02	1.10E-02	1.10E-02
RFNE9	High Oven B	3.35E-02	3.35E-02	2.01E-04	2.01E-04	2.82E-02	1.47E-02	1.47E-02	1.10E-02	1.10E-02
RFNE4	Drying Oven 1	2.51E-02	2.51E-02	1.51E-04	1.51E-04	2.11E-02	1.03E-02	1.03E-02	7.71E-03	7.71E-03
RFNE6	Drying Oven 2 & 3	5.87E-02	5.87E-02	3.52E-04	3.52E-04	4.93E-02	1.59E-02	1.59E-02	1.19E-02	1.19E-02

Attachment 1

Table A1-2 Roxul Modeled Source Emission Rates

Source ID	Description	NO ₂		SO ₂		CO	PM ₁₀		PM _{2.5}	
		1-Hour (g/s)	Annual (g/s)	1-Hour (g/s)	3HR-24HR- Annual (g/s)	1-HR- 8-HR (g/s)	24-Hour (g/s)	Annual (g/s)	24-Hour (g/s)	Annual (g/s)
RFNE5	Spray Paint Cabin	-	-	-	-	-	1.11E-01	1.11E-01	8.33E-02	8.33E-02
RFNE7	Cooling Zone	-	-	-	-	-	2.43E-02	2.43E-02	1.82E-02	1.82E-02
RFNE8	De-dusting Baghouse	-	-	-	-	-	4.29E-02	4.29E-02	2.14E-02	2.14E-02
CM03	Natural Gas Boiler 1	2.28E-02	2.28E-02	3.77E-04	3.77E-04	5.28E-02	4.78E-03	4.78E-03	4.78E-03	4.78E-03
CM04	Natural Gas Boiler 2	2.28E-02	2.28E-02	3.77E-04	3.77E-04	5.28E-02	4.78E-03	4.78E-03	4.78E-03	4.78E-03
RFN10	RFN Building Heat	2.28E-02	2.28E-02	3.77E-04	3.77E-04	5.28E-02	4.78E-03	4.78E-03	4.78E-03	4.78E-03
EFP1	Emergency Fire Pump Engine	intermitte	9.32E-03	intermitte	4.50E-05	7.14E-02	1.98E-04	5.42E-04	1.98E-04	5.42E-04
IMF05	Coal Mill Burner & Baghouse	5.34E-02	5.34E-02	4.42E-04	4.42E-04	6.19E-02	3.99E-02	3.99E-02	3.22E-02	3.22E-02
IMF06	Coal Milling De-Dusting Baghouse	-	-	-	-	-	2.78E-02	2.78E-02	1.39E-02	1.39E-02
IMF04	Coal Conveyor Transition Point (B231 to B235)	-	-	-	-	-	2.50E-03	2.50E-03	1.25E-03	1.25E-03
IMF13	Coal Conveyor Transition Point (B231 to B235)	-	-	-	-	-	2.50E-03	2.50E-03	1.25E-03	1.25E-03
B210	Raw Material Storage (B210)	-	-	-	-	-	4.88E-03	3.83E-03	7.38E-04	5.79E-04
B215	Raw Material Loading Hopper (B215)	-	-	-	-	-	7.65E-04	7.65E-04	1.16E-04	1.16E-04
RM_REJ	Raw Material Reject Collection Bin	-	-	-	-	-	7.50E-06	1.53E-05	1.14E-06	2.32E-06
S_REJ	Sieve Reject Collection Bin	-	-	-	-	-	7.50E-06	1.53E-05	1.14E-06	2.32E-06
P_MARK	Product Marking	4.91E-03	4.91E-03	2.95E-05	2.95E-05	4.13E-03	3.73E-04	3.73E-04	3.73E-04	3.73E-04
RMS	Raw Material Outdoor Stockpile	-	-	-	-	-	3.29E-03	1.43E-03	5.09E-04	2.26E-04
B170	Melting Furnace Portable Crusher & Storage	-	-	-	-	-	3.20E-02	7.80E-03	9.00E-03	1.73E-03
B231	Coal Loading Hopper	-	-	-	-	-	1.14E-05	1.04E-05	1.73E-06	1.58E-06
B235	Coal Milling Building	-	-	-	-	-	1.25E-03	1.25E-03	6.25E-04	6.25E-04
B230	Coal Unloading	-	-	-	-	-	1.14E-05	1.04E-05	1.73E-06	1.58E-06
RD_RM1	Raw Material Paved Haul Road	-	-	-	-	-	8.98E-04	3.90E-04	2.20E-04	9.56E-05
RD_RM2	Raw Material Paved Haul Road	-	-	-	-	-	8.98E-04	3.90E-04	2.20E-04	9.56E-05
RD_RM3	Raw Material Paved Haul Road	-	-	-	-	-	8.98E-04	3.90E-04	2.20E-04	9.56E-05
RD_RM4	Raw Material Paved Haul Road	-	-	-	-	-	8.98E-04	3.90E-04	2.20E-04	9.56E-05
RD_RM5	Raw Material Paved Haul Road	-	-	-	-	-	8.98E-04	3.90E-04	2.20E-04	9.56E-05
RD_RM6	Raw Material Paved Haul Road	-	-	-	-	-	8.98E-04	3.90E-04	2.20E-04	9.56E-05
RD_RM7	Raw Material Paved Haul Road	-	-	-	-	-	8.98E-04	3.90E-04	2.20E-04	9.56E-05
RD_RM8	Raw Material Paved Haul Road	-	-	-	-	-	8.98E-04	3.90E-04	2.20E-04	9.56E-05
RD_RM9	Raw Material Paved Haul Road	-	-	-	-	-	8.98E-04	3.90E-04	2.20E-04	9.56E-05
RD_RM10	Raw Material Paved Haul Road	-	-	-	-	-	8.98E-04	3.90E-04	2.20E-04	9.56E-05

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Table A1-2 Roxul Modeled Source Emission Rates

Source ID	Description	NO ₂		SO ₂		CO	PM ₁₀		PM _{2.5}	
		1-Hour (g/s)	Annual (g/s)	1-Hour (g/s)	3HR-24HR- Annual (g/s)	1-HR- 8-HR (g/s)	24-Hour (g/s)	Annual (g/s)	24-Hour (g/s)	Annual (g/s)
RD_RM11	Raw Material Paved Haul Road	-	-	-	-	-	8.98E-04	3.90E-04	2.20E-04	9.56E-05
RD_RM12	Raw Material Paved Haul Road	-	-	-	-	-	8.98E-04	3.90E-04	2.20E-04	9.56E-05
RD_RM13	Raw Material Paved Haul Road	-	-	-	-	-	8.98E-04	3.90E-04	2.20E-04	9.56E-05
RD_RM14	Raw Material Paved Haul Road	-	-	-	-	-	8.98E-04	3.90E-04	2.20E-04	9.56E-05
RD_RM15	Raw Material Paved Haul Road	-	-	-	-	-	8.98E-04	3.90E-04	2.20E-04	9.56E-05
RD_RM16	Raw Material Paved Haul Road	-	-	-	-	-	8.98E-04	3.90E-04	2.20E-04	9.56E-05
RD_RM17	Raw Material Paved Haul Road	-	-	-	-	-	8.98E-04	3.90E-04	2.20E-04	9.56E-05
RD_RM18	Raw Material Paved Haul Road	-	-	-	-	-	8.98E-04	3.90E-04	2.20E-04	9.56E-05
RD_RM19	Raw Material Paved Haul Road	-	-	-	-	-	8.98E-04	3.90E-04	2.20E-04	9.56E-05
RD_RM20	Raw Material Paved Haul Road	-	-	-	-	-	8.98E-04	3.90E-04	2.20E-04	9.56E-05
RD_RM21	Raw Material Paved Haul Road	-	-	-	-	-	8.98E-04	3.90E-04	2.20E-04	9.56E-05
RD_RM22	Raw Material Paved Haul Road	-	-	-	-	-	8.98E-04	3.90E-04	2.20E-04	9.56E-05
RD_RM23	Raw Material Paved Haul Road	-	-	-	-	-	8.98E-04	3.90E-04	2.20E-04	9.56E-05
RD_RM24	Raw Material Paved Haul Road	-	-	-	-	-	8.98E-04	3.90E-04	2.20E-04	9.56E-05
RD_RM25	Raw Material Paved Haul Road	-	-	-	-	-	8.98E-04	3.90E-04	2.20E-04	9.56E-05
RD_RM26	Raw Material Paved Haul Road	-	-	-	-	-	8.98E-04	3.90E-04	2.20E-04	9.56E-05
RD_RM27	Raw Material Paved Haul Road	-	-	-	-	-	8.98E-04	3.90E-04	2.20E-04	9.56E-05
RD_RM28	Raw Material Paved Haul Road	-	-	-	-	-	8.98E-04	3.90E-04	2.20E-04	9.56E-05
RD_RM29	Raw Material Paved Haul Road	-	-	-	-	-	8.98E-04	3.90E-04	2.20E-04	9.56E-05
RD_RM30	Raw Material Paved Haul Road	-	-	-	-	-	8.98E-04	3.90E-04	2.20E-04	9.56E-05
RD_RM31	Raw Material Paved Haul Road	-	-	-	-	-	8.98E-04	3.90E-04	2.20E-04	9.56E-05
RD_FP1	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP2	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP3	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP4	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP5	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP6	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP7	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP8	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP9	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP10	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06

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Table A1-2 Roxul Modeled Source Emission Rates

Source ID	Description	NO ₂		SO ₂		CO	PM ₁₀		PM _{2.5}	
		1-Hour (g/s)	Annual (g/s)	1-Hour (g/s)	3HR-24HR- Annual (g/s)	1-HR- 8-HR (g/s)	24-Hour (g/s)	Annual (g/s)	24-Hour (g/s)	Annual (g/s)
RD_FP11	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP12	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP13	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP14	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP15	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP16	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP17	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP18	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP19	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP20	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP21	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP22	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP23	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP24	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP25	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP26	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP27	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP28	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP29	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP30	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP31	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP32	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP33	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP34	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_FP35	Finished Product Paved Haul Road	-	-	-	-	-	1.49E-05	1.16E-05	3.65E-06	2.86E-06
RD_CM	FEL - Coal/PET Coke from Bunker to Feed Hopper (for Milling)	-	-	-	-	-	9.33E-05	8.51E-05	2.29E-05	2.09E-05

ATTACHMENT D

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



west virginia department of environmental protection

Division of Air Quality
601 57th Street SE
Charleston, WV 25304

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

MEMORANDUM

To: Jay Fedczak
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 (NO₂) and 1-hour sulfur dioxide (SO₂) 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 NO₂ and 1-hr SO₂ 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 NO₂ and 1-hr SO₂ 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 NO₂ and 1-hr SO₂.

Discussion

On February 9, 2010, EPA published a final rule, which became effective on April 12, 2010, establishing a new 1-hour NO₂ NAAQS at 100 ppb (188 µg/m³ at 25 °C and 760 mm Hg), based

on the 3-year average of the 98th-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 SO₂ NAAQS at 75 ppb (196 µg/m³ at 25 °C and 760 mm Hg), based on the 3-year average of the 99th-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 NO₂ and 1-Hour SO₂ SILs

This memo documents the establishment, for the West Virginia PSD program, of an interim 1-hour NO₂ SIL of 4 ppb (7.5 µg/m³), 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 NO₂ 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 SO₂ SIL of 3 ppb (7.8 µg/m³), 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 SO₂ 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 NO₂ NAAQS for the Prevention of Significant Deterioration Program

FROM: Stephen D. Page, Director *Stephen 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 (NO₂) National Ambient Air Quality Standard (hereinafter, either the 1-hour NO₂ NAAQS or 1-hour NO₂ 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 NO₂ NAAQS to provide the requisite protection of public health. The final rule for the new 1-hour NO₂ 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 NO₂ standard.

EPA is aware of reports from stakeholders indicating that some sources—both existing and proposed—are modeling potential violations of the 1-hour NO₂ 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 NO₂ 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 NO₂ 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 NO₂ National Ambient Air Quality Standard in Prevention of Significant Deterioration Permits, Including an Interim 1-hour NO₂ Significant Impact Level," includes guidance for the preparation and review of PSD permits with respect to the new 1-hour NO₂ standard. This guidance memorandum sets forth a recommended interim 1-hour NO₂ significant impact level (SIL) that states may consider when carrying out the required

PSD air quality analysis for NO₂, until EPA promulgates a 1-hour NO₂ SIL via rulemaking. The second memorandum, titled “Applicability of Appendix W Modeling Guidance for the 1-hour NO₂ National Ambient Air Quality Standard,” includes specific modeling guidance for estimating ambient NO₂ concentrations and determining compliance with the new 1-hour NO₂ 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 NO₂ air quality impacts from proposed construction or modification of NO_x 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 NO₂ 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). If you have questions regarding the modeling guidance in the second memorandum, please contact Tyler Fox (fox.tyler@epa.gov). We are continuing our efforts to address permitting issues related to NO₂ 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 NO₂ National Ambient Air Quality Standard in Prevention of Significant Deterioration Permits, Including an Interim 1-hour NO₂ 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 NO₂ National Ambient Air Quality Standard” (June 28, 2010).

cc: Anna Marie Wood
Richard Wayland
Raj Rao
Tyler Fox
Dan deRoock
Roger Brode
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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 NO₂ National Ambient Air Quality Standard in Prevention of Significant Deterioration Permits, Including an Interim 1-hour NO₂ 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 (NO₂) National Ambient Air Quality Standard (hereinafter, either the 1-hour NO₂ NAAQS or 1-hour NO₂ standard) that became effective on April 12, 2010. EPA revised the primary NO₂ NAAQS by promulgating a 1-hour NO₂ 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 NO₂ concentrations that suggest potential violations of the new 1-hour NO₂ standard under some modeling and permitting scenarios; (2) help reduce the burden of modeling for the hourly NO₂ standard where it can be properly demonstrated that a source will not have a significant impact on ambient 1-hour NO₂ 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 NO₂ 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 NO₂ 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 NO₂. Importantly, however, this guidance also sets forth a recommended interim 1-hour NO₂ 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_x 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 NO₂ 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 NO₂ NAAQS.

BACKGROUND

On April 12, 2010, the new 1-hour NO₂ 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 NO₂ 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 NO₂ NAAQS.

We are responding to reports from stakeholders which indicate that some sources, existing and proposed, are modeling high hourly NO₂ concentrations showing violations of the 1-hour NO₂ NAAQS—based only on the source's projected emissions of NO_x 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 NO₂ 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_x-to-NO₂ conversion in the ambient air. To the extent that this is the case, it may be possible to provide more accurate projections of ambient NO₂ concentrations by applying current procedures which account for the statistical form of the 1-hour NO₂ standard, as well as more realistic estimates of the rate of conversion of NO_x emissions to ambient NO₂ 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 NO₂ National Ambient Air Quality Standard" (June 28, 2010) for specific modeling guidance for estimating ambient NO₂ concentrations consistent with the new 1-hour NO₂ 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 NO₂ assist in resolving some of the issues arising from preliminary analyses that are reportedly showing potential exceedances of the new 1-hour NO₂ 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 NO₂ standard. Moreover, the interim 1-hour NO₂ 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 NO₂ 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 NO₂ NAAQS are predicted, but the permit applicant can show that the NO_x 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.¹ 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)², a major stationary source or major modification (as defined at §51.165(a)(1)(iv) and (v)) that locates in an NO₂ attainment area, but would cause or contribute to a violation of the 1-hour NO₂ 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 [NO₂] 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).³ 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

¹ While there is no 1-hour NO₂ 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 NO₂ requirements in the federal PSD program, and in state programs where states choose to use it.

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

³ 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_x-NO₂ 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_x emissions on ambient concentrations of NO₂ are addressed in EPA modeling guidance, including the June 28, 2010, Memorandum titled, "Applicability of Appendix W Modeling Guidance for the 1-hour NO₂ 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 NO₂ 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_x emissions limits or to meet the annual and 1-hour NAAQS and annual NO₂ 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_x emissions limitations or to determine source compliance with the annual and 1-hour NO₂ 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_x emissions;

- For a stack height equal to or greater than 65 meters, the impact on NO_x 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)).⁴

- 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 NO₂ 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_x/NO₂), “excessive concentrations” means a maximum ground-level concentration of NO₂ due to NO_x 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 NO₂ concentration experienced in the absence of such effects and (a) which contributes to a total NO₂ concentration due to emissions from all sources that is greater than the annual or 1-hour NO₂ NAAQS or (b) greater than the PSD (annual) increment for NO₂. (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 NO₂ 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 NO₂ NAAQS and annual NO₂ increment.

⁴ 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_x (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_x 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 NO₂ 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 NO₂ 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 NO₂ 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_x and the significant monitoring concentration (SMC) for NO₂. EPA intends to evaluate the need for possible changes or additions to each of these important screening tools for NO_x/NO₂ due to the addition of a 1-hour NO₂ 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_x emissions as well as an interim 1-hour NO₂ SIL that we are setting forth today for conducting air quality impact analyses for the 1-hour NO₂ NAAQS. As described in the section titled Introduction, EPA intends to implement the interim 1-hour NO₂ 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 NO₂ standard using an averaging time of less than one year, the NAAQS for SO₂ 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 SO₂ 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 NO₂ significant emissions rate any differently than EPA has historically applied the SO₂ 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 NO₂ standard.

INTERIM 1-HOUR NO₂ 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 (1st 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 NO₂ SIL for the new NAAQS for NO₂. 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_{2.5}), pg. 82 (March 2008) [EPA-HQ-OAR-2003-0062-0278].

Until such time as a 1-hour NO₂ 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 NO₂ 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 NO₂ SIL, the permit applicant and permitting authority can determine: (1) whether, based on the proposed increase in NO_x 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_x emissions will cause or contribute to a modeled violation of the 1-hour NO₂ NAAQS.

In this guidance, EPA recommends an interim 1-hour NO₂ 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 NO₂ concentrations predicted each year at each receptor, based on 5 years of National Weather Service data; or
- The highest modeled 1-hour NO₂ 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 NO₂ 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 NO₂ 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 NO₂ NAAQS (i.e., "causes or contributes to" a modeled violation).

We derived this interim 1-hour NO₂ SIL by using an impact equal to 4% of the 1-hour NO₂ NAAQS (which is 100 ppb). We have chosen this approach because we believe it is reasonable to base the interim 1-hour NO₂ SIL directly on consideration of impacts relative to the 1-hour NO₂ NAAQS. In 1980, we defined SER for each pollutant subject to PSD. 45 FR 52676, August 7, 1980 at 52705-52710. For PM and SO₂, 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,⁵ EPA decided to use 4% of the 24-hour primary NAAQS for PM and SO₂ to define the significant emissions rates (SERs) for those pollutants. It was noted that, at the time, only an annual NO₂ NAAQS existed. Thus, for reasons explained in the 1980 preamble, to define the SER for NO_x emissions we used a design value of 2% of the annual NO₂ NAAQS. See 45 FR 52708. Looking now at a short-term NAAQS for NO₂, we believe that it is reasonable as an interim approach to use a SIL value that represents 4% of the 1-hour NO₂

⁵ 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 NO₂ 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 NO₂ SILs that differ (both higher and lower) from the interim value being recommended herein. The EPA-recommended interim 1-hour NO₂ 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 NO₂ 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).

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

June 28, 2010

MEMORANDUM

SUBJECT: Applicability of Appendix W Modeling Guidance for the 1-hour NO₂ 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 (NO₂) National Ambient Air Quality Standard (1-hour NO₂ NAAQS or 1-hour NO₂ 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 NO₂ 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 NO₂ impacts in accordance with the Prevention of Significant Deterioration (PSD) permit requirements to demonstrate compliance with the new 1-hour NO₂ standard.

SUMMARY OF CURRENT GUIDANCE

While the new 1-hour NAAQS is defined relative to ambient concentrations of NO₂, the majority of nitrogen oxides (NO_x) emissions for stationary and mobile sources are in the form of nitric oxide (NO) rather than NO₂. Appendix W notes that the impact of an individual source on ambient NO₂ 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_x chemistry in determining ambient impact levels of NO₂ based on modeled NO_x emissions, Section 5.2.4 of Appendix W recommends the following three-tiered screening approach for NO₂ modeling for annual averages:

- Tier 1 - assume full conversion of NO to NO₂ based on application of an appropriate refined modeling technique under Section 4.2.2 of Appendix W to estimate ambient NO_x concentrations;
- Tier 2 - multiply Tier 1 result by empirically-derived NO₂/NO_x 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 NO₂/NO_x 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 NO₂, based on NO_x 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 NO₂ NAAQS

In general, the Appendix W recommendations regarding the annual NO₂ standard are also applicable to the new 1-hour NO₂ 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 NO₂ standard without any additional justification;
- Tier 2 may also apply to the 1-hour NO₂ 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 NO₂ 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 NO₂/NO_x ratios based on ambient monitoring data will generally be more difficult to justify for the 1-hour NO₂ 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 NO₂ 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 NO₂ (Hanrahan, 1999b; MACTEC, 2005). EPA is currently updating and extending these evaluations to examine model performance for

predicting hourly NO₂ 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 NO₂ concentrations may be impacted by application of this three-tiered screening approach, and includes comparisons for both annual average and maximum 1-hour NO₂ concentrations.

Key model inputs for both the OLM and PVMRM options are the in-stack ratios of NO₂/NO_x emissions and background ozone concentrations. While the representativeness of these key inputs is important in the context of the annual NO₂ standard, they will generally take on even greater importance for the new 1-hour NO₂ standard, as explained in more detail below. Recognizing the potential importance of the in-stack NO₂/NO_x ratio for hourly NO₂ 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 NO₂/NO_x 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 NO₂ 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_x 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_x 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 NO₂/NO_x 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 NO₂ 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 NO₂ 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 NO₂ 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 NO₂ are averaged across the number of years modeled for comparison to the new 1-hour NO₂ 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 NO₂ 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_{2.5} NAAQS” (EPA, 2010b), combining the 98th percentile monitored value with the 98th percentile modeled concentrations for a cumulative impact assessment could result in a value that is below the 98th percentile of the combined cumulative distribution and would, therefore, not be protective of the NAAQS. However, unlike the recommendations presented for PM_{2.5}, the modeled contribution to the cumulative ambient impact assessment for the 1-hour NO₂ standard should follow the form of the standard based on the 98th 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 NO₂ 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 NO₂ standard would also apply in the context of the new 1-hour NO₂ 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 NO₂ 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 NO₂ 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 NO₂ 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_x emission inventories used to support modeling for compliance with the annual NO₂ 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 NO₂ standard since some aspects of the guidance in Section 8.1 differs for long-term (annual and quarterly) standards vs. short-term (≤ 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 NO₂ standard. Due to the importance of in-stack NO₂/NO_x 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 NO₂/NO_x 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_x emission inventories for the new 1-hour NO₂ 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_x 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 NO₂ 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 NO₂ standard.

Tier-specific Technical Issues

This section discusses technical issues related to application of each tier in the three-tiered screening approach for NO₂ modeling recommended in Section 5.2.4 Appendix W. A basic understanding of NO_x 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 NO₂ will provide the most conservative treatment of NO_x chemistry in assessing ambient impacts, there are no technical issues associated with treatment of NO_x chemistry for this tier. However, the general issues related to emission inventories for the 1-hour NO₂ 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 NO₂ 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 NO₂ 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_x 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 NO₂ 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_x concentrations. By contrast, for elevated sources in relatively flat terrain, the peak hourly NO_x 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 NO₂/NO_x 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 NO₂/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 NO₂/NO_x ratio based on monitoring data for the new 1-hour NO₂ 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 NO₂ (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-NO₂ 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 NO₂ than photosynthesis, and as such is likely to be appropriate for characterizing peak 1-hour NO₂ impacts in many cases.

Both OLM and PVMMRM rely on the same key inputs of in-stack NO₂/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 NO₂ 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 NO₂ 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 NO₂ 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 NO₂ 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 NO₂/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 NO₂ 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_x impacts occur close to the source under stable/light wind conditions, the plume volume will be relatively small and the ambient NO₂ impact for such cases will be largely determined by the in-stack NO₂/NO_x 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 NO₂/NO_x ratios may be greater for some applications than others, depending on the source characteristics and other factors. Assumptions regarding in-stack NO₂/NO_x 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 NO₂ 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_x. 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 NO₂; 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 NO₂ concentrations in most cases since the ambient NO₂ 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_x concentration at each receptor for that hour. Sources which contribute significantly to the ambient NO_x 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_x 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 NO₂ 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 NO₂ concentrations from the application of AERMOD for the Atlanta NO₂ risk and exposure assessment (EPA, 2008), and recent re-evaluations of hourly NO₂ impacts from the two field studies (New Mexico and Palaau) that were used in the evaluation of PVMRM (MACTEC, 2005). These model-to-monitor comparisons of hourly NO₂ concentrations show reasonably good performance using the "OLMGROUP ALL" option within AERMOD, with no indication of any bias to underestimate hourly NO₂ concentrations with OLMGROUP ALL. Furthermore, model-to-monitor comparisons based on OLM without the OLMGROUP option do exhibit a bias to overestimate hourly NO₂ concentrations. We will provide further details regarding these recent hourly NO₂ 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 NO₂ assessments generally applies to the new 1-hour NO₂ standard.
2. While generally applicable, application of the 3-tiered screening approach for assessments of the new 1-hour NO₂ 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 NO₂/NO_x 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.e of Appendix W, should routinely utilize the “OLMGROUP ALL” option for combining plumes.
5. While the 1-hour NAAQS for NO₂ 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_x Emissions for Permit Modeling for the 1-hour NO₂ NAAQS

Introduction

The purpose of this attachment is to address questions about availability of hourly NO_x emissions for permit modeling under the new NO₂ 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 NO₂ permit modeling and computation of hourly emissions appropriate for assessing the new 1-hour NO₂ standard. Although the NAAQS is defined in terms of ambient NO₂ concentrations, source emission estimates for modeling are based on NO_x.

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 (≤ 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 NO₂ 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 NO₂ NAAQS relative to emissions used for the annual standard.

Model Emission Inventory for NO₂ Modeling

For the existing annual NO₂ 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 NO₂ NAAQS. However, appropriate estimates of emissions from background sources for the 1-hour NO₂ 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 NO₂ 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 are 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 NO₂ 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 NO₂ 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_x/10⁶ SCF natural gas combusted. The hourly emission rate is derived by converting the emission factor expressed in terms of lbs. NO_x/10⁶ SCF to lbs. NO_x/MMBtu. The conversion is done by dividing the 100 lbs. NO_x/10⁶ SCF by 1,020 to convert the AP-42 factor to lbs. NO_x/MMBtu. The new emission factor is now 0.098 lbs. NO_x/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.

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

Thus 2.94 lbs/hr represents the emission rate that would be input into the dispersion model for modeling against the 1-hour NO₂ 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_x emissions reported to the NEI is computed by:

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

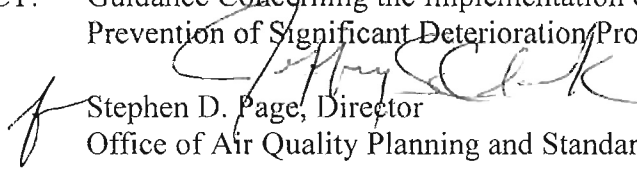
$$E_{annual} = (100 \text{ lbs}/10^6 \text{ SCF}) \times (100 \times 10^6 \text{ SCF/yr}) = 10,000 \text{ lbs. NO}_x/\text{yr or } 5 \text{ tons NO}_x/\text{yr}$$

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 SO₂ 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 (SO₂) National Ambient Air Quality Standard (hereinafter, either the 1-hour SO₂ NAAQS or 1-hour SO₂ 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 SO₂ NAAQS to provide the requisite protection of public health. The final rule for the new 1-hour SO₂ 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 SO₂ standards. However, as explained in this guidance, those SO₂ standards, as well as the 24-hour and annual increments for SO₂, 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 SO₂ 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 SO₂ NAAQS. We also anticipate problems that sources may have interpreting the modeled 1-hour SO₂ 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 SO₂ NAAQS under the PSD permit program.

The first memorandum, titled "General Guidance for Implementing the 1-hour SO₂ National Ambient Air Quality Standard in Prevention of Significant Deterioration Permits, Including an Interim 1-hour SO₂ Significant Impact Level," includes guidance for the preparation and review of PSD permits with respect to the new 1-hour SO₂ standard. That

guidance memorandum sets forth a recommended interim 1-hour SO₂ significant impact level (SIL) that states may consider for carrying out the required PSD air quality analysis for SO₂, until EPA promulgates a 1-hour SO₂ SIL via rulemaking, and addresses the continued use of the existing SO₂ Significant Emissions Rate (SER) and Significant Monitoring Concentration (SMC) to implement the new 1-hour SO₂ standard.. The second memorandum, titled “Applicability of Appendix W Modeling Guidance for the 1-hour SO₂ National Ambient Air Quality Standard,” includes specific modeling guidance for estimating ambient SO₂ concentrations and determining compliance with the new 1-hour SO₂ 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 SO₂ air quality impacts from proposed construction or modification of SO₂ 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 SO₂ 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). For questions pertaining to the modeling guidance in the second memorandum, please contact Tyler Fox (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 SO₂ National Ambient Air Quality Standard in Prevention of Significant Deterioration Permits, Including an Interim 1-hour SO₂ 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 SO₂ National Ambient Air Quality Standard” (August 23, 2010).

cc: Anna Marie Wood
Richard Wayland
Lydia Wegman
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

August 23, 2010

MEMORANDUM

SUBJECT: General Guidance for Implementing the 1-hour SO₂ National Ambient Air Quality Standard in Prevention of Significant Deterioration Permits, Including an Interim 1-hour SO₂ 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 (SO₂) National Ambient Air Quality Standard (hereinafter, either the 1-hour SO₂ NAAQS or 1-hour SO₂ standard) that becomes effective on August 23, 2010. The EPA revised the primary SO₂ NAAQS by promulgating a 1-hour SO₂ 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 SO₂ in the PSD permit (2) reduce the modeling burden to implement the 1-hour SO₂ standard where it can be properly demonstrated that a source will not have a significant impact on ambient 1-hour SO₂ 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 SO₂ 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 SO₂ 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 SO₂ 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 SO₂. Importantly, however, this guidance also sets forth a recommended interim 1-hour SO₂ 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 SO₂ 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 SO₂ NAAQS.

BACKGROUND

On August 23, 2010, the new 1-hour SO₂ 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 SO₂ 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 SO₂ 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 SO₂ National Ambient Air Quality Standard" (August 23, 2010) for specific modeling guidance for estimating ambient SO₂ concentrations consistent with the new 1-hour SO₂ NAAQS.

It is EPA's expectation that currently available SO₂ 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 SO₂ 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 SO₂ 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 SO₂ SIL. The continued use of the existing SO₂ Significant Emissions Rate (SER) and Significant Monitoring Concentration (SMC) to implement the new 1-hour SO₂ standard is also discussed.

SCREENING VALUES

In the final rule establishing the 1-hour SO₂ 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 SO₂ ambient air impact analyses. These screening tools include the SILs, as mentioned by the commenter, but also include the SER for emissions of SO₂ and the SMC for SO₂. The existing screening tools apply to the periods used to define the existing NAAQS for SO₂, 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 SO₂ due to the revision of the SO₂ 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 SO₂ emissions as well as an interim 1-hour SO₂ SIL that we are setting forth today for conducting air quality impact analyses for the 1-hour SO₂ NAAQS. As described in the section titled Introduction, EPA intends to implement the interim 1-hour SO₂ 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 SO₂ in this memorandum; the existing SMC for SO₂, 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 SO₂ 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 SO₂ 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 SO₂ 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 SO₂ standard.

INTERIM 1-HOUR SO₂ 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.¹

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 SO₂ sources located outside the circular area described above, to account for the cumulative hourly SO₂ air quality impacts

¹ 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 (1st 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.² Accordingly, the source will evaluate its contribution to any modeled violation of the 1-hour SO₂ 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 SO₂ NAAQS.

We plan to undertake rulemaking to adopt a 1-hour SO₂ SIL value. However, until such time as a 1-hour SO₂ 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 SO₂ 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 SO₂ 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.³

States may also elect to choose another value that they believe represents a significant air quality impact relative to the 1-hour SO₂ NAAQS. The EPA-recommended interim 1-hour SO₂ 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 SO₂ standard, as described above.

As indicated above, using the interim 1-hour SO₂ SIL, the permit applicant and permitting authority can determine: (1) whether, based on the proposed increase in SO₂ 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 SO₂ emissions will cause or contribute to any modeled violation of the 1-hour SO₂ NAAQS.

² A screening tool known as the Significant Monitoring Concentration (SMC) for SO₂ already exists in the PSD regulations. EPA plans to evaluate the existing SMC in light of the new 1-hour SO₂ NAAQS; however, the existing value of 13 µg/m³, 24-hour average, should continue to be used until and unless a revised value is issued through rulemaking.

³ 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 SO₂ 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 SO₂ concentrations predicted each year at each receptor, based on 5 years of National Weather Service data; or
- The highest modeled 1-hour SO₂ 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 SO₂ 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 SO₂ 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 SO₂ NAAQS (i.e., "causes or contributes to" a modeled violation).

We derived this interim 1-hour SO₂ SIL by using an impact equal to 4% of the 1-hour SO₂ NAAQS (which is 75 ppb). On June 29, 2010, we issued an interim 1-hour NO₂ SIL that used an impact equal to 4% of the 1-hour NO₂ 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 SO₂, 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,⁴ EPA decided to use 4% of the 24-hour primary NAAQS for PM and SO₂ to define the significant emissions rates (SERs) for those pollutants. See 45 FR 52708. Looking now at a 1-hour NAAQS for SO₂, we believe that it is reasonable as an interim approach to use a SIL value that represents 4% of the 1-hour SO₂ NAAQS. EPA will consider other possible alternatives for developing a 1-hour SO₂ 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

⁴ 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 SO₂ that may need to be considered where emissions limitations alone may not enable the source to demonstrate compliance with the new 1-hour SO₂ NAAQS. This is discussed in greater detail below in the section addressing GEP stack height requirements.

Because compliance with the new SO₂ 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 SO₂, 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 SO₂ NAAQS. For estimating the impacts of existing sources, if necessary, existing SO₂ emission inventories used to support modeling for compliance with the 3-hour and 24-hour SO₂ 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 SO₂ 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 SO₂ 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 SO₂ NAAQS, but the permit applicant can show that the SO₂ 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.⁵ [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)⁶, a major stationary source or major modification (as defined at §51.165(a)(1)(iv) and (v)) that locates in a SO₂ attainment area for the 1-hour SO₂ NAAQS and would cause or contribute to a violation of the 1-hour SO₂ 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 [SO₂] 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)].⁷ 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 SO₂ emissions on ambient concentrations of SO₂ are addressed in EPA modeling guidance, including the attached August 23, 2010 Memorandum titled "Applicability of Appendix W Modeling Guidance for the 1-hour SO₂ National Ambient Air Quality Standard."

⁵ While there is no 1-hour SO₂ 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 SO₂ requirements in the federal PSD program, and in state programs where states choose to use it.

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

⁷ 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 SO₂ NAAQS, the June 22, 2010 preamble to the final rule announcing the new 1-hour SO₂ NAAQS explained that those standards will remain in effect for a limited period of time as follows: for current SO₂ nonattainment areas and SIP call areas, until attainment and maintenance SIPs are approved by EPA for the new 1-hour SO₂ 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 SO₂ NAAQS. Accordingly, the annual and 24-hour SO₂ 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 SO₂ NAAQS to a revised SO₂ 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 SO₂ 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 SO₂ NAAQS. Instead, the annual and 24-hour SO₂ 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 SO₂ 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 SO₂ NAAQS, upon which the SO₂ increments are based. Consequently, sources must continue to demonstrate that their proposed emissions increases of SO₂ emissions will not cause or contribute to any modeled violation of the existing annual and 24-hour SO₂ 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 SO₂ 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 SO₂ 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 SO₂ emissions limitations or to determine source compliance with the SO₂ 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)).⁸

- 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 SO₂ 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)).

⁸ 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 SO₂ (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 SO₂ 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 SO₂. 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 SO₂ 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 SO₂. Accordingly, it is permissible for eligible SO₂ 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 SO₂ 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 SO₂.

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 SO₂ 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 SO₂ NAAQS.

GENERAL START-UP CONDITIONS

We do not anticipate widespread problems associated with high short-term SO₂ 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 SO₂ during start-up or shutdown that could adversely affect the new 1-hour SO₂ 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 SO₂ 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).

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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 SO₂ 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 (SO₂) National Ambient Air Quality Standard (1-hour SO₂ NAAQS or 1-hour SO₂ 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 SO₂ 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 SO₂ impacts in accordance with the Prevention of Significant Deterioration (PSD) permit requirements to demonstrate compliance with the new 1-hour SO₂ standard.

SUMMARY OF CURRENT GUIDANCE

Current modeling guidance for estimating ambient impacts of SO₂ 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 SO₂ 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 SO₂ emissions, stating that:

The chemical transformation of SO₂ 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 SO₂ 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 SO₂ concentrations in urban areas under the regulatory default option.

General guidance regarding source emission input data requirements for modeling ambient SO₂ 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 SO₂ NAAQS

The current guidance in Appendix W regarding SO₂ modeling in the context of the previous 24-hour and annual primary SO₂ NAAQS and the 3-hour secondary SO₂ NAAQS is generally applicable to the new 1-hour SO₂ standard. Since short-term SO₂ standards (≤ 24 hours) have been in existence for decades, existing SO₂ emission inventories used to support modeling for compliance with the 3-hour and 24-hour SO₂ 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 SO₂ 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 SO₂ 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 SO₂ 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 SO₂ 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 SO₂ 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 SO₂ are averaged across the number of years modeled for comparison to the new 1-hour SO₂ 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 SO₂ 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_{2.5} NAAQS” (EPA, 2010b), combining the 98th percentile monitored value with the 98th percentile modeled concentrations for a cumulative impact assessment could result in a value that is below the 98th percentile of the combined cumulative distribution and would, therefore, not be protective of the NAAQS. However, unlike the recommendations presented for PM_{2.5}, the modeled contribution to the cumulative ambient impact assessment for the 1-hour SO₂ standard should follow the form of the standard based on the 99th 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 SO₂ 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 SO₂ 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 SO₂ standards, and 3-hour secondary SO₂ standard, is generally applicable for the new 1-hour SO₂ NAAQS.
2. While the 1-hour NAAQS for SO₂ 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 E

Division of Air Quality PM_{2.5} Design Values Report

West Virginia PM2.5

Design Values

data final and certified through 12/31/2016

County	Site	(NAAQS 24 hr 3 yr 98% = 35 ug/m ³)														(Annual NAAQS <= 12.0 ug/m ³)													
		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	15.8	14.9	14.0	12.9	11.8	11.6	10.7	10.4	10.3	9.9		
Brooke	Follansbee	44	42	40	37	37	34	31	27	27	26	24	25	22	16.5	16.8	16.4	16.4	15.4	14.4	13.7	13.0	12.7	11.6	11.1	11.2	10.5		
	Weirton-Marl. Hgts	47	45	43	44	41	37	31	29	27	26	24	24	23	15.8	16.4	15.7	16.1	14.9	14.0	13.1	11.6	11.1	10.1	10.4	10.3	9.8		
Cabell	Huntington	37	35	34	37	32	30	26	25	24	21	21	21	20	15.8	16.3	16.1	16.6	15.2	14.3	13.1	12.1	11.6	10.4	9.8	9.2	8.7		
Hancock	Weirton-Summit Circle												22	21											9.7	8.8			
	Weirton-Oak St.	44	41	40	41	38	35	31	28	27	26	23			17.0	16.6	15.4	15.2	14.3	13.4	12.4	11.7	11.3	10.5	10.0	10.0	9.8		
Harrison	Clarksburg	34	32	35	34	31	26	23	21	21	20	19	19	18	13.6	13.9	13.9	14.2	13.4	12.5	11.8	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	8.6		
	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	9.6	9.0		
Marion	Fairmont	36	34	34	34	32	28	26	26	25	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	36	33	34	35	34	31	29	29	29	25	23	23	22	15.1	15.3	15.0	15.2	14.2	13.4	13.1	13.0	12.8	11.6	11.1	10.7	10.2		
Monongalia	Morgantown	39	36	34	36	34	30	25	25	24	22	18	19	18	14.5	14.5	14.1	14.4	13.6	12.7	11.5	10.9	10.3	9.5	8.8	8.6	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	11.6	10.6	10.4	10.3	9.6		
Raleigh	Beckley	32	31	31	30	28	24	21	20	20	19	14	11		12.6	12.9	12.8	13.0	11.9	11.0	10.1	9.6	9.3	8.3	6.6	5.9	5.1		
Wood	Vienna	35	34	35	37	34	31	28	27	24	22	19	21	19	15.2	15.4	15.3	15.4	14.6	13.7	13.1	12.3	11.8	10.4	9.8	9.4	8.9		

* Summit Circle sampling started 1/1/2015; therefore 3 yr 98% not complete
 Charleston NCore sampling started 1/1/2016; therefore 3 yr 98% not complete

Oak Street site shut-down 12/31/2014
 Charleston site shut-down 12/31/2015