State Implementation Plan Revision – Appendices Q - T

Second Regional Haze Plan (2018 – 2028)

By

Air Quality Program

Washington State Department of Ecology
Olympia, Washington

Appendix Q. Agreed Orders – Alcoa Wenatchee and Intalco Smelters

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

IN THE MATTER OF AN ADMINISTRATIVE ORDER CONCERNING:
ALCOA WENATCHEE WORKS

AGREED ORDER No. 18100

To: David Hulse
Alcoa Wenatchee Works
6200 Malaga/Alcoa Highway
Malaga, WA 98828-9784

I. INTRODUCTION

This Agreed Order (Order) between the Department of Ecology (Ecology) and Alcoa Wenatchee Works (Alcoa) requires Alcoa to prepare and submit for Ecology's review a Four-Factor Analysis prior to re-starting any of the facility's potlines. This Order also requires Alcoa to install or otherwise implement all reasonable emission reduction measures that are identified in the Four-Factor Analysis and subsequently approved by Ecology.

II. ECOLOGY'S JURISDICTION

This Order is issued pursuant to the authority vested in Ecology by the Federal Clean Air Act (FCAA), 42 U.S.C. sec 7401, et seq., the Washington Clean Air Act (CAA), RCW 70.94, and regulations issued under the FCAA and CAA.

RCW 70.94.141(3) in conjunction with RCW 70.94.331(1) authorizes Ecology to issue administrative orders "as necessary to effectuate the purposes of the act" and to enforce those orders.

III. PARTIES BOUND

Alcoa agrees to undertake all actions required of it by the terms and conditions of this Order and not to contest Ecology's jurisdiction or authority to administer this Order. Alcoa voluntarily waives its right to appeal this Order.

Nothing in this Order shall in any way relieve Alcoa of its obligations to comply with the requirements of its Air Operating Permit No. 000068-0 or any other requirements of the law. Nor shall anything in this Order limit Ecology's authority to enforce the provisions of the aforementioned Permit or the CAA.

IV. FINDINGS OF FACT

The FCAA establishes a national goal for "the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory class I Federal areas which impairment results from manmade air pollution." 42 U.S.C. § 7491(a)(1). Each state is required to develop an implementation plan with a long-term strategy for addressing regional haze.

The long-term strategy must include "enforceable emissions limitations, compliance schedules, and other measures that are necessary to make reasonable progress" towards the national goal. 40 C.F.R. § 51.308(f)(2). In order to determine which emission reduction measures are necessary to make reasonable progress, a Four-Factor Analysis must be performed in accordance with 40 C.F.R. § 51.308(f)(2)(i).

Alcoa Wenatchee Works is a primary aluminum smelter located at Malaga/Alcoa Highway, Washington and approximately 96 miles from the Alpine Lakes Wilderness, which is classified as a federally mandated Class I Area. The facility has been curtailed since December 18, 2015. However, because the facility's emission inventory data shows that the facility emitted 69.5 tons of NOx, 457.5 tons of $PM_{2.5}$, and 2934.8 tons of SO_2 in 2014, Ecology has determined that it is appropriate to include the facility as a source to be evaluated for regional haze impacts.

Per 40 C.F.R. § 51.308, Ecology conducted a screening of major facilities by summing the Regional Haze producing emissions (NOx, $PM_{2.5}$, SO_2, and H_2SO_4) for each facility (Q) and dividing by the distance to the closest Class I Area (d). Ecology selected facilities with Q/d values greater than 6.7 as well as facilities that contributed more than 80 percent of the total summed Q/d for a Four-Factor Analysis.

On May 31, 2019, Ecology sent a letter notifying Alcoa that Alcoa Wenatchee Works was selected as a facility requiring a Four-Factor Analysis based on the facility's 2014 emission inventory data.

V. ACTIONS

For the reasons detailed above, and in accordance with RCW 70.94.141, it is agreed that Alcoa shall take the following actions as set forth below. Alcoa has participated in defining these actions and the dates by which they shall be completed. Alcoa shall also submit required documents to all relevant government agencies for any approvals necessary to meet the schedule for installation and operation of the control measures.

Alcoa shall:

1. Prepare and submit a Four-Factor Analysis to Ecology for review and approval at least 180 days prior to restarting any of the facility's potlines. The analysis will be based on the facility's permitted emission limits and will assess potential emission control measures against the following four statutory factors:
    - The cost of compliance,
    - Time necessary for compliance,
    - Energy and non-air quality impacts of compliance, and
    - Remaining useful life of the source.
2. Within 60 days of receipt of Ecology's comments on the Four-Factor Analysis submitted pursuant to Section V.1, provide all additional information and/or documentation requested by Ecology, if any, and submit an updated Four-Factor Analysis that adequately addresses Ecology's comments.

3. Install or otherwise implement and begin operating all emission control measures identified in the final Four-Factor Analysis submitted pursuant to Section V.2 within 3 years of Ecology's approval.

Alcoa or Ecology may request a change to the conditions of this Order by submitting a written request to the other party. Ecology expressly reserves the right to approve any such requests submitted by Alcoa and to require the submission of documentation as needed to justify the requested change. Ecology will document its approval of any changes in writing.

VI. EFFECTIVE DATE

This Order is effective on the date the agreement is signed by both parties.

VII. TERMINATION OF THE AGREED ORDER

Upon completion by Alcoa of the actions in Section V., the requirements of this Agreed Order shall be deemed to be satisfied and shall have no further effect on Alcoa.

VIII. FAILURE TO COMPLY

Per RCW 70.94.141(3), RCW 70.94.331(1) and RCW 70.94.431, failure to comply with any of the provisions of this Agreed Order without first obtaining written approval from Ecology for a change to the Agreed Order as specified in Section V. of this Agreed Order may subject Alcoa to enforcement action by Ecology, including the issuance of civil penalties of up to $10,000 per day per violation.

IX. THIRD PARTY RIGHT TO APPEAL

By signing this Agreed Order, Alcoa voluntarily waives its right to appeal this Order.

However, a third party other than Alcoa may have a right to appeal this Order to the Pollution Control Hearings Board (PCHB) within 30 days of the date of receipt of this Order. The appeal process is governed by Chapter 43.21B RCW and Chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2).

An appellant must do both of the following within 30 days of the date of receipt of this Order:

- File the appeal and a copy of this Order with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.

- Serve a copy of the appeal and this Order on Ecology in paper form – by mail or in person (see addresses below). E-mail is not accepted.

An appellant must also comply with other applicable requirements in RCW 43.21B and WAC 371-08.

An appeal alone will not stay the effectiveness of this Order. Stay requests must be submitted in accordance with RCW 43.21B.320.

X. ADDRESS AND LOCATION INFORMATION

Street Addresses	Mailing Addresses
Department of Ecology Attn: Appeals Processing Desk 300 Desmond Drive SE Lacey, WA 98503 **Pollution Control Hearings Board** 1111 Israel Road SW STE 301 Tumwater, WA 98501	**Department of Ecology** Attn: Appeals Processing Desk PO Box 47608 Olympia, WA 98504-7608 **Pollution Control Hearings Board** PO Box 40903 Olympia, WA 98504-0903

XI. CONTACT INFORMATION

Please direct all questions about this Order to:

Liem Nguyen
Department of Ecology
Industrial Section
PO Box 47600
Olympia, WA 98504-7600

Phone: (360) 407-6955
Email: liem.nguyen@ecy.wa.gov

XII. MORE INFORMATION

- **Pollution Control Hearings Board Website**
  http://www.eho.wa.gov/Board/PCHB
- **Chapter 43.21B RCW – Environmental and Land Use Hearings Office – Pollution Control Hearings Board**
  http://apps.leg.wa.gov/RCW/default.aspx?cite=43.21B
- **Chapter 371-08 WAC – Practice and Procedure**
  http://apps.leg.wa.gov/WAC/default.aspx?cite=371-08
- **Chapter 34.05 RCW – Administrative Procedures Act**
  http://apps.leg.wa.gov/RCW/default.aspx?cite=34.05
- **Laws and Rules**
  http://leg.wa/LawsandAgencyRules/pages/default.aspx

XIII. SIGNATURES

Agreed by:

James DeMay, P.E.
Industrial Section Manager
Department of Ecology

January 22, 2021 -
Date

David Hulse
Plant Manager
Alcoa Wenatchee Works

2021-01-19
Date

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

IN THE MATTER OF AN
ADMINISTRATIVE ORDER
CONCERNING:
INTALCO ALUMINUM LLC

AGREED ORDER No.
18216

To: Felippe Navarro, Site Manager
Intalco Aluminum LLC
4050 Mountain View Road
Ferndale, WA 98248

I. INTRODUCTION

This Agreed Order (Order) between the Department of Ecology (Ecology) and Intalco Aluminum LLC (Intalco) requires Intalco to prepare and submit for Ecology's review a Four-Factor Analysis prior to re-starting any of the facility's potlines. This Order also requires Intalco to install or otherwise implement all reasonable emission reduction measures that are identified in the Four-Factor Analysis and subsequently approved by Ecology.

II. ECOLOGY'S JURISDICTION

This Order is issued pursuant to the authority vested in Ecology by the Federal Clean Air Act (FCAA), 42 U.S.C. sec 7401, et seq., the Washington Clean Air Act (CAA), RCW 70.94, and regulations issued under the FCAA and CAA.

RCW 70.94.141(3) in conjunction with RCW 70.94.331(1) authorizes Ecology to issue administrative orders "as necessary to effectuate the purposes of the act" and to enforce those orders.

III. PARTIES BOUND

Intalco agrees to undertake all actions required of it by the terms and conditions of this Order and not to contest Ecology's jurisdiction or authority to administer this Order. Intalco voluntarily waives its right to appeal this Order.

Nothing in this Order shall in any way relieve Intalco of its obligations to comply with the requirements of its Air Operating Permit No. 000295-0 or any other requirements of the law. Nor shall anything in this Order limit Ecology's authority to enforce the provisions of the aforementioned Permit or the CAA.

IV. FINDINGS OF FACT

The FCAA establishes a national goal for "the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory class I Federal areas which impairment results from manmade air pollution." 42 U.S.C. § 7491(a)(1). Each state is required to develop an implementation plan with a long-term strategy for addressing regional haze.

The long-term strategy must include "enforceable emissions limitations, compliance schedules, and other measures that are necessary to make reasonable progress" towards the national goal. 40 C.F.R. § 51.308(f)(2). In order to determine which emission reduction measures are necessary to make reasonable progress, a Four-Factor Analysis must be performed in accordance with 40 C.F.R. § 51.308(f)(2)(i).

Intalco is a primary aluminum smelter located at 4050 Mountain View Road in Ferndale, Washington and approximately 140 miles from the Olympic National Park which is classified as a federally mandated Class I Area. The facility fully curtailed its operations at the end of August 2020. However, because the facility's emission inventory data shows that the facility emitted 227 tons of NOx, 637 tons of $PM_{2.5}$, and 4794 tons of SO_2 in 2014, Ecology has determined that it is appropriate to include the facility as a source to be evaluated for regional haze impacts.

Per 40 C.F.R. § 51.308, Ecology conducted a screening of major facilities by summing the Regional Haze producing emissions (NOx, $PM_{2.5}$, SO_2, and H_2SO_4) for each facility (Q) and dividing by the distance to the closest Class I Area (d). Ecology selected facilities with Q/d values greater than 6.7 as well as facilities that contributed more than 80 percent of the total summed Q/d for a Four-Factor Analysis. On May 22, 2019, Ecology sent a letter notifying Intalco that the Intalco Aluminum facility was selected as a facility requiring a Four-Factor Analysis based on the facility's 2014 emission inventory data.

V. ACTIONS

For the reasons detailed above, and in accordance with RCW 70.94.141, it is agreed that Intalco shall take the following actions as set forth below. Intalco has participated in defining these actions and the dates by which they shall be completed. Intalco shall also submit required documents to all relevant government agencies for any approvals necessary to meet the schedule for installation and operation of the control measures.

Intalco shall:

1. Prepare and submit a Four-Factor Analysis to Ecology for review and approval at least 180 days prior to restarting any of the facility's potlines. The analysis will be based on the facility's permitted emission limits and will assess potential emission control measures against the following four statutory factors:
    - The cost of compliance,
    - Time necessary for compliance,
    - Energy and non-air quality impacts of compliance, and
    - Remaining useful life of the source.
2. Within 60 days of receipt of Ecology's comments on the Four-Factor Analysis submitted pursuant to Section V.1, provide all additional information and/or documentation requested by Ecology, if any, and submit an updated Four-Factor Analysis that adequately addresses Ecology's comments.
3. Install or otherwise implement and begin operating all emission control measures identified in the final Four-Factor Analysis submitted pursuant to Section V.2 within 3 years of Ecology's approval.

Intalco or Ecology may request a change to the conditions of this Order by submitting a written request to the other party. Ecology expressly reserves the right to approve any such requests submitted by Intalco and to require the submission of documentation as needed to justify the requested change. Ecology will document its approval of any changes in writing.

VI. EFFECTIVE DATE

This Order is effective on the date the agreement is signed by both parties.

VII. TERMINATION OF THE AGREED ORDER

Upon completion by Intalco of the actions in Section V., the requirements of this Agreed Order shall be deemed to be satisfied and shall have no further effect on Intalco.

VIII. FAILURE TO COMPLY

Per RCW 70.94.141(3), RCW 70.94.331(1) and RCW 70.94.431, failure to comply with any of the provisions of this Agreed Order without first obtaining written approval from Ecology for a change to the Agreed Order as specified in Section V. of this Agreed Order may subject Intalco to enforcement action by Ecology, including the issuance of civil penalties of up to $10,000 per day per violation.

IX. THIRD PARTY RIGHT TO APPEAL

By signing this Agreed Order, Intalco voluntarily waives its right to appeal this Order.

However, a third party other than Intalco may have a right to appeal this Order to the Pollution Control Hearings Board (PCHB) within 30 days of the date of receipt of this Order. The appeal process is governed by Chapter 43.21B RCW and Chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2).

An appellant must do both of the following within 30 days of the date of receipt of this Order:

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- Serve a copy of the appeal and this Order on Ecology in paper form – by mail or in person (see addresses below). E-mail is not accepted.

An appellant must also comply with other applicable requirements in RCW 43.21B and WAC 371-08.

An appeal alone will not stay the effectiveness of this Order. Stay requests must be submitted in accordance with RCW 43.21B.320.

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XI. CONTACT INFORMATION

Please direct all questions about this Order to:

Judy Schwieters
Department of Ecology
Industrial Section
PO Box 47600
Olympia, WA 98504-7600

Phone: 360-407-6942
Email: judith.schwieters@ecy.wa.gov

XII. MORE INFORMATION

- **Pollution Control Hearings Board Website**
  http://www.eho.wa.gov/Board/PCHB
- **Chapter 43.21B RCW – Environmental and Land Use Hearings Office – Pollution Control Hearings Board**
  http://apps.leg.wa.gov/RCW/default.aspx?cite=43.21B
- **Chapter 371-08 WAC – Practice and Procedure**
  http://apps.leg.wa.gov/WAC/default.aspx?cite=371-08
- **Chapter 34.05 RCW – Administrative Procedures Act**
  http://apps.leg.wa.gov/RCW/default.aspx?cite=34.05
- **Laws and Rules**
  http://leg.wa/LawsandAgencyRules/pages/default.aspx

XIII. SIGNATURES

Agreed by

JM

James DeMay, P.E.
Industrial Section Manager
Department of Ecology

January 22, 2021 -
Date

Felippe Navarro

Felippe Navarro
Site Manager
Intalco Aluminum LLC

01/15/2021
Date

Appendix R. State to State Consultation

Consultation with Region X, ID, OR, AK – 1/14/19

This was our regular monthly consultation call with all the Region X states requested by ID, this call was to inform the states and EPA on the status of each program, and discuss any problems we might encounter.

ID wanted to discuss the following topics:

4-factor analysis

- When are they due to WRAP?
- Is there a general consensus yet on a reasonable cost/ton amount?
- What kind of review are 4-factor reports being subjected to? Is anyone challenging the $ amount presented by facilities?
- Any state finding that no additional controls are reasonable for this implementation period
- Idaho next step: share 4-factor results with FLMs

Consultation

- Potential to be very redundant if all western states are reporting on the same WRAP meetings we all attended.
- How much detail are states planning on reporting for consultation calls/meetings
- Could region 10 states follow one template and refer to WRAP website for details/minutes?

4-Factor analysis – when does WRAP need it?

Jean-Paul responded that WRAP does not want the analyses itself, but the results, do they can be used in the future year modeling. AK responded that they will not be part of the WRAP modeling – they might be required to do their own modeling (consultants). Phil explained the process and gave some ideas on modeling approaches.

Consensus on cost/ton.

ID stated that the WRAP is thinking about a threshold of $5,000/ton. AK stated that they not that far yet, not thinking about the costs yet. WA has not set an amount yet, and Phil explained his thinking. We know that the consultants are pushing for $5,000. We are considering 3 bins: 0-5,000, 5,000-10,000 and >10,000. We would accept the determination for the first bin, we would take a closer look at the second bin, and for the 3rd bin we would look for errors. That is our current thinking, and we would consider this in a policy.

EPA stated that they are not allowed to name a number, just make sure your justification is solid, for whatever number you pick. However, EPA also stated that they like the WA approach of classifying the bins.

ID will share the results with the FLMs as soon they have the results back from the 4-factor analyses.

WA will review all 4-factor analyses and possibly request more information from industry.

Consultation.

ID asked if we are doing individual notes for the consultations we have. Jean-Paul responded that WA is keeping notes for each and every consultation call we have. We store it on the SharePoint site for future use. ID suggested that we have a standard format for our consultation summaries. Everyone agreed.

EPA stated that it is good to have individual summaries of the consultations, it is easier for EPA to go through them.

There was some discussion about tribal consultation. Jean-Paul said that WA notified the WA tribes in December, with an informative letter, just letting the tribes know what we are doing. EPA was pleased to hear that because eventually they will have to do consultation with the tribes, and they can refer to it. ID and AK thought it was a good idea to inform the tribes. Jean-Paul agreed to email the letter to ID and AK (which he did).

ID asked if somebody else could host the next call in February. AK agreed to host it.

Consultation with Region X, ID, OR, AK – 12/2/19

This was a consultation call with all the Region X states requested by ID, this call was to inform the states and EPA on the status of each program, and discuss any problems we might encounter.

To start, ID gave a status update. They have gotten a few 4-factor analyses from sources, they have 9 sources and the Q/d = 2. ID is working on a prescribed fire rule (did address this during the 1st RH SIP). They will try to adjust glide paths for 2 CIA, tried to adjust the threshold, but are unable to get it low enough to account for the prescribed fires. The Sawtooth CIA is really impacted by prescribed fire. Jeff Hunt said to show your homework when submitting the analyses.

Oregon send out the 4-factor letters to the sources (a thanks to WA for giving us a copy of their letters). There was some discussion on the "required" review period for the FLMs. We need to research this a little more. Is it 60 or 120 days?

Alaska would like to make some adjustments to the glide paths. They are doing it on their own, WRAP is not very helpful. They have not send out any 4-factor letters, but they are working on it. They have about 10 facilities to work with. They are also waiting for the WEP analysis to determine who is impacted what.

Jeff Hunt – It will be hard to approve the 5-yr progress report because of the fires (wild and prescribed fires). States need to do a write-up on the fires, impacts, why…

WA gave an update on their situation, we are waiting for 4-factor analyses from the Pulp & Paper industry, and from the refineries.

There was some more discussion on the approach RH programs in general. At the end of the call it was decided to have a monthly call with the region, to stay informed how things are going. The next call will be in mid-January 2020

Consultation with Region X, ID, OR, AK –3/3/2020

This was our regular monthly consultation call with all the Region X states, this call was to inform the states and EPA on the status of each program, and discuss any problems we might encounter.

EPA gave an update on their modelling effort, they will include Hawaii and Alaska in their effort. Jeff Hunt stated that, at this point, not much is going on.

There was some discussion about BART – WA will not do a 4-factor analysis for TransAlta, the facility is closing. We do need to do a BART update later. We will ignore other BART, we will look at other units. ID is looking at 2 BART facilities, OR similar approach as ID.

No one will be doing emissions trading

In regards to the 5-year progress report, Jeff said to just check the boxes of the 5-yr report. Do not overdo it.

Glidepath adjustments, WRAP will tag prescribed fires to assess their impacts. Bob K also mentioned that the international contributions will be tagged.

OR will not adjust the glidepaths.

Jeff H mentioned that there will be no more EPA modeling in the near future. He had a question whether or not WA participates in the Columbia River Gorge Commission.

ID question: Is EPA going to change or issue a new RHR? States are too far into the process, no new rule scheduled.

WA will host the April meeting

OR will do the May one, and EPA the June one.

Consultation with Region X, ID, OR, WA –4/2/2020

This was our regular monthly consultation call with all the Region X states, this call was to inform the states and EPA on the status of each program, and discuss any problems we might encounter. WA hosting.

4-factor analysis

Phil gave an update on WA's 4-factor analysis. Got info from pulp&paper, we send an additional request for information. The refineries asked for another extension (due to COVID-19) however, we responded that we are requesting them to submit data by April 15. We will issue an Agreed Order for Wenatchee, before they the restart the facility, they must complete a 4-factor analysis and most likely install controls.

ID got all their 4-factor analyses back, they are requesting some more information from industry.

OR had a late start, they did not mail the letters out until last December to ~30 facilities. Their Q/d is 5. They are working with the facilities to complete the work by June 1. June 1 is a hard deadline, after that, OREQ will use their own data and do the work themselves.

EPA (JH) stated that the regions have regular calls with HQ, and he mentioned that all RH decisions are made on a national level. If states have any individual issues, they should contact Jeff, and he will forward them to HQ. Reasonableness will be the metric EPA will be working with.

COVID-19, any experience you want to share?

WA stated that we had some requests for extensions of data requests from industry. Also that we are looking into how to handle CBI in relation to the data requests. WA was also wondering how the delays in data submittals will impact the RH timeline/SIP submittal.

ID and OR said they are under a stay-home order also, but did not account for any problems.

Glidepath adjustments

WA is still considering glidepath adjustments for at least 1 CIA. We will take the international impacts and are looking into the prescribed burning impacts. A lot will depend on the weight of evidence that is needed.

ID is considering 2 CIA, need to evaluate it more. Pascal mentioned that there is a WRAP call next week on the glidepath, stay tuned.

OR was told not to do anything with the glidepath.

Modeling update

Farren gave an update of the status of the modeling effort. The contractor is finishing the model results and will post everything to TSS2. The questions was asked if states will be notified

when results are posted. Farren responded that all states are on the committees, therefore they should get notifications. Jean-Paul stated that he contacted Shawn McClure earlier this week about the TSS uploads. Shawn said that they are working on it and they will upload data as it comes in. Of course the COVID-19 issue complicates things.

OR questioned if the most recent EPA rollback of the engine standards will have an impact on the results of the 2028 modeling. Farren said that they cannot account for the changes, it is too late to incorporate the changes in the model. In addition there is no change made to MOVES to calculate the change. Bob K stated that this rollback will be under litigation for a long time, and not to worry about it.

Permit modifications

OR has permit mods and the facility is asking to have it done before July 2021. How far in the process does it need to be to be counted? JH said there will be no action taken until finished. It is ok to submit the SIP and then submit an addendum to include the final decisions.

OR will host the May meeting and EPA will do the June meeting

Consultation with Region X, ID, OR, WA, AK – 5/7/2020

This was our regular monthly consultation call with all the Region X states, this call was to inform the states and EPA on the status of each program, and discuss any problems we might encounter. WA hosting.

Zach Hedgpeth (EPA) talked about the cost effectiveness for the 4-factor analysis. He already had a consultation with WA. First he gave a little background information – he worked on the BART analysis in the past (with WA and ID)

Two questions came up: what is cost effectiveness and how will this be handled?

EPA will not provide any guidance on these questions, all costs are based on the EPA cost manual. Therefore, the cost analysis must be in accordance with the manual.

What is cost effectiveness: should be a range, not just a number. Zach said he is open for discussions on these topics anytime.

Pascale (ID) said they are struggling with the cost effectiveness, they went back to the 1st SIP to look for answers. How do we determine costs? The NJ SIP has costs for NOx for EGU and boilers.

Zach – there is no clear answer

Pascale – we have more questions on fuel changes – can we talk about that?

Jeff (EPA) – there is no definition of reasonable, maybe the SIPs from the East Coast will be valuable to us. We need to have enforceable mechanisms in the SIP

Aislinn – emission limits or fuel switch??

Scott (WA) – refineries included costs other than control equipment.

Zach – need to look at that very carefully

There was some discussion on permit conditions

D (OR) – we are not taking any international impacts

ID are still undecided – 2 of the 3 CIA are over the glidepath, we have tried to adjust the threshold but could not get there.

AK – we need anything we can get, we have a lot of international impacts. Pat Brewer stated in the past that the states are on their own.

Consultation with Region X 6_10_20

JH – Look at stationary, mobile and area in FFA. Discuss, Woodstoves and Rx fires. Explain why we are not looking for controls there.

On Road contributions are high so explain why we can't do anything about them.

Separate page for Progress report and reference where it is in the plan - Use "Clearest Days" metric

Zach – Common issues with FFA:

- Use process similar to top down BACT process.
- Cost and amortization – Use actual life of control equipment.
  Design or actual life – use actual = how long it actually lasts unless there is a reason for a shorter life
  If using less than 30 year life scrutinize closely except for SNCR – use 20 years
  Usually vendors give costs more in line with actual – if different justify
- Interest rate – in past used flat 7%. Cost Manual uses Bank Prime Loan Rate
- Control efficiency – Look for consistency. If not at high end of what that control technology can achieve must explain why. Efficiency directly affects cost analysis.
- SO2 Controls. Some are ignoring a new technology called circulating dry scrubber. Don't have waste water issues. May want to suggest they look at it.

Consultations with Region X states – Oregon

Phone conversations and email exchanges re: WA effects on OR Class I areas

From:	Hunt, Jeff
To:	Birnbaum, Molly (DEC); Carl Brown; Aislinn.Johns@deq.idaho.gov; Pascale.Warren@deq.idaho.gov; D.wu@state.or.us; Huys, Jean-Paul (ECY); Chi, John; Stinson, Colleen (ECY); Huitsing, Gary (ECY); Kotchenruther, Robert; Goodfellow, Paul J (DEC); Clark, Adam
Cc:	Hunt, Jeff
Subject:	RE: Region 10 States Regional Haze Meeting
Date:	Wednesday, March 4, 2020 2:39:59 PM
Attachments:	Sample progress report chart.docx

Hello all – during yesterday's call I was asked the eminently reasonable question, "Since the progress report and the 2021 SIP will cover the same general information, can we bundle them?" Fortunately the regulatory response and the eminently reasonable response are one in the same. Here is the reg cite:

- 40 CFR 51.308(f)(5) -- So that the plan revision will serve also as a progress report, the State must address in the plan revision the requirements of paragraphs (g)(1) through (5) of this section. However, the period to be addressed for these elements shall be the period since the most recent progress report.

Or if you prefer slightly more explanation. Here is what page 55 of the EPA's August 2019 guidance says:

- **b) Progress report elements**
  - Section 51.308(f)(5) of the Regional Haze Rule requires a state to address in the plan revision the requirements of paragraphs 51.308 (g)(1) through (5), so that the plan revision due in 2021 will serve also as a progress report addressing the period since submission of the progress report for the first implementation period. The progress report for the first implementation period was only able to report on visibility levels, emissions, and implementation status up to a date sometime before it was submitted. To fully inform the public and EPA about past implementation activities, we recommend that the 2021 SIP cover a period approximately from the first full year that was not actually incorporated in the previous progress report through a year that is as close as possible to the submission date of the 2021 SIP.

I also put together a quick chart (attached) to make sure none of the progress report requirements slip through the cracks. Talk to you all soon ……. jh

Memo to File

Re: Consultation with the Idaho DEQ Air Quality Program on the status of the development of regional haze plans (8/14/2019 from 11:00 – 12:00)

Participants:
Idaho: Carl Brown, Aislinn Johns, Pascale Warren
Washington: Colleen Stinson, Phil Gent, Gary Huitsing , Scott Inloes, Farren Herron-Thorpe, Jean-Paul Huys

The Idaho Department of Environmental Quality reached out to Jean-Paul to discuss both states' status on the development of their regional haze plans. This is part of the required state consultation process outlined in the Regional Haze rule.

Both states discussed their approach to the EPA suggested Q/d method to screen the sources and determine which facilities could be subject to the 4-factor analyses. In Washington BART was done in the first round and is being contemplated for one aluminum plant that is currently in curtailment. Washington is using two paths in seeking emission reductions of haze causing emissions. The first is reasonably available control technology (RACT) analysis coupled with the four factor analysis and the second is using enforceable emission reductions at facilities that have occurred since the first round. Washington is looking at Kraft pulp and paper mills using the RACT 4-factor analysis. The other facilities have or will have enforceable requirements (e.g., agreed order, permit conditions, etc.) that will be used to demonstrate reduction of haze causing emissions.

Idaho uses a Q/d of 2, while Washington focused on only major sources and uses an overall Q/d of around 6.7. We talked about the source pool states have to work with, Idaho does not have big pool, due to the restrictions in state law, while we have a slightly bigger pool to look at.
We discussed the RACT/4-factor analyses and went into more specifics on the different source categories subject to a possible RACT/4-factor analyses, specifically the pulp & paper industry and refineries. Washington is requesting a 4-factor analysis from the chemical pulp and paper mills, while. Idaho is requesting that all of their identified sources perform a 4-factor analysis. Idaho has one kraft pulp & paper facility, Washington has 6 kraft mills and 1 sulfite mill. Idaho's sources are three sugar beet plants, Simplot fertilizer plant, a Kraft pulp mill, a P4 (phosphate) Monsanto plant and a natural gas pipeline. They have one other mill that is mechanical not chemical and processes tamarack. Idaho DEQ smoke group is creating a smoke management plan.

After some discussion, both parties agreed to stay in touch and exchange information on the RACT/4-factor analyses. We informed Idaho how we intend to enforce the NSPS for the heaters at the WA refineries (Part Ja).

We also discussed our interactions with EPA Region X, the FLMs and our neighboring states. Idaho has consulted with EPA and Oregon, while WA has discussions with EPA and the FLMs.

Memo to File

Re: Consultation with the Idaho DEQ Air Quality Program on the status of the development of regional haze plans (11/14/2019 from 10:00 – 11:00)

Participants:
Idaho: Carl Brown, Aislinn Johns, Pascale Warren
Washington: Phil Gent, Jean-Paul Huys

The Idaho Department of Environmental Quality reached out to Jean-Paul to discuss both states' status on the progress of the development of their regional haze plans. This is part of the required state consultation process outlined in the Regional Haze rule.

Idaho send out letters to the sources that are subject to the 4-factor analysis. ID got a lot of pushback from the sources, half of them will not meet the deadline to submit the analysis. There is a sugar beet processing plant that already responded that it is not economically feasible to install control equipment.

Phil went over the status of the WA RACT sources, the 2 individual sources that will working on a NOC with the LCAA and TransAlta. Further, Phil reported on the status of the Pulp & Paper industry, and the work we are doing on the refineries. The refineries want to go through RACT, which means we have to write a rule if there are emission reductions available. We briefly discussed the rule process here in WA, and the obstacles we might encounter, such as the amount of rules ecology is currently developing. There was some discussing on the rulemaking in general.

Then we transitioned into a discussion about adjusting the Class I glide path. Several Class I areas do not meet the glide path due to wild fires or prescribed burning. Pasayten in WA is above the glide path due to prescribed burning that impact the IMPROVE monitor. Several option on how to adjust the glide path were discussed during an earlier conference call with WRAP. Originally members of WRAP suggested to adopt the EPA default adjusted glide path, he also suggested to adopt the default glide paths for all Class I areas in a state. However, Jean-Paul suggested that the other option would be to lower the threshold to calculate the Most Impaired Days. Idaho also has Class I areas that are above the glide path due to fire. They looked at lowering the threshold, however, they are down to 87%. There was some discussion on what was necessary to write a defensible weight-of–evidence that EPA would accept. Jean-Paul had contacted Jeff Hunt earlier to discuss this issue, but Jeff could not give him a definite answer. Idaho called their EPA contact (John Chi) to discuss the same issue. In the end, Idaho suggested to have a call with EPA Region 10, WA, ID and possibly OR to discuss this issue in more detail.

The call ended around 10:35

Huys, Jean-Paul (ECY)

From: Gent, Philip (ECY)
Sent: Friday, February 21, 2020 10:39 AM
To: McFall, Keith
Cc: Madsen, Michael A; Takamoto, Clayton; Hamamoto, Dale; Huys, Jean-Paul (ECY); Huitsing, Gary (ECY); Inloes, Scott (ECY); Stinson, Colleen (ECY)
Subject: RE: Follow-up: Request for clarification on WA DEQ approach to Regional Haze related coarse mass from area sources
Attachments: RHSelectionCriteria.docx

Keith,

We don't really have an analysis or direct decision process on not performing a 4-Factor analysis on area sources. We went with a screening process to look at our major sources and select the ones that contributed ~ 80% of the regional haze inducing compounds to the atmosphere. I've attached a document on what we did.

Is your issue with area source coarse mass from volcanic activity? WA doesn't have this sort of high level impact at our IMPROV monitors, but we do have forest fire PM that creates work for us. A method for exceptional events exist where we can identify and deal with the collected information, but this isn't just a regional haze exercise.

The topic of area source course mass has not come up during any of our R10 and R10 states consultation phone calls (we have set-up a monthly call with R10, OR, WA, ID, and AK for consultation purposes). The next one is sometime in March, so I can bring this up at the meeting and see if anyone else is dealing with it.

As an aside, WA should be able to show that we are making progress toward meeting regional haze goals without looking at area source course mass. With the reductions we have on-the-way or on-the-books, we should be okay. For this reason, we didn't feel the need to expend energy on area sources for this round.

Philip Gent, PE
Senior Engineer
Policy & Planning Section
Washington Department of Ecology
(360) 407-6810
Philip.Gent@ecy.wa.gov

From: McFall, Keith [mailto:Keith.McFall@doh.hawaii.gov]
Sent: Friday, February 21, 2020 9:52 AM
To: Gent, Philip (ECY) <pgen461@ECY.WA.GOV>
Cc: Madsen, Michael A <michael.madsen@doh.hawaii.gov>; Takamoto, Clayton <clayton.takamoto@doh.hawaii.gov>; Hamamoto, Dale <dale.hamamoto@doh.hawaii.gov>
Subject: RE: Follow-up: Request for clarification on WA DEQ approach to Regional Haze related coarse mass from area sources

Hi Philip,

Following up on the decision not to perform a 4-factor analysis on area sources, would you be able to share any documentation of the evaluation process WA DEQ went through for this? And/or would you be able to share any documentation of EPA R10 concurrence? Basically, I am looking for documentation to help support the tentative conclusion that Hawaii should not perform a 4-factor analysis on area sources for this SIP.

Thank you very much,

Keith

Keith McFall, PE, PhD
Environmental Engineer, Clean Air Branch
Environmental Management Division
Tel: (808) 586-4200

From: McFall, Keith
Sent: Thursday, February 20, 2020 3:20 PM
To: Gent, Philip (ECY) <pgen461@ECY.WA.GOV>
Cc: Madsen, Michael A <michael.madsen@doh.hawaii.gov>; Takamoto, Clayton <clayton.takamoto@doh.hawaii.gov>; Hamamoto, Dale <Dale.Hamamoto@doh.hawaii.gov>
Subject: RE: Follow-up: Request for clarification on WA DEQ approach to Regional Haze related coarse mass from area sources

Hi Phil,

Thank you very much. That is very helpful.

Keith

Keith McFall, PE, PhD
Environmental Engineer, Clean Air Branch
Environmental Management Division
Tel: (808) 586-4200

From: Gent, Philip (ECY) <pgen461@ECY.WA.GOV>
Sent: Thursday, February 20, 2020 12:30 PM
To: McFall, Keith <Keith.McFall@doh.hawaii.gov>
Cc: Madsen, Michael A <michael.madsen@doh.hawaii.gov>; Takamoto, Clayton <clayton.takamoto@doh.hawaii.gov>; Hamamoto, Dale <dale.hamamoto@doh.hawaii.gov>
Subject: [EXTERNAL] RE: Follow-up: Request for clarification on WA DEQ approach to Regional Haze related coarse mass from area sources

Keith,

We are not performing a 4-Factor analysis on area sources. Also WRAP modeling is holding area sources constant for the future scenario.

Philip

From: McFall, Keith [mailto:Keith.McFall@doh.hawaii.gov]
Sent: Wednesday, February 19, 2020 3:44 PM
To: Gent, Philip (ECY) <pgen461@ECY.WA.GOV>
Cc: Madsen, Michael A <michael.madsen@doh.hawaii.gov>; Takamoto, Clayton <clayton.takamoto@doh.hawaii.gov>; Hamamoto, Dale <dale.hamamoto@doh.hawaii.gov>
Subject: Follow-up: Request for clarification on WA DEQ approach to Regional Haze related coarse mass from area sources

Hi Phil,

I forgot to complete my SUBJECT line on the email.

Thank you,

Keith

Keith McFall, PE, PhD
Environmental Engineer, Clean Air Branch
Environmental Management Division
Tel: (808) 586-4200

From: McFall, Keith
Sent: Wednesday, February 19, 2020 1:36 PM
To: philip.gent@ecy.wa.gov
Cc: Madsen, Michael A (michael.madsen@doh.hawaii.gov) <michael.madsen@doh.hawaii.gov>; Takamoto, Clayton <clayton.takamoto@doh.hawaii.gov>; Hamamoto, Dale <Dale.Hamamoto@doh.hawaii.gov>
Subject: Request for : Coarse Mass IMPROVE data HI vs all IMPROVE site

Hi Phil,

I am currently supporting the Hawaii Clean Air Branch's efforts to prepare a Regional Haze SIP, and I am checking to see if Washington DEQ is performing 4-factor analyses regarding area sources to control sources of coarse mass? I checked your website (https://ecology.wa.gov/Air-Climate/Air-quality/Air-quality-targets/Regional-haze), and it didn't appear to be explicitly called out.

I am cc'ing my coworkers on this since I will be moving to a different job next week.

Thank you very much for your consideration,

Keith

Background:

EPA Region 9 mentioned Arizona's decision to pursue 4-factor analyses with respect to area sources (e.g., unpaved roads) that contribute to coarse mass visibility impairment, so I looked at how their IMPROVE data looked compared to Hawaii's (and other states').

The first sheet of the attached file (reproduced below), shows the % of Coarse Mass bext & % of "Ammonium Nitrate + Ammonium Sulfate" bext relative to total anthropogenic bext (e.g., Nitrate, Sulfate, EC, OC, CM, Soil) for 2014 – 2018 for the most impaired days.

The Hawaii data comes from the "2016-IMPROVE-Photochem-19.xlsx" file (sheet "NoVolc-GRP-90"; that file is not attached) and uses OAQPS model base ammonium sulfate for 2016, and "volcano free" Sept 2018 – Dec 2018 IMPROVE data for 2018.

The bottom line is that Arizona, with its different set of emission sources and generally arid climate, has a large to hugely large Coarse Mass bext to Ammonium Sulfate + Ammonium Nitrate bext ratio compared to Hawaii.

I am looking for states that would be reasonable reference points for Hawaii to consider with regard to the analysis (or deferral to the next planning period) of possible coarse mass control measures.

Keith McFall, PE, PhD
Environmental Engineer, Clean Air Branch
Environmental Management Division
Tel: (808) 586-4200

Huys, Jean-Paul (ECY)

From: Gent, Philip (ECY)
Sent: Wednesday, April 1, 2020 2:18 PM
To: Joshua Jenkins
Cc: Huys, Jean-Paul (ECY)
Subject: RE: Regional Haze: Check-In and Virtual Meeting

Joshua,

Do you want a phone call or would you prefer a Skype meeting? This Friday is open for me for either one. If you do want a Skype meeting, I can send you a Skype meeting request that contains all of the links you need (including using the web version of Skype if you don't have it).

If we use Skype, I can pull in others here (to listen in) and you could have others there. That way if you ask a question I don't know the answer too, one of my teammates might.

Philip Gent, PE
Senior Engineer
Policy & Planning Section
Washington Department of Ecology
(360) 407-6810
Philip.Gent@ecy.wa.gov

From: Joshua Jenkins [mailto:jjenkins@npca.org]
Sent: Wednesday, April 1, 2020 1:54 PM
To: Gent, Philip (ECY) <pgen461@ECY.WA.GOV>
Subject: Regional Haze: Check-In and Virtual Meeting

Hi Philip,

I hope everything is going well and you're staying healthy.

I want to thank you again for the chat back in December about the regional haze process in Washington State.

We're in the process of receiving the 3rd of 3 installments containing 4-factor analyses from Washington State facilities. Once we receive that installment, I would love to set up a time to virtually chat about the next steps in the regional haze process; preferably sometime this month. Right now, I have plenty of flexibility in my schedule and can make more room if possible. If this works for you just let me know what your availability is and I can set something up.

Again, thanks for all of your help so far and I look forward to talking with you soon.

Warmly,
Joshua Jenkins

Joshua Jenkins, MPA
NW Senior Program Coordinator | National Parks Conservation Association
P: 360-409-6266| jjenkins@npca.org | **npca.org**
Pronouns: He/Him
Your parks. Your turn.

Huys, Jean-Paul (ECY)

From: Gent, Philip (ECY)
Sent: Thursday, February 20, 2020 3:42 PM
To: Huys, Jean-Paul (ECY)
Cc: Stinson, Colleen (ECY); Huitsing, Gary (ECY); Hankins, Martha (ECY); Hanlon-Meyer, Christopher (ECY); Inloes, Scott (ECY)
Subject: RH contact

Jean-Paul,

I received a message and then called Sara with SLR consulting out of Oregon. She asked how Washington selected the firms to request 4-Factor analysis from (Q/d). I explained our process, but made sure to emphasize that each state has their own process.

Sara said that Oregon had a Q/d around 5 and Washington's was around 10. I let her know that Idaho had a value around 2 and that Montana was also around 10, it was strictly a matter of relevant criteria that each state evaluates on their own.

I concluded the call by advising Sara to contact Oregon DEQ if she wants details on how they did their selection criteria.

Philip Gent, PE
Senior Engineer
Policy & Planning Section
Washington Department of Ecology
(360) 407-6810
Philip.Gent@ecy.wa.gov

From: WU D
To: Huys, Jean-Paul (ECY); Gent, Philip (ECY)
Cc: "Suarez-Murias, Christine@ARB"
Subject: question about cement companies
Date: Wednesday, March 18, 2020 3:27:20 PM

Hi, all,

We are looking at our Portland cement company (Ash Grove), which WA also has facilities, and thank you, Tina, for sharing the consent decrees for the cement plants you all were dealing with (Leheigh and CalPortland). Oregon DEQ is looking at the consent decrees and we were wondering if you were asking your Portland Cement facilities to undergo FFA?

Thank you
~ D

D Pei Wu, PhD
Pronouns: D; they/them/theirs
Air Quality Planning
Oregon Department of Environmental Quality
700 NE Multnomah St, Suite 600
Portland, OR 97212

O: 503-229-5269
E: wu.d@deq.state.or.us

From: Stinson, Colleen (ECY)
To: "WILLIAMS Karen * DEQ"
Cc: Gent, Philip (ECY)
Subject: RE: Second review of Oregon DEQ reference to Washington RACT
Date: Thursday, April 15, 2021 8:05:45 AM
Importance: High

Hi Karen-
Sorry it has taken me so long to get back to you. We are in the throes of document writing and review as I am sure you are also.
Just one comment - we have several agreed orders and a consent decree for this implementation period, in addition to the planned shutdown of the coal-fired boilers at TransAlta. The Agreed Orders include NOx reductions at TransAlta until it ceases coal-fired power generation in 2025, AOs with 2 Al smelters to do a FFA prior to start-up and implement identified controls approved by Ecology within 3 years of startup. We also have a consent decree with Cardinal Glass for NOx reductions. We are anticipating doing RACT on the refineries since our FFA indicated that additional controls may be reasonable so we have to use the authority in the RACT statute. The refinery controls would not be implemented until next implementation period.
Hopefully Phil can make sure I captured that clearly.
Colleen

From: WILLIAMS Karen * DEQ <karen.williams@deq.state.or.us>
Sent: Friday, April 9, 2021 3:12 PM
To: Stinson, Colleen (ECY) <csti461@ECY.WA.GOV>
Cc: Gent, Philip (ECY) <pgen461@ECY.WA.GOV>
Subject: Second review of Oregon DEQ reference to Washington RACT

Hello, Colleen. Thanks to you and Phil for talking with Michael and me last week about Washington's Regional Haze processes. You mentioned on that call some corrections to the paragraph in our SIP draft about Ecology's screening and control decisions process. Below I've pasted the corrected paragraph. Have I captured Washington's process accurately? I also added a sentence that clarifies that our selection was based only on a Q/d calculation and did not take into account meteorological factors, such as typical wind direction.

Eleven facilities located in Washington may impair visibility in the Mt. Hood Wilderness area in Washington. According to draft documents posted on Washington Ecology's Regional Haze webpage, Ecology relied on the 2014 National Emissions Inventory for Regional Haze Round 2 input; Ecology used a Q/d ratio of 10 as the threshold for facilities to screen into FFA. For facilities where Ecology found pollution controls reasonable, Ecology will implement those decisions through state rules governing Reasonably Available Control Technology.

Thanks for a second review and have a lovely weekend.

Karen Font Williams | Air Quality Planner
she/her/hers
DEQ Air Quality Division
700 NE Multnomah St., Ste. 600 | Portland, OR 97232
(503) 863 – 1664 ***Please note new phone number***

From: Stinson, Colleen (ECY)
To: "WILLIAMS Karen * DEQ"
Cc: Gent, Philip (ECY)
Subject: RE: Review and information requested by Oregon DEQ for Regional Haze Plan
Date: Friday, March 19, 2021 7:25:23 AM

Hi Karen –
Looks like we are not the only ones to have staff changes – Jean-Paul retired in July last year. I had not heard that D was gone too. RH is a heavy lift and we will gladly help you out!
I am forwarding this on to our lead engineer Phil Gent to review your write-up since that is in his wheelhouse more than mine. However, I believe the Q/d we ended up using was 10 and we did not set a monetary threshold.

Best,
Colleen

From: WILLIAMS Karen * DEQ <Karen.WILLIAMS@state.or.us>
Sent: Thursday, March 18, 2021 5:36 PM
To: jhuy461@ECY.WA.GOV; Stinson, Colleen (ECY) <csti461@ECY.WA.GOV>
Subject: Review and information requested by Oregon DEQ for Regional Haze Plan

Dear Jean-Paul and Colleen,

First, let me introduce myself. I'm Karen Williams and an air quality planner at Oregon DEQ. I worked closely with D Pei Wu, DEQ's lead Regional Haze project manager and analyst, before they left in mid-February to pursue other opportunities. With significant help from Joe Westersund, Sr. Engineer from Operations, modeler Phil Allen and planning Manager Michael Orman, I am trying to write up the last sections of the Regional Haze plan before we release it for federal agency review.

I've reviewed D's notes from the state consultation meetings and your state's Regional Haze website to compose the section below that pertains to the Washington facilities that we determined could affect OR Class I areas. I'm writing to ask for your review of this section for accuracy and completeness.

Is it possible for you to get back with me by March 25, next week? I would greatly appreciate your help.

Excerpt

3.1. Impact of facilities in other states on Oregon Class 1 areas

The Regional Haze Rule requires states to investigate and plan for out-of-state facility emissions that affect visibility in that state's Class I areas (40 CFR 51.308(f)(2)(ii)). Specifically, "the State must consult with those States that have emissions that are reasonably anticipated to contribute to visibility impairment in the mandatory Class I Federal area to develop coordinated emission management strategies containing the emission reductions necessary to make reasonable progress."

Through state consultations during 2019 and 2020 (described in Section 6.2), and relying on the regional model available through WRAP, DEQ identified the facilities listed in Table 3-4 as being reasonably likely to contribute to visibility impairment in Oregon Class 1 areas. All of these facilities were on the four factor analysis lists for their respective states.

Eleven facilities located in Washington are likely to impair visibility in the Mt. Hood Wilderness area in Washington. According to draft documents posted on Washington Ecology's Regional Haze webpage, Ecology relied on the 2014 National Emissions Inventory for Regional Haze Round 2 input; Ecology used a Q/d ratio of 6.7 as the threshold for facilities to screen into FFA and a cost effectiveness threshold of $10,000/ton pollutant reduced.[1]

Facility Name	Fac State	OR CIA Name	D (km)	Q-act (tpy)	Q/d Act	NOX Act	PM10-PRI Act	SO2 Act	FFA Decision[2]
TransAlta Centralia Generation, LLC	WA	Mount Hood	169.98	8,323.32	48.97	6,214.37	419.33	1,689.62	• Will cease coal-fired power generation by 12/31/25. • reduced NOX emission standard for remaining facility life.
Nippon									

Dynawave Packaging Co.	WA	Mount Hood	118.70	2,463.94	20.76	1,949.43	124.30	390.21	• Control measures do not appear necessary to meet the reasonable progress goals and would not provide meaningful visibility improvement. • Ecology will reevaluate these sources during the next implementation period.
Georgia-Pacific Consumer Operations LLC	WA	Mount Hood	45.45	689.00	15.16	486.00	163.00	40.00	
Boise Paper	WA	Eagle Cap	114.04	1,656.24	14.52	637.27	133.56	885.41	
Longview Fibre Paper and Packaging, Inc. dba KapStone Kraft Paper Corporation	WA	Mount Hood	113.46	1,449.26	12.77	1,040.95	210.33	197.98	
WestRock Tacoma Mill	WA	Mount Hood	210.43	1,532.36	7.28	1,120.90	221.74	189.72	
Alcoa Primary Metals Intalco Works	WA	Mount Hood	386.45	4,776.22	12.36	190.17	598.71	3,987.34	• Not cost reasonable to add emission control devices. • Currently in curtailment .
BP CHERRY POINT REFINERY	WA	Mount Hood	391.39	2,808.00	7.17	1,918.00	82.00	808.00	• Additional controls are cost-effective . • Ecology recommends RACT rule development
TESORO NORTHWEST COMPANY	WA	Mount Hood	347.26	2,194.33	6.32	1,970.78	143.83	79.72	
Ash Grove Cement Company	WA	Mount Hood	241.76	1,466.47	6.07	1,367.89	29.15	69.42	• Unreasonable cost to install equipment. • Recent upgrade of PM controls. • Recent consent decree addressed SO_2, NO_X, and PM emissions.
Cardinal FG Winlock	WA	Mount Hood	151.89	881.83	5.81	809.14	16.47	56.22	• Installation SCR in 2021; large decrease in NO_X; minor increase in PM and SO_2. • New permit limit for ammonia of 10 ppm and 9.5 tpy is reasonable.

Best regards,
Karen

Karen Font Williams | Air Quality Planner
she/her/hers
DEQ Air Quality Division
700 NE Multnomah St., Ste. 600 | Portland, OR 97232
(503) 229 - 5519

[1] Regional Haze SIP Revision – DRAFT Second 10-Year Plan, Chapter 11: Four Factor Analysis. https://fortress.wa.gov/ecy/ezshare/AQ/RegionalHaze/docs/RhSIPCh11202101.pdf

[2] From Washington Regional Haze website: https://ecology.wa.gov/Air-Climate/Air-quality/Air-quality-targets/Regional-haze;

Consultation with Nevada DEP – 12/10/19

NV: Steve McNeece and Sig Jaunarajs

WA: Phil Gent, Colleen Stinson, Gary Huitsing, Scott Inloes, Farren Herron-Thorpe, Jean-Paul Huys

Nevada had consultations with several neighboring states. They wanted to consult with WA, because modeling showed (in the first RH SIP development) that WA had a significant impact of the visibility of Jarbidge (NV's only Class I area). Jean-Paul clarified that TransAlta was probably the source that had the greatest impact, but that will change in the near future since TransAlta will be closing in 2020 and 2025.

Sig went over NV's Q/d screening analysis that resulted in a Q/d of 4, which encounter for 80% of the total emissions. NV send out 11 letters to facilities in August '19. After comments from sources, the Q/d was reevaluated and dropped to 5 (omitting the airports, mines and gas fired compressors). NV started consultation with sources and started the 4-factor analyses, results are expected in January 2020. The biggest source in NV is the Valmy Generating Station. They were due to close but reconsidered and now they will have to do a 4-factor analysis. NV seems to have a unique situation for each source, and that can be said for all states...

Phil and Jean-Paul explained the situation in WA, the letters send out, responds from the Pulp & Paper industry and refineries. We briefly discussed the hurdles we need to overcome in order to be successful.

NV got information from consultants on the cut point to determine what is economical feasible or not to install control devices. The cut point seems to be around $5,000 – however, not decision has been made.

We discussed the EPA modeling that was done for 2028, and the possibility of adjusting the glide path. Jarbidge is impacted by fires and is above the glide path. NV will try to adjust the glide path if they can, depending on the amount of work involved. Jean-Paul suggested to check with Region 9 on what will be required in the weight-of-evidence. He also mentioned that WRAP is looking into it.

Farren and Sig discussed the WRAP modeling that will happen in 2020, and more specifically the sensitivity runs. They also discussed some of the options NV might have relating to Valmy, and the OTW/OTB versus future emissions reductions. Farren was going to look into it and get back the Sig.

At the end of the call, we told Sig that we would be glad to help and advice if they needed it.

Appendix S. Cardinal Glass Winlock – SCR Project – Air Discharge Permit Application

Wingra Engineering, S.C.
Environmental Engineering Consultants

November 5, 2019

Southwest Clean Air Agency
Attn: Wess Safford, AQ Engineer
11815 NE 99th Street, Suite 1294
Vancouver, WA 98682-2322

Subject: Construction Permit Application
SCR Project
Cardinal FG Winlock
Winlock, Washington

Dear Mr. Safford:

On behalf of Cardinal FG Winlock, please find enclosed a construction permit application for the SCR Project at their glass manufacturing plant in Winlock, Washington. The company is planning to install a new Selective Catalytic Reduction (SCR) control system for NO_x emissions and to increase glass production from 650 to 750 tons per day.

The enclosed application provides all required information including Best Available Control Technology and air quality modeling analyses. It addresses comments from the Southwest Clean Air Agency and Washington Department of Ecology staff on a June 26th pre-application plan and August 1st modeling protocol. *Please note that signed application forms and a check for the application fee of $3,600 will be submitted directly by Cardinal FG Winlock.*

Should you or other Department staff require further information on this project, don't hesitate to contact John Renkert, Environmental Engineer, at (360) 242-4300 or me.

Sincerely,

Wingra Engineering, S.C.

Steven Klafka, P.E., BCEE
Environmental Engineer

Enclosure

cc: J. Renkert – Cardinal FG
S. Inloes - WDOE

Cardinal FG Winlock

Winlock, Washington

SCR Project

Construction Permit Application

November 5, 2019

Prepared by:

Steven Klafka, P.E., BCEE

Wingra Engineering, S.C.

Madison, Wisconsin

INTRODUCTION

Cardinal FG Winlock operates a flat glass manufacturing plant in Winlock, Lewis County, Washington. This plant was originally issued a major source construction permit in 2004 under the Prevention of Significant Deterioration (PSD) rules. At that time, the Washington Department of Ecology (DOE) issued Permit No. PSD-03-03 and the Southwest Clean Air Agency (SWCAA) issued Air Discharge Permit #04-2568. The current Air Operation Permit #SWOS-14-Rl was issued by SWCAA on January 22, 2019.

Figure 1 shows the location of the plant northeast of Winlock, Washington.

Cardinal is planning an SCR Project which includes the following changes to the plant:

1. Installation of a new Selective Catalytic Reduction (SCR) system on the glass furnace to control NO_x emissions. The SCR system will provide an 80% reduction in uncontrolled NO_x emissions.

2. Increase in production capacity from 650 to 750 tons per day of glass.

3. Request that SWCAA issue an air discharge permit for a minor source with emission limitations limiting annual emissions of each air pollutant to less than the major source threshold of 250 tons per year. The plant will become a synthetic minor source. The Best Available Control Technology or BACT limitations and requirements established under the current PSD permit will be updated to reflect state-only BACT under SWCAA and DOE rules.

4. Request that DOE revoke the current major source PSD permit and major source requirements. These include BACT limitations established under the PSD regulations, and ambient air quality impact requirements including use of an SCR system on the emergency generator and a month restriction on furnace burnout operations.

To clarify the requirements for this project, a pre-application plan was submitted to SWCAA and DOE on June 26, 2019, a modeling protocol was submitted August 1st, and a pre-application conference call was conducted on August 6, 2019.

The enclosed air quality permit application requests an air discharge permit from SWCAA. It describes this project, proposed equipment changes, current and future emissions, and compliance with air permit requirements.

Appendix A of the permit application provides relevant application forms.

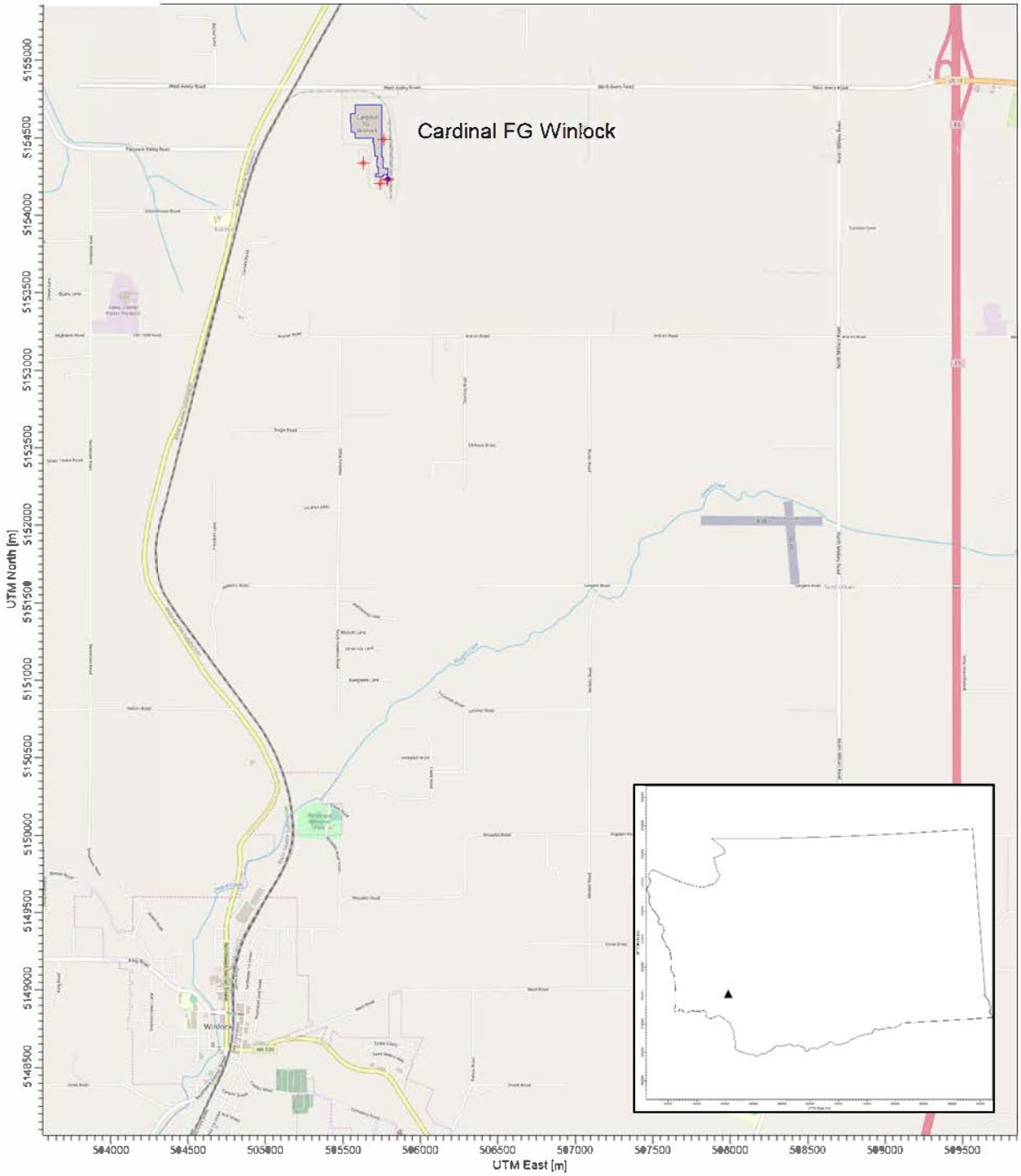

Figure 1 - Location of Cardinal FG Winlock – Winlock, Washington

GENERAL APPLICATION INFORMATION

Owner/Operator:	Cardinal FG - Winlock 545 Avery Road West Winlock, WA 98596
Responsible Official:	Steven Smith, Plant Manager ssmith@cardinalcorp.com (360) 242-4300
Application Contact Person:	John Renkert, Environmental Engineer jrenkert@cardinalcorp.com (360) 242-4300
Application Submitted By:	Steven Klafka, P.E., BCEE Wingra Engineering, S.C. 303 South Paterson Street, Madison, WI 53703 sklafka@wingraengineering.com (608) 255-5030

AIR PERMIT REQUIREMENTS

As previously discussed with SWCAA and DOE staff, Cardinal FG will submit a construction permit application to SWCAA for issuance of a minor source permit with new emission limitations limiting annual emissions of each air pollutant to less than the major source threshold of 250 tons per year so the plant becomes a synthetic minor source. The Best Available Control Technology or BACT limitations established under the current PSD permit will be updated to reflect the state-only BACT requirement.

Once the SCR control system is operational and Cardinal complies with the new minor source emission limitations, it will request that DOE revoke the current major source PSD permit and major source requirements. These include BACT limitations established under the PSD regulations, and ambient air quality impact requirements including use of an SCR system on the emergency generator and month restriction on furnace burnout operations.

STATE ENVIRONMENTAL POLICY ACT

The State Environmental Policy Act (SEPA) requires that the SEPA process be completed for every project which requires an Air Discharge Permit unless the project is specifically exempted under WAC 197-11-800 Categorical Exemptions. The SEPA process needs to be completed only once per project. The SEPA process/determination is to be completed by the Lead Agency for the project. A SEPA screening worksheet will be completed and submitted to SWCAA separately from this application.

PROJECT DESCRIPTION

Cardinal FG Winlock is planning to increase glass production from 650 to 750 tons per day and install new air pollution control equipment for nitrogen oxide (NO_x) emissions from the glass furnace. Similar projects were approved earlier this year at the Cardinal FG plant in Menomonie, Wisconsin and last year at the Cardinal FG plant in Portage, Wisconsin.

The glass furnace designated EU1 – Glass Furnace is the primary source of emissions at the plant. It is a natural gas-fired regenerative furnace, a design common in the flat glass industry. It is currently equipped with a Spray Drier and Electrostatic Precipitator (ESP) control system to reduce sulfur dioxide (SO_2) and particulate matter (PM) emissions, respectively. The *3R Process* is currently used to control NO_x emissions. These control measures were determined to represent Best Available Control Technology (BACT) under the federal major source new source review Prevention of Significant Deterioration regulations when the plant was originally approved in 2004.

To further control NO_x emissions, Cardinal is planning to install a new Selective Catalytic Reduction (SCR) system. The new SCR system will be located after the existing Spray Drier and ESP. It will replace the use of the *3R Process*. Facility NO_x emissions in 2018 were 809 tpy. By installing the SCR system, uncontrolled NO_x emissions will be reduced by more than 80% so that 2018 emissions would have been 211 tpy. With this project, Cardinal also plans to increase the approved production of the plant from 650 to 750 tpd of glass. To accommodate the increase in production, this project will require a proportional increase in the existing PM and SO_2 emission limitations.

Appendix B provides a flow diagram and equipment layout for the addition of the SCR system to the Cardinal FG plant in Portage, Wisconsin. The layout for the Winlock is expected to be similar. A final proposal for the SCR system to be installed in Winlock is still pending. The flue gases will exit the existing ESP, flow through the new SCR equipment and exhaust to the existing stack.

Currently approved natural gas usage is 200 mmbtu/hr. To accommodate the increase in glass production, it is proposed that approved fuel usage increase proportionally to 231 mmbtu/hr. A new reheat burner in the duct will be installed between the current ESP and new SCR control systems with a capacity of approximately 17 MMBtu/hr. Emissions from natural gas combustion are included in the emission limitations for the glass furnace. Full capacity natural gas usage will be 248 mmbtu/hr.

Flat glass is manufactured by melting silica sand, soda ash (sodium carbonate), limestone (calcium carbonate), dolomite (calcium magnesium carbonate), salt cake (sodium sulfate), cullet (broken glass), iron, and carbon in the glass furnace.

Raw materials arrive by rail and trucks. A single below-grade unloading hopper receives bulk raw materials in an enclosed steel building. A bucket elevator moves the bulk materials to storage bins in the batch house.

Raw materials are withdrawn from the receiving silos for batch mixing. The solids are conveyed to a batch hopper scale for weighing and batch preparation. The materials are then mechanically mixed and conveyed to a bin for feeding to the furnace. Dust generated by the material handling operations is captured with fabric filter systems which exhaust internally.

Raw materials are fed to the glass furnace. Combustion gases melt the raw materials and exit the furnace through heat recovery regenerators which retain approximately half of the heat as the gases flow to the air pollution control equipment and the stack. After approximately 15 to 20 minutes, the direction of air flow reverses so combustion air is pre-heated by the regenerators before combining with the natural gas fuel and entering the furnace.

Molten glass flows from the furnace onto a molten tin bath. Tin melts at approximately 450 °F and the glass is hotter than 1,800 °F. The molten glass floats on the molten tin, forming a "ribbon." Metal tools in the molten bath control the thickness and width of the ribbon. Rollers pull the ribbon out of the unit as the glass cools. This operation utilizes a nitrogen and hydrogen atmosphere to minimize oxidation of the tin. Nitrogen and hydrogen gases are stored on-site.

The glass ribbon proceeds from the tin bath to an annealing lehr cooling section where air is used to remove heat, allowing the glass to harden. At this stage, the ribbon is exposed to SO_2 to protect against surface damage. This is adsorbed onto the glass surface to prevent staining. A portion of the unused SO_2 is released, captured by a ventilation system and exhausted to the glass furnace combustion air.

After cooling in the lehr, the glass ribbon is scored and cut for separation into desired sizes. Glass cutting requires a lubricant. This has traditionally been mineral spirits. All of the lubricant is evaporated as volatile organic compound (VOC) emissions into the interior of the production building. The application of VOC lubrication to the glass surface is designated EU2 – Glass Cutting. In 2018, usage was 18,100 lbs/yr, while the permit limitation is 7,317 lbs per month, or 87,804 lbs/yr. For this project, actual lubricant usage will increase with the glass production increase, but no change in current emission limitations or other requirements are necessary.

The scored ribbon is then "snapped" to break it into desired lengths and widths. The sections are called "lites" in the trade. Any broken or unacceptable glass is recycled to the furnace as cullet, while the lites are packaged for shipment. Dust generated by the handling of cullet is captured and designated EU3 – Cullet Return System #1 and EU4 – Cullet Return System #2. Actual cullet handling and associated dust will increase with the proposed increase in production. However, no changes to the EU3 and EU4 baghouse specifications, emission limitations or other permit requirements are necessary.

The pneumatic transfer system for dust captured by the furnace ESP is equipped with two baghouses. These are designated EU5 – EP Dust Baghouse #1 and EU6 – EP Dust Baghouse #2. Actual furnace ESP dust handling will increase with the proposed increase in production. However, no changes to the EU5 and EU6 baghouse specifications, emission limitations or other permit requirements are necessary.

There is currently one back-up diesel-fired electrical generator in case of loss of electric power. It is designated EU7 and rated at 2,000 kW. Usage for maintenance and testing is currently limited to 200 hour per year. With this project, a new emergency generator will be installed. It will be designated EU8 and rated at 1,250 kW.

One goal of this project is to limit annual emissions below the synthetic minor threshold of 250 tons per year. To reduce NO_x emissions from the emergency generators, each will be limited to 50 hour per year of operation. From 2016-2018, combined actual usage was 6.4 hours for testing and 17.3 hours for emergency purposes.

To assure all combustion sources are included in facility emission limitations established to become a minor source, all non-furnace fuel usage will be combined into a new source. This includes maintenance burners and air makeup heaters. It will be designated EU9. Natural gas usage from these operations have historically been included in Green House Gas emission reports submitted to the USEPA. In 2018, combined usage was 23 cf6/yr. Maximum heat input from all small burners is estimated to be 63.1 mmbtu/hr. Annual natural gas usage will be limited to 60 cf6/yr.

The air pollution sources at the plant are summarized in Table 1.

The parameters for all plant stacks are summarized in Table 2. For the glass furnace, the exit flow rate and temperature are those anticipated after installation of the SCR control system. The new control system will operate at a higher temperature than the current system without SCR. The furnace exhaust flow rate can vary with melt rate. The flow rate is estimated for different loads to allow evaluation of air quality impacts at each load.

Table 1 - Current and Proposed Production Capacities

Stack	Control	Process	Project Status
S01	C01A - SD	EU1 - Glass Furnace	Modified
	C01B - ESP		
	C01C - SCR		
None	None	EU2 – Glass Cutting	Existing
S03	C03 – Baghouse	EU3 - Cullet Return System #1	Existing
S04	C04 - Baghouse	EU4 - Cullet Return System #2	Existing
S05	C05 – Baghouse	EU5 – EP Dust Baghouse #1	Existing
S06	C06 – Baghouse	EU6 – EP Dust Baghouse #2	Existing
S07	None	EU7 – Emergency Generator	Existing
S08	None	EU8 – Emergency Generator	New
S09	None	EU9 – Miscellaneous Nat Gas Usage	Existing

Table 2 - Stack Parameters

Stack ID	Height (feet)	Diameter (feet)	Flow (acfm)	Temperature (°F)	Exit
S01 (100%) [1]	175.0	8.0	157,201	608	Vertical No Obstructions
S01 (75%)	175.0	8.0	117,901	608	
S01 (50%)	175.0	8.0	78,601	608	
S03	100.0	2.83	41,500	68	
S04	32.5	2.67	25,000	68	
S05	100	0.67	1,500	68	
S06	100	0.67	1,500	68	
S07	58	0.67	15,500	750	
S08	58	0.67	10,005	807	

[1] Based on flow rate from March 7, 2017 stack test adjusted to 750 tpd and SCR operating temperature.

PROPOSED CHANGES TO LIMITATION AND REQUIREMENTS

EU1 – Glass Furnace

Production Rates - The glass production capacity will increase 15% from 650 to 750 tons per day. The maximum heat input rate will increase proportionally from 200 to 231 mmbtu/hr. A new reheat burner in the duct will be installed between the current ESP and new SCR control systems with a capacity of approximately 17 mmbtu/hr. Due to the installation of the SCR control system, the temperature and flow rate of the exhaust gases from the furnace will increase.

Burnout Maintenance – During furnace burnout maintenance, the *3R Process* cannot be used so the NO_x emissions are uncontrolled. The current permit requires that burnout maintenance of the glass furnace be conducted: 1) no more than twice in any twelve consecutive months, 2) each burnout maintenance shall not exceed fourteen days in length, and 3) burnout maintenance shall be conducted only during the months of January, February, March, or September. With this project, these requirements can be removed from the permit. These requirements were originally imposed due the results of the Class I Area modeling analysis for the original PSD permit. At that time, NO_x emissions would be uncontrolled during burnout maintenance. With this SCR Project, the new SCR control system will control NO_x emissions during this period so they will be similar to normal operation. Additionally, since the plant is becoming a minor source, this original major source requirement is no longer required. Emissions from the burnout maintenance are included with the facility total to show plant emissions are less than 250 tons per year.

NO_x Emission Limits – The current permit has emission limits of 4,550 pounds per 24-hour period, 7 pounds per ton of glass, 882.2 tons per year, 8,645 pounds per 24-hour period during burnout maintenance, 13.3 pounds per ton of glass during burnout maintenance, and requires use of the *3R Process*. With this project, these emission limits and the requirement to use the *3R Process* will be removed. Based on the same uncontrolled rate of 13.3 lbs/ton, the maximum uncontrolled hourly emission rate will increase from 360.2 to 415.6 lbs/hr. This uncontrolled emission rate will occur during the annual maintenance shutdown of the air pollution control equipment. This maintenance period will require five days or 120 hours. Emissions from the glass furnace during the remainder of the year will be reduced using the SCR control system to assure plant emissions remain below 250 tons per year. Controlled emissions will be 50.9 lbs/hr, reducing from the current 7.0 lbs/ton emission factor to 1.63 lbs/ton. Total emissions including both normal and maintenance operation will be 245 tpy. The existing continuous emissions monitor (CEM) will be used to verify compliance. To provide operating flexibility, it is proposed that the averaging period for the NO_x emission limit be a 30-day rolling average. The supporting dispersion modeling analysis shows compliance with air quality standards with either controlled or uncontrolled emissions.

CO Emission Limits – The current permit has emission limits of 432 lbs/hr and 6.5 lbs/ton of glass. With this project, these emission limits will be replaced with lower limits which assure plant emissions are below 250 tons per year. Controlled emissions will be 56.3 lbs/hr or approximately 1.8 lbs/ton during both normal operation and maintenance of the air pollution control equipment. Compliance tests at the Winlock plant on March 13, 2007 measured emissions of 5.65 lbs/ton and 141.3 lbs/hr. With the removal of the *3R Process* for NO_x control, the glass furnace will now operate in an oxidizing mode, significant reducing CO emissions to remain below the major source threshold of 250 tpy. It is proposed that use of the existing CEM is no longer necessary to demonstrate compliance. Instead, compliance will be determined by an initial stack test and monitoring furnace combustion conditions to assure oxidizing conditions. Similar compliance methods are used for the other four Cardinal plants.

SO_2 Emission Limits - The current permit has emission limits of 16.3 lbs/hr and 0.6 lbs/ton for normal operation and 90 lbs/hr during the five days of air pollution control equipment maintenance when SO_2 emissions are uncontrolled. All of these emission limits will increase proportionally with the increase in capacity. Based on the uncontrolled rate of 3.3 lbs/ton, the maximum hourly emission rate will increase from 90 to 103.1 lbs/hr. This uncontrolled emission rate will only occur during the annual maintenance shutdown of the air pollution control equipment. Emissions from the glass furnace during the remainder of the year will be reduced using the current spray drier – ESP control system to assure plant emissions remain below 250 tons per year. It is proposed that the hourly emission limitation for SO_2 emissions for normal operations be increased from 16.25 to 25.0 lbs/hr. These are based on an increase in the emission factor from 0.6 to 0.8 lbs/ton. With the relaxation of the SO_2 emission limitation to remain below the major source threshold of 250 tpy, it is proposed that use of existing CEM to demonstrate compliance is no longer necessary. Instead, compliance will be determined by an initial stack test and continuous monitoring of the reagent usage by the spray drier.

PM/PM_{10} (Filterable) Emission Limits - The current permit has emission limits of 2.44 lbs/hr and 0.09 lbs/ton of glass. The new SCR control system will be located after the existing ESP. The SCR requires higher operating temperatures than currently provided by the ESP. To increase the temperature of the flue gas entering the SCR from approximately 360 to 610°F, the ESP will be operated at a higher temperature and a reheat burner will be installed after the ESP. Pilot tests at the Portage and Menomonie plants have shown the efficiency of the ESP for filterable PM/PM_{10} is reduced as the ESP operating temperature is increased. For this reason, an increase in the emission limitation is required. The new filterable PM/PM_{10} emission limit will be based on the New Source Performance Standard limitation of 0.45 lbs/ton for glass manufacturing. The maximum hourly emission rate at the new capacity of 750 tpd will be 14.1 lbs/hr. Similar limitations were recently approved for the Portage and Menomonie plants which are equipped with the same air pollution control system as the Winlock plant. Compliance with the new emission limitations can be verified by an initial stack test.

PM/PM_{10} (Condensable) Emission Limits - The current permit has emission limits of 23 lbs/hr and 0.85 lbs/ton of glass. Combined with the current limit of 0.09 lbs/ton for filterable PM/PM_{10}, the current limit for total PM/PM_{10} is 0.94 lbs/ton. No change to this current limit for total PM/PM_{10} is proposed. The maximum hourly emissions of total PM/PM_{10} at the new capacity of 750 tpd will be 29.4 lbs/hr. Uncontrolled emissions during maintenance of the air pollution control equipment will be similar to those which occur during normal operations. Similar limitations were recently approved for the Portage and Menomonie plants which are equipped with the same air pollution control system as the Winlock plant. Compliance with the new emission limitations can be verified by an initial stack test.

Maintenance Shutdown – The current permit allows the spray dryer and ESP to be shut down for five days each year for maintenance. There will be no change to this period but it will now include the new SCR control system. It is requested that the hours of shutdown for the SCR, spray drier and ESP be recorded separately. There may be periods when the SCR system must be by-passed for maintenance but the spray drier and ESP may continue to operate. The uncontrolled emissions during this maintenance shutdown period are included with total plant emissions to show they are below the 250 tpy major source threshold.

VOC Emission Limits - The current permit has emission limits of 2.7 lbs/hr and 0.1 lbs/ton of glass. Based on the same emission factor of 0.1 lbs/ton of glass, the maximum hourly emissions at the new capacity of 750 tpd will increase to 3.1 lbs/hr. Compliance with the new emission limitations can be verified by an initial stack test.

Annealing Lehr – The current permit requires: 1) SO_2 usage no greater than 0.25 lbs/ton of glass; 2) requires Cardinal to draw circulation air through the hood located between the tin bath and lehr at all times of glass production; and, 2) route said air to the glass furnace combustion air header and ultimately to the spray dryer ESP system used to control glass furnace emissions. No changes to these two requirements are necessary for the SCR Project.

Fluoride Emission Limit – The current emission limit is 2.9 tpy. This was set below the PSD significant emission rate of 3 tpy. A compliance test on March 14, 2007 measured emissions of 0.002 lbs/ton. This is equivalent to 0.3 tpy based on the proposed capacity of 750 tpd. No change in the current limit of 2.9 tpy is necessary.

Sulfuric Acid Emission Limit – The current emission limit is 6.9 tpy. This was set below the PSD significant emission rate of 7 tpy. A compliance test on September 6, 2011 measured emissions of 0.009 lbs/ton. This is equivalent to 1.2 tpy based on the proposed capacity of 750 tpd. No change in the current limit of 6.9 tpy is necessary.

EU2 – Glass Cutting

Current requirements for the cutting lubricant are: 1) compliance with the ASTM specifications for mineral spirits, 2) contain less than 1% benzene, 3) usage must not exceed 7,317 lbs/month, and 4) work practice measures. In 2018, glass cutting lubricant usage was approximately 1,500 lbs/month. No changes to the current requirements or usage limitation are necessary.

EU3 – Cullet Return Baghouse #1

Current PM/PM_{10} emission limitations are 1.9 lbs/hr and 0.005 gr/dscf. There will be no changes to this baghouse with the SCR Project. No change to the emission limitations are necessary.

EU4 – Cullet Return Baghouse #2

Current PM/PM_{10} emission limitations are 4.69 tpy and 0.005 gr/dscf. There will be no changes to this baghouse with the SCR Project. No change to the emission limitations are necessary.

EU5 – EP Dust Baghouse #1
EU6 – EP Dust Baghouse #2

Current PM/PM_{10} emission limitations for both baghouses combined are 0.56 tpy and 0.005 gr/dscf. There will be no changes to these baghouses with the SCR Project. No change to the emission limitations are necessary.

EU7 – Emergency Generator (2.0 MW)

Current emission limitations for the existing 2.0 MW generator are 2.3 tpy of NO_x, 0.42 tpy of CO, 0.09 tpy of PM_{10} and visible emissions are limited to 10% opacity. The current permit also requires: 1) the generator be equipped with a Selective Catalytic Reduction (SCR) system to control NO_x emissions; 2) diesel fuel sulfur be limited to 0.05%; 3) annual non-emergency operation is limited to 200 hours per year; and, 4) adhere to work practice requirements.

The requirement to operate an SCR control system on the emergency generator was imposed due the results of the Class I Area modeling analysis for the original PSD permit. Since the glass furnace NO_x emissions will now be controlled with the SCR system and the plant is becoming a minor source, this requirement is no longer required. It is proposed that the SCR system be removed from the emergency generator. The supporting dispersion modeling analysis shows compliance with air quality standards with uncontrolled emissions.

To provide more allowable emissions for the glass furnace, non-emergency operating hours will be reduced from 200 to 50 hours per year. New emission limits have been developed due to the lower operating hours and removal of the SCR control system.

EU8 - Emergency Generator

A new 1.25 MW generator will be installed with the SCR Project. It will comply with the current Tier 2 NSPS requirements for generators. To provide more emissions for the glass furnace, non-emergency operating hours limited to 50 hours per year.

EU9 – Miscellaneous Natural Gas Usage

To assure all existing combustion sources are included in facility emission limitations established to become a minor source, all non-furnace fuel usage will be combined into a new source. This includes maintenance burners and air makeup heaters. Natural gas usage from these operations have historically been included in Green House Gas emission reports submitted to the USEPA. In 2018, combined usage was 23 cf6/yr. Maximum heat input from all small burners is estimated to be 63.1 mmbtu/hr. Annual natural gas usage will be limited to 60 cf6/yr.

Special Operating Conditions

Results of a dispersion modeling analysis is provided later in this application. This was conducted to verify compliance with air quality standards. This analysis determined the following new operating conditions are necessary to assure plant compliance with standards after this project:

1. During normal operation of the glass furnace, only one generator is tested at a given time.
2. During maintenance operation of the glass furnace when the air pollution control equipment is shutdown, no generator is tested.
3. Maintenance operation of the glass furnace will only occur during the months from May to October.

EMISSIONS SUMMARY

Table 3 provides a summary of current, proposed and changes to total emissions from the Cardinal FG Winlock plant. The hourly emission rate is the higher uncontrolled rate which occurs during shutdown of the air pollution control equipment during maintenance.

Table 4 provides the proposed emissions for each operation at the plant after completion of this project.

Supporting emission calculations for criteria air pollutants are provided in Appendix C.

Supporting emission calculations for hazardous air pollutants are provided in Appendix D.

Table 3 - Summary of Current, Proposed and Changes to Emission Limitations

Air Pollutant	Current (lbs/hr)	Current (tpy)	Proposed (lbs/hr)	Proposed (tpy)	Change (lbs/hr)	Change (tpy)
PM (Total)	29.5	124.7	34.0	142.5	4.5	17.8
SO_2	91.0	75.7	103.8	114.2	12.9	38.5
NO_x	364.4	888.1	487.4	249.6	123.0	-638.5
CO	180.2	771.5	66.5	249.0	-113.7	-522.5
VOC	13.8	55.9	15.0	57.8	1.2	1.9
Pb	0.01	0.06	0.02	0.07	0.00	0.01
HF	0.66	2.90	0.66	2.90	0.00	0.00
H2SO4	1.58	6.92	1.58	6.92	0.00	0.00
CAA HAP	0.54	2.02	0.66	2.33	0.12	0.31
Subtotal		1,927.8		825.4		-1,102.4
CO2e	35,027.7	139,241.2	51,494.2	172,948.0	16,466.4	33,706.8

Table 4 - Proposed Emissions

Process		EU1 - Melting Furnace (Production)	EU1 - Melting Furnace (Furnace Maintenance)	EU1 - Melting Furnace (APC Maintenance)	EU1 - Melting Furnace (max lbs/hr & total tpy)		EU1 - Annealing Lehr	EU2 - Glass Cutting	EU3 - Cullet Return System #1	EU4 - Cullet Return System #2	EU6 - EP Dust Baghouse #1	EU7 - EP Dust Baghouse #2	EU8 - 2,000 KW Emergency Generator	EU9 - 1,250 KW Emergency Generator	P10 - Miscellaneous Natural Gas Usage	P11- SCR Reheat Burner	Total	
Stack		S01	S01	S01	S01		S02	S03A	S03B	S06	S07	S08	S09	S11	S12			
Control		SD-ESP-SCR	SD-ESP-SCR	None	SD-ESP-SCR	SD-ESP-SCR	None	Baghouse	Baghouse	Baghouse	Baghouse	None	None	None	SD-ESP-SCR			
Thruput		750	750	750		0.25	7,317	750	750	300	300	146.6	87.4	0.0631	0.017			
Thruput	Units	tpd glass	tpd glass	tpd glass		lbs SO2/ton	lbs/mo VOC	tpd glass	tpd glass	tph	tph	gph	gph	cf6/hr	cf6/hr			
Schedule	(hrs/yr)	8,640	0	120	8,760		8,760	8,760	8,760	8,760	8,760	50	50	60	149			
Flow	(acfm)							41,500	25,000	1,500	1,500			cf6/yr	cf6/yr			
PM/PM10/PM2.5 (FH)	Factor	0.45	0.45	0.5														
	Units	lbs/ton	lbs/ton	lbs/ton														
PM/PM10/PM2.5 (BH)	Factor																	
	Units																	
PM/PM10/PM2.5	Factor	0.94	0.94	0.94				0.00534	0.005	0.005	0.005	6.2	0.600	7.6				
	Units	lbs/ton	lbs/ton	lbs/ton				gr/acf	gr/acf	gr/acf	gr/acf	lbs/gal3	lbs/gal3	lbs/cf6				
SO2	Factor	0.8	0.8	3.3								0.216	0.216	0.6				
	Units	lbs/ton	lbs/ton	lbs/ton								lbs/gal3	lbs/gal3	lbs/cf6				
NOx	Factor	1.63	1.63	13.3								276.7	284.900	100				
	Units	lbs/ton	lbs/ton	lbs/ton								lbs/gal3	lbs/gal3	lbs/cf6				
CO	Factor	1.8	1.8	1.8								28.3	5.100	84				
	Units	lbs/ton	lbs/ton	lbs/ton								lbs/gal3	lbs/gal3	lbs/cf6				
VOC	Factor	0.1	0.1	0.1			1					7.4	2.400	5.5				
	Units	lbs/ton	lbs/ton	lbs/ton			lbs/lbs					lbs/gal3	lbs/gal3	lbs/cf6				
Pb	Factor	541	541	541								0.0012	0.0012					
	Units	ppm PM	ppm PM	ppm PM								lbs/gal3	lbs/gal3					
HF	Factor	0.0212	0.0212	0.0212														
	Units	lbs/ton	lbs/ton	lbs/ton														
H2SO4	Factor	0.050527	0.050527	0.050527														
	Units	lbs/ton	lbs/ton	lbs/ton														
CO2e	Factor	1,171	1,171	1,171								22,600	22,600	120000	120000			
	Units	lbs/ton	lbs/ton	lbs/ton								lbs/gal3	lbs/gal3	lbs/cf6	lbs/cf6			
CAA HAP	Factor	0.0170	0.0170	0.0170								0.003790	0.003790					
	Units	lbs/ton	lbs/ton	lbs/ton								lbs/gal3	lbs/gal3					
PM/PM10/PM2.5 (FH)	(lbs/hr)	14.1	14.1	15.6														
	(tpy)	60.8	0.0	0.9	61.7													
PM/PM10/PM2.5 (BH)	(lbs/hr)																	
	(tpy)																	
PM/PM10/PM2.5	(lbs/hr)	29.4	29.4	29.4	29.4			1.90	1.07	0.06	0.06	0.91	0.05	0.48		**33.9**		
	(tpy)	126.9	0.0	1.8	128.7			8.32	4.69	0.28	0.28	0.02	0.001	0.23		**142.5**		
SO2	(lbs/hr)	25.0	25.0	103.1	103.1							0.03	0.02	0.04		**103.2**		
	(tpy)	108.0	0.0	6.2	114.2							0.00	0.00	0.02		**114.2**		
NOx	(lbs/hr)	50.9	50.9	415.6	415.6							40.56	24.90	6.31		**487.4**		
	(tpy)	220.1	0.0	24.9	245.0							1.01	0.62	3.00		**249.6**		
CO	(lbs/hr)	56.3	56.3	56.3	56.3							4.15	0.45	5.30		**66.1**		
	(tpy)	243.0	0.0	3.4	246.4							0.10	0.01	2.52		**249.0**		
VOC	(lbs/hr)	3.1	3.1	3.1	3.1		10.0					1.08	0.21	0.35		**14.8**		
	(tpy)	13.50	0.00	0.19	13.7		43.90					0.03	0.01	0.17		**57.8**		
Pb	(lbs/hr)	0.016	0.016	0.016	0.016							0.0002	0.0001			**0.02**		
	(tpy)	0.069	0.000	0.001	0.070							0.000004	0.000003			**0.07**		
HF	(lbs/hr)	0.66	0.66	0.66	0.66											**0.66**		
	(tpy)	2.86	0.00	0.04	2.90											**2.9**		
H2SO4	(lbs/hr)	1.58	1.58	1.58	1.58											**1.6**		
	(tpy)	6.82	0.00	0.09	6.92											**6.9**		
CO2e	(lbs/hr)	36,594	36,594	36,594	36594							3313.16	1975.24	7,572.0	2,040.0	**51,494**		
	(tpy)	158,085	0	2,196	160281							82.83	49.38	3,600.0	8,935.2	**172,948**		
CAA HAP	(lbs/hr)	0.5	0.5	0.5	0.5							0.5556	0.3312			**1.4**		
	(tpy)	2.3	0.0	0.0	2.3							1.4E-02	8.3E-03			**2.3**	**825**	
Regional Haze Pollutants	(lbs/hr)															**626.1**		
	(tpy)															**513.2**		

BEST AVAILABLE CONTROL TECHNOLOGY (BACT) ANALYSIS

Introduction

When the plant becomes a synthetic minor source, the Best Available Control Technology (BACT) emission limitations, monitoring and testing requirements established under the current major source PSD permit will no longer apply. These requirements will be updated with this project to reflect the state-only BACT requirement. SWCAA's air permit program requires minor air permit applications to demonstrate compliance with all applicable standards such as RACT, BACT, LAER, BART, MACT, NSPS, NESHAPS, ambient air increments and ambient air quality standards. The state-only BACT requirement is specified under RCW 70.94.152(10).

For each pollutant, an analysis of BACT is required. For major source projects subject to the PSD rules, the procedures for determining BACT are interpreted by the USEPA and each state. Procedures are currently outlined in the draft 1990 USEPA *New Source Review Workshop Manual*. BACT is defined as an emission limitation based on the maximum degree of reduction determined on a case-by-case basis taking into account energy, environmental, and economic impacts and other costs. As noted in the *New Source Review Workshop Manual*, the top-down policy enforced by USEPA as of 1987 specifies that BACT must be the most stringent control technology. If there are sufficient technical considerations, or energy, environmental, or economic impacts, that demonstrate that the most stringent technology may not be achievable, the next most effective alternative is evaluated.

Table B-1 of the *New Source Review Workshop Manual* identifies the key steps necessary for a Top-Down BACT analysis. These are as follows:

1. Identify All Control Technologies
2. Eliminate Technically Infeasible Options
3. Rank Remaining Control Technologies by Control Effectiveness
4. Evaluate Most Effective Controls and Document Results
5. Select BACT

To begin the BACT analysis, the USEPA BACT/LAER Clearinghouse database was searched for BACT determinations for glass manufacturing during the past ten years. The only determination for a flat glass plant was for the Cardinal FG plant in Portage, Wisconsin. The Portage plant was issued Permit #17-DMM-196 in 2018 for its SCR Project. Like the Winlock plant, Portage is equipped with a spray drier and ESP control system, then added SCR to control NO_x emissions.

There are additional completed or ongoing NO_x control projects at the three remaining Cardinal plants. These projects and their emission limitations are summarized in Table 5.

The Menomonie, Wisconsin plant received Permit #19-POY-012 earlier this year. Similar to the

Portage and Winlock plants, it is adding SCR to the existing spray drier – ESP control system. Due to the unique interpretation of the state agency, the emission limitations for the Portage and Menomonie plants were subject to the federal PSD requirement for BACT even though the plants would become synthetic minor sources.

Table 5 - Emission Limits for Recent Cardinal FG Glass Plant Projects

Location	Winlock, WA	Menomonie, WI	Durant, OK	Mooresville, NC	Portage, WI
Permit	Pending	19-POY-012	2014-2167-TVR2 (M-2)	08618T11	17-DMM-196
Approval Date	Pending	August 26, 2019	July 12, 2019	February 18, 2019	June 11, 2018
Capacity	750	650	750	700	700
Control System	Spray Drier ESP SCR	Spray Drier ESP SCR	Dry Scrubber Catalytic Ceramic Filter	Dry Scrubber Catalytic Ceramic Filter	Spray Drier ESP SCR
Maintenance Period	120 hours	96 hours	36 hours	n/a	96 hours
PM Limits Normal	29.4 lbs/hr (0.94 lbs/ton)	25.5 lbs/hr (0.94 lbs/ton)	29.7 lbs/hr (0.95 lbs/ton)	27.7 lbs/hr (0.95 lbs/ton)	27.5 lbs/hr (0.94 lbs/ton)
PM Limits Maintenance	29.4 lbs/hr (0.94 lbs/ton)	25.5 lbs/hr (0.94 lbs/ton)	20.5 lbs/hr (0.66 lbs/ton)	n/a	27.5 lbs/hr (0.94 lbs/ton)
SO_2 Limits Normal	25.0 lbs/hr (0.8 lbs/ton)	16.25 lbs/hr (0.6 lbs/ton)	55.9 lbs/hr (1.8 lbs/ton)	247 tpy (1.7 lbs/ton)	16.25 lbs/hr (0.56 lbs/ton)
SO_2 Limits Maintenance	103.1 lbs/hr (3.3 lbs/ton)	99.03. lbs/hr (3.7 lbs/ton)	55.9 lbs/hr (1.8 lbs/ton)	n/a	105 lbs/hr (3.6 lbs/ton)
NO_x Limits Normal	245 tpy (1.63 lbs/ton)	243.3 tpy	54.4 lbs/hr (1.7 lbs/ton)	234 tpy	238.7 tpy
NO_x Limits Maintenance	415.6 lbs/hr (13.3 lbs/ton)	400 lbs/hr (14.8 lbs/ton)	54.4 lbs/hr (1.7 lbs/ton)	n/a	400 lbs/hr (13.7 lbs/ton)
CO Limits Normal	56.3 lbs/hr (1.8 lbs/ton)	51.3 lbs/hr (1.9 lbs/ton)	55.9 lbs/hr (1.8 lbs/ton)	244 tpy (1.9 lbs/ton)	51.3 lbs/hr (1.8 lbs/ton)
CO Limits Maintenance	56.3 lbs/hr (1.8 lbs/ton)	51.3 lbs/hr (1.9 lbs/ton)	55.9 lbs/hr (1.8 lbs/ton)	n/a	51.3 lbs/hr (1.8 lbs/ton)
Pb Limits Normal	0.016 lbs/hr (541 ppm)	0.014 lbs/hr (545 ppm)	0.05 lbs/hr (1,795 ppm)	n/a	0.015 lbs/ton (545 ppm)
Pb Limits Maintenance	0.016 lbs/hr (541 ppm)	0.014 lbs/hr (545 ppm)	0.04 lbs/hr (1,795 ppm)	n/a	0.015 lbs/ton (545 ppm)

The plants in Durant, Oklahoma and Mooresville, North Carolina were originally approved under the federal PSD requirements for BACT with no add-on air pollution control equipment for PM and SO_2 emissions, and use of the *3R Process* to control NO_x emissions. For their NO_x control projects, these plants installed a new air pollution control system consisting of a dry scrubber and catalytic ceramic filters. The use of the *3R Process* was eliminated. These projects became synthetic minor sources and were not subject to the federal PSD requirement for BACT. The Durant plant was subject to the state-only requirement for BACT, but its limitations were similar

to those used for the Mooresville plant.

BACT Analysis for Particulate Matter (PM)

1. Identify All Control Technologies

PM emissions from the EU1 – Glass Furnace are subject to the state-only BACT requirement. Minor emissions are contributed by the emergency generators, EU7 and EU8, and miscellaneous natural gas usage, EU9.

Industrial process PM emissions are typically controlled using the following control technologies:

- Fabric Filter Baghouse
- Electrostatic Precipitator (ESP)
- Wet Scrubber
- Multicyclone
- Settling Chamber

PM emissions from the EU1 – Glass Furnace are currently controlled using an ESP. This was determined to represent BACT when the Winlock plant was first approved in 2004. It is the same control method used for the Cardinal plants in Portage, Wisconsin and Menomonie, Wisconsin, and other competitor flat glass manufacturing plants.

For this project, it is proposed that the current ESP control system remain the same and the hourly emission limitations for total PM emissions be increased proportionally due to the change in production from 650 to 750 tpd. The proposed total PM (front-half and back-half) limit of 29.4 lbs/hr is equivalent to 0.94 lbs/ton. Earlier this year, the Portage and Menomonie plants also received a total limit based on 0.94 lbs/ton.

While the emission factor limit for total PM will remain the same, it is proposed that the PM (front-half) limit increase from 0.09 lbs/ton to 0.45 lbs/ton. This increase is necessary to accommodate the installation of the new SCR control system for NO_x emissions. The operating temperature of the ESP used for PM control must be increased to help achieve the 608 °F operating temperature of the SCR. Pilot tests by Cardinal FG at the Portage and Menomonie plants have shown that increasing the ESP operating temperature reduces its efficiency and increases front-half PM emissions. The 0.45 lbs/ton is equivalent to the limitation of 0.225 gm/kg in the New Source Performance Standards (NSPS) for glass manufacturing under Section NR 440.46(3)(a)1., Wis. Adm. Code.

Consistent with current practice at the Winlock plant, it is proposed there be 5 days or 120 hours each year for shutdown and maintenance of the ESP. It is anticipated that during maintenance, PM

emissions will be lower than normal operation. This situation is due to the fact that uncontrolled PM emissions from glass furnaces are relatively low, but when a spray drier is used for SO_2 control, the PM emissions into the ESP are increased. For simplicity, the total PM emission limit during maintenance will remain 0.94 lbs/ton.

The emergency generators, EU7 and EU8, are designed to comply with their applicable NESHAP requirements for non-road engines. PM, CO and VOC emissions from diesel engines can be reduced by the use of add-on Diesel Oxidation Catalysts or DOC. USEPA has verified reductions of PM by 20 to 40%, CO by 10 to 60%, and VOC by 40 to 75%.

The miscellaneous natural gas usage consists of numerous small space heating equipment and supplementary furnace burners. The small size of these burners precludes the use of add-on control equipment.

2. Eliminate Technically Infeasible Options

All of the five previously discussed control options for PM emissions are technically feasible for the glass furnace.

The use of DOC to control emissions from the engines is feasible.

3. Rank Remaining Control Technologies by Control Effectiveness

For the glass furnace, the baghouse and ESP are the most effective control options.

For the emergency generators, the DOC control system is the most effective control option, followed by compliance with the NESHAP requirements.

4. Evaluate Most Effective Controls and Document Results

For the glass furnace, the most effective control option, the existing ESP, will be used. Changing from the current ESP to a baghouse would: 1) not likely generate significant emission reductions, 2) require a significant expenditure and time of uncontrolled emissions to remove the ESP and install a baghouse, and 3) unlikely be able to operate at the higher operating temperatures required for the new SCR control system.

For the emergency generators, the DOC control system is the most effective control option.

5. Select BACT

For the EU1 – Glass Furnace, it is proposed that PM emissions be controlled using the current ESP control system. The current hourly emission limitations for front-half and total emissions will be increased due to the change in production from 650 to 750 tpd and the installation of the SCR control system for NO_x emissions. The current PM (front-half) limit of 0.09 lbs/ton and 2.44 lbs/hr

will increase to 0.45 lbs/ton and 14.1 lbs/hr. The PM (total) limit of 0.94 lbs/ton and 25.5 lbs/hr will increase to 29.4 lbs/hr with the 0.94 lbs/ton limit will remaining the same. Compliance with these emission limitations will be determined by a compliance stack test.

While no change in the total PM emission limitation of 0.94 lbs/ton is requested, the front-half PM limitation will increase from 0.09 to 0.45 lbs/ton. The higher value is the maximum emission limitation allowed under the NSPS for flat glass plants. This higher limitation is necessary because higher temperatures will be needed to accommodate the use of the new SCR control system for NO_x emissions. These will be achieved by allowing more high temperature furnace flue gases to pass through the spray drier and ESP. As the temperature of the flue gases increases, the collection efficiency of the ESP is reduced, increasing the front-half PM emissions. This reduction in efficiency was found during pilot tests at the Cardinal FG plants in Portage and Menomonie while operating their current control systems at higher flue gas temperatures.

Table 6 provides a summary of compliance stack tests on the ESP control system at the Cardinal FG plant in Portage. The 2013 and 2015 results show the ability of the existing ESP control system to comply with the existing front-half PM emission limitations of 0.2 lbs/ton and 5.5 lbs/hr while operating at the current operating temperature of 368 °F. The 2017 results are from two pilot tests while operating the ESP at temperature of 460 °F and 510 °F, respectively, to accommodate the new SCR control system for NO_x. A significant reduction in ESP efficiency and increase in PM (front-half) emissions occurred at the higher temperatures.

Table 6 - PM Compliance Tests on Glass Furnace at Cardinal FG – Portage

Test Year	PM (Total) (lbs/hr)	PM (FH) (lbs/hr)	PM (FH) (g/kg)	PM (FH) (lbs/ton)	PM (Total) (lbs/ton)
2013	7.08	2.27	0.05	0.09	0.29
2015	7.43	2.41	0.04	0.09	0.27
2017 (460 °F)	11.2	6.5	0.11	0.24	0.42
2017 (510 °F)	14.2	8.6	0.14	0.32	0.53

Table 7 provides a summary of compliance stack tests on the ESP control system at the Cardinal FG plant in Menomonie. The 2017 results show the ability of the existing ESP control system to comply with the existing front-half PM emission limitations of 0.22 lbs/ton and 5.5 lbs/hr while operating at the current operating temperature of 353 °F. The 2018 results are from a pilot test while operating the ESP at temperature of 418 °F to accommodate the new SCR control system for NO_x. A 25% increase in PM (front-half) emissions occurred at the higher temperature.

Table 7 - PM Compliance Tests on Glass Furnace at Cardinal FG – Menomonie

Test Year	PM (Total) (lbs/hr)	PM (FH) (lbs/hr)	PM (FH) (g/kg)	PM (FH) (lbs/ton)	PM (Total) (lbs/ton)

2017 (353 °F)	7.67	2.91	0.15	0.12	0.30
2018 (418 °F)	9.26	3.70	0.18	0.15	0.37

The injection of reagent in the spray drier creates a significant amount of reaction products which contribute to the PM emissions which need to be captured by the ESP. For this reason, uncontrolled PM emissions from the furnace are lower than those leaving the spray drier. Uncontrolled PM emissions during shutdown of the spray drier and ESP for maintenance are lower than the proposed controlled emission limitation of 0.94 lbs/ton. For simplicity, it is proposed that the emission limitation for the maintenance shutdown be the same as during controlled operations.

The emergency generators, EU7 and EU8, are anticipated to operate very few hours. During the 2016-18 period, the existing generator operating 23.2 total hours for both testing and emergency usage. For this project, it is proposed that operation be limited to 50 hours per year. Using an add-on control system such as DOC would not be cost effective due to the relatively low emissions that would be controlled. The existing and new generator are subject to the Tier 1 and Tier 2 NESHAP, respectively, which limits PM emissions to 0.54 and 0.2 gm/kwh. Actual emissions based on the generator specifications are 0.21 and 0.02 g/kwh. Since the actual emission rates were used to assure facility emissions remain below 250 tpy, it is proposed that the actual emission rates become the emission limitations. This is verified by the generator specifications.

As BACT for the miscellaneous natural gas usage, EU9, it is proposed that PM emissions be based on their uncontrolled emission factors of 7.6 lbs/cf6.

6. Compliance Demonstration

No change to current glass furnace ESP monitoring and recording requirements is proposed.

It is requested that the annual compliance test for PM emissions from the glass furnace be changed to once every five years due to: 1) the successful compliance history of the plant, 2) continued compliance with air quality standards, and 3) the change from a major to minor source.

BACT Analysis for Sulfur Dioxide (SO_2)

1. Identify All Control Technologies

SO_2 emissions from the EU1 – Glass Furnace are subject to the state-only BACT requirement. Minor emissions are contributed by the emergency generators, EU7 and EU8, and miscellaneous natural gas usage, EU9.

Industrial process and utility SO_2 emissions are typically controlled using the following control technologies:

- Low Sulfur Fuel
- Raw Material Substitution
- Dry Scrubber
- Spray Dryer
- Wet Scrubber

SO_2 emissions from the EU1 – Glass Furnace are currently controlled using a spray drier which injects the reagent in concert with the ESP to capture the reaction solids. This was determined to represent BACT when the Winlock plant was first approved in 2004. It is the same control method used for the Cardinal plants in Portage and Menomonie, Wisconsin.

The emergency generators, EU7 and EU8, are designed to comply with their applicable NESHAP requirements for non-road engines. These requirements include the use of ultra-low sulfur diesel (ULSD) fuel. Prior to the NESHAPS, the sulfur content of diesel fuel could be as higher as 0.05% or 500 ppm. Now, the sulfur content can be no greater than 15 ppm.

The miscellaneous natural gas usage consists of numerous small space heating equipment and supplementary furnace burners. The small size of these burners and the use of natural gas as fuel precludes the use of add-on control equipment.

2. Eliminate Technically Infeasible Options

All of the control options are technically feasible for the glass furnace.

The use of ULSD fuel by the generators is feasible.

3. Rank Remaining Control Technologies by Control Effectiveness

The furnace already uses natural gas, the lowest sulfur fuel option for glass furnaces. SO_2 emissions are primarily created by the oxidation of salt cake which is a glass making raw material. Salt cake usage varies slightly depending on the manufacturing conditions.

The add-on control methods in order of effectiveness are wet, semi-dry and dry scrubbing.

Use of ULSD fuel by the generators is the only option.

4. Evaluate Most Effective Controls and Document Results

While more effective, use of wet scrubbing would require replacement of the existing semi-dry spray drier control system. It would not be compatible with the existing ESP. It would also not be compatible with the high temperature requirements of the proposed SCR control system so would require significant reheating of the exhaust gas to the operating temperature of the SCR. Both replacement of the existing scrubber and use of gas reheating would make the wet scrubber not cost effective.

The Cardinal FG plants in Durant and Mooresville use dry scrubbers. Their SO_2 emission limitations are significantly higher because dry scrubbing is a less effective control option than a current spray drier and limitations are established to maintain emissions below the 250 tpy major source threshold. Their limitations are based on emission factors of 1.8 and 1.7 lbs/ton, respectively.

Use of ULSD fuel by the generators is the most effective option.

5. Select BACT

It is proposed that the current spray drier control system remain as BACT for the control of SO_2 emissions. It is the most effective control option that allows for the proposed installation of the new SCR control system. It is proposed that the hourly emission limitation for SO_2 emissions for normal operations be increased from 16.25 to 25.0 lbs/hr. These are based on an increase in the emission factor from 0.6 to 0.8 lbs/ton. The higher emission limitation for normal operation is proposed for the following reasons:

- The glass melting capacity will increase from 650 to 750 tons per day.
- The modeling analysis which shows that even uncontrolled emissions during air pollution control equipment maintenance will comply with air quality standards.
- The proposed limitations will easily maintain potential emissions below the major source threshold of 250 tpy.
- The emission factors for the recently approved Cardinal plants in Durant and Mooresville were more than twice as high.
- Unlike the Cardinal plants in Portage and Menomonie, the federal BACT requirement will no longer apply.

- The installation of the new SCR control system for NO_x emissions will require the existing spray drier and ESP to operate at higher temperatures. These are expected to reduce the spray drier and ESP effectiveness for controlling SO_2 and PM emissions.

Consistent with current practice it is proposed there be 5 days or 120 hours each year for shutdown and maintenance of the spray drier and ESP. It is requested that the hours of shutdown for the SCR, spray drier and ESP be recorded separately. There may be periods when the SCR system must be by-passed for maintenance but the spray drier and ESP may continue to operate.

Uncontrolled emissions air pollution control equipment shutdowns for maintenance are 3.3 lbs/ton. Uncontrolled emissions during control equipment maintenance will increase proportionally from 90.0 to 103.0 lbs/hr.

For the emergency generators, EU7 and EU8, it is proposed as BACT for SO_2 that they comply with the NESHAP and use ULSD fuel.

For the miscellaneous natural gas usage, EU9, it is proposed that natural gas be used as fuel.

6. Compliance Demonstration

With the relaxation of the SO_2 emission limitation to remain below the major source threshold of 250 tpy, it is proposed that use of the existing CEM to demonstrate compliance is no longer necessary. Instead, compliance will be determined by an initial stack test and continuous monitoring of the reagent usage by the spray drier. Similar compliance methods are used for SO_2 by the Cardinal plants in Durant and Mooresville.

BACT Analysis for Nitrogen Oxides

1. Identify All Control Technologies

NO_x sources subject to the state-only BACT requirement include the EU1 – Glass Furnace. Minor emissions are contributed by the emergency generators, EU7 and EU8, and miscellaneous natural gas usage, EU9.

Emissions from glass furnaces have been controlled using the following control technologies:

- Low-NO_x Burners
- *3R Process*
- Oxy-Fuel
- Selective Catalytic Reduction (SCR)

NO_x emissions are currently controlled by the use of the *3R Process* which creates a reducing combustion atmosphere in the furnace heat recovery refractory. The existing emission limitations are 7.0 lbs/ton during normal operation and 13.3 lbs/ton during annual furnace maintenance. These were determined to represent BACT under the major source PSD regulations when the Winlock plant was originally approved in 2004.

The existing EU7 generator and proposed EU8 generator are designed to comply with their applicable NESHAP requirements for non-road engines. Available add-on control equipment for the engines is the use of SCR. The existing generator is currently equipped with an SCR system. This was required to address predicted impacts on regional visibility at nearby Class I areas assuming the generator operated 8,760 hours per year. With this project it is requested that the requirement to operate the SCR system be removed since it is no longer necessary. The generator will be limited to 50 hours per year for maintenance and testing operation.

The miscellaneous natural gas usage designated EU9 consists of numerous existing small space heating equipment and supplementary furnace burners. The small size of these burners precludes the use of add-on control equipment.

2. Eliminate Technically Infeasible Options

All control options for the glass furnace are technically feasible except for oxy-fuel. The existing glass furnace is a regenerative excess air type. An oxy-fuel design would require replacing the furnace which is not considered economically feasible for this project.

Compliance with the NESHAPS and use of SCR to control emissions from the emergency generators have been shown to be technically feasible.

3. Rank Remaining Control Technologies by Control Effectiveness

Based on glass furnace emissions limitations established in prior air permits, the remaining control methods and their anticipated emissions for the glass furnace in order of effectiveness are as follows:

- Low-NO_x Burners – 13.3 lbs/ton
- *3R Process* – 7 lbs/ton
- SCR – 2 lbs/ton

For the emergency generators, the SCR control system is the most effective control option.

4. Evaluate Most Effective Controls and Document Results

The glass furnace already incorporates low-NO_x burner design to minimize combustion air leakage which contributes to the formation of NO_x.

The existing furnace currently uses the *3R Process*. This control method uses excess natural gas to create oxygen-starved reducing zones in the furnace or heat recovery regenerators to reduce NO_x emissions. Prior to the availability of add-on emission control equipment such as SCR, this option was considered BACT for glass furnaces. However, the reducing conditions used by the *3R Process* causes accelerated damage to the furnace and heat recovery regenerator refractory.

Since the original approval of the Winlock plant, SCR has been demonstrated to be technically feasible on flat glass furnaces. For SCR, ammonia or a similar reagent is injected into a high temperature catalyst to reduce NO_x to N. This option includes the traditional SCR equipment which only reduces NO_x, and newer ceramic catalytic filters which simultaneously reduce NO_x and capture PM. Both the traditional SCR equipment and filters are expected to provide similar performance.

The Cardinal FG plants in Oklahoma and Mooresville were originally approved without the use of add-on control equipment. For this reason, a new dry injection – ceramic catalytic filter control system could be installed to simultaneously reduce emissions of PM, SO_2 and NO_x below the major source thresholds.

The Cardinal FG plants in Portage and Menomonie, Wisconsin were originally approved with a spray drier – ESP control system for PM and SO_2 emissions. Rather than replace the existing control system, a new SCR stage was added after the ESP to control NO_x emissions.

For this project, it is proposed that a new SCR system also be installed at the Winlock plant after the existing spray drier – ESP control system.

The existing and new generator are designed to comply with the Tier 1 and Tier 2 NESHAPS requirements and emission limitations. The existing generator is equipped with an SCR control system, but it is concluded that SCR does not represent BACT. It is not a cost-effective control option due to the relatively high capital and operating cost, and small amount of NO_x emissions.

5. Select BACT

As BACT for the glass furnace (EU1), it is proposed that a new SCR control system be installed for NO_x. The current emission limitation for normal operations based on 7 lbs/ton will be reduced to 1.63 lbs/ton in order to reduce facility wide emission below the major source threshold of 250 tons per year. During normal operations, NO_x emissions will be 50.9 lbs/hr.

Consistent with current practice it is proposed there be 5 days or 120 hours each year for shutdown and maintenance of the SCR. It is requested that the hours of shutdown for the SCR, spray drier and ESP be recorded separately. There may be periods when the SCR system must be by-passed for maintenance but the spray drier and ESP may continue to operate. Uncontrolled emissions during the air pollution control equipment shut down for maintenance are 13.3 lbs/ton.

Uncontrolled emissions during control equipment maintenance will increase proportionally from 360.2 to 415.6 lbs/hr.

Total furnace emissions during normal and maintenance operation will be reduced to 245 tpy. It is proposed that the furnace emission limitation for NO_x be established in the form of a total NO_x limitation of 245 tpy. Compliance would be demonstrated using the existing CEM. This form of the limitation is identical to that established for the Cardinal FG plant in Portage, Wisconsin, and that proposed for the plant in Menomonie, Wisconsin.

The emergency generators are anticipated to operate very few hours. During the 2016-18 period, the existing generator operating 23.2 total hours for both testing and emergency usage. For this project, it is proposed that operation be limited to 50 hours per year. Using an add-on control system such as SCR would not be cost effective due to the relatively low emissions that would be controlled.

For example, the original capital cost for the current SCR system was $113,894 in 2003. Adjusted for inflation, the 2019 value would be $158,590.[2] Assuming 7% interest and a 20-year life, the annualized cost would be $14,999 per year. This does not include installation and operating costs. Based on full capacity operation for 50 hours, NO_x emissions from the existing generator would be 1.04 tpy. Assuming the SCR system provides an 80% reduction in NO_x emissions, the cost effectiveness of the SCR system is $18,071 per ton of NO_x removed. This is above the threshold considered reasonable for BACT.

The existing and new generator are subject to the Tier 1 and Tier 2 NESHAP, respectively, which limits NO_x emissions to 9.2 and 6.4 gm/kwh. The Tier 1 limit includes VOC emissions as well. Actual emissions based on the generator specifications are 9.5 and 9.0 gm/kwh. These are the potential not to exceed values from the specifications so may not reflect conditions required for the NESHAP compliance test. As agreed during discussions with SWCAA staff for the existing generator, EU7, the NESHAP limit of 9.2 gm/kwh was used for the modeling analysis to avoid using an excessively conservative emission rate. The actual rate of 9.0 gm/kwh was used for the new generator, EU8. It is proposed that these modeled emission rates become the emission limitations. This is verified by the generator specifications.

As BACT for the miscellaneous natural gas usage, EU9, it is proposed that NO_x emissions be based on their uncontrolled emission factor of 100 lbs/cf6.

[2] https://www.usinflationcalculator.com/

6. Compliance Demonstration

It is proposed that the CEM for NO_x continue to be used to verify compliance with the emission limitations. However, it is proposed that the limitation become an annual average of 245 tpy. This will include emissions during both normal and maintenance operating modes.

BACT Analysis for Carbon Monoxide (CO)

1. Identify All Control Technologies

CO sources subject to the state-only BACT requirement include the EU1 – Glass Furnace. Minor emissions are contributed by the emergency generators, EU7 and EU8, and miscellaneous natural gas usage, EU9.

CO emissions from the glass furnace can be controlled or affected by the following methods:

- Reducing Furnace with the *3R Process*
- Oxidizing Furnace
- Add-on Incineration

CO emissions are currently controlled or affected by the use of the *3R Process* which creates a reducing combustion atmosphere in the furnace heat recovery refractory. This is a NO_x control method that also generates more combustion by-products like CO and VOC. Current CO emissions are limited to a relatively high emission rate of 16.0 lbs/ton on a 1-hour average basis.

With the installation of the SCR system to control NO_x emissions, the furnace will be operated in a more common oxidizing mode. CO emissions will be reduced from 16 to 1.8 lbs/ton. With this project, emissions will be 56.3 lbs/hr or approximately 1.8 lbs/ton during both normal operation and maintenance of the air pollution control equipment. Compliance tests at the Winlock plant on March 13, 2007 while using the *3R Process* measured emissions of 5.65 lbs/ton and 141.3 lbs/hr. However, the ability to operate the glass furnace in oxidizing mode will significantly reduce CO emissions as has been shown at other Cardinal plants.

Incineration is an add-on control method typically use to combust and control high concentrations of CO emissions. Based on the proposed glass furnace emission rate of 56.3 lbs/hr and the exhaust flow rate of 176,000 acfm at 608 F, the outlet CO concentration will be 177 ppm. As shown by stack tests at other plants, the actual concentration will be much lower. The 177 ppm concentration is lower than other processes which use incineration to control their CO emissions such as an iron melting cupola with uncontrolled CO emissions exceeding 150,000 ppm.

The emergency generators, EU7 and EU8, are designed to comply with their applicable NESHAP

requirements for non-road engines. PM, CO and VOC emissions from diesel engines can be reduced by the use of add-on Diesel Oxidation Catalysts or DOC. USEPA has verified reductions of PM by 20 to 40%, CO by 10 to 60%, and VOC by 40 to 75%.

The miscellaneous natural gas usage consists of numerous small space heating equipment and supplementary furnace burners. The small size of these burners precludes the use of add-on control equipment.

2. Eliminate Technically Infeasible Options

Operating a furnace in a reducing or oxidizing mode is technically feasible. No glass furnace has been equipped with an add-on incineration system and uncontrolled emissions are below concentrations which are typically controlled. It is concluded that add-on incinerator is a not a technically feasible control option.

The use of DOC to control emissions from the engines is feasible.

3. Rank Remaining Control Technologies by Control Effectiveness

Based on emissions limitations established in prior air permits, the remaining control methods and their anticipated emissions for the glass furnace in order of effectiveness are as follows:

- Reducing Furnace with the *3R Process* – 16.0 lbs/ton
- Oxidizing Furnace – 1.8 lbs/ton

For the emergency generators, the DOC control system is the most effective control option, followed by compliance with the NESHAP requirements.

4. Evaluate Most Effective Controls and Document Results

The existing furnace currently uses the *3R Process*. For this project, an add-on SCR control system will be used to control NO_x emissions so the furnace so it can now operate in an oxidizing mode which will significantly reduce its CO emissions.

For the emergency generators, the DOC control system is the most effective control option.

5. Select BACT

As BACT, it is proposed that the furnace (EU01) operate in an oxidizing mode. This will reduce the emissions from 16.0 to 1.8 lbs/ton. This rate is also necessary to reduce facility wide emission below the major source threshold of 250 tons per year. During normal operation and during annual shutdown of the air pollution control equipment for maintenance, maximum CO emissions will be 56.3 lbs/hr.

The emergency generators, EU7 and EU8, are anticipated to operate very few hours. During the 2016-18 period, the existing generator operating 23.2 total hours for both testing and emergency usage. For this project, it is proposed that operation be limited to 50 hours per year. Using an add-on control system such as DOC would not be cost effective due to the relatively low emissions that would be controlled. The existing and new generator are subject to the Tier 1 and Tier 2 NESHAP, respectively, which limits CO emissions to 11.4 and 3.5 gm/kwh. Actual emissions based on the generator specifications are 0.9 and 0.3 gm/kwh. Since the actual emission rates were used to assure facility emissions remain below 250 tpy, it is proposed that the actual emission rates become the emission limitations. This is verified by the generator specifications.

As BACT for the miscellaneous natural gas usage, EU9, it is proposed that CO emissions be based on their uncontrolled emission factors of 84 lbs/cf6.

6. Compliance Demonstration

With the removal of the *3R Process* for NO_x control, the glass furnace will now operate in an oxidizing mode, significant reducing CO emissions to remain below the major source threshold of 250 tpy. It is proposed that use of the existing CEM is no longer necessary to demonstrate compliance. Instead, compliance will be determined by an initial stack test and monitoring furnace combustion conditions to assure oxidizing conditions. Similar compliance methods are used for the other four Cardinal plants.

BACT Analysis for Volatile Organic Compounds (VOC)

1. Identify All Control Technologies

VOC sources subject to the state-only BACT requirement are similar to CO sources and include the EU1 – Glass Furnace with minor emissions contributed by the emergency generators, EU7 and EU8, and miscellaneous natural gas usage, EU9.

VOC emissions from the glass furnace can be controlled or affected by the following methods:

- Reducing Furnace with the *3R Process*
- Oxidizing Furnace
- Add-on Incineration

VOC emissions are currently controlled or affected by the use of the *3R Process* which creates a reducing combustion atmosphere in the furnace heat recovery refractory. This is a NO_x control method that also generates more combustion by-products like CO and VOC. Current VOC emissions are limited to 0.1 lbs/ton on a 1-hour average basis.

With the installation of the SCR system to control NO_x emissions, the furnace will be operated in a more common oxidizing mode. VOC emissions are expected to be reduced. Since VOC emission from glass furnaces is a relatively insignificant air pollutant, there has been little compliance testing to clarify the difference between furnaces with and without the *3R Process*. For this reason, no change in the current 0.1 lbs/ton emission factor is proposed. However, due to the increase in glass production capacity, emissions will increase to 3.125 lbs/hr. during both normal operation and maintenance of the air pollution control equipment. Compliance tests at the Winlock plant on March 13, 2007 while using the *3R Process* measured emissions of 0.3 ppm (wet), 0.12 lbs/hr and 0.004 lbs/ton, as propane.

Incineration is an add-on control method typically use to combust and control high concentrations of VOC emissions. Based on the proposed glass furnace emission rate of 3.125 lbs/hr and the exhaust flow rate of 176,000 acfm at 608 ºF, the outlet VOC concentration will be 15 ppm, though the 2017 test at Winlock shows a lower concentration. The 15 ppm concentration is lower than processes which actually use incineration to control their VOC emissions such as an printing press with uncontrolled VOC emissions exceeding 1,000 ppm.

The emergency generators, EU7 and EU8, are designed to comply with their applicable NESHAP requirements for non-road engines. PM, CO and VOC emissions from diesel engines can be reduced by the use of add-on Diesel Oxidation Catalysts or DOC. USEPA has verified reductions of PM by 20 to 40%, CO by 10 to 60%, and VOC by 40 to 75%.

The miscellaneous natural gas usage consists of numerous small space heating equipment and supplementary furnace burners. The small size of these burners precludes the use of add-on control equipment.

2. Eliminate Technically Infeasible Options

Operating a furnace in a reducing or oxidizing mode is technically feasible.

No glass furnace has been equipped with an add-on incineration system and uncontrolled emissions are below concentrations which are typically controlled. It is concluded that add-on incinerator is a not a technically feasible control option.

The use of DOC to control emissions from the engines is feasible.

3. Rank Remaining Control Technologies by Control Effectiveness

Based on emissions limitations established in prior air permits, the remaining control methods of the *3R Process* and oxidizing furnace have similar emission factors, though emissions from the oxidizing furnace are expected to be lower.

For the emergency generators, the DOC control system is the most effective control option,

followed by compliance with the NESHAP requirements.

4. Evaluate Most Effective Controls and Document Results

The existing furnace currently uses the *3R Process*. For this project, an add-on SCR control system will be used to control NO_x emissions so the furnace so it can now operate in an oxidizing mode which will reduce its actual VOC emissions.

For the emergency generators, the DOC control system is the most effective control option.

5. Select BACT

As BACT, it is proposed that the furnace (EU01) operate in an oxidizing mode. This will reduce the emissions but the emission factor of 0.1 lbs/ton will continue to be used. This rate is also necessary to reduce facility wide emission below the major source threshold of 250 tons per year. During normal operation and during annual shutdown of the air pollution control equipment for maintenance, maximum VOC emissions will be 3.125 lbs/hr. Compliance would be demonstrated by a periodic stack test.

The emergency generators, EU7 and EU8, are anticipated to operate very few hours. During the 2016-18 period, the existing generator operating 23.2 total hours for both testing and emergency usage. For this project, it is proposed that operation be limited to 50 hours per year. Using an add-on control system such as DOC would not be cost effective due to the relatively low emissions that would be controlled. The existing and new generator are subject to the Tier 1 and Tier 2 NESHAP, respectively. These rules have no VOC limit for Tier 1, but sets a combined NO_x/VOC limit of 6.4 gm/kwh for Tier 2 engines. Actual emissions based on the generator specifications are 0.25 and 0.15 gm/kwh. Since the actual emission rates were used to assure facility emissions remain below 250 tpy, it is proposed that the actual emission rates become the emission limitations. This is verified by the generator specifications.

As BACT for the miscellaneous natural gas usage, EU9, it is proposed that VOC emissions be based on their uncontrolled emission factors of 5.5 lbs/cf6.

6. Compliance Demonstration

The current operation permit requires an annual compliance test for VOC emissions from the glass furnace. Historical stack tests have demonstrated compliance with the emission limitation. It is proposed that an initial compliance test be conducted to verify compliance with the new emission limitation. However, recurring stack tests are not needed.

BACT for Visible Emissions

Typically, any source of SO_2 and $PM/PM_{10}/PM_{2.5}$ emissions is also subject to a BACT requirement for visible emissions. Sources include the EU1 – Glass Furnace are subject to the state-only BACT requirement. Minor PM and SO_2 emissions are contributed by the emergency generators, EU7 and EU8, and miscellaneous natural gas usage, EU9.

1. Identify All Control Technologies

The control technologies listed in the BACT analysis for SO_2 and $PM/PM_{10}/PM_{2.5}$ emissions above are also applicable control technologies for reducing visible emissions.

2. Through 4.

Steps 2 through 4 of the BACT analysis for SO_2 and $PM/PM_{10}/PM_{2.5}$ emissions addressed above serve as the analysis for Steps 2 through 4 for visible emissions.

5. Select BACT

The current BACT limit for the glass furnace is 10% opacity. Visible emissions from the glass furnace are mainly due to the existence of PM emissions and the secondary formation of sulfate compounds from the SO_2 emissions. Controlling the PM and SO_2 emissions with BACT will result in BACT for visible emissions as well.

A prior compliance test for visible emissions at the Cardinal FG plant in Portage, Wisconsin included 72 emission readings. The majority of readings being 0% opacity and 8 percent of the readings being 5% opacity. Prior compliance tests for visible emissions on the uncontrolled glass furnace at the North Carolina plant found that average visible emissions were 7% opacity in 2010 and 10% opacity in 2002.

It is proposed that BACT for visible emissions should remain at 10% opacity averaged over each 6-minute period during all periods of operation other than routine maintenance of add-on controls. During periods of routine maintenance of add-on controls when they are bypassed, the limit should be 20% opacity averaged over each 6-minute period.

6. Compliance Demonstration

The current operation permit requires monthly visible emission readings of the glass furnace stack. No change to this compliance method is proposed.

AIR QUALITY IMPACT ANALYSIS

Introduction

When the original major source PSD permit was issued in 2004, modeling analyses were conducted to verify compliance with air quality standards for criteria air pollutants, toxic air pollutants, and impacts on Class I Areas. The modeling analysis has been updated for this project. The air quality modeling requirements were initially discussed with SWCAA and DOE staff. A modeling protocol was provided to the agencies on August 1st and reviewed during a pre-application conference call on August 6th.

For this project, the capacity will increase from 650 to 750 tons per day. A selective catalytic reduction (SCR) control system will be installed to control NO_x emissions. After this project, all air pollutants will be limited on an annual basis to less than the major source threshold of 250 tons per year. Separate emission limitations will be established for normal operations and annual shutdown of the air pollution control equipment for maintenance for a maximum of five days.

The proposed emission changes and modeling procedures are as follows:

Particulate Matter (PM_{10} and $PM_{2.5}$)

For normal operations, the current glass furnace emission limitation of 25.5 lbs/hr will increase to 29.4 lbs/hr so there will be a 3.9 lbs/hr increase in emissions. This increase was modeled with the 0.05 lbs/hr from the new emergency generator. The predicted impacts are compared with the Significant Impact Levels (SIL). If any SIL is exceeded, further modeling is conducted to verify compliance with the National Ambient Air Quality Standards (NAAQS).

For maintenance operations, the emission limitations and stack parameters will be the same as normal operations so a separate analysis is not required.

The modeling results presented in Appendix E show impacts are below the SIL for PM_{10} and $PM_{2.5}$ so no further modeling analysis to verify compliance with air quality standards was necessary.

Sulfur Dioxide (SO_2)

For normal operations, the current glass furnace emission limitation of 16.3 lbs/hr will change to 25.0 lbs/hr so there will be an 8.7 lbs/hr increase in emissions. This increase was modeled with the 0.02 lbs/hr from the new emergency generator, and the 1.01 lbs/hr emissions decrease from the existing generator due to the reduction in diesel fuel sulfur content from 0.05% to 15 ppm. The predicted impacts are compared with the SIL. If any SIL is exceeded, further modeling is conducted to verify compliance with the NAAQS.

For maintenance operations, the uncontrolled glass furnace emissions will increase from 89.9 to 103.8 lbs/hr so there will be a 13.9 lbs/hr increase in emissions. This increase was modeled with the 0.02 lbs/hr from the new emergency generator, and the 1.01 lbs/hr emissions decrease from the existing generator. The predicted impacts are compared with the SIL. If any SIL is exceeded, further modeling will be conducted to verify compliance with the NAAQS.

The modeling results presented in Appendix E show that only the 1-hour average SIL for SO_2 was exceeded for uncontrolled emissions during glass furnace maintenance. Proposed controlled and uncontrolled allowable emissions rates for all facility operations were then modeled. The results show compliance with the 1-hour average NAAQS for SO_2. No special operating conditions were required.

Nitrogen Oxides (NO_x)

For normal operations, the current glass furnace emission limitation will be reduced from 189.6 to 50.9 lbs/hr so there will be a 138.7 lbs/hr decrease in emissions. There would be a new 24.9 lbs/hr from the new emergency generator, and a 37.54 lbs/hr increase from the existing generator due to the removal of its current SCR control system.

For maintenance operations, the uncontrolled glass furnace emissions from the glass furnace will increase from 360.2 to 415.6 lbs/hr so there will be a 55.45 lbs/hr increase in emissions. There would be a new 24.9 lbs/hr from the new emergency generator, and a 37.54 lbs/hr increase from the existing generator due to the removal of its current SCR control system.

For NO_x emissions, it was assumed that the 1-hour and annual average SIL for NO_x would be exceeded, so a modeling analysis was immediately conducted to verify compliance with the NAAQS. Proposed controlled and uncontrolled allowable emission rates for all facility operations were modeled. The results presented in Appendix E show compliance with the 1-hour and annual average NAAQS for NO_x.

To assure compliance with the NAAQS, several special operating conditions were required:

1. During normal operation of the glass furnace, only one generator is tested at a given time.
2. During maintenance operation of the glass furnace when the air pollution control equipment is shutdown, no generator is tested.
3. Maintenance operation of the glass furnace will only occur during the months from May to October.

Carbon Monoxide (CO)

For normal operations, the current glass furnace emission limitation will be reduced from 176.0 to 56.3 lbs/hr so there will be a 115.7 lbs/hr decrease in emissions. This decrease was modeled with the 4.15 lbs/hr from the new emergency generator. The predicted impacts were compared

with the SIL. If any SIL is exceeded, further modeling is conducted to verify compliance with the NAAQS.

For maintenance, the emission limitations and stack parameters will be the same as normal operations so a separate analysis was not required.

The modeling results presented in Appendix E show impacts are below the 1-hour and 8-hour average SIL for CO so no further modeling analysis to verify compliance with air quality standards was necessary.

Lead (Pb)

For normal operations, the current glass furnace emission limitation of 0.014 lbs/hr will increase to 0.016 lbs/hr so there will be a 0.002 lbs/hr increase in emissions. This increase was modeled for comparison with the SIL. If the SIL is exceeded, further modeling is conducted to verify compliance with the NAAQS. Pb emissions from the generator are insignificant.

For maintenance, the emission limitations and stack parameters will be the same as normal operations so a separate analysis is not required.

The modeling results presented in Appendix E show impacts are well below the 3-month average SIL for Pb (i.e. 0.03%) so no further modeling analysis to verify compliance with the air quality standards was necessary.

Toxic Air Pollutants (TAP)

The increase in TAP due to this project are compared with the Small Quantity Emission Rates (SQER) under Section 173-460-070 WAC and SWCAA rules. If the SQER is exceeded, a modeling analysis is needed to verify compliance with the applicable Acceptable Source Impact Level (ASIL). For listed TAP with no SQER, a modeling analysis is required. Based on emission estimates, the following TAP will be included in the modeling analysis: Benz(a)anthracene, Beryllium, Cadmium, Formaldehyde, Nickel and Total PAH. Refer to the HAP emission calculations in Appendix D for the comparison with the SQER.

For maintenance, the TAP emission limitations and stack parameters will be the same as normal operations so a separate analysis is not required.

The modeling results presented in Appendix E show that each TAP is well below its respective 24-hour and annual average ASIL.

Fluorides

In addition to the ASIL, there are Ambient Air Quality and Environmental Standards (AAQES) for fluorides under WAC 173-481-110. These standards were established to protect livestock and vegetation. Since there will be no change in the current fluoride emission limitations, no modeling analysis is needed.

Class I Area Impact Analysis

The original major source PSD permit issued to the Cardinal FG Winlock plant required an evaluation of impacts on nearby Class I Areas. The closest area is Mount Rainier National Park which is 80 km from the plant. The plant will become a synthetic minor source and is no longer subject to the PSD permit requirements. However, DOE has requested an updated evaluation of impacts on Class I areas using either a semi- quantitative assessment or long-range modeling using CALPUFF.

Due to the large reduction in annual emissions, installation of the new SCR control system for NO_x and classification of the facility as a minor source, it is preferable to use a semi-qualitative assessment rather than pursue the time and cost of a new CALPUFF modeling analysis.

Air Quality Standards

Table 8 summarizes the current SIL, PSD increments and NAAQS for each air pollutant to be modeled.

Table 8 - Air Quality Standards

Air Pollutant	Averaging Period	SIL Statistic	Class II Area SIL	Class II Area Increment	NAAQS
PM_{10}	24-hour	1st Highest	5	30	150
	Annual	1st Highest	1	17	-
$PM_{2.5}$	24-hour	5-Yr Avg 1st High Day	1.2	9.0	35
	Annual	5-Yr Avg	0.3	4.0	12.0
SO_2	1-hour	5-Yr Avg 1st High Hr Day	7.8	-	196
	3-hour	1st Highest	25	512	1,300
	24-hour	1st Highest	5	91	-
	Annual	1st Highest	1	20	-
NO_x	1-hour	5-Yr Avg 1st High Hr Day	7.5	-	188
	Annual	1st Highest	1.0	25	100
CO	1-hour	1st Highest	2,000	-	40,000
	8-hour	1st Highest	500	-	10,000
Pb	3-month	1st Highest	-	-	0.15

Dispersion Models

All modeling was conducted using the latest versions of the AERMOD modeling system including AERMET, AERMAP, AERSURFACE, AERMINUTE and BPIPPRIME. The AERMOD model (v. 18081) was run with the regulatory default options selected.

Coordinate System

The Universal Transverse Mercator (UTM) NAD83 coordinate system was used for identifying the easting (x) and northing (y) coordinates of the modeled sources and receptors. The UTM zone is 10. The glass furnace stack S01 is located at North Latitude 46.541°, West Longitude 122.925°.

Elevations

Elevations of receptors were obtained from National Elevation Dataset (NED) GeoTiff data available from the USGS National Map Seamless Server. Elevations were extracted from 1 arc-second (30 meter) resolution NED files using USEPA's AERMAP program, v. 18081.

Receptors

While the plant property is large, it is not fenced to preclude public access. For this reason, modeling receptors are typically placed on the property. Since the plant property is large, located in a rural area, and measures are taken to preclude public access, SWCAA and DOE agreed to the start of receptor placement on the edge of the property boundary. At the plant there is a continual presence of facility personnel and a site policy prohibiting unescorted visitors.

Along the property boundary, 12.5-meter spaced receptors were used. Beginning at the property boundary, the receptor grid spacing follows DOE recommendations in its First, Second, and Third Tier Review of Toxic Air Pollution Sources. This spacing is summarized in Table 9.

Table 9 - Modeling Receptor Spacing

Distance from Source (meters)	Grid Spacing (meters)
0 – 150	12.5
150 – 400	25
400 – 900	50
900 – 2,000	100
2,000 – 4,500	300
10,000	600

Stack Parameters

Air quality impacts are predicted for both the normal and maintenance modes to verify compliance with air quality standards. During maintenance mode, the air pollution control equipment of the glass furnace is shut down for repairs for a maximum of five days per year. Due to the high temperature needed to operate the new SCR control system for NO_x, the stack parameters including flow rate and temperature during normal operation and the maintenance shutdown are similar.

Table 10 summarizes the stack parameters and emissions during normal operations. Table 11 summarizes the stack parameters and emissions during maintenance. The difference between current and proposed emission limitations was used for the modeling analysis to determine if the predicted impact exceeds the SIL for air pollutant.

Load Analysis

The glass furnace is capable of operating at less than 100% load. To assure air quality impacts are estimated for multiple loads and their associated stack parameters, modeling scenarios include furnace operation at 100%, 75% and 50% load. The exhaust flow rate and emissions are adjusted proportionally for the lower loads. Typically, the 100% load is predicted to have the highest impact. The non-furnace plant operations always have the same stack parameters and emissions regardless of process load.

The stack parameters and emissions presented in Tables 10 and 11 include those for the glass furnace at 100%, 75% and 50% load.

Consideration of Downwash

The dimensions of all buildings and structures at the plant are updated for the analysis. These are used to evaluate downwash effects using the BPIPPRIME model. Buildings of multiple heights were entered first using the height of the lowest building as Tier 1 and taller sections of building were entered as additional tiers.

Supporting Figures

Figure 2 shows the entire modeling domain and receptor locations.

Figure 3 provides an outline of the facility and 50-meter, 25-meter and 12.5-meter receptor grids.

Figure 4 shows the facility building and stack locations.

Meteorological Data

DOE has requested that the modeling analysis be conducted with three sets of meteorological data:

1. Chehalis-Centralia Airport (KCLS) AWOS weather station which has no one-minute wind data.

2. Olympia Regional Airport (KOLM) ASOS weather station supplemented with one-minute wind data to reduce the number of calm hours.
3. Olympia Regional Airport (KOLM) ASOS weather station not supplemented with one-minute wind data.

The AWOS airport station at Chehalis is approximately 9.9 miles or 15.9 km from the main stack at the plant. However, there is a significant amount of calms and missing data (i.e. 54%). The alternative ASOS airport station at Olympia has one-minute wind data available to replace calms.

The modeling analysis would be run three times. First with Chehalis weather (A), second with Olympia weather supplemented with one-minute data (B), and third with Olympia weather without one-minute data (C). The final modeling result for comparison with the SIL and NAAQS would be based on the following formula:

Final Modeling Result = A x B/C

DOE has proposed that the B/C ratio can be based on either the spatially varying nature of the scaling factor or the domain-wide maximum value. For the enclosed modeling analysis, the domain-wide maximum values from the Olympia-based modeling results were used to adjust the Chehalis-based modeling results.

The surface weather measurements would be obtained from the NCDC for the most current five-year period, 2014-18.[3]

Concurrent upper air data are obtained for the nearest and most representative station in Salem, Oregon from the NOAA/ESRL Radiosonde Database.[4]

The weather data were processed using the latest version of AERMET.

DOE has specified that the weather be processed using the current regulatory approved version of AERSURFACE (v. 13016) and the NLCD 1992 dataset.[5] The weather is processed using 12 sectors. The sites are designated as Airports. Based on a review of climate data, annual precipitation is assumed to be "Average" for all five years and there are no months with continuous snow cover.

Rural and Urban Dispersion Coefficients

Prior modeling analyses for the Winlock site have used rural rather than urban dispersion

[3] ftp://ftp.ncdc.noaa.gov/pub/data/noaa/
[4] https://ruc.noaa.gov/raobs/
[5] Email, T. Ghidey – DOE to S. Klafka – Wingra, Cardinal FG - Winlock - Pre-Application Plan for SCR Project, July 9, 2019.

coefficients. Rural coefficients were used for this analysis.

NO_2/NO_x Modeling Procedures

Air quality standards have been established for NO_2. However, emissions are released in various forms of nitrogen or NO_x. Tier I modeling procedures assume all NO_x emissions are released as NO_2. Tier II uses the ambient ratio method (ARM). For this project, the ARM2 procedure will be used. This assumes a minimum NO_2/NO_x Ratio of 0.500 (50%) and maximum NO_2/NO_x Ratio of 0.900 (90%).

Background Concentrations

Representative background concentrations for the area were provided by the DOE staff. [6] Model and monitoring data from July 2014 through June 2017 were used to estimate background concentrations of criteria air pollutant design values for use in air permit engineering. The on-line tool allows retrieval of the estimated design values in Washington, Idaho, and Oregon.

Emergency Generator Evaluation

DOE has requested that emergency generators be included the modeling analysis. They were modeled using the maximum hourly emission rates and assuming operation 8,760 hour per year. Historically, the current generator actually operated during the 2016 to 2018 period for 6.4 hours of testing and 17.3 hours of emergency use.

Assuming the generators operate are full capacity the entire year is very conservative. It was determined that three conditions are necessary to assure compliance with the 1-hour NAAQS for NO_x:

1. During normal operation of the glass furnace, only one generator is tested at a given time.
2. During maintenance operation of the glass furnace when the air pollution control equipment is shutdown, no generator is tested.
3. Maintenance operation of the glass furnace will only occur during the months from May to October.

[6] https://idahodeq.maps.arcgis.com/apps/MapSeries/index.html?appid=0c8a006e11fe4ec5939804b873098dfe.

Class I Area Impact Analysis

Introduction

The original major source PSD permit issued to the Cardinal FG Winlock plant required an evaluation of impacts on nearby Class I Areas. The closest area is Mount Rainier National Park which is 80 km from the plant. With this project, there will be significant reductions in annual emissions so that the plant will cease to be a major PSD source and will become a synthetic minor source. There will be an increase in short-term emissions during air pollution control equipment maintenance. For this reason, DOE has requested an evaluation of impacts on Class I Areas using either a semi- quantitative assessment or long-range modeling using CALPUFF.

Due to the large reduction in annual emissions, installation of the new SCR control system for NO_x, and classification of the facility as a minor source, it is preferable to use a semi-qualitative assessment rather than pursue the time and cost of a new CALPUFF modeling analysis. The semi-quantitative assessment will compare the change in hourly and annual emissions due to this project, and the change in hours of the year when uncontrolled conditions may occur. The anticipated assessment is provided below for consideration by SWCAA and DOE.

Emissions During Normal Operations

Currently PM and SO_2 emissions are controlled with the spray drier-ESP control system. These will increase due to the increase in production capacity. NO_x emissions are currently controlled using the *3R Process*. This control method will be replaced with an SCR control system. This will be reduced controlled NO_x emissions from 7.0 lbs/ton to 1.63 lbs/ton.

Effect on Short-Term Emissions

During normal operations, controlled hourly emissions of PM and SO_2 during normal operations will increase due to the increase in production capacity from 650 to 750 tpd. NO_x emissions, however, will be reduced 73% from 189.6 to 50.9 lbs/hr due to the installation of the new SCR control system. Total hourly emissions of PM, SO_2 and NO_x during normal production will be reduced 55% from 231.3 to 105.3 lbs/hr.

Effect on Long-term Emissions

Considering the installation of the new SCR control system for NO_x, increase in production capacity and reduction in the number of days of uncontrolled emissions during maintenance, combined emissions of PM, SO_2 and NO_x will be reduced 55% from 1,074.3 to 487.8 tpy.

Emissions During Maintenance

The current permit allows uncontrolled emissions during two periods: 1) shutdown of the air pollution control (APC) equipment for maintenance, and 2) glass furnace maintenance using burnout.

The permit currently allows five days of APC maintenance each year. During these five days, emissions of PM and SO_2 are uncontrolled, but NO_x emissions continue to be controlled. With this project, there will be a new SCR control system for NO_x emissions. During the five days of maintenance, PM, SO_2 and NO_x emissions will be uncontrolled.

The permit currently allows 28 days per year for furnace maintenance using burnout. During this period, emissions of NO_x are uncontrolled, but PM and SO_2 emissions continue to be controlled. The current permit requires that burnout maintenance of the glass furnace be conducted: 1) no more than twice in any twelve consecutive months, 2) each burnout maintenance shall not exceed fourteen days in length, and 3) burnout maintenance shall be conducted only during the months of January, February, March, or September. With this project, NO_x emissions during the 28 days of burnout will now be controlled with the new SCR control system.

Effect on Short-term Emissions

During the five days of APC maintenance, uncontrolled PM and SO_2 will increase 15% due to the 15% increase in production capacity from 650 to 750 tpd, increasing from 115.4 lbs/hr to 132.7 lbs/hr. NO_x emissions will increase both due to the increase capacity and the removal of the *3R Process* which currently controls NO_x, increasing from 189.6 lbs/hr to 415.6 lbs/hr. Total hourly emissions of PM, SO_2 and NO_x during the five days of APC maintenance will increase from 305.0 to 548.3 lbs/hr.

During 28 days of furnace maintenance, controlled PM and SO_2 and uncontrolled NO_x emissions are currently 401.9 lbs/hr. After this project, emissions of PM, SO_2 and NO_x will be controlled during furnace maintenance and will be reduced to 105.3 lbs/hr.

Effect on Long-term Emissions

Annual emissions during the current 33 days of maintenance are as follows:

APC Maintenance = (25.5 lbs/hr PM + 89.9 lbs/hr SO_2) x 5 days x 24 hours = 6.9 tpy

Furnace Maintenance = 360.2 lbs/hr NO_x x 28 days x 24 hours = 121.0 tpy

Total APC and Furnace Maintenance = 6.9 + 121.0 = 127.9 tpy

Annual emissions during the proposed 5 days of maintenance are as follows:

APC Maintenance
= (29.4 lbs/hr PM + 103.8 lbs/hr SO_2 + 415.6 lbs/hr NO_x) x 5 days x 24 hours = 32.9 tpy

With this project, emissions during APC and furnace maintenance will be reduced 74% from 127.9 to 32.9 tpy.

Regional Haze Evaluation

Cardinal FG received a May 31, 2019 letter from DOE explaining the results of the initial Regional Haze RACT/4-Factor Analysis. Since the Q/D Ratio was over 10, DOE has determined that the Cardinal plant should be evaluated to determine if additional control or lower emissions standards are appropriate to reduce air quality impacts due to regional haze.

The initial screening by DOE based on 2014 actual emissions produced the following results:

D = 80.08 km to nearest Class I Area (Mount Rainier National Park)
Q = 859.82 tpy (total NO_x, PM2.5, SO_2 and H2SO4)
Q/D = 859.82/80.82 = 10.74

Based on the proposed potential or allowable emissions after the SCR Project, the screening analysis is updated as follows:

D = 80.08 km to nearest Class I Area (Mount Rainier National Park)
Q = 513.2 tpy (total NOx, PM2.5, SO2 and H2SO4)
Q/D = 513.2/80.82 = 6.3

After this project, the Q/D Ratio will be reduced to 6.3 which is much less than the 10 threshold. Since this new ratio is based on potential or allowable emissions, the actual ratio will be lower.

Dispersion Modeling Results

Results for the modeling analysis are provided in Appendix E.

Supporting Files

All modeling software input and output files will be submitted with the application to verify the accuracy of the modeling analysis.

Table 10 - Stack Parameters and Emissions for Normal Operations

Stack ID			S01 (100%)	S01 (75%)	S01 (50%)	S03	S04	S05	S06	S07	S08
Process			Furnace	Furnace	Furnace	Cullet BH #1	Cullet BH #2	EP Baghouse 1	EP Baghouse 2	2 KW Generator	1.25 KW Generator
Status			Modified	Modified	Modified	Existing	Existing	Existing	Existing	Existing	New
Height		(feet)	175	175	175	100	32.5	100	100	58	58
Diam.		(feet)	8.0	8.0	8.0	2.83	2.67	0.67	0.67	1.375	1.1
Flow		(acfm)	157,201	117,901	78,601	41,500	25,000	1500	1500	15,500	10005
Temp		(°F)	608	608	608	68	68	68	68	750	807
PM	Current	(lbs/hr)	25.5	19.125	12.75	1.90	1.07	0.06	0.06	0.91	0
	Proposed	(lbs/hr)	29.4	22.05	14.7	1.90	1.07	0.06	0.06	0.91	0.1
	Change	(lbs/hr)	3.9	2.925	1.95	0	0	0	0	0	0.1
S02	Current	(lbs/hr)	16.3	12.225	8.15					1.035	0
	Proposed	(lbs/hr)	25	18.75	12.50					0.03	0.02
	Change	(lbs/hr)	8.7	6.53	4.35					-1.01	0.02
NOx	Current	(lbs/hr)	189.6	142.2	94.8					4.17	0
	Proposed	(lbs/hr)	50.9	38.18	25.45					40.56	24.9
	Change	(lbs/hr)	-138.7	-104.03	-69.35					36.39	24.9
CO	Current	(lbs/hr)	176	132	88					4.15	0
	Proposed	(lbs/hr)	56.3	42.23	28.15					4.15	0.84
	Change	(lbs/hr)	-119.7	-89.78	-59.85					0	0.84
Pb	Current	(lbs/hr)	0.014	0.010	0.007						
	Proposed	(lbs/hr)	0.016	0.012	0.008						
	Change	(lbs/hr)	0.002	0.002	0.001						
H2SO4	Proposed	(lbs/hr)	1.59375	1.1953125	0.796875						
Fluorides	Proposed	(lbs/hr)	0.6875	0.515625	0.34375						
Benz(a)anthracene	Proposed	(lbs/hr)	4.464E-07	3.348E-07	2.232E-07						
Beryllium	Proposed	(lbs/hr)	0.000002976	0.000002232	0.000001488						
Cadmium	Proposed	(lbs/hr)	0.024675	0.01850625	0.0123375						
Formaldehyde	Proposed	(lbs/hr)	0.0186	0.01395	0.0093						
Nickel	Proposed	(lbs/hr)	0.00558125	0.004185938	0.002790625						
Total PAH	Proposed	(lbs/hr)	2.06336E-05	1.54752E-05	1.03168E-05						

Table 11 - Stack Parameters and Emissions for Maintenance Operations

Stack ID			S01 (100%)	S01 (75%)	S01 (50%)	S03A	S03B	S06	S07	S07	S08
Process			Furnace	Furnace	Furnace	Cullet BH #1	Cullet BH #2	EP Baghouse 1	EP Baghouse 2	2 KW Generator	1.25 KW Generator
Status			Modified	Modified	Modified	Existing	Existing	Existing	Existing	Existing	New
Height		(feet)	175	175	175	100	32.5	100	100	58	58
Diam.		(feet)	8.0	8.0	8.0	2.83	2.67	0.67	0.67	1.375	1.1
Flow		(acfm)	157,201	117,901	78,601	41,500	25,000	1500	1500	15,500	10005
Temp		(°F)	608	608	608	68	68	68	68	750	807
PM	Current	(lbs/hr)	25.5	19.125	12.75	1.90	1.07	0.06	0.06	0.91	0
	Proposed	(lbs/hr)	29.4	22.05	14.7	1.90	1.07	0.06	0.06	0.91	0.1
	Change	(lbs/hr)	3.9	2.925	1.95	0	0	0	0	0	0.1
S02	Current	(lbs/hr)	89.9	67.425	44.95					1.035	0
	Proposed	(lbs/hr)	103.8	77.85	51.90					0.03	0.02
	Change	(lbs/hr)	13.9	10.43	6.95					-1.005	0.02
NOx	Current	(lbs/hr)	360.2	270.15	180.1					4.17	0
	Proposed	(lbs/hr)	415.6	311.70	207.80					40.56	24.9
	Change	(lbs/hr)	55.4	41.55	27.70					36.39	24.9
CO	Current	(lbs/hr)	176	132	88					4.15	0
	Proposed	(lbs/hr)	56.3	42.23	28.15					4.15	0.84
	Change	(lbs/hr)	-119.7	-89.78	-59.85					0	0.84
Pb	Current	(lbs/hr)	0.014	0.010	0.007						
	Proposed	(lbs/hr)	0.016	0.012	0.008						
	Change	(lbs/hr)	0.002	0.002	0.001						
H2SO4	Proposed	(lbs/hr)	1.5938	1.1953	0.7969						
Fluorides	Proposed	(lbs/hr)	0.6875	0.5156	0.3438						
Benz(a)anthracene	Proposed	(lbs/hr)	4.5E-07	3.3E-07	2.2E-07						
Beryllium	Proposed	(lbs/hr)	0.0000030	0.0000022	0.0000015						
Cadmium	Proposed	(lbs/hr)	0.0247	0.0185	0.0123						
Formaldehyde	Proposed	(lbs/hr)	0.0186	0.0140	0.0093						
Nickel	Proposed	(lbs/hr)	0.0056	0.0042	0.0028						
Total PAH	Proposed	(lbs/hr)	2.1E-05	1.5E-05	1.0E-05						

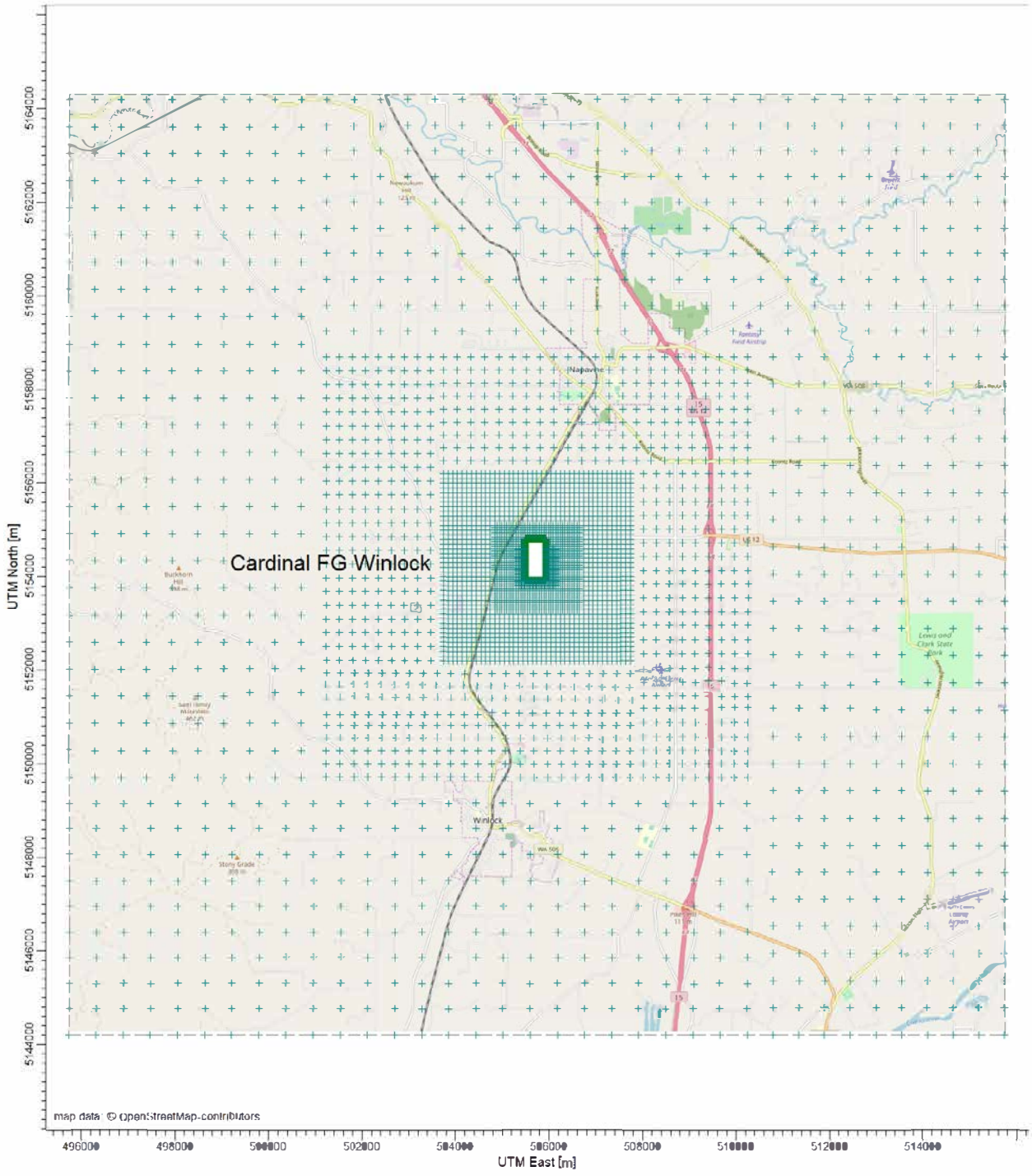

Figure 2 - Cardinal FG Winlock – Entire Modeling Domain and Receptor Locations

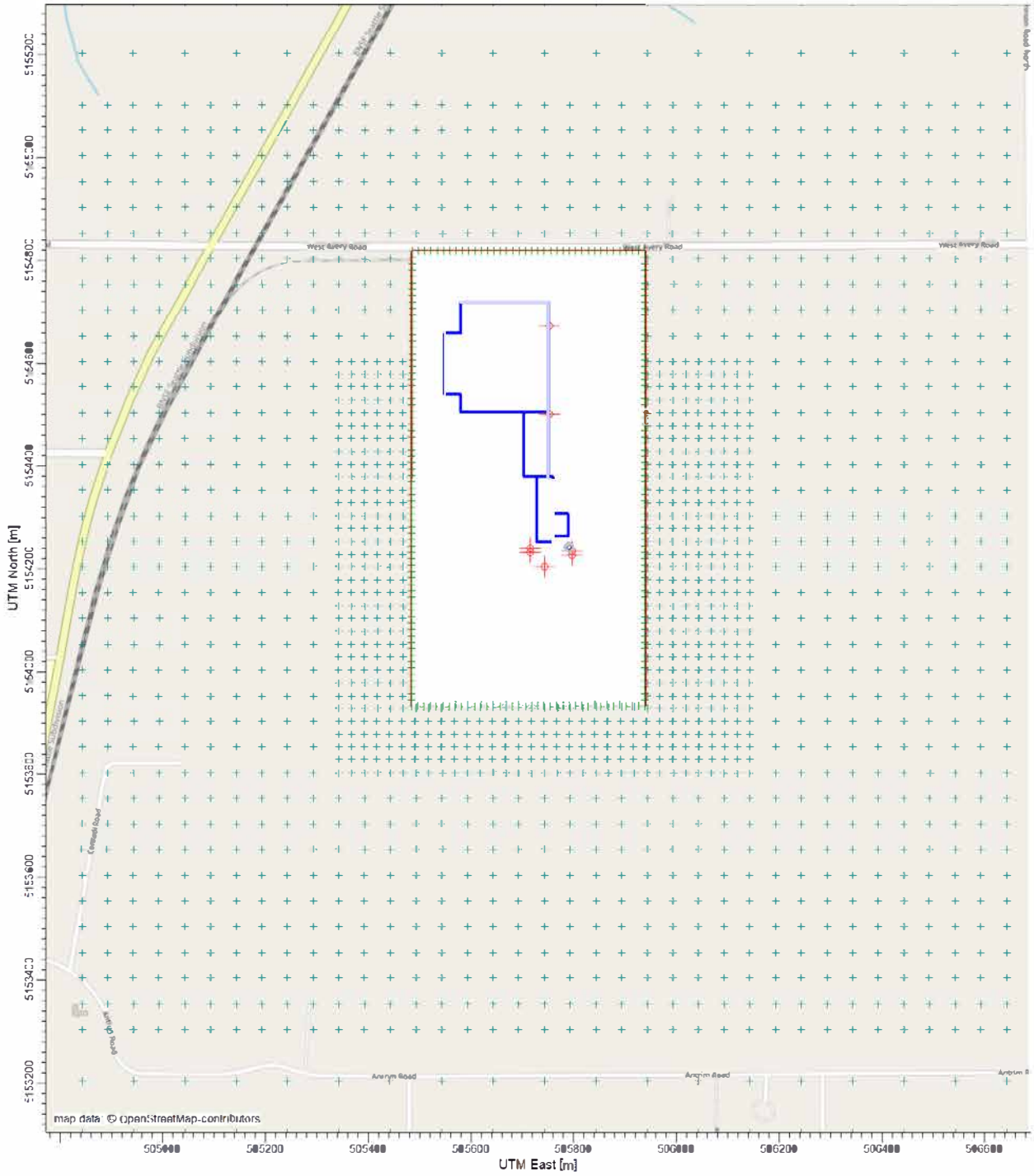

Figure 3 - Cardinal FG Winlock – Facility Outline and 50-meter Receptor Grid

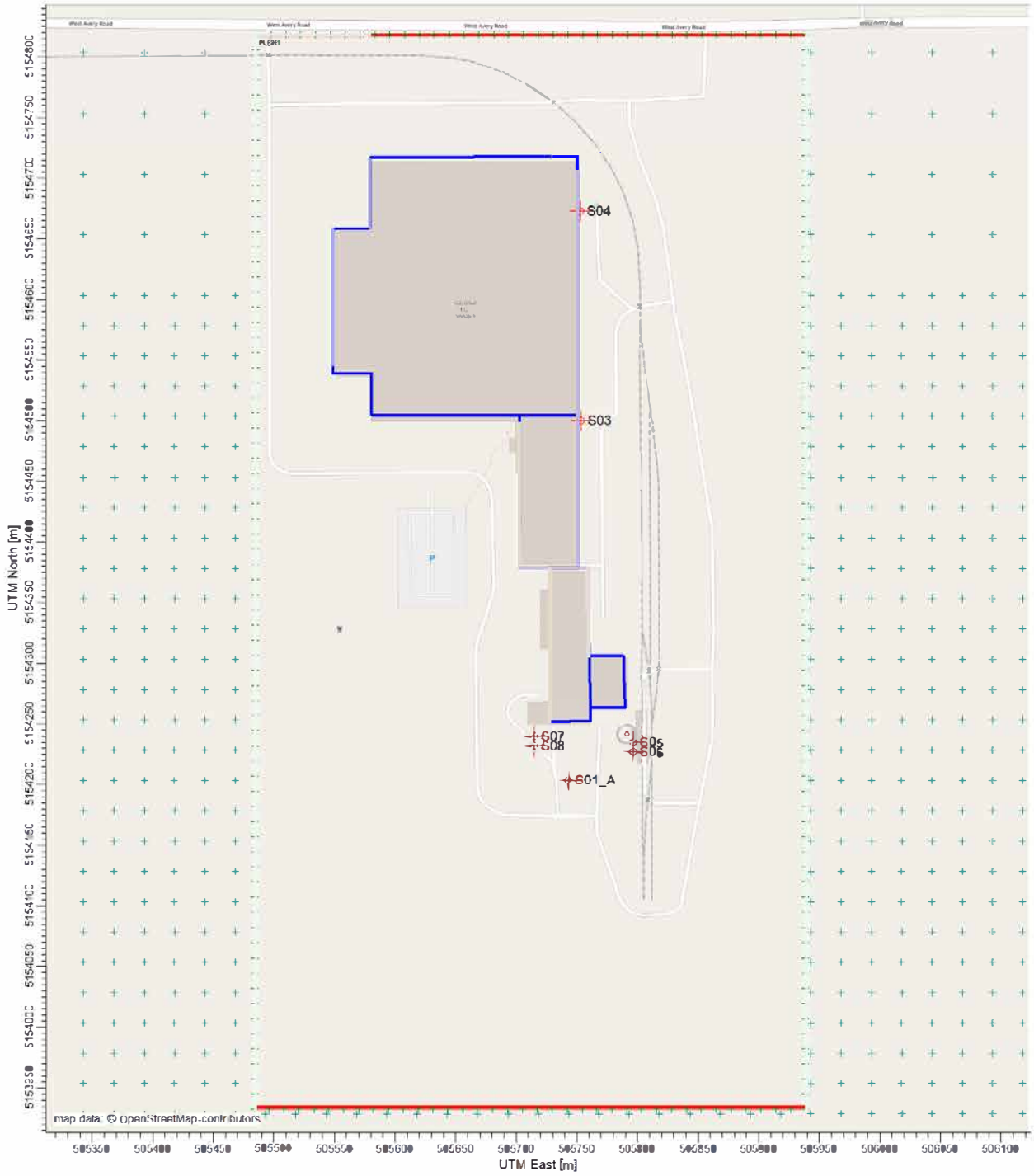

Figure 4 - Cardinal FG Company – Facility Building and Stack Locations

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Appendix A

Application Forms

Southwest Clean Air Agency
INSTRUCTIONS FOR PERMIT APPLICATION

Use this sheet as a checklist to determine when your application is substantially complete.

☞ Each PERMIT APPLICATION for the construction, installation, or establishment of a new air contaminant source, or modification of existing air pollution source or control equipment or permit needs to be accompanied by the following information to be considered complete:

Included	N/A	
☑	☐	Process flow sheets and equipment layout diagrams.
☑	☐	Process and control equipment manufacturer, model number, size, serial number, date of manufacture (for each piece of control equipment).
☑	☐	Quantify average and maximum hourly throughput values, average yearly totals, and maximum concentrations for each pollutant.
☑	☐	Applicant's calculation of the kinds and amounts of emissions for each emission point, materials handling operation or fugitive category (both controlled and uncontrolled).
☑	☐	Plot plan including identification of proposed emission points to the atmosphere, distance to property boundaries, height of buildings, and stack height above ground level.
☑	☐	Identification of raw materials and/or product specifications (physical and chemical properties) and typical ranges of operating conditions as related to each emission point (toxic air contaminants require a separate summary); Material Safety Data Sheets (MSDSs) should be included in the PERMIT APPLICATION for all compounds used.
☑	☐	Identification of the methods/equipment proposed for prevention/control of emissions to the atmosphere.
☑	☐	Information sufficient to demonstrate the ability of the emission controls proposed as being consistent with those provided in the applicable regulations (BACT/NSPS/RACT/NESHAPS/LAER analysis) – see attached worksheet for typical layout of BACT analysis information.
☐	☑	The kinds and amounts of emission offset credits proposed for assignment when operations are within a maintenance boundary (see SWCAA 400-120 and 400-130).
☑	☐	Estimates of the proposed project ambient impact under average and least favorable conditions where pertinent to PSD (WAC 173-400-171) or Toxic Air Pollutants (WAC 173-460) requirements.
☑	☐	Additional information, evidence, or documentation as required by the Board of Directors, or the Control Officer, to show that the proposed project will meet federal, state, and local air pollution control regulations.
☐	☑	For applications that include equipment that has previously been approved, authorized or registered, a lapse is considered to have occurred if the registration fees are delinquent for more than one calendar year or the source has not operated within five years prior to the receipt of any required PERMIT APPLICATION (SWCAA 400-030(56) and SWCAA 400-110).
☐	☑	Applications that include previously approved or authorized equipment require that additional information regarding previous owners or approvals be provided so that SWCAA records can be updated. Equipment registered and/or approved for a given company cannot be authorized without a legal name change, purchase of company or equipment, or a legal contract or subcontract to do business with or for the approved source. Responsibility for operation of authorized equipment rests with the registered source.
☑	☐	All applications need to be accompanied with a completed SEPA checklist or SEPA determination.

☞ The application transmittal shall conform to SWCAA review requirements wherever possible as detailed in SWCAA General Regulations for Air Pollution Sources (SWCAA 400).

☞ Each drawing, document, or other form of transmittal considered by the applicant to be proprietary and confidential must be suitably identified as confidential in red ink, and signed and dated by the applicant or its agent. Be aware that SWCAA follows the requirements in SWCAA 400-270 and 40 CFR 2 for determination of confidentiality. SWCAA may not process company sensitive information as confidential.

☞ Air Discharge Permits (to construct, modify, or install) are issued for specific equipment or processes described in the application. Changes to the processes or control equipment are not allowed without new source review (Permit Application and Permit) if these changes result in an emission of a different type or an increase in emissions (SWCAA 400-110). Process equipment changes that result in decreased emissions require notification to SWCAA.

☞ The SIC code is identified as the four digit major group classification in the 1987 Standard Industrial Code Classification Manual or refer to the SWCAA website at http://www.swcleanair.org/forms.html for a listing of SIC codes and NAICS Codes.

☞ Mail or deliver in person the completed application package to:

Southwest Clean Air Agency
11815 NE 99th Street, Suite 1294
Vancouver, WA 98682-2322

☞ **Application and engineering review fees must accompany the application for the application to be considered complete. Make checks payable to "Southwest Clean Air Agency" or "SWCAA."**

☞ **The PERMIT APPLICATION package submitted must be complete. All applications are screened for completeness before processing. Applicants submitting incomplete application packages will be notified of their incomplete status and may result in a delay in processing the application.**

Southwest Clean Air Agency

A permit application review fee is required with the submittal of each permit application. There is a base fee composed of an application fee and an engineering review fee from the **Consolidated Fee Schedule (Table 2 or 9)**, which is based on the primary emission unit or activity of the proposed new, modified or altered "stationary source." Permit application review fees based on emissions are determined using the proposed emissions (after controls) as supported by test data or emission factors and review fees based on equipment capacity or size are to utilize the design capacities of affected equipment.

If the staff time required to review a permit application exceeds the number of review hours associated specified in the Consolidated fee Schedule (Table 2 or 9), the applicant will be invoiced for each additional work hours.

Consolidated Fee Schedule (Table 2 or 9) http://www.swcleanair.org/fees/index.asp

FEE CALCULATION

APPLICATION FEE	**Required**	$ 600	If expedited, double fee
ENGINEERING REVIEW FEE	**Required**	+ $ 3,000	Enter the fee for the *primary* equipment/activity from the **Consolidated Fee Schedule (Table 9)** or if you want an expedited review, enter double the fee from the **Consolidated Fee Schedule (Table 2 or 9)**
TOTAL FEE		$ 3,600	← **Submit this amount with application**

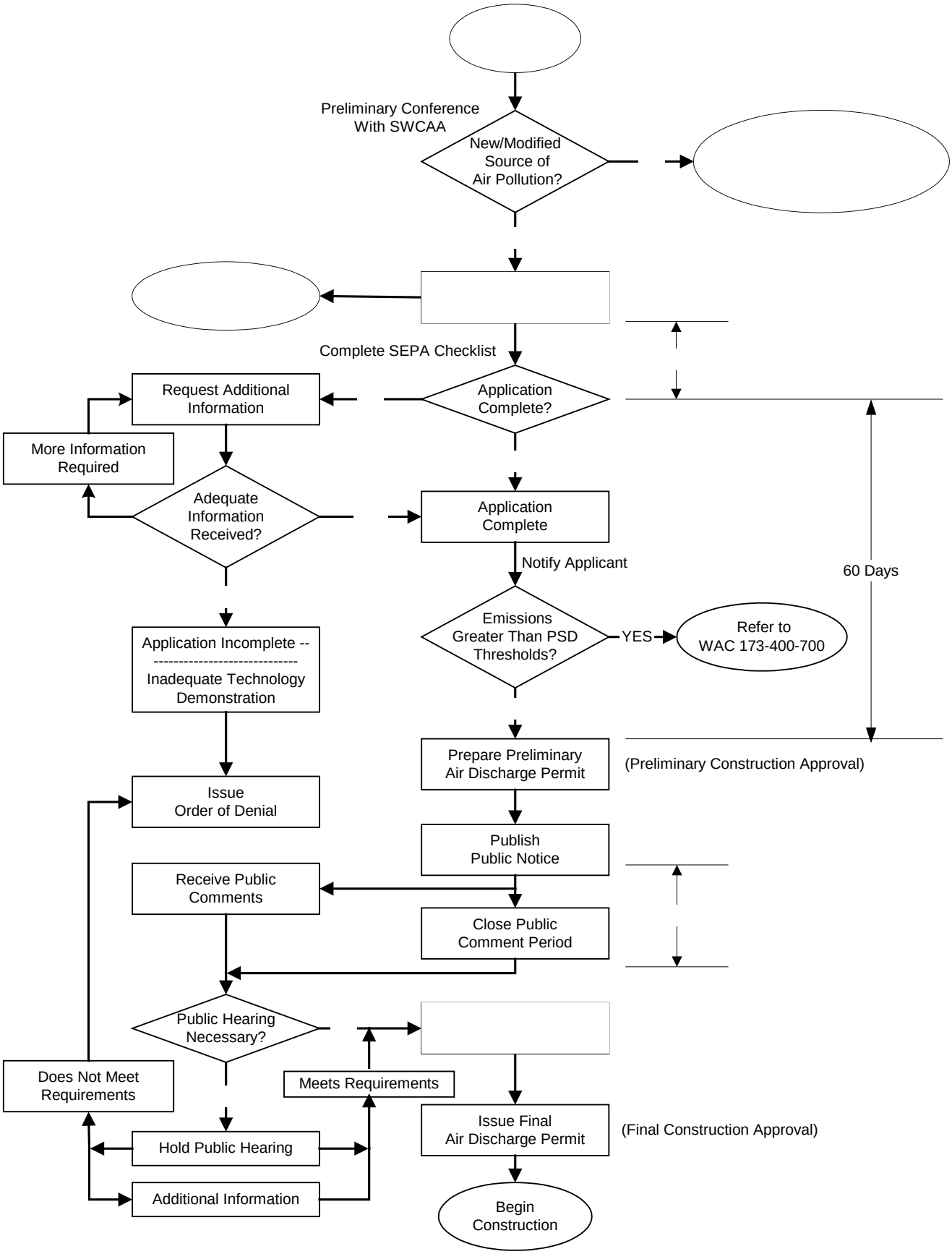
Additional Fees

After you have submitted your application and the fee above, **contact SWCAA concerning any additional applicable fees**. You will be invoiced for any additional fees prior to the issuance of your final permit.

- Legal Notice Fee. The fee plus the actual publication cost of the legal notice; See **Consolidated Fee Schedule (Table 2 or 9**)
- Additional Review Time Fee. If the review time needed to process your application exceeds the time listed in the **Consolidated Fee Schedule (Table 2 or 9)**, you will be charged for each additional hour of review;
- Additional Engineering Review Fee. Specific projects or activities listed in the **Consolidated Fee Schedule (Table 2 or 9)** are subject to a fee; and
- Major NSR Review Fee. Specific projects or activities are subject to the fee listed in the **Consolidated Fee Schedule (Table 2 or 9).**

Southwest Clean Air Agency

AIR DISCHARGE PERMIT APPLICATION FLOW CHART



Southwest Clean Air Agency

11815 NE 99th Street, Suite 1294, Vancouver, WA 98682-2322 Voice: (360) 574-3058 Fax: (360) 576-0925

PERMIT APPLICATION

TOTAL ENCLOSED FEE: $ 1,200 (to be submitted with application, no fee required for change of location or change of registered owner) If you want this permit application to be expedited, have you **doubled the fee**? ☐ YES ☑ NO

See Consolidated Fee Schedule (Table 2 or 9) http://www.swcleanair.org/fees/index.asp

COMPANY INFORMATION

NAME OF APPLICANT	STREET	CITY	STATE	ZIP	PHONE	FAX
Cardinal FG Winlock	545 Avery Road West	Winlock, WA 98596			(360) 242-4300	

LEGAL NAME OF BUSINESS FOR WHICH APPLICATION APPLIES | **PHONE** | **FAX**

STREET	PO BOX	CITY	COUNTY	STATE	ZIP

TYPE OF ORGANIZATION

☑ CORPORATION ☐ LIMITED PARTNERSHIP ☐ GOVERNMENT ENTITY
☐ INDIVIDUAL (Sole Proprietorship) ☐ GENERAL PARTNERSHIP ☐ OTHER _____

ARE ALL FACILITIES, UNDER THE SAME OWNERSHIP IN WASHINGTON, IN COMPLIANCE WITH FEDERAL, STATE, AND LOCAL AIR POLLUTION REGULATIONS? ☑ YES ☐ NO

ARE YOU THE OWNER OF THE EQUIPMENT UNDER THIS APPLICATION? ☑ YES ☐ NO OWNER IDENTIFICATION NUMBER

IF NO, ENTER LEGAL NAME OF OWNER: _____ ☐ S.S. NUMBER ___ ___ ___ - ___ ___ - ___ ___ ___ ___

☑ UBI No. 602-082-179

FACILITY INFORMATION

FACILITY NAME	EQUIPMENT ADDRESS / LOCATION Street	City	County	State	Zip
Cardinal FG Winlock					

MAILING ADDRESS Street	City	State	Zip	FACILITY OPERATING SCHEDULE
545 Avery Road West	Winlock, WA 98596			hrs/day 24 days/wk 7 wks/yr 52

CONTACT PERSON AND TITLE	PHONE	EMAIL
John Renkert, Environmental Engineer	(360) 242-4300	jrenkert@cardinalcorp.com

SIC Code (refer to instructions)
3211 -- FLAT GLASS

IS THERE A SCHOOL OR DAYCARE WITHIN 1000 FT OF THIS FACILITY? ☐ YES ☑ NO

CONTROL EQUIPMENT INFORMATION

EQUIPMENT DESCRIPTION

Addition of selective catalytic reduction (SCR) control system for NOx emissions and increase in production capacity from 650 to 750 tons per day.

APPLICATION FOR:

☐ New Construction or Installation ☑ Modification or Alteration of Equipment ☐ Change of Location
☐ Change of Approval Condition (Title V Opt-Out) ☐ Change of Registered Owner ☐ Other _____
☐ Existing Equipment Operating Without Approval ☐ Existing Equipment With Expired or Lapsed Approval or Registration
Has a Notice of Violation been Issued? ☐ Yes ☐ No If Yes, Number: _____

ESTIMATED COST:
For Total Modification / New Facility: $0 For Air Pollution Control Equipment: $9.5 million

ESTIMATED INSTALLATION START DATE:	ESTIMATED COMPLETION DATE:
April 1, 2020	January 1, 2021

DO YOU CLAIM CONFIDENTIALITY OF INFORMATION? ☐ YES ☑ NO (Each page with confidential information must be clearly marked in red ink)

I do hereby certify that the information contained in this PERMIT APPLICATION is, to the best of my knowledge, accurate and complete.

Signature: _____ Title: Plant Manager Date: 11-4-19

AGENCY USE ONLY

SWCAA ID #: _____ Expedited Application: ☐ YES ☐ NO
Application Fee: _____ Date: _____ Application #: _____
Review/Add'l Fees: _____ Date: _____ SIC/NAICS #: _____

AGENCY USE ONLY

Date Stamp

Southwest Clean Air Agency

11815 NE 99th Street, Suite 1294, Vancouver, WA 98682-2322 Voice: (360) 574-3058 Fax (360) 576-0925

PERMIT APPLICATION / NEW SOURCE REVIEW

BACT IMPACT ANALYSIS WORKSHEET

Facility Name: Cardinal FG Winlock **Date:** October 1, 2019

CONTROL ALTERNATIVE	EMISSIONS [lbs/hr] & [tons/yr]	EMISSIONS REDUCTION ① [tons/yr]	INSTALLED CAPITAL COST ② [$]	TOTAL ANNUALIZED COST ③⑦ [$]	AVERAGE COST EFFECTIVENESS OVER BASELINE ④ [$/ton]	INCREMENTAL COST EFFECTIVENESS ⑤ [$/ton]	ENERGY INCREASE OVER BASELINE ⑥ [MMBtu/yr]	TOXICS IMPACT [Yes/No]	ADVERSE ENVIRONMENTAL IMPACT [Yes/No]
1)	Refer to BACT Analysis is the enclosed permit application.								
2)									
3)									
4)									
5) Uncontrolled Baseline (worst case - no controls)									

① Emissions reduction over baseline control level.
② Installed capital cost relative to baseline.
③ Total annualized cost (capital, direct, and indirect) of purchasing, installing, and operating the proposed control alternative. A capital recovery factor approach using a real interest rate (i.e., absent inflation) is used to express capital costs in present-day annual costs.
④ Average cost effectiveness over baseline is equal to total annualized cost for the control option divided by the emissions reductions resulting from the uncontrolled baseline.
⑤ The optional incremental cost effectiveness criterion is the same as the average cost effectiveness criteria except that the control alternative is considered relative to the next most stringent alternative rather than the baseline control alternative.
⑥ Energy impacts are the difference in total project energy requirements with the control alternative uncontrolled baseline expressed in equivalent millions of Btus per year.
⑦ Assumptions made on catalyst life may have a substantial affect upon cost effectiveness.

Notes:

The number of alternatives to be evaluated will vary depending on application.
Values for each variable should be provided as they are applicable. Use N/A if not applicable.
Emission rates are the expected or predicted emission rates.
Calculations should provide for a range of alternatives.
Emissions reduction should use estimated efficiency if actual efficiency is unknown - should so state.
Attach worksheets as necessary to substantiate above values.

Southwest Clean Air Agency

11815 NE 99th Street, Suite 1294, Vancouver, WA 98682-2322 Voice: (360) 574-3058 Fax (360) 576-0925

PERMIT APPLICATION / NEW SOURCE REVIEW

EMISSION ESTIMATE SUMMARY WORKSHEET

ESTIMATION CODE
Process Knowledge 0
Source Test 1
Material Balance.....2
EPA Factor 3
Guess 4
Non-EPA Factor 5
Other _____.....6

FACILITY NAME: Cardinal FG Winlock **DATE:** October 1, 2019

EMISSION POINT NUMBER① **:** _____ **EMISSION POINT NAME:** _____

POLLUTANT: (circle)	**UNCONTROLLED EMISSIONS** lbs/yr or tons/yr	**CONTROLLED EMISSIONS** lbs/yr or tons/yr	**MAX HOURLY CONCENTRATION** µg/m^3 or grains	**HOURLY/MONTHLY EMISSIONS** lbs or tons	**YEARLY EMISSIONS** lbs/yr or tons/yr	**ESTIMATION CODE**	**TOXIC**② Y / N
Particulate Matter (PM):							
PM_{10}:							
Sulfur Dioxide (SO_2):							
Nitrogen Oxides (NO_x):							
Volatile Organic Compounds (VOC):							
Carbon Monoxide (CO):							
Other:							

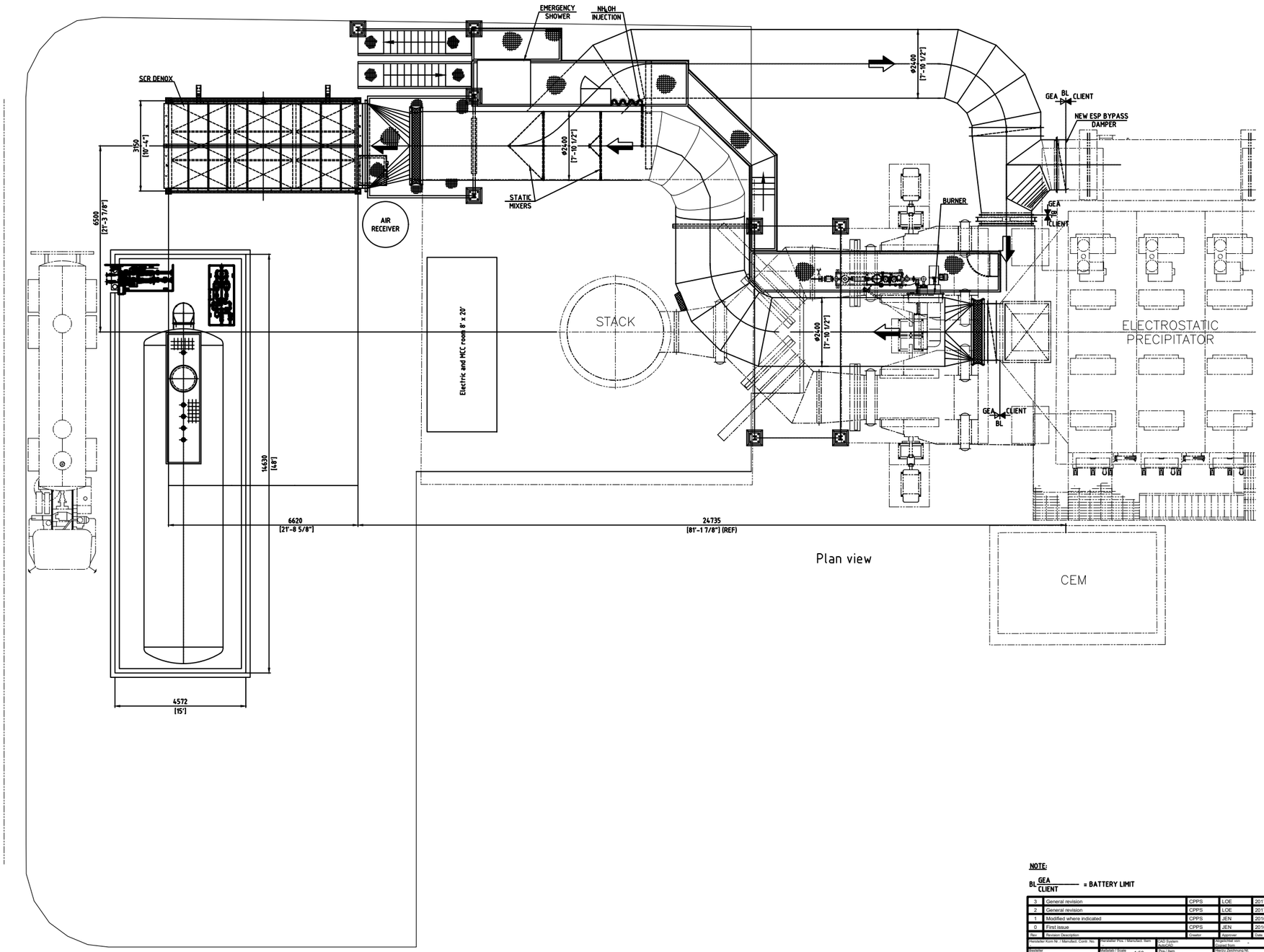
Refer to the supporting emission calculations in the enclosed permit application.

① Emission Point Number should be consistent with the annual Air Emission Inventory Data Sheets. If this application represents a new emission point, write "new."
② VOC toxics should be summarized on the VOC Emission Summary Worksheet. All other toxics should be explained below.

EXPLANATION / NOTES: _____

Appendix B

SCR Layout



Plan view

NOTE:

BL GEA / CLIENT = BATTERY LIMIT

Rev.	Revision Description	Creator	Approved	Date
3	General revision	CPPS	LOE	2017-11-16
2	General revision	CPPS	LOE	2017-10-27
1	Modified where indicated	CPPS	JEN	2016-11-11
0	First issue	CPPS	JEN	2016-09-12

Hersteller Kenn Nr. / Manufact. Contr. No.	Hersteller Pos. / Manufact. Item	CAD System AutoCAD	Abgeliefert mit / Added Item: -
Besteller / Customer	Massstab / Scale 1:50	Pos / Item -	Hierzu zeichnung Nr. / Related Drawing No.: -
Auftrag Nr. / Job No. 200729	Benennung / Material -	Gewicht / Weight -	Ersetzt für / Replaces: -

GEA Process Engineering – a better world

GEA Bischoff GmbH
Germany

Sheet 1/1
Format A0

Title: SCR DENOX PLANT
GENERAL ARRANGEMENT- PLAN VIEW

ID No: DW-M00-001-A0 Rev: 3

Appendix C

Emission Calculations

TABLE 1 CURRENT CAPACITY OF 650 TPD		EU1 - Melting Furnace (Production)	EU1 - Melting Furnace (Furnace Maintenance)	EU1 - Melting Furnace (APC Maintenance)	EU1 - Melting Furnace (max lbs/hr & total tpy)		EU1 - Annealing Lehr	EU2 - Glass Cutting	EU3 - Cullet Return System #1	EU4 - Cullet Return System #2	EU6 - EP Dust Baghouse #1	EU7 - EP Dust Baghouse #2	EU8 - 2,000 KW Emergency Generator		**Total Emissions**	
Stack		S01	S01	S01	S01		S02	S03A	S03B	S06	S07	S08				
Control		SD-ESP-3R	SD-ESP-3R	None	SD-ESP-3R	SD-ESP-3R	None	Baghouse	Baghouse	Baghouse	Baghouse	SCR				
Thruput		650	650	650		0.25	7,317	650	650	300	300	146.6				
Thruput	Units	tpd glass	tpd glass	tpd glass		lbs/ton	lbs/mo	tpd glass	tpd glass	tph	tph	gph				
Schedule	(hrs/yr)	7,968	672	120	8,760		8,760	8,760	8,760	8,760	8,760	200				
Flow	(acfm)							41,500	25,000	1,500	1,500					
PM/PM10/PM2.5 (FH)	Factor	0.09	0.09	0.5												
	Units	lbs/ton	lbs/ton	lbs/ton												
PM/PM10/PM2.5 (BH)	Factor	0.85	0.85	0.5												
	Units	lbs/ton	lbs/ton	lbs/ton												
PM/PM10/PM2.5	Factor	0.94	0.94	0.65				0.005	0.005	0.005	0.005	6.2				
	Units	lbs/ton	lbs/ton	lbs/ton				gr/acf	gr/acf	gr/acf	gr/acf	lbs/gal3				
SO2	Factor	0.6	0.6	3.32								7.1				
	Units	lbs/ton	lbs/ton	lbs/ton								lbs/gal3				
NOx	Factor	7	13.3	7								28.45				
	Units	lbs/ton	lbs/ton	lbs/ton								lbs/gal3				
CO	Factor	6.5	6.5	6.5								28.3				
	Units	lbs/ton	lbs/ton	lbs/ton								lbs/gal3				
VOC	Factor	0.1	0.1	0.1			1					7.4				
	Units	lbs/ton	lbs/ton	lbs/ton			lbs/lbs					lbs/gal3				
Pb	Factor	541	541	541								0.0012				
	Units	ppm PM	ppm PM	ppm PM								lbs/gal3				
HF	Factor	0.0244	0.0244	0.0244												
	Units	lbs/ton	lbs/ton	lbs/ton												
H2SO4	Factor	0.0583	0.0583	0.0583												
	Units	lbs/ton	lbs/ton	lbs/ton												
CO2e	Factor	1,171	1,171	1,171								22,600				
	Units	lbs/ton	lbs/ton	lbs/ton								lbs/gal3				
CAA HAP	Factor	0.0170	0.0170	0.0170								0.003790				
	Units	lbs/ton	lbs/ton	lbs/ton								lbs/gal3				
PM/PM10/PM2.5 (FH)	(lbs/hr)	2.44	2.44	13.5												
	(tpy)	9.7	0.8	0.8	11.3											
PM/PM10/PM2.5 (BH)	(lbs/hr)	23.0	23.0	13.5												
	(tpy)	91.7	7.7	0.8	100.3											
PM/PM10/PM2.5	(lbs/hr)	25.5	25.5	17.6	25.5			1.90	1.07	0.06	0.06	0.91		**29.5**		
	(tpy)	101.4	8.6	1.1	111.0			8.32	4.69	0.28	0.28	0.09		**124.7**		
SO2	(lbs/hr)	16.3	16.3	89.9	89.9							1.04		**91.0**		
	(tpy)	64.7	5.5	5.4	75.6							0.10		**75.7**	Subtotals	
NOx	(lbs/hr)	189.6	360.2	189.6	360.2							4.17		**364.4**	231.3	
	(tpy)	755.3	121.0	11.4	887.7							0.42		**888.1**	1074.3	
CO	(lbs/hr)	176.0	176.0	176.0	176.0							4.15		**180.2**	401.9	
	(tpy)	701.4	59.2	10.6	771.1							0.41		**771.5**	1,095.4	
VOC	(lbs/hr)	2.7	2.7	2.7	2.7		10.0					1.08		**13.8**		
	(tpy)	10.79	0.91	0.16	11.9		43.90					0.11		**55.9**		
Pb	(lbs/hr)	0.014	0.014	0.010	0.014							0.0002		**0.01**		
	(tpy)	0.055	0.005	0.001	0.060							0.00002		**0.1**		
HF	(lbs/hr)	0.66	0.66	0.66	0.66									**0.66**		
	(tpy)	2.63	0.22	0.04	2.89									**2.9**		
H2SO4	(lbs/hr)	1.58	1.58	1.58	1.58									**1.6**		
	(tpy)	6.29	0.53	0.09	6.92									**6.9**		
CO2e	(lbs/hr)	31,715	31,715	31,715	31715							3313.16		**35,028**		
	(tpy)	126,351	10,656	1,903	138910							331.32		**139,241**		
CAA HAP	(lbs/hr)	0.5	0.5	0.5	0.5							0.0006		**0.5**		
	(tpy)	1.8	0.2	0.0	2.0							0.0000556		**2.0**	1,928	
Regional Haze Pollutants	(lbs/hr)													**486.4**		
	(tpy)													**1,095.4**		

TABLE 2 PROPOSED CAPACITY OF 750 TPD		EU1 - Melting Furnace (Production)	EU1 - Melting Furnace (Furnace Maintenance)	EU1 - Melting Furnace (APC Maintenance)	EU1 - Melting Furnace (max lbs/hr & total tpy)	EU1 - Annealing Lehr	EU2 - Glass Cutting	EU3 - Cullet Return System #1	EU4 - Cullet Return System #2	EU6 - EP Dust Baghouse #1	EU7 - EP Dust Baghouse #2	EU8 - 2,000 KW Emergency Generator	EU9 - 1,250 KW Emergency Generator	P10 - Miscellaneous Natural Gas Usage	P11- SCR Reheat Burner	Total	
Stack		S01	S01	S01	S01		S02	S03A	S03B	S06	S07	S08	S09	S11	S12		
Control		SD-ESP-SCR	SD-ESP-SCR	None	SD-ESP-SCR	SD-ESP-SCR	None	Baghouse	Baghouse	Baghouse	Baghouse	None	None	None	SD-ESP-SCR		
Thruput		750	750	750		0.25	7,317	750	750	300	300	146.6	87.4	0.0631	0.017		
Thruput	Units	tpd glass	tpd glass	tpd glass		lbs SO2/ton	lbs/mo VOC	tpd glass	tpd glass	tph	tph	gph	gph	cf6/hr	cf6/hr		
Schedule	(hrs/yr)	8,640	0	120	8,760		8,760	8,760	8,760	8,760	8,760	50	50	60	149		
Flow	(acfm)							41,500	25,000	1,500	1,500			cf6/yr	cf6/yr		
PM/PM10/PM2.5 (FH)	Factor	0.45	0.45	0.5													
	Units	lbs/ton	lbs/ton	lbs/ton													
PM/PM10/PM2.5 (BH)	Factor																
	Units																
PM/PM10/PM2.5	Factor	0.94	0.94	0.94				0.00534	0.005	0.005	0.005	6.2	0.600	7.6			
	Units	lbs/ton	lbs/ton	lbs/ton				gr/acf	gr/acf	gr/acf	gr/acf	lbs/gal3	lbs/gal3	lbs/cf6			
SO2	Factor	0.8	0.8	3.3								0.216	0.216	0.6			
	Units	lbs/ton	lbs/ton	lbs/ton								lbs/gal3	lbs/gal3	lbs/cf6			
NOx	Factor	1.63	1.63	13.3								276.7	284.900	100			
	Units	lbs/ton	lbs/ton	lbs/ton								lbs/gal3	lbs/gal3	lbs/cf6			
CO	Factor	1.8	1.8	1.8								28.3	5.100	84			
	Units	lbs/ton	lbs/ton	lbs/ton								lbs/gal3	lbs/gal3	lbs/cf6			
VOC	Factor	0.1	0.1	0.1			1					7.4	2.400	5.5			
	Units	lbs/ton	lbs/ton	lbs/ton			lbs/lbs					lbs/gal3	lbs/gal3	lbs/cf6			
Pb	Factor	541	541	541								0.0012	0.0012				
	Units	ppm PM	ppm PM	ppm PM								lbs/gal3	lbs/gal3				
HF	Factor	0.0212	0.0212	0.0212													
	Units	lbs/ton	lbs/ton	lbs/ton													
H2SO4	Factor	0.050527	0.050527	0.050527													
	Units	lbs/ton	lbs/ton	lbs/ton													
CO2e	Factor	1,171	1,171	1,171								22,600	22,600	120000	120000		
	Units	lbs/ton	lbs/ton	lbs/ton								lbs/gal3	lbs/gal3	lbs/cf6	lbs/cf6		
CAA HAP	Factor	0.0170	0.0170	0.0170								0.003790	0.003790				
	Units	lbs/ton	lbs/ton	lbs/ton								lbs/gal3	lbs/gal3				
PM/PM10/PM2.5 (FH)	(lbs/hr)	14.1	14.1	15.6													
	(tpy)	60.8	0.0	0.9	61.7												
PM/PM10/PM2.5 (BH)	(lbs/hr)																
	(tpy)																
PM/PM10/PM2.5	(lbs/hr)	29.4	29.4	29.4	29.4			1.90	1.07	0.06	0.06	0.91	0.05	0.48		**33.9**	
	(tpy)	126.9	0.0	1.8	128.7			8.32	4.69	0.28	0.28	0.02	0.001	0.23		**142.5**	
SO2	(lbs/hr)	25.0	25.0	103.1	103.1							0.03	0.02	0.04		**103.2**	
	(tpy)	108.0	0.0	6.2	114.2							0.00	0.00	0.02		**114.2**	Subtotals
NOx	(lbs/hr)	50.9	50.9	415.6	415.6							40.56	24.90	6.31		**487.4**	105.3
	(tpy)	220.1	0.0	24.9	245.0							1.01	0.62	3.00		**249.6**	487.8
CO	(lbs/hr)	56.3	56.3	56.3	56.3							4.15	0.45	5.30		**66.1**	105.3
	(tpy)	243.0	0.0	3.4	246.4							0.10	0.01	2.52		**249.0**	513.2
VOC	(lbs/hr)	3.1	3.1	3.1	3.1		10.0					1.08	0.21	0.35		**14.8**	
	(tpy)	13.50	0.00	0.19	13.7		43.90					0.03	0.01	0.17		**57.8**	
Pb	(lbs/hr)	0.016	0.016	0.016	0.016							0.0002	0.0001			**0.02**	
	(tpy)	0.069	0.000	0.001	0.070							0.000004	0.000003			**0.07**	
HF	(lbs/hr)	0.66	0.66	0.66	0.66											**0.66**	
	(tpy)	2.86	0.00	0.04	2.90											**2.9**	
H2SO4	(lbs/hr)	1.58	1.58	1.58	1.58											**1.6**	
	(tpy)	6.82	0.00	0.09	6.92											**6.9**	
CO2e	(lbs/hr)	36,594	36,594	36,594	36594							3313.16	1975.24	7,572.0	2,040.0	**51,494**	
	(tpy)	158,085	0	2,196	160281							82.83	49.38	3,600.0	8,935.2	**172,948**	
CAA HAP	(lbs/hr)	0.5	0.5	0.5	0.5							0.5556	0.3312			**1.4**	
	(tpy)	2.3	0.0	0.0	2.3							1.4E-02	8.3E-03			**2.3**	825
Regional Haze Pollutants	(lbs/hr)															**626.1**	
	(tpy)															**513.2**	

TABLE 3 - NET CHANGE IN EMISSIONS

PM/PM10/PM2.5	(lbs/hr)															**4.4**
	(tpy)															**17.8**
SO2	(lbs/hr)															**12.3**
	(tpy)															**38.5**
NOx	(lbs/hr)															**123.0**
	(tpy)															**-638.5**
CO	(lbs/hr)															**-114.0**
	(tpy)															**-522.5**
VOC	(lbs/hr)															**1.0**
	(tpy)															**1.9**
Pb	(lbs/hr)															**0.002**
	(tpy)															**0.010**
HF	(lbs/hr)															**0.002**
	(tpy)															**0.007**
H2SO4	(lbs/hr)															**0.000**
	(tpy)															**0.000**
CO2e	(lbs/hr)															**16,466**
	(tpy)															**33,707**
CAA HAP	(lbs/hr)															**1.0**
	(tpy)															**0.3**
Regional Haze Pollutants	(lbs/hr)															**139.7**
	(tpy)															**-582.2**

Appendix D

HAP Emission Calculations

Stack	S01		**Description**		Furnace									
Control	C01A - Spray Drier		**Production Rate (TPD)**		750									
	C01B - ESP		**Natural Gas Usage (cf6/hr)**		0.248									
	C01C - SCR													
Process	P01													
Air	**Emission**	**Emission**	**Uncontrolled**	**Collection**	**Potential**	**Potential**	**Potential**	**Potential**	**Potential**					
Pollutant	**Factor**	**Factor**	**Emission**	**Efficiency**	**Emission**	**Emissions**	**Emissions**	**Emissions**	**Emissions**					
	Units	**Reference**	**Factor**	**%**	**Factor**	**lbs/hr**	**TPY**	**lbs/hr**	**lbs/hr**					
								75% Capacity	50% Capacity					
Criteria Air Pollutants														
PM (total)	lbs/ton	A	0.94	0%	0.94	29.38	128.7	22.0	14.7					
H2SO4	lbs/ton	B	0.051	0%	0.051	1.59	7.0	1.20	0.80					
Fluorides	lbs/ton	C	0.0220	0%	0.0220	0.69	3.0	0.52	0.34					
Pb	ppm in PM	D	297	0%	297	0.0087	0.038	0.007	0.004					
					Potential	**Potential**	**Potential**							
					Emission	**Emissions**	**Emissions**							
Inorganic Air Toxics					**Factor**	**lbs/hr**	**TPY**							
Arsenic	ppm in PM	E			645	0.0189	0.083							
Barium	lbs/cf6	F			0.0044	0.0010912	0.005							
Beryllium	lbs/cf6	F			0.000012	0.000002976	0.000							
Cadmium	ppm in PM	D			840	0.0247	0.108							
Chromium	ppm in PM	D			630	0.0185	0.081							
Cobalt	lbs/cf6	F			0.000084	0.000020832	0.000							
Copper	lbs/cf6	F			0.00085	0.0002108	0.001							
Manganese	lbs/cf6	F			0.00038	0.00009424	0.000							
Mercury	lbs/cf6	F			0.00026	0.00006448	0.000							
Molybdenum	lbs/cf6	F			0.0011	0.0002728	0.001							
Nickel	ppm in PM	D			190	0.0056	0.024							
Selenium	lbs/cf6	F			0.000024	0.000005952	0.000							
Vanadium	lbs/cf6	F			0.0023	0.0005704	0.002							
Zinc	lbs/cf6	F			0.029	0.007192	0.032							
Ammonia	lbs/ton	G			0.070	2.180123	9.549							
					Potential	**Potential**	**Potential**							
					Emission	**Emissions**	**Emissions**							
Organic Air Toxics					**Factor**	**lbs/hr**	**TPY**							
Acenaphthene	lbs/cf6	F			0.0000018	0.0000004	0.0000020							
Acenaphthylene	lbs/cf6	F			0.0000018	0.0000004	0.0000020							
Anthracene	lbs/cf6	F			0.0000024	0.0000006	0.0000026							
Benz(a)anthracene	lbs/cf6	F			0.0000018	0.0000004	0.0000020							
Benzene	lbs/cf6	F			0.00210	0.0005208	0.0022811							
Benzo(a)pyrene	lbs/cf6	F			0.0000012	0.0000003	0.0000013							
Benzo(b)fluoranthene	lbs/cf6	F			0.0000018	0.0000004	0.0000020							
Benzo(g,h,i)perylene	lbs/cf6	F			0.0000012	0.0000003	0.0000013							
Benzo(k)fluoranthene	lbs/cf6	F			0.0000018	0.0000004	0.0000020							
Butane	lbs/cf6	F			2.1	0.5208000	2.2811040							
Chrysene	lbs/cf6	F			0.0000018	0.0000004	0.0000020							
Dibenzo(a,h,)anthracene	lbs/cf6	F			0.0000012	0.0000003	0.0000013							
Dichlorobenzene	lbs/cf6	F			0.0012	0.0002976	0.0013035							
Dimethylbenze(a)anthracene	lbs/cf6	F			0.000016	0.0000040	0.0000174							
Ethane	lbs/cf6	F			3.1	0.7688000	3.3673440							
Fluoranthene	lbs/cf6	F			0.000003	0.0000007	0.0000033							
Fluorene	lbs/cf6	F			0.0000028	0.0000007	0.0000030							
Formaldehyde	lbs/cf6	F			0.075	0.0186000	0.0814680							
Hexane	lbs/cf6	F			1.8	0.4464000	1.9552320							
Indeno(1,2,3-cd)pyrene	lbs/cf6	F			0.0000018	0.0000004	0.0000020							
Methylchloranthrene	lbs/cf6	F			0.0000018	0.0000004	0.0000020							
Methylnaphthalene	lbs/cf6	F			0.000024	0.0000060	0.0000261							
Naphthalene	lbs/cf6	F			0.00061	0.0001513	0.0006626							

Pentane	lbs/cf6	F			2.6	0.6448000	2.8242240							
Phenanathrene	lbs/cf6	F			0.000017	0.0000042	0.0000185							
Propane	lbs/cf6	F			1.6	0.3968000	1.7379840							
Pyrene	lbs/cf6	F			0.000005	0.0000012	0.0000054							
Toluene	lbs/cf6	F			0.0034	0.0008432	0.0036932							
Total PAH	lbs/cf6	F			0.0000832	0.0000206	0.0000904							
Total Clean Air Act HAP	lbs/ton				0.017	0.5437458	2.3816064							
Not CAA HAP														
References														
A - Proposed total PM emission limitation.														
B - H2SO4 limitation established to maintain emissions below 7 TPY PSD significant emissions increase threshold.														
C - Fluorides limitation established to maintain emissions below 3.0 TPY PSD significant emissions increase threshold.														
D - Concentration in PM from Cardinal FG - Mooresville stack test results from March 7, 2000 with a safety factor of 10.														
E - Concentration in PM from Cardinal FG - Mooresville stack test results from March 7, 2000 with a safety factor of 5.														
F - Compilation of Air Pollutant Emission Factors, Tables 1.4-3 and 1.4.4, EF from Natural Gas Combustion, July 1998.														
G - Ammonia emissions are based on SCR vendors guarantee of 10 ppm slip using the exhaust flow rate at 100% capacity.														
(acfm)	(deg F)	(scfm)	(ppmv)	(scf/lb-mole)	(lbs/hr)	(lbs/ton)								
157,201	608	77,717	10	385	2.1801	0.070								
USEPA, AP-42, POM Emission Factors for Natural Gas Combustion														
		AP42	Factor											
Pollutant	CAS	Footnote	lbs/cf6											
2-Methylnaphthalene	91-57-6	b,c	2.40E-05											
3-Methylchloranthrene	56-49-5	b,c	1.80E-06											
7,12-Dimethylbenz(a)anthracene		b,c	1.60E-05											
Acenaphthene	83-32-9	b,c	1.80E-06											
Acenaphthylene	203-96-8	b,c	1.80E-06											
Anthracene	120-12-7	b,c	2.40E-06											
Benz(a)anthracene	56-55-3	b,c	1.80E-06											
Benzo(a)pyrene	50-32-8	b,c	1.20E-06											
Benzo(b)fluoranthene	205-99-2	b,c	1.80E-06											
Benzo(g,h,i)perylene	191-24-2	b,c	1.20E-06											
Benzo(k)fluoranthene	205-82-3	b,c	1.80E-06											
Chrysene	218-01-9	b,c	1.80E-06											
Dibenzo(a,h)anthracene	53-70-3	b,c	1.20E-06											
Fluoranthene	206-44-0	b,c	3.00E-06											
Fluorene	86-73-7	b,c	2.80E-06											
Indeno(1,2,3-cd)pyrene	193-39-5	b,c	1.80E-06											
Phenanathrene	85-01-8	b,c	1.70E-05											
Total POM			**8.32E-05**											
AP42 footnote C = CAA POM														

TAP Emissions					**1998**	**1998**	**Exceeds**	**SWCAA**	**SWCAA**	**2009**	**2009**	**Exceeds**	**WAC**	**WAC**
Air	**Potential**	**Potential**			**SWCAA**	**SWCAA**	**SWCAA**	**24-hour**	**Annual**	**WAC**	**WAC**	**WAC**	**24-hour**	**Annual**
Pollutant	**Emissions**	**Emissions**	**TAP**	**HAP?**	**SQER**	**SQER**	**SQER**	**ASIL**	**ASIL**	**SQER**	**SQER**	**SQER**	**ASIL**	**ASIL**
	(lbs/hr)	**(lbs/yr)**	**Class**		**(lbs/hr)**	**(lbs/yr)**	**Threshold?**	**(ug/m3)**	**(ug/m3)**	**(lbs/day)**	**(lbs/yr)**	**Threshold?**	**(ug/m3)**	**(ug/m3)**
Ammonia	2.18	19098	B	N	2.0	17,500	TRUE	100		0.388	n/a	TRUE	70.8	
H2SO4	1.59	13961	B	N	0.02	175	TRUE	3.3		0.00548	n/a	TRUE	1	
Fluorides	0.69	6023	B	N	0.02	175	TRUE	8.3		0.0712	n/a	TRUE	13	
Acenaphthene	0.0000004	0.00	A	Y	None	None	FALSE		0.00000003					
Acenaphthylene	0.0000004	0.00	A	Y	None	None	FALSE		0.00048					
Anthracene	0.0000006	0.01	A	Y	None	None	FALSE		0.00048					
Arsenic	0.01895	166	A	Y	None	None	FALSE		0.00023	n/a	0.0581	TRUE		0.000303
Barium	0.00109	9.56	B	N	0.02	175	FALSE	1.7						
Benz(a)anthracene	0.0000004	0.004	A	Y	None	None	FALSE		0.00048	n/a	1.74	FALSE		0.00909
Benzene	0.00052	5	A	Y	None	20	FALSE		0.12	n/a	6.62	FALSE		0.0345
Benzo(a)pyrene	0.0000003	0.003	A	Y	None	0.174	FALSE		0.00048	n/a	1.74	FALSE		0.00909
Benzo(b)fluoranthene	0.00000	0.00	A	Y	None	None	FALSE		0.00048	n/a	1.74	FALSE		0.00909

Benzo(g,h,i)perylene	0.00000	0.00	A	Y	None	None	FALSE		0.00048					
Benzo(k)fluoranthene	0.000000	0.00	A	Y	None	None	FALSE		0.00048	n/a	1.74	FALSE		0.00909
Beryllium	0.0000030	0.03	A	Y	None	None	FALSE		0.00042	n/a	0.08	FALSE		0.000417
Butane	0.521	4562	B	N	5	43748	FALSE	6300						
Cadmium	0.025	216	A	Y	None	None	FALSE		0.00056	n/a	0.0457	TRUE		0.000238
Chromium	0.019	162	B	Y	0.02	175	FALSE	1.7		n/a	0.00128	FALSE		0.00000667
Chrysene	0.0000004	0.0	A	Y	None	None	FALSE		0.00048	n/a	17.4	FALSE		0.0909
Cobalt	0.00002	0.18	B	Y	0.02	175	FALSE	0.17						
Copper	0.00021	1.8	B (fumes)	N	0.02	175	FALSE	0.67	n/a					
Dibenzo(a,h)anthracene	0.00000	0.00	A	Y	None	None	FALSE		0.00048	n/a	0.16	FALSE		0.000833
Dichlorobenzene	0.00030	2.6	A	Y	5	43748	FALSE	1000	5					
Dimethylbenz(a)anthracene	0.000004	0.03	A	Y	None	None	FALSE		0.00048					
Ethane	0.77	6735	Not Regulated	N	Not Regulated	Not Regulated	Not Regulated	Not Regulated	Not Regulated					
Fluoranthene	0.00000	0.0	A	Y	None	None	FALSE		0.00048					
Fluorene	0.00000	0.0	A	Y	None	None	FALSE		0.00048					
Formaldehyde	0.01860	163	A	Y	None	20	TRUE	n/a	0.077	n/a	32	TRUE		0.167
Hexane	0.45	3910	B (isomers)	Y	5	43748	FALSE	5900	n/a	3.83	n/a	TRUE		700
Indeno(1,2,3-cd)pyrene	0.00000	0.00	A	Y	None	None	FALSE		0.00048	n/a	1.74	FALSE		0.00909
Manganese	0.00038	3.33	B (fumes)	Y	0.02	175	FALSE	0.4	n/a	0.000219	n/a	TRUE		0.04
Mercury	0.00026	2.28	B (fumes)	Y	0.02	175	FALSE	0.33	n/a	0.000493	n/a	TRUE		0.09
Methylchloranthrene	0.0000004	0.0039	Not Regulated	N	Not Regulated	Not Regulated	Not Regulated	Not Regulated	Not Regulated					
Methylnaphthalene	0.000006	0.052	A	Y	None	None	FALSE		0.00048					
Molybdenum	0.00558	48.9	B	Y	0.2	1750	FALSE	17	n/a					
Naphthalene	0.00015	1	B	Y	2.6	22750	FALSE	170	n/a	n/a	5.64	FALSE		0.0294
Nickel	0.00558	49	A	Y	n/a	0.5	TRUE	n/a	0.0021	n/a	0.806	TRUE		0.0042
Pentane	0.64	5648	B	N	5	43748	FALSE	6000	n/a					
Phenanathrene	0.00000	0.0	Not Regulated	N	Not Regulated	Not Regulated	Not Regulated	Not Regulated	Not Regulated					
Propane	0.40	3476	Not Regulated	N	Not Regulated	Not Regulated	Not Regulated	Not Regulated	Not Regulated					
Pyrene	0.00000	0.0	A	Y	None	None	FALSE		0.00048					
Selenium	0.00001	0.05	B	Y	0.02	175	FALSE	0.67	n/a	2.63	n/a	FALSE		20
Toluene	0.00084	7	B	Y	5	43748	FALSE	400	n/a	27.4	n/a	FALSE		5000
Total PAH	0.00002	0	A	Y	0	0	TRUE	n/a	0.00048					
Vanadium	0.00057	5.0	B	N	0.02	175	FALSE	0.17	n/a	0.00329	n/a	TRUE		30
Zinc	0.00719	63	B	N	0.2	None	FALSE	17	n/a					

HAP Compliance Evaluation						**Exceeds**		
Air	**Potential**	**Potential**	**173-460-050**	**173-460-080**	**173-460-080**	**173-460-080**	**24-hour**	**Annual**
Pollutant	**Emissions**	**Emissions**	**173-460-060**	**Exemption**	**Exemption**	**Exemption**	**ASIL**	**ASIL**
	(lbs/hr)	**(lbs/yr)**	**Category**	**(lbs/hr)**	**(lbs/yr)**	**Threshold?**	**(ug/m3)**	**(ug/m3)**
H2SO4	1.59	13961	B	0.02	175	TRUE	3.3	n/a
Fluorides	0.69	6023	B	0.02	175	TRUE	8.3	n/a
Benzo(a)pyrene	0.0000004	0.004	A	n/a	None	n/a	n/a	0.00048
Beryllium	0.0000030	0.026	A	n/a	None	n/a	n/a	0.00042
Cadmium	0.025	216	A	n/a	None	n/a	n/a	0.00056
Formaldehyde	0.019	163	A	n/a	20	TRUE	n/a	0.077
Nickel	0.006	49	A	n/a	0.5	TRUE	n/a	0.0021
Total PAH	0.00002	0.2	A	n/a	None	n/a	n/a	0.00048

Appendix E

Dispersion Modeling Results

Scenario	Operating Mode	Comments	S01 - Furnace (lbs/hr)	S07 - Generator (lbs/hr)	S08 - Generator (lbs/hr)	Averaging Period	SIL (µg/m3)	SIL Statistic	Source Group	Sources	Corrected Result (µg/m3)
SIL - PM2.5	Normal	a	3.9	0	0.05	24-hour	1.2	5-Yr Avg 1st High Day	NORM1007	S01, S07	0.6
						Annual	0.3	5-Yr Avg	NORM1007	S01, S07	0.1
	Maintenance	a	3.9	0	0	24-hour	1.2	5-Yr Avg 1st High Day	MAINS01	S01	0.5
						Annual	0.3	5-Yr Avg	MAINS01	S01	0.03
SIL - PM10	Normal	a	3.9	-1.01	0.05	24-hour	5	1st Highest	NORM1007	S01, S07	0.3
						Annual	1	1st Highest	NORM1007	S01, S07	0.05
	Maintenance	a	3.9	0	0	24-hour	5	1st Highest	MAINS01	S01	0.3
						Annual	1	1st Highest	MAINS01	S01	0.03
SIL - SO2	Normal	b	8.75	-1.01	0.02	1-hour	7.8	5-Yr Avg 1st High Hr Day	NORM1007	S01, S07	7.6
						3-hour	25	1st Highest	NORM1007	S01, S07	5.3
						24-hour	5	1st Highest	NORM1007	S01, S07	2.5
						Annual	1	1st Highest	NORM1007	S01, S07	0.1
	Maintenance	b	13.9	0	0	1-hour	7.8	5-Yr Avg 1st High Hr Day	MAINS01	S01	11.4
						3-hour	25	1st Highest	MAINS01	S01	8.2
						24-hour	5	1st Highest	MAINS01	S01	1.6
						Annual	1	1st Highest	MAINS01	S01	0.1
SIL - CO	Normal	c	[-115.7]	0	4.15	1-hour	2000	1st Highest	S07S08	S07, S08	41.5
						8-hour	500	1st Highest	S07S08	S07, S08	16.6
	Maintenance		Same as Normal	Same as Normal	Same as Normal						
SIL - Pb	Normal	d	0.002	0	0	3-month	0.15	1st Highest	MAINS01	S01	0.00004
	Maintenance		Same as Normal	Same as Normal	Same as Normal						
NAAQS - NOx	Normal	e	50.9	40.56	0	1-hour	188	5-Yr Avg 8th High Hr Day	NORM1007	S01, S07	135.4
				0	24.9		188		NORM1008	S01, S08	101.6
			50.9	40.56	0	Annual	100	1st Highest	NORM1007	S01, S07	15.2
				0	24.9		100		NORM1008	S01, S08	6.3
	Maintenance	f	415.6	0	0	1-hour	188	5-Yr Avg 8th High Hr Day	MAINS01	S01	128.2
			415.6	0	0	Annual	100	1st Highest	MAINS01	S01	2.9
NAAQS - SO2	Normal	e	25.0	0.03	0	1-hour	188	5-Yr Avg 8th High Hr Day	NORM1007	S01, S07	25.7
				0	0.02		188		NORM1008	S01, S08	25.7
	Maintenance	f	103.8	0	0	1-hour	188	5-Yr Avg 8th High Hr Day	MAINS01	S01	107.2

Modeling Comments

a - Based on increase in emissions from the glass furnace (S01) and new emergency generator (S08). During glass furnace maintenance there will be no generator testing or emissions.

b - Based on increase in emissions from the glass furnace (S01), reduction in emissions from existing generator (S07) and emissions from new emergency generator (S08). During glass furnace maintenance there will be no generator testing or emissions.

c - Based on allowable emissions from new emergency generator. The glass furnace has an emissions reduction of 115.7 lbs/hr but this was not included in the analysis.

d - Based on increase in emissions from the glass furnace. Negligible emissions from emergency generators.

e - Based on new controlled emissions from glass furnace and 100% capacity uncontrolled emissions from either generator, S07 or S08.

f - Based on new uncontrolled emissions from glass furnace with no generator operation during air pollution control equipment maintenance, which will only occurs from May to October.

Corrected Result = Result using Chehalis Meteorlogy without One Minute Winds x Result using Olympia Meteorology with One Minute Winds ÷ Result using Olympia Meteorology without One Minute Winds

Corrected Result is based on maximum concentration predicted for each meteorology set and does not account for differences in time period or location.

Background (µg/m3)	Total Impact (µg/m3)	Complies with SIL or NAAQS?	Meteorology Chehalis	AERMOD File	A Result (µg/m3)	Meteorology Olympia - One	AERMOD File	B Result (µg/m3)	Meteorology Olympia - No One	AERMOD File	C Result (µg/m3)
0	0.6	Yes	KCLS1418	CFGpm1418A1	0.3	KOLM1418	CFGpm1418B1	0.4	KOLM1418NO_ONE	CFGpm1418C1	0.2
0	0.1	Yes	KCLS1418	CFGpm1418A1	0.05	KOLM1418	CFGpm1418B1	0.03	KOLM1418NO_ONE	CFGpm1418C1	0.03
0	0.5	Yes	KCLS1418	CFGpm1418A1	0.3	KOLM1418	CFGpm1418B1	0.3	KOLM1418NO_ONE	CFGpm1418C1	0.2
0	0.03	Yes	KCLS1418	CFGpm1418A1	0.03	KOLM1418	CFGpm1418B1	0.02	KOLM1418NO_ONE	CFGpm1418C1	0.02
0	0.3	Yes	KCLS1418	CFGpm1418A2	0.2	KOLM1418	CFGpm1418B2	0.5	KOLM1418NO_ONE	CFGpm1418C2	0.3
0	0.05	Yes	KCLS1418	CFGpm1418A2	0.05	KOLM1418	CFGpm1418B2	0.03	KOLM1418NO_ONE	CFGpm1418C2	0.03
0	0.3	Yes	KCLS1418	CFGpm1418A2	0.2	KOLM1418	CFGpm1418B2	0.4	KOLM1418NO_ONE	CFGpm1418C2	0.3
0	0.03	Yes	KCLS1418	CFGpm1418A2	0.02	KOLM1418	CFGpm1418B2	0.03	KOLM1418NO_ONE	CFGpm1418C2	0.02
0	7.6	Yes	KCLS1418	CFGsx1418A1	2.3	KOLM1418	CFGsx1418B1	10.9	KOLM1418NO_ONE	CFGsx1418C1	3.3
0	5.3	Yes	KCLS1418	CFGsx1418A2	1.1	KOLM1418	CFGsx1418B2	7.2	KOLM1418NO_ONE	CFGsx1418C2	1.5
0	2.5	Yes	KCLS1418	CFGsx1418A2	0.4	KOLM1418	CFGsx1418B2	1.9	KOLM1418NO_ONE	CFGsx1418C2	0.3
0	0.1	Yes	KCLS1418	CFGsx1418A2	0.04	KOLM1418	CFGsx1418B2	0.04	KOLM1418NO_ONE	CFGsx1418C2	0.02
0	11.4	No	KCLS1418	CFGsx1418A1	2.8	KOLM1418	CFGsx1418B1	15.9	KOLM1418NO_ONE	CFGsx1418C1	3.9
0	8.2	Yes	KCLS1418	CFGsx1418A2	2.4	KOLM1418	CFGsx1418B2	8.2	KOLM1418NO_ONE	CFGsx1418C2	2.4
0	1.6	Yes	KCLS1418	CFGsx1418A2	1.1	KOLM1418	CFGsx1418B2	1.3	KOLM1418NO_ONE	CFGsx1418C2	0.9
0	0.1	Yes	KCLS1418	CFGsx1418A2	0.1	KOLM1418	CFGsx1418B2	0.1	KOLM1418NO_ONE	CFGsx1418C2	0.1
0	41.5	Yes	KCLS1418	CFGco1418A1	25.7	KOLM1418	CFGco1418B1	41	KOLM1418NO_ONE	CFGco1418C1	25.4
0	16.6	Yes	KCLS1418	CFGco1418A1	16.9	KOLM1418	CFGco1418B1	16.1	KOLM1418NO_ONE	CFGco1418C1	16.4
0	0.00004	Yes	KCLS1418	CFGpb1418A1	0.00004	KOLM1418	CFGpb1418B1	0.00004	KOLM1418NO_ONE	CFGpC1418C1	0.00004
51.6	187.0	Yes	KCLS1418	CFGnx1418A1	117.3	KOLM1418	CFGnx1418B1	161.3	KOLM1418NO_ONE	CFGnx1418C1	139.7
51.6	153.2	Yes	KCLS1418	CFGnx1418A1	70.0	KOLM1418	CFGnx1418B1	106.0	KOLM1418NO_ONE	CFGnx1418C1	73.0
12.7	27.9	Yes	KCLS1418	CFGnx1418A1	14.3	KOLM1418	CFGnx1418B1	17.6	KOLM1418NO_ONE	CFGnx1418C1	16.6
12.7	19.0	Yes	KCLS1418	CFGnx1418A1	8.9	KOLM1418	CFGnx1418B1	11.7	KOLM1418NO_ONE	CFGnx1418C1	16.6
51.6	179.8	Yes	KCLS1418	CFGnx1418A1	41.6	KOLM1418	CFGnx1418B1	126.4	KOLM1418NO_ONE	CFGnx1418C1	41.0
12.7	15.6	Yes	KCLS1418	CFGnx1418A1	2.4	KOLM1418	CFGnx1418B1	2.3	KOLM1418NO_ONE	CFGnx1418C1	1.9
12.7	38.4	Yes	KCLS1418	CFGsx1418A3	4.3	KOLM1418	CFGsx1418B3	25.1	KOLM1418NO_ONE	CFGsx1418C3	4.2
12.7	38.4	Yes	KCLS1418	CFGsx1418A3	4.3	KOLM1418	CFGsx1418B3	25.1	KOLM1418NO_ONE	CFGsx1418C3	4.2
12.7	119.9	Yes	KCLS1418	CFGsx1418A3	17.7	KOLM1418	CFGsx1418B3	104.2	KOLM1418NO_ONE	CFGsx1418C3	17.2

Compliance Evaluation						Exceeds	
Air	Potential	Potential	173-460-050	173-460-080	173-460-080	173-460-080	24-hour
Pollutant	Emissions	Emissions	173-460-060	Exemption	Exemption	Exemption	ASIL
	(lbs/hr)	(lbs/yr)	Category	(lbs/hr)	(lbs/yr)	Threshold?	(ug/m3)
Ammonia	2.1801	13961.3	B	2	17,500	TRUE	100
H2SO4	1.5938	13961.3	B	0.02	175	TRUE	3.3
Fluorides	0.6875	6022.5	B	0.02	175	TRUE	8.3
Benzo(a)pyrene	0.0000004	0.004	A	n/a	None	n/a	n/a
Beryllium	0.000003	0.026	A	n/a	None	n/a	n/a
Cadmium	0.0247	216.2	A	n/a	None	n/a	n/a
Formaldehyde	0.0186	162.9	A	n/a	20	TRUE	n/a
Nickel	0.0056	48.9	A	n/a	0.5	TRUE	n/a
Total PAH	0.00002	0.2	A	n/a	None	n/a	n/a

Note:

Note: HAP modeling concentrations are derived using 1-hour and annual-average modeling results for glass furnace EU1 alone and ratio of HAP emissions and SO2 emissions from glass furnace EU1 alone.

Annual	SO2	SO2	SO2	HAP	HAP	HAP < ASIL
ASIL	Rate	24-hour Average	Annual Average	24-hour Average	Annual Average	
(ug/m3)	(lbs/hr)	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)	
n/a	13.9	1.6	0.1	0.25		Yes
n/a	13.9	1.6	0.1	0.18		Yes
n/a	13.9	1.6	0.1	0.08		Yes
0.00048	13.9	1.6	0.1		3.2E-09	Yes
0.00042	13.9	1.6	0.1		2.1E-08	Yes
0.00056	13.9	1.6	0.1		1.8E-04	Yes
0.077	13.9	1.6	0.1		1.3E-04	Yes
0.0021	13.9	1.6	0.1		4.0E-05	Yes
0.00048	13.9	1.6	0.1		1.5E-07	Yes

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Appendix T. EPA Memo – Clarifications Regarding RH SIP

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

July 8, 2021

MEMORANDUM

SUBJECT: Clarifications Regarding Regional Haze State Implementation Plans for the Second Implementation Period

FROM: Peter Tsirigotis
Director

Tsirigotis, Peter
Digitally signed by Tsirigotis, Peter
Date: 2021.07.08 14:44:35 -04'00'

TO: Regional Air Division Directors, Regions 1-10

This memorandum provides information on the Regional Haze second planning period in light of questions and information the Environmental Protection Agency (EPA) is receiving regarding State Implementation Plan (SIP) development. The purpose is to share more broadly the types of issues in draft SIPs being raised from EPA Regions and from other stakeholders and to offer feedback more broadly to help support SIP development, submittal, review, and action for the second planning period (also referred to as the second implementation period). The memorandum provides a good balance of flexibility and accountability for states and sources to ensure that the regional haze program will continue to improve visibility in our national parks and wilderness areas.

EPA promulgated revisions to the Regional Haze Rule (RHR) in 2017[1] and in August 2019 issued *Guidance on Regional Haze State Implementation Plans for the Second Implementation Period* (August 2019 Guidance or Guidance).[2] Since that time, air agencies and other stakeholders including industry, conservation organizations, and Federal Land Managers (FLMs) have raised various questions regarding RHR requirements as part of their SIP development for the second planning period. EPA recognizes and appreciates the work of all stakeholders in developing and providing feedback on SIPs so far. With the July 31, 2021, SIP deadline rapidly approaching, some states have already submitted final SIPs to EPA; some are undergoing public notice and comment processes at the state level, as well as other types of engagement; and some are still in the development phase. This memorandum highlights key aspects of the RHR and August 2019 Guidance in the context of questions and information shared from states and EPA Regional offices during SIP development.

[1] "Protection of Visibility: Amendments to Requirements for State Plans," 82 FR 3078 (January 10, 2017).
[2] Available at *https://www.epa.gov/sites/production/files/2019-08/documents/8-20-2019_-_regional_haze_guidance_final_guidance.pdf.*

EPA is committed to supporting state efforts to develop SIPs that comply with the Clean Air Act (CAA) and RHR as we work together in partnership to prevent any future, and remedy any existing, impairment of visibility in mandatory Class I Federal areas – America's treasured national parks and wilderness areas. EPA intends the second planning period of the regional haze program to secure meaningful reductions in visibility impairing pollutants that build on the significant progress states have already achieved. There exist many opportunities for states to leverage both ongoing and upcoming emission reductions under other CAA programs; however, we also expect states to undertake rigorous reasonable progress analyses that identify further opportunities to advance the national visibility goal consistent with the statutory and regulatory requirements.

This memorandum does not change or substitute for provisions or requirements of the CAA or RHR, nor does it create any new requirements. Rather, this memorandum clarifies and provides further information on the existing statutory and regulatory requirements. EPA evaluates and acts on states' SIP submissions on a case-by-case basis. The Agency reviews each submission against the applicable requirements; the Agency's approval or disapproval of a state's submission is subject to judicial review in the appropriate U.S. Circuit Court of Appeal pursuant to CAA section 307(b)(1). This memorandum does not constitute or prejudge EPA action on any state's submission but rather clarifies our interpretation of the applicable statutory and regulatory requirements against which submissions will be evaluated in subsequent, separate actions.

Non-mandatory language such as "guidance," "recommend," and "may" in this memorandum is intended to describe EPA's non-binding recommendations, while mandatory terminology such as "must," "required," and "may not" is intended to describe legal requirements under the CAA or EPA regulations. Neither such language nor anything else in this memorandum is intended to or does establish legally binding requirements in and of itself, and no part of this memorandum has legally binding effect or represents the consummation of Agency decision making. It is, therefore, not a final agency action and is not judicially reviewable.

1. Background

The regulatory requirements for states' second planning period SIPs are codified at 40 CFR 51.308(f). The August 2019 Guidance provides a suggested process for meeting these requirements and outlines eight key regional haze SIP development steps.[3] This memorandum addresses specific issues related to several of these steps in response to stakeholder questions and issues arising in draft SIPs. Specifically, Section 2 of this memorandum discusses source selection, Section 3 discusses characterization of factors for emission control measures, and Section 4 discusses decisions on what control measures are necessary to make reasonable progress. Section 5 discusses topics that span multiple steps in the Guidance: consideration of visibility in making control determinations, consideration of the five additional factors, characterizing visibility impacts and benefits, use of the uniform rate of progress (URP) is not a safe harbor, the contents of the long-term strategy, setting of reasonable progress goals (RPGs), and environmental justice.

[3] *See* August 2019 Guidance at 5-6.

2. Selection of Sources for Analysis

In reviewing draft SIPs, EPA has observed that states are applying an array of source selection methods and are, in some instances, relying on multi-state evaluations. In this context, multi-state or regional evaluations involve consideration of sources across more than one state and rank those sources based on their relative visibility impact. Based on these initial SIP reviews, this section reiterates key aspects of source selection in order to support Regional offices in working collaboratively with states on this issue. Consistent with RHR section 51.08(f)(2)(i), SIPs must include a description of the criteria the state used to determine the sources or groups of sources it evaluated for controls that may be necessary to make reasonable progress. "Step 3" of the August 2019 Guidance describes the process by which states determine, or select, sources for subsequent control analysis using the four statutory factors in CAA section 169A(g)(1). Source selection is a critical step in states' analytical processes. All subsequent determinations of what constitutes reasonable progress flow from states' initial decisions regarding the universe of pollutants and sources they will consider for the second planning period. States cannot reasonably determine that they are making reasonable progress if they have not adequately considered the contributors to visibility impairment. Thus, while states have discretion to reasonably select sources, this analysis should be designed and conducted to ensure that source selection results in a set of pollutants and sources the evaluation of which has the potential to meaningfully reduce their contributions to visibility impairment.

2.1. Factors to Consider for Source Selection

While reviewing draft regional haze SIPs, EPA has found that some rely on source selection methodologies that result in selection of the largest regional contributors to visibility impairment across multiple states. While this approach may be permissible in some cases, it may not be reasonable for a particular state if it results in few or no sources in that state being selected. Under the RHR, each state has an obligation to submit a long-term strategy that addresses the regional haze visibility impairment resulting from emissions from within that state.[4] This obligation is not discharged simply because another state's contributions to visibility impairment may be greater.

States have discretion to choose any source selection threshold or methodology that is reasonable; however, whatever choices states make should be reasonably explained and produce a reasonable outcome. The RHR does not explicitly list factors that states must or may not consider when selecting sources for analysis, but the August 2019 Guidance identifies several factors that states may consider. A state that relies on a visibility (or proxy for visibility impact) threshold to select sources for four-factor analysis should set the threshold at a level that captures a meaningful portion of the state's total contribution to visibility impairment to Class I areas. In applying a source selection methodology, states should focus on the in-state contribution to visibility impairment and not decline to select sources based on the fact that there are larger out-of-state contributors. What is reasonable will depend on the specific circumstances. We generally think that a threshold that captures only a small portion of a state's contribution to visibility impairment in Class I areas is more likely to be unreasonable. Similarly, a threshold that excludes a state's largest visibility impairing sources from selection is more likely to be unreasonable.

[4] *See* 40 CFR 51.308(f)(2).

The 2017 RHR recognized that, due to the nature of regional haze (visibility impairment that is caused by the emissions of air pollutants from numerous anthropogenic sources located over a wide geographic area), numerous and sometimes (relatively) smaller in-state sources may need to be selected and evaluated for control measures as part of the reasonable progress analysis. As stated in response to comments on the 2017 RHR, "[a] state should not fail to address its many relatively low-impact sources merely because it only has such sources and another state has even more low-impact sources and/or some high impact sources."[5] In a source-selection process that relies on multi-state rankings of sources, impacts from large out-of-state sources can exceed the contributions from relatively smaller, but still important in-state sources. States should not use that fact to ignore selecting the largest in-state sources. In general, states with larger sources that contribute more to visibility impairment should select more sources, and states with relatively small sources compared to their neighbors should nonetheless select their largest in-state sources.

As an example, and purely for purposes of illustration, a 2,500 tons per year (tpy) source may not be considered "high impact" by some states depending on state-specific circumstances or as compared to a 25,000 tpy source in a nearby state. However, a state should still select the 2,500 tpy source if it is among the largest sources of visibility impairment in the state. Importantly, the numbers are offered as an illustration and should not be construed as broadly applicable thresholds for source selection; the appropriate threshold for a state to use will generally depend on the sources in each state. Moreover, we are not suggesting that states should select sources that have inarguably negligible impacts on visibility. Additionally, states should be consistent in their source selection. Absent a persuasive reason, a state should not select some sources for analysis but decline to select other, similarly situated sources (*e.g.*, in terms of emissions, visibility impacts, feasibility of controls). EPA anticipates that this overall approach would be consistent with the RHR and the CAA.

Finally, given the interstate nature of regional haze, other states that also contribute at a given Class I area and FLMs play important roles in addressing visibility impairment. Pursuant to the RHR, states must, therefore, consider selecting sources identified by other states[6] or by FLMs.[7] A state receiving a request to select a particular source(s) should either perform a four-factor analysis on the source(s) or provide a well-reasoned explanation as to why it is choosing not to do so.[8]

2.2. Pollutants Considered for Source Selection and Control Strategy Analysis

Consistent with the first planning period, EPA generally expects that each state will analyze sulfur dioxide (SO_2) and nitrogen oxide (NOx) in selecting sources and determining control measures.[9] In nearly all Class I areas, the largest particulate matter (PM) components of anthropogenic visibility impairment are sulfate and nitrate, caused primarily by PM precursors SO_2 and NOx, respectively. A state that chooses not to consider at least these two pollutants in the

[5] Responses to Comments on Protection of Visibility: Amendments to Requirements for States Plans; Proposed Rule (81 FR 26942, May 4, 2016) at 87-88, available at *https://www.regulations.gov/document/EPA-HQ-OAR-2015-0531-0635*.
[6] *See* 40 CFR 51.308(f)(2)(ii).
[7] *See* 40 CFR 51.308(i)(2)-(3).
[8] *See* 40 CFR 51.308(f)(2)(ii), (i)(2)-(3).
[9] *See* August 2019 Guidance at 12.

second planning period should show why such consideration would be unreasonable, especially if the state considered both these pollutants in the first planning period. Regional offices are encouraged to work closely with states to ensure the bases for their decisions are sufficiently developed to demonstrate a reasonable analysis.

2.3. Sources that are Not Selected Based on Existing Effective Controls

The August 2019 Guidance provides that a source that otherwise would undergo four-factor analysis (*e.g.*, because it exceeds a threshold of emissions divided by distance or Q/d, visibility, or other source-selection threshold) may forgo a full four-factor analysis if it is already "effectively controlled."[10] While this flexibility has the potential to streamline states' planning processes, states that identify "effectively controlled" sources need to explain why it is reasonable to assume that a four-factor analysis would likely result in the conclusion that no further controls are reasonable.

The underlying rationale for the "effective controls" flexibility is that if a source's emissions are already well controlled, it is unlikely that further cost-effective reductions are available. A state relying on an "effective control" to avoid performing a four-factor analysis for a source should demonstrate why, for that source specifically, a four-factor analysis would not result in new controls and would, therefore, be a futile exercise. States should first assess whether the source in question already operates an "effective control" as described in the August 2019 Guidance.[11] They should further consider information specific to the source, including recent actual and projected emission rates, to determine if the source could reasonably attain a lower rate. It may be difficult for a state to demonstrate that a four-factor analysis is futile for a source just because it has an "effective control" if it has recently operated at a significantly lower emission rate. In that case, a four-factor analysis may identify a lower emission rate (*e.g.*, associated with more efficient use of the "effective existing controls") that may be reasonable and thus necessary for reasonable progress. If a source can achieve, or is achieving, a lower emission rate using its existing measures than the rate assumed for the "effective control," a state should further analyze the lower emission rate(s) as a potential control option.

2.4. States that Select No Sources for Four-Factor Analysis

EPA has noted that multiple draft regional haze SIPs selected no sources for four-factor analysis. Although the August 2019 Guidance implied that there may be circumstances in which this might be reasonable,[12] we expect such circumstances to be rare given that anthropogenic visibility impairment remains in all Class I areas and that all states contains sources of visibility impairing pollutants.[13] We reiterate that a state that brings no sources forward for analysis of

[10] *See* August 2019 Guidance at 22-25.
[11] *Id.*
[12] *See* August 2019 Guidance at 10.
[13] *Cf.* "Approval and Promulgation of Air Quality Implementation Plans; District of Columbia; Regional Haze State Implementation Plan for the Second Implementation Period and Reasonably Available Control Technology for Major Stationary Sources of Nitrogen Oxides; Technical Amendment," 86 FR 1793, 19805-07 (April 15, 2021) (explaining that EPA proposed to find the District of Columbia's decision to not conduct four-factor analyses for any sources reasonable because, *inter alia*, the District does not contain any point sources with large emissions of visibility impairing pollutants and the largest point source is already effectively controlled).

control measures must explain how doing so is consistent with the statutory and regulatory requirements for SIPs to contain the measures necessary to make reasonable progress. In this case, the state is not merely asserting that its sources need no further controls to make reasonable progress, but that even identifying sources to analyze is a futile exercise because it is obvious that a four-factor analysis would not result in any new controls. Bringing no sources forward for source selection without a thoroughly justified explanation of why it is reasonable to forgo a four-factor analysis is inconsistent with the statutory and regulatory requirements because, as discussed in Section 3, the determination of reasonable progress is based on the consideration of the four statutory factors.

3. Characterization of Factors for Emission Control Measures

States must evaluate and determine the emission reduction measures, or controls, for selected sources that are necessary to make reasonable progress by considering the four statutory factors (costs of compliance, time necessary for compliance, energy and non-air quality environmental impacts of compliance, and the remaining useful life of any existing source).[14] That is, a state must apply the four factors to its selected sources, either individually or as a group. In light of our review of draft SIPs and questions from states, we are sharing feedback here regarding three key aspects of the four-factor analysis: the structure of the reasonable progress analysis; what control options states should consider in a reasonable four-factor analysis; and what constitutes a reasonable grouping of sources for four-factor analysis.

3.1. Relationship Between Four-Factor Analysis, Long-Term Strategy, and Reasonable Progress Goals

Over the course of recent discussions with states and stakeholders, we have realized that there is still some confusion regarding the relationship between the four-factor analysis, the long-term strategy, and RPGs. We are, therefore, reiterating our explanation from the 2017 RHR revisions that the four statutory factors are used to determine the emission reduction measures that are necessary to make reasonable progress and must, therefore, be included in a state's long-term strategy.[15] Reasonable progress towards natural visibility conditions at any particular Class I area is achieved when all contributing states are implementing the measures in their long-term strategies. RPGs are the modeled result of the measures in states' long-term strategies, as well as other measures required under the CAA (that have compliance dates on or before the end of 2028).[16] RPGs cannot be determined before states have conducted their four-factor analyses and determined the control measures that are necessary to make reasonable progress.[17]

[14] 40 CFR 51.308(f)(2)(i).
[15] 40 CFR 51.308(f)(2)(i), (f)(2); *see also* 82 FR at 3090-96.
[16] 40 CFR 51.308(f)(3).
[17] The August 2019 Guidance allows for the possibility of post-modeling adjustments to the RPGs to account for the fact that final long-term strategy decisions for the state or for other states may not be known until late in the process, or even after SIPs are submitted. *See* August 2019 Guidance at 46-48. *See also*, 82 FR 3078, 3080 (January 10, 2017).

3.2. Control Options for Four-Factor Analysis

We are providing additional feedback about the control measures that states should include in four-factor analyses for their sources. The four factors are used to assess and choose between emission reduction measures for sources of visibility impairing pollutants. A reasonable four-factor analysis will consider the full range of potentially reasonable options for reducing emissions. The August 2019 Guidance lists examples of different types of control measures that states may consider in their four-factor analyses for sources.[18] In addition to add-on controls and other retrofits, the Guidance also lists emission reductions through improved work practices; upgrades or replacements for existing, less effective controls; and year-round operation of existing controls.

Similarly, in some cases, states may be able to achieve greater control efficiencies, and, therefore, lower emission rates, using their existing measures. Considering efficiency improvements for an existing control (*e.g.*, using additional reagent to increase the efficiency of an existing scrubber) as a potential measure is generally reasonable since in many cases such improvements may only involve additional operation and maintenance costs. States should generally include efficiency improvements for sources' existing measures as control options in their four-factor analyses in addition to other types of emission reduction measures. In rare instances, increasing the efficiency of a control measure might result in adverse energy or non-air quality environmental impacts. If this is the case, such impacts should generally be addressed in the context of a four-factor analysis, rather than be used as a reason to not analyze increased efficiency of the measure in the first instance. We generally expect that most adverse energy and non-air quality environmental impacts of compliance are best assessed as part of the cost-effectiveness calculation; only in unusual circumstances do we anticipate that such impacts will preclude selection of an otherwise cost-effective control.

In addition to efficiency improvements, as part of a four-factor analysis states should consider recent actual and projected emission rates to determine if the source could otherwise reasonably attain a lower rate with its existing measures. This is especially important when a source has already achieved or is achieving a lower emission rate using its existing measures than the rate assumed in the baseline for its four-factor analysis. That is, a state might have assumed a conservatively high baseline emission rate for a source in its four-factor analysis, but the source has actually achieved, either currently or in recent years, a lower rate through status quo implementation of its existing measures. In this case, we expect the state to at least analyze the lower rate as a potential control option. It would be difficult for a state to demonstrate that there are no cost-effective emission reductions available for a source that has recently operated at significantly lower emission rates compared to the four-factor analysis baseline. That is, a four-factor analysis may identify a lower emission rate that may be necessary for reasonable progress.

3.3. Reasonable Grouping of Sources for Four-Factor Analysis

We also are clarifying that, although states have flexibility to consider the four factors for groups of sources, the reasonableness of grouping sources in any particular instance will depend on the circumstances and the manner in which grouping is conducted. If it is feasible to establish and enforce different requirements for sources or subgroups of sources, and if relevant factors can

[18] *See* August 2019 Guidance at 29-30.

be quantified for those sources or subgroups, then states should make a separate reasonable progress determination for each source or subgroup. For example, where a control measure is highly cost effective, results in large emissions reductions, and is identified as important for addressing visibility impairment by virtue of a source having been selected for four-factor analysis, the state should generally not reject that control by grouping the source together with other sources without similarly reasonable controls and then claiming that no controls should be required across the entire group. If the control is reasonable for the source, the state should generally require it.

4. Decisions on What Control Measures are Necessary to Make Reasonable Progress

EPA has received multiple questions from states and stakeholders asking what to do when a four-factor analysis concludes that no new emission control measures are reasonable for a source. The August 2019 Guidance addresses how, once a state has characterized the four statutory factors for the selected sources, it makes decisions on what emission control measures are necessary to make reasonable progress for the second planning period.[19] If four-factor analyses evaluate a reasonable range of potential control options, we anticipate that in many cases states will find that new (*i.e.*, additional) measures are necessary to make reasonable progress. All new measures must be included in the SIP.[20]

However, there may be other cases where, after having conducted robust source selection and rigorous analysis of the four factors, states have not identified any new measures that are reasonable to require for a source. In such cases, states will have to address whether the source's existing measures are necessary to make reasonable progress. The August 2019 Guidance provides that, "[i]f a state determines that an in-place emission control at a source is a measure that is necessary to make reasonable progress and there is not already an enforceable emission limit corresponding to that control in the SIP, the state is required to adopt emission limits based on those controls as part of its long-term strategy in the SIP via the regional haze second planning period plan submission."[21]

4.1. Determining When Existing Measures are Necessary for Reasonable Progress

States and stakeholders have raised a number of questions related to determining when in-place (*i.e.*, "existing") measures at a source are necessary for reasonable progress. The four-factor analysis is used to determine the emission control measures that are necessary to make reasonable progress towards the national visibility goal. That goal has two prongs: the prevention of any future anthropogenic visibility impairment and the remedying of any existing anthropogenic visibility impairment.[22] Existing visibility impairment is remedied by reducing emissions from existing sources. Future visibility impairment is prevented by mitigating impacts from new sources and ensuring that existing sources do not increase their emissions in a manner inconsistent with reasonable progress. Thus, when the outcome of a four-factor analysis is a new measure, that measure is needed to remedy existing visibility impairment and is necessary to make reasonable progress. When the outcome of a four-factor analysis is that no new measures are reasonable for a

[19] *See* August 2019 Guidance at 36-45.
[20] CAA 169A(b)(2); 40 CFR 51.308(f)(2).
[21] August 2019 Guidance at 43.
[22] *See* CAA section 169A(a)(1).

source, the source's existing measures are generally needed to prevent future visibility impairment (*i.e.*, to prevent future emission increases) and thus necessary to make reasonable progress. Measures that are necessary to make reasonable progress must be included in the SIP.

However, there may be circumstances in which a source's existing measures are not necessary to make reasonable progress. Specifically, if a state can demonstrate that a source will continue to implement its existing measures and will not increase its emission rate, it may not be necessary to require those measures under the regional haze program in order to prevent future emission increases. In this case, a state may reasonably conclude that a source's existing measures are not necessary to make reasonable progress and thus do not need to be included in the SIP. A determination that a source's existing measures are not necessary to make reasonable progress should be supported by a robust technical demonstration. This empirical, weight-of-evidence demonstration should be based on data and information on (1) the source's past implementation of its existing measures and its historical emission rate, (2) the source's projected emissions and emission rate, and (3) any enforceable emissions limits or other requirements related to the source's existing measures.

Information on a source's past performance using its existing measures may help to inform the expected future operation of that source. If either a source's implementation of its existing measures or the emission rate achieved using those measures has not been consistent in the past, it is not reasonable to assume that the source's emission rate will remain consistent and will not increase in the future. To this end, states should include data for a representative historical period demonstrating that the source has consistently implemented its existing measures and has achieved, using those measures, a reasonably consistent emission rate.[23] For most sources, data from the most recent 5 years (if available) is sufficient to make this showing. Information pertinent to a source's implementation of its existing measures going forward is also critical to a state's demonstration. States should provide data and information on the source's projected emission rate (*e.g.*, for 2028), including assumptions and inputs to those projections. States should justify those assumptions and inputs and explain why it is reasonable to expect that the source's emission rate will not increase in the future.

The existence of an enforceable emission limit or other enforceable requirement (*e.g.*, a work practice standard or operational limit) reflecting a source's existing measures may also be evidence that the source will continue implementing those measures. A federally enforceable and permanent requirement provides the greatest certainty and, therefore, is the preferred and best evidence. EPA will consider these and other types of limits and operational requirements as part of its weight-of-evidence evaluation. To be relevant, the limit should reflect the emission rate the source is actually achieving with its existing measures. A limit that is significantly higher than the emission rate a source is actually achieving does not keep the source from increasing its rate in the future. States should provide information on any enforceable emission limits associated with sources' existing measures. States should also clearly identify the instrument in which the relevant limit(s) exist (by providing, *e.g.*, the applicable permit number and where it can be found) and

[23] The information on emission rates should be representative of the typical averaging time of enforceable limits for the source. Typical averaging times for regional haze SIP measures are 30-day rolling averages or 30-day boiler operating day averages, but could also be shorter-term averages, (*e.g.*, pounds/hour) or may be expressed in different units (*e.g.*, pounds/ton of product produced).

provide information on the specific permit provision(s) on which they are relying. If the instrument is not publicly available or readily accessible, a state should provide a copy of the instrument to EPA with its SIP submission.

States may also provide any additional information they believe demonstrates that a source will continue to implement its existing measures and that its emission rate will not increase in the future. EPA will evaluate states' demonstrations to determine if they adequately support a determination that a source's existing measures are not necessary to make reasonable progress.

4.2. Existing Effective Controls

As noted in Section 2.3, states may rely on "existing effective controls" to not select a source for a full four-factor analysis. In determining whether such controls are necessary to make reasonable progress, states should follow the same approach as for existing measures. A decision to forgo a full four-factor analysis based on a source's existing effective controls is equivalent to a determination that no new measures are necessary to make reasonable progress. In this scenario, existing effective controls are, therefore, generally necessary to make reasonable progress and thus must be adopted into the regulatory portion of the SIP. However, the state may provide a weight-of-evidence demonstration as described in Section 4.1 to justify that the existing effective control is not necessary for reasonable progress.

4.3. "On-the-Way" Measures and Shutdowns

States and stakeholders have also asked about how to treat so-called "on-the way" measures. Generally, on-the-way measures include situations in which measures have not yet been implemented and the associated emissions reductions have not yet occurred as of the SIP submission date. If a state is relying on an on-the-way measure to achieve future emission reductions that are needed to remedy existing visibility impairment, that measure is necessary to make reasonable progress. Anticipated source shutdowns could be considered the most stringent on-the-way measure,[24] and may be relied upon to forgo a four-factor analysis or shorten the remaining useful life of a source.[25] In general, there is less certainty that a future control measure or shutdown will be implemented and permanent, or that it will actually achieve the emission reductions that are necessary to make reasonable progress. Therefore, on-the-way measures, including anticipated shutdowns that are relied on to forgo a four-factor analysis or to shorten the remaining useful life of a source, are necessary to make reasonable progress and must be included in a SIP.

[24] The August 2019 Guidance provides two ways in which states may rely on anticipated shutdowns in the reasonable progress analysis: to forgo conducting a four-factor analysis for a source or to shorten the remaining useful life of a source for the purpose of a four-factor analysis. *See* August 2019 Guidance at 20 and 34, respectively.

[25] *See* August 2019 Guidance at 20, 34.

4.4. Ongoing Evaluation of the Adequacy of Existing Measures

A state's determination that an existing measure is not necessary to make reasonable progress depends on a well-supported demonstration about the future implementation of that measure. EPA anticipates conducting robust evaluations of these determinations not only when acting on the SIP submission, but also as the planning period moves forward.

There are several available tools for states and EPA to report and track emissions. First, the RHR contains a mechanism for states and EPA to evaluate whether existing SIP-based emissions limits are sufficient to achieve reasonable progress. States are required to submit periodic reports describing their progress towards the reasonable progress goals for each Class I area within the state and each Class I area outside the state that may be affected by emissions from within the state. For the second planning period, states' progress reports are due January 31, 2025.[26] As part of this report, states must assess whether their SIPs contain adequate enforceable emission limitations and other elements to ensure that their sources will achieve reasonable progress the second planning period. Additionally, 40 CFR 51.308(h) requires states, at the same time they submit their progress reports, to determine whether their SIPs are adequate to ensure reasonable progress. If a state determines that its SIP is inadequate to ensure reasonable progress due to emissions from sources within the state, the RHR requires that state to revise its SIP within 1 year to address the deficiencies.[27]

EPA expects to use states' progress reports, and the assessments required under 40 CFR 51.308(g)(6) and determinations under 40 CFR 51.308(h) in particular, as a check on whether sources are continuing to implement any existing measures a state determined were not necessary to make reasonable progress and, therefore, not required under the regional haze program. In addition, sources are required to report emissions data on an ongoing basis under several EPA programs, such as the Air Emissions Reporting Rule (40 CFR Appendix A to Part 51) and Continuous Emissions Monitoring (40 CFR Part 75). If at any point a source's emission rate increases to an extent that its existing SIP is inadequate to ensure reasonable progress, EPA has the authority to address such a scenario (*e.g.*, under CAA sections 110(k)(5) and (6)).

4.5. Form of Emission Limit

EPA has received several questions from states and stakeholders about establishing emission limits, with a specific focus on existing measures that are necessary to make reasonable progress and must be included in the SIP. This section provides feedback on what SIP-based emission limits, whether for new or existing measures, should reflect. In general, an emission limit reflecting a source's existing measures that are necessary to make reasonable progress should be in the form of the emission rate achieved when implementing those measures (*e.g.*, pounds per million British thermal units or lbs/MMBtu, pounds per hour or lbs/hr, or pounds per ton or lbs/ton of produced material). For either a new or existing measure, states will have considered a specific emissions rate that can be achieved through implementation of that measure.[28] We, therefore,

[26] 40 CFR 51.308(g).
[27] 40 CFR 51.308(h)(4).
[28] As explained in section 3.2, if a source is able to achieve a lower emissions rate using its existing measure than the rate assumed in the baseline for its four-factor analysis, the state should consider that lower emissions rate as a potential control option.

expect that when a state that has determined a source's existing measures are necessary to make reasonable progress, it will effectively have determined that implementation of those measures *to achieve a particular emission rate* is necessary to make reasonable progress. The SIP-based emission limit for that source should correspond to the emission rate that was determined to be necessary to make reasonable progress.

Additionally, for the purpose of a four-factor analysis for a particular source, a state may have assumed significantly lower baseline emissions (total emissions by mass) due to a projected reduction in utilization or production. This issue has come up in some SIPs and has implications for both new and existing measures. As explained in the August 2019 Guidance, reasonable bases for projecting that future emissions will be significantly different than past emissions are enforceable requirements and energy efficiency, renewable energy, or other similar programs, where there is a documented commitment to participate and a verifiable basis for quantifying changes in future emissions. However, in some cases states may have projected significantly lower total emissions due to unenforceable utilization or production assumptions and those projections are dispositive of the four-factor analysis. For example, a state that rejected new controls solely based on cost effectiveness values that were higher due to low utilization assumptions. In this circumstance, an emission limit that requires compliance with only an emission rate may not be able to reasonably ensure that the source's future emissions will be consistent with the assumptions relied upon for the reasonable progress determination. EPA anticipates these circumstances will be rare. One option a state may consider in this case is to incorporate a utilization or production limit corresponding to the assumption in the four-factor analysis into the SIP. Although not required, this approach is one way for states to address circumstances in which a specific emission rate does not, by itself, represent the reasonable progress determination. That is, EPA would not require a state to lock-in the exact emission levels (tons of pollutant) a source assumed for the purpose of its four-factor analysis or the 2028 projected emission levels (tons of pollutant) assumed in air quality modeling analyses. An alternative approach would be to perform the four-factor analysis using recent historical utilization or production levels as the baseline. A revised four-factor analysis may show that cost-effective controls are available at the source's current or recent historical utilization or production.

5. Additional Issues Related to Assessing Control Measures

This section discusses the following additional issues, which span multiple steps as laid out in the August 2019 Guidance:

- Additional factors to evaluate emission controls (including visibility and the five "additional factors" listed in the RHR)
- Characterizing visibility impacts and benefits
- URP is not a safe harbor
- Contents of the long-term strategy and setting of RPGs
- Environmental justice considerations

5.1. Visibility as an Additional Factor

EPA has interpreted the CAA and RHR as allowing states to consider visibility alongside the four statutory factors when determining the emission reduction measures that are necessary to make reasonable progress. We have explained that:

> While the CAA lists the four reasonable progress factors, it is silent as to whether states or the EPA may consider other, additional factors. This final rule neither requires nor prohibits states from considering visibility when making reasonable progress determinations. . . . However, a state that elects to consider an additional factor such as visibility benefit must consider it in a reasonable way that does not undermine or nullify the role of the four statutory factors in determining what controls are necessary to make reasonable progress.[29]

Specifically, a state should not use visibility to summarily dismiss cost-effective potential controls. However, visibility benefits can be used alongside the four statutory factors when comparing multiple emission control options. For instance, the approach taken for Best Available Retrofit Technology (BART) determinations in the first planning period could be used as a model.[30] That is, for a source with multiple cost-effective controls, a state may balance visibility with cost effectiveness and other statutory factors in selecting a reasonable control. Another potentially reasonable approach might be for a state that identifies cost-effective new controls at a multitude of sources to choose to require controls at only a subset of those sources that constitute the vast majority of the visibility benefit. In this case, the state could rely on visibility benefits to prioritize which sources would receive new controls. By contrast, a state that has identified cost-effective controls for its sources but rejects most (or all) such cost-effective controls across those sources based on visibility benefits is likely to be improperly using visibility as an additional factor.

5.2. Consideration of the Five "Additional Factors"

We are aware that some states are using the five additional regulatory factors, in particular 40 CFR 51.308(f)(2)(iv)(A) and (E), to reject controls that are otherwise reasonable based on the four statutory factors. In the August 2019 Guidance, EPA provided that states may consider the five "additional factors" in section 51.308(f)(2)(iv) in making their emission control determinations.[31] However, a state should generally not reject cost-effective and otherwise reasonable controls merely because there have been emission reductions since the first planning period owing to other ongoing air pollution control programs or merely because visibility is otherwise projected to improve at Class I areas. More broadly, we do not think a state should rely on these two additional factors to summarily assert that the state has already made sufficient progress and, therefore, no sources need to be selected or no new controls are needed regardless of the outcome of four-factor analyses. Doing so would be similar in principle as relying on URP as a safe harbor, which we have consistently stated does not comport with the RHR, as noted in Section 5.4. We do think states can consider these factors in a more tailored manner, for instance in choosing between multiple control options when all are reasonable based on the four statutory factors.

[29] Response to Comments on Protection of Visibility: Amendments to Requirements for State Plans; Proposed Rule at 186.
[30] *See* 40 CFR 51.308(e)(1)(ii)(A).
[31] *See* August 2019 Guidance at 21.

5.3. Characterizing Visibility Impacts/Benefits

We have observed that some draft SIPs are using modeled visibility benefits to justify rejecting otherwise cost-effective control measures. It is important that, where applicable, each state considers the magnitude of modeled visibility impacts or benefits[32] in the context of its own contribution to visibility impairment. That is, whether a particular visibility impact or change is "meaningful" should be assessed in the context of the individual state's contribution to visibility impairment, rather than total impairment at a Class I area. As stated in the RHR preamble:

> Regional haze is visibility impairment that is caused by the emission of air pollutants from numerous sources located over a wide geographic area. At any given Class I area, hundreds or even thousands of individual sources may contribute to regional haze. Thus, it would not be appropriate for a state to reject a control measure (or measures) because its effect on the RPG is subjectively assessed as not "meaningful."[33]

EPA recognizes the significant improvements in visibility that have already occurred in most Class I areas but notes that additional progress is needed to achieve the national goal set by Congress. Evaluation of control measures for relatively smaller sources (with commensurate smaller visibility benefits from each individual source) will be needed to continue making reasonable progress towards the national goal. This is true for the second planning period, as many of the largest individual visibility impairing sources have either already been controlled (under the RHR or other CAA or state programs) or have retired. To this end, EPA is reiterating that visibility thresholds used for BART and other analyses in the first planning period (*e.g.*, 0.5 deciviews) are, in most cases, not appropriate thresholds for selecting sources or evaluating the impact of controls for reasonable progress in the second planning period. This is the case for several reasons.

First, regional haze is caused by hundreds or thousands of individual sources and very few remaining sources (or even none of them) will individually have impacts as large as 0.5 deciviews or some other threshold that might be considered a "perceptible" or "meaningful" impact. However, these sources still contribute to visibility impairment and have a meaningful impact in the aggregate. Second, the magnitude of the previously recommended subject-to-BART threshold (0.5 deciviews) was closely tied to the specific modeling tools and metrics recommended in the BART Guidelines,[34] as well as to the purpose and structure of the BART provisions.[35] For the second planning period, most states that are both establishing RPGs and (where applicable) evaluating individual source or sector visibility impacts, are using photochemical models with a focus on visibility impacts averaged over the 20 percent most impaired days at each Class I area. The difference in technical tools as well as emissions assumptions and impact metrics make any comparison of the modeling for the second planning period to the previous BART modeling an "apples-to-oranges" analysis.

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[32] As explained in the August 2019 Guidance, modeled visibility impacts can be expressed in either inverse megameters (Mm^{-1}) or deciviews (dv). However, if visibility impacts are expressed in deciviews, the value should be calculated relative to natural conditions. *See* August 2019 Guidance page 16 and footnotes 36, 37, and 38.
[33] 82 FR at 3093.
[34] 40 CFR part 51 appendix Y, Guidelines for BART Determinations Under the Regional Haze Rule § III.
[35] *See also* August 2019 Guidance footnote 41.

The differences between approaches include the type and number of days considered for a single source analysis, the emissions used to represent a single source, and metrics used to express visibility impacts. In particular, the BART Guidelines recommended modeling the highest measured daily emissions for a source, using the same high emissions value for every day of the year, in conjunction with a 98th percentile visibility metric that focused on the days with the largest visibility impact *from the source*. In addition, BART modeling assessments used 3 consecutive years to capture meteorological regimes that would be most conducive to high source impacts at a given downwind receptor. That makes the BART modeling results particularly conservative compared to current photochemical modeling that generally uses actual hourly and daily emissions, and typically evaluates visibility impacts averaged over the 20 percent most impaired days for a single year (representing the days with the largest anthropogenic visibility impairment at the Class I area receptors, not the days with the largest visibility impacts from the source). In many cases, the difference in the form of the modeled emissions and the visibility impact metrics alone could account for BART Guideline modeling impacts that are an order of magnitude, or more, higher than typical photochemical modeling impacts averaged over the 20 percent most impaired days for a single year.

Additionally, the August 2019 Guidance discusses other metrics[36] that may be appropriate for evaluating visibility impacts from individual sources, and notes that modeling a single year of meteorology and evaluating impacts only on the 20 percent most impaired days may not fully capture visibility impacts from an individual source at a given Class I area. The Guidance suggests that other metrics such as the maximum daily impact over the year may be a more meaningful metric for examining individual source impacts.[37] If available, visibility impacts from individual sectors and sources can also be evaluated as a fraction of state and/or total U.S. anthropogenic visibility impairment at a Class I area. Evaluating a source's or sector's visibility impact as a fraction of *anthropogenic* impairment is preferable to calculating impacts relative to *total* impairment since anthropogenic impairment is directly relevant to determining what constitutes reasonable progress towards the national goal. As noted elsewhere, a source's visibility impact relative to a *state's* total contribution to visibility impairment is relevant to ensuring that a state is addressing its own contribution regardless of what other states are doing.

5.4. Uniform Rate of Progress is Not a "Safe Harbor"

EPA has reviewed several draft second planning period regional haze SIPs that conclude that additional controls, including potentially cost-effective and otherwise reasonable controls, are not needed because all of the Class I areas in the state (and those out-of-state areas affected by emissions from the state) are below their uniform rates of progress (URPs). The 2017 RHR preamble and the August 2019 Guidance clearly state that it is not appropriate to use the URP in this way, *i.e.,* as a "safe harbor." The URP is a planning metric used to gauge the amount of progress made thus far and the amount left to make. It is not based on consideration of the four statutory factors and, therefore, cannot answer the question of whether the amount of progress made in any particular implementation period is "reasonable progress." This concept was explained in the RHR preamble.[38] Therefore, states must select a reasonable number sources and

[36] *See* August 2019 Guidance at 35.
[37] *See* August 2019 Guidance at 15-16 and 35.
[38] 82 FR at 3099.

evaluate and determine emission reduction measures that are necessary to make reasonable progress by considering the four statutory factors.

5.5. Contents of the Long-term Strategy and Setting RPGs

EPA has observed that, in some instances, states are not clearly articulating what measures are necessary for reasonable progress and being submitted for inclusion in the regulatory portion of their SIPs. Pursuant to CAA section 169A(b)(2) and 40 CFR 51.308(f)(2), the measures that are necessary to make reasonable progress must be included in a state's long-term strategy. States should clearly identify in their SIP narratives the emission reduction measures they have determined are necessary to make reasonable progress, as well as the corresponding emission limits and supporting conditions to make those limits practicably enforceable[39] that will be included in the regulatory portion of their SIPs. We note that states may also in their discretion identify additional measures, beyond what is necessary to make reasonable progress, for inclusion in the long-term strategy. Such optional measures do not, however, satisfy a state's obligation to identify the measures that are necessary to make reasonable progress by considering the four statutory factors and include those measures in the long-term strategy.

5.6. Environmental Justice

EPA encourages states to consider whether there may be equity and environmental justice impacts when developing their regional haze strategies for the second planning period. This consideration could occur in different ways, including undertaking meaningful outreach to environmental justice communities; ensuring adequate opportunity for feedback on states' proposed strategies; and considering equity and environmental justice impacts as part of the technical analyses supporting the SIP, including source selection and four-factor analyses. For example, states could consider environmental justice when they consider the appropriate inclusivity of source selection and the suite of emissions control options that should be analyzed, and when they exercise their discretion in determining what is necessary to make reasonable progress towards the national visibility goal. In general, we encourage states to be aware of where sources of visibility impairing air pollutants are located and impacts, they may have on environmental justice communities. States have discretion to consider environmental justice in determining the measures that are necessary to make reasonable progress and formulating their long-term strategies, as long as such consideration is reasonable and not contrary to the regional haze requirements.

6. Conclusion

EPA appreciates all the efforts of stakeholders, states, and Regional offices to support development of second planning period SIPs that are consistent with the RHR and the CAA. This memorandum is intended to broadly share specific issues and information commonly arising during SIP development in an effort to continue to support development of approvable SIPs. We appreciate that Regional offices will continue to be engaged with states and provide feedback on these and other aspects of draft second planning period SIPs. Additional consultation and coordination requirements of the RHR provide states with important information and

[39] *See* August 2019 Guidance at 42-43.

considerations from FLMs and other states relevant to the reasonable progress analysis. Regional offices are encouraged to urge states to consider that feedback and engage in timely and complete consultations to support development of approvable SIPs.

Please share this memorandum with your staff, as well as colleagues at state, local, and tribal air agencies. If states or stakeholders have state-specific questions, we encourage them to reach out to relevant Regional office contacts. If you have any questions concerning this memorandum, please contact Vera Kornylak, Associate Director of the Air Quality Policy Division at *kornylak.vera@epa.gov* or (919) 541-4067. This memorandum is posted on EPA's visibility website at: *https://www.epa.gov/visibility/clarifications-regarding-regional-haze-state-implementation-plans-second-implementation*.