Agrium

16 May 2019

Mr. Aaron Simpson
Alaska Department of Environmental Conservation
Division of Air Quality
410 Willoughby Avenue, Suite 303
Juneau, Alaska 99811-1800

Re: Prevention of Significant Deterioration Construction Permit Application
Kenai Nitrogen Operations
Kenai, Alaska

Dear Mr. Simpson:

Agrium U.S. Inc. (Agrium) was issued Air Quality Control Construction Permit AQ0083CPT06 on 6 January 2015 for the proposed restart of a portion of its Kenai Nitrogen Operations (KNO) fertilizer operation in Kenai, Alaska. As a result of certain design changes related to the project, Agrium is submitting a request for a new Prevention of Significant Deterioration (PSD) Construction Permit pursuant to 18 AAC 50.306 for this project. Changes from the original design relate to the five (5) Solar Turbines at the facility, the five (5) Waste Heat Boilers, and the three (3) Package Boilers. The proposed changes are described in greater detail below.

KNO now plans to replace the existing natural gas-fired Solar Turbines (Units 55, 56, 57, 58, and 59), with higher capacity natural gas-fired turbines. The existing Solar Turbines are rated at 37.6 MMBtu/hr, each and the proposed replacement Solar Turbines will be rated at 55.443 MMBtu/hr, each.

Due to the increased capacity and higher combustion temperatures of the replacement Solar Turbines, the supplemental heat input requirements for the existing Waste Heat Boilers (Units 50, 51, 52, 53, and 54) will be reduced. The Waste Heat Boilers are currently identified as having heat input capacities of 50.0 MMBtu/hr, each. Upon the replacement of the Solar Turbines, the heat input requirements of the Waste Heat Boilers will be 46.729 MMBtu/hr, each.

In addition to the changes related to the Solar Turbines and Waste Heat Boilers described above, KNO has made the decision to change the proposed nitrogen oxide (NOx) control technology for the three package boilers (Units 44, 48, and 49). NOx emissions from these units were proposed to be controlled through the use of ultra-low NOx burners and flue gas recirculation. KNO is now proposing to control NOx emissions from the three package boilers through the use of Selective Catalytic Reduction (SCR) control technology.

The following documents are included to provide ADEC with the necessary information to process Agrium's request for a PSD Construction Permit for KNO:

- Emission Unit Information forms for the units modified from the original design are provided in Attachment A. Application forms pertaining to units that have not been modified from the original design are incorporated by reference from the original application.

- Revised emission calculations for modified units are provided in Attachment B to this request. Emission calculations for units that have not been modified are incorporated by reference from the original application. Electronic copies of emission calculation spreadsheets for all units will be provided to ADEC separately.

- A detailed top-down BACT analysis for the Solar Turbines, Waste Heat Boilers, and Package Boilers is provided in Attachment C to this request. This document also includes an update to the BACT analysis for units that have not changed from the original design.

- Attachment D to this request contains an updated air quality impact analysis for the project that incorporates revised emission rates/stack parameters for units that have changed from the original design and addresses growth in the area since the date of the original PSD Construction Permit.

If you have any questions regarding this information, please contact Ted Hartman of Agrium at (913) 302-7469 or Dave Jordan of ERM at (317) 706-2006.

Sincerely,

Frederick C. Werth
Manager, Kenai Plant

cc: Ted Hartman, Agrium
David Jordan, ERM

Enclosure: Attachment A – ADEC Forms
Attachment B – Emission Calculations
Attachment C – BACT Analysis
Attachment D – Modeling Analysis

Attachment A
Application Forms

Alaska Department of Environmental Conservation
AIR QUALITY CONSTRUCTION PERMIT APPLICATION
Project Information Form

Section 1 Stationary Source Information

Stationary Source Name: Agrium Kenai Nitrogen Operations			SIC:
Project Name (if different):	Stationary Source Frederick Werth		
Source Physical Address: Mile 21 Kenai Spur Highway	City: Kenai	State: AK	Zip: 99611
	Telephone: (907) 776-8144 E-Mail Address: Frederick.Werth@Nutrien.com		
UTM Coordinates (m) or Latitude/Longitude (NAD 27)	Northing: 22120449	Easting: 1930150	Zone: 6
	Latitude: 60° 48' 28"	Longitude: 151°22' 45"	

Section 2 Legal Owner

Name: Agrium U.S. Inc.		
Mailing Address: 5296 Harvest Lake Drive		
City: Loveland	State: CO	Zip: 80538
Telephone:		
E-Mail Address:		

Section 3 Operator *(if different from owner)*

Name:		
Mailing Address: 47901 Kenai Spur Hwy., P.O. Box 575		
City: Kenai	State: AK	Zip: 99611
Telephone: (907) 776-8144		
E-Mail Address: Frederick.Werth@nutrien.com		

Section 4 Designated Agent *(for service of process)*

Name:		
Mailing Address:		
City:	State:	Zip:
Physical Address:		
City:	State:	Zip:
Telephone :		
E-Mail Address:		

Section 5 Billing Contact Person *(if different from owner)*

Name: Frederick Werth		
Mailing Address: 47901 Kenai Spur Hwy., P.O. Box 575		
City: Kenai	State: AK	Zip: 499611
Telephone: (907) 776-8144		
E-Mail Address: Frederick.Werth@nutrien.com		

Section 6 Application Contact

Name: Ted Hartman			
Mailing Address: 7540 W. 160th St., Ste. 130	City: Overland Park	State: KS	Zip: 66085
	Telephone: (913) 302-7469		
	E-Mail Address: Ted.Hartman@nutrien.com		

Section 7 Major Permit Classification(s)
(Check all that apply)

- ☒ 18 AAC 50.306
- ☐ 18 AAC 50.311
- ☐ 18 AAC 50.316

Section 8 Minor Permit Classification(s)
(Check all that apply)

- ☐ 18 AAC 50.502(b)(1)
- ☐ 18 AAC 50.502(b)(2)
- ☐ 18 AAC 50.502(b)(3)
- ☐ 18 AAC 50.502(b)(4)
- ☐ 18 AAC 50.502(b)(5)
- ☐ 18 AAC 50.502(b)(6)
- ☐ 18 AAC 50.502(c)(2)(A)
- ☐ 18 AAC 50.502(c)(2)(B)
- ☐ 18 AAC 50.502(c)(3)
- ☐ 18 AAC 50.508(3)
- ☐ 18 AAC 50.508(5)
- ☐ 18 AAC 50.508(6)

Section 9 Project Description

Provide/attach a short narrative describing the project. Discuss the purpose for conducting this project, what emission units/activities will be added/modified under this project (i.e., project scope), and the project timeline. If the project is a modification to an existing stationary source, describe how this project will affect the existing process. Include any other discussion that may assist the Department in understanding your project or processing your application. Include a schedule of construction and the desired date for permit issuance.

If this application includes an Owner Requested Limit or a request to revise an existing permit term or condition, describe the intent of the limit, and provide sample language for the limit, and for monitoring, record keeping, and reporting for showing compliance with the limit.

Add additional pages if necessary.

Agrium is proposing to replace the existing natural gas-fired Solar Turbines (Units 55, 56, 57, 58, and 59) with higher capacity natural gas-fired turbines. The existing Solar Turbines are rated at 37.6 MMBtu/hr, each. The proposed replacement Solar Turbines are rated at 55.443 MMBtu/hr, each.

Due to the increased capacity and higher combustion temperatures of the replacement Solar Turbines, the supplemental heat input requirements for the existing Waste Heat Boilers (Units 50, 51, 52, 53, and 54) will be reduced. The Waste Heat Boilers are currently identified as having heat input capacities of 50.0 MMBtu/hr, each. Upon the replacement of the Solar Turbines, the heat input requirements of the Waste Heat Boilers will be 46.729 MMBtu/hr, each.

Agrium is providing top-down BACT analyses for the Solar Turbines and Waste Heat Boilers in Attachment C to this request. Revised emission calculations are provided in Attachment B to this request. In addition, Agrium has performed an updated air quality impact analysis.

In addition, Agrium is proposing to install SCR for NOx control on the Package Boilers (Units 44, 48, and 49). These emission units went through PSD BACT as part of the permitting for AQ0083CPT06. Under the Air Quality Control Construction Permit, BACT for NOx was identified as use of ultra low NOx burners. A top-down BACT analysis for the Package Boilers is provided in Attachment C to this request.

Section 10 Certification

This certification applies to the Air Quality Control Construction Permit Application for the ______________ (Stationary Source Name)
submitted to the Department on: ______________ .

Type of Application

☐ Initial Application

☒ Change to Initial Application

The application is **NOT** complete unless the certification of truth, accuracy, and completeness on this form bears the **signature of a responsible official** of the firm making the application. (18 AAC 50.205)

CERTIFICATION OF TRUTH, ACCURACY, AND COMPLETENESS

"Based on information and belief formed after reasonable inquiry, I certify that the statements and information in and attached to this document are true, accurate, and complete."

Signature: [signature]	Date: 5/20/2019
Printed Name: FRED C. WERTH	Title: PLANT MANAGER

Section 11 Attachments

☐ Attachments Included. List attachments:

____

____

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____

Section 12 Mailing Address

Submit the construction permit application to the Permit Intake Clerk in the Department's Anchorage office. Submitting to a different office will delay processing. The mailing address and phone number for the Anchorage office is:

Permit Intake Clerk
Alaska Department of Environmental
Conservation Air Permit Program
619 E. Ship Creek, Suite 249
Anchorage, Alaska 99501
(907) 269-6881

Alaska Department of Environmental Conservation **Air Quality Control Construction Permit Application**	**ADEC USE ONLY** Receiving Date: ADEC Control #:

FORM F – EMISSION UNIT INFORMATION

Section 1 Stationary Source Information

Source Name: Agrium Kenai Nitrogen Operations (KNO)
Source Physical Address: Mile 21 Kenai Spur Highway
City: Kenai

Include a copy of this form for each emission unit that will emit a regulated air pollutant.

Section 2 Emission Unit Identification

Emission Unit No.: 6B-708A

Section 3 Emission Unit Description

Equipment Type: Boiler	Make: Cleaver Brooks
Model (attach Vendor Specs): TBD	Serial No.: TBD
Maximum Rated Capacity or Maximum Design Throughput: 243 mmBtu/hr	
Note: Rated capacity or design throughput may become a permit limit.	

Section 4 Fuels and Materials Processed

Fuel Type(s): Natural Gas	Maximum Design Fuel Consumption Rate: 0.24 MMscf/hr
Materials Processed: Water	Maximum Material Processing Rate:
Describe Method of Operation: Natural gas fired boiler to generate steam for process and heating.	
☐ *See attached for additional details.*	
Schedule of Operation (indicate the maximum operation for each time period):	3-hr 3 hr 8-hr 8 hr 24-hr 24 hr Days/yr 365 days

Section 5 Exhaust Parameters

Stack Height (m):	Base Elevation (m):	Stack Inner Exhaust Diameter or Dimensions (m):	Actual Flow Rate (acm/s):	Exit Temp (deg K):
30.48	39.63	1.67	31.9	422

Is stack height greater than 65 meters? YES ☐ NO ☒

☐ If yes, a calculation of good engineering practices stack height, including any computer modeling analyses or field studies, is attached. *If yes, this calculation must be attached in order for your application to be complete.*

Section 6 Plans Showing Emission Unit and Exhaust Point Location

☒ A set of plans showing the location of the emission unit, associated buildings and other nearby structures is attached.
☒ A table of building dimensions is attached.
Note: These must be attached in order for your application to be complete.

Emission Unit No.: 6B-708A

Section 7 Emission Control Information *(if applicable) NOTE: For PSD and Nonattainment Major Sources and Modifications, for control equipment installed for BACT/LAER purposes, skip this section and complete Section 11 instead.*

Control Equipment:		Pollutant(s) Controlled:	
Provide a physical description of the control equipment:			
☐ *See attached for additional details.*			
Provide a description of the significant operating parameters and set points for the control equipment:			
☐ *See attached for additional details.*			
This control equipment is necessary:	☐ To comply with an emission standard	☐ To avoid a project classification	☐ Other – Indicate purpose of control equipment:

Control Equipment:		Pollutant(s) Controlled:	
Provide a physical description of the control equipment:			
☐ *See attached for additional details.*			
Provide a description of the significant operating parameters and set points for the control equipment:			
☐ *See attached for additional details.*			
This control equipment is necessary:	☐ To comply with an emission standard	☐ To avoid a project classification	☐ Other – Indicate purpose of control equipment:

Emission Unit No.: 6B-708A

Section 8 Applicable Federal Emission Limits

New Source Performance Standard (NSPS) Affected Facility?	YES ☒	NO ☐	*If yes, complete Form J.*
National Emission Standard for Hazardous Air Pollutants (NESHAP) Affected Facility?	YES ☒	NO ☐	*If yes, complete Form K.*
Maximum Achievable Control Technology (MACT) Affected Facility?	YES ☒	NO ☐	*If yes, complete Form K.*

Other Emission Limits listed in 18 AAC 50.040

Emission Limit or Standard	Regulation Citation

☐ A demonstration of compliance for each emission limit or standard is attached. *Note: This must be attached in order for your application to be complete.*

Section 9 Applicable State Emission Limits *(listed in 18 AAC 50.050 through 18 AAC 50.090)*

Emission Limit or Standard	Regulation Citation
Visible emissions, excluding condensed water vapor, from an industrial process or fuel-burning equipment may not reduce visibility through the exhaust effluent by more than 20 percent averaged over any six consecutive minutes.	**18 AAC 50.055 (a)**
Particulate matter emitted from an industrial process or fuel-burning equipment may not exceed, per cubic foot of exhaust gas corrected to standard conditions and averaged over three hours, 0.05 grains.	**18 AAC 50.055 (b)**
Sulfur-compound emissions, expressed as sulfur dioxide, from an industrial process or from fuel-burning equipment may not exceed 500 ppm averaged over a period of three hours.	**18 AAC 50.055 (c)**

☒ A demonstration of compliance for each emission limit or standard is attached. *Note: This must be attached in order for your application to be complete.*

Include multiple copies of this page if more space is required.

Section 10 Mass Emission Rates for Facilities Requiring an Air Quality Impact Analysis

Regulated Air Pollutant	Mass Emission Rate (grams/second)				
	1-hr	3-hr	8-hr	24-hr	Annual
Carbon Monoxide	**1.13**		**1.13**		
Nitrogen Oxides	**0.30**				**0.30**
PM-10				**0.23**	
PM-2.5				**0.23**	**0.23**
Sulfur Oxides					

Emission Unit No.: 6B-708A

Section 11 Emission Control Information for PSD and/or Nonattainment Major Sources and Modifications Only

Control Equipment: SCR	Pollutant(s) Controlled: NOx
Provide a physical description of the control equipment: The boilers will be equipped with SCR to control NOx emissions.	
☒ *See attached for additional details.*	
Provide a description of the significant operating parameters and set points for the control equipment: TBD	
☐ *See attached for additional details.*	
This control equipment is proposed as BACT ☒ LAER ☐ for pollutant(s): NOx	
Proposed BACT/LAER performance limit: (see attached) lbs/hr for pollutant:	
lbs/hr for pollutant:	
lbs/hr for pollutant:	
Note: The proposed BACT/LAER performance limits may become permit limits.	
☒ If the control equipment is proposed as BACT or LAER, a detailed BACT analysis or LAER demonstration is attached. *Note: This must be attached in order for your application to be complete.*	

Control Equipment:	Pollutant(s) Controlled:
Provide a physical description of the control equipment:	
☐ *See attached for additional details.*	
Provide a description of the significant operating parameters and set points for the control equipment:	
☐ *See attached for additional details.*	
This control equipment is proposed as BACT ☐ LAER ☐ for pollutant(s):	
Proposed BACT/LAER performance limit: lbs/hr for pollutant:	
lbs/hr for pollutant:	
lbs/hr for pollutant:	
Note: The proposed BACT/LAER performance limits may become permit limits.	
☐ If the control equipment is proposed as BACT or LAER, a detailed BACT analysis or LAER demonstration is attached. *Note: This must be attached in order for your application to be complete.*	

Emission Unit No.: 6B-708A

Section 12 Attachments

☒ Attachments Included. List attachments: ____________________

Alaska Department of Environmental Conservation **Air Quality Control Construction Permit Application**	**ADEC USE ONLY** Receiving Date: ADEC Control #:

FORM F – EMISSION UNIT INFORMATION

Section 1 Stationary Source Information

Source Name: Agrium Kenai Nitrogen Operations (KNO)
Source Physical Address: Mile 21 Kenai Spur Highway
City: Kenai

Include a copy of this form for each emission unit that will emit a regulated air pollutant.

Section 2 Emission Unit Identification

Emission Unit No.: 6B-708B

Section 3 Emission Unit Description

Equipment Type: Boiler	Make: Cleaver Brooks
Model (attach Vendor Specs): TBD	Serial No.: TBD
Maximum Rated Capacity or Maximum Design Throughput: 243 MMBtu/hr	
Note: Rated capacity or design throughput may become a permit limit.	

Section 4 Fuels and Materials Processed

Fuel Type(s): Natural Gas	Maximum Design Fuel Consumption Rate: 0.24 MMscf/hr
Materials Processed: Water	Maximum Material Processing Rate: TBD
Describe Method of Operation: Natural gas-fired boiler to generate steam for process use and heating	
☐ *See attached for additional details.*	
Schedule of Operation (indicate the maximum operation for each time period):	3-hr 3 hr 8-hr 8 hr 24-hr 24 hr Days/yr 365 days

Section 5 Exhaust Parameters

Stack Height (m): 30.48	Base Elevation (m): 39.63	Stack Inner Exhaust Diameter or Dimensions (m): 1.67	Actual Flow Rate (acm/s): 31.9	Exit Temp (deg K): 422

Is stack height greater than 65 meters? YES ☐ NO ☒

☐ If yes, a calculation of good engineering practices stack height, including any computer modeling analyses or field studies, is attached. *If yes, this calculation must be attached in order for your application to be complete.*

Section 6 Plans Showing Emission Unit and Exhaust Point Location

☒ A set of plans showing the location of the emission unit, associated buildings and other nearby structures is attached.
☒ A table of building dimensions is attached.
Note: These must be attached in order for your application to be complete.

Emission Unit No.: 6B-708B

Section 7 Emission Control Information *(if applicable) NOTE: For PSD and Nonattainment Major Sources and Modifications, for control equipment installed for BACT/LAER purposes, skip this section and complete Section 11 instead.*

Control Equipment:		Pollutant(s) Controlled:	
Provide a physical description of the control equipment:			
☐ *See attached for additional details.*			
Provide a description of the significant operating parameters and set points for the control equipment:			
☐ *See attached for additional details.*			
This control equipment is necessary:	☐ To comply with an emission standard	☐ To avoid a project classification	☐ Other – Indicate purpose of control equipment:

Control Equipment:		Pollutant(s) Controlled:	
Provide a physical description of the control equipment:			
☐ *See attached for additional details.*			
Provide a description of the significant operating parameters and set points for the control equipment:			
☐ *See attached for additional details.*			
This control equipment is necessary:	☐ To comply with an emission standard	☐ To avoid a project classification	☐ Other – Indicate purpose of control equipment:

FORM F – EMISSION UNIT INFORMATION

Emission Unit No.: 6B-708B

Section 8 Applicable Federal Emission Limits

New Source Performance Standard (NSPS) Affected Facility?	YES ☒	NO ☐	*If yes, complete Form J.*
National Emission Standard for Hazardous Air Pollutants (NESHAP) Affected Facility?	YES ☒	NO ☐	*If yes, complete Form K.*
Maximum Achievable Control Technology (MACT) Affected Facility?	YES ☒	NO ☐	*If yes, complete Form K.*

Other Emission Limits listed in 18 AAC 50.040

Emission Limit or Standard	Regulation Citation
☐ A demonstration of compliance for each emission limit or standard is attached. *Note: This must be attached in order for your application to be complete.*	

Section 9 Applicable State Emission Limits *(listed in 18 AAC 50.050 through 18 AAC 50.090)*

Emission Limit or Standard	Regulation Citation
Visible emissions, excluding condensed water vapor, from an industrial process or fuel-burning equipment may not reduce visibility through the exhaust effluent by more than 20 percent averaged over any six consecutive minutes.	**18 AAC 50.055 (a)**
Particulate matter emitted from an industrial process or fuel-burning equipment may not exceed, per cubic foot of exhaust gas corrected to standard conditions and averaged over three hours, 0.05 grains.	**18 AAC 50.055 (b)**
Sulfur-compound emissions, expressed as sulfur dioxide, from an industrial process or from fuel-burning equipment may not exceed 500 ppm averaged over a period of three hours.	**18 AAC 50.055 (c)**
☒ A demonstration of compliance for each emission limit or standard is attached. *Note: This must be attached in order for your application to be complete.*	
Include multiple copies of this page if more space is required.	

Section 10 Mass Emission Rates for Facilities Requiring an Air Quality Impact Analysis

Regulated Air Pollutant	Mass Emission Rate (grams/second)				
	1-hr	3-hr	8-hr	24-hr	Annual
Carbon Monoxide	**1.13**		**1.13**		
Nitrogen Oxides	**0.30**				**0.30**
PM-10				**0.23**	
PM-2.5				**0.23**	**0.23**
Sulfur Oxides					

Emission Unit No.: 6B-708B

Section 11 Emission Control Information for PSD and/or Nonattainment Major Sources and Modifications Only

Control Equipment: SCR	Pollutant(s) Controlled: NOx
Provide a physical description of the control equipment: The boiler will be equipped with SCR to control NOx emissions.	
☒ *See attached for additional details.*	
Provide a description of the significant operating parameters and set points for the control equipment: TBD	
☐ *See attached for additional details.*	
This control equipment is proposed as BACT ☒ LAER ☐ for pollutant(s):	
Proposed BACT/LAER performance limit: (see attached) lbs/hr for pollutant:	
lbs/hr for pollutant:	
lbs/hr for pollutant:	
Note: The proposed BACT/LAER performance limits may become permit limits.	
☒ If the control equipment is proposed as BACT or LAER, a detailed BACT analysis or LAER demonstration is attached. *Note: This must be attached in order for your application to be complete.*	

Control Equipment:	Pollutant(s) Controlled:
Provide a physical description of the control equipment:	
☐ *See attached for additional details.*	
Provide a description of the significant operating parameters and set points for the control equipment:	
☐ *See attached for additional details.*	
This control equipment is proposed as BACT ☐ LAER ☐ for pollutant(s):	
Proposed BACT/LAER performance limit: lbs/hr for pollutant:	
lbs/hr for pollutant:	
lbs/hr for pollutant:	
Note: The proposed BACT/LAER performance limits may become permit limits.	
☐ If the control equipment is proposed as BACT or LAER, a detailed BACT analysis or LAER demonstration is attached. *Note: This must be attached in order for your application to be complete.*	

Emission Unit No.: 6B-708B

Section 12 Attachments

☒ Attachments Included. List attachments: ______

Alaska Department of Environmental Conservation Air Quality Control Construction Permit Application	ADEC USE ONLY Receiving Date: ADEC Control #:

FORM F – EMISSION UNIT INFORMATION

Section 1 Stationary Source Information

Source Name: Agrium Kenai Nitrogen Operations (KNO)
Source Physical Address: Mile 21 Kenai Spur Highway
City: Kenai

Include a copy of this form for each emission unit that will emit a regulated air pollutant.

Section 2 Emission Unit Identification

Emission Unit No.: 6B-708C

Section 3 Emission Unit Description

Equipment Type: Boiler	Make: Cleaver Brooks
Model (attach Vendor Specs): TBD	Serial No.: TBD
Maximum Rated Capacity or Maximum Design Throughput: 243 MMBtu/hr	
Note: Rated capacity or design throughput may become a permit limit.	

Section 4 Fuels and Materials Processed

Fuel Type(s): Natural Gas	Maximum Design Fuel Consumption Rate: 0.24 MMscf/hr
Materials Processed: Water	Maximum Material Processing Rate: TBD
Describe Method of Operation:	
☐ *See attached for additional details.*	
Schedule of Operation (indicate the maximum operation for each time period):	3-hr 3 hr 8-hr 8 hr 24-hr 24 hr Days/yr 365 days

Section 5 Exhaust Parameters

Stack Height (m): 30.48	Base Elevation (m): 39.63	Stack Inner Exhaust Diameter or Dimensions (m): 1.67	Actual Flow Rate (acm/s): 31.9	Exit Temp (deg K): 422

Is stack height greater than 65 meters? YES ☐ NO ☒

☐ If yes, a calculation of good engineering practices stack height, including any computer modeling analyses or field studies, is attached. *If yes, this calculation must be attached in order for your application to be complete.*

Section 6 Plans Showing Emission Unit and Exhaust Point Location

☒ A set of plans showing the location of the emission unit, associated buildings and other nearby structures is attached.
☒ A table of building dimensions is attached.
Note: These must be attached in order for your application to be complete.

Emission Unit No.: 6B-708C

Section 7 Emission Control Information *(if applicable) NOTE: For PSD and Nonattainment Major Sources and Modifications, for control equipment installed for BACT/LAER purposes, skip this section and complete Section 11 instead.*

Control Equipment:		Pollutant(s) Controlled:	
Provide a physical description of the control equipment:			
☐ *See attached for additional details.*			
Provide a description of the significant operating parameters and set points for the control equipment:			
☐ *See attached for additional details.*			
This control equipment is necessary:	☐ To comply with an emission standard	☐ To avoid a project classification	☐ Other – Indicate purpose of control equipment:

Control Equipment:		Pollutant(s) Controlled:	
Provide a physical description of the control equipment:			
☐ *See attached for additional details.*			
Provide a description of the significant operating parameters and set points for the control equipment:			
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This control equipment is necessary:	☐ To comply with an emission standard	☐ To avoid a project classification	☐ Other – Indicate purpose of control equipment:

FORM F – EMISSION UNIT INFORMATION

Emission Unit No.: 6B-708C

Section 8 Applicable Federal Emission Limits

New Source Performance Standard (NSPS) Affected Facility?	YES ☒	NO ☐	*If yes, complete Form J.*
National Emission Standard for Hazardous Air Pollutants (NESHAP) Affected Facility?	YES ☒	NO ☐	*If yes, complete Form K.*
Maximum Achievable Control Technology (MACT) Affected Facility?	YES ☒	NO ☐	*If yes, complete Form K.*

Other Emission Limits listed in 18 AAC 50.040

Emission Limit or Standard	Regulation Citation
☐ A demonstration of compliance for each emission limit or standard is attached. *Note: This must be attached in order for your application to be complete.*	

Section 9 Applicable State Emission Limits *(listed in 18 AAC 50.050 through 18 AAC 50.090)*

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Sulfur-compound emissions, expressed as sulfur dioxide, from an industrial process or from fuel-burning equipment may not exceed 500 ppm averaged over a period of three hours.	**18 AAC 50.055 (c)**
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Include multiple copies of this page if more space is required.	

Section 10 Mass Emission Rates for Facilities Requiring an Air Quality Impact Analysis

Regulated Air Pollutant	Mass Emission Rate (grams/second)				
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Carbon Monoxide	**1.13**		**1.13**		
Nitrogen Oxides	**0.30**				**0.30**
PM-10				**0.23**	
PM-2.5				**0.23**	**0.23**
Sulfur Oxides					

Emission Unit No.: 6B-708C

Section 11 Emission Control Information for PSD and/or Nonattainment Major Sources and Modifications Only

Control Equipment: SCR | Pollutant(s) Controlled: NOx

Provide a physical description of the control equipment: The boiler will be equipped with SCR to control NOx emissions.

☒ *See attached for additional details.*

Provide a description of the significant operating parameters and set points for the control equipment:

☐ *See attached for additional details.*

This control equipment is proposed as BACT ☒ LAER ☐ for pollutant(s): NOx

Proposed BACT/LAER performance limit: (see attached) lbs/hr for pollutant:

lbs/hr for pollutant:

lbs/hr for pollutant:

Note: The proposed BACT/LAER performance limits may become permit limits.

☒ If the control equipment is proposed as BACT or LAER, a detailed BACT analysis or LAER demonstration is attached. *Note: This must be attached in order for your application to be complete.*

Control Equipment: | Pollutant(s) Controlled:

Provide a physical description of the control equipment:

☐ *See attached for additional details.*

Provide a description of the significant operating parameters and set points for the control equipment:

☐ *See attached for additional details.*

This control equipment is proposed as BACT ☐ LAER ☐ for pollutant(s):

Proposed BACT/LAER performance limit: lbs/hr for pollutant:

lbs/hr for pollutant:

lbs/hr for pollutant:

Note: The proposed BACT/LAER performance limits may become permit limits.

☐ If the control equipment is proposed as BACT or LAER, a detailed BACT analysis or LAER demonstration is attached. *Note: This must be attached in order for your application to be complete.*

Emission Unit No.: 6B-708C

Section 12 Attachments

☒ Attachments Included. List attachments: ____________________

Alaska Department of Environmental Conservation Air Quality Control Construction Permit Application	**ADEC USE ONLY** Receiving Date: ADEC Control #:

FORM F – EMISSION UNIT INFORMATION

Section 1 Stationary Source Information

Source Name: Agrium Kenai Nitrogen Operations (KNO)
Source Physical Address: Mile 21 Kenai Spur Highway
City: Kenai

Include a copy of this form for each emission unit that will emit a regulated air pollutant.

Section 2 Emission Unit Identification

Emission Unit No.: GGT-744A

Section 3 Emission Unit Description

Equipment Type: Turbine	Make: Solar
Model (attach Vendor Specs): GSC-4701	Serial No.:
Maximum Rated Capacity or Maximum Design Throughput: 55.443 MMBtu/hr	
Note: Rated capacity or design throughput may become a permit limit.	

Section 4 Fuels and Materials Processed

Fuel Type(s): Natural Gas	Maximum Design Fuel Consumption Rate: 0.05 MMscf/hr
Materials Processed: NA	Maximum Material Processing Rate: NA
Describe Method of Operation: Natural gas-fired combustion turbine to generate electricity for the plant	
☐ *See attached for additional details.*	
Schedule of Operation (indicate the maximum operation for each time period):	3-hr 3 hr 8-hr 8 hr 24-hr 24 hr Days/yr 365 days

Section 5 Exhaust Parameters

Stack Height (m):	Base Elevation (m):	Stack Inner Exhaust Diameter or Dimensions (m):	Actual Flow Rate (acm/s):	Exit Temp (deg K):
18.29	39.62	1.01	47.36	608

Is stack height greater than 65 meters? YES ☐ NO ☒

☐ If yes, a calculation of good engineering practices stack height, including any computer modeling analyses or field studies, is attached. *If yes, this calculation must be attached in order for your application to be complete.*

Section 6 Plans Showing Emission Unit and Exhaust Point Location

☒ A set of plans showing the location of the emission unit, associated buildings and other nearby structures is attached.
☒ A table of building dimensions is attached.
Note: These must be attached in order for your application to be complete.

Emission Unit No.: GGT-744A

Section 7 Emission Control Information *(if applicable) NOTE: For PSD and Nonattainment Major Sources and Modifications, for control equipment installed for BACT/LAER purposes, skip this section and complete Section 11 instead.*

Control Equipment:		Pollutant(s) Controlled:	
Provide a physical description of the control equipment:			
☐ *See attached for additional details.*			
Provide a description of the significant operating parameters and set points for the control equipment:			
☐ *See attached for additional details.*			
This control equipment is necessary:	☐ To comply with an emission standard	☐ To avoid a project classification	☐ Other – Indicate purpose of control equipment:

Control Equipment:		Pollutant(s) Controlled:	
Provide a physical description of the control equipment:			
☐ *See attached for additional details.*			
Provide a description of the significant operating parameters and set points for the control equipment:			
☐ *See attached for additional details.*			
This control equipment is necessary:	☐ To comply with an emission standard	☐ To avoid a project classification	☐ Other – Indicate purpose of control equipment:

FORM F – EMISSION UNIT INFORMATION

Emission Unit No.: GGT-744A

Section 8 Applicable Federal Emission Limits

New Source Performance Standard (NSPS) Affected Facility?	YES ☒	NO ☐	*If yes, complete Form J.*
National Emission Standard for Hazardous Air Pollutants (NESHAP) Affected Facility?	YES ☐	NO ☒	*If yes, complete Form K.*
Maximum Achievable Control Technology (MACT) Affected Facility?	YES ☐	NO ☒	*If yes, complete Form K.*

Other Emission Limits listed in 18 AAC 50.040

Emission Limit or Standard	**Regulation Citation**

☐ A demonstration of compliance for each emission limit or standard is attached. *Note: This must be attached in order for your application to be complete.*

Section 9 Applicable State Emission Limits *(listed in 18 AAC 50.050 through 18 AAC 50.090)*

Emission Limit or Standard	**Regulation Citation**
Visible emissions, excluding condensed water vapor, from an industrial process or fuel-burning equipment may not reduce visibility through the exhaust effluent by more than 20 percent averaged over any six consecutive minutes.	**18 AAC 50.055 (a)**
Particulate matter emitted from an industrial process or fuel-burning equipment may not exceed, per cubic foot of exhaust gas corrected to standard conditions and averaged over three hours, 0.05 grains.	**18 AAC 50.055 (b)**
Sulfur-compound emissions, expressed as sulfur dioxide, from an industrial process or from fuel-burning equipment may not exceed 500 ppm averaged over a period of three hours.	**18 AAC 50.055 (c)**

☒ A demonstration of compliance for each emission limit or standard is attached. *Note: This must be attached in order for your application to be complete.*

Include multiple copies of this page if more space is required.

Section 10 Mass Emission Rates for Facilities Requiring an Air Quality Impact Analysis

Regulated Air Pollutant	**Mass Emission Rate (grams/second)**				
	1-hr	**3-hr**	**8-hr**	**24-hr**	**Annual**
Carbon Monoxide	**0.761**		**0.761**		
Nitrogen Oxides	**4.586**				**0.1067**
PM-10				**0.0461**	
PM-2.5				**0.0461**	**0.00106**
Sulfur Oxides	**0.0237**	**0.0237**			

Emission Unit No.: GGT-744A

Section 11 Emission Control Information for PSD and/or Nonattainment Major Sources and Modifications Only

Control Equipment: SCR Control System	Pollutant(s) Controlled: NOx
Provide a physical description of the control equipment: SCR to control NOx emissions from Waste Heat Boiler/Solar Turbine exhaust	
☒ *See attached for additional details.*	
Provide a description of the significant operating parameters and set points for the control equipment:	
☐ *See attached for additional details.*	
This control equipment is proposed as BACT ☒ LAER ☐ for pollutant(s):	
Proposed BACT/LAER performance limit: (see attached) lbs/hr for pollutant: NOx	
lbs/hr for pollutant:	
lbs/hr for pollutant:	
Note: The proposed BACT/LAER performance limits may become permit limits.	
☒ If the control equipment is proposed as BACT or LAER, a detailed BACT analysis or LAER demonstration is attached. *Note: This must be attached in order for your application to be complete.*	

Control Equipment:	Pollutant(s) Controlled:
Provide a physical description of the control equipment:	
☐ *See attached for additional details.*	
Provide a description of the significant operating parameters and set points for the control equipment:	
☐ *See attached for additional details.*	
This control equipment is proposed as BACT ☐ LAER ☐ for pollutant(s):	
Proposed BACT/LAER performance limit: lbs/hr for pollutant:	
lbs/hr for pollutant:	
lbs/hr for pollutant:	
Note: The proposed BACT/LAER performance limits may become permit limits.	
☐ If the control equipment is proposed as BACT or LAER, a detailed BACT analysis or LAER demonstration is attached. *Note: This must be attached in order for your application to be complete.*	

FORM F – EMISSION UNIT INFORMATION

Emission Unit No.: GGT-744A

Section 12 Attachments

☒ Attachments Included. List attachments: ______

Alaska Department of Environmental Conservation Air Quality Control Construction Permit Application	**ADEC USE ONLY** Receiving Date: ADEC Control #:

FORM F – EMISSION UNIT INFORMATION

Section 1 Stationary Source Information

Source Name: Agrium Kenai Nitrogen Operations (KNO)
Source Physical Address: Mile 21 Kenai Spur Highway
City: Kenai

Include a copy of this form for each emission unit that will emit a regulated air pollutant.

Section 2 Emission Unit Identification

Emission Unit No.: GGT-744B

Section 3 Emission Unit Description

Equipment Type: Turbine	Make: Solar
Model (attach Vendor Specs): GSC-4701	Serial No.:
Maximum Rated Capacity or Maximum Design Throughput: 55.443 MMBtu/hr	
Note: Rated capacity or design throughput may become a permit limit.	

Section 4 Fuels and Materials Processed

Fuel Type(s): Natural Gas	Maximum Design Fuel Consumption Rate: 0.05 MMscf/hr
Materials Processed: NA	Maximum Material Processing Rate: NA
Describe Method of Operation: Natural gas-fired combustion turbine to generate electricity for the plant	
☐ *See attached for additional details.*	
Schedule of Operation (indicate the maximum operation for each time period):	3-hr 3 hr 8-hr 8 hr 24-hr 24 hr Days/yr 365 days

Section 5 Exhaust Parameters

Stack Height (m):	Base Elevation (m):	Stack Inner Exhaust Diameter or Dimensions (m):	Actual Flow Rate (acm/s):	Exit Temp (deg K):
18.29	39.62	1.01	47.36	608

Is stack height greater than 65 meters? YES ☐ NO ☒

☐ If yes, a calculation of good engineering practices stack height, including any computer modeling analyses or field studies, is attached. *If yes, this calculation must be attached in order for your application to be complete.*

Section 6 Plans Showing Emission Unit and Exhaust Point Location

☒ A set of plans showing the location of the emission unit, associated buildings and other nearby structures is attached.
☒ A table of building dimensions is attached.
Note: These must be attached in order for your application to be complete.

Emission Unit No.: GGT-744B

Section 7 Emission Control Information *(if applicable) NOTE: For PSD and Nonattainment Major Sources and Modifications, for control equipment installed for BACT/LAER purposes, skip this section and complete Section 11 instead.*

Control Equipment:		Pollutant(s) Controlled:	
Provide a physical description of the control equipment:			
☐ *See attached for additional details.*			
Provide a description of the significant operating parameters and set points for the control equipment:			
☐ *See attached for additional details.*			
This control equipment is necessary:	☐ To comply with an emission standard	☐ To avoid a project classification	☐ Other – Indicate purpose of control equipment:

Control Equipment:		Pollutant(s) Controlled:	
Provide a physical description of the control equipment:			
☐ *See attached for additional details.*			
Provide a description of the significant operating parameters and set points for the control equipment:			
☐ *See attached for additional details.*			
This control equipment is necessary:	☐ To comply with an emission standard	☐ To avoid a project classification	☐ Other – Indicate purpose of control equipment:

FORM F – EMISSION UNIT INFORMATION

Emission Unit No.: GGT-744B

Section 8 Applicable Federal Emission Limits

New Source Performance Standard (NSPS) Affected Facility?	YES ☒	NO ☐	*If yes, complete Form J.*
National Emission Standard for Hazardous Air Pollutants (NESHAP) Affected Facility?	YES ☐	NO ☒	*If yes, complete Form K.*
Maximum Achievable Control Technology (MACT) Affected Facility?	YES ☐	NO ☒	*If yes, complete Form K.*

Other Emission Limits listed in 18 AAC 50.040

Emission Limit or Standard	Regulation Citation
☐ A demonstration of compliance for each emission limit or standard is attached. *Note: This must be attached in order for your application to be complete.*	

Section 9 Applicable State Emission Limits *(listed in 18 AAC 50.050 through 18 AAC 50.090)*

Emission Limit or Standard	Regulation Citation
Visible emissions, excluding condensed water vapor, from an industrial process or fuel-burning equipment may not reduce visibility through the exhaust effluent by more than 20 percent averaged over any six consecutive minutes.	**18 AAC 50.055 (a)**
Particulate matter emitted from an industrial process or fuel-burning equipment may not exceed, per cubic foot of exhaust gas corrected to standard conditions and averaged over three hours, 0.05 grains.	**18 AAC 50.055 (b)**
Sulfur-compound emissions, expressed as sulfur dioxide, from an industrial process or from fuel-burning equipment may not exceed 500 ppm averaged over a period of three hours.	**18 AAC 50.055 (c)**
☒ A demonstration of compliance for each emission limit or standard is attached. *Note: This must be attached in order for your application to be complete.*	
Include multiple copies of this page if more space is required.	

Section 10 Mass Emission Rates for Facilities Requiring an Air Quality Impact Analysis

Regulated Air Pollutant	Mass Emission Rate (grams/second)				
	1-hr	3-hr	8-hr	24-hr	Annual
Carbon Monoxide	**0.761**		**0.761**		
Nitrogen Oxides	**4.586**				**0.1067**
PM-10				**0.0461**	
PM-2.5				**0.0461**	**0.00106**
Sulfur Oxides	**0.0237**	**0.0237**			

Emission Unit No.: GGT-744B

Section 11 Emission Control Information for PSD and/or Nonattainment Major Sources and Modifications Only

Control Equipment: SCR Control System	Pollutant(s) Controlled: NOx
Provide a physical description of the control equipment: SCR to control NOx emissions from Waste Heat Boiler/Solar Turbine exhaust	
☒ *See attached for additional details.*	
Provide a description of the significant operating parameters and set points for the control equipment:	
☐ *See attached for additional details.*	
This control equipment is proposed as BACT ☒ LAER ☐ for pollutant(s):	
Proposed BACT/LAER performance limit: (see attached) lbs/hr for pollutant: NOx	
lbs/hr for pollutant:	
lbs/hr for pollutant:	
Note: The proposed BACT/LAER performance limits may become permit limits.	
☒ If the control equipment is proposed as BACT or LAER, a detailed BACT analysis or LAER demonstration is attached. *Note: This must be attached in order for your application to be complete.*	

Control Equipment:	Pollutant(s) Controlled:
Provide a physical description of the control equipment:	
☐ *See attached for additional details.*	
Provide a description of the significant operating parameters and set points for the control equipment:	
☐ *See attached for additional details.*	
This control equipment is proposed as BACT ☐ LAER ☐ for pollutant(s):	
Proposed BACT/LAER performance limit: lbs/hr for pollutant:	
lbs/hr for pollutant:	
lbs/hr for pollutant:	
Note: The proposed BACT/LAER performance limits may become permit limits.	
☐ If the control equipment is proposed as BACT or LAER, a detailed BACT analysis or LAER demonstration is attached. *Note: This must be attached in order for your application to be complete.*	

Emission Unit No.: GGT-744B

Section 12 Attachments

☒ Attachments Included. List attachments:

Alaska Department of Environmental Conservation Air Quality Control Construction Permit Application	ADEC USE ONLY Receiving Date: ADEC Control #:

FORM F – EMISSION UNIT INFORMATION

Section 1 Stationary Source Information

Source Name: Agrium Kenai Nitrogen Operations (KNO)
Source Physical Address: Mile 21 Kenai Spur Highway
City: Kenai

Include a copy of this form for each emission unit that will emit a regulated air pollutant.

Section 2 Emission Unit Identification

Emission Unit No.: GGT-744C

Section 3 Emission Unit Description

Equipment Type: Turbine	Make: Solar
Model (attach Vendor Specs): GSC-4701	Serial No.:
Maximum Rated Capacity or Maximum Design Throughput: 55.442 MMBtu/hr	
Note: Rated capacity or design throughput may become a permit limit.	

Section 4 Fuels and Materials Processed

Fuel Type(s): Natural Gas	Maximum Design Fuel Consumption Rate: 0.05 MMscf/hr
Materials Processed: NA	Maximum Material Processing Rate: NA
Describe Method of Operation: Natural gas-fired combustion turbine to generate electricity for the plant	
☐ *See attached for additional details.*	
Schedule of Operation (indicate the maximum operation for each time period):	3-hr 3 hr 8-hr 8 hr 24-hr 24 hr Days/yr 365 days

Section 5 Exhaust Parameters

Stack Height (m):	Base Elevation (m):	Stack Inner Exhaust Diameter or Dimensions (m):	Actual Flow Rate (acm/s):	Exit Temp (deg K):
18.29	39.62	1.01	47.36	608

Is stack height greater than 65 meters? YES ☐ NO ☒

☐ If yes, a calculation of good engineering practices stack height, including any computer modeling analyses or field studies, is attached. *If yes, this calculation must be attached in order for your application to be complete.*

Section 6 Plans Showing Emission Unit and Exhaust Point Location

☒ A set of plans showing the location of the emission unit, associated buildings and other nearby structures is attached.
☒ A table of building dimensions is attached.
Note: These must be attached in order for your application to be complete.

Emission Unit No.: GGT-744C

Section 7 Emission Control Information *(if applicable) NOTE: For PSD and Nonattainment Major Sources and Modifications, for control equipment installed for BACT/LAER purposes, skip this section and complete Section 11 instead.*

Control Equipment:		Pollutant(s) Controlled:	
Provide a physical description of the control equipment:			
☐ *See attached for additional details.*			
Provide a description of the significant operating parameters and set points for the control equipment:			
☐ *See attached for additional details.*			
This control equipment is necessary:	☐ To comply with an emission standard	☐ To avoid a project classification	☐ Other – Indicate purpose of control equipment:

Control Equipment:		Pollutant(s) Controlled:	
Provide a physical description of the control equipment:			
☐ *See attached for additional details.*			
Provide a description of the significant operating parameters and set points for the control equipment:			
☐ *See attached for additional details.*			
This control equipment is necessary:	☐ To comply with an emission standard	☐ To avoid a project classification	☐ Other – Indicate purpose of control equipment:

FORM F – EMISSION UNIT INFORMATION

Emission Unit No.: GGT-744C

Section 8 Applicable Federal Emission Limits

New Source Performance Standard (NSPS) Affected Facility?	YES ☒	NO ☐	*If yes, complete Form J.*
National Emission Standard for Hazardous Air Pollutants (NESHAP) Affected Facility?	YES ☐	NO ☒	*If yes, complete Form K.*
Maximum Achievable Control Technology (MACT) Affected Facility?	YES ☐	NO ☒	*If yes, complete Form K.*

Other Emission Limits listed in 18 AAC 50.040

Emission Limit or Standard	Regulation Citation

☐ A demonstration of compliance for each emission limit or standard is attached. *Note: This must be attached in order for your application to be complete.*

Section 9 Applicable State Emission Limits *(listed in 18 AAC 50.050 through 18 AAC 50.090)*

Emission Limit or Standard	Regulation Citation
Visible emissions, excluding condensed water vapor, from an industrial process or fuel-burning equipment may not reduce visibility through the exhaust effluent by more than 20 percent averaged over any six consecutive minutes.	**18 AAC 50.055 (a)**
Particulate matter emitted from an industrial process or fuel-burning equipment may not exceed, per cubic foot of exhaust gas corrected to standard conditions and averaged over three hours, 0.05 grains.	**18 AAC 50.055 (b)**
Sulfur-compound emissions, expressed as sulfur dioxide, from an industrial process or from fuel-burning equipment may not exceed 500 ppm averaged over a period of three hours.	**18 AAC 50.055 (c)**

☒ A demonstration of compliance for each emission limit or standard is attached. *Note: This must be attached in order for your application to be complete.*

Include multiple copies of this page if more space is required.

Section 10 Mass Emission Rates for Facilities Requiring an Air Quality Impact Analysis

Regulated Air Pollutant	Mass Emission Rate (grams/second)				
	1-hr	**3-hr**	**8-hr**	**24-hr**	**Annual**
Carbon Monoxide	**0.761**		**0.761**		
Nitrogen Oxides	**4.586**				**0.1067**
PM-10				**0.0461**	
PM-2.5				**0.0461**	**0.00106**
Sulfur Oxides	**0.0237**	**0.0237**			

FORM F – EMISSION UNIT INFORMATION

Emission Unit No.: GGT-744C

Section 11 Emission Control Information for PSD and/or Nonattainment Major Sources and Modifications Only

Control Equipment: SCR Control System | Pollutant(s) Controlled: NOx

Provide a physical description of the control equipment: SCR to control NOx emissions from Waste Heat Boiler/Solar Turbine exhaust

☒ *See attached for additional details.*

Provide a description of the significant operating parameters and set points for the control equipment:

☐ *See attached for additional details.*

This control equipment is proposed as BACT ☒ LAER ☐ for pollutant(s):

Proposed BACT/LAER performance limit: (see attached) lbs/hr for pollutant: NOx

lbs/hr for pollutant:

lbs/hr for pollutant:

Note: The proposed BACT/LAER performance limits may become permit limits.

☒ If the control equipment is proposed as BACT or LAER, a detailed BACT analysis or LAER demonstration is attached. *Note: This must be attached in order for your application to be complete.*

Control Equipment: | Pollutant(s) Controlled:

Provide a physical description of the control equipment:

☐ *See attached for additional details.*

Provide a description of the significant operating parameters and set points for the control equipment:

☐ *See attached for additional details.*

This control equipment is proposed as BACT ☐ LAER ☐ for pollutant(s):

Proposed BACT/LAER performance limit: lbs/hr for pollutant:

lbs/hr for pollutant:

lbs/hr for pollutant:

Note: The proposed BACT/LAER performance limits may become permit limits.

☐ If the control equipment is proposed as BACT or LAER, a detailed BACT analysis or LAER demonstration is attached. *Note: This must be attached in order for your application to be complete.*

Emission Unit No.: GGT-744C

Section 12 Attachments

☒ Attachments Included. List attachments: ______________________

Alaska Department of Environmental Conservation Air Quality Control Construction Permit Application	ADEC USE ONLY Receiving Date: ADEC Control #:

FORM F – EMISSION UNIT INFORMATION

Section 1 Stationary Source Information

Source Name: Agrium Kenai Nitrogen Operations (KNO)
Source Physical Address: Mile 21 Kenai Spur Highway
City: Kenai

Include a copy of this form for each emission unit that will emit a regulated air pollutant.

Section 2 Emission Unit Identification

Emission Unit No.: GGT-744D

Section 3 Emission Unit Description

Equipment Type: Turbine	Make: Solar
Model (attach Vendor Specs): GSC-4701	Serial No.:
Maximum Rated Capacity or Maximum Design Throughput: 55.442 MMBtu/hr	
Note: Rated capacity or design throughput may become a permit limit.	

Section 4 Fuels and Materials Processed

Fuel Type(s): Natural Gas	Maximum Design Fuel Consumption Rate: 0.05 MMscf/hr
Materials Processed: NA	Maximum Material Processing Rate: NA
Describe Method of Operation: Natural gas-fired combustion turbine to generate electricity for the plant	
☐ *See attached for additional details.*	
Schedule of Operation (indicate the maximum operation for each time period):	3-hr 3 hr 8-hr 8 hr 24-hr 24 hr Days/yr 365 days

Section 5 Exhaust Parameters

Stack Height (m):	Base Elevation (m):	Stack Inner Exhaust Diameter or Dimensions (m):	Actual Flow Rate (acm/s):	Exit Temp (deg K):
10.98	46	1.22	22.1	417

Is stack height greater than 65 meters? YES ☐ NO ☒

☐ If yes, a calculation of good engineering practices stack height, including any computer modeling analyses or field studies, is attached. *If yes, this calculation must be attached in order for your application to be complete.*

Section 6 Plans Showing Emission Unit and Exhaust Point Location

☒ A set of plans showing the location of the emission unit, associated buildings and other nearby structures is attached.
☒ A table of building dimensions is attached.
Note: These must be attached in order for your application to be complete.

Emission Unit No.: GGT-744D

Section 7 Emission Control Information *(if applicable) NOTE: For PSD and Nonattainment Major Sources and Modifications, for control equipment installed for BACT/LAER purposes, skip this section and complete Section 11 instead.*

Control Equipment:		Pollutant(s) Controlled:	
Provide a physical description of the control equipment:			
☐ *See attached for additional details.*			
Provide a description of the significant operating parameters and set points for the control equipment:			
☐ *See attached for additional details.*			
This control equipment is necessary:	☐ To comply with an emission standard	☐ To avoid a project classification	☐ Other – Indicate purpose of control equipment:

Control Equipment:		Pollutant(s) Controlled:	
Provide a physical description of the control equipment:			
☐ *See attached for additional details.*			
Provide a description of the significant operating parameters and set points for the control equipment:			
☐ *See attached for additional details.*			
This control equipment is necessary:	☐ To comply with an emission standard	☐ To avoid a project classification	☐ Other – Indicate purpose of control equipment:

Emission Unit No.: GGT-744D

Section 8 Applicable Federal Emission Limits

New Source Performance Standard (NSPS) Affected Facility?	YES ☒	NO ☐	*If yes, complete Form J.*
National Emission Standard for Hazardous Air Pollutants (NESHAP) Affected Facility?	YES ☐	NO ☒	*If yes, complete Form K.*
Maximum Achievable Control Technology (MACT) Affected Facility?	YES ☐	NO ☒	*If yes, complete Form K.*

Other Emission Limits listed in 18 AAC 50.040

Emission Limit or Standard	Regulation Citation

☐ A demonstration of compliance for each emission limit or standard is attached. *Note: This must be attached in order for your application to be complete.*

Section 9 Applicable State Emission Limits *(listed in 18 AAC 50.050 through 18 AAC 50.090)*

Emission Limit or Standard	Regulation Citation
Visible emissions, excluding condensed water vapor, from an industrial process or fuel-burning equipment may not reduce visibility through the exhaust effluent by more than 20 percent averaged over any six consecutive minutes.	**18 AAC 50.055 (a)**
Particulate matter emitted from an industrial process or fuel-burning equipment may not exceed, per cubic foot of exhaust gas corrected to standard conditions and averaged over three hours, 0.05 grains.	**18 AAC 50.055 (b)**
Sulfur-compound emissions, expressed as sulfur dioxide, from an industrial process or from fuel-burning equipment may not exceed 500 ppm averaged over a period of three hours.	**18 AAC 50.055 (c)**

☒ A demonstration of compliance for each emission limit or standard is attached. *Note: This must be attached in order for your application to be complete.*

Include multiple copies of this page if more space is required.

Section 10 Mass Emission Rates for Facilities Requiring an Air Quality Impact Analysis

Regulated Air Pollutant	Mass Emission Rate (grams/second)				
	1-hr	**3-hr**	**8-hr**	**24-hr**	**Annual**
Carbon Monoxide	**0.761**		**0.761**		
Nitrogen Oxides	**4.586**				**0.1067**
PM-10				**0.0461**	
PM-2.5				**0.0461**	**0.00106**
Sulfur Oxides	**0.0237**	**0.0237**			

Emission Unit No.: GGT-744D

Section 11 Emission Control Information for PSD and/or Nonattainment Major Sources and Modifications Only

Control Equipment: SCR Control System | Pollutant(s) Controlled: NOx

Provide a physical description of the control equipment: SCR to control NOx emissions from Waste Heat Boiler/Solar Turbine exhaust

☒ *See attached for additional details.*

Provide a description of the significant operating parameters and set points for the control equipment:

☐ *See attached for additional details.*

This control equipment is proposed as BACT ☒ LAER ☐ for pollutant(s):

Proposed BACT/LAER performance limit: (see attached) lbs/hr for pollutant: NOx

lbs/hr for pollutant:

lbs/hr for pollutant:

Note: The proposed BACT/LAER performance limits may become permit limits.

☒ If the control equipment is proposed as BACT or LAER, a detailed BACT analysis or LAER demonstration is attached. *Note: This must be attached in order for your application to be complete.*

Control Equipment: | Pollutant(s) Controlled:

Provide a physical description of the control equipment:

☐ *See attached for additional details.*

Provide a description of the significant operating parameters and set points for the control equipment:

☐ *See attached for additional details.*

This control equipment is proposed as BACT ☐ LAER ☐ for pollutant(s):

Proposed BACT/LAER performance limit: lbs/hr for pollutant:

lbs/hr for pollutant:

lbs/hr for pollutant:

Note: The proposed BACT/LAER performance limits may become permit limits.

☐ If the control equipment is proposed as BACT or LAER, a detailed BACT analysis or LAER demonstration is attached. *Note: This must be attached in order for your application to be complete.*

Emission Unit No.: GGT-744D

Section 12 Attachments

☒ Attachments Included. List attachments: ______

Alaska Department of Environmental Conservation **Air Quality Control Construction Permit Application**	**ADEC USE ONLY** Receiving Date: ADEC Control #:

FORM F – EMISSION UNIT INFORMATION

Section 1 Stationary Source Information

Source Name: Agrium Kenai Nitrogen Operations (KNO)
Source Physical Address: Mile 21 Kenai Spur Highway
City: Kenai

Include a copy of this form for each emission unit that will emit a regulated air pollutant.

Section 2 Emission Unit Identification

Emission Unit No.: GGT-744E

Section 3 Emission Unit Description

Equipment Type: Turbine	Make: Solar
Model (attach Vendor Specs): GSC-4701	Serial No.:
Maximum Rated Capacity or Maximum Design Throughput: 55.442 MMBtu/hr	
Note: Rated capacity or design throughput may become a permit limit.	

Section 4 Fuels and Materials Processed

Fuel Type(s): Natural Gas	Maximum Design Fuel Consumption Rate: 0.05 MMscf/hr
Materials Processed: NA	Maximum Material Processing Rate: NA
Describe Method of Operation: Natural gas-fired combustion turbine to generate electricity for the plant	
☐ *See attached for additional details.*	
Schedule of Operation (indicate the maximum operation for each time period):	3-hr 3 hr 8-hr 8 hr 24-hr 24 hr Days/yr 365 days

Section 5 Exhaust Parameters

Stack Height (m):	Base Elevation (m):	Stack Inner Exhaust Diameter or Dimensions (m):	Actual Flow Rate (acm/s):	Exit Temp (deg K):
18.29	39.62	1.01	47.36	608

Is stack height greater than 65 meters? YES ☐ NO ☒

☐ If yes, a calculation of good engineering practices stack height, including any computer modeling analyses or field studies, is attached. *If yes, this calculation must be attached in order for your application to be complete.*

Section 6 Plans Showing Emission Unit and Exhaust Point Location

☒ A set of plans showing the location of the emission unit, associated buildings and other nearby structures is attached.
☒ A table of building dimensions is attached.
Note: These must be attached in order for your application to be complete.

Emission Unit No.: GGT-744E

Section 7 Emission Control Information *(if applicable) NOTE: For PSD and Nonattainment Major Sources and Modifications, for control equipment installed for BACT/LAER purposes, skip this section and complete Section 11 instead.*

Control Equipment:		Pollutant(s) Controlled:	
Provide a physical description of the control equipment:			
☐ *See attached for additional details.*			
Provide a description of the significant operating parameters and set points for the control equipment:			
☐ *See attached for additional details.*			
This control equipment is necessary:	☐ To comply with an emission standard	☐ To avoid a project classification	☐ Other – Indicate purpose of control equipment:

Control Equipment:		Pollutant(s) Controlled:	
Provide a physical description of the control equipment:			
☐ *See attached for additional details.*			
Provide a description of the significant operating parameters and set points for the control equipment:			
☐ *See attached for additional details.*			
This control equipment is necessary:	☐ To comply with an emission standard	☐ To avoid a project classification	☐ Other – Indicate purpose of control equipment:

Emission Unit No.: GGT-744E

Section 8 Applicable Federal Emission Limits

New Source Performance Standard (NSPS) Affected Facility?	YES ☒	NO ☐	*If yes, complete Form J.*
National Emission Standard for Hazardous Air Pollutants (NESHAP) Affected Facility?	YES ☐	NO ☒	*If yes, complete Form K.*
Maximum Achievable Control Technology (MACT) Affected Facility?	YES ☐	NO ☒	*If yes, complete Form K.*

Other Emission Limits listed in 18 AAC 50.040

Emission Limit or Standard	**Regulation Citation**
☐ A demonstration of compliance for each emission limit or standard is attached. *Note: This must be attached in order for your application to be complete.*	

Section 9 Applicable State Emission Limits *(listed in 18 AAC 50.050 through 18 AAC 50.090)*

Emission Limit or Standard	**Regulation Citation**
Visible emissions, excluding condensed water vapor, from an industrial process or fuel-burning equipment may not reduce visibility through the exhaust effluent by more than 20 percent averaged over any six consecutive minutes.	**18 AAC 50.055 (a)**
Particulate matter emitted from an industrial process or fuel-burning equipment may not exceed, per cubic foot of exhaust gas corrected to standard conditions and averaged over three hours, 0.05 grains.	**18 AAC 50.055 (b)**
Sulfur-compound emissions, expressed as sulfur dioxide, from an industrial process or from fuel-burning equipment may not exceed 500 ppm averaged over a period of three hours.	**18 AAC 50.055 (c)**
☒ A demonstration of compliance for each emission limit or standard is attached. *Note: This must be attached in order for your application to be complete.*	
Include multiple copies of this page if more space is required.	

Section 10 Mass Emission Rates for Facilities Requiring an Air Quality Impact Analysis

Regulated Air Pollutant	**Mass Emission Rate (grams/second)**				
	1-hr	**3-hr**	**8-hr**	**24-hr**	**Annual**
Carbon Monoxide	**0.761**		**0.761**		
Nitrogen Oxides	**4.586**				**0.1067**
PM-10				**0.0461**	
PM-2.5				**0.0461**	**0.00106**
Sulfur Oxides	**0.0237**	**0.0237**			

Emission Unit No.: GGT-744E

Section 11 Emission Control Information for PSD and/or Nonattainment Major Sources and Modifications Only

Control Equipment: SCR Control System	Pollutant(s) Controlled: NOx
Provide a physical description of the control equipment: SCR to control NOx emissions from Waste Heat Boiler/Solar Turbine exhaust	
☒ *See attached for additional details.*	
Provide a description of the significant operating parameters and set points for the control equipment:	
☐ *See attached for additional details.*	
This control equipment is proposed as BACT ☒ LAER ☐ for pollutant(s):	
Proposed BACT/LAER performance limit: (see attached) lbs/hr for pollutant: NOx	
lbs/hr for pollutant:	
lbs/hr for pollutant:	
Note: The proposed BACT/LAER performance limits may become permit limits.	
☒ If the control equipment is proposed as BACT or LAER, a detailed BACT analysis or LAER demonstration is attached. *Note: This must be attached in order for your application to be complete.*	

Control Equipment:	Pollutant(s) Controlled:
Provide a physical description of the control equipment:	
☐ *See attached for additional details.*	
Provide a description of the significant operating parameters and set points for the control equipment:	
☐ *See attached for additional details.*	
This control equipment is proposed as BACT ☐ LAER ☐ for pollutant(s):	
Proposed BACT/LAER performance limit: lbs/hr for pollutant:	
lbs/hr for pollutant:	
lbs/hr for pollutant:	
Note: The proposed BACT/LAER performance limits may become permit limits.	
☐ If the control equipment is proposed as BACT or LAER, a detailed BACT analysis or LAER demonstration is attached. *Note: This must be attached in order for your application to be complete.*	

Emission Unit No.: GGT-744E

Section 12 Attachments

☒ Attachments Included. List attachments: ______

Alaska Department of Environmental Conservation Air Quality Control Construction Permit Application	**ADEC USE ONLY** Receiving Date: ADEC Control #:

FORM J – NEW SOURCE PERFORMANCE STANDARDS

Section 1 Stationary Source Information	**Section 2 Emission Unit Identification**
Source Name: Agrium Kenai Nitrogen Operations (KNO)	Emission Unit No.: GGT-744A, B, C, D, E *See Form F for this Emission Unit No.*
Source Physical Address: Mile 21 Kenai Spur Highway	☒ New ☐ Modified ☐ Reconstructed
City: Kenai	

Section 3 40 CFR Part 60 Subpart A

List applicable sections of Subpart A: 60.7(a), 60.7(b), 60.7(c), 60.7(d), 60.7(f), 60.8(a), 60.8(b), 60.8(c), 60.8(d), 60.8(e), 60.8(f), 60.11(d), 60.11(g), 60.12, 60.13(b), 60.13(d), 60.13(e), 60.13(f), 60.13(h), 60.14(a), 60.14(g), 60.15(d)

Section 4 Applicable Subpart: 40 CFR Part 60 Subpart KKKK

List applicable sections: 60.4320(a), 60.4330(a)(1) & (a)(2), 60.4333(a), 60.4340(a), 60.4355(a), 60.4360, 60.4365, 60.4370(b) & (c), 60.4375, 60.4385(a) & (c), 60.4395, 60.4400, 60.4415

List applicable emission standards:
60.4320(a): NOX - 25 ppm or 1.2 lb/MWh.
60.4330(a)(1) & (a)(2): SO2 - 110 ng/J (0.9 lb/MWh)gross output; do not burn fuel with potential sulfur emissions >26 ng SO2 /J (0.06 lb SO2/MMBtu)

☐ *See attached for additional details.*

List inapplicable sections of subpart: 60.4325, 60.4330(b), 60.4333(b), 60.4335, 60.4340(b), 60.4345, 60.4350, 60.4370(a), 60.4380, 60.4390, 60.4405, 60.4410

Description of inapplicability of sections of subpart:
60.4325: Only burns natural gas.
60.4330(b): Not located in a noncontinental area.
60.4333(b): Does not have a common steam header.
60.4335: Will not use stack injection.
60.4340(b): Will perform annual performance test instead of installing CMS
60.4345, 60.4350, 60.4380, 60.4405, 60.4410: Not using a CMS
60.4370(a): Do not use fuel oil.
60.4390: Not an emergency or research & development turbine.

☐ *See attached for additional details.*

List Monitoring, Record Keeping and Reporting Requirements:
60.4340(a): Annual performance test.
60.4355(a): Develop & keep on site a parameter monitoring plan.
60.4360 & 60.4365: Monitor the total sulfur content of the fuel, or demonstrate the total sulfur content of the fuel does not exceed the limit by showing the fuel quality characteristics in a current contract or with representative fuel sampling data.
60.4370(b) & (c): Test fuel sulfur daily or on a custom schedule unless elect to demonstrate fuel sulfur content using 60.4365.
60.4375(a): Submit reports of excess emissions and monitor downtime, including start-up, shutdown, and malfunction.
60.4375(b): Submit annual performance test results within 60 days of completion of performance test.

60.4400: Perform initial performance test within 60 days of reaching maximum production rate but no later than 180 days after initial startup.
60.4415: Conduct an annual performance test for sulfur.

☐ *See attached for additional details.*

Section 5 Attachments

☐ Attachments Included. List attachments: ______________________

Alaska Department of Environmental Conservation **Air Quality Control Construction Permit Application**	**ADEC USE ONLY** Receiving Date: ADEC Control #:

FORM F – EMISSION UNIT INFORMATION

Section 1 Stationary Source Information

Source Name: Agrium Kenai Nitrogen Operations (KNO)
Source Physical Address: Mile 21 Kenai Spur Highway
City: Kenai

Include a copy of this form for each emission unit that will emit a regulated air pollutant.

Section 2 Emission Unit Identification

Emission Unit No.: B-705A

Section 3 Emission Unit Description

Equipment Type: Boiler	Make: Certified & Nebraska Boiler Co.
Model (attach Vendor Specs): K-611	Serial No.: W-2169
Maximum Rated Capacity or Maximum Design Throughput: 46.729 MMBtu/Hr	
Note: Rated capacity or design throughput may become a permit limit.	

Section 4 Fuels and Materials Processed

Fuel Type(s): Natural Gas	Maximum Design Fuel Consumption Rate: 0.05 MMscf/hr
Materials Processed: Water	Maximum Material Processing Rate:
Describe Method of Operation: Waste heat boiler that generates steam using heat from Solar Turbine and natural gas combustion.	
☐ *See attached for additional details.*	
Schedule of Operation (indicate the maximum operation for each time period):	3-hr 3 hr 8-hr 8 hr 24-hr 24 hr Days/yr 365 days

Section 5 Exhaust Parameters

Stack Height (m): 30.48	Base Elevation (m): 39.62	Stack Inner Exhaust Diameter or Dimensions (m): 1.22	Actual Flow Rate (acm/s): 23.38	Exit Temp (deg K): 416

Is stack height greater than 65 meters? YES ☐ NO ☒

☐ If yes, a calculation of good engineering practices stack height, including any computer modeling analyses or field studies, is attached. *If yes, this calculation must be attached in order for your application to be complete.*

Section 6 Plans Showing Emission Unit and Exhaust Point Location

☒ A set of plans showing the location of the emission unit, associated buildings and other nearby structures is attached.
☒ A table of building dimensions is attached.
Note: These must be attached in order for your application to be complete.

Emission Unit No.: B-705A

Section 7 Emission Control Information *(if applicable) NOTE: For PSD and Nonattainment Major Sources and Modifications, for control equipment installed for BACT/LAER purposes, skip this section and complete Section 11 instead.*

Control Equipment:		Pollutant(s) Controlled:	
Provide a physical description of the control equipment:			
☐ *See attached for additional details.*			
Provide a description of the significant operating parameters and set points for the control equipment:			
☐ *See attached for additional details.*			
This control equipment is necessary:	☐ To comply with an emission standard	☐ To avoid a project classification	☐ Other – Indicate purpose of control equipment:

Control Equipment:		Pollutant(s) Controlled:	
Provide a physical description of the control equipment:			
☐ *See attached for additional details.*			
Provide a description of the significant operating parameters and set points for the control equipment:			
☐ *See attached for additional details.*			
This control equipment is necessary:	☐ To comply with an emission standard	☐ To avoid a project classification	☐ Other – Indicate purpose of control equipment:

Emission Unit No.: B-705A

Section 8 Applicable Federal Emission Limits

New Source Performance Standard (NSPS) Affected Facility?	YES ☐	NO ☒	*If yes, complete Form J.*
National Emission Standard for Hazardous Air Pollutants (NESHAP) Affected Facility?	YES ☒	NO ☐	*If yes, complete Form K.*
Maximum Achievable Control Technology (MACT) Affected Facility?	YES ☒	NO ☐	*If yes, complete Form K.*

Other Emission Limits listed in 18 AAC 50.040

Emission Limit or Standard	Regulation Citation

☐ A demonstration of compliance for each emission limit or standard is attached. *Note: This must be attached in order for your application to be complete.*

Section 9 Applicable State Emission Limits *(listed in 18 AAC 50.050 through 18 AAC 50.090)*

Emission Limit or Standard	Regulation Citation
Visible emissions, excluding condensed water vapor, from an industrial process or fuel-burning equipment may not reduce visibility through the exhaust effluent by more than 20 percent averaged over any six consecutive minutes.	**18 AAC 50.055 (a)**
Particulate matter emitted from an industrial process or fuel-burning equipment may not exceed, per cubic foot of exhaust gas corrected to standard conditions and averaged over three hours, 0.05 grains.	**18 AAC 50.055 (b)**
Sulfur-compound emissions, expressed as sulfur dioxide, from an industrial process or from fuel-burning equipment may not exceed 500 ppm averaged over a period of three hours.	**18 AAC 50.055 (c)**

☒ A demonstration of compliance for each emission limit or standard is attached. *Note: This must be attached in order for your application to be complete.*

Include multiple copies of this page if more space is required.

Section 10 Mass Emission Rates for Facilities Requiring an Air Quality Impact Analysis

Regulated Air Pollutant	Mass Emission Rate (grams/second)				
	1-hr	**3-hr**	**8-hr**	**24-hr**	**Annual**
Carbon Monoxide	**1.403**		**1.403**		
Nitrogen Oxides	**0.329**				**0.329**
PM-10				**0.090**	
PM-2.5				**0.090**	**0.090**
Sulfur Oxides	**0.020**	**0.020**			

Emission Unit No.: B-705A

Section 11 Emission Control Information for PSD and/or Nonattainment Major Sources and Modifications Only

Control Equipment: SCR | Pollutant(s) Controlled: NOx

Provide a physical description of the control equipment: A SCR control system will be installed on the exhaust from the Waste Heat Boiler/Solar Turbine. A BACT analysis is attached.

☒ *See attached for additional details.*

Provide a description of the significant operating parameters and set points for the control equipment: TBD

☐ *See attached for additional details.*

This control equipment is proposed as BACT ☒ LAER ☐ for pollutant(s): NOx

Proposed BACT/LAER performance limit: (See Attached) lbs/hr for pollutant:

lbs/hr for pollutant:

lbs/hr for pollutant:

Note: The proposed BACT/LAER performance limits may become permit limits.

☒If the control equipment is proposed as BACT or LAER, a detailed BACT analysis or LAER demonstration is attached. *Note: This must be attached in order for your application to be complete.*

Control Equipment: | Pollutant(s) Controlled:

Provide a physical description of the control equipment:

☐ *See attached for additional details.*

Provide a description of the significant operating parameters and set points for the control equipment:

☐ *See attached for additional details.*

This control equipment is proposed as BACT ☐ LAER ☐ for pollutant(s):

Proposed BACT/LAER performance limit: lbs/hr for pollutant:

lbs/hr for pollutant:

lbs/hr for pollutant:

Note: The proposed BACT/LAER performance limits may become permit limits.

☐ If the control equipment is proposed as BACT or LAER, a detailed BACT analysis or LAER demonstration is attached. *Note: This must be attached in order for your application to be complete.*

Emission Unit No.: B-705A

Section 12 Attachments

☒ Attachments Included. List attachments: ______

Alaska Department of Environmental Conservation Air Quality Control Construction Permit Application	**ADEC USE ONLY** Receiving Date: ADEC Control #:

FORM F – EMISSION UNIT INFORMATION

Section 1 Stationary Source Information

Source Name: Agrium Kenai Nitrogen Operations (KNO)
Source Physical Address: Mile 21 Kenai Spur Highway
City: Kenai

Include a copy of this form for each emission unit that will emit a regulated air pollutant.

Section 2 Emission Unit Identification

Emission Unit No.: B-705B

Section 3 Emission Unit Description

Equipment Type: Boiler	Make: Certified & Nebraska Boiler Co.
Model (attach Vendor Specs): K-611	Serial No.: W-2171
Maximum Rated Capacity or Maximum Design Throughput: 46.729 MMBtu/hr	
Note: Rated capacity or design throughput may become a permit limit.	

Section 4 Fuels and Materials Processed

Fuel Type(s): Natural Gas	Maximum Design Fuel Consumption Rate: 0.05 MMscf/hr
Materials Processed: Water	Maximum Material Processing Rate:
Describe Method of Operation: Waste heat boiler that generates steam using heat from Solar Turbine and natural gas combustion.	
☐ *See attached for additional details.*	

Schedule of Operation (indicate the maximum operation for each time period):

3-hr	3 hr
8-hr	8 hr
24-hr	24 hr
Days/yr	365 days

Section 5 Exhaust Parameters

Stack Height (m):	Base Elevation (m):	Stack Inner Exhaust Diameter or Dimensions (m):	Actual Flow Rate (acm/s):	Exit Temp (deg K):
30.48	39.62	1.22	23.38	416

Is stack height greater than 65 meters? YES ☐ NO ☒

☐ If yes, a calculation of good engineering practices stack height, including any computer modeling analyses or field studies, is attached. *If yes, this calculation must be attached in order for your application to be complete.*

Section 6 Plans Showing Emission Unit and Exhaust Point Location

☒ A set of plans showing the location of the emission unit, associated buildings and other nearby structures is attached.
☒ A table of building dimensions is attached.
Note: These must be attached in order for your application to be complete.

Emission Unit No.: B-705B

Section 7 Emission Control Information *(if applicable) NOTE: For PSD and Nonattainment Major Sources and Modifications, for control equipment installed for BACT/LAER purposes, skip this section and complete Section 11 instead.*

Control Equipment:		Pollutant(s) Controlled:	
Provide a physical description of the control equipment:			
☐ *See attached for additional details.*			
Provide a description of the significant operating parameters and set points for the control equipment:			
☐ *See attached for additional details.*			
This control equipment is necessary:	☐ To comply with an emission standard	☐ To avoid a project classification	☐ Other – Indicate purpose of control equipment:

Control Equipment:		Pollutant(s) Controlled:	
Provide a physical description of the control equipment:			
☐ *See attached for additional details.*			
Provide a description of the significant operating parameters and set points for the control equipment:			
☐ *See attached for additional details.*			
This control equipment is necessary:	☐ To comply with an emission standard	☐ To avoid a project classification	☐ Other – Indicate purpose of control equipment:

FORM F – EMISSION UNIT INFORMATION

Emission Unit No.: B-705B

Section 8 Applicable Federal Emission Limits

New Source Performance Standard (NSPS) Affected Facility?	YES ☐	NO ☒	*If yes, complete Form J.*
National Emission Standard for Hazardous Air Pollutants (NESHAP) Affected Facility?	YES ☒	NO ☐	*If yes, complete Form K.*
Maximum Achievable Control Technology (MACT) Affected Facility?	YES ☒	NO ☐	*If yes, complete Form K.*

Other Emission Limits listed in 18 AAC 50.040

Emission Limit or Standard	Regulation Citation
☐ A demonstration of compliance for each emission limit or standard is attached. *Note: This must be attached in order for your application to be complete.*	

Section 9 Applicable State Emission Limits *(listed in 18 AAC 50.050 through 18 AAC 50.090)*

Emission Limit or Standard	Regulation Citation
Visible emissions, excluding condensed water vapor, from an industrial process or fuel-burning equipment may not reduce visibility through the exhaust effluent by more than 20 percent averaged over any six consecutive minutes.	**18 AAC 50.055 (a)**
Particulate matter emitted from an industrial process or fuel-burning equipment may not exceed, per cubic foot of exhaust gas corrected to standard conditions and averaged over three hours, 0.05 grains.	**18 AAC 50.055 (b)**
Sulfur-compound emissions, expressed as sulfur dioxide, from an industrial process or from fuel-burning equipment may not exceed 500 ppm averaged over a period of three hours.	**18 AAC 50.055 (c)**
☒ A demonstration of compliance for each emission limit or standard is attached. *Note: This must be attached in order for your application to be complete.*	
Include multiple copies of this page if more space is required.	

Section 10 Mass Emission Rates for Facilities Requiring an Air Quality Impact Analysis

Regulated Air Pollutant	Mass Emission Rate (grams/second)				
	1-hr	**3-hr**	**8-hr**	**24-hr**	**Annual**
Carbon Monoxide	**1.403**		**1.403**		
Nitrogen Oxides	**0.329**				**0.329**
PM-10				**0.090**	
PM-2.5				**0.090**	**0.090**
Sulfur Oxides	**0.020**	**0.020**			

FORM F – EMISSION UNIT INFORMATION

Emission Unit No.: B-705B

Section 11 Emission Control Information for PSD and/or Nonattainment Major Sources and Modifications Only

Control Equipment: SCR	Pollutant(s) Controlled: NOx
Provide a physical description of the control equipment: A SCR control system will be installed on the exhaust from the Waste Heat Boiler/Solar Turbine. A BACT analysis is attached	
☒ *See attached for additional details.*	
Provide a description of the significant operating parameters and set points for the control equipment: TBD	
☐ *See attached for additional details.*	
This control equipment is proposed as BACT ☒ LAER ☐ for pollutant(s):	
Proposed BACT/LAER performance limit: (See Attached) lbs/hr for pollutant: lbs/hr for pollutant: lbs/hr for pollutant:	
Note: The proposed BACT/LAER performance limits may become permit limits.	
☒ If the control equipment is proposed as BACT or LAER, a detailed BACT analysis or LAER demonstration is attached. *Note: This must be attached in order for your application to be complete.*	

Control Equipment:	Pollutant(s) Controlled:
Provide a physical description of the control equipment:	
☐ *See attached for additional details.*	
Provide a description of the significant operating parameters and set points for the control equipment:	
☐ *See attached for additional details.*	
This control equipment is proposed as BACT ☐ LAER ☐ for pollutant(s):	
Proposed BACT/LAER performance limit: lbs/hr for pollutant: lbs/hr for pollutant: lbs/hr for pollutant:	
Note: The proposed BACT/LAER performance limits may become permit limits.	
☐ If the control equipment is proposed as BACT or LAER, a detailed BACT analysis or LAER demonstration is attached. *Note: This must be attached in order for your application to be complete.*	

Emission Unit No.: B-705B

Section 12 Attachments

☒ Attachments Included. List attachments: ____________________

Alaska Department of Environmental Conservation **Air Quality Control Construction Permit Application**	**ADEC USE ONLY** Receiving Date: ADEC Control #:

FORM F – EMISSION UNIT INFORMATION

Section 1 Stationary Source Information

Source Name: Agrium Kenai Nitrogen Operations (KNO)
Source Physical Address: Mile 21 Kenai Spur Highway
City: Kenai

Include a copy of this form for each emission unit that will emit a regulated air pollutant.

Section 2 Emission Unit Identification

Emission Unit No.: B-705C

Section 3 Emission Unit Description

Equipment Type: Boiler	Make: Certified & Nebraska Boiler Co.
Model (attach Vendor Specs): K-611	Serial No.: W-2170
Maximum Rated Capacity or Maximum Design Throughput: 46.729 MMBtu/hr	
Note: Rated capacity or design throughput may become a permit limit.	

Section 4 Fuels and Materials Processed

Fuel Type(s): Natural Gas	Maximum Design Fuel Consumption Rate: 0.05 MMscf/hr
Materials Processed: Water	Maximum Material Processing Rate:
Describe Method of Operation: Waste heat boiler that generates steam using heat from Solar Turbine and natural gas combustion.	
☐ *See attached for additional details.*	
Schedule of Operation (indicate the maximum operation for each time period):	3-hr 3 hr 8-hr 8 hr 24-hr 24 hr Days/yr 365 days

Section 5 Exhaust Parameters

Stack Height (m):	Base Elevation (m):	Stack Inner Exhaust Diameter or Dimensions (m):	Actual Flow Rate (acm/s):	Exit Temp (deg K):
30.48	39.62	1.22	23.38	416

Is stack height greater than 65 meters? YES ☐ NO ☒

☐ If yes, a calculation of good engineering practices stack height, including any computer modeling analyses or field studies, is attached. *If yes, this calculation must be attached in order for your application to be complete.*

Section 6 Plans Showing Emission Unit and Exhaust Point Location

☒ A set of plans showing the location of the emission unit, associated buildings and other nearby structures is attached.
☒ A table of building dimensions is attached.
Note: These must be attached in order for your application to be complete.

Emission Unit No.: B-705C

Section 7 Emission Control Information *(if applicable) NOTE: For PSD and Nonattainment Major Sources and Modifications, for control equipment installed for BACT/LAER purposes, skip this section and complete Section 11 instead.*

Control Equipment:		Pollutant(s) Controlled:	
Provide a physical description of the control equipment:			
☐ *See attached for additional details.*			
Provide a description of the significant operating parameters and set points for the control equipment:			
☐ *See attached for additional details.*			
This control equipment is necessary:	☐ To comply with an emission standard	☐ To avoid a project classification	☐ Other – Indicate purpose of control equipment:

Control Equipment:		Pollutant(s) Controlled:	
Provide a physical description of the control equipment:			
☐ *See attached for additional details.*			
Provide a description of the significant operating parameters and set points for the control equipment:			
☐ *See attached for additional details.*			
This control equipment is necessary:	☐ To comply with an emission standard	☐ To avoid a project classification	☐ Other – Indicate purpose of control equipment:

FORM F – EMISSION UNIT INFORMATION

Emission Unit No.: B-705C

Section 8 Applicable Federal Emission Limits

New Source Performance Standard (NSPS) Affected Facility?	YES ☐	NO ☒	*If yes, complete Form J.*
National Emission Standard for Hazardous Air Pollutants (NESHAP) Affected Facility?	YES ☒	NO ☐	*If yes, complete Form K.*
Maximum Achievable Control Technology (MACT) Affected Facility?	YES ☒	NO ☐	*If yes, complete Form K.*

Other Emission Limits listed in 18 AAC 50.040

Emission Limit or Standard	Regulation Citation
☐ A demonstration of compliance for each emission limit or standard is attached. *Note: This must be attached in order for your application to be complete.*	

Section 9 Applicable State Emission Limits *(listed in 18 AAC 50.050 through 18 AAC 50.090)*

Emission Limit or Standard	Regulation Citation
Visible emissions, excluding condensed water vapor, from an industrial process or fuel-burning equipment may not reduce visibility through the exhaust effluent by more than 20 percent averaged over any six consecutive minutes.	**18 AAC 50.055 (a)**
Particulate matter emitted from an industrial process or fuel-burning equipment may not exceed, per cubic foot of exhaust gas corrected to standard conditions and averaged over three hours, 0.05 grains.	**18 AAC 50.055 (b)**
Sulfur-compound emissions, expressed as sulfur dioxide, from an industrial process or from fuel-burning equipment may not exceed 500 ppm averaged over a period of three hours.	**18 AAC 50.055 (c)**
☒ A demonstration of compliance for each emission limit or standard is attached. *Note: This must be attached in order for your application to be complete.*	
Include multiple copies of this page if more space is required.	

Section 10 Mass Emission Rates for Facilities Requiring an Air Quality Impact Analysis

Regulated Air Pollutant	Mass Emission Rate (grams/second)				
	1-hr	3-hr	8-hr	24-hr	Annual
Carbon Monoxide	**1.403**		**1.403**		
Nitrogen Oxides	**0.329**				**0.329**
PM-10				**0.090**	
PM-2.5				**0.090**	**0.090**
Sulfur Oxides	**0.020**	**0.020**			

Emission Unit No.: B-705C

Section 11 Emission Control Information for PSD and/or Nonattainment Major Sources and Modifications Only

Control Equipment: SCR	Pollutant(s) Controlled: NOx
Provide a physical description of the control equipment: A SCR control system will be installed on the exhaust from the Waste Heat Boiler/Solar Turbine. A BACT analysis is attached	
☒ *See attached for additional details.*	
Provide a description of the significant operating parameters and set points for the control equipment: TBD	
☐ *See attached for additional details.*	
This control equipment is proposed as BACT ☒ LAER ☐ for pollutant(s):	
Proposed BACT/LAER performance limit: (see attached) lbs/hr for pollutant:	
lbs/hr for pollutant:	
lbs/hr for pollutant:	
Note: The proposed BACT/LAER performance limits may become permit limits.	
☒ If the control equipment is proposed as BACT or LAER, a detailed BACT analysis or LAER demonstration is attached. *Note: This must be attached in order for your application to be complete.*	

Control Equipment:	Pollutant(s) Controlled:
Provide a physical description of the control equipment:	
☐ *See attached for additional details.*	
Provide a description of the significant operating parameters and set points for the control equipment:	
☐ *See attached for additional details.*	
This control equipment is proposed as BACT ☐ LAER ☐ for pollutant(s):	
Proposed BACT/LAER performance limit: lbs/hr for pollutant:	
lbs/hr for pollutant:	
lbs/hr for pollutant:	
Note: The proposed BACT/LAER performance limits may become permit limits.	
☐ If the control equipment is proposed as BACT or LAER, a detailed BACT analysis or LAER demonstration is attached. *Note: This must be attached in order for your application to be complete.*	

Emission Unit No.: B-705C

Section 12 Attachments

☒ Attachments Included. List attachments: ____

Alaska Department of Environmental Conservation Air Quality Control Construction Permit Application	**ADEC USE ONLY** Receiving Date: ADEC Control #:

FORM F – EMISSION UNIT INFORMATION

Section 1 Stationary Source Information

Source Name: Agrium Kenai Nitrogen Operations (KNO)
Source Physical Address: Mile 21 Kenai Spur Highway
City: Kenai

Include a copy of this form for each emission unit that will emit a regulated air pollutant.

Section 2 Emission Unit Identification

Emission Unit No.: B-705D

Section 3 Emission Unit Description

Equipment Type: Boiler	Make: Certified & Nebraska Boiler Co.
Model (attach Vendor Specs): K-611	Serial No.: W-2173
Maximum Rated Capacity or Maximum Design Throughput: 46.729 MMBtu/hr	
Note: Rated capacity or design throughput may become a permit limit.	

Section 4 Fuels and Materials Processed

Fuel Type(s): Natural Gas	Maximum Design Fuel Consumption Rate: 0.05 MMscf/hr
Materials Processed: Water	Maximum Material Processing Rate:
Describe Method of Operation: Waste heat boiler that generates steam using heat from Solar Turbine and natural gas combustion.	
☐ *See attached for additional details.*	

Schedule of Operation (indicate the maximum operation for each time period):

3-hr	3 hr
8-hr	8 hr
24-hr	24 hr
Days/yr	365 days

Section 5 Exhaust Parameters

Stack Height (m):	Base Elevation (m):	Stack Inner Exhaust Diameter or Dimensions (m):	Actual Flow Rate (acm/s):	Exit Temp (deg K):
30.48	39.62	1.22	23.38	416

Is stack height greater than 65 meters? YES ☐ NO ☒

☐ If yes, a calculation of good engineering practices stack height, including any computer modeling analyses or field studies, is attached. *If yes, this calculation must be attached in order for your application to be complete.*

Section 6 Plans Showing Emission Unit and Exhaust Point Location

☒ A set of plans showing the location of the emission unit, associated buildings and other nearby structures is attached.
☒ A table of building dimensions is attached.
Note: These must be attached in order for your application to be complete.

Emission Unit No.: B-705D

Section 7 Emission Control Information *(if applicable) NOTE: For PSD and Nonattainment Major Sources and Modifications, for control equipment installed for BACT/LAER purposes, skip this section and complete Section 11 instead.*

Control Equipment:		Pollutant(s) Controlled:	
Provide a physical description of the control equipment:			
☐ *See attached for additional details.*			
Provide a description of the significant operating parameters and set points for the control equipment:			
☐ *See attached for additional details.*			
This control equipment is necessary:	☐ To comply with an emission standard	☐ To avoid a project classification	☐ Other – Indicate purpose of control equipment:

Control Equipment:		Pollutant(s) Controlled:	
Provide a physical description of the control equipment:			
☐ *See attached for additional details.*			
Provide a description of the significant operating parameters and set points for the control equipment:			
☐ *See attached for additional details.*			
This control equipment is necessary:	☐ To comply with an emission standard	☐ To avoid a project classification	☐ Other – Indicate purpose of control equipment:

FORM F – EMISSION UNIT INFORMATION

Emission Unit No.: B-705D

Section 8 Applicable Federal Emission Limits

New Source Performance Standard (NSPS) Affected Facility?	YES ☐	NO ☒	*If yes, complete Form J.*
National Emission Standard for Hazardous Air Pollutants (NESHAP) Affected Facility?	YES ☒	NO ☐	*If yes, complete Form K.*
Maximum Achievable Control Technology (MACT) Affected Facility?	YES ☒	NO ☐	*If yes, complete Form K.*

Other Emission Limits listed in 18 AAC 50.040

Emission Limit or Standard	Regulation Citation
☐ A demonstration of compliance for each emission limit or standard is attached. *Note: This must be attached in order for your application to be complete.*	

Section 9 Applicable State Emission Limits *(listed in 18 AAC 50.050 through 18 AAC 50.090)*

Emission Limit or Standard	Regulation Citation
Visible emissions, excluding condensed water vapor, from an industrial process or fuel-burning equipment may not reduce visibility through the exhaust effluent by more than 20 percent averaged over any six consecutive minutes.	**18 AAC 50.055 (a)**
Particulate matter emitted from an industrial process or fuel-burning equipment may not exceed, per cubic foot of exhaust gas corrected to standard conditions and averaged over three hours, 0.05 grains.	**18 AAC 50.055 (b)**
Sulfur-compound emissions, expressed as sulfur dioxide, from an industrial process or from fuel-burning equipment may not exceed 500 ppm averaged over a period of three hours.	**18 AAC 50.055 (c)**
☒ A demonstration of compliance for each emission limit or standard is attached. *Note: This must be attached in order for your application to be complete.*	
Include multiple copies of this page if more space is required.	

Section 10 Mass Emission Rates for Facilities Requiring an Air Quality Impact Analysis

Regulated Air Pollutant	Mass Emission Rate (grams/second)				
	1-hr	**3-hr**	**8-hr**	**24-hr**	**Annual**
Carbon Monoxide	**1.403**		**1.403**		
Nitrogen Oxides	**0.329**				**0.329**
PM-10				**0.090**	
PM-2.5				**0.090**	**0.090**
Sulfur Oxides	**0.020**	**0.020**			

Emission Unit No.: B-705D

Section 11 Emission Control Information for PSD and/or Nonattainment Major Sources and Modifications Only

Control Equipment: SCR | Pollutant(s) Controlled: NOx

Provide a physical description of the control equipment: A SCR control system will be installed on the exhaust from the Waste Heat Boiler/Solar Turbine. A BACT analysis is attached

☒ *See attached for additional details.*

Provide a description of the significant operating parameters and set points for the control equipment: TBD

☐ *See attached for additional details.*

This control equipment is proposed as BACT ☒ LAER ☐ for pollutant(s):

Proposed BACT/LAER performance limit: (see attached) lbs/hr for pollutant:

lbs/hr for pollutant:

lbs/hr for pollutant:

Note: The proposed BACT/LAER performance limits may become permit limits.

☒ If the control equipment is proposed as BACT or LAER, a detailed BACT analysis or LAER demonstration is attached. *Note: This must be attached in order for your application to be complete.*

Control Equipment: | Pollutant(s) Controlled:

Provide a physical description of the control equipment:

☐ *See attached for additional details.*

Provide a description of the significant operating parameters and set points for the control equipment:

☐ *See attached for additional details.*

This control equipment is proposed as BACT ☐ LAER ☐ for pollutant(s):

Proposed BACT/LAER performance limit: lbs/hr for pollutant:

lbs/hr for pollutant:

lbs/hr for pollutant:

Note: The proposed BACT/LAER performance limits may become permit limits.

☐ If the control equipment is proposed as BACT or LAER, a detailed BACT analysis or LAER demonstration is attached. *Note: This must be attached in order for your application to be complete.*

Emission Unit No.: B-705D

Section 12 Attachments

☒ Attachments Included. List attachments: ______

Alaska Department of Environmental Conservation Air Quality Control Construction Permit Application	**ADEC USE ONLY** Receiving Date: ADEC Control #:

FORM F – EMISSION UNIT INFORMATION

Section 1 Stationary Source Information

Source Name: Agrium Kenai Nitrogen Operations (KNO)
Source Physical Address: Mile 21 Kenai Spur Highway
City: Kenai

Include a copy of this form for each emission unit that will emit a regulated air pollutant.

Section 2 Emission Unit Identification

Emission Unit No.: B-705E

Section 3 Emission Unit Description

Equipment Type: Boiler	Make: Certified & Nebraska Boiler Co.
Model (attach Vendor Specs): K-611	Serial No.: W-2172
Maximum Rated Capacity or Maximum Design Throughput: 46.729 MMBtu/hr	
Note: Rated capacity or design throughput may become a permit limit.	

Section 4 Fuels and Materials Processed

Fuel Type(s): Natural Gas	Maximum Design Fuel Consumption Rate: 0.05 MMscf/hr
Materials Processed: Water	Maximum Material Processing Rate:
Describe Method of Operation: Waste heat boiler that generates steam using heat from Solar Turbine and natural gas combustion.	
☐ *See attached for additional details.*	
Schedule of Operation (indicate the maximum operation for each time period):	3-hr: 3 hr 8-hr: 8 hr 24-hr: 24 hr Days/yr: 365 days

Section 5 Exhaust Parameters

Stack Height (m):	Base Elevation (m):	Stack Inner Exhaust Diameter or Dimensions (m):	Actual Flow Rate (acm/s):	Exit Temp (deg K):
21.34	34.15	1.22	88.3	416

Is stack height greater than 65 meters? YES ☐ NO ☒

☐ If yes, a calculation of good engineering practices stack height, including any computer modeling analyses or field studies, is attached. *If yes, this calculation must be attached in order for your application to be complete.*

Section 6 Plans Showing Emission Unit and Exhaust Point Location

☒ A set of plans showing the location of the emission unit, associated buildings and other nearby structures is attached.
☒ A table of building dimensions is attached.
Note: These must be attached in order for your application to be complete.

Emission Unit No.: B-705E

Section 7 Emission Control Information *(if applicable) NOTE: For PSD and Nonattainment Major Sources and Modifications, for control equipment installed for BACT/LAER purposes, skip this section and complete Section 11 instead.*

Control Equipment:		Pollutant(s) Controlled:	
Provide a physical description of the control equipment:			
☐ *See attached for additional details.*			
Provide a description of the significant operating parameters and set points for the control equipment:			
☐ *See attached for additional details.*			
This control equipment is necessary:	☐ To comply with an emission standard	☐ To avoid a project classification	☐ Other – Indicate purpose of control equipment:

Control Equipment:		Pollutant(s) Controlled:	
Provide a physical description of the control equipment:			
☐ *See attached for additional details.*			
Provide a description of the significant operating parameters and set points for the control equipment:			
☐ *See attached for additional details.*			
This control equipment is necessary:	☐ To comply with an emission standard	☐ To avoid a project classification	☐ Other – Indicate purpose of control equipment:

FORM F – EMISSION UNIT INFORMATION

Emission Unit No.: B-705E

Section 8 Applicable Federal Emission Limits

New Source Performance Standard (NSPS) Affected Facility?	YES ☐	NO ☒	*If yes, complete Form J.*
National Emission Standard for Hazardous Air Pollutants (NESHAP) Affected Facility?	YES ☒	NO ☐	*If yes, complete Form K.*
Maximum Achievable Control Technology (MACT) Affected Facility?	YES ☒	NO ☐	*If yes, complete Form K.*

Other Emission Limits listed in 18 AAC 50.040

Emission Limit or Standard	Regulation Citation
☐ A demonstration of compliance for each emission limit or standard is attached. *Note: This must be attached in order for your application to be complete.*	

Section 9 Applicable State Emission Limits *(listed in 18 AAC 50.050 through 18 AAC 50.090)*

Emission Limit or Standard	Regulation Citation
Visible emissions, excluding condensed water vapor, from an industrial process or fuel-burning equipment may not reduce visibility through the exhaust effluent by more than 20 percent averaged over any six consecutive minutes.	**18 AAC 50.055 (a)**
Particulate matter emitted from an industrial process or fuel-burning equipment may not exceed, per cubic foot of exhaust gas corrected to standard conditions and averaged over three hours, 0.05 grains.	**18 AAC 50.055 (b)**
Sulfur-compound emissions, expressed as sulfur dioxide, from an industrial process or from fuel-burning equipment may not exceed 500 ppm averaged over a period of three hours.	**18 AAC 50.055 (c)**
☒ A demonstration of compliance for each emission limit or standard is attached. *Note: This must be attached in order for your application to be complete.*	
Include multiple copies of this page if more space is required.	

Section 10 Mass Emission Rates for Facilities Requiring an Air Quality Impact Analysis

Regulated Air Pollutant	Mass Emission Rate (grams/second)				
	1-hr	**3-hr**	**8-hr**	**24-hr**	**Annual**
Carbon Monoxide	**0.693**		**0.693**		
Nitrogen Oxides	**0.0567**				**0.0567**
PM-10				**0.0469**	
PM-2.5				**0.0469**	**0.0469**
Sulfur Oxides	**0.00085**	**0.00085**			

FORM F – EMISSION UNIT INFORMATION

Emission Unit No.: B-705E

Section 11 Emission Control Information for PSD and/or Nonattainment Major Sources and Modifications Only

Control Equipment:	Pollutant(s) Controlled:
Provide a physical description of the control equipment: A SCR control system will be installed on the exhaust from the Waste Heat Boiler/Solar Turbine. A BACT analysis is attached	
☐ *See attached for additional details.*	
Provide a description of the significant operating parameters and set points for the control equipment:	
☐ *See attached for additional details.*	
This control equipment is proposed as BACT ☐ LAER ☐	for pollutant(s):
Proposed BACT/LAER performance limit:	lbs/hr for pollutant:
	lbs/hr for pollutant:
	lbs/hr for pollutant:
Note: The proposed BACT/LAER performance limits may become permit limits.	
☐ If the control equipment is proposed as BACT or LAER, a detailed BACT analysis or LAER demonstration is attached. *Note: This must be attached in order for your application to be complete.*	

Control Equipment:	Pollutant(s) Controlled:
Provide a physical description of the control equipment:	
☐ *See attached for additional details.*	
Provide a description of the significant operating parameters and set points for the control equipment:	
☐ *See attached for additional details.*	
This control equipment is proposed as BACT ☐ LAER ☐	for pollutant(s):
Proposed BACT/LAER performance limit:	lbs/hr for pollutant:
	lbs/hr for pollutant:
	lbs/hr for pollutant:
Note: The proposed BACT/LAER performance limits may become permit limits.	
☐ If the control equipment is proposed as BACT or LAER, a detailed BACT analysis or LAER demonstration is attached. *Note: This must be attached in order for your application to be complete.*	

FORM F – EMISSION UNIT INFORMATION

Emission Unit No.: B-705E

Section 12 Attachments

☒ Attachments Included. List attachments: ____

Alaska Department of Environmental Conservation Air Quality Control Construction Permit Application	**ADEC USE ONLY** Receiving Date: ADEC Control #:

FORM K – NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS

Section 1 Stationary Source Information	**Section 2 Emission Unit Identification**	
Source Name: Agrium Kenai Nitrogen Operations (KNO)	Emission Unit No.: B-705A, B, C, D, E	*See Form F for this Emission Unit No.*
Source Physical Address: Mile 21 Kenai Spur Highway	☒ New ☐ Modified	*Complete this form for each unit subject to a NESHAP. See Instruction Manual.*
City: Kenai	☐ Reconstructed	

Section 3 Applicable Subpart: 40 CFR Part 61 ☐ 63 ☒ Subpart A

List applicable sections of Subpart A: 63.4, 63.6(e), 63.9(b), 63.9(h), 63.10(b), 63.10(d)

Section 4 Applicable Subpart: 40 CFR Part 61 ☐ 63 ☒ Subpart DDDDD

List applicable sections: 63.7500(e), 63.7500(f), 63.7505(a), 63.7510(g), 63.7515(d), 63.7540(a)(10), 63.7540(a)(13), 63.7540(d), 63.7545(a), 63.7545(c), 63.7545(f), 63.7550(a), 63.7550(b), 63.7550(c)(1), 63.7550(d)(1) - (d)(2), 63.7550(h)(3), 63.7555(a)(1), 63.7560

List applicable pollutant(s): Benzene, Dichlorobenzene, Formaldehyde, n-Hexane, Napthalene, Toluene, Acenaphthene, Acenaphthylene, Anthracene, Benz(a)anthrancene, Benzo(b,k)fluoranthene, Benzo(g,h,i)perylene, Benzo(a)pyrene, Chrysene, Dibenzo(a,h)anthracene, 7,12-Dimethylbenz(a)anthracene, Fluoranthene, Fluorene, Indeno(1,2,3-cd)pyrene, 3-Methylchloranthene, 2-Methylnaphthalene, Phenanthrene, Pyrene

List applicable emission standards: None

☐ *See attached for additional details.*

List inapplicable sections: 63.7500(a), 63.7500(c), 63.7500(d), 63.7505(c) - (e), 63.7510(a) - (f), 63.7510(h), 3.7510(i) - (j), 63.7515(a) - (c), 63.7515(e) - (g), 63.7515(h), 63.7515(i), 63.7520, 63.7521, 63.7525, 63.7530(a) - (c), (e) - (i), 63.7535, 63.7540(b), 63.7540(c)

Description of inapplicability:
63.7500(a): Burns gas 1 fuels.
63.7500(c): Not a limited-use boiler.
63.7500(d): Burns gas 1 fuels.
63.7505(c) - (e), 63.7510(a) - (f): Not subject to emission limits.
63.7510(h): Does not burn solid waste.
63.7510(i) - (j): New source.
63.7515(a) - (c): Not required to conduct performance tests.
63.7515(e) - (g): Not required to conduct performance tests or fuel analyses.
63.7515(h): Only burn gas 1 fuels.
63.7515(i): No CO monitoring required.
63.7520: Not required to conduct performance tests.
63.7521: Burns natural gas.
63.7522 Not subject to emission limits.
63.7525: Not subject to emission or operating limits.
63.7530(a) - (i): Not subject to emission limits and not required to conduct performance tests.

63.7535: Not required to monitor emissions. 63.7540(b): Not subject to emission limits. 63.7540(c): Only burns natural gas.
☐ *See attached for additional details.*

List Monitoring, Record Keeping and Reporting Requirements: 63.7515(d): Annual tune-up must be no more than 13 months after the previous tune-up. 63.7530(d): Submit a signed statement in the Notification of Compliance Status report that indicates you conducted a tune-up of the unit. 63.7540(a)(10): Conduct an annual tune-up. 63.7540(d): Meet the work practice standards in Table 3. 63.7545(a): Submit to the Administrator all of the notifications in 63.9(b) by the dates specified. 63.7545(c): Submit an Initial Notification not later than 15 days after the actual date of startup of the affected source. 63.7550(a): Submit each applicable report required by Table 9. 63.7555(a): Keep a copy of each notification and report submitted, including all supporting documentation; records of compliance demonstrations and performance evaluations. 63.7555(i) - (j): Maintain records of the calendar date, time, occurrence and duration of each startup and shutdown and type(s) and amount(s) of fuels used during each startup and shutdown. 63.7560: Maintain records so they are readily avaliable for expedious review. Keep records for 5 years, at least 2 years on site.
☐ *See attached for additional details*

Emission Unit No.: B-705A, B, C, D, E

Section 5 Case-By-Case MACT *(Complete this section only if applicable.)*

40 CFR Part 63, Subpart B

List applicable pollutant(s): ______________________

List case-by-case MACT standards:

☐ *See attached for additional details.*

List Monitoring, Record Keeping and Reporting Requirements to show compliance with case-by-case MACT standards:

☐ *See attached for additional details*

☐ Supporting documentation for Case-By-Case MACT determination is attached. *Note: If you are subject to a case-by-case MACT determination, this must be attached for your application to be complete.*

Section 6 Attachments

☐ Attachments Included. List attachments: ______________________

Attachment B
Emission Calculations

Stack ID **44**
Tag Number **6B-708C**
Source Name **Package Boiler**

Operating Parameters			Note
Heat Input	243.0	(MMBtu/hr)	1
Fuel Heating Value	1020	(Btu/scf)	1
Maximum Fuel Usage	0.24	(MMscf/hr)	
	2087	(MMscf/yr)	
Operating Time:	24	(hr/day)	1
	8760	(hr/year)	1

Pollutant	Emission Factor	Unit	Emission Rate (lb/hr)	Emission Rate (tpy)	Note	
NO_x	0.01	lb/mmBtu	2.4	10.6		(BACT assumed to be equal to 0.01 lb/mmBtu for new boiler with SCR)
CO	0.037	lb/mmBtu	9.0	39.4		(BACT assumed to be equal to 50 ppm @ 3% O2, or approximately 0.037 lb/mmBtu)
SO_2	0.600	(lb/MMscf)	1.4E-01	0.6	3	
PM (Filterable)	1.9	(lb/MMscf)	0.5	2.0	3	
PM_{10} (total)	7.6	(lb/MMscf)	1.8	7.9	3	
$PM_{2.5}$ (total)	7.6	(lb/MMscf)	1.8	7.9	3	
VOC	5.5	(lb/MMscf)	1.3	5.7	3	
Lead	0.0005	(lb/MMscf)	1.2E-04	5.2E-04	3	
NH3	10	ppmv			5	
CO_2	120000	(lb/MMscf)	2.859E+04	1.252E+05	3	
N_2O (low NOx burner)	0.64	(lb/MMscf)	1.525E-01	6.678E-01	3	
Methane	2.3	(lb/MMscf)	5.479E-01	2.400E+00	3	
CO_2e			2.865E+04	1.255E+05	4	

Notes:
(1) Design Data
(2) BACT
(3) USEPA AP-42 Chapter 1.4 *Natural Gas Combustion* , Table 1.4-2, July 1998
(4) 40 CFR Part 98 Table A-1 Global Warming Potentials
(5) Ammonia Slip

Stack ID **48**
Tag Number **6B-708B**
Source Name **Package Boiler**

Operating Parameters			**Note**
Heat Input	243.0	(MMBtu/hr)	1
Fuel Heating Value	1020	(Btu/scf)	1
Maximum Fuel Usage	0.24	(MMscf/hr)	
	2087	(MMscf/yr)	
Operating Time:	24	(hr/day)	1
	8760	(hr/year)	1

Pollutant	**Emission Factor**	**Unit**	**mission Rate (lb/hr)**	**(tpy)**	**Note**	
NO_x	0.01	lb/mmBtu	2.4	10.6	2	(BACT assumed to be equal to 0.01 lb/mmBtu for new boiler with SCR)
CO	0.037	lb/mmBtu	9.0	39.4	2	(BACT assumed to be equal to 50 ppm @ 3% O2, or approximately 0.037 lb/mmBtu)
SO_2	0.600	(lb/MMscf)	1.4E-01	0.6	3	
PM (Filterable)	1.9	(lb/MMscf)	0.5	2.0	3	
PM_{10} (total)	7.6	(lb/MMscf)	1.8	7.9	3	
$PM_{2.5}$ (total)	7.6	(lb/MMscf)	1.8	7.9	3	
VOC	5.5	(lb/MMscf)	1.3	5.7	3	
Lead	0.0005	(lb/MMscf)	1.2E-04	5.2E-04	3	
NH3	10	ppmv			5	
CO_2	120000	(lb/MMscf)	2.859E+04	1.252E+05	3	
N_2O (low NOx burner)	0.64	(lb/MMscf)	1.525E-01	6.678E-01	3	
Methane	2.3	(lb/MMscf)	5.479E-01	2.400E+00	3	
CO_2e			2.865E+04	1.255E+05	4	

Notes:
(1) Design Data
(2) BACT
(3) USEPA AP-42 Chapter 1.4 *Natural Gas Combustion* , Table 1.4-2, July 1998
(4) 40 CFR Part 98 Table A-1 Global Warming Potentials
(5) Ammonia Slip

Stack ID **49**
Tag Number **6B-708A**
Source Name **Package Boiler**

Operating Parameters			Note
Heat Input	243.0	(MMBtu/hr)	1
Fuel Heating Value	1020	(Btu/scf)	1
Maximum Fuel Usage	0.24	(MMscf/hr)	
	2087	(MMscf/yr)	
Operating Time:	24	(hr/day)	1
	8760	(hr/year)	1

Pollutant	Emission Factor	Unit	Emission Rate (lb/hr)	Emission Rate (tpy)	Note
NO_x	0.01	lb/mmBtu	2.4	10.6	2
CO	0.037	lb/mmBtu	9.0	39.4	2
SO_2	0.600	(lb/MMscf)	1.4E-01	0.6	3
PM (Filterable)	1.9	(lb/MMscf)	0.5	2.0	3
PM_{10} (total)	7.6	(lb/MMscf)	1.8	7.9	3
$PM_{2.5}$ (total)	7.6	(lb/MMscf)	1.8	7.9	3
VOC	5.5	(lb/MMscf)	1.3	5.7	3
Lead	0.0005	(lb/MMscf)	1.2E-04	5.2E-04	3
NH3	10	ppmv			5
CO_2	120000	(lb/MMscf)	2.859E+04	1.252E+05	3
N_2O (low NOx burner)	0.64	(lb/MMscf)	1.525E-01	6.678E-01	3
Methane	2.3	(lb/MMscf)	5.479E-01	2.400E+00	3
CO_2e			2.865E+04	1.255E+05	4

(BACT assumed to be equal to 0.01 lb/mmBtu for new boiler with SCR)
(BACT assumed to be equal to 50 ppm @ 3% O2, or approximately 0.037 lb/mmBtu)

Notes:
(1) Design Data
(2) BACT
(3) USEPA AP-42 Chapter 1.4 *Natural Gas Combustion* , Table 1.4-2, July 1998
(4) 40 CFR Part 98 Table A-1 Global Warming Potentials
(5) Ammonia Slip

Stack ID **50**
Tag Number **B-705A**
Source Name **Waste Heat Boiler**

Operating Parameters			Note
Heat Input	46.7	(MMBtu/hr)	1
Fuel Heating Value	1020	(Btu/scf)	1
Maximum Fuel Usage	0.05	(MMscf/hr)	
Operating Time:	24	(hr/day)	1
	8760	(hr/year)	1

Pollutant	Emission Factor	Unit	Emission Rate (lb/hr)	Emission Rate (tpy)	Note	
NO_x	0.008	lb/mmBtu	0.37	1.6	1	(BACT proposed to be SCR achieving 7 ppmv NOx @15% O2 for combined Solar Turbine/Waste Heat Boiler exhaust, or approximately 0.008 lb/mmBtu NOx emission rate from Waste Heat Boilers)
CO	0.109	lb/mmBtu	5.09	22.3	1	(BACT proposed to be 50 ppm CO @ 15% O2, or approximately 0.109 lb/mmBtu)
SO_2	0.6	(lb/MMscf)	2.7E-02	0.1	2	
PM (Filterable)	1.9	(lb/MMscf)	0.09	0.4	1	(BACT proposed to be 0.0074 lb/MMBtu)
PM_{10} (total)	7.6	(lb/MMscf)	0.35	1.5	1	(BACT proposed to be 0.0074 lb/MMBtu)
$PM_{2.5}$ (total)	7.6	(lb/MMscf)	0.35	1.5	1	(BACT proposed to be 0.0074 lb/MMBtu)
VOC	5.5	(lb/MMscf)	0.25	1.1	3	(BACT proposed to be 0.0054 lb/MMBtu (3-hr average))
Lead	0.0005	(lb/MMscf)	2.3E-05	0.0	3	
NH3	10	ppmv			5	
CO_2	120000	(lb/MMscf)	5.5E+03	2.41E+04	3	
N_2O	2.2	(lb/MMscf)	1.0E-01	0.4	3	
Methane	2.3	(lb/MMscf)	1.1E-01	0.5	3	
CO_2e			5.5E+03	2.42E+04	4	(BACT proposed to be a combined CO2e emission limit of 121,112 tons per year from all turbines)

Notes:
(1) Proposed BACT
(2) USEPA AP-42 Chapter 1.4 *Natural Gas Combustion* , Table 1.4-1, July 1998
(3) USEPA AP-42 Chapter 1.4 *Natural Gas Combustion* , Table 1.4-2, July 1998
(4) 40 CFR Part 98 Table A-1 Global Warming Potentials
(5) Ammonia Slip

Stack ID **51**
Tag Number **B-705B**
Source Name **Waste Heat Boiler**

Operating Parameters			Note
Heat Input	46.7	(MMBtu/hr)	1
Fuel Heating Value	1020	(Btu/scf)	1
Maximum Fuel Usage	0.05	(MMscf/hr)	
Operating Time:	24	(hr/day)	1
	8760	(hr/year)	1

Pollutant	Emission Factor	Unit	Emission Rate (lb/hr)	Emission Rate (tpy)	Note	
NO_x	0.008	lb/mmBtu	0.37	1.6	1	(BACT proposed to be SCR achieving 7 ppmv NOx @15% O2 for combined Solar Turbine/Waste Heat Boiler exhaust, or approximately 0.008 lb/mmBtu NOx emission rate from Waste Heat Boilers)
CO	0.109	lb/mmBtu	5.09	22.3	1	(BACT proposed to be 50 ppm CO @ 15% O2, or approximately 0.109 lb/mmBtu)
SO_2	0.6	(lb/MMscf)	2.7E-02	0.1	2	
PM (Filterable)	1.9	(lb/MMscf)	0.09	0.4	1	(BACT proposed to be 0.0074 lb/MMBtu)
PM_{10} (total)	7.6	(lb/MMscf)	0.35	1.5	1	(BACT proposed to be 0.0074 lb/MMBtu)
$PM_{2.5}$ (total)	7.6	(lb/MMscf)	0.35	1.5	1	(BACT proposed to be 0.0074 lb/MMBtu)
VOC	5.5	(lb/MMscf)	0.25	1.1	3	(BACT proposed to be 0.0054 lb/MMBtu (3-hr average))
Lead	0.0005	(lb/MMscf)	2.3E-05	0.0	3	
NH3	10	ppmv			5	
CO_2	120000	(lb/MMscf)	5.5E+03	2.41E+04	3	
N_2O	2.2	(lb/MMscf)	1.0E-01	0.4	3	
Methane	2.3	(lb/MMscf)	1.1E-01	0.5	3	
CO_2e			5.5E+03	2.42E+04	4	(BACT proposed to be a combined CO2e emission limit of 121,112 tons per year from all turbines)

Notes:
(1) Proposed BACT
(2) USEPA AP-42 Chapter 1.4 *Natural Gas Combustion*, Table 1.4-1, July 1998
(3) USEPA AP-42 Chapter 1.4 *Natural Gas Combustion*, Table 1.4-2, July 1998
(4) 40 CFR Part 98 Table A-1 Global Warming Potentials
(5) Ammonia Slip

Stack ID 52
Tag Number B-705C
Source Name Waste Heat Boiler

Operating Parameters			Note
Heat Input	46.7	(MMBtu/hr)	1
Fuel Heating Value	1020	(Btu/scf)	1
Maximum Fuel Usage	0.05	(MMscf/hr)	
Operating Time:	24	(hr/day)	1
	8760	(hr/year)	1

Pollutant	Emission Factor	Unit	Emission Rate (lb/hr)	Emission Rate (tpy)	Note	
NO_x	0.008	lb/mmBtu	0.37	1.6	1	(BACT proposed to be SCR achieving 7 ppmv NOx @15% O2 for combined Solar Turbine/Waste Heat Boiler exhaust, or approximately 0.008 lb/mmBtu NOx emission rate from Waste Heat Boilers)
CO	0.109	lb/mmBtu	5.09	22.3	1	(BACT proposed to be 50 ppm CO @ 15% O2, or approximately 0.109 lb/mmBtu)
SO_2	0.6	(lb/MMscf)	2.7E-02	0.1	2	
PM (Filterable)	1.9	(lb/MMscf)	0.09	0.4	1	(BACT proposed to be 0.0074 lb/MMBtu)
PM_{10} (total)	7.6	(lb/MMscf)	0.35	1.5	1	(BACT proposed to be 0.0074 lb/MMBtu)
$PM_{2.5}$ (total)	7.6	(lb/MMscf)	0.35	1.5	1	(BACT proposed to be 0.0074 lb/MMBtu)
VOC	5.5	(lb/MMscf)	0.25	1.1	3	(BACT proposed to be 0.0054 lb/MMBtu (3-hr average))
Lead	0.0005	(lb/MMscf)	2.3E-05	0.0	3	
NH3	10	ppmv			5	
CO_2	120000	(lb/MMscf)	5.5E+03	2.41E+04	3	
N_2O	2.2	(lb/MMscf)	1.0E-01	0.4	3	
Methane	2.3	(lb/MMscf)	1.1E-01	0.5	3	
CO_2e			5.5E+03	2.42E+04	4	(BACT proposed to be a combined CO2e emission limit of 121,112 tons per year from all turbines)

Notes:
(1) Proposed BACT
(2) USEPA AP-42 Chapter 1.4 *Natural Gas Combustion*, Table 1.4-1, July 1998
(3) USEPA AP-42 Chapter 1.4 *Natural Gas Combustion*, Table 1.4-2, July 1998
(4) 40 CFR Part 98 Table A-1 Global Warming Potentials
(5) Ammonia Slip

Stack ID **53**
Tag Number **B-705D**
Source Name **Waste Heat Boiler**

Operating Parameters			**Note**
Heat Input	46.7	(MMBtu/hr)	1
Fuel Heating Value	1020	(Btu/scf)	1
Maximum Fuel Usage	0.05	(MMscf/hr)	
Operating Time:	24	(hr/day)	1
	8760	(hr/year)	1

Pollutant	**Emission Factor**	**Unit**	**Emission Rate (lb/hr)**	**Emission Rate (tpy)**	**Note**	
NO_x	0.008	lb/mmBtu	0.37	1.6	1	(BACT proposed to be SCR achieving 7 ppmv NOx @15% O2 for combined Solar Turbine/Waste Heat Boiler exhaust, or approximately 0.008 lb/mmBtu NOx emission rate from Waste Heat Boilers)
CO	0.109	lb/mmBtu	5.09	22.3	1	(BACT proposed to be 50 ppm CO @ 15% O2, or approximately 0.109 lb/mmBtu)
SO_2	0.6	(lb/MMscf)	2.7E-02	0.1	2	
PM (Filterable)	1.9	(lb/MMscf)	0.09	0.4	1	(BACT proposed to be 0.0074 lb/MMBtu)
PM_{10} (total)	7.6	(lb/MMscf)	0.35	1.5	1	(BACT proposed to be 0.0074 lb/MMBtu)
$PM_{2.5}$ (total)	7.6	(lb/MMscf)	0.35	1.5	1	(BACT proposed to be 0.0074 lb/MMBtu)
VOC	5.5	(lb/MMscf)	0.25	1.1	3	(BACT proposed to be 0.0054 lb/MMBtu (3-hr average))
Lead	0.0005	(lb/MMscf)	2.3E-05	0.0	3	
NH3	10	ppmv			5	
CO_2	120000	(lb/MMscf)	5.5E+03	2.41E+04	3	
N_2O	2.2	(lb/MMscf)	1.0E-01	0.4	3	
Methane	2.3	(lb/MMscf)	1.1E-01	0.5	3	
CO_2e			5.5E+03	2.42E+04	4	(BACT proposed to be a combined CO2e emission limit of 121,112 tons per year from all turbines)

Notes:
(1) Proposed BACT
(2) USEPA AP-42 Chapter 1.4 *Natural Gas Combustion* , Table 1.4-1, July 1998
(3) USEPA AP-42 Chapter 1.4 *Natural Gas Combustion* , Table 1.4-2, July 1998
(4) 40 CFR Part 98 Table A-1 Global Warming Potentials
(5) Ammonia Slip

Stack ID **54**
Tag Number **B-705E**
Source Name **Waste Heat Boiler**

Operating Parameters			Note
Heat Input	46.7	(MMBtu/hr)	1
Fuel Heating Value	1020	(Btu/scf)	1
Maximum Fuel Usage	0.05	(MMscf/hr)	
Operating Time:	24	(hr/day)	1
	8760	(hr/year)	1

Pollutant	Emission Factor	Unit	Emission Rate (lb/hr)	Emission Rate (tpy)	Note	
NO_x	0.008	lb/mmBtu	0.37	1.6	1	(BACT proposed to be SCR achieving 7 ppmv NOx @15% O2 for combined Solar Turbine/Waste Heat Boiler exhaust, or approximately 0.008 lb/mmBtu NOx emission rate from Waste Heat Boilers)
CO	0.109	lb/mmBtu	5.09	22.3	1	(BACT proposed to be 50 ppm CO @ 15% O2, or approximately 0.109 lb/mmBtu)
SO_2	0.6	(lb/MMscf)	2.7E-02	0.1	2	
PM (Filterable)	1.9	(lb/MMscf)	0.09	0.4	1	(BACT proposed to be 0.0074 lb/MMBtu)
PM_{10} (total)	7.6	(lb/MMscf)	0.35	1.5	1	(BACT proposed to be 0.0074 lb/MMBtu)
$PM_{2.5}$ (total)	7.6	(lb/MMscf)	0.35	1.5	1	(BACT proposed to be 0.0074 lb/MMBtu)
VOC	5.5	(lb/MMscf)	0.25	1.1	3	(BACT proposed to be 0.0054 lb/MMBtu (3-hr average))
Lead	0.0005	(lb/MMscf)	2.3E-05	0.0	3	
NH3	10	ppmv			5	
CO_2	120000	(lb/MMscf)	5.5E+03	2.41E+04	3	
N_2O	2.2	(lb/MMscf)	1.0E-01	0.4	3	
Methane	2.3	(lb/MMscf)	1.1E-01	0.5	3	
CO_2e			5.5E+03	2.42E+04	4	(BACT proposed to be a combined CO2e emission limit of 121,112 tons per year from all turbines)

Notes:
(1) Proposed BACT
(2) USEPA AP-42 Chapter 1.4 *Natural Gas Combustion* , Table 1.4-1, July 1998
(3) USEPA AP-42 Chapter 1.4 *Natural Gas Combustion* , Table 1.4-2, July 1998
(4) 40 CFR Part 98 Table A-1 Global Warming Potentials
(5) Ammonia Slip

Stack ID 55
Tag Number GGT-744A
Source Name Solar Turbine/Generator Set

Operating Parameters			Note	
Heat Input	55.4	(MMBtu/hr)	1	
Bypass Hours	204.0	(hr/yr)		(hours per year Solar Turbine would operate without Waste Heat Boiler (bypassing the SCR control system)
NOx Emissions during bypass hours	36.4	lb/hr		(highest hourly emission rate based on worst case Solar NOx generation rate (0.656 lbs/MMBtu) considering both HHV and LHV)
Operating Time:	24	(hr/day)	1	
	8760	(hr/year)	1	

Pollutant	Emission Factor	Unit	Emission Rate (lb/hr)	Emission Rate (tpy)	Note	
NO_x	0.041	(lb/MMBtu)	2.27	13.44	1	(BACT proposed to be SCR achieving 7 ppmv NOx @15% O2 for combined Solar Turbine/Waste Heat Boiler exhaust, or approximately 0.041 lb/mmBtu NOx emission rate from Solar Turbine)
CO	0.109	(lb/MMBtu)	6.04	26.47	1	(BACT proposed to be 50 ppm @ 15% O2, or approximately 0.109 lb/MMBtu)
SO_2	3.4E-03	(lb/MMBtu)	0.19	0.83	2,3	
PM (Filterable)	7.4E-03	(lb/MMBtu)	0.41	1.80	1	(BACT proposed to be 0.0074 lb/MMBtu)
PM_{10} (total)	7.4E-03	(lb/MMBtu)	0.41	1.80	1	(BACT proposed to be 0.0074 lb/MMBtu)
$PM_{2.5}$ (total)	7.4E-03	(lb/MMBtu)	0.41	1.80	1	(BACT proposed to be 0.0074 lb/MMBtu)
CO_2	1.1E+02	(lb/MMBtu)	6.10E+03	2.67E+04	2	
N_2O	3.0E-03	(lb/MMBtu)	0.17	0.73	2	
Methane	8.6E-03	(lb/MMBtu)	0.48	2.09	2	
CO_2e			6.16E+03	2.70E+04	4	(BACT proposed to be a combined CO2e emission limit of 134,909 tons per year from all turbines)
VOC	2.1E-03	(lb/MMBtu)	0.12	0.51	1	(BACT proposed to be 0.0021 lb/MMBtu (3-hr average))

Notes:
(1) Proposed BACT
(2) USEPA AP-42 Chapter 3.1 *Stationary Gas Turbines* , Table 3.1-2a, April 2000
(3) Assumed factor for natural gas usage, see note h in Table 3.1-1a
(4) 40 CFR Part 98 Table A-1 Global Warming Potentials

<u>Computation of Annual Emissions for Q/D (Incremental Increase Based on Max 24-hour Emissions Multiplied by 365)</u>

Maximum Hours per day = 24

	lb/hr	lb/day	t/yr	t/yr increase over baseline
NOx	36.4	874.08	159.5196	144.4
PM10	no change			
SO2	no change			

Stack ID **56**
Tag Number **GGT-744B**
Source Name **Solar Turbine/Generator Set**

Operating Parameters			**Note**	
Heat Input	55.4	(MMBtu/hr)	1	
Bypass Hours	204.0	(hr/yr)		(hours per year Solar Turbine would operate without Waste Heat Boiler (bypassing the SCR control system)
NOx Emissions during bypass hours	36.4	lb/hr		(highest hourly emission rate based on worst case Solar NOx generation rate (0.656 lbs/MMBtu) considering both HHV and LHV)
Operating Time:	24	(hr/day)	1	
	8760	(hr/year)	1	

Pollutant	**Emission Factor**	**Unit**	**Emission Rate (lb/hr)**	**Emission Rate (tpy)**	**Note**	
NO_x	0.041	(lb/MMBtu)	2.27	13.44	1	(BACT proposed to be SCR achieving 7 ppmv NOx @15% O2 for combined Solar Turbine/Waste Heat Boiler exhaust, or approximately 0.041 lb/mmBtu NOx emission rate from Solar Turbine)
CO	0.109	(lb/MMBtu)	6.04	26.47	1	(BACT proposed to be 50 ppm @ 15% O2, or approximately 0.109 lb/MMBtu)
SO_2	3.4E-03	(lb/MMBtu)	0.19	0.83	2,3	
PM (Filterable)	7.4E-03	(lb/MMBtu)	0.41	1.80	1	(BACT proposed to be 0.0074 lb/MMBtu)
PM_{10} (total)	7.4E-03	(lb/MMBtu)	0.41	1.80	1	(BACT proposed to be 0.0074 lb/MMBtu)
$PM_{2.5}$ (total)	7.4E-03	(lb/MMBtu)	0.41	1.80	1	(BACT proposed to be 0.0074 lb/MMBtu)
CO_2	1.1E+02	(lb/MMBtu)	6.10E+03	2.67E+04	2	
N_2O	3.0E-03	(lb/MMBtu)	0.17	0.73	2	
Methane	8.6E-03	(lb/MMBtu)	0.48	2.09	2	
CO_2e			6.16E+03	2.70E+04	4	(BACT proposed to be a combined CO2e emission limit of 134,909 tons per year from all turbines)
VOC	2.1E-03	(lb/MMBtu)	0.12	0.51	1	(BACT proposed to be 0.0021 lb/MMBtu (3-hr average))

Notes:
(1) Proposed BACT
(2) USEPA AP-42 Chapter 3.1 *Stationary Gas Turbines*, Table 3.1-2a, April 2000
(3) Assumed factor for natural gas usage, see note h in Table 3.1-1a
(4) 40 CFR Part 98 Table A-1 Global Warming Potentials

Computation of Annual Emissions for Q/D (Incremental Increase Based on Max 24-hour Emissions Multiplied by 365)

Maximum Hours per day = 24

	lb/hr	lb/day	t/yr	t/yr increase over baseline
NOx	36.4	874.08	159.5196	144.4
PM10	no change			
SO2	no change			

Stack ID **57**
Tag Number **GGT-744C**
Source Name **Solar Turbine/Generator Set**

Operating Parameters			Note	
Heat Input	55.4	(MMBtu/hr)	1	
Bypass Hours	204.0	(hr/yr)		(hours per year Solar Turbine would operate without Waste Heat Boiler (bypassing the SCR control system)
NOx Emissions during bypass hours	36.4	lb/hr		(highest hourly emission rate based on worst case Solar NOx generation rate (0.656 lbs/MMBtu) considering both HHV and LHV)
Operating Time:	24	(hr/day)	1	
	8760	(hr/year)	1	

Pollutant	Emission Factor	Unit	Emission Rate (lb/hr)	Emission Rate (tpy)	Note	
NO_x	0.041	(lb/MMBtu)	2.27	13.44	1	(BACT proposed to be SCR achieving 7 ppmv NOx @15% O2 for combined Solar Turbine/Waste Heat Boiler exhaust, or approximately 0.041 lb/mmBtu NOx emission rate from Solar Turbine)
CO	0.109	(lb/MMBtu)	6.04	26.47	1	(BACT proposed to be 50 ppm @ 15% O2, or approximately 0.109 lb/MMBtu)
SO_2	3.4E-03	(lb/MMBtu)	0.19	0.83	2,3	
PM (Filterable)	7.4E-03	(lb/MMBtu)	0.41	1.80	1	(BACT proposed to be 0.0074 lb/MMBtu)
PM_{10} (total)	7.4E-03	(lb/MMBtu)	0.41	1.80	1	(BACT proposed to be 0.0074 lb/MMBtu)
$PM_{2.5}$ (total)	7.4E-03	(lb/MMBtu)	0.41	1.80	1	(BACT proposed to be 0.0074 lb/MMBtu)
CO_2	1.1E+02	(lb/MMBtu)	6.10E+03	2.67E+04	2	
N_2O	3.0E-03	(lb/MMBtu)	0.17	0.73	2	
Methane	8.6E-03	(lb/MMBtu)	0.48	2.09	2	
CO_2e			6.16E+03	2.70E+04	4	(BACT proposed to be a combined CO2e emission limit of 134,909 tons per year from all turbines)
VOC	2.1E-03	(lb/MMBtu)	0.12	0.51	1	(BACT proposed to be 0.0021 lb/MMBtu (3-hr average))

Notes:
(1) Proposed BACT
(2) USEPA AP-42 Chapter 3.1 *Stationary Gas Turbines* , Table 3.1-2a, April 2000
(3) Assumed factor for natural gas usage, see note h in Table 3.1-1a
(4) 40 CFR Part 98 Table A-1 Global Warming Potentials

Computation of Annual Emissions for Q/D (Incremental Increase Based on Max 24-hour Emissions Multiplied by 365)

No change (maximum of two Solar Turbines at one time would be operated in bypass mode)

Stack ID **58**
Tag Number **GGT-744D**
Source Name **Solar Turbine/Generator Set**

Operating Parameters			**Note**	
Heat Input	55.4	(MMBtu/hr)	1	
Bypass Hours	204.0	(hr/yr)		(hours per year Solar Turbine would operate without Waste Heat Boiler (bypassing the SCR control system)
NOx Emissions during bypass hours	36.4	lb/hr		(highest hourly emission rate based on worst case Solar NOx generation rate (0.656 lbs/MMBtu) considering both HHV and LHV)
Operating Time:	24	(hr/day)	1	
	8760	(hr/year)	1	

Pollutant	**Emission Factor**	**Unit**	**Emission Rate (lb/hr)**	**Emission Rate (tpy)**	**Note**	
NO_x	0.041	(lb/MMBtu)	2.27	13.44	1	(BACT proposed to be SCR achieving 7 ppmv NOx @15% O2 for combined Solar Turbine/Waste Heat Boiler exhaust, or approximately 0.041 lb/mmBtu NOx emission rate from Solar Turbine)
CO	0.109	(lb/MMBtu)	6.04	26.47	1	(BACT proposed to be 50 ppm @ 15% O2, or approximately 0.109 lb/MMBtu)
SO_2	3.4E-03	(lb/MMBtu)	0.19	0.83	2,3	
PM (Filterable)	7.4E-03	(lb/MMBtu)	0.41	1.80	1	(BACT proposed to be 0.0074 lb/MMBtu)
PM_{10} (total)	7.4E-03	(lb/MMBtu)	0.41	1.80	1	(BACT proposed to be 0.0074 lb/MMBtu)
$PM_{2.5}$ (total)	7.4E-03	(lb/MMBtu)	0.41	1.80	1	(BACT proposed to be 0.0074 lb/MMBtu)
CO_2	1.1E+02	(lb/MMBtu)	6.10E+03	2.67E+04	2	
N_2O	3.0E-03	(lb/MMBtu)	0.17	0.73	2	
Methane	8.6E-03	(lb/MMBtu)	0.48	2.09	2	
CO_2e			6.16E+03	2.70E+04	4	(BACT proposed to be a combined CO2e emission limit of 134,909 tons per year from all turbines)
VOC	2.1E-03	(lb/MMBtu)	0.12	0.51	1	(BACT proposed to be 0.0021 lb/MMBtu (3-hr average))

Notes:
(1) Proposed BACT
(2) USEPA AP-42 Chapter 3.1 *Stationary Gas Turbines* , Table 3.1-2a, April 2000
(3) Assumed factor for natural gas usage, see note h in Table 3.1-1a
(4) 40 CFR Part 98 Table A-1 Global Warming Potentials

Computation of Annual Emissions for Q/D (Incremental Increase Based on Max 24-hour Emissions Multiplied by 365)

No change (maximum of two Solar Turbines at one time would be operated in bypass mode)

Stack ID **59**
Tag Number **GGT-744E**
Source Name **Solar Turbine/Generator Set**

Operating Parameters			Note	
Heat Input	55.4	(MMBtu/hr)	1	
Bypass Hours	204.0	(hr/yr)		(hours per year Solar Turbine would operate without Waste Heat Boiler (bypassing the SCR control system)
NOx Emissions during bypass hours	36.4	lb/hr		(highest hourly emission rate based on worst case Solar NOx generation rate (0.656 lbs/MMBtu) considering both HHV and LHV)
Operating Time:	24	(hr/day)	1	
	8760	(hr/year)	1	

Pollutant	Emission Factor	Unit	Emission Rate (lb/hr)	Emission Rate (tpy)	Note	
NO_x	0.041	(lb/MMBtu)	2.27	13.44	1	(BACT proposed to be SCR achieving 7 ppmv NOx @15% O2 for combined Solar Turbine/Waste Heat Boiler exhaust, or approximately 0.041 lb/mmBtu NOx emission rate from Solar Turbine)
CO	0.109	(lb/MMBtu)	6.04	26.47	1	(BACT proposed to be 50 ppm @ 15% O2, or approximately 0.109 lb/MMBtu)
SO_2	3.4E-03	(lb/MMBtu)	0.19	0.83	2,3	
PM (Filterable)	7.4E-03	(lb/MMBtu)	0.41	1.80	1	(BACT proposed to be 0.0074 lb/MMBtu)
PM_{10} (total)	7.4E-03	(lb/MMBtu)	0.41	1.80	1	(BACT proposed to be 0.0074 lb/MMBtu)
$PM_{2.5}$ (total)	7.4E-03	(lb/MMBtu)	0.41	1.80	1	(BACT proposed to be 0.0074 lb/MMBtu)
CO_2	1.1E+02	(lb/MMBtu)	6.10E+03	2.67E+04	2	
N_2O	3.0E-03	(lb/MMBtu)	0.17	0.73	2	
Methane	8.6E-03	(lb/MMBtu)	0.48	2.09	2	
CO_2e			6.16E+03	2.70E+04	4	(BACT proposed to be a combined CO2e emission limit of 134,909 tons per year from all turbines)
VOC	2.1E-03	(lb/MMBtu)	0.12	0.51	1	(BACT proposed to be 0.0021 lb/MMBtu (3-hr average))

Notes:
(1) Proposed BACT
(2) USEPA AP-42 Chapter 3.1 *Stationary Gas Turbines*, Table 3.1-2a, April 2000
(3) Assumed factor for natural gas usage, see note h in Table 3.1-1a
(4) 40 CFR Part 98 Table A-1 Global Warming Potentials

<u>Computation of Annual Emissions for Q/D (Incremental Increase Based on Max 24-hour Emissions Multiplied by 365)</u>

No change (maximum of two Solar Turbines at one time would be operated in bypass mode)

Attachment C
BACT Analysis

BACT Analysis

Agrium Kenai, Alaska

Kenai Nitrogen Operation

15 May 2019

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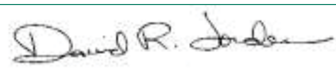
BACT Analysis

Kenai Nitrogen Operation



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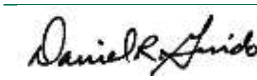

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CONTENTS

List of Tables

1. BEST AVAILABLE CONTROL TECHNOLOGY (BACT) BACKGROUND

1.1 Introduction

Agrium U.S. Inc. (Agrium) was issued Air Quality Control Construction Permit AQ0083CPT06 on 6 January 2015 for the proposed restart of a portion of it fertilizer production facility (Facility) at the Kenai Nitrogen Operation in Kenai, Alaska. In a letter dated 4 March 2016, the Alaska Department of Environmental Conservation (ADEC) extended the deadline by which construction must commence by eighteen (18) months until 6 January 2018. In a second letter dated 3 October 2017, the ADEC extended the deadline by which construction must commence by an additional eighteen (18) months until 6 July 2019.

Since the issuance of the ADEC letter dated 3 October 2017, Agrium has decided to replace the five (5) existing 37.6 MMBtu/hr Solar Turbines identified as Units 55, 56, 57, 58, and 59. The replacement Solar Turbines will each have a maximum rated heat input capacity of 55.443 MMBtu/hr. The new Solar Turbines will utilize the existing Waste Heat Boilers (Units 50, 51, 52, 53, and 54) for heat recovery. Due to the increase in heat input capacities of the new Solar Turbines, the required supplemental heat input capacity of the 50.0 MMBtu/hr Waste Heat Boilers have decreased. The Waste Heat Boilers once integrated with the new Solar Turbines, will now only have heat input capacities of 46.729 MMBtu/hr, each. Since the heat input capacities of the Waste Heat Boilers are changing, as are the potential emissions, Agrium is providing updated top-down BACT analyses for these affected units, in addition to the top-down BACT analyses for the new Solar Turbines.

In addition, Agrium is proposing to install Selective Catalytic Reduction (SCR) for NOx control on the Package Boilers (Units 44, 48, and 49). These emission units went through PSD BACT as part of the permitting for AQ0083CPT06. Under the Air Quality Control Construction Permit, BACT for NOx was identified as use of ultra low NOx burners. SCR is considered to provide the same, if not a higher, control efficiency than the use of ultra low NOx burners.

This document is presented as Attachment C to the 2019 Prevention of Significant Deterioration (PSD) permit application for the Facility and presents the Best Available Control Technology (BACT) review for the affected units at the Facility. It also contains an evaluation of BACT for the unaffected units originally permitted in the PSD Construction Permit. In addition, this document includes information contained in appendices as follows:

- Appendix A RBLC Search Summary – This appendix includes the search results of the USEPA RACT/BACT/LAER Clearinghouse (RBLC) database to identify the permit limits on similar sources in the United States. The table also includes permit limit information for recently issued permits that are not in the RBLC.
- Appendix B Cost Estimates – This appendix includes information on the cost estimates for various air pollution control equipment.

This document incorporates by reference additional information contained in the original application that has not changed from the original application, including process descriptions.

1.2 Regulatory Basis for BACT Analysis

Section 163(3) of the Clean Air Act (CAA) defines Best Available Control Technology (BACT) as:

> *"An emission limitation based on the maximum degree of reduction of each pollutant subject to regulation under [the CAA] emitted from or which results from any major emitting facility, which the permitting authority, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such facility through application of production processes and available methods, systems, and techniques, including fuel cleaning, clean fuels, or treatment or innovative fuel combustion techniques for control of each such pollutant."*

Based on projected potential emission rates, BACT is required for the following criteria pollutants:

- Nitrogen Oxides (NO_X)
- Carbon Monoxide (CO)
- Volatile Organic Compounds (VOC)
- Particulate Matter (PM)
- Particulate Matter ≤ 10 microns in aerodynamic diameter (PM_{10})
- Particulate Matter ≤ 2.5 microns in aerodynamic diameter ($PM_{2.5}$)

In addition, the proposed project is subject to a BACT review for the greenhouse gas (GHG) pollutants under EPA's Tailoring Rule. The regulated GHGs include the following:

- Carbon Dioxide (CO_2)
- Methane (CH_4)
- Nitrous Oxide (N_2O)
- Carbon Dioxide Equivalent (CO_2e)

Where CO2e represents the CO2 equivalence of the emissions. CO2e emissions are calculated as the sum of the mass emissions of each individual GHGs adjusted for its respective global warming potential (GWP). The GWP values are included in Table A-1 of the Greenhouse Gas Mandatory Reporting Rule found in 40 CFR 98, Subpart A.

1.3 Five-Step Top-Down BACT Process

This BACT analysis is conducted following EPA's "top-down" BACT approach, as described in EPA's *Draft New Source Review Workshop Manual* (EPA 1990). The five basic steps of a top-down BACT analysis are listed below:

Step 1: Identify potential control technologies
Step 2: Eliminate technically infeasible options
Step 3: Rank remaining control technologies by control effectiveness
Step 4: Evaluate the most effective controls and document results
Step 5: Select BACT

The first step is to identify potentially "available" control options for each emission unit triggering PSD, for each pollutant under review. Available options consist of a comprehensive list of those technologies with a potentially practical application to the emission unit in question. The list includes technologies used to satisfy BACT requirements, innovative technologies, and controls applied to similar source categories.

For this analysis, the following sources were investigated to identify potentially available control technologies:

- EPA's RACT/BACT/LAER Clearinghouse (RBLC) database.
- EPA's New Source Review website.
- In-house experts.
- State air regulatory agency contacts.
- Technical articles and publications.
- A number of permits issued for similar sources that have not yet been entered into the RBLC.
- Guidance documents and personal communications with federal and state agencies.

After identifying potential technologies, the second step is to eliminate technically infeasible options from further consideration. To be considered feasible for BACT, a technology must be commercially available and applicable to a given emission unit.

The third step is to rank the technologies not eliminated in Step 2 in order of descending control effectiveness for each pollutant of concern. If the highest ranked technology is proposed as BACT, it is not necessary to perform technical or economic evaluation of the selected or less effective control technologies identified as outlined in Step 4. Potential adverse impacts, however, must still be identified and evaluated.

The fourth step entails an evaluation of energy, environmental, and economic impacts for determining a final level of control. The evaluation begins with the most stringent control option and continues until a technology under consideration cannot be eliminated based on adverse energy, environmental, or economic impacts. The economic or "cost-effectiveness" analysis is conducted in a manner consistent with EPA's *OAQPS Control Cost Manual, Sixth Edition*[1] and subsequent revisions.

Cost effectiveness is expressed in terms of dollars per ton of pollutant removed ($/ton). The costs in the numerator of that expression are determined by adding the annualized capital cost and the annual operation and maintenance costs of a given control device under evaluation. Annualized costs are determined by the following equation:

$$\text{Annualized equipment cost in \$/yr} = PV(i / [1 - (1 + i) -n])$$

Where:
PV = Present value of the equipment;
i = Interest rate (cost of money); and
n = Number of years of the life of the equipment.

The annual mass (ton) of pollutant removed is determined by multiplying the annual uncontrolled emission rate by the expected control efficiency. The uncontrolled emission rate may, in some cases, be the rate after some level of control. In addition, the annual emission rate may be the potential to emit, or a level based on limited hours of operation.

The fifth and final step is to select as BACT the emission limit from application of the most effective of the remaining technologies under consideration for each pollutant of concern.

[1] USEPA, *OAQPS Control Cost Manual, Sixth Edition* (Research Triangle Park, NC, 2002)

2. SUMMARY OF AFFECTED EMISSION UNITS AND POLLUTANTS

2.1 Brief Facility Description

Air Quality Control Construction Permit AQ0083CPT06 permitted Agrium to construct a facility consisting of an agricultural fertilizer production facility. The facility will consist of three (3) distinct plants:

1. Plant 4 – Ammonia Plant
2. Plant 5 – Urea Plant
3. Plant 6 – Supporting Utility Plant

Each plant within the permitted facility includes several emission units. In the synthetic ammonia production process, natural gas molecules are reduced to carbon and hydrogen. The hydrogen is then purified and reacted with nitrogen to produce ammonia. Ammonia is synthesized by reacting hydrogen with nitrogen at a molar ratio of 3 to 1, then compressing and cooling the gas. Nitrogen is obtained from the air, while hydrogen is obtained from the catalytic steam reforming of natural gas.

Generally, there are six process steps to produce synthetic ammonia using the catalytic steam reforming process as follows:

1. Natural gas desulfurization,
2. Catalytic steam reforming,
3. Carbon monoxide (CO) shift,
4. Carbon dioxide (CO2) removal,
5. Methanation, and
6. Ammonia synthesis.

The synthetic ammonia produced at the Ammonia Plant is used as feedstock for the Urea Plant at the facility and will also be sold as a product. In the Urea Plant, urea is produced by reacting ammonia and CO_2.

A more detailed description of the permitted facility and associated air emission units is provided in the Appendix A of the original BACT analysis.

2.2 Package Boilers Units (Units 44, 48, and 49)

The three (3) Package Boilers at the plant are natural gas-fired boilers used to generate steam for plant operations. Emissions of regulated pollutants from the Package Boilers include:

- Nitrogen Oxides (NOx)
- Carbon Monoxide (CO)
- Volatile Organic Compounds (VOC)
- Particulate Matter (PM)
- Particulate Matter ≤ 10 microns in aerodynamic diameter (PM10)
- Particulate Matter ≤ 2.5 microns in aerodynamic diameter (PM2.5)
- Carbon Dioxide (CO2)
- Methane (CH4)
- Nitrous Oxide (N2O)
- Carbon Dioxide Equivalent (CO2e)

2.3 Waste Heat Boilers (Units 50, 51, 52, 53, and 54)

The five (5) Waste Heat Boilers at the plant are natural gas-fired units used to generate steam for the plant using natural gas and waste heat from the turbines. Emissions of regulated pollutants from the Waste Heat Boilers include:

- Nitrogen Oxides (NOx)
- Carbon Monoxide (CO)
- Volatile Organic Compounds (VOC)

- Particulate Matter (PM)
- Particulate Matter ≤ 10 microns in aerodynamic diameter (PM10)
- Particulate Matter ≤ 2.5 microns in aerodynamic diameter (PM2.5)
- Carbon Dioxide (CO2)
- Methane (CH4)
- Nitrous Oxide (N2O)
- Carbon Dioxide Equivalent (CO2e)

2.4 Solar Turbine/Generator Sets (Units 55, 56, 57, 58, and 59)

The five (5) proposed Solar Turbines/Generator Sets are natural gas-fired units primarily used to generate electricity for use at the plant site. Emissions of regulated pollutants from the Solar Turbines include:

- Nitrogen Oxides (NOx)
- Carbon Monoxide (CO)
- Volatile Organic Compounds (VOC)
- Particulate Matter (PM)
- Particulate Matter ≤ 10 microns in aerodynamic diameter (PM10)
- Particulate Matter ≤ 2.5 microns in aerodynamic diameter (PM2.5)
- Carbon Dioxide (CO2)
- Methane (CH4)
- Nitrous Oxide (N2O)
- Carbon Dioxide Equivalent (CO2e)

3. CRITERIA POLLUTANT BEST AVAILABLE CONTROL TECHNOLOGY (BACT) ANALYSIS

Criteria pollutants subject to BACT Analysis for this project include:

- Carbon Monoxide (CO)
- Nitrogen Oxides (NOX)
- Volatile Organic Compounds (VOC)
- Particulate Matter (PM)
- Particulate Matter ≤ 10 microns in aerodynamic diameter (PM10)
- Particulate Matter ≤ 2.5 microns in aerodynamic diameter ($PM_{2.5}$)

Generally, these pollutants are the result of natural gas combustion at the planned facility; although, sources other than combustion sources are included at the facility. The sections below include a BACT Analysis for the regulated criteria air pollutants emitted from each emission unit. Greenhouse gas (GHG) pollutants are addressed in Section 4.0 of this document.

3.1 Package Boilers (Units 44, 48, and 49)

KNO currently has three existing natural gas-fired package boilers at its facility. As a part of the BACT Analysis, KNO has evaluated the costs to retro-fit these boilers as compared to the costs of constructing new units. KNO has determined that it is most cost effective to replace the three existing package boilers with three new package boilers. As a result, this analysis will focus on BACT for new boilers rather than for existing boilers. The following subsections present the step-by-step BACT review for the Package Boilers for each applicable criteria pollutant including CO, NO_X, VOC, and $PM/PM_{10}/PM_{2.5}$.

The boilers are subject to the boiler MACT standard under 40 CFR Part 63, Subpart DDDDD; however, there are no emission limits in that rule for natural gas combustion sources that will impact this BACT. The Package Boilers are also subject to a New Source Performance Standard (NSPS) under 40 CFR Part 60 Subpart Db.

3.1.1 BACT Evaluation for CO Emissions from the Package Boilers

Step 1 – Identify All Available Control Technologies

Review of the RBLC database identified two control technologies for control of CO emissions from natural gas-fired boilers - Good Combustion Practices (GCP), and in a couple instances, an Oxidation Catalyst (OC). Emission limits range from 0.0013 to 0.84 lb/mmBtu for natural gas combustion. Available control technologies for the control of CO emissions include good combustion practices, oxidation catalyst, and thermal oxidation. Most of the RBLC entries used the AP-42 emission factor for open combustion of natural gas. The Iowa Fertilizer Corporation (IFC) boiler used a much lower emission rate and the RBLC entry shows that compliance is unverified.

Step 2 – Eliminate Technically Infeasible Options

<u>**Oxidation Catalyst**</u>

Oxidation catalysts use a noble metal catalyst to reduce the activation energy of the oxidation reaction:

$$2CO + O_2 \rightarrow 2CO_2$$

Although oxidation catalysts are used to reduce CO emissions from natural gas-fired combustion turbines, they have limited demonstration in reducing CO emissions from natural gas-fired boilers. To be effective, the oxidation catalyst must be placed in a location with gas temperatures of at least 600 ˚F. The typical excess oxygen levels in natural gas-fired boilers and heaters are in the range of 3 –

6%. These low excess oxygen levels limit the potential effectiveness of an oxidation catalyst on a boiler or furnace exhaust; however, this technology is carried forward for control of CO emissions from the Package Boilers.

Thermal Oxidation

Thermal oxidation has never been required nor used on a natural gas-fired boiler, and the effectiveness of the technology in reducing CO emissions from natural gas-fired boilers is questionable. Thermal oxidation would involve injecting additional air into the flue gas and heating the oxygen enriched mixture to approximately 1,500 ˚F to oxidize CO to carbon dioxide. However, since the combustion of the reheat fuel would itself result in CO emissions, there is no evidence that thermal oxidation would result in overall reductions in CO emission.

Since thermal oxidation has never been demonstrated on a natural gas-fired boiler, and because there is no evidence that it could reduce CO emissions, thermal oxidation is not a technically feasible CO control technology for the Package Boilers.

Good Combustion Practices

GCPs typically include the following elements:

1. Sufficient residence time to complete combustion
2. Providing and Maintaining proper air/fuel ratio
3. High temperatures and low oxygen levels in the primary combustion zone
4. High enough overall excess oxygen levels to complete combustion and maximize thermal efficiency
5. Proper fuel gas supply system designed to minimize effects of contaminants or fluctuations in pressure and flow on the fuel gas delivered

Combustion efficiency is dependent on the gas residence time, the combustion temperature, and the amount of mixing in the combustion zone. Each of these parameters is incorporated into the design of the burners and the fire box of a boiler or furnace to optimize combustion and minimize fuel consumption. In addition to the above parameters the level of oxygen in the boiler is important to GCP. Therefore, combustion control is accomplished primarily through boiler design as it relates to time, temperature, and mixing, and through boiler operation as it relates to excess oxygen levels. Combustion design for modern boilers is intended to simultaneously minimize formation of CO and NOx emissions. This is a difficult task, since emissions of NOx and emissions of CO are inversely related. That is, measures used to reduce NOx emissions often lead to increases in CO emissions. Therefore, the boiler design to minimize CO emissions is interrelated with the boiler design to minimize NOx formation.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

GCPs are planned for the fuel burning equipment at the facility and represent the baseline BACT for the boilers; therefore, an oxidation catalyst represents the highest ranked level of control for CO emissions from the Package Boilers.

Step 4 – Evaluate Most Effective Controls and Document Results

The cost to install a catalytic oxidation system was evaluated and determined to have an estimated cost of $29,000 per ton of CO removed. A cost summary spreadsheet is provided in Appendix B. For CO emissions this level of cost is considered to be economically infeasible. A CO-catalyst for control of CO emission from the Package Boilers is eliminated from further consideration as representing BACT for this source.

Step 5 – Select BACT

Agrium proposes the use of Good Combustion Practices as the BACT for CO emissions from the Package Boilers. CO Emissions from the Package Boilers will be limited to 50 ppmv at 3% O_2. Initial compliance with the proposed emission limit will be demonstrated by conducting an initial stack test.

3.1.2 BACT Evaluation for VOC Emissions from the Package Boilers

Step 1 – Identify All Available Control Technologies

Options for the control of VOC emissions from the Package Boilers are the same as the CO emission control options - GCPs, oxidation catalyst, and thermal oxidation.

Step 2 – Eliminate Technically Infeasible Options

For the same reasons given for CO control from the Package Boilers exhaust, thermal oxidation is eliminated from further consideration. A CO oxidation catalyst will provide some level of control of VOC emissions in addition to CO emissions and is carried forward in this review along with the baseline control provided by GCP.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

GCPs are planned for the fuel burning equipment at the facility and represent the baseline BACT for the boilers; therefore, an oxidation catalyst represents the highest ranked level of control for VOC emissions from the Package Boilers.

Step 4 – Evaluate Most Effective Controls and Document Results

A cost estimate for a CO-catalyst to control VOC emissions from the Package Boilers is included in Appendix B of this document. The cost estimate shows that the cost of control is $248,400 per ton of VOC controlled. This level of cost is excessive and the CO-catalyst option is dropped from further consideration as representing BACT for VOC emissions from the Package Boilers.

Step 5 – Select BACT

Agrium proposes the use of Good Combustion Practices as the BACT for VOC emissions from the Package Boilers. VOC Emissions from the Package Boilers will be limited to 0.0054 lb/MMBtu.

3.1.3 BACT Evaluation for NO_X Emissions from the Package Boilers

Step 1 – Identify All Available Control Technologies

Options for the control of NO_X emissions from the Package Boilers include Selective Catalytic Reduction (SCR), Selective Non-Catalytic Reduction (SNCR), Low-NOx Burners (LNB), Ultra Low-NOx Burners (ULNB), and Good Combustion Practices (GCP).

Step 2 – Eliminate Technically Infeasible Options

Selective Catalytic Reduction (SCR)

Selective Catalytic Reduction (SCR) is a control technology in which ammonia or urea is injected into the exhaust gas before it is passed over a catalyst. The gas stream then reacts with the catalyst to form nitrogen (N_2). Optimum NO_X reduction occurs between 480°F and 800°F[2]. SCR systems typically operate at reduction efficiencies of 70% to 90%[3]. A typical SCR system consists of reagent storage, reagent injection equipment, catalyst housing and catalyst, and associated system control instrumentation. SCR is technically feasible for control of NOx emissions from the Package Boilers and is carried forward in this BACT review.

Selective Non-Catalytic Reduction (SNCR)

Selective Non-Catalytic Reduction (SNCR) involves the injection of ammonia or urea into the post-combustion flue gas. Typical SNCR reduction efficiencies are 30% to 50%[4]. NO_X reduction reactions

[2] U.S. EPA Clean Air Technology Center, Air Pollution Control Technology Fact Sheet for SCR. http://www.epa.gov/ttncatc1/dir1/fscr.pdf.

[3] U.S. EPA, Office of Air Quality Planning and Standards. OAQPS Control Cost Manual Section 4-2 Chapter 2, 6th edition. EPA 452/B-02-001. Research Triangle Park, NC. January 2002.

[4] Ibid.

occur at temperatures between 1600°F and 2100°F[5]. A typical SNCR system consists of reagent storage, multi-level reagent-injection equipment, and associated control instrumentation. The SNCR reagent storage and handling systems are similar to those for SCR systems. However, because of higher stoichiometric ratios, both ammonia and urea SNCR processes require three or four times more reagent as SCR systems to achieve a high level of NOx reductions.

Effluent gas temperatures from the Package Boilers exhaust undergo extensive heat recovery and are not high enough to effectively utilize SNCR so the reagent would need to be injected into the Package Boilers. The gas residence times in the temperature window of greater than one second are needed for optimal SNCR performance while the catalytic reformer design residence time range is less than a second. In addition, review of available literature and the RBLC database indicate that there are no installations of SNCR for control of NO_X emissions from package boilers of this type. This is likely because SCR can be implemented and achieve a higher level of control. For these reasons, SNCR is not technically feasible and is eliminated from further consideration.

Low NO_X Burners

Low NO_X Burners are used to minimize combustion related NO_X emissions by reducing peak flame temperatures. The basic principle involves reducing the temperature of combustion to minimize the formation of thermal NOx in the combustion process.

Ultra Low NO_X Burners

Ultra Low NO_X burners use a similar technique as Low NO_X Burners, however they also employ flue gas recirculation to lower the flame temperature and achieve lower NOx formation than LNB.

Good Combustion Practices

Good Combustion Practices are outline in the CO BACT review for the Package Boilers.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

The remaining control technologies and their associated control efficiencies are shown in the table below.

Table 1 NOx Control Efficiencies for the Package Boilers

Control Technology	Control Efficiency
SCR and Low NOx Burners	85% - 95%
SCR	70% - 90%
Ultra Low NO_X Burners	50% - 90%
Low NO_X Burners6	40% - 60%
Good Combustion Practices	N/A

Step 4 – Evaluate Most Effective Controls and Document Results

KNO has been provided with design specifications for boilers using SCR capable of meeting 0.01 lb/MMBtu. This emission rate is comparable to units identified in the RBLC that have been permitted using SCR. Because no RBLC entries required the use of SCR and Low NOx burners, the cost to install low NOx burners on these boilers has not been evaluated.

Step 5 – Select BACT

Agrium proposes the use of SCR as BACT for NO_X emissions from the Package Boilers. NO_X Emissions from the Package Boilers will be limited to 0.01 lb/MMBtu. This limit is comparable to the

[5] U.S. EPA Clean Air Technology Center, Air Pollution Control Technology Fact Sheet for SNCR. http://www.epa.gov/ttn/catc/dir1/fsncr.pdf .

[6] U.S. EPA Technical Bulletin – Nitrogen Oxides (NO_X), why and how they are controlled. EPA-456/F-99-006R. November 1999.

top level BACT determinations for natural gas-fired package boilers. Compliance with the proposed emission limit will be demonstrated through the use of NO_x CEMS.

3.1.4 BACT Evaluation for $PM/PM_{10}/PM_{2.5}$ Emissions from the Package Boilers

Step 1 – Identify All Available Control Technologies

Options for the control of $PM/PM_{10}/PM_{2.5}$ emissions from the Package Boilers include fabric filters, cartridge filters, mechanical separators, wet and dry electrostatic precipitators (ESP), wet scrubbers, venturi scrubbers, and good combustion practices. It is important to note that the estimated particulate matter emission rate from the Package Boilers stack is 7.6 lb/MMscf or 0.007 gr/dscf. This is a low level of particulate emission and is too low for add-on control.

Step 2 – Eliminate Technically Infeasible Options

Fabric Filters

Fabric Filters or baghouses are comprised of an array of filter bags contained in housing. Air passes through the filter media from the "dirty" to the "clean" side of the bag. These devices undergo periodic bag cleaning based on the build-up of filtered material on the bag as measured by pressure drop across the device. The cleaning cycle is set to allow operation within a range of design pressure drop. Fabric Filters are characterized by the type of cleaning cycle - mechanical-shaker, pulse-jet, and reverse-air. Fabric Filter systems have control efficiencies of 99% to 99.9%7, and are generally specified to meet a discharge concentration of filterable particulate (e.g., 0.01 grains per dry standard cubic feet). Because the filterable particulate emissions resulting from natural gas combustion are so low (0.007 gr/dscf), Fabric Filters are not used to control particulate emissions from natural gas combustion sources. For this reason Fabric Filters are considered technically infeasible and are dropped from further consideration in this BACT review.

Cartridge Collectors

Cartridge Collectors involve the use of filter media supported on a wire framework to collect filterable particulate matter from an air stream or exhaust. Typical Cartridge Collectors have control efficiencies of 99.99% to 99.999%8. Use of a HEPA type filter can achieve even greater control efficiency. Cartridge Collectors generally do not have a means of self-cleaning and are replaced when the pressure drop across the filter becomes excessive and impedes air flow or fan operation. Cartridge Filters are not practical for use to control emissions from a continuous operation and have never been used to control filterable particulate emissions from a natural gas combustion source. For these reasons Cartridge Collectors are not carried forward in this BACT review.

Mechanical Separators

Separators are often referred to as "precleaners," and are typically used to reduce the inlet loading of $PM/PM_{10}/PM_{2.5}$ to control devices further downstream by removing large particles. Typical inlet grain loading values for Separators are 4 – 110 gr/ft^3 9. Mechanical Separators are never used for particulate control from natural gas combustion sources because the small particle size and low filterable particulate emissions from natural gas combustion. Mechanical Separators are considered technically infeasible and are not carried further in this evaluation.

[7] U.S. EPA Clean Air Technology Center, Air Pollution Control Technology Fact Sheet for Fabric Filters. http://www.epa.gov/ttn/catc/dir1/ff-shaker.pdf, http://www.epa.gov/ttn/catc/dir1/ff-revar.pdf, http://www.epa.gov/ttn/catc/dir1/ff-pulse.pdf

[8] U.S. EPA Clean Air Technology Center, Air Pollution Control Technology Fact Sheet for Fabric Filters. http://www.epa.gov/ttn/catc/dir1/ff-cartr.pdf

[9] U.S. EPA Clean Air Technology Center, Air Pollution Control Technology Fact Sheet for Fabric Filters. http://www.epa.gov/ttn/catc/dir1/fmechan.pdf

Wet and Dry Electrostatic Precipitators (ESP)

Wet and Dry Electrostatic Precipitators (ESPs) remove particles from a gas stream by electrically charging particles with a discharge electrode in the gas path and then collecting the charged particles on grounded. The inlet air is quenched with water on a Wet ESP to saturate the gas stream and ensure a wetted surface on the collection plate. This wetted surface along with a period deluge of water is what cleans the collection plate surface. Wet ESPs typically control streams with inlet grain loading values of 0.5 – 5 gr/ft^3 and have control efficiencies between 99% and 99.9%[10]. Wet ESPs have the advantage of controlling some amount of condensable particulate matter. The collection plates in a Dry ESP are periodically cleaned by a rapper or hammer that sends a shock wave that knocks the collected particulate off the plate. Dry ESPs typically control streams with inlet grain loading values of 0.5 – 5 gr/ft^3 and have control efficiencies between 99% and 99.9%[11]. Both Wet and Dry ESPs are considered to be technically infeasible for filterable and condensable particulate matter control from the Package Boilers because of the low level of emissions from natural gas combustion (0.007 gr/dscf) and are not carried forward in this BACT review.

Wet Scrubbers

Wet Scrubbers use a scrubbing solution to remove $PM/PM_{10}/PM_{2.5}$ from an exhaust gas streams. The mechanism for particulate collection is impaction and interception by water droplets. Wet Scrubbers are configured as counter-flow, cross-flow, or concurrent flow, but typically employ counter-flow where the scrubbing fluid is in the opposite direction as the gas flow. Wet Scrubbers have control efficiencies of 50% - 99%[12]. One advantage of wet Scrubbers is that they can be effective on condensable particulate matter. A disadvantage of a Wet Scrubber is that they consume water and produce wastewater and sludge. Wet Scrubbers are never used for particulate control on natural gas fired combustion units because of the low particulate emissions resulting from natural gas combustion (0.007 gr/dscf). Wet Scrubbers are considered to be technically infeasible for filterable and condensable particulate matter control from the Package Boilers and are not carried forward in this BACT review.

Venturi Scrubbers

Venturi Scrubbers for the gas and liquid (scrubbing fluid) into a venturi throat to enhance the gas-liquid contact to remove particulate matter removal. The $PM/PM_{10}/PM_{2.5}$ containing droplets are then settled out by gravity in an expanded section of the exhaust duct. Venturi Scrubbers control streams with inlet grain loadings of 0.1 – 50 gr/ft^3 and have control efficiencies of 70% - 99%[13]. Like other wet control systems, Venturi Scrubbers have the advantage of controlling some level of condensable particulate matter. Venturi Scrubbers are never used for particulate control on natural gas fired combustion units because of the low particulate emissions resulting from natural gas combustion (0.007 gr/dscf). Venturi Scrubbers are considered to be technically infeasible for filterable and condensable particulate matter control from the Package Boilers and are not carried forward in this BACT review.

Good Combustion Practices

Good Combustion Practices typically include the following elements:

1. Sufficient residence time to complete combustion
2. Providing proper air/fuel ratio
3. High temperatures and low oxygen levels in the primary combustion zone

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[10] U.S. EPA Clean Air Technology Center, Air Pollution Control Technology Fact Sheet for Fabric Filters. http://www.epa.gov/ttn/catc/dir1/fwespwpi.pdf

[11] U.S. EPA Clean Air Technology Center, Air Pollution Control Technology Fact Sheet for Fabric Filters. http://www.epa.gov/ttn/catc/dir1/fdespwpi.pdf

[12] U.S. EPA Clean Air Technology Center, Air Pollution Control Technology Fact Sheet for Fabric Filters. http://www.epa.gov/ttn/catc/dir1/fpack.pdf, http://www.epa.gov/ttn/catc/dir1/fsprytwr.pdf

[13] U.S. EPA Clean Air Technology Center, Air Pollution Control Technology Fact Sheet for Fabric Filters. http://www.epa.gov/ttn/catc/dir1/fventuri.pdf

4. High enough overall excess oxygen levels to complete combustion and maximize thermal efficiency
5. Proper fuel gas supply system design to minimize effects of contaminants or fluctuations in pressure and flow on the fuel gas delivered

A review of the RBLC for reformers also indicates that no add-on controls have been implemented to control $PM/PM_{10}/PM_{2.5}$ emissions from natural gas fired boilers. This is due to the fact that natural gas contains almost no inert materials and generates very little particulate matter emissions. Therefore all add-on controls are considered technically infeasible.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

Based on the analysis above, the only technically feasible control technology for control of $PM/PM_{10}/PM_{2.5}$ emissions from the Package Boilers is the use of Good Combustion Practices. Therefore no ranking is necessary.

Step 4 – Evaluate Most Effective Controls and Document Results

The only remaining control technology is the use of Good Combustion Practices. Therefore no further evaluation is necessary.

Step 5 – Select BACT

Agrium proposes the use of Good Combustion Practices as BACT for $PM/PM_{10}/PM_{2.5}$ emissions from the Package Boilers. $PM/PM_{10}/PM_{2.5}$ Emissions from the Package Boilers will be limited to 0.0074 lb/MMBtu. Agrium will record total fuel usage for the Package Boilers to ensure compliance.

3.2 Waste Heat Boilers (Units 50, 51, 52, 53, and 54)

KNO operates five natural gas fired waste heat boilers that utilize waste heat from the five solar turbines to generate steam. The following subsections present the step-by-step BACT review for the waste heat boilers for each applicable criteria pollutant including CO, NO_X, VOC, and $PM/PM_{10}/PM_{2.5}$.

3.2.1 BACT Evaluation for CO Emissions from the Waste Heat Boilers

Step 1 – Identify All Available Control Technologies

Review of the RBLC database identified two control technologies for control of CO emissions from natural gas-fired boilers - Good Combustion Practices (GCP), and in one instance, an Oxidation Catalyst (OC). Emission limits range from 0.035 to 0.14 lb/mmBtu for natural gas combustion. Available control technologies for the control of CO emissions include good combustion practices, oxidation catalyst, and thermal oxidation.

Step 2 – Eliminate Technically Infeasible Options

<u>Oxidation Catalyst</u>

Oxidation catalysts use a noble metal catalyst to reduce the activation energy of the oxidation reaction:

$2CO + O_2 \rightarrow 2CO_2$

Although oxidation catalysts are used to reduce CO emissions from natural gas-fired combustion turbines, they have limited demonstration in reducing CO emissions from natural gas-fired boilers. To be effective, the oxidation catalyst must be placed in a location with gas temperatures of at least 600 ˚F. The typical excess oxygen levels in natural gas-fired boilers and heaters are in the range of 3 – 6%. In contrast to typical natural gas-fired boilers, the Waste heat boilers operate at a high excess air due to Waste heat from combustion turbines. As a result, oxidation catalysts are not practical for these units. Oxidation catalyst is eliminated as a viable control option.

Thermal Oxidation

Thermal oxidation has never been required nor used on a natural gas-fired boiler, and the effectiveness of the technology in reducing CO emissions from natural gas-fired boilers is questionable. Thermal oxidation would involve injecting additional air into the flue gas and heating the oxygen enriched mixture to approximately 1,500 ˚F to oxidize CO to carbon dioxide. However, since the combustion of the reheat fuel would itself result in CO emissions, there is no evidence that thermal oxidation would result in overall reductions in CO emission.

Since thermal oxidation has never been demonstrated on a natural gas-fired boiler, and because there is no evidence that it could reduce CO emissions, thermal oxidation is not a technically feasible CO control technology for the Waste Heat Boilers.

Good Combustion Practices

GCPs typically include the following elements:

1. Sufficient residence time to complete combustion
2. Providing and Maintaining proper air/fuel ratio
3. High enough overall excess oxygen levels to complete combustion and maximize thermal efficiency
4. Proper fuel gas supply system designed to minimize effects of contaminants or fluctuations in pressure and flow on the fuel gas delivered

Combustion efficiency is dependent on the gas residence time, the combustion temperature, and the amount of mixing in the combustion zone. Each of these parameters is incorporated into the design of the burners and the fire box of a boiler or furnace to optimize combustion and minimize fuel consumption. In addition to the above parameters the level of oxygen in the boiler is important to GCP. Therefore, combustion control is accomplished primarily through boiler design as it relates to time, temperature, and mixing, and through boiler operation as it relates to excess oxygen levels. Combustion design for modern boilers is intended to simultaneously minimize formation of CO and NOx emissions.

This is a difficult task, since emissions of NOx and emissions of CO are inversely related. That is, measures used to reduce NOx emissions often lead to increases in CO emissions.

Therefore, the boiler design to minimize CO emissions is interrelated with the boiler design to minimize NOx formation.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

GCPs are planned for the fuel burning equipment at the facility and represent the baseline BACT for the boilers. Because no other feasible control options are available for CO control from Waste Heat Boilers, this is considered to be the best control option available.

Step 4 – Evaluate Most Effective Controls and Document Results

GCPs are considered to be the best control technology available. As a result, no further analysis of control options is necessary.

Step 5 – Select BACT

Agrium proposes the use of Good Combustion Practices as the BACT for CO emissions from the Waste Heat Boilers. CO Emissions from the Waste Heat Boilers will be limited to 50 ppmv at 15% O_2. Initial compliance with the proposed emission limit will be demonstrated by conducting an initial stack test.

3.2.2 BACT Evaluation for VOC Emissions from the Waste Heat Boilers

Step 1 – Identify All Available Control Technologies

Options for the control of VOC emissions from the Waste Heat Boilers are the same as the CO emission control options - GCPs, oxidation catalyst, and thermal oxidation.

Step 2 – Eliminate Technically Infeasible Options

For the same reasons given for CO control from the Waste Heat Boilers oxidation catalyst and thermal oxidation are eliminated from further consideration.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

GCPs are planned for the fuel burning equipment at the facility and represent the best available controls for VOC emissions from Waste Heat Boilers.

Step 4 – Evaluate Most Effective Controls and Document Results

GCPs are considered to be the best control technology available. As a result, no further analysis of control options is necessary.

Step 5 – Select BACT

Agrium proposes the use of Good Combustion Practices as the BACT for VOC emissions from the Waste Heat Boilers. VOC emissions from the Waste Heat Boilers will be limited to 0.0054 lb/MMBtu.

3.2.3 BACT Evaluation for NO_X Emissions from the Waste Heat Boilers

Step 1 – Identify All Available Control Technologies

Options for the control of NO_X emissions from the Waste Heat Boilers include Selective Catalytic Reduction (SCR), Selective Non-Catalytic Reduction (SNCR), Low-NOx Burners (LNB), Ultra Low-NOx Burners (ULNB), and Good Combustion Practices (GCP).

Step 2 – Eliminate Technically Infeasible Options

<u>Selective Catalytic Reduction (SCR)</u>

Selective Catalytic Reduction (SCR) is a control technology in which ammonia or urea is injected into the exhaust gas before it is passed over a catalyst. The gas stream then reacts with the catalyst to form nitrogen (N_2). Optimum NO_X reduction occurs between 480°F and 800°F[14]. SCR systems typically operate at reduction efficiencies of 70% to 90%[15]. A typical SCR system consists of reagent storage, reagent injection equipment, catalyst housing and catalyst, and associated system control instrumentation. SCR is technically feasible for control of NOx emissions from the Waste Heat Boilers and is carried forward in this BACT review.

<u>Selective Non-Catalytic Reduction (SNCR)</u>

Selective Non-Catalytic Reduction (SNCR) involves the injection of ammonia or urea into the post-combustion flue gas. Typical SNCR reduction efficiencies are 30% to 50%[16]. NO_X reduction reactions occur at temperatures between 1600°F and 2100°F[17]. A typical SNCR system consists of reagent storage, multi-level reagent-injection equipment, and associated control instrumentation. The SNCR reagent storage and handling systems are similar to those for SCR systems. However, because of higher stoichiometric ratios, both ammonia and urea SNCR processes require three or four times more reagent as SCR systems to achieve a high level of NOx reductions.

Effluent gas temperatures from the Waste Heat Boilers exhaust undergo extensive heat recovery and are not high enough to effectively utilize SNCR so the reagent would need to be injected into the Waste Heat Boilers. The gas residence times in the temperature window of greater than one second are needed for optimal SNCR performance while the Waste Heat Boiler design residence time range

[14] U.S. EPA Clean Air Technology Center, Air Pollution Control Technology Fact Sheet for SCR. http://www.epa.gov/ttncatc1/dir1/fscr.pdf.

[15] U.S. EPA, Office of Air Quality Planning and Standards. OAQPS Control Cost Manual Section 4-2 Chapter 2, 6th edition. EPA 452/B-02-001. Research Triangle Park, NC. January 2002.

[16] Ibid.

[17] U.S. EPA Clean Air Technology Center, Air Pollution Control Technology Fact Sheet for SNCR. http://www.epa.gov/ttn/catc/dir1/fsncr.pdf.

is less than a second. In addition, review of available literature and the RBLC database indicate that there are no installations of SNCR for control of NO_X emissions from boilers of this size. This is likely because SCR can be implemented and achieve a higher level of control. For these reasons, SNCR is not technically feasible and is eliminated from further consideration.

Low NO_X Burners

Low NO_X Burners are used to minimize combustion related NO_X emissions by reducing peak flame temperatures. The basic principle involves reducing the temperature of combustion to minimize the formation of thermal NOx in the combustion process.

Ultra Low NOX Burners

Ultra Low NO_X burners use a similar technique as Low NO_X Burners, however they also employ flue gas recirculation to lower the flame temperature and achieve lower NOx formation than LNB.

Good Combustion Practices

Good Combustion Practices are outlined in the CO BACT review for the Waste Heat Boilers.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

The remaining control technologies and their associated control efficiencies are shown in the table below.

Table 2 NOx Control Efficiencies for the Waste Heat Boilers

Control Technology	Control Efficiency
SCR/Low NOx Burners	85%-95%
SCR	70% - 92%
Ultra Low NO_X Burners	50% - 70%
Low NO_X Burners[18]	40% - 60%
Good Combustion Practices	N/A

Step 4 – Evaluate Most Effective Controls and Document Results

Low NOx Burners in combination with SCR is identified as the most effective control technology available. Because the Waste Heat Boilers at KNO are existing units, the Waste Heat Boilers would need to be retrofitted with replacement burners. KNO has performed an analysis of the cost to install low NOx burners on each of the Waste Heat Boilers, which would allow the unit to meet a lower NOx emission rate. This cost analysis is provided in Appendix B. This analysis shows that the additional cost incurred by installing low NOx burners would be $111,105/ton of NOx controlled. KNO considers this cost to be above the level that is reasonable for NOx control costs.

Step 5 – Select BACT

Agrium proposes the use of SCR as BACT for NO_X emissions from the Waste Heat Boilers. NO_X Emissions from the Waste Heat Boilers will be limited to 0.008 lb/MMBtu, or a stack NOx emission rate of 7 ppmv at 15% O_2. Due to the relatively small size of these units, the fact they are existing units, and costs to install low NOx Burners, SCR is considered to be the best control technology available to limit NOx from these units.

3.2.4 BACT Evaluation for $PM/PM_{10}/PM_{2.5}$ Emissions from the Waste Heat Boilers

Step 1 – Identify All Available Control Technologies

Options for the control of $PM/PM_{10}/PM_{2.5}$ emissions from the Waste Heat Boilers include fabric filters, cartridge filters, mechanical separators, wet and dry electrostatic precipitators (ESP), wet scrubbers,

[18] U.S. EPA Technical Bulletin – Nitrogen Oxides (NOX), why and how they are controlled. EPA-456/F-99-006R. November 1999.

venturi scrubbers, and good combustion practices. It is important to note that the estimated particulate matter emission rate from the Waste Heat Boilers stack is 7.6 lb/MMscf or 0.007 gr/dscf, which is a low level of particulate emission.

Step 2 – Eliminate Technically Infeasible Options

Fabric Filters

Fabric Filters or baghouses are comprised of an array of filter bags contained in housing. Air passes through the filter media from the "dirty" to the "clean" side of the bag. These devices undergo periodic bag cleaning based on the build-up of filtered material on the bag as measured by pressure drop across the device. The cleaning cycle is set to allow operation within a range of design pressure drop. Fabric Filters are characterized by the type of cleaning cycle - mechanical-shaker, pulse-jet, and reverse-air. Fabric Filter systems have control efficiencies of 99% to 99.9%[19,] and are generally specified to meet a discharge concentration of filterable particulate (e.g., 0.01 grains per dry standard cubic feet). Because the filterable particulate emissions resulting from natural gas combustion are so low (0.007 gr/dscf), Fabric Filters are not used to control particulate emissions from natural gas combustion sources. For this reason Fabric Filters are considered technically infeasible and are dropped from further consideration in this BACT review.

Cartridge Collectors

Cartridge Collectors involve the use of filter media supported on a wire framework to collect filterable particulate matter from an air stream or exhaust. Typical Cartridge Collectors have control efficiencies of 99.99% to 99.999%[20]. Use of a HEPA type filter can achieve even greater control efficiency. Cartridge Collectors generally do not have a means of self-cleaning and are replaced when the pressure drop across the filter becomes excessive and impedes air flow or fan operation. Cartridge Filters are not practical for use to control emissions from a continuous operation and have never been used to control filterable particulate emissions from a natural gas combustion source. For these reasons Cartridge Collectors are not carried forward in this BACT review.

Mechanical Separators

Separators are often referred to as "precleaners," and are typically used to reduce the inlet loading of $PM/PM_{10}/PM_{2.5}$ to control devices further downstream by removing large particles. Typical inlet grain loading values for Separators are 4 – 110 gr/ft^3 [21]. Mechanical Separators are never used for particulate control from natural gas combustion sources because the small particle size and low filterable particulate emissions from natural gas combustion. Mechanical Separators are considered technically infeasible and are not carried further in this evaluation.

Wet and Dry Electrostatic Precipitators (ESP)

Wet and Dry Electrostatic Precipitators (ESPs) remove particles from a gas stream by electrically charging particles with a discharge electrode in the gas path and then collecting the charged particles on grounded. The inlet air is quenched with water on a Wet ESP to saturate the gas stream and ensure a wetted surface on the collection plate. This wetted surface along with a period deluge of water is what cleans the collection plate surface. Wet ESPs typically control streams with inlet grain loading values of 0.5 – 5 gr/ft^3 and have control efficiencies between 99% and 99.9%[22]. Wet ESPs have the advantage of controlling some amount of condensable particulate matter. The collection plates in a Dry ESP are periodically cleaned by a rapper or hammer that sends a shock wave that

19 U.S. EPA Clean Air Technology Center, Air Pollution Control Technology Fact Sheet for Fabric Filters. http://www.epa.gov/ttn/catc/dir1/ff-shaker.pdf, http://www.epa.gov/ttn/catc/dir1/ff-revar.pdf, http://www.epa.gov/ttn/catc/dir1/ff-pulse.pdf

20 U.S. EPA Clean Air Technology Center, Air Pollution Control Technology Fact Sheet for Fabric Filters. http://www.epa.gov/ttn/catc/dir1/ff-cartr.pdf

21 U.S. EPA Clean Air Technology Center, Air Pollution Control Technology Fact Sheet for Fabric Filters. http://www.epa.gov/ttn/catc/dir1/fmechan.pdf

22 U.S. EPA Clean Air Technology Center, Air Pollution Control Technology Fact Sheet for Fabric Filters. http://www.epa.gov/ttn/catc/dir1/fwespwpi.pdf

knocks the collected particulate off the plate. Dry ESPs typically control streams with inlet grain loading values of 0.5 – 5 gr/ft^3 and have control efficiencies between 99% and 99.9%[23]. Both Wet and Dry ESPs are considered to be technically infeasible for filterable and condensable particulate matter control from the Waste Heat Boilers because of the low level of emissions from natural gas combustion (0.007 gr/dscf) and are not carried forward in this BACT review.

Wet Scrubbers

Wet Scrubbers use a scrubbing solution to remove $PM/PM_{10}/PM_{2.5}$ from an exhaust gas streams. The mechanism for particulate collection is impaction and interception by water droplets. Wet Scrubbers are configured as counter-flow, cross-flow, or concurrent flow, but typically employ counter-flow where the scrubbing fluid is in the opposite direction as the gas flow. Wet Scrubbers have control efficiencies of 50% - 99%[24]. One advantage of wet Scrubbers is that they can be effective on condensable particulate matter. A disadvantage of a Wet Scrubber is that they consume water and produce Wastewater and sludge. Wet Scrubbers are never used for particulate control on natural gas fired combustion units because of the low particulate emissions resulting from natural gas combustion (0.007 gr/dscf). Wet Scrubbers are considered to be technically infeasible for filterable and condensable particulate matter control from the Waste Heat Boilers and are not carried forward in this BACT review.

Venturi Scrubbers

Venturi Scrubbers for the gas and liquid (scrubbing fluid) into a venturi throat to enhance the gas-liquid contact to remove particulate matter removal. The $PM/PM_{10}/PM_{2.5}$ containing droplets are then settled out by gravity in an expanded section of the exhaust duct. Venturi Scrubbers control streams with inlet grain loadings of 0.1 – 50 gr/ft^3 and have control efficiencies of 70% - 99%[25]. Like other wet control systems, Venturi Scrubbers have the advantage of controlling some level of condensable particulate matter. Venturi Scrubbers are never used for particulate control on natural gas fired combustion units because of the low particulate emissions resulting from natural gas combustion (0.007 gr/dscf). Venturi Scrubbers are considered to be technically infeasible for filterable and condensable particulate matter control from the Waste Heat Boilers and are not carried forward in this BACT review.

Good Combustion Practices

Good Combustion Practices typically include the following elements:

1. Sufficient residence time to complete combustion
2. Providing proper air/fuel ratio
3. High temperatures and low oxygen levels in the primary combustion zone
4. High enough overall excess oxygen levels to complete combustion and maximize thermal efficiency
5. Proper fuel gas supply system design to minimize effects of contaminants or fluctuations in pressure and flow on the fuel gas delivered

A review of the RBLC for boilers also indicates that no add-on controls have been implemented to control $PM/PM_{10}/PM_{2.5}$ emissions from boilers at existing or recently permitted facilities. This is due to the fact that natural gas contains almost inert materials and generates very little particulate matter emissions. Therefore all add-on controls are considered technically infeasible.

[23] U.S. EPA Clean Air Technology Center, Air Pollution Control Technology Fact Sheet for Fabric Filters. http://www.epa.gov/ttn/catc/dir1/fdespwpi.pdf

[24] U.S. EPA Clean Air Technology Center, Air Pollution Control Technology Fact Sheet for Fabric Filters. http://www.epa.gov/ttn/catc/dir1/fpack.pdf, http://www.epa.gov/ttn/catc/dir1/fsprytwr.pdf

[25] U.S. EPA Clean Air Technology Center, Air Pollution Control Technology Fact Sheet for Fabric Filters. http://www.epa.gov/ttn/catc/dir1/fventuri.pdf

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

Based on the analysis above, the only technically feasible control technology for control of PM/PM_{10}/$PM_{2.5}$ emissions from the Waste Heat Boilers is the use of Good Combustion Practices. Therefore no ranking is necessary.

Step 4 – Evaluate Most Effective Controls and Document Results

The only remaining control technology is the use of Good Combustion Practices. Therefore no further evaluation is necessary.

Step 5 – Select BACT

Agrium proposes the use of Good Combustion Practices as BACT for PM/PM_{10}/$PM_{2.5}$ emissions from the Waste Heat Boilers. PM/PM_{10}/$PM_{2.5}$ Emissions from the Waste Heat Boilers will be limited to 0.0074 lb/MMBtu. Agrium will record total fuel usage for the Waste Heat Boilers to ensure compliance.

3.3 Solar Turbine/Generator Sets (Units 55, 56, 57, 58, and 59)

The five Solar Turbines at the facility are natural gas fired combustion turbines used to generate electricity. The following subsections present the step-by-step BACT review for the Solar Turbines for each applicable criteria pollutant including CO, NO_X, VOC, and PM/PM_{10}/$PM_{2.5}$.

3.3.1 BACT Evaluation for CO Emissions from the Solar Turbine/Generator Sets

Step 1 – Identify All Available Control Technologies

Review of the RBLC database identified two control technologies for control of CO emissions from natural gas-fired combustion turbines - Good Combustion Practices (GCP), and in two instances, an Oxidation Catalyst (OC). Available control technologies for the control of CO emissions include good combustion practices, oxidation catalyst, and thermal oxidation.

Step 2 – Eliminate Technically Infeasible Options

Oxidation Catalyst

Oxidation catalysts use a noble metal catalyst to reduce the activation energy of the oxidation reaction:

$$2CO + O_2 \rightarrow 2CO_2$$

Oxidation catalysts have been used to control CO emissions from combustion turbines in other applications, although the configuration of these units directs exhaust from the Solar Turbines through Waste Heat Boilers prior to discharge.

Thermal Oxidation

Thermal oxidation has never been required nor used on a natural gas-fired combustion turbine, and the effectiveness of the technology in reducing CO emissions from natural gas-fired combustion turbine is questionable. Thermal oxidation would involve injecting additional air into the flue gas and heating the oxygen enriched mixture to approximately 1,500 ˚F to oxidize CO to carbon dioxide. However, since the combustion of the reheat fuel would itself result in CO emissions, there is no evidence that thermal oxidation would result in overall reductions in CO emission.

Since thermal oxidation has never been demonstrated on a natural gas-fired combustion turbine, and because there is no evidence that it could reduce CO emissions, thermal oxidation is not a technically feasible CO control technology for the Solar Turbines.

Good Combustion Practices

GCPs typically include the following elements:

1. Sufficient residence time to complete combustion
2. Providing and Maintaining proper air/fuel ratio
3. High enough overall excess oxygen levels to complete combustion and maximize thermal efficiency
4. Proper fuel gas supply system designed to minimize effects of contaminants or fluctuations in pressure and flow on the fuel gas delivered

Combustion efficiency is dependent on the gas residence time, the combustion temperature, and the amount of mixing in the combustion zone. Each of these parameters is incorporated into the design of the burners and the combustion zone of a turbine to optimize combustion and minimize fuel consumption. In addition to the above parameters the level of oxygen in the combustion turbine is important to GCP. Therefore, combustion control is accomplished primarily through combustion turbine design as it relates to time, temperature, and mixing, and through combustion turbine operation as it relates to excess oxygen levels. Combustion design for modern combustion turbines is intended to simultaneously minimize formation of CO and NOx emissions. This is a difficult task, since emissions of NOx and emissions of CO are inversely related. That is, measures used to reduce NOx emissions often lead to increases in CO emissions. Therefore, the design to minimize CO emissions is interrelated with the design to minimize NOx formation.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

GCPs are planned for the fuel burning equipment at the facility and represent the baseline BACT. The use of an oxidation catalyst represents the highest ranked level of control for CO emissions from the Solar Turbines.

Step 4 – Evaluate Most Effective Controls and Document Results

A cost estimate for a CO-catalyst oxidizer for control of the CO emissions from Solar Turbines was performed. Due to the current design of these units, the evaluation was performed considering the exhaust and CO emissions from each Waste Heat Boiler/Solar Turbine combined unit. The computed cost to control CO using catalyst oxidation was computed to be $21,600 per ton. For CO emissions this level of cost is considered to be economically infeasible. A CO-catalyst for control of CO emission from the Solar Turbine/Generator Sets is eliminated from further consideration as representing BACT for this source.

Step 5 – Select BACT

Agrium proposes the use of Good Combustion Practices as the BACT for CO emissions from the Solar Turbines. CO Emissions from the Solar Turbines will be limited to 50 ppmv at 15% O_2. Initial compliance with the proposed emission limit will be demonstrated by conducting an initial stack test.

3.3.2 BACT Evaluation for VOC Emissions from the Solar Turbine/Generator Sets

Step 1 – Identify All Available Control Technologies

Options for the control of VOC emissions are the same as the CO emission control options - GCPs, oxidation catalyst, and thermal oxidation.

Step 2 – Eliminate Technically Infeasible Options

For the same reasons given for CO control from the exhaust, thermal oxidation is eliminated from further consideration. A CO oxidation catalyst will provide some level of control of VOC emissions in addition to CO emissions and is carried forward in this review along with the baseline control provided by GCP.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

GCPs are planned for the fuel burning equipment at the facility and represent the baseline BACT for the Solar Turbines; therefore, an oxidation catalyst represents the highest ranked level of control for VOC emissions from the Solar Turbines.

Step 4 – Evaluate Most Effective Controls and Document Results

A cost estimate for a CO-catalyst to control VOC emissions from the Solar Turbine is included in Appendix B of this document. As with the CO analysis above, this analysis is performed using the combined exhaust from a Solar Turbine/Waste Heat Boiler combined unit. The cost estimate shows that the cost of control is in excess of $809,800 per ton. This level of cost is excessive and the CO-catalyst option is dropped from further consideration as representing BACT for VOC emissions from the Solar Turbines.

Step 5 – Select BACT

Agrium proposes the use of Good Combustion Practices as the BACT for VOC emissions from the Solar Turbines. VOC Emissions from the Solar Turbines will be limited to 0.0021 lb/MMBtu.

3.3.3 BACT Evaluation for NO_X Emissions from the Solar Turbine/Generator Sets

Step 1 – Identify All Available Control Technologies

Options for the control of NO_X emissions from the include Selective Catalytic Reduction (SCR), Selective Non-Catalytic Reduction (SNCR), Low-NOx Burners (LNB), Ultra Low-NOx Burners (ULNB), Dry Low Emission (DLE) Combustion Technology, Water Injection, and Good Combustion Practices (GCP).

Step 2 – Eliminate Technically Infeasible Options

Selective Catalytic Reduction (SCR)

Selective Catalytic Reduction (SCR) is a control technology in which ammonia or urea is injected into the exhaust gas before it is passed over a catalyst. The gas stream then reacts with the catalyst to form nitrogen (N_2). Optimum NO_X reduction occurs between 480°F and 800°F[26]. SCR systems typically operate at reduction efficiencies of 70% to 90%[27]. A typical SCR system consists of reagent storage, reagent injection equipment, catalyst housing and catalyst, and associated system control instrumentation. SCR is technically feasible for control of NOx emissions from the Solar Turbines and is carried forward in this BACT review.

Selective Non-Catalytic Reduction (SNCR)

Selective Non-Catalytic Reduction (SNCR) involves the injection of ammonia or urea into the post-combustion flue gas. Typical SNCR reduction efficiencies are 30% to 50%[28]. NO_X reduction reactions occur at temperatures between 1600°F and 2100°F[29]. A typical SNCR system consists of reagent storage, multi-level reagent-injection equipment, and associated control instrumentation. The SNCR reagent storage and handling systems are similar to those for SCR systems. However, because of higher stoichiometric ratios, both ammonia and urea SNCR processes require three or four times more reagent as SCR systems to achieve a high level of NOx reductions.

Effluent gas temperatures from the exhaust undergo extensive heat recovery and are not high enough to effectively utilize SNCR so the reagent would need to be injected into the . The gas residence times

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[26] U.S. EPA Clean Air Technology Center, Air Pollution Control Technology Fact Sheet for SCR. http://www.epa.gov/ttncatc1/dir1/fscr.pdf.

[27] U.S. EPA, Office of Air Quality Planning and Standards. OAQPS Control Cost Manual Section 4-2 Chapter 2, 6th edition. EPA 452/B-02-001. Research Triangle Park, NC. January 2002.

[28] Ibid.

[29] U.S. EPA Clean Air Technology Center, Air Pollution Control Technology Fact Sheet for SNCR. http://www.epa.gov/ttn/catc/dir1/fsncr.pdf.

in the temperature window of greater than one second are needed for optimal SNCR performance while the Solar Turbine design residence time range is less than a second. In addition, review of available literature and the RBLC database indicate that there are no installations of SNCR for control of NO_X emissions from combustion turbines of this size. This is likely because SCR can be implemented and achieve a higher level of control. For these reasons, SNCR is not technically feasible and is eliminated from further consideration.

Dry Low Emissions (DLE) Combustion Technology

Dry Low Emissions (DLE)[30] combustion technology, sometimes also referred to as Dry Low NOx (DLN), is a lean pre-mix combustion system design. DLE pre-mixes the gaseous fuel and compressed air so that there are no local zones of high temperatures, or "hot spots," where high levels of NOx would form. Lean premixed combustion requires specially designed mixing chambers and mixture inlet zones to avoid flashback of the flame. Optimized application of DLN combustion requires an integrated approach for combustor and turbine design. The DLE combustor becomes an intrinsic part of the turbine design, and specific combustor designs must be developed for each turbine application. While NOx levels as low as 9 ppm have been achieved, most manufacturers typically offer a range of 15-25 ppm DLN/DLE combustion systems when operating on natural gas.

Water Injection

Water injection is frequently used to limit NOx emissions from combustion turbines, and is considered to be an available technology for the Solar Turbines for this smaller size capacity.

Good Combustion Practices

Good Combustion Practices are outline in the CO BACT review for the Solar Turbines.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

The remaining control technologies and their associated control efficiencies are shown in the table below.

Table 3 NOx Control Efficiencies for the Solar Turbine/Generator Sets

Control Technology	Control Efficiency
SCR/Water Injection Combination	80% - 95%
SCR	70% - 92%
Dry Low Emission Technology	50% - 70%
Water Injection	50% - 70%
Good Combustion Practices	N/A

Step 4 – Evaluate Most Effective Controls and Document Results

As illustrated in the table above, the combination of SCR and water injection is expected to result in the greatest level of NOx control from the Solar Turbines. KNO has made the decision to install SCR on the combined exhaust from the Solar Turbine/Waste Heat Boiler, and evaluated the cost that would be incurred through further control with the use of water injection. A cost analysis is provided in Appendix B, and estimates the cost of NOx control at $12,291 per ton of NOx controlled. KNO considers this cost to be excessive, and has eliminated water injection from further consideration as BACT.

Step 5 – Select BACT

Agrium proposes the use of SCR on the Solar Turbines for NO_X emissions at the Waste Heat Boiler outlet of 7 ppmv at 15% O_2. For the Solar Turbines, this will be equivalent to a NOx emission limit of 0.041 lb/MMBtu. Compliance with the proposed emission limit will be demonstrated by conducting an initial stack test to obtain an emission rate.

[30] U.S. EPA Combined Heat and Power Partnership, Catalog of CHP Technologies, Section 3. Technology Characterization – Combustion Turbines. https://www.epa.gov/sites/production/files/2015-07/documents/catalog_of_chp_technologies_section_3._technology_characterization_-_combustion_turbines.pdf

3.3.4 BACT Evaluation for $PM/PM_{10}/PM_{2.5}$ Emissions from the Solar Turbine/Generator Sets

Step 1 – Identify All Available Control Technologies

Options for the control of $PM/PM_{10}/PM_{2.5}$ emissions from the include fabric filters, cartridge filters, mechanical separators, wet and dry electrostatic precipitators (ESP), wet scrubbers, venturi scrubbers, and good combustion practices. It is important to note that the estimated particulate matter emission rate from the stack is 7.6 lb/MMscf or 0.007 gr/dscf, which is a low level of particulate emissions.

Step 2 – Eliminate Technically Infeasible Options

Fabric Filters

Fabric Filters or baghouses are comprised of an array of filter bags contained in housing. Air passes through the filter media from the "dirty" to the "clean" side of the bag. These devices undergo periodic bag cleaning based on the build-up of filtered material on the bag as measured by pressure drop across the device. The cleaning cycle is set to allow operation within a range of design pressure drop. Fabric Filters are characterized by the type of cleaning cycle - mechanical-shaker, pulse-jet, and reverse-air. Fabric Filter systems have control efficiencies of 99% to 99.9%[31], and are generally specified to meet a discharge concentration of filterable particulate (e.g., 0.01 grains per dry standard cubic feet). Because the filterable particulate emissions resulting from natural gas combustion are so low (0.007 gr/dscf), Fabric Filters are not used to control particulate emissions from natural gas combustion sources. For this reason Fabric Filters are considered technically infeasible and are dropped from further consideration in this BACT review.

Cartridge Collectors

Cartridge Collectors involve the use of filter media supported on a wire framework to collect filterable particulate matter from an air stream or exhaust. Typical Cartridge Collectors have control efficiencies of 99.99% to 99.999%[32]. Use of a HEPA type filter can achieve even greater control efficiency. Cartridge Collectors generally do not have a means of self-cleaning and are replaced when the pressure drop across the filter becomes excessive and impedes air flow or fan operation. Cartridge Filters are not practical for use to control emissions from a continuous operation and have never been used to control filterable particulate emissions from a natural gas combustion source. For these reasons Cartridge Collectors are not carried forward in this BACT review.

Mechanical Separators

Separators are often referred to as "precleaners," and are typically used to reduce the inlet loading of $PM/PM_{10}/PM_{2.5}$ to control devices further downstream by removing large particles. Typical inlet grain loading values for Separators are 4 – 110 gr/ft^3 [33]. Mechanical Separators are never used for particulate control from natural gas combustion sources because the small particle size and low filterable particulate emissions from natural gas combustion. Mechanical Separators are considered technically infeasible and are not carried further in this evaluation.

Wet and Dry Electrostatic Precipitators (ESP)

Wet and Dry Electrostatic Precipitators (ESPs) remove particles from a gas stream by electrically charging particles with a discharge electrode in the gas path and then collecting the charged particles on grounded. The inlet air is quenched with water on a Wet ESP to saturate the gas stream and ensure a wetted surface on the collection plate. This wetted surface along with a period deluge of

[31] U.S. EPA Clean Air Technology Center, Air Pollution Control Technology Fact Sheet for Fabric Filters. http://www.epa.gov/ttn/catc/dir1/ff-shaker.pdf, http://www.epa.gov/ttn/catc/dir1/ff-revar.pdf, http://www.epa.gov/ttn/catc/dir1/ff-pulse.pdf

[32] U.S. EPA Clean Air Technology Center, Air Pollution Control Technology Fact Sheet for Fabric Filters. http://www.epa.gov/ttn/catc/dir1/ff-cartr.pdf

[33] U.S. EPA Clean Air Technology Center, Air Pollution Control Technology Fact Sheet for Fabric Filters. http://www.epa.gov/ttn/catc/dir1/fmechan.pdf

water is what cleans the collection plate surface. Wet ESPs typically control streams with inlet grain loading values of 0.5 – 5 gr/ft^3 and have control efficiencies between 99% and 99.9%[34]. Wet ESPs have the advantage of controlling some amount of condensable particulate matter. The collection plates in a Dry ESP are periodically cleaned by a rapper or hammer that sends a shock wave that knocks the collected particulate off the plate. Dry ESPs typically control streams with inlet grain loading values of 0.5 – 5 gr/ft^3 and have control efficiencies between 99% and 99.9%[35]. Both Wet and Dry ESPs are considered to be technically infeasible for filterable and condensable particulate matter control from the Solar Turbines because of the low level of emissions from natural gas combustion (0.007 gr/dscf) and are not carried forward in this BACT review.

Wet Scrubbers

Wet Scrubbers use a scrubbing solution to remove $PM/PM_{10}/PM_{2.5}$ from an exhaust gas streams. The mechanism for particulate collection is impaction and interception by water droplets. Wet Scrubbers are configured as counter-flow, cross-flow, or concurrent flow, but typically employ counter-flow where the scrubbing fluid is in the opposite direction as the gas flow. Wet Scrubbers have control efficiencies of 50% - 99%[36]. One advantage of wet Scrubbers is that they can be effective on condensable particulate matter. A disadvantage of a Wet Scrubber is that they consume water and produce e water and sludge. Wet Scrubbers are never used for particulate control on natural gas fired combustion units because of the low particulate emissions resulting from natural gas combustion (0.007 gr/dscf). Wet Scrubbers are considered to be technically infeasible for filterable and condensable particulate matter control from the Solar Turbines and are not carried forward in this BACT review.

Venturi Scrubbers

Venturi Scrubbers for the gas and liquid (scrubbing fluid) into a venturi throat to enhance the gas-liquid contact to remove particulate matter removal. The $PM/PM_{10}/PM_{2.5}$ containing droplets are then settled out by gravity in an expanded section of the exhaust duct. Venturi Scrubbers control streams with inlet grain loadings of 0.1 – 50 gr/ft^3 and have control efficiencies of 70% - 99%[37]. Like other wet control systems, Venturi Scrubbers have the advantage of controlling some level of condensable particulate matter. Venturi Scrubbers are never used for particulate control on natural gas fired combustion units because of the low particulate emissions resulting from natural gas combustion (0.007 gr/dscf). Venturi Scrubbers are considered to be technically infeasible for filterable and condensable particulate matter control from the Solar Turbines and are not carried forward in this BACT review.

Good Combustion Practices

Good Combustion Practices typically include the following elements:

1. Sufficient residence time to complete combustion
2. Providing proper air/fuel ratio
3. High enough overall excess oxygen levels to complete combustion and maximize thermal efficiency
4. Proper fuel gas supply system design to minimize effects of contaminants or fluctuations in pressure and flow on the fuel gas delivered

A review of the RBLC for reformers also indicates that no add-on controls have been implemented to control $PM/PM_{10}/PM_{2.5}$ emissions from combustion turbines at existing or recently permitted facilities.

[34] U.S. EPA Clean Air Technology Center, Air Pollution Control Technology Fact Sheet for Fabric Filters. http://www.epa.gov/ttn/catc/dir1/fwespwpi.pdf

[35] U.S. EPA Clean Air Technology Center, Air Pollution Control Technology Fact Sheet for Fabric Filters. http://www.epa.gov/ttn/catc/dir1/fdespwpi.pdf

[36] U.S. EPA Clean Air Technology Center, Air Pollution Control Technology Fact Sheet for Fabric Filters. http://www.epa.gov/ttn/catc/dir1/fpack.pdf, http://www.epa.gov/ttn/catc/dir1/fsprytwr.pdf

[37] U.S. EPA Clean Air Technology Center, Air Pollution Control Technology Fact Sheet for Fabric Filters. http://www.epa.gov/ttn/catc/dir1/fventuri.pdf

This is due to the fact that natural gas contains almost inert materials and generates very little particulate matter emissions. Therefore all add-on controls are considered technically infeasible.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

Based on the analysis above, the only technically feasible control technology for control of $PM/PM_{10}/PM_{2.5}$ emissions from the Waste Heat Boilers is the use of Good Combustion Practices. Therefore no ranking is necessary.

Step 4 – Evaluate Most Effective Controls and Document Results

The only remaining control technology is the use of Good Combustion Practices. Therefore no further evaluation is necessary.

Step 5 – Select BACT

Agrium proposes the use of Good Combustion Practices as BACT for $PM/PM_{10}/PM_{2.5}$ emissions from the Solar Turbines. $PM/PM_{10}/PM_{2.5}$ emissions from the Solar Turbines will be limited to 0.0074 lb/MMBtu. Agrium will record total fuel usage for the Solar Turbines to ensure compliance.

4. GREENHOUSE GAS (GHG) BEST AVAILABLE CONTROL TECHNOLOGY (BACT) ANALYSIS

The GHGs subject to BACT Analysis for this project include:

- Carbon Dioxide (CO_2)
- Methane (CH_4)
- Nitrous Oxide (N_2O)
- Carbon Dioxide Equivalent (CO_{2e})

The sections below include a BACT Analysis for all GHGs emitted from each emission unit.

4.1 Package Boilers (Units 44, 48, and 49)

4.1.1 BACT Evaluation for GHG Emissions from the Package Boilers

Step 1 – Identify All Available Control Technologies

Options for the control of GHG emissions from the Package Boilers include:

<u>Carbon Capture and Sequestration (CCS)</u>

Carbon Capture

Post-combustion carbon capture technologies include absorption processes (liquid), hybrid solutions (mixed physical and chemical solvent), adsorption processes (solid surface, ionic liquid), and physical separation (membrane, cryogenic separation). These technologies are in various stages of development, ranging from the laboratory bench-scale through pilot-scale demonstrations which have been applied to coal-fired generation units and industrial facilities, such as refineries, cement plants, and biofuels plants. Numerous large-scale demonstration projects are also being planned and constructed throughout the United States and globally.

The CO_2 absorption processes under investigation include chemical and physical absorption. In chemical absorption, CO_2 is scrubbed from the flue gas through a chemical reaction with the scrubbing medium. In physical absorption systems, there is no chemical reaction between the CO_2 and the scrubbing medium. Generally, the energy to regenerate, or desorb the CO_2 from the scrubbing medium, is greater for chemical absorption than physical absorption, because the chemical reaction must be reversed in the chemical desorption/regeneration process.

Chemical absorption is characterized by the occurrence of a chemical reaction between the gas component being absorbed and a component in the liquid to form a compound. The most prevalent chemical absorbents under investigation for CO_2 removal from flue gas are amine solvents. An amine is a class of basic, nitrogen-containing organic compounds derived from ammonia. Gas scrubbing systems employing amine solvents are used for a wide variety of gas or liquid hydrocarbon treatment applications where hydrogen sulfide (H_2S) or CO_2 is present in a gas or in a liquid hydrocarbon feed stream.

Close contact between the gas and the liquid amine solution is provided to promote the mass transfer between the target compound and the amine. Several amine solvents are commercially used in scrubbing solutions including monoethanolamine (MEA), diethanolamine (DEA), triethanolamine (TEA), diisopropanolamine (DIPA), diglycolamine (DGA), methyldiethanolamine (MDEA), n-methylethanolamine (NMEA), alkanolamine and various proprietary mixtures of these amines. A simple amine scrubbing solution consists of one or more of these amine solvents diluted to a typical 10 – 60 percent concentration range with water.

Other chemical absorbents currently under laboratory or bench-scale evaluation include a number of inorganic sorbents. A lithium-silicate based ceramic material38 developed by Toshiba is reported as

[38] Toshiba website - www.toshiba.co.jp/about/press/2003_06/pr2301.htm

having the ability to absorb CO_2 at up to 500 times its volume. Regeneration of the material and release of the CO_2 occurs when the material is heated above 1,300ºF.

In physical absorption, the chemical component being absorbed is more soluble in the liquid absorbent than the other gas components in a gas mixture, but that chemical component does not react chemically with the absorbent. Physical absorbents under investigation for CO_2 capture include propylene carbonate, Selexol™, Rectisol™ and Morphysorb™. Close contact between the scrubbing solvent and the gas forces the CO_2 into solution. Although the energy required to regenerate physical sorbents is lower than that of chemical sorbents, they are less effective than chemical sorbents at removing CO_2 in dilute gas streams.

A hybrid absorption approach involves a mixture of chemical and physical sorbents. In theory, the sorbent mixture can be tailored to the specific application. This process is also currently used to remove intermediate concentrations of CO_2 from natural gas in natural gas production.

Adsorption is a physical separation process. Laboratory evaluations of natural zeolite, manufactured zeolite molecular sieves, and activated carbon have all shown that these materials preferentially adsorb CO_2 over nitrogen, oxygen, and water vapor at elevated pressures. These materials show promise for CO_2 capture from high pressure gas streams. However, they have not shown high CO_2 capture potential for the dilute, lower pressure exhaust from a conventional combustion process. Desorption of the CO_2 is accomplished by reducing the pressure, known as a “pressure swing,” on the adsorbed CO_2, thus regenerating the adsorbent material and releasing the CO_2 for subsequent sequestration.

The physical separation technologies available utilize membrane separation and cryogenic separation. These technologies, including polymer-based membrane separation of CO_2, are in the initial stages of investigation. Membrane separation is potentially less energy intensive than other methods of CO_2 capture, because there is no chemical reaction or phase change in the process. Currently, the membrane materials being tested are prone to chemical and thermal degradation. In cryogenic separation of CO_2, the gas is cooled and compressed to condense CO_2. This process is only effective on dry gas streams with very high CO_2 concentrations and is not applicable to the dilute gas streams from a traditional combustion source.

There is ongoing research into algae strains that can uptake CO_2 from a concentrated stream and produce bio-fuel. The mechanism for CO_2 uptake is photosynthesis. This research is in the early stages, and there are no commercial products available at this time for treating CO_2 from traditional combustion sources.

Carbon Sequestration

To achieve the objective of reducing the atmospheric concentration of greenhouse gases (i.e., CO_2), CO_2 must be kept out of the atmosphere once it is captured. This process is referred to as carbon sequestration. Carbon sequestration is the long-term isolation of CO_2 from the atmosphere through physical, chemical, biological, or engineered processes. In general, carbon sequestration is achieved through storage in geologic formations or terrestrial ecosystems, or through conversion into commercial products.

Although beneficial reuse options are developing with solutions such as the use of captured material to enhance oil or gas recovery from well fields in the petroleum industry, currently, the demand for CO_2 for such applications is well below the ultimate quantity of CO_2 that is available for capture. Without a market to use the recovered CO_2, the material would instead require sequestration, or permanent storage. Geologic sequestration refers to the injection and storage of captured CO_2 in an underground location where it will not readily escape into the atmosphere, such as within deep rock formations at pressures and temperatures where CO_2 is in the supercritical phase (typically ½ mile or more below ground surface). In general, CO_2 storage could be successful in porous, high-permeability rock formations or deep saline formations that are overlain by a thick, continuous layer of low-permeability rock, such as a shale, where CO_2 may remain immobilized beneath the ground surface for extended periods of time. Other geologic formations deemed suitable for geologic sequestration include coal beds that are too thin or deep to be cost effectively mined and depleted oil and gas reservoirs, where in addition to CO_2 storage, economic gains may also be achieved (most notably through the use of enhanced oil recovery to obtain residual oil in mature oil fields).

An understanding of site-specific geologic studies and formation characteristics is critical to determine the ultimate CO_2 storage capacity and, ultimately the feasibility of geologic sequestration, for a particular area. Other factors to consider when determining the feasibility (both technical and economic) of geologic sequestration are the cost, constructability, and potential environmental impacts of infrastructure necessary for the transportation of captured CO_2 from the source to the ultimate geologic sequestration site; and the amount of measurement, monitoring (baseline, operational, etc.), and verification of CO_2 distribution required following injection into the subsurface to ensure the risk of leakage of CO_2 is minimized or eliminated.

Cogeneration/Combined Heat and Power (CHP)

Combined Heat and Power (CHP) or Cogeneration involves the production of useable heat and electricity from a single source. The use of CHP results in significant energy gains. Significant reductions in GHG emissions are achieved by recovering energy which would otherwise go to Waste.

Energy Efficient Design

Energy efficient designs can reduce the natural gas required to produce the necessary amount of steam. Therefore emissions of GHGs are reduced. Energy efficient design elements for boilers include combustion control optimization, tuning, instrumentation and controls, economizer, blowdown heat recovery, and condensate return system.

Alternative Fuels

The production of steam is the primary function of the Package Boilers. Natural gas is the lowest GHG-emitting fossil fuel that can be used for steam production. Natural gas also serves as the ammonia process used in several plant operations.

Step 2 – Eliminate Technically Infeasible Options

CCS technologies were identified in Step 1 as potentially feasible control alternatives. Although there are a number of completed or planned CCS projects, they are generally subsidized with government funding and are considered in the demonstration phase of the technology. The specific carbon capture technologies discussed in Step 1 are also in the developmental stage and none have been demonstrated in practice and generally rely on government subsidies for demonstration-phase funding.

Although the capture technologies for CO_2 are developing, after CO_2 is separated (captured), it must be prepared for beneficial reuse or transport to a sequestration or storage facility, if a storage facility is not locally available for direct injection. In order to transport CO_2, it must be compressed and delivered via pipeline to a storage facility.

According to a U.S. Department of Energy report, there is currently no enhanced oil recovery (EOR) underway in Alaska[39]. The report speculates that as the North Slope oil fields mature, EOR may be used to economically recover more reserves. The North Slope oil field is over 600 miles from the Agrium facility in Nikiski, Alaska. Closer to the facility, the Cook Inlet is a mature offshore oil field approximately 140 miles from Nikiski. Given that there is currently no EOR in Alaska and that the closest candidate oilfield would require extensive underwater piping, EOR is excluded from the evaluation of CCS options for the project.

Without a market to use the recovered CO_2, the material would instead require sequestration, or permanent storage. Sequestration of CO_2 is generally accomplished via available geologic reservoirs that must be either local to the point of capture, or accessible via pipeline to enable the transportation of recovered CO_2 to the permanent storage location. The United States 2012 Carbon Utilization and Storage Atlas (Fourth Edition published by the U.S. Department of Energy, Office of

39 Basin Oriented Strategies for CO_2 Enhanced Oil Recovery, USDOE, March 2005

Fossil Energy) identifies an extensive saline aquifer directly below Nikiski as being "screened, high sequestration potential;" however, this area has not had detailed evaluation for CO_2 sequestration and lies in a fault zone. This saline aquifer is not deemed to be suitable for CCS at this time. In addition, CCS technologies for the ammonia production industry are considered to be in the research phase [1]. Therefore CCS is considered to be currently technically infeasible and is eliminated from further consideration for GHG BACT.

Furthermore, a review of the RBLC database from natural gas-fired heaters and boilers indicates that add-on control technologies have never been required or applied to reduce GHG emissions.

The Package Boilers are used to provide process steam to the plant. Significant process modifications would be required to convert the Package Boilers to CHP. These modifications would alter the purpose of the Package Boilers therefore CHP is considered to be technically infeasible. The plant already utilizes Solar Turbines to generate electricity for the plant.

The production of steam is the primary function of the Package Boilers. Natural gas is the lowest GHG-emitting fossil fuel that can be used for steam production. Because natural gas is an inherently low GHG emitting fuel and it is inherently available to the plant, alternative fuel firing is considered technically infeasible for the Package Boilers.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

The only remaining control technology is Energy Efficient Design, therefore no ranking is necessary.

Step 4 – Evaluate Most Effective Controls and Document Results

The only remaining control technology is Energy Efficient Design, therefore no further evaluation is necessary.

Step 5 – Select BACT

Agrium proposes the use of Energy Efficient Design as GHG BACT for the Package Boilers. Agrium proposes the following as energy efficient design parameters for the Package Boilers:

- Air inlet controls, heat recovery and condensate recovery;
- Package Boilers shall be designed to achieve a thermal efficiency of 80%; and
- CO_2 emissions from the package boilers shall not exceed 59.61 MMcf of natural gas combusted or 376,500 tpy (combined).

4.2 Waste Heat Boilers (Units 50, 51, 52, 53, and 54)

4.2.1 BACT Evaluation for GHG Emissions from the Waste Heat Boilers

Step 1 – Identify All Available Control Technologies

Options for the control of GHG emissions from the Waste Heat Boilers include:

Carbon Capture and Sequestration (CCS)

A detailed description of CCS is discussed in the GHG BACT Analysis for the Package Boilers.

Cogeneration/Combined Heat and Power (CHP)

Combined Heat and Power (CHP) or Cogeneration involves the production of useable heat and electricity from a single source. The use of CHP results in significant energy gains. Significant reductions in GHG emissions are achieved by recovering energy which would otherwise go to waste.

Energy Efficient Design

Energy efficient designs can reduce the natural gas required to produce the necessary amount of steam. Therefore emissions of GHGs are reduced. Energy efficient design elements for boilers

[1] Carbon Dioxide Capture and Storage in the Nitrogen and Syngas Industries," R. Strait and M. Nagvekar of KBR Technology, Nitrogen+Syngas, January/February 2010.

include combustion control optimization, tuning, instrumentation and controls, economizer, blowdown heat recovery, and condensate return system.

Alternative Fuels

Natural gas is the lowest GHG-emitting fossil fuel that can be used for steam production.

Step 2 – Eliminate Technically Infeasible Options

As discussed in the GHG BACT Analysis for the Package Boilers, CCS is not a technically feasible control technology. Therefore CCS is removed from consideration as a possible control technology.

The Waste Heat Boilers are used to recover energy from the Solar Turbines to provide process steam to the plant. In combination with the Solar Turbines these units are considered to be CHP.

The production of steam is the primary function of the Waste Heat Boilers. Natural gas is the lowest GHG-emitting fossil fuel that can be used for steam production. Because natural gas is an inherently low GHG emitting fuel and it is inherently available to the plant, alternative fuel firing is considered technically infeasible for the Waste Heat Boilers.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

The highest-ranking control technology is combined heat and power.

Step 4 – Evaluate Most Effective Controls and Document Results

The highest-ranking control technology is combined heat and power, therefore no further evaluation is necessary.

Step 5 – Select BACT

Agrium proposes the use of combined heat and power as GHG BACT for the Waste Heat Boilers. The 3-hour average CO_{2e} emissions from each waste heat boiler will be limited to 59.61 tons per million cubic foot (MMcf) and the combined CO_{2e} emissions from all waste heat boilers will be limited to 121,500 tons per year.

4.3 Solar Turbines/Generator Sets (Units 55, 56, 57, 58, and 59)

4.3.1 BACT Evaluation for GHG Emissions from the Solar Turbines/Generator Sets

Step 1 – Identify All Available Control Technologies

Options for the control of GHG emissions from the Solar Turbines include:

Carbon Capture and Sequestration (CCS)

A detailed description of CCS is discussed in the GHG BACT Analysis for the Waste Heat Boilers.

Cogeneration/Combined Heat and Power (CHP)

Combined Heat and Power (CHP) or Cogeneration involves the production of useable heat and electricity from a single source. The use of CHP results in significant energy gains. Significant reductions in GHG emissions are achieved by recovering energy which would otherwise go to waste.

Alternative Fuels

The generation of electricity is the primary function of the Solar Turbines. Natural gas is the lowest GHG-emitting fossil fuel that can be used for combustion turbines.

Step 2 – Eliminate Technically Infeasible Options

As discussed in the GHG BACT Analysis for the Waste Heat Boilers, CCS is not a technically feasible control technology. Therefore CCS is removed from consideration as a possible control technology.

The Solar Turbines are used to generate electricity for the plant. By recovering energy from the Solar Turbines through the Waste Heat Boilers, the unit falls within the scope of combined heat and power.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

The only remaining control technology is combined heat and power.

Step 4 – Evaluate Most Effective Controls and Document Results

The only remaining control technology is Energy Efficient Design, therefore no further evaluation is necessary.

Step 5 – Select BACT

Agrium proposes the use of combined heat and power as GHG BACT for the Solar Turbines. The 3-hr average CO_2e emissions from each Solar Turbine will be limited to 59.61 tons/MMcf and the combined CO_2e emissions from all Solar Turbines will be limited to 135,000 tons per year.

5. BEST AVAILABLE CONTROL TECHNOLOGY (BACT) ANALYSIS UPDATES

This section of the analysis is provided as a supplement to the BACT analyses performed for the original PSD Construction Permit application for KNO, submitted in October 2014. This section provides an evaluation of RACT/BACT/LAER Clearinghouse (RBLC) results associated with permits issued since the original PSD permit was issued in January 2015. Based on the information provided below, KNO concludes that no new permits have been issued since the issuance of AQ0083COT06 that contain BACT limits that are inconsistent with the BACT determinations made for KNO as part of the original PSD Construction Permit.

Tables summarizing RBLC entries since the issuance of AQ0083COT06 are provided in Attachment B to this request. The results of all three analyses for emission units contained in the KNO PSD permit are summarized below:

5.1 Ammonia Tank Flare (Unit 11)

Ammonia Tank Flare (Unit 11) – One permit was identified with permit limits for ammonia tank flare emissions that was issued since January 2015. This permit was issued to Midwest Fertilizer Company LLC (RBLC ID IN-0263), and contained limits for PM10, PM2.5, NOx, CO, VOC, and CO2e. Emissions of all pollutants were controlled using “pilot and purge gas shall be natural gas, and process flaring minimization practices; operated with a flame present at all times; continuously monitored."

Emission limits established are consistent with standard emission factors for flares and natural gas combustion and are consistent with RBLC BACT determinations utilized as a basis for the KNO permit. The BACT approach and emission factors contained in this permit are consistent with those contained in the KNO permit.

5.2 Primary Reformer (Unit 12)

Two permits were identified that have been issued since January 2015. The first was a permit issued to Topchem Pollock, LLC (RBLC ID LA-0306), which was issued 20 December 2016 and updated 8 August 2017. This permit contains limits for CO and $PM_{2.5}$ that were based on good combustion practices, with a limit for CO based on an emission rate of 0.0824 lb/mmBtu of natural gas combusted and a $PM_{2.5}$ emission rate of 0.00745 lb/mmBtu of natural gas combusted. This is consistent with the control technology selected as BACT for the Primary Reformer for KNO and is based on consistent emission factors for CO and $PM_{2.5}$. The Topchem permit also contained a limit for CO_{2e} emissions that was established at 363,287 tons per year using control technology described as “energy efficiency measure”. The ton per year limit established in this permit is consistent with the emission factor utilized for CO_{2e} emissions in the KNO permit.

The other permit issued was for the Agrium facility in Borger, Texas (RBLC ID TX-0814). This permit contained a limit for CO_{2e} emissions of 564,019 tons per year utilizing “good engineering practices”. This is consistent with the approach utilized by KNO.

5.3 Startup Heater (Unit 13)

KNO identified several permits issued to facilities with startup heaters that have been issued since January 2015. This includes Gerdau Macsteel, Inc. – Gerdau Macsteel Monroe (RBLC ID MI-0438), Topchem Pollock LLC (RBLC ID LA-0306), Midwest Fertilizer Company LLC (RBLC ID IN-0263), Lake Charles Methanol LLC (RBLC ID LA-0305), Indeck Niles, LLC (RBLC ID MI-0423 (draft)), and Holland Board of Public Works (RBLC ID MI-0424). BACT controls for nearly all of these units were established as good combustion practices and the use of natural gas. Emission limits corresponding to BACT determinations for startup heaters relate to standard emission factors for natural gas combustion.

The NOx BACT control requirement for the unit identified in RBLC ID MI-0438, revised February 2019, was established as low NOx burners in addition to the use of natural gas and good combustion practices. The Michigan LAER/BACT requiring low NOx burners is for a new unit, not yet constructed, and the low NOx burners are being incorporated into the design parameters. The startup heater at Agrium KNO is an existing unit and was not designed with low NOx burner technology. During the permitting of AQ0083CPT06, there were other RBLC entries containing low NOx burners as a required control, however; the Agrium KNO BACT for NOx was determined to be limited use of the unit at 200 hours per year and an emission limit of 0.098 lb/MMBtu.

The BACT approach and emission limits contained in these permits are consistent with limits incorporated into, and evaluated against, during the permitting of AQ0083CPT06.

5.4 CO_2 Vent (Unit 14)

KNO identified two ammonia plant permits with CO_2 Vent Stack emissions that have been added to RBLC since January 2015. Each is briefly discussed below:

- Agrium US permit for facility in Borger, Texas (RBLC ID TX-0814). This permit limits CO_{2e} emissions to 843,150 tons per year using “good combustion practices”.
- Topchem Pollock, LLC permit (RBLC ID LA-0306) with limit of 162,511 tons per year based on the use of pipeline quality natural gas and good combustion practices.

The BACT approach and technology are consistent with RBLC permit limits that existed at the time the KNO PSD permit was issued, and is consistent with limits set in the final KNO permit.

5.5 Small Flare and Emergency Flare (Units 22 and 23)

KNO identified three permits with BACT limits that were issued to sources with flares since the first January 2015. These facilities were Topchem Pollock, LLC (RBLC ID LA-0306), Midwest Fertilizer Company LLC (RBLC ID IN-0263), and Agrium US, Inc. (RBLC ID TX-0814). These permits included limits for PM_{10}, $PM_{2.5}$, NOx, CO, VOC, and CO_{2e}. Emissions of all pollutants were controlled using BACT described as “pilot and purge gas shall be natural gas”, correct flare design, good combustion practices, process flaring minimization practices, and operation of flares with a flame present at all times. Emission limits established are consistent with standard emission factors for flares and natural gas combustion.

The BACT control measures and corresponding emission limits are consistent with BACT control measures and emission factors utilized by KNO for these units.

5.6 Urea Granulation (Units 35 and 36)

KNO identified one permit issued since January 2015 with limits established for urea granulation operations. This permit was issued to Midwest Fertilizer Company LLC (RBLC ID IN-0263). This permit contained limits for PM, PM_{10}, and $PM_{2.5}$ of 0.163 pounds per ton of material for a three-hour average. This limit was established on the basis of a wet scrubber. Although this permit was issued since the issuance of Agrium KNO’s permit, this limit was contained in an earlier permit to Midwest Fertilizer Company LLC that was included in the ADEC Technical Analysis Report (TAR) that accompanied the final permit. Thus, no new emission limits for urea granulation operations have been established since the KNO permit was issued.

5.7 Cooling Tower (Unit 40)

Several BACT determinations for cooling towers have been made since January 2015, including cooling towers located at ammonia fertilizer manufacturing facilities. For particulate matter, the required BACT control technology is the use of high efficiency drift eliminators, with drift rates set as low as 0.0005%. These determinations are consistent with BACT determinations at the time the KNO BACT analysis was performed. Thus, no more stringent emission limits for BACT have been established for cooling towers since the KNO permit was issued.

As noted in the original KNO BACT analysis, the KNO cooling tower is a cross-flow tower that cannot achieve the lower drift elimination rates that counter flow cooling towers can achieve. Thus, no new information exists to change the BACT determination made for the KNO facility.

5.8 UF-85 Storage Tank (Unit 41A)

One permit has been issued since January 2015 with a BACT limit for urea storage tanks. This permit was issued to Toyota Motors Motor Vehicle Assembly Plant (TX-0846) and contained no numerical emission limitation. The BACT for these units was identified as the tank to be a white fixed roof storage tank equipped with a submerged fill tank. The KNO BACT is the most stringent limitation, with VOC emissions limited to 0.00004 lb/hr. Thus, no new information exists to change the BACT determination made for the KNO facility.

5.9 MDEA Storage Tanks (Units 41B and 41C)

No permits since the issuance of AQ0083CPT06 were identified with BACT emission limits specific to MDEA storage tanks. One permit has been issued since January 2015 with a BACT limit for storage tanks under process code 42.009. This permit was issued to Toyota Motors Motor Vehicle Assembly Plant (TX-0846) and was specific to storage tanks storing very low vapor pressure non gasoline automotive fluids – gear lube, engine oil, diesel fuel, urea, ATF, etc. Thus, no new information exists to change the BACT determination made for the KNO facility.

5.10 Urea Ship Loading (Unit 47)

No permits since the issuance of AQ0083CPT06 were identified with BACT emission limits for ship loading operations.

5.11 Urea Material Handling Units (Unit 47A, 47B, 47C, and 47D)

One permit was identified with permit limits for urea handling operations that was issued since January 2015. This permit was issued to Midwest Fertilizer Company LLC (RBLC ID IN-0263) for truck and rail loading operations, and contained limits for PM, PM_{10}, and $PM_{2.5}$. BACT was determined to be the use of baghouse dust collectors, and emissions were limited to 0.15 pounds per hour for PM, PM_{10}, and $PM_{2.5}$. This RBLC entry corresponds to a revised BACT limit for truck and rail loading operations originally included in RBLC ID IN-0180, permitted June 4, 2014 and was available for consideration during the permitting of AQ0083CPT06. The use of baghouse dust collectors is consistent with the BACT determination for KNO's urea handling units permitted in AQ0083CPT06.

5.12 Diesel Well Pump (Unit 65)

Several permits have been issued since January 2015 with BACT limits for small diesel-fired internal combustion engines. KNO did not document the RACT/BACT/LAER Clearinghouse (RBLC) results to identify the permits issued since January 2015. The technology and air quality considerations made as a part of the initial permit review for small internal combustion engines, under process type 17.210, remain the same. BACT for nearly all of the units evaluated initially between 2004 and 2014, as well as those issued since, is good combustion practices, occasionally coupled with limited use requirements. KNO's original BACT is consistent with the more recent determinations included in RBLC. Thus, no new information exists to change the BACT determination made for the KNO facility.

5.13 Gasoline Fire Pump (Unit 66)

Several permits have been issued since January 2015 with BACT limits for internal combustion engines identified as fire pumps. KNO did not document the RACT/BACT/LAER Clearinghouse (RBLC) results to identify the permits issued since January 2015. The technology and air quality considerations made as a part of the initial permit review for small internal combustion engines, under process type 17.200, remain the same. BACT for nearly all of the units evaluated initially between 2004 and 2014, as well as those issued since, is good combustion practices, occasionally coupled with limited use requirements. KNO's original BACT is consistent with the more recent ones included in the RBLC. Thus, no new information exists to change the BACT determination made for the KNO facility.

APPENDIX A RBLC SUMMARY

Appendix A
KNO Restart - RBLC Summary

KNO Restart
RBLC Search Summary
Search: "Reformer" - Fertilizer Plants only
Unit 12 - Primary Reformer

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
Topchem Pollock, LLC	LA-0306	12/20/2016, updated 8/8/17	CO2e	Primary Reformer Stack RS-16-1 (EQT029)	363287	tpy	Energy Efficiency Measure (note: 111.72 kg/MM BTU of CO2, 0.001 kg/MM BTU of CH4, and 0.0001 kg/MM BTU of N2O)
Topchem Pollock, LLC	LA-0306	12/20/2016, updated 8/8/17	CO	Primary Reformer Stack RS-16-1 (EQT029)	33.26	lb/hr	Good Combustion Practices (Note: 0.0824 lb/MMBtu of natural gas)
Topchem Pollock, LLC	LA-0306	12/20/2016, updated 8/8/17	CO	Primary Reformer Stack RS-16-1 (EQT029)	121.41	tpy	Good Combustion Practices (Note: 0.0824 lb/MMBtu of natural gas)
Topchem Pollock, LLC	LA-0306	12/20/2016, updated 8/8/17	PM2.5	Primary Reformer Stack RS-16-1 (EQT029)	3.01	lb/hr	Good Combustion Practices (Note: 0.00745 lb/MMBtu of natural gas)
Topchem Pollock, LLC	LA-0306	12/20/2016, updated 8/8/17	PM2.5	Primary Reformer Stack RS-16-1 (EQT029)	10.99	tpy	Good Combustion Practices (Note: 0.00745 lb/MMBtu of natural gas)
Agrium US, Inc	TX-0814	1/5/2017(draft)	CO2e	Reformer Furnace 101-B	564019	tpy	Good engineering practices (1100 MMBtu/hr)
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	CH4	Primary Reformer	0.0023	lb/MMBtu average of 3 stack tests	Good operating practices & use of natural gas
Iowa Fertilizer Company	IA-0105	10/26/2012	CH4	Primary Reformer	0.0023	lb/MMBtu average of 3 stack tests	Good Combustion Practices
CF Industries Inc. Donaldsonville Nitrogen Cor	LA-0236	3/3/2009	CO	NO. 1,2,3,&4 Ammonia Plant Reformers	301.29	tons/year	Optimum combustion control and the use of natural gas as fuel
CF Industries Inc. Donaldsonville Nitrogen Cor	LA-0236	3/3/2009	CO	NO. 1,2,3,&4 Ammonia Plant Reformers	303.47	lb/hr	Optimum combustion control and the use of natural gas as fuel
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	CO	Primary Reformer	0.0194	lb/MMBtu average of 3 stack tests	Good operating practices & use of natural gas
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	CO	Primary Reformer	90.3	tpy Rolling 12 month total	Good operating practices & use of natural gas
Iowa Fertilizer Company	IA-0105	10/26/2012	CO	Primary Reformer	0.0194	lb/MMBtu average of 3 stack tests	Good Combustion Practices
Iowa Fertilizer Company	IA-0105	10/26/2012	CO	Primary Reformer	96.3	tons/year rolling 12 month total	Good Combustion Practices
Ohio Valley Resources, LLC	TBD	9/25/2013	CO	Primary Reformer	43.45	lb/MMcf 3 hour average	Good Combustion Practices
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	CO2	Primary Reformer	117	lb/MMBtu 30 day rolling average	Good operating practices & use of natural gas
Iowa Fertilizer Company	IA-0105	10/26/2012	CO2	Primary Reformer	117	lb/MMBtu 30 day rolling average	Good Combustion Practices
Ohio Valley Resources, LLC	TBD	9/25/2013	CO2	Primary Reformer	59.61	tons/MMcf 3 hour average	Good Combustion Practices
Ohio Valley Resources, LLC	TBD	9/25/2013	CO2	Primary Reformer	515246	tons per 12 consecutive month period	Good Combustion Practices
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	CO2e	Primary Reformer	545674	tpy Rolling 12 month total	Good operating practices & use of natural gas
Iowa Fertilizer Company	IA-0105	10/26/2012	CO2e	Primary Reformer	596905	tpy Rolling 12 month total	Good Combustion Practices
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	N2O	Primary Reformer	0.0006	lb/MMBtu average of 3 stack tests	Good operating practices & use of natural gas
Iowa Fertilizer Company	IA-0105	10/26/2012	N2O	Primary Reformer	0.0006	lb/MMBtu average of 3 stack tests	Good Combustion Practices
Altoona GTL LLC/Gilberton	PA-0285	1/16/2013	NH3	Convection Reformers	5	PPMVD @ 15%O2, 3 hr average, rolling by 1 hr	SCR
Air Products and Chemicals, Inc.	LA-0264	9/4/2012	NOx	Reformers	48.74	lb/hr hourly maximum	ULNB and SCR
Air Products and Chemicals, Inc.	LA-0264	9/4/2012	NOx	Reformers	0.015	lb/MMBtu annual average	ULNB and SCR
Iowa Fertilizer Company	IA-0105	10/26/2012	NOx	Primary Reformer	9	ppmv 30 day rolling average	SCR
Iowa Fertilizer Company	IA-0105	10/26/2012	NOx	Primary Reformer	56	tons/year rolling 12 month total	SCR
Ohio Valley Resources, LLC	TBD	9/25/2013	NOx	Primary Reformer	9	ppmvd 30 day rolling average	SCR
Air Products and Chemicals, Inc.	LA-0264	9/4/2012	PM	Reformers	11.24	lb/hr hourly average	Proper equipment designs, good combustion practices, and gaseous fuel
Air Products and Chemicals, Inc.	LA-0264	9/4/2012	PM	Reformers	0.0075	lb/MMBtu	Proper equipment designs, good combustion practices, and gaseous fuel
Altoona GTL LLC/Gilberton	PA-0285	1/16/2013	PM	Convection Reformers	0.2	Grains/DSCF	Unknown
Altoona GTL LLC/Gilberton	PA-0285	1/16/2013	PM	Reformers	0.2	Grains/DSCF	Unknown
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM	Primary Reformer	0.0024	lb/MMBtu average of 3 stack tests	Good operating practices & use of natural gas
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM	Primary Reformer	11.2	tpy Rolling 12 month total	Good operating practices & use of natural gas
Iowa Fertilizer Company	IA-0105	10/26/2012	PM	Primary Reformer	0.0024	lb/MMBtu average of 3 stack tests	Good Combustion Practices
Iowa Fertilizer Company	IA-0105	10/26/2012	PM	Primary Reformer	11.9	tons/year rolling 12 month total	Good Combustion Practices
Ohio Valley Resources, LLC	TBD	9/25/2013	PM	Primary Reformer	1.9	lb/MMcf 3 hour average	Good Combustion Practices
Air Products and Chemicals, Inc.	LA-0264	9/4/2012	PM10	Reformers	11.24	lb/hr hourly average	Proper equipment designs, good combustion practices, and gaseous fuel
Air Products and Chemicals, Inc.	LA-0264	9/4/2012	PM10	Reformers	0.0075	lb/MMBtu	Proper equipment designs, good combustion practices, and gaseous fuel
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM10	Primary Reformer	0.0024	lb/MMBtu average of 3 stack tests	Good operating practices & use of natural gas
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM10	Primary Reformer	11.2	tpy Rolling 12 month total	Good operating practices & use of natural gas
Iowa Fertilizer Company	IA-0105	10/26/2012	PM10	Primary Reformer	0.0024	lb/MMBtu average of 3 stack tests	Good Combustion Practices
Iowa Fertilizer Company	IA-0105	10/26/2012	PM10	Primary Reformer	11.9	tons/year rolling 12 month total	Good Combustion Practices
Ohio Valley Resources, LLC	TBD	9/25/2013	PM10	Primary Reformer	7.6	lb/MMcf 3 hour average	Good Combustion Practices
Air Products and Chemicals, Inc.	LA-0264	9/4/2012	PM2.5	Reformers	11.24	lb/hr hourly average	Proper equipment designs, good combustion practices, and gaseous fuel
Air Products and Chemicals, Inc.	LA-0264	9/4/2012	PM2.5	Reformers	0.0075	lb/MMBtu	Proper equipment designs, good combustion practices, and gaseous fuel
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM2.5	Primary Reformer	0.0024	lb/MMBtu average of 3 stack tests	Good operating practices & use of natural gas
Navajo Refining Company LLC Navajo Refinin	NM-0050	12/14/2007	PM10	Steam Methane Reformer Heater	2.52	lbs/hr hourly	Gaseous Fuel Combustion Only
Navajo Refining Company LLC Navajo Refinin	NM-0050	12/14/2007	SO2	Steam Methane Reformer Heater	2.16	tpy	Selective Catalytic Reduction
Navajo Refining Company LLC Navajo Refinin	NM-0050	12/14/2007	SO2	Steam Methane Reformer Heater	0.494	lbs/hr	Selective Catalytic Reduction
Navajo Refining Company LLC Navajo Refinin	NM-0050	12/14/2007	VOC	Steam Methane Reformer Heater	0.005	lb/MMBtu hourly	Gaseous Fuel Combustion Only
Navajo Refining Company LLC Navajo Refinin	NM-0050	12/14/2007	VOC	Steam Methane Reformer Heater	1.69	lbs/hr hourly	Gaseous Fuel Combustion Only
Altoona GTL LLC/Gilberton	PA-0285	1/16/2013	SOx	Reformers	500	PPMVD expressed as SO2	Unknown
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	Visible Emissions	Primary Reformer	0	%	Good operating practices & use of natural gas
Iowa Fertilizer Company	IA-0105	10/26/2012	Visible Emissions	Primary Reformer	0	%	Good Operation Practices
Pryor Plant Chemical Company	OK-0134 OK-0135	2/23/2009	PM	Primary Reformer	1.68	lbs/hr	Unknown
Pryor Plant Chemical Company	OK-0134 OK-0135	2/23/2009	PM10	Primary Reformer	1.26	lbs/hr 24-hr	Unknown
Pryor Plant Chemical Company	OK-0134 OK-0135	2/23/2009	SO2	Primary Reformer	1.35	lb/hr	Natural Gas
Pryor Plant Chemical Company	OK-0134 OK-0135	2/23/2009	SO2	Primary Reformer	0.2	lb/MMBtu	Natural Gas
Pryor Plant Chemical Company	OK-0134 OK-0135	2/23/2009	VOC	Primary Reformer	1.21	lbs/hr	Unknown

Notes:
Some facilities are not shown because they are not fertilizer production facilities. These units are not directly comparable because they do not flare common process gas.
Some facilities are not shown because they are not fertilizer production facilities. These units are not directly comparable because they are not natural gas fired.

Appendix A
KNO Restart - RBLC Summary

KNO Restart
RBLC Search Summary
Search: "CO2 Vent", "CO2 Stripper" - All Results Included
Unit 14 - CO_2 Vent

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
Praxair Inc - Praxair Clear Lake Plant	TX-0830	10/19/2017	CO2e	HyCO CO2 Stripper MSS	0		No controls feasible.
Praxair Inc - Praxair Clear Lake Plant	TX-0830	10/19/2017	CO	HyCO CO2 Stripper MSS	3.3	tpy	No controls feasible.
Praxair Inc - Praxair Clear Lake Plant	TX-0827	10/19/2017	CO2e	HyCO CO2 Stripper MSS	0		No controls feasible. Emissions included in sitewide grouped limit
Praxair Inc - Praxair Clear Lake Plant	TX-0827	10/19/2017	CO	HyCO CO2 Stripper MSS	3.3	tpy	No controls feasible.
Agrium US, Inc	TX-0814	1/5/2017(draft)	CO2e	CO2 Stripper Vent	843150	tpy	Good engineering practices to minimize CO2e emissions, with emissions limited to releasing to the atmoshpere the CO2 with cannot be sold. (730,000 TPY Urea and 702,625 TPY Ammonia Greenhouse gas (GHG) will be controlled by using Carbon dioxide (CO2) as a raw material to produce urea. If the Urea Plant is not operating, the CO2 generated in the ammonia process will be vented to the atmosphere)
Lake Charles Methanol, LLC	LA-0305	6/30/16, 4/26/17 update	CO	Acid Gas Removal Unit/CO2 Vent	No Numeric Limit	No Numeric Limit	Thermal Oxidizers
Lake Charles Methanol, LLC	LA-0305	6/30/16, 4/26/17 update	CO2e	Acid Gas Removal Unit/CO2 Vent	No Numeric Limit	No Numeric Limit	Thermal Oxidizers
Topchem Pollock, LLC	LA-0306	12/20/2016 (draft), 08/08/2017 update	CO2e	CO2 Stripper Column CO2SC-16-1 (EQT031)	162511	tpy	Use of pipeline quality natural gas and good combustion practices. 0.29 Ton CO2e/Metric Ton of NH3 produced.
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	Acetaldehyde[(1)]	Carbon Dioxide Regenerator	1,226,814	tpy rolling 12 month total	Good operational practices
CF Industries Inc. Donaldsonville Nitrogen Complex - Ammonia Plant	LA-0236	3/3/2009	CO	CO2 Vents	5.59	lbs/hr	Optimum Catalytic Conversion of CO to CO2 in the high and low shift converters, and continued use of an optimum liquid alkanol amine solution, or other solution to maximize the absorbing of CO2
CF Industries Inc. Donaldsonville Nitrogen Complex - Ammonia Plant	LA-0236	3/3/2009	CO	CO2 Vents	6.55	tons/year	Optimum Catalytic Conversion of CO to CO2 in the high and low shift converters, and continued use of an optimum liquid alkanol amine solution, or other solution to maximize the absorbing of CO2
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	CO	Carbon Dioxide Regenerator	0.02	lb/ton of NH3 average of 3 stack tests	Good operational practices
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	CO	Carbon Dioxide Regenerator	9.74	tpy rolling 12 month total	Good operational practices
Iowa Fertilizer company	IA-0105	10/26/2012	CO	CO2 Regenerator	0.02	lb/ton of NH3 average of 3 stack tests	Good operational practices
Iowa Fertilizer company	IA-0105	10/26/2012	CO	CO2 Regenerator	9.65	tpy rolling 12 month total	Good operational practices
Ohio Valley Resources, LLC	TBD	9/25/2013	CO	CO2 purification process	0.0117	lb/ton of NH3 3 hour average	good operational practices and the use of a process catalyst
Southeast Idaho Energy, LLC Power County Advanced Energy Center	ID-0017	2/10/2009	CO	Selexol AGR CO2 Vent	8.7	lbs/hr	Thermal Oxidizer (Cat-Ox)
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	CO2	Carbon Dioxide Regenerator	1.26	lb/ton of NH3 30 day rollin g average[(2)]	Good operational practices
Iowa Fertilizer company	IA-0105	10/26/2012	CO2	CO2 Regenerator	1.26	Tons/ton of NH3 rolling 30 day average	Good operational practices
Ohio Valley Resources, LLC	TBD	9/25/2013	CO2	CO2 purification process	1.275	ton/ton of NH3 3 hour average	Good Operational Practices
Pryor Plant Chemical Company	OK-0135	2/23/2009	CO2	Carbon dioxide vent	3.65	lbs/hr 1 hour/8 hour	good operation practices
Iowa Fertilizer company	IA-0105	10/26/2012	CO2e	CO2 Regenerator	1,211,847	tpy rolling 12 month total	Good operational practices
Southeast Idaho Energy, LLC Power County Advanced Energy Center	ID-0017	2/10/2009	NOx	Selexol AGR CO2 Vent	0.9	lbs/hr	Thermal Oxidizer (Cat-Ox)
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	VOC	Carbon Dioxide Regenerator	0.106	lb/ton of NH3 average of 3 stack tests	Good operational practices
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	VOC	Carbon Dioxide Regenerator	51.60	tpy rolling 12 month total	Good operational practices
Iowa Fertilizer company	IA-0105	10/26/2012	VOC	CO2 Regenerator	0.106	lb/ton of NH3 average of 3 stack tests	Good operational practices
Iowa Fertilizer company	IA-0105	10/26/2012	VOC	CO2 Regenerator	51.2	tpy rolling 12 month total	Good operational practices
Ohio Valley Resources, LLC	TBD	9/25/2013	VOC	CO2 purification process	0.0558	lb/ton of NH3 3 hour average	low VOC catalyst

[(1)] This is not correct according to Chris Roling for the Iowa DNR, most likely CO2e

[(2)] The units may be incorrect. It might be tons/ton of NH3

Notes:
Highlighted fields represent the lowest limit in common units (e.g., lb/MMBtu). Other units may be shown; however, there is not enough information to convert to common units or averaging times.

Appendix A
KNO Restart - RBLC Summary

KNO Restart
RBLC Search Summary
Search: "Flare" - Fertilizer Plants only
Unit 22 - Plants 4 and 5 Small Flare
Unit 23 - Plants 4 and 5 Emergency Flare

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
Topchem Pollock, LLC	LA-0306	12/20/2016, updated 8/8/17	PM2.5	Process Flare FL-16-1 (EQT034)	0.01	lb/hr hourly maximum	Correct flare design and good combustion practices; Compliance with the Louisiana Non-NSPS Flare Requirements (2.17 MMBtu/hr)(Flare shall nc operate more than 4 hours above normal firing rate in any 24 consecutive hours and 148 hours per year)
Topchem Pollock, LLC	LA-0306	12/20/2016, updated 8/8/17	PM2.5	Process Flare FL-16-1 (EQT034)	0.02	tpy annual maximum	Correct flare design and good combustion practices; Compliance with the Louisiana Non-NSPS Flare Requirements (2.17 MMBtu/hr)(Flare shall nc operate more than 4 hours above normal firing rate in any 24 consecutive hours and 148 hours per year)
Topchem Pollock, LLC	LA-0306	12/20/2016, updated 8/8/17	CO	Process Flare FL-16-1 (EQT034)	0.87	lb/hr hourly maximum	Correct flare design and good combustion practices; Compliance with the Louisiana Non-NSPS Flare Requirements (2.17 MMBtu/hr)(Flare shall nc operate more than 4 hours above normal firing rate in any 24 consecutive hours and 148 hours per year)
Topchem Pollock, LLC	LA-0306	12/20/2016, updated 8/8/17	CO	Process Flare FL-16-1 (EQT034)	3.76	tpy annual maximum	Correct flare design and good combustion practices; Compliance with the Louisiana Non-NSPS Flare Requirements (2.17 MMBtu/hr)(Flare shall nc operate more than 4 hours above normal firing rate in any 24 consecutive hours and 148 hours per year)
Topchem Pollock, LLC	LA-0306	12/20/2016, updated 8/8/17	CO2e	Process Flare FL-16-1 (EQT034)	370	tpy annual maximum	Correct flare design and good combustion practices; Compliance with the Louisiana Non-NSPS Flare Requirements (2.17 MMBtu/hr)(Flare shall nc operate more than 4 hours above normal firing rate in any 24 consecutive hours and 148 hours per year)
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	TPM	Back End Flare (EU-018)	0.0019	lb/MMBtu 3 hour average	
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	TPM	Back End Flare (EU-018)	336	hours/12 consec month	
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	TPM	Back End Flare (EU-018)	No Numeric Limit	No Numeric Limit	Pilot and purge gas shall be natural gas; and process flaring minimization practices; operated with a flame present at all times; continuously monitore
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	PM10	Back End Flare (EU-018)	0.0075	lb/MMBtu 3 hour average	
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	PM10	Back End Flare (EU-018)	336	hours/12 consec month venting	
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	PM10	Back End Flare (EU-018)	No Numeric Limit	No Numeric Limit	Pilot and purge gas shall be natural gas; and process flaring minimization practices; operated with a flame present at all times; continuously monitore
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	PM2.5	Back End Flare (EU-018)	0.0075	lb/MMBtu 3 hour average	
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	PM2.5	Back End Flare (EU-018)	336	hours/12 consec month venting	
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	PM2.5	Back End Flare (EU-018)	No Numeric Limit	No Numeric Limit	Pilot and purge gas shall be natural gas; and process flaring minimization practices; operated with a flame present at all times; continuously monitore
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	NOx	Back End Flare (EU-018)	0.068	lb/MMBtu during normal operations 3 hour average	
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	NOx	Back End Flare (EU-018)	624.94	lb/hour venting operations 3 hour average	
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	NOx	Back End Flare (EU-018)	No Numeric Limit	No Numeric Limit	Pilot and purge gas shall be natural gas; and process flaring minimization practices; operated with a flame present at all times; continuously monitore
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	CO	Back End Flare (EU-018)	0.37	lb/MMBtu during normal operations 3 hour average	
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	CO	Back End Flare (EU-018)	804.76	lb/hour venting operations 3 hour average	
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	CO	Back End Flare (EU-018)	No Numeric Limit	No Numeric Limit	Pilot and purge gas shall be natural gas; and process flaring minimization practices; operated with a flame present at all times; continuously monitore
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	VOC	Back End Flare (EU-018)	0.0054	lb/MMBtu during normal operations 3 hour average	
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	VOC	Back End Flare (EU-018)	11.73	lb/hour venting operations 3 hour average	
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	VOC	Back End Flare (EU-018)	No Numeric Limit	No Numeric Limit	Pilot and purge gas shall be natural gas; and process flaring minimization practices; operated with a flame present at all times; continuously monitore
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	CO2	Back End Flare (EU-018)	116.89	lb/MMBtu during normal operations 3 hour average	
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	CO2	Back End Flare (EU-018)	573	tons/12 consecutive months	
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	CO2	Back End Flare (EU-018)	No Numeric Limit	No Numeric Limit	Pilot and purge gas shall be natural gas; and process flaring minimization practices; operated with a flame present at all times; continuously monitore
Agrium US, Inc	TX-0814	1/5/2017(draft)	CO2e	Ammonia Emergency Flare	157	tpy	Good Engineering Practices (0.31 MMBtu/hr and 2715 MMBtu/year)
Agrium US, Inc	TX-0814	1/5/2017(draft)	CO2e	Urea Emergency Flare	1418	tpy	Good Engineering Practices (2.76 MMBtu/hr)
Agrium US, Inc	TX-0814	1/5/2017(draft)	CO2e	Urea Emergency Flare (maintenance)	5.9	tpy	Good Engineering Practices (2000 kg/event, 36 hrs/event, 4 events/yr

Appendix A
KNO Restart - RBLC Summary

KNO Restart
RBLC Search Summary
Search: "Flare" - Fertilizer Plants only
Unit 22 - Plants 4 and 5 Small Flare
Unit 23 - Plants 4 and 5 Emergency Flare

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	CH4	Flares	No Numeric Limit	No Numeric Limit	Good operating practices & use of natural gas
Iowa Fertilizer Company	IA-0105	10/26/2012	CH4	Ammonia Flare	No Numeric Limit	No Numeric Limit	Work Practice/Good Combustion Practices
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	CO	Flares	No Numeric Limit	No Numeric Limit	Good operating practices & use of natural gas
Ohio Valley Resources, LLC	TBD	9/25/2013	CO	Front End Process Flare	0.37	lb/MMBtu 3 hour average	Proper flare design and good combustion practices; and process flaring minimization practices
Ohio Valley Resources, LLC	TBD	9/25/2013	CO	Front End Process Flare	3240.16	lb/hr 3 hour average	Proper flare design and good combustion practices; and process flaring minimization practices
Ohio Valley Resources, LLC	TBD	9/25/2013	CO	Back end ammonia process vent flare	0.37	lb/MMBtu 3 hour average	Proper flare design and good combustion practices; and process flaring minimization practices
Ohio Valley Resources, LLC	TBD	9/25/2013	CO	Back end ammonia process vent flare	804.76	lb/hr 3 hour average	Proper flare design and good combustion practices; and process flaring minimization practices
Southeast Idaho Energy, LLC Power County Advanced Energy Center	ID-0017	2/10/2009	CO	Process Flare	No Numeric Limit	No Numeric Limit	Good combustion practices. Meet 40 CFR 60.18
United Wisconsin Grain Producers UWGP - Fuel Grade Ethanol Plant	WI-0204	8/14/2003	CO	Bypass Flare, Biomethanator	2.4	lbs/hr	Operation Limit: No more than 5040 hr/yr
Iowa Fertilizer Company	IA-0105	10/26/2012	NOx	Ammonia Flare	No Numeric Limit	No Numeric Limit	Work Practice/Good Combustion Practices
Ohio Valley Resources, LLC	TBD	9/25/2013	NOx	Front End Process Flare	0.068	lb/MMBtu 3 hour average	Proper flare design and good combustion practices; and process flaring minimization practices
Ohio Valley Resources, LLC	TBD	9/25/2013	NOx	Front End Process Flare	595.47	lb/hr 3 hour average	Proper flare design and good combustion practices; and process flaring minimization practices
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	Visible Emissions	Flares	No Numeric Limit	No Numeric Limit	Good operating practices & use of natural gas
Iowa Fertilizer Company	IA-0105	10/26/2012	Visible Emissions	Ammonia Flare	No Numeric Limit	No Numeric Limit	Work Practice/Good Combustion Practices
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	VOC	Flares	No Numeric Limit	No Numeric Limit	Good operating practices & use of natural gas
Iowa Fertilizer Company	IA-0105	10/26/2012	VOC	Ammonia Flare	No Numeric Limit	No Numeric Limit	Work Practice/Good Combustion Practices
Ohio Valley Resources, LLC	TBD	9/25/2013	VOC	Front End Process Flare	0.0054	lb/MMBtu 3 hour average	Proper flare design and good combustion practices; and process flaring minimization practices
Ohio Valley Resources, LLC	TBD	9/25/2013	VOC	Front End Process Flare	47.26	lb/hr 3 hour average	Proper flare design and good combustion practices; and process flaring minimization practices
Sunoco, Inc. Sun Company, Inc., Toledo Refinery	OH-0308	2/23/2009	CO	Flare, Steam Assisted	12.8	lbs/hr	Unknown
Sunoco, Inc. Sun Company, Inc., Toledo Refinery	OH-0308	2/23/2009	CO	Flare, Steam Assisted	56.07	tons/year 365-day sum of daily emissions	Unknown
Sunoco, Inc. Sun Company, Inc., Toledo Refinery	OH-0308	2/23/2009	NOx	Flare, Steam Assisted	15.23	lbs/hr	Unknown
Sunoco, Inc. Sun Company, Inc., Toledo Refinery	OH-0308	2/23/2009	NOx	Flare, Steam Assisted	66.71	tons/year 365-day sum of daily emissions	Unknown
Sunoco, Inc. Sun Company, Inc., Toledo Refinery	OH-0308	2/23/2009	PM10	Flare, Steam Assisted	1.16	lbs/hr	Unknown
Sunoco, Inc. Sun Company, Inc., Toledo Refinery	OH-0308	2/23/2009	PM10	Flare, Steam Assisted	5.08	tons/year 365-day sum of daily emissions	Unknown
Sunoco, Inc. Sun Company, Inc., Toledo Refinery	OH-0308	2/23/2009	SOx	Flare, Steam Assisted	4.2	lbs/hr	Unknown
Sunoco, Inc. Sun Company, Inc., Toledo Refinery	OH-0308	2/23/2009	SOx	Flare, Steam Assisted	18.4	tons/year 365-day sum of daily emissions	Unknown
Sunoco, Inc. Sun Company, Inc., Toledo Refinery	OH-0308	2/23/2009	Visible Emissions	Flare, Steam Assisted	0	% opacity no NE except for 5 min during any 2 hrs	Unknown
Sunoco, Inc. Sun Company, Inc., Toledo Refinery	OH-0308	2/23/2009	VOC	Flare, Steam Assisted	3.68	tons/year 365-day sum of daily emissions	Unknown
Sunoco, Inc. Sun Company, Inc., Toledo Refinery	OH-0308	2/23/2009	VOC	Flare, Steam Assisted	0.84	lbs/hr	Unknown
Ohio Valley Resources, LLC	TBD	9/25/2013	VOC	Back end ammonia process vent flare	0.0054	lb/MMBtu 3 hour average	Proper flare design and good combustion practices; and process flaring minimization practices
Ohio Valley Resources, LLC	TBD	9/25/2013	VOC	Back end ammonia process vent flare	11.73	lb/hr 3 hour average	Proper flare design and good combustion practices; and process flaring minimization practices
United Wisconsin Grain Producers UWGP - Fuel Grade Ethanol Plan	WI-0204	8/14/2003	VOC	Bypass Flare, Biomethanator	0.3	lbs/hr	Operation Limit: No more than 5040 hr/yr
WM Atlantic Waste Disposal Inc. Atlantic Waste Disposal Landfill	VA-0294	2/5/2003	CO	Flares, 3500 SCFM LFG (3)	17.3	lbs/hr	Proper maintenance of the flare, including monitoring for the presence of flame, LGF flow rate, 0% opacity, measuring % methane in LFG
WM Atlantic Waste Disposal Inc. Atlantic Waste Disposal Landfill	VA-0294	2/5/2003	CO	Flares, 3500 SCFM LFG (3)	98%	Reduction	Proper maintenance of the flare, including monitoring for the presence of flame, LGF flow rate, 0% opacity, measuring % methane in LFG
WM Atlantic Waste Disposal Inc. Atlantic Waste Disposal Landfill	VA-0294	2/5/2003	CO	Flares, 2500 SCFM LFG (2)	12.3	lbs/hr	Proper maintenance of the flare, including monitoring for the presence of flame, LGF flow rate, 0% opacity, measuring % methane in LFG
WM Atlantic Waste Disposal Inc. Atlantic Waste Disposal Landfill	VA-0294	2/5/2003	CO	Flares, 2500 SCFM LFG (2)	98%	Reduction	Proper maintenance of the flare, including monitoring for the presence of flame, LGF flow rate, 0% opacity, measuring % methane in LFG
WM Atlantic Waste Disposal Inc. Atlantic Waste Disposal Landfill	VA-0294	2/5/2003	NOx	Flares, 2500 SCFM LFG (2)	3.6	lbs/hr	Proper maintenance of the flare, including monitoring for the presence of flame, LGF flow rate, 0% opacity, measuring % methane in LFG
WM Atlantic Waste Disposal Inc. Atlantic Waste Disposal Landfill	VA-0294	2/5/2003	NOx	Flares, 3500 SCFM LFG (3)	5.1	lbs/hr	Proper maintenance of the flare, including monitoring for the presence of flame, LGF flow rate, 0% opacity, measuring % methane in LFG
WM Atlantic Waste Disposal Inc. Atlantic Waste Disposal Landfill	VA-0294	2/5/2003	NOx	Flares, 3500 SCFM LFG (3)	98%	Reduction	Proper maintenance of the flare, including monitoring for the presence of flame, LGF flow rate, 0% opacity, measuring % methane in LFG
WM Atlantic Waste Disposal Inc. Atlantic Waste Disposal Landfill	VA-0294	2/5/2003	NOx	Flares, 2500 SCFM LFG (2)	98%	Reduction	Proper maintenance of the flare, including monitoring for the presence of flame, LGF flow rate, 0% opacity, measuring % methane in LFG
WM Atlantic Waste Disposal Inc. Atlantic Waste Disposal Landfill	VA-0294	2/5/2003	PM10	Flares, 2500 SCFM LFG (2)	1.6	lbs/hr	Proper maintenance of the flare, including monitoring for the presence of flame, LGF flow rate, 0% opacity, measuring % methane in LFG
WM Atlantic Waste Disposal Inc. Atlantic Waste Disposal Landfill	VA-0294	2/5/2003	PM10	Flares, 2500 SCFM LFG (2)	98%	Reduction	Proper maintenance of the flare, including monitoring for the presence of flame, LGF flow rate, 0% opacity, measuring % methane in LFG
WM Atlantic Waste Disposal Inc. Atlantic Waste Disposal Landfill	VA-0294	2/5/2003	PM10	Flares, 3500 SCFM LFG (3)	2.2	lbs/hr	Proper maintenance of the flare, including monitoring for the presence of flame, LGF flow rate, 0% opacity, measuring % methane in LFG
WM Atlantic Waste Disposal Inc. Atlantic Waste Disposal Landfill	VA-0294	2/5/2003	PM10	Flares, 3500 SCFM LFG (3)	98%	Reduction	Proper maintenance of the flare, including monitoring for the presence of flame, LGF flow rate, 0% opacity, measuring % methane in LFG
WM Atlantic Waste Disposal Inc. Atlantic Waste Disposal Landfill	VA-0294	2/5/2003	SO2	Flares, 2500 SCFM LFG (2)	1.4	lbs/hr	Proper maintenance of the flare, including monitoring for the presence of flame, LGF flow rate, 0% opacity, measuring % methane in LFG
WM Atlantic Waste Disposal Inc. Atlantic Waste Disposal Landfill	VA-0294	2/5/2003	SO2	Flares, 3500 SCFM LFG (3)	1.9	lbs/hr	Proper maintenance of the flare, including monitoring for the presence of flame, LGF flow rate, 0% opacity, measuring % methane in LFG
WM Atlantic Waste Disposal Inc. Atlantic Waste Disposal Landfill	VA-0294	2/5/2003	VOC	Flares, 2500 SCFM LFG (2)	1	lbs/hr nonmethane organic carbon	Proper maintenance of the flare, including monitoring for the presence of flame, LGF flow rate, 0% opacity, measuring % methane in LFG
WM Atlantic Waste Disposal Inc. Atlantic Waste Disposal Landfill	VA-0294	2/5/2003	VOC	Flares, 2500 SCFM LFG (2)	98%	Reduction	Proper maintenance of the flare, including monitoring for the presence of flame, LGF flow rate, 0% opacity, measuring % methane in LFG
WM Atlantic Waste Disposal Inc. Atlantic Waste Disposal Landfill	VA-0294	2/5/2003	VOC	Flares, 3500 SCFM LFG (3)	0.6	lbs/hr	Proper maintenance of the flare, including monitoring for the presence of flame, LGF flow rate, 0% opacity, measuring % methane in LFG
WM Atlantic Waste Disposal Inc. Atlantic Waste Disposal Landfil	VA-0294	2/5/2003	VOC	Flares, 3500 SCFM LFG (3)	1.4	lbs/hr nonmethane organic carbor	Proper maintenance of the flare, including monitoring for the presence of flame, LGF flow rate, 0% opacity, measuring % methane in LF

Notes:
Highlighted fields represent the lowest limit in common units (e.g., lb/MMBtu). Other units may be shown; however, there is not enough information to convert to common units or averaging times.
Some facilities are not shown because they are not fertilizer production facilities. These units are not directly comparable because they do not flare common process gas.

Appendix A
KNO Restart - RBLC Summary

KNO Restart
RBLC Search Summary
Search: "MDEA", "methyl","42.009","61.999" - All Results
MDEA Storage Tank

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
No New Results							
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	VOC	Methyl-diethanol Amine (MDEA) Storage Tank	0.1	tons/year rolling 12 month total	Nitrogen Gas Blanket
Iowa Fertilizer Company	IA-0105	10/26/2012	VOC	MDEA Storage Tank	0.1	tons/year rolling 12 month total	Nitrogen Gas Blanket

Notes:
Highlighted fields represent the lowest limit in common units (e.g., lb/MMBtu).

Appendix A
KNO Restart - RBLC Summary

KNO Restart
RBLC Search Summary
Search: "Start up", "Start-up","Preheat" - All Results Included
Unit 13 - Startup Heater

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
Gerdau Macsteel Inc. - Gerdau Macsteel Monroe	MI-0438	10/29/2018, updated 2/19/2019	FPM	Ladle Preheater (30 mmbtu/hr burner)	0.0076	lb/MMBtu Hourly	Use of NG fuel and good combustion practices
Gerdau Macsteel Inc. - Gerdau Macsteel Monroe	MI-0438	10/29/2018, updated 2/19/2019	PM10	Ladle Preheater (30 mmbtu/hr burner)	0.0076	lb/MMBtu Hourly	Use of NG fuel and good combustion practices
Gerdau Macsteel Inc. - Gerdau Macsteel Monroe	MI-0438	10/29/2018, updated 2/19/2019	PM2.5	Ladle Preheater (30 mmbtu/hr burner)	0.0076	lb/MMBtu Hourly	Use of NG fuel and good combustion practices
Gerdau Macsteel Inc. - Gerdau Macsteel Monroe	MI-0438	10/29/2018, updated 2/19/2019	NOx	Ladle Preheater (30 mmbtu/hr burner)	0.08	lb/MMBtu Hourly	LAER - Low NOx burners, use of NG fuel, and good combustion practices. NOx subject to LAER due to non-attainment for ozone, also subject to NOx BACT in NOx attainment area.
Gerdau Macsteel Inc. - Gerdau Macsteel Monroe	MI-0438	10/29/2018, updated 2/19/2019	CO	Ladle Preheater (30 mmbtu/hr burner)	0.084	lb/MMBtu Hourly	Use of NG fuel and good combustion practices
Gerdau Macsteel Inc. - Gerdau Macsteel Monroe	MI-0438	10/29/2018, updated 2/19/2019	SO2	Ladle Preheater (30 mmbtu/hr burner)	0.0006	lb/MMBtu Hourly	Use of NG fuel and good combustion practices
Topchem Pollock, LLC	LA-0306	12/20/2016, updated 8/8/17	PM2.5	Ammonia Converter Start-up Heater Stack SUH-16-1 (EQT030)	0.18	lb/hr hourly maximum	Use of pipeline quality natural gas and good combustion practices
Topchem Pollock, LLC	LA-0306	12/20/2016, updated 8/8/17	PM2.5	Ammonia Converter Start-up Heater Stack SUH-16-1 (EQT030)	0.01	tpy annual maximum	Use of pipeline quality natural gas and good combustion practices
Topchem Pollock, LLC	LA-0306	12/20/2016, updated 8/8/17	CO	Ammonia Converter Start-up Heater Stack SUH-16-1 (EQT030)	1.96	lb/hr hourly maximum	Use of pipeline quality natural gas and good combustion practices
Topchem Pollock, LLC	LA-0306	12/20/2016, updated 8/8/17	CO	Ammonia Converter Start-up Heater Stack SUH-16-1 (EQT030)	0.12	tpy annual maximum	Use of pipeline quality natural gas and good combustion practices
Topchem Pollock, LLC	IN-0263 (draft)	12/20/2016, updated 8/8/17	CO2e	Ammonia Converter Start-up Heater Stack SUH-16-1 (EQT030)	169	tpy annual maximum	Use of pipeline quality natural gas and good combustion practices
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft), updated 7/10/17	FPM	Startup Heater EU-002	0.13	lb/hr 3 hour average	Good Combustion Practices & use of natural gas (70 MMBtu/hr)
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft), updated 7/10/17	FPM	Startup Heater EU-002	200	hours/year	Good Combustion Practices & use of natural gas (70 MMBtu/hr)
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft), updated 7/10/17	PM10	Startup Heater EU-002	0.522	lb/hr 3 hour average	Good Combustion Practices & use of natural gas (70 MMBtu/hr)
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft), updated 7/10/17	PM10	Startup Heater EU-002	200	hours/year	Good Combustion Practices & use of natural gas (70 MMBtu/hr)
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft), updated 7/10/17	PM2.5	Startup Heater EU-002	0.522	lb/hr 3 hour average	Good Combustion Practices & use of natural gas (70 MMBtu/hr)
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft), updated 7/10/17	PM2.5	Startup Heater EU-002	200	hours/year	Good Combustion Practices & use of natural gas (70 MMBtu/hr)
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft), updated 7/10/17	NOx	Startup Heater EU-002	12.611	lb/hr 3 hour average	Good Combustion Practices & use of natural gas (70 MMBtu/hr)
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft), updated 7/10/17	NOx	Startup Heater EU-002	200	hours/year	Good Combustion Practices & use of natural gas (70 MMBtu/hr)
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft), updated 7/10/17	CO	Startup Heater EU-002	2.556	lb/hr 3 hour average	Good Combustion Practices & use of natural gas (70 MMBtu/hr)
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft), updated 7/10/17	CO	Startup Heater EU-002	200	hours/year	Good Combustion Practices & use of natural gas (70 MMBtu/hr)
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft), updated 7/10/17	VOC	Startup Heater EU-002	0.378	lb/hr 3 hour average	Good Combustion Practices & use of natural gas (70 MMBtu/hr)
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft), updated 7/10/17	VOC	Startup Heater EU-002	200	hours/year	Good Combustion Practices & use of natural gas (70 MMBtu/hr)
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft), updated 7/10/17	CO2	Startup Heater EU-002	8184	lb/hr 3 hour average	Good Combustion Practices & use of inlet air control sensors that limit excess air(70 MMBtu/hr)
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft), updated 7/10/17	CO2	Startup Heater EU-002	200	hours/year	Good Combustion Practices & use of inlet air control sensors that limit excess air(70 MMBtu/hr)
Lake Charles Methanol, LLC	LA-0305	6/30/16, 4/26/17 update	PM10	Gasifier Start-up Preheat Burners	No Numeric Limit	No Numeric Limit	Good engineering practices, good combustion technology, and use of clean fuels (23 MMBtu/hr each)
Lake Charles Methanol, LLC	LA-0305	6/30/16, 4/26/17 update	PM2.5	Gasifier Start-up Preheat Burners	No Numeric Limit	No Numeric Limit	Good engineering practices, good combustion technology, and use of clean fuels (23 MMBtu/hr each)
Lake Charles Methanol, LLC	LA-0305	6/30/16, 4/26/17 update	SO2	Gasifier Start-up Preheat Burners	No Numeric Limit	No Numeric Limit	Good engineering practices, good combustion technology, and use of clean fuels (23 MMBtu/hr each)
Lake Charles Methanol, LLC	LA-0305	6/30/16, 4/26/17 update	NOx	Gasifier Start-up Preheat Burners	No Numeric Limit	No Numeric Limit	Good engineering practices, good combustion technology, and use of clean fuels (23 MMBtu/hr each)
Lake Charles Methanol, LLC	LA-0305	6/30/16, 4/26/17 update	CO	Gasifier Start-up Preheat Burners	No Numeric Limit	No Numeric Limit	Good engineering practices, good combustion technology, and use of clean fuels (23 MMBtu/hr each)
Lake Charles Methanol, LLC	LA-0305	6/30/16, 4/26/17 update	CO2e	Gasifier Start-up Preheat Burners	No Numeric Limit	No Numeric Limit	Good equipment design and good combustion practices (23 MMBtu/hr each)
Lake Charles Methanol, LLC	LA-0305	6/30/16, 4/26/17 update	PM10	WSA Preheat Burners	No Numeric Limit	No Numeric Limit	Good engineering design and practices and use of clean fuels (no size listed)
Lake Charles Methanol, LLC	LA-0305	6/30/16, 4/26/17 update	PM2.5	WSA Preheat Burners	No Numeric Limit	No Numeric Limit	Good engineering design and practices and use of clean fuels(no size listed)

Appendix A
KNO Restart - RBLC Summary

KNO Restart
RBLC Search Summary
Search: "Start up", "Start-up","Preheat" - All Results Included
Unit 13 - Startup Heater

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
Lake Charles Methanol, LLC	LA-0305	6/30/16, 4/26/17 update	SO2	WSA Preheat Burners	No Numeric Limit	No Numeric Limit	Good engineering design and practices and use of clean fuels (no size listed)
Lake Charles Methanol, LLC	LA-0305	6/30/16, 4/26/17 update	NOx	WSA Preheat Burners	No Numeric Limit	No Numeric Limit	Good engineering design and practices and use of clean fuels(no size listed)
Lake Charles Methanol, LLC	LA-0305	6/30/16, 4/26/17 update	CO	WSA Preheat Burners	No Numeric Limit	No Numeric Limit	Good engineering design and practices and use of clean fuels (no size listed)
Lake Charles Methanol, LLC	LA-0305	6/30/16, 4/26/17 update	CO2e	WSA Preheat Burners	No Numeric Limit	No Numeric Limit	Good equipment design and good combustion practices (no size listed)
Indeck Niles, LLC	MI-0423 (draft)	1/4/2017, 7/25/17 update	CO	FGFUELHTR (Two fuel pre-heaters identified as EUFUELHTR1 & EUFUELHTR2)	2.22	lb/hr hourly; each unit	SIP - Good combustion practices (27 MMBtu/hr each)
Indeck Niles, LLC	MI-0423 (draft)	1/4/2017, 7/25/17 update	NOx	FGFUELHTR (Two fuel pre-heaters identified as EUFUELHTR1 & EUFUELHTR2)	2.65	lb/hr hourly; each unit	SIP - Good combustion practices (27 MMBtu/hr each)
Indeck Niles, LLC	MI-0423 (draft)	1/4/2017, 7/25/17 update	FPM	FGFUELHTR (Two fuel pre-heaters identified as EUFUELHTR1 & EUFUELHTR2)	0.002	lb/MMBtu Test Protocol will Specify Avg Time	Good combustion practices (27 MMBtu/hr each)
Indeck Niles, LLC	MI-0423 (draft)	1/4/2017, 7/25/17 update	TPM10	FGFUELHTR (Two fuel pre-heaters identified as EUFUELHTR1 & EUFUELHTR2)	0.2	lb/hr hourly; each fuel heater	SIP - Good combustion practices (27 MMBtu/hr each)
Indeck Niles, LLC	MI-0423 (draft)	1/4/2017, 7/25/17 update	TPM2.5	FGFUELHTR (Two fuel pre-heaters identified as EUFUELHTR1 & EUFUELHTR2)	0.2	lb/hr hourly; each fuel heater	SIP - Good combustion practices (27 MMBtu/hr each)
Indeck Niles, LLC	MI-0423 (draft)	1/4/2017, 7/25/17 update	VOC	FGFUELHTR (Two fuel pre-heaters identified as EUFUELHTR1 & EUFUELHTR2)	0.15	lb/hr hourly; each fuel heater	Good combustion practices (27 MMBtu/hr each)
Indeck Niles, LLC	MI-0423 (draft)	1/4/2017, 7/25/17 update	SO2	FGFUELHTR (Two fuel pre-heaters identified as EUFUELHTR1 & EUFUELHTR2)	2000	gr/MMscf Based upon Fuel Receipt Records	SIP - Good combustion practices and the use of pipeline quality natural gas (The limit is 2,000 grains of sulfur per MMscf. The natural gas material limit of 2000 grains of sulfur per MMscf is what the emission factor is based upon.) (27 MMBtu/hr each)
Indeck Niles, LLC	MI-0423 (draft)	1/4/2017, 7/25/17 update	CO2e	FGFUELHTR (Two fuel pre-heaters identified as EUFUELHTR1 & EUFUELHTR2)	13848	tpy combined 12-month rolling time period	Energy efficiency measures and the use of a low carbon fuel (pipeline quality natural gas) (27 MMBtu/hr each)
Holland Board of Public Works - East 5th Street	**MI-0424 (draft) (update of MI-0412)**	12/5/2016, 7/31/17 update	CO	EUFUELHTR (Fuel pre-heater)	0.41	lb/hr Test Protocol will Specify Avg Time	SIP - Good combustion practices (3.7 MMBtu/hr each)
Holland Board of Public Works - East 5th Street	MI-0424 (draft)	12/5/2016, 7/31/17 update	NOx	EUFUELHTR (Fuel pre-heater)	0.55	lb/hr Test Protocol will Specify Avg Time	SIP - Good combustion practices (3.7 MMBtu/hr each)
Holland Board of Public Works - East 5th Street	MI-0424 (draft)	12/5/2016, 7/31/17 update	FPM	EUFUELHTR (Fuel pre-heater)	0.007	lb/MMBtu Test Protocol will Specify Avg Time	Good combustion practices (3.7 MMBtu/hr each)
Holland Board of Public Works - East 5th Street	MI-0424 (draft)	12/5/2016, 7/31/17 update	TPM10	EUFUELHTR (Fuel pre-heater)	0.0075	lb/MMBtu Test Protocol will Specify Avg Time	SIP - Good combustion practices (3.7 MMBtu/hr each)
Holland Board of Public Works - East 5th Street	MI-0424 (draft)	12/5/2016, 7/31/17 update	TPM2.5	EUFUELHTR (Fuel pre-heater)	0.0075	lb/MMBtu Test Protocol will Specify Avg Time	SIP - Good combustion practices (3.7 MMBtu/hr each)
Holland Board of Public Works - East 5th Street	MI-0424 (draft)	12/5/2016, 7/31/17 update	VOC	EUFUELHTR (Fuel pre-heater)	0.03	lb/hr Test Protocol will Specify Avg Time	Good combustion practices (3.7 MMBtu/hr each)
Holland Board of Public Works - East 5th Street	MI-0424 (draft)	12/5/2016, 7/31/17 update	SO2	EUFUELHTR (Fuel pre-heater)	2000	gr/MMscf Based upon Fuel Receipt Records	SIP - Good combustion practices and the use of pipeline quality natural gas (The limit is 2,000 grains of sulfur per MMscf. The natural gas material limit of 2000 grains of sulfur per MMscf is what the emission factor is based upon.) (3.7 MMBtu/hr each)
Holland Board of Public Works - East 5th Street	MI-0424 (draft)	12/5/2016, 7/31/17 update	CO2e	EUFUELHTR (Fuel pre-heater)	1934	tpy combined 12-month rolling time period	Good combustion practices (3.7 MMBtu/hr each)
CPV Fairview, LLC - CPV Fairview Energy Center	PA-0310	9/2/16, 7/31/17 update	NOx	Dew Point Heater 13.8	0.011	lb/MMBtu	NSPS (12.8 MMBtu/hr)
CPV Fairview, LLC - CPV Fairview Energy Center	PA-0310	9/2/16, 7/31/17 update	CO	Dew Point Heater 13.8	0.08	lb/MMBtu	NSPS (12.8 MMBtu/hr)
CPV Fairview, LLC - CPV Fairview Energy Center	PA-0310	9/2/16, 7/31/17 update	CO	Dew Point Heater 3.2	0.08	lb/MMBtu	NSPS (3.2 MMBtu/hr)
CPV Fairview, LLC - CPV Fairview Energy Center	PA-0310	9/2/16, 7/31/17 update	NOx	Dew Point Heater 3.2	0.035	lb/MMBtu	NSPS (3.2 MMBtu/hr)
Mid-Kansas Electric Company, LLC - Rubart Statior	KS-0030 (draft)	3/31/16, 7/19/17 update	NOx	Indirect Fuel-Gas Heater	0.2	lb/hr excludes SSM	(One (1) indirect fuel-gas heater, rated at 2 mmBtu/hr heat input, which shall only burn natural gas, for the purpose of heating the natural gas fuel prior to combustion in the Caterpillar 4SLB RICE)
Mid-Kansas Electric Company, LLC - Rubart Statior	KS-0030 (draft)	3/31/16, 7/19/17 update	CO	Indirect Fuel-Gas Heater	0.16	lb/hr excludes SSM	(One (1) indirect fuel-gas heater, rated at 2 mmBtu/hr heat input, which shall only burn natural gas, for the purpose of heating the natural gas fuel prior to combustion in the Caterpillar 4SLB RICE)
Mid-Kansas Electric Company, LLC - Rubart Statior	KS-0030 (draft)	3/31/16, 7/19/17 update	VOC	Indirect Fuel-Gas Heater	0.011	lb/hr excludes SSM	(One (1) indirect fuel-gas heater, rated at 2 mmBtu/hr heat input, which shall only burn natural gas, for the purpose of heating the natural gas fuel prior to combustion in the Caterpillar 4SLB RICE)
Mid-Kansas Electric Company, LLC - Rubart Statior	KS-0030 (draft)	3/31/16, 7/19/17 update	TPM	Indirect Fuel-Gas Heater	0.015	lb/hr excludes SSM	(One (1) indirect fuel-gas heater, rated at 2 mmBtu/hr heat input, which shall only burn natural gas, for the purpose of heating the natural gas fuel prior to combustion in the Caterpillar 4SLB RICE)
Mid-Kansas Electric Company, LLC - Rubart Statior	KS-0030 (draft)	3/31/16, 7/19/17 update	TPM10	Indirect Fuel-Gas Heater	0.015	lb/hr excludes SSM	(One (1) indirect fuel-gas heater, rated at 2 mmBtu/hr heat input, which shall only burn natural gas, for the purpose of heating the natural gas fuel prior to combustion in the Caterpillar 4SLB RICE)

Appendix A
KNO Restart - RBLC Summary

KNO Restart
RBLC Search Summary
Search: "Start up", "Start-up","Preheat" - All Results Included
Unit 13 - Startup Heater

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
Mid-Kansas Electric Company, LLC - Rubart Station	KS-0030 (draft)	3/31/16, 7/19/17 update	TPM2.5	Indirect Fuel-Gas Heater	0.015	lb/hr excludes SSM	(One (1) indirect fuel-gas heater, rated at 2 mmBtu/hr heat input, which shall only burn natural gas, for the purpose of heating the natural gas fuel prior to combustion in the Caterpillar 4SLB RICE)
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	CH4	Startup Heater	0.0023	lb/MMBtu average of 3 stack tests	good operating practices & use of natural gas
Iowa Fertilizer Company	IA-0105	10/26/2012	CH4	Startup Heater	0.0023	lb/MMBtu average of 3 stack tests	Good Combustion Practices
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	CO	Startup Heater	0.0194	lb/MMBtu average of 3 stack tests	good operating practices & use of natural gas
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	CO	Startup Heater	0.057	tons/year rolling 12 month total	good operating practices & use of natural gas
Iowa Fertilizer Company	IA-0105	10/26/2012	CO	Startup Heater	0.0194	lb/MMBtu average of 3 stack tests	Good Combustion Practices
Iowa Fertilizer Company	IA-0105	10/26/2012	CO	Startup Heater	0.1	tons/year rolling 12 month total	Good Combustion Practices
Ohio Valley Resources, LLC	TBD	9/25/2013	CO	Ammonia catalyst startup heater	37.23	lb/MMcf 3 hour average	good heater design and good combustion practices
Williams Refining & Marketing, L.L.C.	TN-0153	4/3/2002	CO	Heaters	0.01	lb/MMBtu	Unknown
Williams Refining & Marketing, L.L.C.	TN-0153	4/3/2002	CO	Heaters, Reboiler	0.01	lb/MMBtu	Unknown
Williams Refining & Marketing, L.L.C.	TN-0153	4/3/2002	CO	Heater, CCR Reactor	0.01	lb/MMBtu	Unknown
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	CO2	Startup Heater	117	lb/MMBtu average of 3 stack tests	good operating practices & use of natural gas
Iowa Fertilizer Company	IA-0105	10/26/2012	CO2	Startup Heater	117	lb/MMBtu average of 3 stack tests	Good Combustion Practices
Ohio Valley Resources, LLC	TBD	9/25/2013	CO2	Ammonia catalyst startup heater	59.61	ton/MMcf 3 hour average	good heater design and good combustion practices
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	CO2e	Startup Heater	345	tons/year rolling 12 month total	good operating practices & use of natural gas
Iowa Fertilizer Company	IA-0105	10/26/2012	CO2e	Startup Heater	638	tons/year rolling 12 month total	Good Combustion Practices
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	N2O	Startup Heater	0.0006	lb/MMBtu average of 3 stack tests	good operating practices & use of natural gas
Iowa Fertilizer Company	IA-0105	10/26/2012	N2O	Startup Heater	0.0006	lb/MMBtu average of 3 stack tests	Good Combustion Practices
Iowa Fertilizer Company	IA-0105	10/26/2012	NOx	Startup Heater	0.119	lb/MMBtu average of 3 stack tests	Good Combustion Practices
Iowa Fertilizer Company	IA-0105	10/26/2012	NOx	Startup Heater	0.63	tons/year rolling 12 month total	Good Combustion Practices
Ohio Valley Resources, LLC	TBD	9/25/2013	NOx	Ammonia catalyst startup heater	183.7	lb/MMcf 3 hour average	good heater design and good combustion practices
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM	Startup Heater	0.0024	lb/MMBtu average of 3 stack tests	good operating practices & use of natural gas
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM	Startup Heater	0.007	tons/year rolling 12 month total	good operating practices & use of natural gas
Iowa Fertilizer Company	IA-0105	10/26/2012	PM	Startup Heater	0.0024	lb/MMBtu average of 3 stack tests	Good Combustion Practices
Iowa Fertilizer Company	IA-0105	10/26/2012	PM	Startup Heater	0.01	tons/year rolling 12 month total	Good Combustion Practices
Ohio Valley Resources, LLC	TBD	9/25/2013	PM	Ammonia catalyst startup heater	1.9	lb/MMcf 3 hour average	good heater design and good combustion practices
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM10	Startup Heater	0.0024	lb/MMBtu average of 3 stack tests	good operating practices & use of natural gas
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM10	Startup Heater	0.007	tons/year rolling 12 month total	good operating practices & use of natural gas
Iowa Fertilizer Company	IA-0105	10/26/2012	PM10	Startup Heater	0.0024	lb/MMBtu average of 3 stack tests	Good Combustion Practices
Iowa Fertilizer Company	IA-0105	10/26/2012	PM10	Startup Heater	0.01	tons/year rolling 12 month total	Good Combustion Practices
Ohio Valley Resources, LLC	TBD	9/25/2013	PM10	Ammonia catalyst startup heater	7.6	lb/MMcf 3 hour average	good heater design and good combustion practices
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM2.5	Startup Heater	0.0024	lb/MMBtu average of 3 stack tests	good operating practices & use of natural gas
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM2.5	Startup Heater	0.007	tons/year rolling 12 month total	good operating practices & use of natural gas
Iowa Fertilizer Company	IA-0105	10/26/2012	PM2.5	Startup Heater	0.0024	lb/MMBtu average of 3 stack tests	Good Combustion Practices
Iowa Fertilizer Company	IA-0105	10/26/2012	PM2.5	Startup Heater	0.01	tons/year rolling 12 month total	Good Combustion Practices
Ohio Valley Resources, LLC	TBD	9/25/2013	PM2.5	Ammonia catalyst startup heater	7.6	lb/MMcf 3 hour average	good heater design and good combustion practices
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	Visible Emissions	Startup Heater	0	%	good operating practices & use of natural gas
Iowa Fertilizer Company	IA-0105	10/26/2012	Visible Emissions	Startup Heater	0	% Opacity	Good Combustion Practices
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	VOC	Startup Heater	0.0014	lb/MMBtu average of 3 stack tests	good operating practices & use of natural gas
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	VOC	Startup Heater	0.004	tons/year rolling 12 month total	good operating practices & use of natural gas
Iowa Fertilizer Company	IA-0105	10/26/2012	VOC	Startup Heater	0.0014	lb/MMBtu average of 3 stack tests	Good Combustion Practices
Iowa Fertilizer Company	IA-0105	10/26/2012	VOC	Startup Heater	0.01	tons/year rolling 12 month total	Good Combustion Practices
Ohio Valley Resources, LLC	TBD	9/25/2013	VOC	Ammonia catalyst startup heater	5.5	lb/MMcf 3 hour average	good heater design and good combustion practices

Notes:
Highlighted fields represent the lowest limit in common units (e.g., lb/MMBtu). Other units may be shown; however, there is not enough information to convert to common units or averaging times.
Some facilities are not shown because they are not fertilizer production facilities. These units are not directly comparable because they are not used for startup.

Appendix A
KNO Restart - RBLC Summary

KNO Restart
RBLC Search Summary
Search: "Urea" - All Results Included
Unit 35 - Urea Granulators A/B
Unit 36 - Urea Granulators C/D

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft)	PM	Urea Granulation Unit (EU-008)	0.163	lb/ton 3 hour average	Wet Scrubber
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft)	PM	Urea Granulation Unit (EU-008)	368040	tons/12 consecutive mos	Wet Scrubber
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft)	PM10	Urea Granulation Unit (EU-008)	0.163	lb/ton 3 hour average	Wet Scrubber
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft)	PM10	Urea Granulation Unit (EU-008)	368040	tons/12 consecutive mos	Wet Scrubber
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft)	PM2.5	Urea Granulation Unit (EU-008)	0.163	lb/ton 3 hour average	Wet Scrubber
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft)	PM2.5	Urea Granulation Unit (EU-008)	368040	tons/12 consecutive mos	Wet Scrubber
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	CH4	Urea Granulator	0.0023	lb/MMBtu average of 3 stack tests	good combustion practices
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	CO	Urea Granulator	0.0194	lb/MMBtu average of 3 stack tests	good combustion practices
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	CO	Urea Granulator	5.5	tpy rolling 12 month total	good combustion practices
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	CO2	Urea Granulator	117	lb/MMBtu average of 3 stack tests	good combustion practices
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	CO2e	Urea Granulator	33469	tpy rolling 12 month total	good combustion practices
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	N2O	Urea Granulator	0.0006	lb/MMBtu average of 3 stack tests	good combustion practices
Agrium U.S. Incorporated Kennewick Fertilizer Operations	WA-0318	7/11/2008	PM	Granular Urea Ammonium Nitrate Production	0.096	gr/dscf 24 hour average	Wet Scrubber, Mist Eliminator, and Product Hardener
Agrium U.S. Incorporated Kennewick Fertilizer Operations	WA-0318	7/11/2008	PM	Granular Urea Ammonium Nitrate Production	99.6	tons/year 12 month rolling average	Wet Scrubber, Mist Eliminator, and Product Hardener
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM	Urea Granulator	0.11	lb/ton of urea average of 3 stack tests	good combustion practices along with a wet scrubber
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM	Urea Granulator	85.7	tpy rolling 12 month total	good combustion practices along with a wet scrubber
Iowa Fertilizer Company	IA-0105	10/26/2012	PM	Urea Granulator	0.1	kg/metric ton average of 3 stack tests	Wet Scrubber
Iowa Fertilizer Company	IA-0105	10/26/2012	PM	Urea Granulator	60.4	tons/year rolling 12 month total	Wet Scrubber
Pryor Plant Chemical Company	OK-0135	2/23/2009	PM	Granulator Scrubbers	0.7	lbs/hr 24-hour	Good operating practices
Pryor Plant Chemical Company	OK-0135	2/23/2009	PM	Granulator Scrubbers	80%	Reduction	Good operating practices
Southeast Idaho Energy, LLC Power County Advanced Energy Center	ID-0017	2/10/2009	PM	Urea Granulation Vent	0.011	lb/ton	Wet Scrubber
Southeast Idaho Energy, LLC Power County Advanced Energy Center	ID-0017	2/10/2009	PM	Urea Granulation Vent	20.5	lbs/hr	Wet Scrubber
Southeast Idaho Energy, LLC Power County Advanced Energy Center	ID-0017	2/10/2009	PM	Urea Granulation Vent	20%	Reduction	Wet Scrubber
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM10	Urea Granulator	0.11	lb/ton of urea average of 3 stack tests	good combustion practices along with a wet scrubber
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM10	Urea Granulator	85.7	tpy rolling 12 month total	good combustion practices along with a wet scrubber
Iowa Fertilizer Company	IA-0105	10/26/2012	PM10	Urea Granulator	0.1	kg/metric ton average of 3 stack tests	Wet Scrubber
Iowa Fertilizer Company	IA-0105	10/26/2012	PM10	Urea Granulator	60.4	tons/year rolling 12 month total	Wet Scrubber
Koch Nitrogen Company Enid Nitrogen Plant	OK-0124	5/1/2008	PM10	Urea Granulators	6.6	lbs/hr per granulator	Wet Scrubber
Pryor Plant Chemical Company	OK-0135	2/23/2009	PM10	Granulator Scrubbers	0.7	lbs/hr 24-hour	Good operating practices
Pryor Plant Chemical Company	OK-0135	2/23/2009	PM10	Granulator Scrubbers	80%	Reduction	Good operating practices
Southeast Idaho Energy, LLC Power County Advanced Energy Center	ID-0017	2/10/2009	PM10	Urea Granulation Vent	0.005	lb/ton	Wet Scrubber
Southeast Idaho Energy, LLC Power County Advanced Energy Center	ID-0017	2/10/2009	PM10	Urea Granulation Vent	9	lbs/hr	Wet Scrubber
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM2.5	Urea Granulator	0.108	lb/ton of urea average of 3 stack tests	good combustion practices along with a wet scrubber
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM2.5	Urea Granulator	85.7	tpy rolling 12 month total	good combustion practices along with a wet scrubber
Iowa Fertilizer Company	IA-0105	10/26/2012	PM2.5	Urea Granulator	0.025	kg/metric ton average of 3 stack tests	Wet Scrubber
Iowa Fertilizer Company	IA-0105	10/26/2012	PM2.5	Urea Granulator	15.1	tons/year rolling 12 month total	Wet Scrubber
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	Visible Emission	Urea Granulator	0	%	good combustion practices and wet scrubber
Iowa Fertilizer Company	IA-0105	10/26/2012	Visible Emission	Urea Granulator	0	% opacity	Wet Scrubber
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	VOC	Urea Granulator	0.05	lb/ton of urea average of 3 stack tests	good combustion practices and wet scrubber
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	VOC	Urea Granulator	38.9	tpy rolling 12 month total	good combustion practices and wet scrubber

Notes:
Highlighted fields represent the lowest limit in common units (e.g., lb/MMBtu). Other units may be shown; however, there is not enough information to convert to common units or averaging times.

Appendix A
KNO Restart - RBLC Summary

KNO Restart
RBLC Search Summary
Search: "MDEA", "methyl","urea","42.009","61.999" - All Results
UF-85 Tanks

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
Toyota Motors - Motor Vehicle Assembly Plant	TX-0846	9/23/2018(draft)	VOC	Storage Tanks – Very Low Vapor Pressure Non Gasoline Automotive Fluids – Gear Lube, Engine Oil, Diesel fuel, Urea, ATF Etc. <20,000 gal each	0		P2: White fixed roof storage tanks equipped with a submerged fill pipe. use of drain dry construction is required to minimize the emissions from tank entry and inspection.
Iowa Fertilizer Company	IA-0105	10/26/2012	VOC	MDEA Storage Tank	0.1	tons/year rolling 12 month total	Nitrogen Gas Blanket
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	VOC	Urea uf-85 Storage Tank	0.046	lb/hr average of 3 stack tests	packed bed scrubber

Notes:
Highlighted fields represent the lowest limit in common units (e.g., lb/MMBtu). Other units may be shown; however, there is not enough information to convert to common units or averaging times.

Appendix A
KNO Restart - RBLC Summary

KNO Restart
RBLC Search Summary
Search: "Cooling Tower" - All Results Included
Unit 40 - Cooling Tower

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
Nucor Steel Kankakee, Inc.	IL-0126	11/1/2018 updated 2/19/2019	TPM (PM, PM10 and PM2.5)	Cooling Tower	0.0010	Weight %	Drift Eliminator (BACT-PSD) 4500.00 gallons/minute throughput
Nucor Steel Kankakee, Inc.	IL-0126	11/1/2018 updated 2/19/2019	TPM (PM, PM10 and PM2.5)	Cooling Tower	4000	total dissolved solid	Drift Eliminator (BACT-PSD) 4500.00 gallons/minute throughput
Nucor Steel Kankakee, Inc.	IL-0126	11/1/2018 updated 2/19/2019	TPM (PM, PM10 and PM2.5)	Cooling Tower	0.79	tpy 12-month rolling basis	Permit Limit
Knauf Insulation, Inc. - Albion Facility	MI-0437	10/10/2018 updated 2/19/2019	FPM	EU-COOLTOWER (Cooling Tower)	0.39	tpy 12-month rolling basis	Drift Eliminator (99.0 % efficient) (BACT-PSD-SIP) 1500.00 gallons/minute throughput
Knauf Insulation, Inc. - Albion Facility	MI-0437	10/10/2018 updated 2/19/2019	TPM10	EU-COOLTOWER (Cooling Tower)	0.39	tpy 12-month rolling basis	Drift Eliminator (99.0 % efficient) (BACT-PSD-SIP)
Knauf Insulation, Inc. - Albion Facility	MI-0437	10/10/2018 updated 2/19/2019	TPM2.5	EU-COOLTOWER (Cooling Tower)	0.39	tpy 12-month rolling basis	Drift Eliminator (99.0 % efficient) (BACT-PSD-SIP)
Knauf Insulation, Inc. - Albion Facility	MI-0437	10/10/2018 updated 2/19/2019	FPM	EU-COOLTOWER (Cooling Tower)	2200	PPM by weight monthly	Drift Eliminator (99.0 % efficient) (BACT-PSD-SIP)
Knauf Insulation, Inc. - Albion Facility	MI-0437	10/10/2018 updated 2/19/2019	TPM10	EU-COOLTOWER (Cooling Tower)	2200	PPM by weight monthly	Drift Eliminator (99.0 % efficient) (BACT-PSD-SIP)
Knauf Insulation, Inc. - Albion Facility	MI-0437	10/10/2018 updated 2/19/2019	TPM2.5	EU-COOLTOWER (Cooling Tower)	2200	PPM by weight monthly	Drift Eliminator (99.0 % efficient) (BACT-PSD-SIP)
Knauf Insulation, Inc. - Albion Facility	MI-0437	10/10/2018 updated 2/19/2019	FPM	EU-COOLTOWER (Cooling Tower)	0.005	% drift rate or less	Drift Eliminator (99.0 % efficient) (BACT-PSD-SIP) Vendor certification of drift rate required
Knauf Insulation, Inc. - Albion Facility	MI-0437	10/10/2018 updated 2/19/2019	TPM10	EU-COOLTOWER (Cooling Tower)	0.005	% drift rate or less	Drift Eliminator (99.0 % efficient) (BACT-PSD-SIP) Vendor certification of drift rate required
Knauf Insulation, Inc. - Albion Facility	MI-0437	10/10/2018 updated 2/19/2019	TPM2.5	EU-COOLTOWER (Cooling Tower)	0.005	% drift rate or less	Drift Eliminator (99.0 % efficient) (BACT-PSD-SIP) Vendor certification of drift rate required
Premcor Refining Group - Valero Port Arthur Refinery	TX-0847 (draft)	9/16/2018 updated 2/14/2019	VOC	Cooling Tower/Heat Exchange System	0.08	PPMW	Noncontact (BACT-PSD)
Premcor Refining Group - Valero Port Arthur Refinery	TX-0847 (draft)	9/16/2018 updated 2/14/2019	TPM10	Cooling Tower/Heat Exchange System	0.001	% drift rate or less	Drift Eliminators (BACT-PSD)
Premcor Refining Group - Valero Port Arthur Refinery	TX-0847 (draft)	9/16/2018 updated 2/14/2019	TPM2.5	Cooling Tower/Heat Exchange System	0.001	% drift rate or less	Drift Eliminators (BACT-PSD)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018 updated 2/19/2019	FPM	EUCOOLINGTWR: Cooling Tower (14 cell wet mechanical draft cooling tower)	4.03	lb/hr hourly	High Efficiency Drift/Mist Eliminators (BACT-PSD)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018 updated 2/19/2019	FPM	EUCOOLINGTWR: Cooling Tower (14 cell wet mechanical draft cooling tower)	0.0005	% drift rate or less	High Efficiency Drift/Mist Eliminators (BACT-PSD) Vendor certification of drift rate required
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018 updated 2/19/2019	FPM	EUCOOLINGTWR: Cooling Tower (14 cell wet mechanical draft cooling tower)	3000	PPM TDS by weight monthly	Permit Limit
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018 updated 2/19/2019	TPM10	EUCOOLINGTWR: Cooling Tower (14 cell wet mechanical draft cooling tower)	0.48	lb/hr	High Efficiency Drift/Mist Eliminators (BACT-PSD)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018 updated 2/19/2019	TPM10	EUCOOLINGTWR: Cooling Tower (14 cell wet mechanical draft cooling tower)	0.0005	% drift rate or less	High Efficiency Drift/Mist Eliminators (BACT-PSD) Vendor certification of drift rate required
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018 updated 2/19/2019	TPM10	EUCOOLINGTWR: Cooling Tower (14 cell wet mechanical draft cooling tower)	3000	PPM TDS by weight monthly	Permit Limit
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018 updated 2/19/2019	TPM2.5	EUCOOLINGTWR: Cooling Tower (14 cell wet mechanical draft cooling tower)	0.48	lb/hr	High Efficiency Drift/Mist Eliminators (BACT-PSD)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018 updated 2/19/2019	TPM2.5	EUCOOLINGTWR: Cooling Tower (14 cell wet mechanical draft cooling tower)	0.0005	% drift rate or less	High Efficiency Drift/Mist Eliminators (BACT-PSD) Vendor certification of drift rate required
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018 updated 2/19/2019	TPM2.5	EUCOOLINGTWR: Cooling Tower (14 cell wet mechanical draft cooling tower)	3000	PPM TDS by weight monthly	Permit Limit

Appendix A
KNO Restart - RBLC Summary

KNO Restart
RBLC Search Summary
Search: "Cooling Tower" - All Results Included
Unit 40 - Cooling Tower

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
Dow Chemical - LHC-9	TX-0841	7/1/2018 updated 2/19/2019	FPM	Cooling Tower/Heat Exchange System	0.005	% efficiency	Drift Eliminators (BACT-PSD)
Dow Chemical - LHC-9	TX-0841	7/1/2018 updated 2/19/2019	TPM10	Cooling Tower/Heat Exchange System	0.005	% efficiency	Drift Eliminators (BACT-PSD)
Dow Chemical - LHC-9	TX-0841	7/1/2018 updated 2/19/2019	TPM2.5	Cooling Tower/Heat Exchange System	0.005	% efficiency	Drift Eliminators (BACT-PSD)
Marshall Energy Center LLC MEC North, LLC and MEC South LLC	MI-0433	6/29/2018 updated 2/19/2019	FPM	EUCOOLTOWER (North Plant): Cooling Tower (8 cell wet mechanical draft cooling tower)	5.59	tpy 12-month rolling basis	High Efficiency Drift/Mist Eliminators (BACT-PSD) (170,000 gal/min)
Marshall Energy Center LLC MEC North, LLC and MEC South LLC	MI-0433	6/29/2018 updated 2/19/2019	FPM	EUCOOLTOWER (North Plant): Cooling Tower (8 cell wet mechanical draft cooling tower)	0.0005	% drift rate or less	High Efficiency Drift/Mist Eliminators (BACT-PSD) Vendor certification of drift rate required
Marshall Energy Center LLC MEC North, LLC and MEC South LLC	MI-0433	6/29/2018 updated 2/19/2019	FPM	EUCOOLTOWER (North Plant): Cooling Tower (8 cell wet mechanical draft cooling tower)	3000	PPM TDS by weight monthly	Permit Limit
Marshall Energy Center LLC MEC North, LLC and MEC South LLC	MI-0433	6/29/2018 updated 2/19/2019	TPM10	EUCOOLTOWER (North Plant): Cooling Tower (8 cell wet mechanical draft cooling tower)	2.85	tpy 12-month rolling basis	High Efficiency Drift/Mist Eliminators (BACT-PSD) (170,000 gal/min)
Marshall Energy Center LLC MEC North, LLC and MEC South LLC	MI-0433	6/29/2018 updated 2/19/2019	TPM10	EUCOOLTOWER (North Plant): Cooling Tower (8 cell wet mechanical draft cooling tower)	0.0005	% drift rate or less	High Efficiency Drift/Mist Eliminators (BACT-PSD) Vendor certification of drift rate required
Marshall Energy Center LLC MEC North, LLC and MEC South LLC	MI-0433	6/29/2018 updated 2/19/2019	TPM10	EUCOOLTOWER (North Plant): Cooling Tower (8 cell wet mechanical draft cooling tower)	3000	PPM TDS by weight monthly	Permit Limit
Marshall Energy Center LLC MEC North, LLC and MEC South LLC	MI-0433	6/29/2018 updated 2/19/2019	TPM2.5	EUCOOLTOWER (North Plant): Cooling Tower (8 cell wet mechanical draft cooling tower)	2.85	tpy 12-month rolling basis	High Efficiency Drift/Mist Eliminators (BACT-PSD) (170,000 gal/min)
Marshall Energy Center LLC MEC North, LLC and MEC South LLC	MI-0433	6/29/2018 updated 2/19/2019	TPM2.5	EUCOOLTOWER (North Plant): Cooling Tower (8 cell wet mechanical draft cooling tower)	0.0005	% drift rate or less	High Efficiency Drift/Mist Eliminators (BACT-PSD) Vendor certification of drift rate required
Marshall Energy Center LLC MEC North, LLC and MEC South LLC	MI-0433	6/29/2018 updated 2/19/2019	TPM2.5	EUCOOLTOWER (North Plant): Cooling Tower (8 cell wet mechanical draft cooling tower)	3000	PPM TDS by weight monthly	Permit Limit
Marshall Energy Center LLC MEC North, LLC and MEC South LLC	MI-0433	6/29/2018 updated 2/19/2019	FPM	EUCOOLTOWER (South Plant): Cooling Tower (8 cell wet mechanical draft cooling tower)	5.59	tpy 12-month rolling basis	High Efficiency Drift/Mist Eliminators (BACT-PSD) (170,000 gal/min)
Marshall Energy Center LLC MEC North, LLC and MEC South LLC	MI-0433	6/29/2018 updated 2/19/2019	FPM	EUCOOLTOWER (South Plant): Cooling Tower (8 cell wet mechanical draft cooling tower)	0.0005	% drift rate or less	High Efficiency Drift/Mist Eliminators (BACT-PSD) Vendor certification of drift rate required
Marshall Energy Center LLC MEC North, LLC and MEC South LLC	MI-0433	6/29/2018 updated 2/19/2019	FPM	EUCOOLTOWER (South Plant): Cooling Tower (8 cell wet mechanical draft cooling tower)	3000	PPM TDS by weight monthly	Permit Limit
Marshall Energy Center LLC MEC North, LLC and MEC South LLC	MI-0433	6/29/2018 updated 2/19/2019	TPM10	EUCOOLTOWER (South Plant): Cooling Tower (8 cell wet mechanical draft cooling tower)	2.85	tpy 12-month rolling basis	High Efficiency Drift/Mist Eliminators (BACT-PSD) (170,000 gal/min)
Marshall Energy Center LLC MEC North, LLC and MEC South LLC	MI-0433	6/29/2018 updated 2/19/2019	TPM10	EUCOOLTOWER (South Plant): Cooling Tower (8 cell wet mechanical draft cooling tower)	0.0005	% drift rate or less	High Efficiency Drift/Mist Eliminators (BACT-PSD) Vendor certification of drift rate required
Marshall Energy Center LLC MEC North, LLC and MEC South LLC	MI-0433	6/29/2018 updated 2/19/2019	TPM10	EUCOOLTOWER (South Plant): Cooling Tower (8 cell wet mechanical draft cooling tower)	3000	PPM TDS by weight monthly	Permit Limit
Marshall Energy Center LLC MEC North, LLC and MEC South LLC	MI-0433	6/29/2018 updated 2/19/2019	TPM2.5	EUCOOLTOWER (South Plant): Cooling Tower (8 cell wet mechanical draft cooling tower)	2.85	tpy 12-month rolling basis	High Efficiency Drift/Mist Eliminators (BACT-PSD) (170,000 gal/min)
Marshall Energy Center LLC MEC North, LLC and MEC South LLC	MI-0433	6/29/2018 updated 2/19/2019	TPM2.5	EUCOOLTOWER (South Plant): Cooling Tower (8 cell wet mechanical draft cooling tower)	0.0005	% drift rate or less	High Efficiency Drift/Mist Eliminators (BACT-PSD) Vendor certification of drift rate required
Marshall Energy Center LLC MEC North, LLC and MEC South LLC	MI-0433	6/29/2018 updated 2/19/2019	TPM2.5	EUCOOLTOWER (South Plant): Cooling Tower (8 cell wet mechanical draft cooling tower)	3000	PPM TSD by weight monthly	High Efficiency Drift/Mist Eliminators (Permit) (170,000 gal/min)
Shintech Louisiana, LLC - Plaquemines Plant 1	LA-0328	5/2/2018 updated 2/19/2019	TPM10	Cooling Tower 2 (P-35)	0.0005	% drift rate or less	Drift Eliminator (BACT-PSD, OPERATING PERMIT) (26,000 gal/min)
Shintech Louisiana, LLC - Plaquemines Plant 1	LA-0328	5/2/2018 updated 2/19/2019	TPM2.5	Cooling Tower 2 (P-35)	0.0005	% drift rate or less	Drift Eliminator (BACT-PSD, OPERATING PERMIT) (26,000 gal/min)

Appendix A
KNO Restart - RBLC Summary

KNO Restart
RBLC Search Summary
Search: "Cooling Tower" - All Results Included
Unit 40 - Cooling Tower

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
Novi Energy - C4GT, LLC	VA-0328 (draft)	4/26/2018 updated 11/16/2018(draft)		Cooling Tower	6250	mg/l TSD - monthly water quality testing	This is pollution prevention measure. No Controls Feasible (SIP)
Entergy Texas Inc - Montgomery County Power Station	TX-0834	3/30/2018 updated 2/19/2019	TPM	Cooling Tower	0.005	% efficiency	Drift Eliminators (BACT-PSD)(9,864,000 gal/hr)
Entergy Texas Inc - Montgomery County Power Station	TX-0834	3/30/2018 updated 2/19/2019	TPM10	Cooling Tower	0.005	% efficiency	Drift Eliminators (BACT-PSD)(9,864,000 gal/hr)
Entergy Texas Inc - Montgomery County Power Station	TX-0834	3/30/2018 updated 2/19/2019	TPM2.5	Cooling Tower	0.005	% efficiency	Drift Eliminators (BACT-PSD)(9,864,000 gal/hr)
Exxonmobil Oil Corporation - Exxonmobile Beaumont Refinery	TX-0832	1/9/2018 updated 2/19/2019	TPM	Cooling Towers	0.005	% efficiency	Drift Eliminator (BACT-PSD, NSPS Ja, MACT CC)
Exxonmobil Oil Corporation - Exxonmobile Beaumont Refinery	TX-0832	1/9/2018 updated 2/19/2019	TPM10	Cooling Towers	0.005	% efficiency	Drift Eliminator (BACT-PSD, NSPS Ja, MACT CC)
Exxonmobil Oil Corporation - Exxonmobile Beaumont Refinery	TX-0832	1/9/2018 updated 2/19/2019	TPM2.5	Cooling Towers	0.005	% efficiency	Drift Eliminator (BACT-PSD, NSPS Ja, MACT CC)
Filer City Station Limited Partnership - Filer City Station	MI-0427	11/17/2017 updated 3/8/2018	FPM	EUCOOLTWR (Cooling Tower--Wet Mechanical Drift)	0.0006	% max drift rate (vendor certified)	BACT is to equip and maintain four-cell evaporative cooling tower in series with mechanical chilling to cool turbine inlet air with high efficiency drift eliminators.
Filer City Station Limited Partnership - Filer City Station	MI-0427	11/17/2017 updated 3/8/2018	FPM	EUCOOLTWR (Cooling Tower--Wet Mechanical Drift)	7700	PPM TDS by weight	BACT is to equip and maintain four-cell evaporative cooling tower in series with mechanical chilling to cool turbine inlet air with high efficiency drift eliminators.
Filer City Station Limited Partnership - Filer City Station	MI-0427	11/17/2017 updated 3/8/2018	TPM10	EUCOOLTWR (Cooling Tower--Wet Mechanical Drift)	0.0006	% max drift rate (vendor certified)	BACT is to equip and maintain four-cell evaporative cooling tower in series with mechanical chilling to cool turbine inlet air with high efficiency drift eliminators.
Filer City Station Limited Partnership - Filer City Station	MI-0427	11/17/2017 updated 3/8/2018	TPM10	EUCOOLTWR (Cooling Tower--Wet Mechanical Drift)	7700	PPM TDS by weight	BACT is to equip and maintain four-cell evaporative cooling tower in series with mechanical chilling to cool turbine inlet air with high efficiency drift eliminators.
Filer City Station Limited Partnership - Filer City Station	MI-0427	11/17/2017 updated 3/8/2018	TPM2.5	EUCOOLTWR (Cooling Tower--Wet Mechanical Drift)	0.0006	% max drift rate (vendor certified)	BACT is to equip and maintain four-cell evaporative cooling tower in series with mechanical chilling to cool turbine inlet air with high efficiency drift eliminators.
Filer City Station Limited Partnership - Filer City Station	MI-0427	11/17/2017 updated 3/8/2018	TPM2.5	EUCOOLTWR (Cooling Tower--Wet Mechanical Drift)	7700	PPM TDS by weight	BACT is to equip and maintain four-cell evaporative cooling tower in series with mechanical chilling to cool turbine inlet air with high efficiency drift eliminators.
Kimberly-Clark Corporation - Mobile Operations - Kimberly-Clark Mobile	AL-0321	10/11/2017 updated 5/11/2018	FPM10	803 Cooling Tower	0.005	% drift elimination	No Controls Feasible
Kimberly-Clark Corporation - Mobile Operations - Kimberly-Clark Mobile	AL-0321	10/11/2017 updated 5/11/2018	FPM10	803 Cooling Tower	1000	mg/L TDS 12 month avg	No Controls Feasible
Kimberly-Clark Corporation - Mobile Operations - Kimberly-Clark Mobile	AL-0321	10/11/2017 updated 5/11/2018	FPM2.5	803 Cooling Tower	0.005	% drift elimination	No Controls Feasible
Kimberly-Clark Corporation - Mobile Operations - Kimberly-Clark Mobile	AL-0321	10/11/2017 updated 5/11/2018	FPM2.5	803 Cooling Tower	1000	mg/L TDS 12 month avg	No Controls Feasible
Knauf Insulation, Inc. - Inwood	WV-0027	9/15/2017 updated 5/1/2018	TPM	Cooling Tower 3 Cells	0.04	lb/hr 3-hour avg	0.005% drift eliminator - Restrict the make-up water to be provided from the local water company or have a TDS of less than 750 ppm by weight. 3 mechanical draft cooling towers.
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft)	PM	Eighteen Cell Cooling Tower (EU-010)	2000	mg/l avg on a monthly basis	High Efficiency Drift Eliminator
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft)	PM	Eighteen Cell Cooling Tower (EU-010)	0.0005	% Drift	High Efficiency Drift Eliminator
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft)	PM10	Eighteen Cell Cooling Tower (EU-010)	2000	mg/l avg on a monthly basis	High Efficiency Drift Eliminator
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft)	PM10	Eighteen Cell Cooling Tower (EU-010)	0.0005	% Drift	High Efficiency Drift Eliminator
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft)	PM2.5	Eighteen Cell Cooling Tower (EU-010)	2000	mg/l avg on a monthly basis	High Efficiency Drift Eliminator
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft)	PM2.5	Eighteen Cell Cooling Tower (EU-010)	0.0005	% Drift	High Efficiency Drift Eliminator
Topchem Pollock, LLC	LA-0306	12/20/2016, updated 8/8/17	PM2.5	Cooling Tower CT-16-1 (EQT032)	0.001	lbs/hr	High Efficiency Drift Eliminator
Topchem Pollock, LLC	LA-0306	12/20/2016, updated 8/8/17	PM2.5	Cooling Tower CT-16-1 (EQT032)	0.01	tons/year	High Efficiency Drift Eliminator
Lake Charles Methanol, LLC	LA-0305	6/30/16, 4/26/17 update	PM10	Cooling Towers	0.0005	% three one-hour test average	Drift Eliminators (Unit A = 241,843 gpm Unit B = 201,196 gpm Unit C = 72,531 gpm)
Lake Charles Methanol, LLC	LA-0305	6/30/16, 4/26/17 update	PM2.5	Cooling Towers		% three one-hour test average	Drift Eliminators (Unit A = 241,843 gpm Unit B = 201,196 gpm Unit C = 72,531 gpm)
Lyondell Chemical Bayport Choate Plant	TX-0823 (draft)	6/7/17 draft, 8/7/17 update	VOC	Cooling Towers	4.05	tpy	VOC leak detection system to identify leaks into the cooling water (LAER) (products and byproducts throughput)
Total Petrochemicals & Refining USA, Inc.	TX-0815 (draft)	1/17/17 draft, 1/26/17 update	VOC	Cooling Towers	27.95	tpy	coolint water VOC concentration (non-contact) (MACT XX) (no additional notes)
Total Petrochemicals & Refining USA, Inc.	TX-0815 (draft)	1/17/17 draft, 1/26/17 update	PM10	Cooling Towers	No numerical limit	No numerical limit	Drift Eliminators (99.999% efficiency)
Methanex - Geismar Methanol Plant	LA-0317	12/22/16, 4/28/17 update	PM10	Cooling Towers (I-CT-621, II-CT-621)	0.001	% Drift Rate	Drift Eliminators (66000 gpm throughput)

KNO Restart
RBLC Search Summary
Search: "Cooling Tower" - All Results Included
Unit 40 - Cooling Tower

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
Methanex - Geismar Methanol Plant	LA-0317	12/22/16, 4/28/17 update	PM2.5	Cooling Towers (I-CT-621, II-CT-621)	0.001	% Drift Rate	Drift Eliminators (66000 gpm throughput)
Holland Board of Public Works - East 5th Street	MI-0424 (draft)	12/5/16 draft, 7/31/17 update	TPM10	EUCOOLTWR (Cooling Tower--Wet Mechanical Draft)	2.37	tpy 12-month rolling time period	Mist/Drift Eliminators (SIP) (A three-cell wet mechanical draft cooling tower with plume abatement by a dry heat exchanger.)
Holland Board of Public Works - East 5th Street	MI-0424 (draft)	12/5/16 draft, 7/31/17 update	TPM10	EUCOOLTWR (Cooling Tower--Wet Mechanical Draft)	0.005	% Drift Rate	Mist/Drift Eliminators (SIP) (A three-cell wet mechanical draft cooling tower with plume abatement by a dry heat exchanger.)
Holland Board of Public Works - East 5th Street	MI-0424 (draft)	12/5/16 draft, 7/31/17 update	TPM2.5	EUCOOLTWR (Cooling Tower--Wet Mechanical Draft)	2.37	tpy 12-month rolling time period	Mist/Drift Eliminators (SIP) (A three-cell wet mechanical draft cooling tower with plume abatement by a dry heat exchanger.)
Holland Board of Public Works - East 5th Street	MI-0424 (draft)	12/5/16 draft, 7/31/17 update	TPM2.5	EUCOOLTWR (Cooling Tower--Wet Mechanical Draft)	0.005	% Drift Rate	Mist/Drift Eliminators (SIP) (A three-cell wet mechanical draft cooling tower with plume abatement by a dry heat exchanger.)
Nucor Steel	IN-0255	9/21/16, 10/11/16 update	FPM	Hot Mill Contact Cooling Tower	0.001	% Drift Rate	Drift Eliminators (25000 gpm throughput)
Nucor Steel	IN-0255	9/21/16, 10/11/16 update	FPM	Hot Mill Contact Cooling Tower	0.38	lb/hr	Drift Eliminators (25000 gpm throughput)
Nucor Steel	IN-0255	9/21/16, 10/11/16 update	TPM10	Hot Mill Contact Cooling Tower	0.001	% Drift Rate	Drift Eliminators (25000 gpm throughput)
Nucor Steel	IN-0255	9/21/16, 10/11/16 update	TPM10	Hot Mill Contact Cooling Tower	0.19	lb/hr	Drift Eliminators (25000 gpm throughput)
Nucor Steel	IN-0255	9/21/16, 10/11/16 update	TPM2.5	Hot Mill Contact Cooling Tower	0.001	% Drift Rate	Drift Eliminators (25000 gpm throughput)
Nucor Steel	IN-0255	9/21/16, 10/11/16 update	TPM2.5	Hot Mill Contact Cooling Tower	0.001	lb/hr	Drift Eliminators (25000 gpm throughput)
CPV Fairview Energy Center	PA-0310 (draft)	9/2/16 draft, 7/31/17 update	TPM	Cooling Tower	0.8	lb/hr	NSPS (12-cell mechanical draft wet cooling tower with high-efficiency drift eliminator. Permittee shall sample, analyze, and record the circulating water TDS on a monthly basis. TDS solids shall not exceed 1500 ppm.)
CPV Fairview Energy Center	PA-0310 (draft)	9/2/16 draft, 7/31/17 update	TPM	Cooling Tower	3.4	tpy 12-month rolling basis	NSPS (12-cell mechanical draft wet cooling tower with high-efficiency drift eliminator. Permittee shall sample, analyze, and record the circulating water TDS on a monthly basis. TDS solids shall not exceed 1500 ppm.)
CPV Fairview Energy Center	PA-0310 (draft)	9/2/16 draft, 7/31/17 update	TPM10	Cooling Tower	0.8	lb/hr	NSPS (12-cell mechanical draft wet cooling tower with high-efficiency drift eliminator. Permittee shall sample, analyze, and record the circulating water TDS on a monthly basis. TDS solids shall not exceed 1500 ppm.)
CPV Fairview Energy Center	PA-0310 (draft)	9/2/16 draft, 7/31/17 update	TPM10	Cooling Tower	3.4	tpy	NSPS (12-cell mechanical draft wet cooling tower with high-efficiency drift eliminator. Permittee shall sample, analyze, and record the circulating water TDS on a monthly basis. TDS solids shall not exceed 1500 ppm.)
CPV Fairview Energy Center	PA-0310 (draft)	9/2/16 draft, 7/31/17 update	TPM2.5	Cooling Tower	0.4	lb/hr	NSPS (12-cell mechanical draft wet cooling tower with high-efficiency drift eliminator. Permittee shall sample, analyze, and record the circulating water TDS on a monthly basis. TDS solids shall not exceed 1500 ppm.)
CPV Fairview Energy Center	PA-0310 (draft)	9/2/16 draft, 7/31/17 update	TPM2.5	Cooling Tower	1.8	tpy	NSPS (12-cell mechanical draft wet cooling tower with high-efficiency drift eliminator. Permittee shall sample, analyze, and record the circulating water TDS on a monthly basis. TDS solids shall not exceed 1500 ppm.)
Sasol Chemicals - Comonimer-1 Unit	LA-0277	9/1/16, 4/28/17 update	VOC	Cooling Tower Y12-800			NESHAP - Comply with requirements of 40 CFR 63.104 (15200 gpm)
Sasol Chemicals -Lake Charles Chemical Complex - Comonimer-1 Unit	LA-0319	9/1/16, 4/28/17 update	VOC	cooling tower y12-800			NESHAP - Comply with requirements of 40 CFR 63.104
Entergy Louisiana, LLC - St. Charles Power Station	LA-0313	8/31/16, 4/28/17 update	FPM10	SCPS Cooling Tower 1	1.24	lb/hr hourly maximum	High Efficiency Drift Eliminators (164400 gpm)
Entergy Louisiana, LLC - St. Charles Power Station	LA-0313	8/31/16, 4/28/17 update	FPM10	SCPS Cooling Tower 1	3.61	tpy annual maximum	High Efficiency Drift Eliminators (164400 gpm)
Entergy Louisiana, LLC - St. Charles Power Station	LA-0313	8/31/16, 4/28/17 update	FPM10	SCPS Cooling Tower 1	0.005	% Drift Rate	BACT - High Efficiency Drift Eliminators (164400 gpm)
Entergy Louisiana, LLC - St. Charles Power Station	LA-0313	8/31/16, 4/28/17 update	FPM2.5	SCPS Cooling Tower 1	1.24	lb/hr hourly maximum	High Efficiency Drift Eliminators (164400 gpm)
Entergy Louisiana, LLC - St. Charles Power Station	LA-0313	8/31/16, 4/28/17 update	FPM2.5	SCPS Cooling Tower 1	3.61	tpy annual maximum	High Efficiency Drift Eliminators (164400 gpm)
Entergy Louisiana, LLC - St. Charles Power Station	LA-0313	8/31/16, 4/28/17 update	FPM2.5	SCPS Cooling Tower 1	0.005	% Drift Rate	BACT - High Efficiency Drift Eliminators (164400 gpm)
Indorama Ventures Olefins, LLC - Indorama Lake Charles Facility	LA-0314	8/3/16, 4/28/17 update	TPM10	cooling towers - 007	0.005	% Drift Rate	Drift Eliminators (86500 gpm)
Indorama Ventures Olefins, LLC - Indorama Lake Charles Facility	LA-0314	8/3/16, 4/28/17 update	TPM10	cooling towers - 007	1400	PPM TDS	Drift Eliminators (86500 gpm)
Indorama Ventures Olefins, LLC - Indorama Lake Charles Facility	LA-0314	8/3/16, 4/28/17 update	TPM2.5	cooling towers - 007	0.005	% Drift Rate	Drift Eliminators (86500 gpm)
Indorama Ventures Olefins, LLC - Indorama Lake Charles Facility	LA-0314	8/3/16, 4/28/17 update	TPM2.5	cooling towers - 007	1400	PPM TDS	Drift Eliminators (86500 gpm)
Indorama Ventures Olefins, LLC - Indorama Lake Charles Facility	LA-0314	8/3/16, 4/28/17 update	VOC	cooling towers - 007	No numeric limit		NESHAP - monitored as required by 40 CFR 63 subpart XX (86500 gpm)

Appendix A
KNO Restart - RBLC Summary

KNO Restart
RBLC Search Summary
Search: "Cooling Tower" - All Results Included
Unit 40 - Cooling Tower

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
Stonegate Power, LLC - Middlesex Energy Center, LLC	NJ-0085	7/19/16, 11/3/16 update	FPM	Cooling Tower	0.685	lb/hr	BACT, NSPS - High Efficiency Drift Eliminators (One 8-cell, 124,800 gallon per minute (GPM) Mechanical Induced Draft Cooling Tower)
Stonegate Power, LLC - Middlesex Energy Center, LLC	NJ-0085	7/19/16, 11/3/16 update	FPM10	Cooling Tower	0.535	lb/hr	BACT - High Efficiency Drift Eliminators (One 8-cell, 124,800 gallon per minute (GPM) Mechanical Induced Draft Cooling Tower)
Stonegate Power, LLC - Middlesex Energy Center, LLC	NJ-0085	7/19/16, 11/3/16 update	FPM2.5	Cooling Tower	0.223	lb/hr	BACT - High Efficiency Drift Eliminators (One 8-cell, 124,800 gallon per minute (GPM) Mechanical Induced Draft Cooling Tower)
Equistar Chemicals, LP - Westlake Facility	LA-0295	7/12/16, 9/19/16 update	VOC	CGP Unit Cooling Tower (3-03, EQT 15)	0.13	lb/hr hourly maximum	BACT - Monthly hydrocarbon monitoring; maintain equipment to minimize fugitive emissions; repair faulty equipment at the earliest opportunity, but no later than the next scheduled unit shutdown (Annual VOC emissions from the CGP Unit Cooling Tower, along with VOC emissions from a number of other cooling towers not addressed in the PSD permit, are capped at 12.29 TPY (GRP 13). (3000 GPM)
Flint Hills Resources Houston Chemical LLC - PL Propylene Houston Olefins Plant	TX-0803 (draft)	7/12/16 draft, 8/31/16 update	TPM10	Cooling Tower	0.001	% Drift Rate	BACT - Drift Eliminators
Flint Hills Resources Houston Chemical LLC - PL Propylene Houston Olefins Plant	TX-0803 (draft)	7/12/16 draft, 8/31/16 update	TPM2.5	Cooling Tower	0.001	% Drift Rate	BACT - Drift Eliminators
Flint Hills Resources Houston Chemical LLC - PL Propylene Houston Olefins Plant	TX-0801 (draft)	6/24/16 draft, 7/20/16 update	CO2e	Cooling Tower	0.005	Drift	BACT - % drift design
Florida Power & Light - Okeechobee Clean Energy Center	FL-0356	03/09/2016	TPM	Mechanical draft cooling tower	0.0005	% Drift Rate	BACT (Must have certified drift rate no more than 0.0005%)
Commercial Metals Company - CMC Steel Oklahoma	OK-0173	1/19/16, 7/7/16 update	TPM10	Cooling Towers	0.001	% Drift Rate	BACT - Drift Eliminators (For this analysis, as a simplifying conservative assumption, all of the particulate resulting from the drift is considered to be PM10.Throughput Capacity/Size deemed "Confidential" by applicant.) (The only feasible option at this location is a wet cooling tower with high efficiency drift eliminators (0.001%). The emission rate is somewhat higher than many cooling towers, but the sizes proposed are very much smaller than the cooling towers that are installed at power plants, refineries, etc.)
Flopam, Inc. - Flopam Facility	LA-0318	1/7/16, 4/28/17 update	TPM10	Cooling Towers	No numeric limit		Integrated Drift Eliminators (PSD-LA-747 entered as LA-0240 and PSD-LA-747(M1) entered as LA-0251. LA-0318 is for PSD-747(M2), dated 7/5/12 (add dust collectors, cooling tower, and diesel engines), PSD-747(M3), dated 5/13/13 (no BACT changes), PSD-747(M4), dated 2/10/15 (add a cooling tower and diesel engines), and PSD-747(M5), dated 1/7/16 (add dust collectors))
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM	Cooling Towers	0.0005	% Drift	Drift Eliminator
Iowa Fertilizer Company	IA-0105	10/26/2012	PM	Cooling Tower	0.0005	% Drift	Drift Eliminator
Ohio Valley Resources, LLC	TBD	9/26/2013	PM	Cooling Towers	0.0005	% Drift	High Efficiency Drift Eliminator
Southeast Idaho Energy, LLC Power County Advanced Energy Center	ID-0017	2/10/2009	PM	Cooling Tower	0.0005	% of total circ flow	Drift/Mist Eliminators
Southeast Idaho Energy, LLC Power County Advanced Energy Center	ID-0017	2/10/2009	PM	Cooling Tower	1.5	lbs/hr	Drift/Mist Eliminators
Southeast Idaho Energy, LLC Power County Advanced Energy Center	ID-0017	2/10/2009	PM	Cooling Tower	20%	Reduction	Drift/Mist Eliminators
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM10	Cooling Towers	0.0005	% Drift	Drift Eliminator
Consolidated Environmental Management Inc. - Nucor Direct Reduction Iron Plant	LA-0248	1/27/2011	PM10	Process Water Cooling Tower	0.11	lbs/hr	BACT is a combination of less than or equal to 1000 milligrams per liter TDS concentration in the culling water and drift eliminators employing a drift maximum of 0.0005%
Consolidated Environmental Management Inc. - Nucor Direct Reduction Iron Plant	LA-0248	1/27/2011	PM10	Process Water Cooling Tower	0.4	tons/year	BACT is a combination of less than or equal to 1000 milligrams per liter TDS concentration in the culling water and drift eliminators employing a drift maximum of 0.0005%
Consolidated Environmental Management Inc. - Nucor Direct Reduction Iron Plant	LA-0248	1/27/2011	PM10	Clean Water Cooling Tower	0.07	lbs/hr	BACT is a combination of less than or equal to 1000 milligrams per liter TDS concentration in the culling water and drift eliminators employing a drift maximum of 0.0005%
Consolidated Environmental Management Inc. - Nucor Direct Reduction Iron Plant	LA-0248	1/27/2011	PM10	Clean Water Cooling Tower	0.29	tons/year	BACT is a combination of less than or equal to 1000 milligrams per liter TDS concentration in the culling water and drift eliminators employing a drift maximum of 0.0005%
Entergy Louisiana LLC Ninemile Point Electric Generating Plant	LA-0254	8/16/2011	PM10	Cooling Tower	0.0005	% Drift annual average	High Efficiency Mist Eliminator
Entergy Louisiana LLC Ninemile Point Electric Generating Plant	LA-0254	8/16/2011	PM10	Chiller Cooling Tower	0.001	% Drift annual average	High Efficiency Mist Eliminator
Iowa Fertilizer Company	IA-0105	10/26/2012	PM10	Cooling Tower	0.0005	% Drift	Drift Eliminator
Koch Nitrogen Company Enid Nitrogen Plant	OK-0124	5/1/2008	PM10	Cooling Tower	No numeric limit		High Efficiency Drift Eliminator
Ohio Valley Resources, LLC	TBD	9/26/2013	PM10	Cooling Towers	0.0005	% Drift	High Efficiency Drift Eliminator
Southeast Idaho Energy, LLC Power County Advanced Energy Center	ID-0017	2/10/2009	PM10	Cooling Tower	0.0005	% of total circ flow	Drift/Mist Eliminators
Southeast Idaho Energy, LLC Power County Advanced Energy Center	ID-0017	2/10/2009	PM10	Cooling Tower	1.5	lbs/hr	Drift/Mist Eliminators
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM2.5	Cooling Towers	0.0005	% Drift	Drift Eliminator
Entergy Louisiana LLC Ninemile Point Electric Generating Plant	LA-0254	8/16/2011	PM2.5	Cooling Tower	0.0005	% Drift annual average	High Efficiency Mist Eliminator
Entergy Louisiana LLC Ninemile Point Electric Generating Plant	LA-0254	8/16/2011	PM2.5	Chiller Cooling Tower	0.001	% Drift annual average	High Efficiency Mist Eliminator
Iowa Fertilizer Company	IA-0105	10/26/2012	PM2.5	Cooling Tower	0.0005	% Drift	Drift Eliminator
Ohio Valley Resources, LLC	TBD	9/26/2013	PM2.5	Cooling Towers	0.0005	% Drift	High Efficiency Drift Eliminator
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	Visible Emission	Cooling Towers	0	%	Drift Eliminator
Iowa Fertilizer Company	IA-0105	10/26/2012	Visible Emission	Cooling Tower	0	% Opacity	Drift Eliminator
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	VOC	Cooling Towers	No numeric limit		limit the amount of VOC in treatment chemicals and a drift eliminator

Notes:
Highlighted fields represent the lowest limit in common units (e.g., lb/MMBtu). Other units may be shown; however, there is not enough information to convert to common units or averaging times.
Some facilities are not shown because they are not fertilizer production facilities. These units are not directly comparable because they do not flare common process gas.

Appendix A
KNO Restart - RBLC Summary

KNO Restart
RBLC Search Summary
Search: "boiler","heater" - All Results for boilers and heaters >100 MMBtu/hr Included
Unit 44 - Package Boiler
Unit 48 - Package Boiler
Unit 49 - Package Boiler

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
Venture Global Calcasieu Pass, LLC - Calcasieu Pass LNG Project	LA-0331 (draft)	9/21/2018, updated 2/19/2019	NOx	Hot Oil Heaters (HOH1 to HOH6) (115 MMBtu/hr)	0.038	lb/MMBtu 3-hr average	Ultra Low NOx Burners and Good Combustion Practices (BACT-PSD NSPS)
Venture Global Calcasieu Pass, LLC - Calcasieu Pass LNG Project	LA-0331 (draft)	9/21/2018, updated 2/19/2019	CO	Hot Oil Heaters (HOH1 to HOH6) (115 MMBtu/hr)	0.082	lb/MMBtu 3-hr average	Exclusive Combustion of Fuel Gas and Good Combustion Practices (BACT-PSD NSPS)
Venture Global Calcasieu Pass, LLC - Calcasieu Pass LNG Project	LA-0331 (draft)	9/21/2018, updated 2/19/2019	TPM10	Hot Oil Heaters (HOH1 to HOH6) (115 MMBtu/hr)	0.0075	lb/MMBtu 3-hr average	Exclusive Combustion of Fuel Gas and Good Combustion Practices (BACT-PSD NSPS)
Venture Global Calcasieu Pass, LLC - Calcasieu Pass LNG Project	LA-0331 (draft)	9/21/2018, updated 2/19/2019	TPM2.5	Hot Oil Heaters (HOH1 to HOH6) (115 MMBtu/hr)	0.0075	lb/MMBtu 3-hr average	Exclusive Combustion of Fuel Gas and Good Combustion Practices (BACT-PSD NSPS)
Venture Global Calcasieu Pass, LLC - Calcasieu Pass LNG Project	LA-0331 (draft)	9/21/2018, updated 2/19/2019	SO2	Hot Oil Heaters (HOH1 to HOH6) (115 MMBtu/hr)	0.0006	lb/MMBtu 3-hr average	Exclusive Use of Low Sulfur Fuel Gas and Proper Engineering Practices (BACT-PSD NSPS)
Venture Global Calcasieu Pass, LLC - Calcasieu Pass LNG Project	LA-0331 (draft)	9/21/2018, updated 2/19/2019	VOC	Hot Oil Heaters (HOH1 to HOH6) (115 MMBtu/hr)	0.0054	lb/MMBtu 3-hr average	Proper Equipment Design and Operation, Good Combustion Practices, and Exclusive Combustion of Fuel Gas (BACT-PSD NSPS)
Venture Global Calcasieu Pass, LLC - Calcasieu Pass LNG Project	LA-0331 (draft)	9/21/2018, updated 2/19/2019	CO2e	Hot Oil Heaters (HOH1 to HOH6) (115 MMBtu/hr)	354456	tons/year	Exclusive Use of Low Carbon Fuel Gas, Good Combustion Practices, Good Operation and Mantenance Practices and Insulation (BACT Limit based on Annual Total for 6 Heaters. 40 CFR Subpart Dc) (BACT-PSD NSPS)
ESC Brooke County Power I, LLC	WV-0032 (draft)	9/18/2018 (draft) updated 1/2/2019	TPM (all PM is assumed to be PM2.5 or less)	Auxiliary Boiler (111.90 MMBtu/hr - Natural Gas/Ethane)	0.008	lbs/MMBtu	Good combustion practices, use of natural gas.
ESC Brooke County Power I, LLC	WV-0032 (draft)	9/18/2018 (draft) updated 1/2/2019	TPM (all PM is assumed to be PM2.5 or less)	Auxiliary Boiler (111.90 MMBtu/hr - Natural Gas/Ethane)	0.87	lb/hr	Good combustion practices, use of natural gas.
ESC Brooke County Power I, LLC	WV-0032 (draft)	9/18/2018 (draft) updated 1/2/2019	TPM (all PM is assumed to be PM2.5 or less)	Auxiliary Boiler (111.90 MMBtu/hr - Natural Gas/Ethane)	1.99	tons/year	Good combustion practices at all times boilers are in operation, use of natural gas. Annual emissions are based on 512,140 mmBtu/yr.
ESC Brooke County Power I, LLC	WV-0032 (draft)	9/18/2018 (draft) updated 1/2/2019	Sulfuric Acid	Auxiliary Boiler (111.90 MMBtu/hr - Natural Gas/Ethane)	0.0001	lbs/MMBtu	Use of natural gas.
ESC Brooke County Power I, LLC	WV-0032 (draft)	9/18/2018 (draft) updated 1/2/2019	Sulfuric Acid	Auxiliary Boiler (111.90 MMBtu/hr - Natural Gas/Ethane)	0.02	lb/hr	Use of natural gas.
ESC Brooke County Power I, LLC	WV-0032 (draft)	9/18/2018 (draft) updated 1/2/2019	Sulfuric Acid	Auxiliary Boiler (111.90 MMBtu/hr - Natural Gas/Ethane)	0.03	tons/year	Use of natural gas. Annual emissions are based on 512,140 mmBtu/yr.
ESC Brooke County Power I, LLC	WV-0032 (draft)	9/18/2018 (draft) updated 1/2/2019	NOx	Auxiliary Boiler (111.90 MMBtu/hr - Natural Gas/Ethane)	0.011	lb/MMBtu	Low NOx burners and good combustion practices. Annual emissions are based on 512,140 mmBtu/yr.
ESC Brooke County Power I, LLC	WV-0032 (draft)	9/18/2018 (draft) updated 1/2/2019	NOx	Auxiliary Boiler (111.90 MMBtu/hr - Natural Gas/Ethane)	1.23	lb/hour	Low NOx burners and good combustion practices.
ESC Brooke County Power I, LLC	WV-0032 (draft)	9/18/2018 (draft) updated 1/2/2019	NOx	Auxiliary Boiler (111.90 MMBtu/hr - Natural Gas/Ethane)	2.82	tons/year	Low NOx burners and good combustion practices.
ESC Brooke County Power I, LLC	WV-0032 (draft)	9/18/2018 (draft) updated 1/2/2019	CO	Auxiliary Boiler (111.90 MMBtu/hr - Natural Gas/Ethane)	0.037	lb/MMBtu	Good combustion practices at all times boilers are in operation, must only combust natural gas. Annual emissions are based on 512,140 mmBtu/yr.
ESC Brooke County Power I, LLC	WV-0032 (draft)	9/18/2018 (draft) updated 1/2/2019	CO	Auxiliary Boiler (111.90 MMBtu/hr - Natural Gas/Ethane)	4.14	lb/hour	Good combustion practices.
ESC Brooke County Power I, LLC	WV-0032 (draft)	9/18/2018 (draft) updated 1/2/2019	CO	Auxiliary Boiler (111.90 MMBtu/hr - Natural Gas/Ethane)	9.47	tons/year	Good combustion practices, use of natural gas. Annual emissions are based on 512,140 mmBtu/yr.
ESC Brooke County Power I, LLC	WV-0032 (draft)	9/18/2018 (draft) updated 1/2/2019	VOC	Auxiliary Boiler (111.90 MMBtu/hr - Natural Gas/Ethane)	0.008	lb/MMBtu	Good combustion practices, use of natural gas.
ESC Brooke County Power I, LLC	WV-0032 (draft)	9/18/2018 (draft) updated 1/2/2019	VOC	Auxiliary Boiler (111.90 MMBtu/hr - Natural Gas/Ethane)	0.9	lb/hour	Good combustion practices, use of natural gas.
ESC Brooke County Power I, LLC	WV-0032 (draft)	9/18/2018 (draft) updated 1/2/2019	VOC	Auxiliary Boiler (111.90 MMBtu/hr - Natural Gas/Ethane)	2.05	tons/year	Good combustion practices, use of natural gas. Annual emissions are based on 512,140 mmBtu/yr.
ESC Brooke County Power I, LLC	WV-0032 (draft)	9/18/2018 (draft) updated 1/2/2019	CO2e	Auxiliary Boiler (111.90 MMBtu/hr - Natural Gas/Ethane)	14768	lb/hour	Use of natural gas.
ESC Brooke County Power I, LLC	WV-0032 (draft)	9/18/2018 (draft) updated 1/2/2019	CO2e	Auxiliary Boiler (111.90 MMBtu/hr - Natural Gas/Ethane)	33790	tons/year	Use of natural gas. Annual emissions are based on 512,140 mmBtu/yr.
Novi Energy - C4GT, LLC	VA-0328 (draft)	4/26/2018, updated 11/16/2018	NOx	Auxiliary Boiler (902 mmcf/year)	0.011	lb/MMBtu corrected to 3% O2	Low NOx Burners (Annual limit of 5.1 tons/yr on a 12-month rolling total. Compliance based on stack test and annual fuel throughput) (BACT-PSD NSPS SIP)
Novi Energy - C4GT, LLC	VA-0328 (draft)	4/26/2018, updated 11/16/2018	NOx	Auxiliary Boiler (902 mmcf/year)	1.2	lb/hr	Low NOx Burners (Annual limit of 5.1 tons/yr on a 12-month rolling total. Compliance based on stack test and annual fuel throughput) (BACT-PSD NSPS SIP)
Novi Energy - C4GT, LLC	VA-0328 (draft)	4/26/2018, updated 11/16/2018	CO	Auxiliary Boiler (902 mmcf/year)	0.037	lb/MMBtu	Good Combustion Practices and Clean Fuel (Compliance based on stack test. Annual limit 17.1 tons/year base on fuel throughput.)(BACT-PSD SIP)

Appendix A
KNO Restart - RBLC Summary

KNO Restart
RBLC Search Summary
Search: "boiler","heater" - All Results for boilers and heaters >100 MMBtu/hr Included
Unit 44 - Package Boiler
Unit 48 - Package Boiler
Unit 49 - Package Boiler

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
Novi Energy - C4GT, LLC	VA-0328 (draft)	4/26/2018, updated 11/16/2018	CO	Auxiliary Boiler (902 mmcf/year)	3.9	lb/hr	Good Combustion Practices and Clean Fuel (Compliance based on stack test. Annual limit 17.1 tons/year base on fuel throughput.)(BACT-PSD SIP)
Novi Energy - C4GT, LLC	VA-0328 (draft)	4/26/2018, updated 11/16/2018	TPM10	Auxiliary Boiler (902 mmcf/year)	0.8	lb/hr	Good Combustion Practices and the Use of Pipeline Quality Natural Gas with a Maximum Sulfur Content of 0.4 gr/100 scf on a 12-month rolling avg.(BACT-PSD SIP)
Novi Energy - C4GT, LLC	VA-0328 (draft)	4/26/2018, updated 11/16/2018	TPM10	Auxiliary Boiler (902 mmcf/year)	3.3	tons/year 12-month rolling total	Good Combustion Practices and the Use of Pipeline Quality Natural Gas with a Maximum Sulfur Content of 0.4 gr/100 scf on a 12-month rolling avg.(BACT-PSD SIP)
Novi Energy - C4GT, LLC	VA-0328 (draft)	4/26/2018, updated 11/16/2018	TPM2.5	Auxiliary Boiler (902 mmcf/year)	0.8	lb/hr	Good Combustion Practices and the Use of Pipeline Quality Natural Gas with a Maximum Sulfur Content of 0.4 gr/100 scf on a 12-month rolling avg.(BACT-PSD SIP)
Novi Energy - C4GT, LLC	VA-0328 (draft)	4/26/2018, updated 11/16/2018	TPM2.5	Auxiliary Boiler (902 mmcf/year)	3.3	tons/year 12-month rolling total	Good Combustion Practices and the Use of Pipeline Quality Natural Gas with a Maximum Sulfur Content of 0.4 gr/100 scf on a 12-month rolling avg.(BACT-PSD SIP)
Novi Energy - C4GT, LLC	VA-0328 (draft)	4/26/2018, updated 11/16/2018	SO2	Auxiliary Boiler (902 mmcf/year)	0.0012	lb/MMBtu	The Use of Pipeline Quality Natural Gas with a Maximum Sulfur Content of 0.4 gr/100 scf on a 12-month rolling avg. (Compliance based on compliance with the fuel sulfur limit)(BACT-PSD SIP)
Novi Energy - C4GT, LLC	VA-0328 (draft)	4/26/2018, updated 11/16/2018	SO2	Auxiliary Boiler (902 mmcf/year)	0.6	tons/year 12-month rolling avg	The Use of Pipeline Quality Natural Gas with a Maximum Sulfur Content of 0.4 gr/100 scf on a 12-month rolling avg. (Compliance based on compliance with the fuel sulfur limit)(BACT-PSD SIP)
Novi Energy - C4GT, LLC	VA-0328 (draft)	4/26/2018, updated 11/16/2018	Sulfuric Acid (mist, vapors, etc)	Auxiliary Boiler (902 mmcf/year)			The Use of Pipeline Quality Natural Gas with a Maximum Sulfur Content of 0.4 gr/100 scf on a 12-month rolling avg. (Compliance based on compliance with the fuel sulfur content)(BACT-PSD SIP)
Novi Energy - C4GT, LLC	VA-0328 (draft)	4/26/2018, updated 11/16/2018	VOC	Auxiliary Boiler (902 mmcf/year)	0.005	lb/MMBtu	Good Combustion Practices(BACT-PSD SIP)
Novi Energy - C4GT, LLC	VA-0328 (draft)	4/26/2018, updated 11/16/2018	VOC	Auxiliary Boiler (902 mmcf/year)	2.3	tons/year 12-month rolling avg	Good Combustion Practices(BACT-PSD SIP)
Novi Energy - C4GT, LLC	VA-0328 (draft)	4/26/2018, updated 11/16/2018	CO2e	Auxiliary Boiler (902 mmcf/year)	53863	tons/year 12-month rolling total	Use of Natural Gas and High Efficiency Design and Operation(BACT-PSD SIP)
Targa - Channel View Terminal	TX-0835	4/13/2018, updated 2/19/2019	VOC	Crude Process Heaters (100 MMBtu/hr)	0.0013	lb/MMBtu	Good Combustion (Note: Process Type says Refinery Flares) (LAER NSPS)
Filer City Station Limited Partnership - Filer City Station	MI-0427	11/17/2017, updated 3/8/2018	CO	EUAUXBOILER (Auxiliary Boiler) (182 MMBtu/hr)	0.04	lb/MMBtu	Good Combustion Practices (Catalytic Reduction not economically feasible)(BACT-PSD SIP)
Filer City Station Limited Partnership - Filer City Station	MI-0427	11/17/2017, updated 3/8/2018	NOx	EUAUXBOILER (Auxiliary Boiler) (182 MMBtu/hr)	0.04	lb/MMBtu 30 day rolling avg	LNB that incorporate intern (within the burner) FGR and Good Combustion Practices (70% control efficiency) (SCR not economically feasible)(BACT-PSD SIP)
Filer City Station Limited Partnership - Filer City Station	MI-0427	11/17/2017, updated 3/8/2018	FPM	EUAUXBOILER (Auxiliary Boiler) (182 MMBtu/hr)	0.005	lb/MMBtu	Good Combustion Practices (Add-on controls not economically feasible)(BACT-PSD)
Filer City Station Limited Partnership - Filer City Station	MI-0427	11/17/2017, updated 3/8/2018	TPM10	EUAUXBOILER (Auxiliary Boiler) (182 MMBtu/hr)	0.0075	lb/MMBtu	Good Combustion Practices (Add-on controls not economically feasible)(BACT-PSD)
Filer City Station Limited Partnership - Filer City Station	MI-0427	11/17/2017, updated 3/8/2018	TPM2.5	EUAUXBOILER (Auxiliary Boiler) (182 MMBtu/hr)	0.0075	lb/MMBtu	Good Combustion Practices (Add-on controls not economically feasible)(BACT-PSD)
Filer City Station Limited Partnership - Filer City Station	MI-0427	11/17/2017, updated 3/8/2018	CO2e	EUAUXBOILER (Auxiliary Boiler) (182 MMBtu/hr)	93346	tons/year 12-month roll time period	Good Combustion Practices (Add-on controls not economically feasible)(BACT-PSD)
Praxiar Inc. - Praxiar Clear Lake	TX-0830	10/20/2017, updated 2/19/2019	CO	HyCO Heater (180 MMBtu/hr)	50	PPMVD@3% O2	The Use of gaseous fuel and good combustion practices (BACT-PSD NSPS)
Praxiar Inc. - Praxiar Clear Lake	TX-0830	10/20/2017, updated 2/19/2019	CO2e	HyCO Heater (180 MMBtu/hr)	1148305	tons/year	Annual tune ups. Emissions are based on a plantwide grouped limit(BACT-PSD NSPS)
Praxair Inc. - Praxair Clear Lake Plant	TX-0827	10/19/2017, updated 11/2/2017	CO	HyCO Heater (180 MMBtu/hr)	50	PPMVD@3% O2	The Use of gaseous fuel and good combustion practices(BACT-PSD NSPS)
Praxair Inc. - Praxair Clear Lake Plant	TX-0827	10/19/2017, updated 11/2/2017	CO2e	HyCO Heater (180 MMBtu/hr)	1148305	tons/year	Annual tune ups. Emissions are based on a plantwide grouped limit(BACT-PSD NSPS)
Agrium US, Inc	TX-0814	1/5/2017 (draft)	CO2e	Package Boiler 1 (240 MMBtu/hr)	123059	tpy	Good Engineering Practices
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft), updated 7/10/17	TPM	Natural Gas Auxiliary Boilers (EU-012A, EU-012B, EU-012C)	1.9	lb/MMcf 3 hour average	Proper design and good combustion practices at all times boilers are in operation, must only combust natural gas (218.6 MMBtu/hr)
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft), updated 7/10/17	TPM	Natural Gas Auxiliary Boilers (EU-012A, EU-012B, EU-012C)	1877.39	MMcf per 12 consecutive months	Proper design and good combustion practices at all times boilers are in operation, must only combust natural gas (218.6 MMBtu/hr)
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft), updated 7/10/17	PM10	Natural Gas Auxiliary Boilers (EU-012A, EU-012B, EU-012C)	7.6	lb/MMcf 3 hour average	Proper design and good combustion practices at all times boilers are in operation, must only combust natural gas (218.6 MMBtu/hr)
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft), updated 7/10/17	PM10	Natural Gas Auxiliary Boilers (EU-012A, EU-012B, EU-012C)	1877.39	MMcf per 12 consecutive months	Proper design and good combustion practices at all times boilers are in operation, must only combust natural gas (218.6 MMBtu/hr)

Appendix A
KNO Restart - RBLC Summary

KNO Restart
RBLC Search Summary
Search: "boiler","heater" - All Results for boilers and heaters >100 MMBtu/hr Included
Unit 44 - Package Boiler
Unit 48 - Package Boiler
Unit 49 - Package Boiler

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft), updated 7/10/17	PM2.5	Natural Gas Auxiliary Boilers (EU-012A, EU-012B, EU-012C)	7.6	lb/MMcf 3 hour average	Proper design and good combustion practices at all times boilers are in operation, must only combust natural gas (218.6 MMBtu/hr)
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft), updated 7/10/17	PM2.5	Natural Gas Auxiliary Boilers (EU-012A, EU-012B, EU-012C)	1877.39	MMcf per 12 consecutive months	Proper design and good combustion practices at all times boilers are in operation, must only combust natural gas (218.6 MMBtu/hr)
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft), updated 7/10/17	NOx	Natural Gas Auxiliary Boilers (EU-012A, EU-012B, EU-012C)	20.4	lb/MMcf 3 hour average	Low NOx burners with flue gas recirculation and good combustion practices, must only combust natural gas (218.6 MMBtu/hr)
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft), updated 7/10/17	NOx	Natural Gas Auxiliary Boilers (EU-012A, EU-012B, EU-012C)	1877.39	MMcf per 12 consecutive months	Low NOx burners with flue gas recirculation and good combustion practices, must only combust natural gas (218.6 MMBtu/hr)
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft), updated 7/10/17	CO	Natural Gas Auxiliary Boilers (EU-012A, EU-012B, EU-012C)	37.22	lb/MMcf 3 hour average	Good combustion practices at all times boilers are in operation, must only combust natural gas (218.6 MMBtu/hr)
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft), updated 7/10/17	CO	Natural Gas Auxiliary Boilers (EU-012A, EU-012B, EU-012C)	1877.39	MMcf per 12 consecutive months	Good combustion practices at all times boilers are in operation, must only combust natural gas (218.6 MMBtu/hr)
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft), updated 7/10/17	VOC	Natural Gas Auxiliary Boilers (EU-012A, EU-012B, EU-012C)	5.5	lb/MMcf 3 hour average	Good combustion practices at all times boilers are in operation, must only combust natural gas (218.6 MMBtu/hr)
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft), updated 7/10/17	VOC	Natural Gas Auxiliary Boilers (EU-012A, EU-012B, EU-012C)	1877.39	MMcf per 12 consecutive months	Good combustion practices at all times boilers are in operation, must only combust natural gas (218.6 MMBtu/hr)
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft), updated 7/10/17	CO2	Natural Gas Auxiliary Boilers (EU-012A, EU-012B, EU-012C)	59.61	ton/MMcf 3 hour average	Good combustion practices at all times boilers are in operation, must only combust natural gas (218.6 MMBtu/hr)
Midwest Fertilizer Company LLC	IN-0263 (draft)	3/23/17 (draft), updated 7/10/17	CO2	Natural Gas Auxiliary Boilers (EU-012A, EU-012B, EU-012C)	1877.39	MMcf per 12 consecutive months	Good combustion practices at all times boilers are in operation, must only combust natural gas, shall be designed to achieve a minimum 80% thermal efficiency limit, each shall be equipped with the energy efficiency design features (1) air inlet controls, (2) heat recovery, (3) condensate recovery, (4) blow down heat recovery (218.6 MMBtu/hr)
Indeck Niles, LLC	MI-0423 (draft)	1/4/2017, 7/25/17 update	CO	EUAUXBOILER (Auxiliary Boiler)	0.04	lb/MMBtu Test protocol will specify avg time	SIP - Good combustion practices (182 MMBtu/hr)
Indeck Niles, LLC	MI-0423 (draft)	1/4/2017, 7/25/17 update	NOx	EUAUXBOILER (Auxiliary Boiler)	0.04	lb/MMBtu 30-day rolling avg time period	NSPS, SIP - Low NOx burners/Flue gas recirculation and good combustion practices. (182 MMBtu/hr)
Indeck Niles, LLC	MI-0423 (draft)	1/4/2017, 7/25/17 update	FPM	EUAUXBOILER (Auxiliary Boiler)	0.005	lb/MMBtu Test protocol will specify avg time	Good combustion practices (182 MMBtu/hr)
Indeck Niles, LLC	MI-0423 (draft)	1/4/2017, 7/25/17 update	TPM10	EUAUXBOILER (Auxiliary Boiler)	1.36	lb/hr hourly, test protocol	SIP - Good combustion practices (182 MMBtu/hr)
Indeck Niles, LLC	MI-0423 (draft)	1/4/2017, 7/25/17 update	TPM2.5	EUAUXBOILER (Auxiliary Boiler)	1.36	lb/hr hourly, test protocol	Good combustion practices (182 MMBtu/hr)
Indeck Niles, LLC	MI-0423 (draft)	1/4/2017, 7/25/17 update	VOC	EUAUXBOILER (Auxiliary Boiler)	0.004	lb/MMBtu Test protocol will specify avg time	Good combustion practices (182 MMBtu/hr)
Indeck Niles, LLC	MI-0423 (draft)	1/4/2017, 7/25/17 update	SO2	EUAUXBOILER (Auxiliary Boiler)	0.6	lb/MMscf Based on Fuel Receipt Records	Good combustion practices and the use of pipeline quality natural gas (182 MMBtu/hr)
Indeck Niles, LLC	MI-0423 (draft)	1/4/2017, 7/25/17 update	SO2	EUAUXBOILER (Auxiliary Boiler)	2000	gr/MMscf Based upon Fuel Receipts	NSPS, SIP - Good combustion practices and the use of pipeline quality natural gas.(2,000 grains of sulfur per MMscf. The natural gas material limit of 2,000 grains of sulfur per MMscf is what the emission factor is based upon) (182 MMBtu/hr)
Indeck Niles, LLC	MI-0423 (draft)	1/4/2017, 7/25/17 update	CO2e	EUAUXBOILER (Auxiliary Boiler)	93346	tpy 12-month rolling time period	Energy efficiency measures and the use of a low carbon fuel (pipeline quality natural gas). (182 MMBtu/hr)
Rextac, LLC - Odessa Petrochemical Plant	TX-0813 (draft)	11/22/2016, 12/1/16 update	VOC	Boilers	0.0005	lb/MMBtu	NSPS Db - Best combustion practices (2 boilers - 223 Mmbtu/hr)
Rextac, LLC - Odessa Petrochemical Plant	TX-0813 (draft)	11/22/2016, 12/1/16 update	CO2e	Boilers	63796	tpy	MACT DDDDD - Minimul thermal design efficiency of 75%
Lake Charles Methanol, LLC	LA-0305	6/30/16, 4/26/17 update	PM10	Auxiliary Boilers and Superheaters	No Numeric Limit	No Numeric Limit	Good engineering design and proper operation (Supplement fuel: fuel gas Boilers: 225 MM BTU/hr each)
Lake Charles Methanol, LLC	LA-0305	6/30/16, 4/26/17 update	PM2.5	Auxiliary Boilers and Superheaters	No Numeric Limit	No Numeric Limit	Good engineering design and proper operation (Supplement fuel: fuel gas Boilers: 225 MM BTU/hr each)
Lake Charles Methanol, LLC	LA-0305	6/30/16, 4/26/17 update	SO2	Auxiliary Boilers and Superheaters	No Numeric Limit	No Numeric Limit	Fuel gases and/or pipeline quality natural gas (Supplement fuel: fuel gas Boilers: 225 MM BTU/hr each)
Lake Charles Methanol, LLC	LA-0305	6/30/16, 4/26/17 update	NOx	Auxiliary Boilers and Superheaters	0.015	lbs/MMBtu 30 rolling avg, except SCR, SU or Maint	SCR (Supplement fuel: fuel gas Boilers: 225 MM BTU/hr each)
Lake Charles Methanol, LLC	LA-0305	6/30/16, 4/26/17 update	CO	Auxiliary Boilers and Superheaters	No Numeric Limit	No Numeric Limit	Good engineering design and good combustion practices (Supplement fuel: fuel gas Boilers: 225 MM BTU/hr each)
Lake Charles Methanol, LLC	LA-0305	6/30/16, 4/26/17 update	CO2e	Auxiliary Boilers and Superheaters	No Numeric Limit	No Numeric Limit	Good equipment design and good combustion practices (Supplement fuel: fuel gas Boilers: 225 MM BTU/hr each)
Magnolia LNG Facility	LA-0307	3/21/16, 4/28/17 update	CO2e	Auxiliary Boilers	No Numeric Limit	No Numeric Limit	Good combustion/operating/maintenance practices and fueled by natural gas (171 MMBtu/hr)

Appendix A
KNO Restart - RBLC Summary

KNO Restart
RBLC Search Summary
Search: "boiler","heater" - All Results for boilers and heaters >100 MMBtu/hr Included
Unit 44 - Package Boiler
Unit 48 - Package Boiler
Unit 49 - Package Boiler

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
Magnolia LNG Facility	LA-0307	3/21/16, 4/28/17 update	TPM10	Auxiliary Boilers	No Numeric Limit	No Numeric Limit	Good combustion practices (171 MMBtu/hr)
Magnolia LNG Facility	LA-0307	3/21/16, 4/28/17 update	TPM2.5	Auxiliary Boilers	No Numeric Limit	No Numeric Limit	Good combustion practices (171 MMBtu/hr)
Magnolia LNG Facility	LA-0307	3/21/16, 4/28/17 update	NOx	Auxiliary Boilers	No Numeric Limit	No Numeric Limit	Low NOx Burners (171 MMBtu/hr)
Magnolia LNG Facility	LA-0307	3/21/16, 4/28/17 update	CO	Auxiliary Boilers	No Numeric Limit	No Numeric Limit	Good combustion practices (171 MMBtu/hr)
Magnolia LNG Facility	LA-0307	3/21/16, 4/28/17 update	VOC	Auxiliary Boilers	No Numeric Limit	No Numeric Limit	Good combustion practices (171 MMBtu/hr)
Tennessee Valley Authority	TN-0162 (draft)	4/19/16, 5/19/16 update	TPM	Two Natural Gas-Fired Auxiliary Boilers	0.008	lb/MMBtu	Good combustion design and practices (450 MMBtu/hr each)
Tenaska PA Partners LLC - Tenaska PA Partners/Westmoreland Gen Fac	PA-0306 (draft)	2/12/16, 7/12/17 update	TPM2.5	245 MMBtu natural gas fired Auxiliary boiler	0.0075	lb/MMBtu 3 hr avg	NSPS - Good combustion practices. Total fuel usage of the auxiliary boiler shall not exceed 1052 MMsch/yr on a 12-month rolling basis.
Tenaska PA Partners LLC - Tenaska PA Partners/Westmoreland Gen Fac	PA-0306 (draft)	2/12/16, 7/12/17 update	TPM2.5	245 MMBtu natural gas fired Auxiliary boiler	4	t;py	NSPS - Good combustion practices. Total fuel usage of the auxiliary boiler shall not exceed 1052 MMsch/yr on a 12-month rolling basis.
Tenaska PA Partners LLC - Tenaska PA Partners/Westmoreland Gen Fac	PA-0306 (draft)	2/12/16, 7/12/17 update	Sulfuric Acid (mist, vapors, etc)	245 MMBtu natural gas fired Auxiliary boiler	0.0049	t;py	NSPS - Good combustion practices. Total fuel usage of the auxiliary boiler shall not exceed 1052 MMsch/yr on a 12-month rolling basis.
Tenaska PA Partners LLC - Tenaska PA Partners/Westmoreland Gen Fac	PA-0306 (draft)	2/12/16, 7/12/17 update	VOC	245 MMBtu natural gas fired Auxiliary boiler	0.0054	lb/MMBtu	Good combustion practices. Total fuel usage of the auxiliary boiler shall not exceed 1052 MMsch/yr on a 12-month rolling basis.
Tenaska PA Partners LLC - Tenaska PA Partners/Westmoreland Gen Fac	PA-0306 (draft)	2/12/16, 7/12/17 update	VOC	245 MMBtu natural gas fired Auxiliary boiler	2.89	t;py	Good combustion practices. Total fuel usage of the auxiliary boiler shall not exceed 1052 MMsch/yr on a 12-month rolling basis.
American Municipal Power Generating Station	OH-0310	10/8/2009	CO	Auxiliary Boiler	12.6	lbs/hr	Unknown
American Municipal Power Generating Station	OH-0310	10/8/2009	CO	Auxiliary Boiler	5.52	tons/year per rolling 12 months	Unknown
American Municipal Power Generating Station	OH-0310	10/8/2009	NOx	Auxiliary Boiler	21	lbs/hr	Unknown
American Municipal Power Generating Station	OH-0310	10/8/2009	NOx	Auxiliary Boiler	9.2	tons/year per rolling 12 months	Unknown
American Municipal Power Generating Station	OH-0310	10/8/2009	PM10	Auxiliary Boiler	1.14	lbs/hr	Unknown
American Municipal Power Generating Station	OH-0310	10/8/2009	PM10	Auxiliary Boiler	0.5	tons/year per rolling 12 months	Unknown
American Municipal Power Generating Station	OH-0310	10/8/2009	SO2	Auxiliary Boiler	0.09	lbs/hr	Unknown
American Municipal Power Generating Station	OH-0310	10/8/2009	SO2	Auxiliary Boiler	0.04	tons/year per rolling 12 months	Unknown
American Municipal Power Generating Station	OH-0310	10/8/2009	Visible Emission	Auxiliary Boiler	10	% opacity as a 6 minute average	Unknown
American Municipal Power Generating Station	OH-0310	10/8/2009	VOC	Auxiliary Boiler	0.83	lbs/hr	Unknown
American Municipal Power Generating Station	OH-0310	10/8/2009	VOC	Auxiliary Boiler	0.36	tons/year per rolling 12 months	Unknown
Calpine Construction Finance Co. LP Amella Energy Center	TX-0386	3/26/2002	CO	Auxiliary Boiler	13.9	lbs/hr	Unknown
Calpine Construction Finance Co. LP Amella Energy Center	TX-0386	3/26/2002	CO	Auxiliary Boiler	0.08	lb/MMBtu	Unknown
Calpine Construction Finance Co. LP Amella Energy Center	TX-0386	3/26/2002	H2SO4	Auxiliary Boiler	0.129	lbs/hr	Unknown
Calpine Turner Energy Center, LLC	OR-0046	1/6/2005	PM10	Auxiliary Boiler	No numeric limit	No numeric limit	use of natural gas
Calpine Turner Energy Center, LLC	OR-0046	1/6/2005	VOC	Auxiliary Boiler	0.0044	lb/MMBtu 3-hr block	Oxidation Catalyst
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	CH4	Boilers	0.0023	lb/MMBtu average of 3 stack tests	proper operation and use of natural gas
Iowa Fertilizer Company	IA-0105	10/26/2012	CH4	Auxiliary Boiler	0.0023	lb/MMBtu average of 3 stack tests	Good Combustion Practices
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	CO	Boilers	0.0013	lb/MMBtu average of 3 stack tests	oxidation catalyst
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	CO	Boilers	2.6	tpy rolling 12 month total	oxidation catalyst
Iowa Fertilizer Company	IA-0105	10/26/2012	CO	Auxiliary Boiler	0.0013	lb/MMBtu average of 3 stack tests	Good Combustion Practices
Iowa Fertilizer Company	IA-0105	10/26/2012	CO	Auxiliary Boiler	0.57	tons/year rolling 12 month total	Good Combustion Practices
Ohio Valley Resources, LLC	TBD	9/26/2013	CO	Natural gas fired boilers	37.22	lb/MMcf 3 hour average	proper burning design, good combustion practices
Rocky Mountain Energy Center, LLC	CO-0052	8/11/2002	CO	Auxiliary Boiler	0.039	lb/MMBtu	Good combustion control practices
Rocky Mountain Energy Center, LLC	CO-0052	8/11/2002	CO	Auxiliary Boiler	70%	Reduction	Good combustion control practices
Southeast Idaho Energy, LLC Power County Advanced Energy C	ID-0017	2/10/2009	CO	250 MMBTU/H package boiler	0.074	lb/MMBtu	Good combustion practices
Southeast Idaho Energy, LLC Power County Advanced Energy C	ID-0017	2/10/2009	CO	250 MMBTU/H package boiler	18.5	lb/hr	Good combustion practices
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	CO2	Boilers	117	lb/MMBtu average of 3 stack tests	proper operation and use of natural gas
Iowa Fertilizer Company	IA-0105	10/26/2012	CO2	Auxiliary Boiler	117	lb/MMBtu rolling 30 day average	Good Combustion Practices
Ohio Valley Resources, LLC	TBD	9/26/2013	CO2	Natural gas fired boilers	59.61	ton/MMcf 3 hour average	proper burning design, good combustion practices
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	CO2e	Boilers	234168	tpy rolling 12 month total	proper operation and use of natural gas
Forsyth Energy Projects, LLC Forsyth Energy Plant	NC-0101	9/29/2005	CO	Auxiliary Boiler	9.08	lbs/hr based on 3-hr average	Low-NOx Burners, good combustion control and clean burning, low sulfur fuel (natural gas)
Forsyth Energy Projects, LLC Forsyth Energy Plant	NC-0101	9/29/2005	NOx	Auxiliary Boiler	15.13	lbs/hr based on 3-hr average	Low-NOx Burners, good combustion control and clean burning, low sulfur fuel (natural gas)
Forsyth Energy Projects, LLC Forsyth Energy Plant	NC-0101	9/29/2005	PM10	Auxiliary Boiler	0.82	lbs/hr based on 3-hr average	Low-NOx Burners, good combustion control and clean burning, low sulfur fuel (natural gas)
Iowa Fertilizer Company	IA-0105	10/26/2012	NOx	Auxiliary Boiler	0.0125	lb/MMBtu rolling 30 day average	LNB and FGR
Iowa Fertilizer Company	IA-0105	10/26/2012	NOx	Auxiliary Boiler	5.52	tons/year rolling 12 month total	LNB and FGR
Ohio Valley Resources, LLC	TBD	9/26/2013	NOx	Natural gas fired boilers	20.4	lb/MMcf 24 hour average	Ultra Low NOx Burners and Flue Gas Recirculation
Rocky Mountain Energy Center, LLC.	CO-0052	8/11/2002	NOx	Auxiliary Boiler	0.038	lb/MMBtu	Operation is limited to 1900 hr/yr. Low NOx combustion system.
Rocky Mountain Energy Center, LLC.	CO-0052	8/11/2002	NOx	Auxiliary Boiler	80%	Reduction	Operation is limited to 1900 hr/yr. Low NOx combustion system.

Appendix A
KNO Restart - RBLC Summary

KNO Restart
RBLC Search Summary
Search: "boiler","heater" - All Results for boilers and heaters >100 MMBtu/hr Included
Unit 44 - Package Boiler
Unit 48 - Package Boiler
Unit 49 - Package Boiler

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
Southeast Idaho Energy, LLC Power County Advanced Energy C	ID-0017	2/10/2009	NOx	250 MMBTU/H package boiler	0.02	lb/MMBtu	Low-NOx Burners and FGR
Southeast Idaho Energy, LLC Power County Advanced Energy C	ID-0017	2/10/2009	NOx	250 MMBTU/H package boiler	5	lb/hr	Low-NOx Burners and FGR
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM	Boilers	0.0024	lb/MMBtu average of 3 stack tests	proper operation and use of natural gas
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM	Boilers	4.79	tpy rolling 12 month total	proper operation and use of natural gas
Iowa Fertilizer Company	IA-0105	10/26/2012	PM	Auxiliary Boiler	0.0024	lb/MMBtu average of 3 stack tests	Good Combustion Practices
Iowa Fertilizer Company	IA-0105	10/26/2012	PM	Auxiliary Boiler	1.06	tons/year rolling 12 month total	Good Combustion Practices
Ohio Valley Resources, LLC	TBD	9/26/2013	PM	Natural gas fired boilers	1.9	lb/MMcf 3 hour average	proper burning design, good combustion practices
Southeast Idaho Energy, LLC Power County Advanced Energy C	ID-0017	2/10/2009	PM	250 MMBTU/H package boiler	0.0052	lb/MMBtu	Good Combustion Practices
Southeast Idaho Energy, LLC Power County Advanced Energy C	ID-0017	2/10/2009	PM	250 MMBTU/H package boiler	1.3	lbs/hr	Good Combustion Practices
Liberty Generating Station	NJ-0043	3/28/2002	CO	Auxiliary Boiler	100	ppmvd @ 7% O2	CO catalyst
Liberty Generating Station	NJ-0043	3/28/2002	CO	Auxiliary Boiler	17.4	lb/hr	CO catalyst
Liberty Generating Station	NJ-0043	3/28/2002	NOx	Auxiliary Boiler	0.2	lb/MMBtu	SCR
Liberty Generating Station	NJ-0043	3/28/2002	NOx	Auxiliary Boiler	7.2	lbs/hr	SCR
Liberty Generating Station	NJ-0043	3/28/2002	PM	Auxiliary Boiler	1.6	lb/hr	unknown
Liberty Generating Station	NJ-0043	3/28/2002	PM	Auxiliary Boiler	0.008	lb/MMBtu	Unknown
Liberty Generating Station	NJ-0043	3/28/2002	PM10	Auxiliary Boiler	1.6	lb/hr	unknown
Liberty Generating Station	NJ-0043	3/28/2002	PM10	Auxiliary Boiler	0.008	lb/MMBtu	Unknown
Liberty Generating Station	NJ-0043	3/28/2002	SO2	Auxiliary Boiler	0.004	lb/MMBtu	None
Liberty Generating Station	NJ-0043	3/28/2002	SO2	Auxiliary Boiler	0.8	lbs/hr	None
Liberty Generating Station	NJ-0043	3/28/2002	VOC	Auxiliary Boiler	50	ppmvd @7% O2	CO catalyst
Liberty Generating Station	NJ-0043	3/28/2002	VOC	Auxiliary Boiler	1.6	lbs/hr	CO catalyst
Southeast Idaho Energy, LLC Power County Advanced Energy C	ID-0017	2/10/2009	PM	250 MMBTU/H package boiler	20%	Reduction	Good Combustion Practices
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM10	Boilers	0.0024	lb/MMBtu average of 3 stack tests	proper operation and use of natural gas
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM10	Boilers	4.79	tpy rolling 12 month total	proper operation and use of natural gas
Iowa Fertilizer Company	IA-0105	10/26/2012	PM10	Auxiliary Boiler	0.0024	lb/MMBtu average of 3 stack tests	Good Combustion Practices
Some facilities are not shown because they are not fertilizer prod	IA-0105	10/26/2012	PM10	Auxiliary Boiler	1.06	tons/year rolling 12 month total	Good Combustion Practices
Ohio Valley Resources, LLC	TBD	9/26/2013	PM10	Natural gas fired boilers	7.6	lb/MMcf 3 hour average	proper burning design, good combustion practices
Southeast Idaho Energy, LLC Power County Advanced Energy C	ID-0017	2/10/2009	PM10	250 MMBTU/H package boiler	0.0052	lb/MMBtu	Good Combustion Practices
Southeast Idaho Energy, LLC Power County Advanced Energy C	ID-0017	2/10/2009	PM10	250 MMBTU/H package boiler	1.3	lbs/hr	Good Combustion Practices
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM2.5	Boilers	0.0024	lb/MMBtu average of 3 stack tests	proper operation and use of natural gas
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM2.5	Boilers	4.79	tpy rolling 12 month total	proper operation and use of natural gas
Iowa Fertilizer Company	IA-0105	10/26/2012	PM2.5	Auxiliary Boiler	0.0024	lb/MMBtu average of 3 stack tests	Good Combustion Practices
Iowa Fertilizer Company	IA-0105	10/26/2012	PM2.5	Auxiliary Boiler	1.06	tons/year rolling 12 month total	Good Combustion Practices
Ohio Valley Resources, LLC	TBD	9/26/2013	PM2.5	Natural gas fired boilers	7.6	lb/MMcf 3 hour average	proper burning design, good combustion practices
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	Visible Emission	Boilers	0	%	proper operation and use of natural gas
Iowa Fertilizer Company	IA-0105	10/26/2012	Visible Emission	Auxiliary Boiler	0	% opacity	Good Combustion Practices
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	VOC	Boilers	0.0014	lb/MMBtu average of 3 stack tests	proper operation and use of natural gas
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	VOC	Boilers	2.8	tpy rolling 12 month total	proper operation and use of natural gas
Iowa Fertilizer Company	IA-0105	10/26/2012	VOC	Auxiliary Boiler	0.0014	lb/MMBtu average of 3 stack tests	Good Combustion Practices
Iowa Fertilizer Company	IA-0105	10/26/2012	VOC	Auxiliary Boiler	0.62	tons/year rolling 12 month total	Good Combustion Practices
Ohio Valley Resources, LLC	TBD	9/26/2013	VOC	Natural gas fired boilers	5.5	lb/MMcf 3 hour average	proper burning design, good combustion practices
Williams Refining & Marketing, L.L.C.	TN-0153	4/3/2002	NOx	WCR Heater	0.03	lb/MMBtu	Unknown
Williams Refining & Marketing, L.L.C.	TN-0153	4/3/2002	PM	Heaters	0.005	lb/MMBtu	Unknown
Williams Refining & Marketing, L.L.C.	TN-0153	4/3/2002	PM	Heater, Reboiler	0.005	lb/MMBtu	Unknown
Williams Refining & Marketing, L.L.C.	TN-0153	4/3/2002	PM	WCR Heater	0.005	lb/MMBtu	Unknown
Williams Refining & Marketing, L.L.C.	TN-0153	4/3/2002	PM	CCR Reactor	0.005	lb/MMBtu	Unknown

Notes:
Highlighted fields represent the lowest limit in common units (e.g., lb/MMBtu). Other units may be shown; however, there is not enough information to convert to common units or averaging times.
Some facilities are not shown because they are not fertilizer production facilities. These units are not directly comparable because they are not natural gas fired.

Appendix A
KNO Restart - RBLC Summary

KNO Restart
RBLC Search Summary
Search: "Flare" - Fertilizer Plants only
Unit 11 - Ammonia Tank Flare

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	PM10	Ammonia Storage Flare (EU-016)	0.0075	lb/MMBtu 3 hour average	
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	PM10	Ammonia Storage Flare (EU-016)	168	hours/12 consec month compliance determined end of month	
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	PM10	Ammonia Storage Flare (EU-016)	No Numeric Limit	No Numeric Limit	Pilot and purge gas shall be natural gas; and process flaring minimization practices; operated with a flame present at all times; continuously monitored
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	PM2.5	Ammonia Storage Flare (EU-016)	0.0075	lb/MMBtu 3 hour average	
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	PM2.5	Ammonia Storage Flare (EU-016)	168	hours/12 consec month compliance determined end of month	
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	PM2.5	Ammonia Storage Flare (EU-016)	No Numeric Limit	No Numeric Limit	Pilot and purge gas shall be natural gas; and process flaring minimization practices; operated with a flame present at all times; continuously monitored
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	NOx	Ammonia Storage Flare (EU-016)	125	lb/hr while venting 3 hour average	
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	NOx	Ammonia Storage Flare (EU-016)	0.068	lb/MMBtu during normal operations 3 hour average	
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	NOx	Ammonia Storage Flare (EU-016)	No Numeric Limit	No Numeric Limit	Pilot and purge gas shall be natural gas; and process flaring minimization practices; operated with a flame present at all times; continuously monitored
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	CO	Ammonia Storage Flare (EU-016)	0.37	lb/MMBtu during normal operations 3 hour average	
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	CO	Ammonia Storage Flare (EU-016)	168	hours/year compliance determined end of ea month	
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	CO	Ammonia Storage Flare (EU-016)	No Numeric Limit	No Numeric Limit	Pilot and purge gas shall be natural gas; and process flaring minimization practices; operated with a flame present at all times; continuously monitored
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	VOC	Ammonia Storage Flare (EU-016)	0.0054	lb/MMBtu during normal operations 3 hour average	
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	VOC	Ammonia Storage Flare (EU-016)	168	hours/12 consec month compliance determined end of month	
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	VOC	Ammonia Storage Flare (EU-016)	No Numeric Limit	No Numeric Limit	Pilot and purge gas shall be natural gas; and process flaring minimization practices; operated with a flame present at all times; continuously monitored
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	CO2	Ammonia Storage Flare (EU-016)	563	tons/12 consec month	
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	CO2	Ammonia Storage Flare (EU-016)	168	hours/12 consec month compliance determined end of month	
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft), updated 7/10/17	CO2	Ammonia Storage Flare (EU-016)	No Numeric Limit	No Numeric Limit	Pilot and purge gas shall be natural gas; and process flaring minimization practices; operated with a flame present at all times; continuously monitored

Appendix A
KNO Restart - RBLC Summary

KNO Restart
RBLC Search Summary
Search: "Flare" - Fertilizer Plants only
Unit 11 - Ammonia Tank Flare

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	CH4	Flares	No Numeric Limit	No Numeric Limit	Good operating practices & use of natural gas
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	CO	Flares	No Numeric Limit	No Numeric Limit	Good operating practices & use of natural gas
Ohio Valley Resources, LLC	TBD	9/25/2013	CO	Front End Process Flare	0.37	lb/MMBtu 3 hour average	Proper flare design and good combustion practices; and process flaring minimization practices
Ohio Valley Resources, LLC	TBD	9/25/2013	CO	Front End Process Flare	3240.16	lb/hr 3 hour average	Proper flare design and good combustion practices; and process flaring minimization practices
Ohio Valley Resources, LLC	TBD	9/25/2013	CO	Back end ammonia process vent flare	0.37	lb/MMBtu 3 hour average	Proper flare design and good combustion practices; and process flaring minimization practices
Ohio Valley Resources, LLC	TBD	9/25/2013	CO	Back end ammonia process vent flare	804.76	lb/hr 3 hour average	Proper flare design and good combustion practices; and process flaring minimization practices
Southeast Idaho Energy, LLC Power County Advanced Energy Center	ID-0017	2/10/2009	CO	Process Flare	No Numeric Limit	No Numeric Limit	Good combustion practices. Meet 40 CFR 60.18
United Wisconsin Grain Producers UWGP - Fuel Grade Ethanol Plant	WI-0204	8/14/2003	CO	Bypass Flare, Biomethanator	2.4	lbs/hr	Operation Limit: No more than 5040 hr/yr
Ohio Valley Resources, LLC	TBD	9/25/2013	CO	Ammonia Storage Flare	0.37	lb/MMBtu 3 hour average	Proper flare design and good combustion practices; and process flaring minimization practices
Southeast Idaho Energy, LLC Power County Advanced Energy Center	ID-0017	2/10/2009	CO	Ammonia Storage Flare	No Numeric Limit	No Numeric Limit	Good combustion practices. Meet 40 CFR 60.18
Iowa Fertilizer Company	IA-0105	10/26/2012	CO2	Ammonia Flare	No Numeric Limit	No Numeric Limit	Work Practice/Good Combustion Practices
Ohio Valley Resources, LLC	TBD	9/25/2013	CO2	Front End Process Flare	511.8	ton/hr 3 hour average	Proper flare design and good combustion practices; and process flaring minimization practices
Ohio Valley Resources, LLC	TBD	9/25/2013	CO2	Front End Process Flare	116.89	lb/MMBtu 3 hour average	Proper flare design and good combustion practices; and process flaring minimization practices
Ohio Valley Resources, LLC	TBD	9/25/2013	CO2	Back end ammonia process vent flare	116.89	lb/MMBtu 3 hour average	Proper flare design and good combustion practices; and process flaring minimization practices
Ohio Valley Resources, LLC	TBD	9/25/2013	CO2	Ammonia Storage Flare	52.02	lb/hr 3 hour average	Proper flare design and good combustion practices; and process flaring minimization practices
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	CO2e	Flares	No Numeric Limit	No Numeric Limit	Good operating practices & use of natural gas
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	CO2e	Flares	No Numeric Limit	No Numeric Limit	Good operating practices & use of natural gas
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	N2O	Flares	No Numeric Limit	No Numeric Limit	Good operating practices & use of natural gas
Iowa Fertilizer Company	IA-0105	10/26/2012	N2O	Ammonia Flare	No Numeric Limit	No Numeric Limit	Work Practice/Good Combustion Practices
Degussa Engineered Carbons Inc. Borger Carbon Black Plant	TX-0436	10/3/2002	NOx	Dryers, Boilers, Flare	0.1	lb/MMBtu	Good combustion practices and design
Iowa Fertilizer Company	IA-0105	10/26/2012	NOx	Ammonia Flare	No Numeric Limit	No Numeric Limit	Work Practice/Good Combustion Practices
Ohio Valley Resources, LLC	TBD	9/25/2013	NOx	Front End Process Flare	0.068	lb/MMBtu 3 hour average	Proper flare design and good combustion practices; and process flaring minimization practices
Ohio Valley Resources, LLC	TBD	9/25/2013	NOx	Front End Process Flare	595.47	lb/hr 3 hour average	Proper flare design and good combustion practices; and process flaring minimization practices
Ohio Valley Resources, LLC	TBD	9/25/2013	NOx	Back end ammonia process vent flare	0.068	lb/MMBtu 3 hour average	Proper flare design and good combustion practices; and process flaring minimization practices
Ohio Valley Resources, LLC	TBD	9/25/2013	NOx	Back end ammonia process vent flare	624.94	lb/hr 3 hour average	Proper flare design and good combustion practices; and process flaring minimization practices
Southeast Idaho Energy, LLC Power County Advanced Energy Center	ID-0017	2/10/2009	NOx	Process Flare	No Numeric Limit	No Numeric Limit	Good combustion practices. Meet 40 CFR 60.19
Ohio Valley Resources, LLC	TBD	9/25/2013	NOx	Ammonia Storage Flare	0.068	lb/MMBtu 3 hour average	Proper flare design and good combustion practices; and process flaring minimization practices
Ohio Valley Resources, LLC	TBD	9/25/2013	NOx	Ammonia Storage Flare	125	lb/hr 3 hour average	Proper flare design and good combustion practices; and process flaring minimization practices
Southeast Idaho Energy, LLC Power County Advanced Energy Center	ID-0017	2/10/2009	NOx	Ammonia Storage Flare	No Numeric Limit	No Numeric Limit	Good combustion practices. Meet 40 CFR 60.19
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM	Flares	No Numeric Limit	No Numeric Limit	Good operating practices & use of natural gas
Ohio Valley Resources, LLC	TBD	9/25/2013	PM	Ammonia Storage Flare	0.0019	lb/MMBtu 3 hour average	Proper flare design and good combustion practices; and process flaring minimization practices
Southeast Idaho Energy, LLC Power County Advanced Energy Center	ID-0017	2/10/2009	PM	Ammonia Storage Flare	No Numeric Limit	No Numeric Limit	Smokeless flare. Air or steam-assist only if unassisted flare produces smoke. Good combustion practices. Meet 40 CFR 60.21
Ohio Valley Resources, LLC	TBD	9/25/2013	PM10	Ammonia Storage Flare	0.0075	lb/MMBtu 3 hour average	Proper flare design and good combustion practices; and process flaring minimization practices
Southeast Idaho Energy, LLC Power County Advanced Energy Center	ID-0017	2/10/2009	PM10	Ammonia Storage Flare	No Numeric Limit	No Numeric Limit	Smokeless flare. Air or steam-assist only if unassisted flare produces smoke. Good combustion practices. Meet 40 CFR 60.21
Ohio Valley Resources, LLC	TBD	9/25/2013	PM2.5	Ammonia Storage Flare	0.0075	lb/MMBtu 3 hour average	Proper flare design and good combustion practices; and process flaring minimization practices
Iowa Fertilizer Company	IA-0105	10/26/2012	Visible Emissions	Ammonia Flare	0	%	Work Practice/Good Combustion Practices
Ohio Valley Resources, LLC	TBD	9/25/2013	VOC	Ammonia Storage Flare	0.0054	lb/MMBtu 3 hour average	Proper flare design and good combustion practices; and process flaring minimization practices

Notes:
Highlighted fields represent the lowest limit in common units (e.g., lb/MMBtu). Other units may be shown; however, there is not enough information to convert to common units or averaging times.
Some facilities are not shown because they are not fertilizer production facilities. These units are not directly comparable because they do not flare common process gas.

Appendix A
KNO Restart - RBLC Summary

KNO Restart
RBLC Search Summary
Search: "Urea" - All Results Included
Unit 47 - Urea Loading
Unit 47a - Urea Transfer
Unit 47b - Urea Transfer

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft)	PM	Truck and Rail Loading Operation (EU-021A)	0.15	lb/hr 3 hour average	Baghouse (4800 metric ton/day)
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft)	PM10	Truck and Rail Loading Operation (EU-021A)	0.15	lb/hr 3 hour average	Baghouse (4800 metric ton/day)
Midwest Fertilizer Company LLC	IN-0263	3/23/17 (draft)	PM2.5	Truck and Rail Loading Operation (EU-021A)	0.15	lb/hr 3 hour average	Baghouse (4800 metric ton/day)
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM	Urea Loading	0.003	lb/ton average of 3 stack tests	Bin Vent Filter
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM	Urea Loading	5.48	tpy rolling 12 month total	Bin Vent Filter
Iowa Fertilizer Company	IA-0105	10/26/2012	PM	Granulated Urea Transfer	0.005	gr/dscf average of 3 stack tests	Bin Vent Filter
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM10	Urea Loading	0.0011	lb/ton average of 3 stack tests	Bin Vent Filter
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM10	Urea Loading	2.01	tpy rolling 12 month total	Bin Vent Filter
Iowa Fertilizer Company	IA-0105	10/26/2012	PM10	Granulated Urea Transfer	0.005	gr/dscf average of 3 stack tests	Bin Vent Filter
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM2.5	Urea Loading	0.0011	lb/ton average of 3 stack tests	Bin Vent Filter
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	PM2.5	Urea Loading	1.97	tpy rolling 12 month total	Bin Vent Filter
Iowa Fertilizer Company	IA-0105	10/26/2012	PM2.5	Granulated Urea Transfer	0.0013	gr/dscf average of 3 stack tests	Bin Vent Filter
CF Industries Nitrogen, LLC	IA-0106	7/12/2013	Visible Emissions	Urea Loading	0	%	Bin Vent Filter
Iowa Fertilizer Company	IA-0105	10/26/2012	Visible Emissions	Granulated Urea Transfer	0	% opacity	Bin Vent Filter

Notes:
Highlighted fields represent the lowest limit in common units (e.g., lb/MMBtu). Other units may be shown; however, there is not enough information to convert to common units or averaging times.

Appendix A
KNO Restart - RBLC Summary

KNO Restart
RBLC Search Summary
Search: "16.210 - combined cycle & cogen <25 MW" - All Results
Unit 55-Solar Turbines
Unit 56-Solar Turbines
Unit 57-Solar Turbines
Unit 58-Solar Turbines
Unit 59-Solar Turbines

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
Equistar Chemicals, LP - Westlake Facility	LA-0295	7/12/2016	NOx	Solar Titan 130 Gas Turbine with Unfired HRSG (3-08, EQT 323)	14.25	lb/hr hourly maximum	Dry low NOx combustor (SoLoNOx) and good combustion practices, including good equipment design, use of gaseous fuels for good mixing, and proper combustion techniques (159.46 MM BTU/HR) (Output power at generator: 14.117 MW) Turbine is subject to 40 CFR 60 Subpart KKKK. Good combustion practices shall include monitoring of the flue gas oxygen content, combustion air flow, fuel consumption, and flue gas temperature. These parameters shall be maintained within the manufacturer's recommended operating guidelines or within a range that is otherwise indicative of proper operation of the emissions unit.
Equistar Chemicals, LP - Westlake Facility	LA-0295	7/12/2016	NOx	Solar Titan 130 Gas Turbine with Unfired HRSG (3-08, EQT 323)	15	ppmv @ 15% O2 Annual Average	Dry low NOx combustor (SoLoNOx) and good combustion practices, including good equipment design, use of gaseous fuels for good mixing, and proper combustion techniques (159.46 MM BTU/HR) (Output power at generator: 14.117 MW) Turbine is subject to 40 CFR 60 Subpart KKKK. Good combustion practices shall include monitoring of the flue gas oxygen content, combustion air flow, fuel consumption, and flue gas temperature. These parameters shall be maintained within the manufacturer's recommended operating guidelines or within a range that is otherwise indicative of proper operation of the emissions unit.
Equistar Chemicals, LP - Westlake Facility	LA-0295	7/12/2016	VOC	Solar Titan 130 Gas Turbine with Unfired HRSG (3-08, EQT 323)	1.64	lb/hr hourly maximum	Good combustion practices, including good equipment design, use of gaseous fuels for good mixing, and proper combustion techniques consistent with the manufacturer's recommendations to maximize fuel efficiency and minize emissions. (159.46 MM BTU/HR) (Output power at generator: 14.117 MW) Turbine is subject to 40 CFR 60 Subpart KKKK. Good combustion practices shall include monitoring of the flue gas oxygen content, combustion air flow, fuel consumption, and flue gas temperature. These parameters shall be maintained within the manufacturer's recommended operating guidelines or within a range that is otherwise indicative of proper operation of the emissions unit. PSD permit requires an annual stack test for VOC. If VOC < 75% of the permit limit, the frequency of the testing may be reduced to once every 2 years. If result of any subsequent test exceeds 75% of the permit limit, resume annual testing.
Equistar Chemicals, LP - Westlake Facility	LA-0295	7/12/2016	VOC	Solar Titan 130 Gas Turbine with Unfired HRSG (3-08, EQT 323)	2.5	ppmv @ 15% O2 Annual Average	Good combustion practices, including good equipment design, use of gaseous fuels for good mixing, and proper combustion techniques consistent with the manufacturer's recommendations to maximize fuel efficiency and minize emissions. (159.46 MM BTU/HR) (Output power at generator: 14.117 MW) Turbine is subject to 40 CFR 60 Subpart KKKK. Good combustion practices shall include monitoring of the flue gas oxygen content, combustion air flow, fuel consumption, and flue gas temperature. These parameters shall be maintained within the manufacturer's recommended operating guidelines or within a range that is otherwise indicative of proper operation of the emissions unit. PSD permit requires an annual stack test for VOC. If VOC < 75% of the permit limit, the frequency of the testing may be reduced to once every 2 years. If result of any subsequent test exceeds 75% of the permit limit, resume annual testing.
Matem Limited Partnership - Medical Area Total Energy Plant	MA-0041	7/1/16, 4/28/17 update	NOx	Combustion Turbine with Duct Burner	2	ppmv @ 15% O2 1-hour block avg/excluding SS - ng firing	NSPS and SIP - Dry Low NOx Combustor & Selective Catalytic Reduction (a nominal 14.4 Megawatt (MW) Solar Titan 130 Combustion Turbine Generator (164.6MMBtu/hr for NG firing(also permitted to burn fuel oil)) with Heat Recovery Steam Generator including a Duct Burner) (38.8MMBtu/hr NG firing only). NOx limits are determined as BACT under 310 CMR 7.02(8). NOx(firing NG): ≤0.0074 lb/MMBtu, ≤1.21 lb/hr(no duct firing), ≤1.51 lb/hr(with duct firing); during start-ups (≤3 hrs): ≤36.2 lb per event, during shutdowns (≤1 hr): ≤11.2 lb per event.
Matem Limited Partnership - Medical Area Total Energy Plant	MA-0041	7/1/16, 4/28/17 update	CO	Combustion Turbine with Duct Burner	2	ppmv @ 15% O2 1-hour block avg/excluding SS - ng firing	SIP - Oxidation Catalyst (a nominal 14.4 Megawatt (MW) Solar Titan 130 Combustion Turbine Generator (164.6MMBtu/hr for NG firing(also permitted to burn fuel oil)) with Heat Recovery Steam Generator including a Duct Burner) (38.8MMBtu/hr NG firing only). CO limits are determined as BACT under 310 CMR 7.02(8). CO(firing NG): ≤0.0045 lb/MMBtu, ≤0.74 lb/hr(no duct firing), ≤0.92 lb/hr(with duct firing); during start-ups (≤3 hrs): ≤153.7 lb per event, during shutdowns (≤1 hr): ≤41.6 lb per event.

Appendix A
KNO Restart - RBLC Summary

KNO Restart
RBLC Search Summary
Search: "16.210 - combined cycle & cogen <25 MW" - All Results
Unit 55-Solar Turbines
Unit 56-Solar Turbines
Unit 57-Solar Turbines
Unit 58-Solar Turbines
Unit 59-Solar Turbines

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
Matem Limited Partnership - Medical Area Total Energy Plant	MA-0041	7/1/16, 4/28/17 update	VOC	Combustion Turbine with Duct Burner	1.7	ppmv @ 15% O2 1-hour block avg/excluding SS - ng firing	SIP - Oxidation Catalyst (a nominal 14.4 Megawatt (MW) Solar Titan 130 Combustion Turbine Generator (164.6MMBtu/hr for NG firing(also permitted to burn fuel oil)) with Heat Recovery Steam Generator including a Duct Burner) (38.8MMBtu/hr NG firing only). VOC limits are determined as BACT under 310 CMR 7.02(8). VOC as CH4(firing NG): ≤0.0022 lb/MMBtu, ≤0.36 lb/hr(no duct firing), ≤0.45 lb/hr(with duct firing); during start-ups (≤3 hrs): ≤11.4 lb per event, during shutdowns (≤1 hr): ≤3.3 lb per event VOC as CH4.
Matem Limited Partnership - Medical Area Total Energy Plant	MA-0041	7/1/16, 4/28/17 update	SO2	Combustion Turbine with Duct Burner	0.6	ppmv @ 15% O2 1-hour block avg/excluding SS - ng firing	NSPS and SIP - clean fuels - using natural gas as primary fuel (a nominal 14.4 Megawatt (MW) Solar Titan 130 Combustion Turbine Generator (164.6MMBtu/hr for NG firing(also permitted to burn fuel oil as backup)) with Heat Recovery Steam Generator including a Duct Burner) (38.8MMBtu/hr NG firing only). SO2 limits are determined as BACT under 310 CMR 7.02(8). SO2(firing NG): ≤0.0029 lb/MMBtu, ≤0.48 lb/hr(no duct firing), ≤0.58 lb/hr(with duct firing); during start-ups (≤3 hrs): ≤1.8 lb per event, during shutdowns (≤1 hr): ≤0.6 lb per event.
Matem Limited Partnership - Medical Area Total Energy Plant	MA-0041	7/1/16, 4/28/17 update	Sulfuric Acid (mist, vapors, etc)	Combustion Turbine with Duct Burner	0.4	ppmv @ 15% O2 1-hour block avg/excluding SS - ng firing	SIP - clean fuels - using natural gas as primary fuel (a nominal 14.4 Megawatt (MW) Solar Titan 130 Combustion Turbine Generator (164.6MMBtu/hr for NG firing(also permitted to burn fuel oil as backup)) with Heat Recovery Steam Generator including a Duct Burner) (38.8MMBtu/hr NG firing only). H2SO4 limits are determined as BACT under 310 CMR 7.02(8). H2SO4(firing NG): ≤0.0029lb/MMBtu, ≤0.47 lb/hr(no duct firing), ≤0.58 lb/hr(with duct firing); during start-ups (≤3 hrs): ≤1.8 lb per event, during shutdowns (≤1 hr): ≤0.6 lb per event.
Matem Limited Partnership - Medical Area Total Energy Plant	MA-0041	7/1/16, 4/28/17 update	Ammonia (NH3)	Combustion Turbine with Duct Burner	2	ppmv @ 15% O2 1-hour block avg/excluding SS - ng firing	SIP - no controls listed (a nominal 14.4 Megawatt (MW) Solar Titan 130 Combustion Turbine Generator (164.6MMBtu/hr for NG firing(also permitted to burn fuel oil as backup)) with Heat Recovery Steam Generator including a Duct Burner) (38.8MMBtu/hr NG firing only). NH3 limits are determined as BACT under 310 CMR 7.02(8). NH3(firing NG): ≤0.44 lb/hr(no duct firing), ≤0.55 lb/hr(with duct firing); NH3(turbine firing ULSD): ≤0.0029 lb/MMBtu, ≤0.46 lb/hr(no duct firing), ≤0.57 lb/hr(with duct firing).
Matem Limited Partnership - Medical Area Total Energy Plant	MA-0041	7/1/16, 4/28/17 update	Ammonia (NH3)	Combustion Turbine with Duct Burner	0.0027	lb/MMBtu 1-hour block avg/excluding SS - ng firing	SIP - no controls listed (a nominal 14.4 Megawatt (MW) Solar Titan 130 Combustion Turbine Generator (164.6MMBtu/hr for NG firing(also permitted to burn fuel oil as backup)) with Heat Recovery Steam Generator including a Duct Burner) (38.8MMBtu/hr NG firing only). NH3 limits are determined as BACT under 310 CMR 7.02(8). NH3(firing NG): ≤0.44 lb/hr(no duct firing), ≤0.55 lb/hr(with duct firing); NH3(turbine firing ULSD): ≤0.0029 lb/MMBtu, ≤0.46 lb/hr(no duct firing), ≤0.57 lb/hr(with duct firing).
Matem Limited Partnership - Medical Area Total Energy Plant	MA-0041	7/1/16, 4/28/17 update	TPM10	Combustion Turbine with Duct Burner	0.02	lb/MMBtu 1-hour block avg/excluding SS - ng firing	SIP - no controls listed (a nominal 14.4 Megawatt (MW) Solar Titan 130 Combustion Turbine Generator (164.6MMBtu/hr for NG firing(also permitted to burn fuel oil as backup)) with Heat Recovery Steam Generator including a Duct Burner) (38.8MMBtu/hr NG firing only). PM10(firing NG): ≤3.29 lb/hr(no duct firing), ≤4.07 lb/hr(with duct firing); during start-ups (≤3 hrs): ≤12.2 lb per event, during shutdowns (≤1 hr): ≤4.1 lb per event.
Matem Limited Partnership - Medical Area Total Energy Plant	MA-0041	7/1/16, 4/28/17 update	TPM2.5	Combustion Turbine with Duct Burner	0.02	lb/MMBtu 1-hour block avg/excluding SS - ng firing	SIP - no controls listed (a nominal 14.4 Megawatt (MW) Solar Titan 130 Combustion Turbine Generator (164.6MMBtu/hr for NG firing(also permitted to burn fuel oil as backup)) with Heat Recovery Steam Generator including a Duct Burner) (38.8MMBtu/hr NG firing only). PM2.5(firing NG): ≤3.29 lb/hr(no duct firing), ≤4.07 lb/hr(with duct firing); during start-ups (≤3 hrs): ≤12.2 lb per event, during shutdowns (≤1 hr): ≤4.1 lb per event.
Matem Limited Partnership - Medical Area Total Energy Plant	MA-0041	7/1/16, 4/28/17 update	CO2e	Combustion Turbine with Duct Burner	119	lb/MMBtu 1-hour block avg/excluding SS - ng firing	SIP - no controls listed (a nominal 14.4 Megawatt (MW) Solar Titan 130 Combustion Turbine Generator (164.6MMBtu/hr for NG firing(also permitted to burn fuel oil as backup)) with Heat Recovery Steam Generator including a Duct Burner) (38.8MMBtu/hr NG firing only). CO2e(firing NG): ≤19,584 lb/hr(no duct firing), ≤24,200 lb/hr(with duct firing).

Appendix A
KNO Restart - RBLC Summary

KNO Restart
RBLC Search Summary
Search: "16.210 - combined cycle & cogen <25 MW" - All Results
Unit 55-Solar Turbines
Unit 56-Solar Turbines
Unit 57-Solar Turbines
Unit 58-Solar Turbines
Unit 59-Solar Turbines

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
Wesleyan University	CT-0155	8/27/2008	CO	2.4 MW natural gas fired cogeneration facility	0.48	G/B-HP-H short term emission limit	oxidation catalyst
Wesleyan University	CT-0155	8/27/2008	CO	2.4 MW natural gas fired cogeneration facility	15.51	tpy annual emission limit	oxidation catalyst
Geisinger Medical Center	PA-0289	6/18/2010	CO	Combined heat and power combustion turbine	25	ppm @ 15% O2 in solonox mode	Unknown
Geisinger Medical Center	PA-0289	6/18/2010	CO	Combined heat and power combustion turbine	100	ppm @ 15% O2 in non solonox mode	Unknown
Geisinger Medical Center	PA-0289	6/18/2010	Formaldehyde	Combined heat and power combustion turbine	0.0029	lb/MMBtu	Unknown
Wesleyan University	CT-0155	8/27/2008	NOx	2.4 MW natural gas fired cogeneration facility	0.18	G/B-HP-H short term emission limit	Steuler Eco2pro SCR
Wesleyan University	CT-0155	8/27/2008	NOx	2.4 MW natural gas fired cogeneration facility	5.82	tpy annual emission limit	Steuler Eco2pro SCR
Cutrale Citrus Juices USA Auburndale citrus facility	FL-0313	6/12/2008	NOx	Cogen System Turbine NO.1 W/existing duct Burner #1	25	PPMVD hr average/corrected to 25%O2	dry low NOx burners
Cutrale Citrus Juices USA Leesburg citrus facility	FL-0314	6/2/2008	NOx	Cogen System Turbine & existing steam generator	25	PPMVD hr average/corrected to 25%O2	dry low NOx burners
Geisinger Medical Center	PA-0289	6/18/2010	NOx	Combined heat and power combustion turbine	15	ppm @ 15% O2 in solonox mode	SoLoNOx combustor
Geisinger Medical Center	PA-0289	6/18/2010	NOx	Combined heat and power combustion turbine	42	ppm @ 15% O2 in non solonox mode	SoLoNOx combustor
Cornell university Cornell combined heat & power project	NY-0101	3/12/2008	PM	Combustion Turbines 1, 2, 3	6.5	lb/hr above 1 hour average	sulfur in gas assigned max 1.2 gr/100scf; work practices to minimize NHZ slip
Cornell university Cornell combined heat & power project	NY-0101	3/12/2008	PM	Combustion Turbines 1, 2, 3	0.022	lb/MMBtu above 1 hour average w/duct firing	sulfur in gas assigned max 1.2 gr/100scf; work practices to minimize NHZ slip
Cornell university Cornell combined heat & power project	NY-0101	3/12/2008	PM10	Combustion Turbines 1, 2, 3	6.7	lb/hr above/below 1 hour average	sulfur in gas assigned max 1.2 gr/100scf; work practices to minimize NHZ slip
Cornell university Cornell combined heat & power project	NY-0101	3/12/2008	PM10	Combustion Turbines 1, 2, 3	0.023	lb/MMBtu above/below 1 hour average w/duct firing	sulfur in gas assigned max 1.2 gr/100scf; work practices to minimize NHZ slip
Cornell university Cornell combined heat & power project	NY-0101	3/12/2008	PM2.5	Combustion Turbines 1, 2, 3	6.7	lb/hr above/below 1 hour average	sulfur in gas assigned max 1.2 gr/100scf; work practices to minimize NHZ slip
Cornell university Cornell combined heat & power project	NY-0101	3/12/2008	PM2.5	Combustion Turbines 1, 2, 3	0.023	lb/MMBtu above/below 1 hour average w/duct firing	sulfur in gas assigned max 1.2 gr/100scf; work practices to minimize NHZ slip
Geisinger Medical Center	PA-0289	6/18/2010	VOC	Combined heat and power combustion turbine	0.6	lb/hr in solonox mode	unknown
Geisinger Medical Center	PA-0289	6/18/2010	VOC	Combined heat and power combustion turbine	11.9	lb/hr sub-zero in non-solonox mode	unknown

Notes:
Highlighted fields represent the lowest limit in common units (e.g., lb/MMBtu). Other units may be shown; however, there is not enough information to convert to common units or averaging times.

Some facilities are not shown because they are not fertilizer production facilities. These units are not directly comparable because they do not flare common process gas.

Appendix A
KNO Restart - RBLC Summary

KNO Restart
RBLC Search Summary
Search: "boiler","heater" - All Results for boilers <100 MMBtu/hr, not included in startup
Unit 50- Waste Heat Boiler
Unit 51- Waste Heat Boiler
Unit 52- Waste Heat Boiler
Unit 53- Waste Heat Boiler
Unit 54- Waste Heat Boiler

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
Nucor Steel Kankakee, Inc.	IL-0126	11/1/2018, updated 2/19/2019	FPM	Gas-Fired Space Heaters (25 MMBtu/hr)	0.0019	lb/MMBtu Individual Units	Operate and maintain in accordance with manufacturer's design
Nucor Steel Kankakee, Inc.	IL-0126	11/1/2018, updated 2/19/2019	FPM	Gas-Fired Space Heaters (25 MMBtu/hr)	0.15	lb/hr (total from all units)	Permit Limit
Nucor Steel Kankakee, Inc.	IL-0126	11/1/2018, updated 2/19/2019	NOx	Gas-Fired Space Heaters (25 MMBtu/hr)	0.1	lb/MMBtu Individual Units	Good combustion practices
Nucor Steel Kankakee, Inc.	IL-0126	11/1/2018, updated 2/19/2019	NOx	Gas-Fired Space Heaters (25 MMBtu/hr)	1.93	lb/hr (total from all units)	Good combustion practices
Nucor Steel Kankakee, Inc.	IL-0126	11/1/2018, updated 2/19/2019	CO2e	Gas-Fired Space Heaters (25 MMBtu/hr)	10197	ton/year	Good combustion practices (Compliance with limit in accordance with provisions of 40 CFR Part 98)
Nucor Steel Kankakee, Inc.	IL-0126	11/1/2018, updated 2/19/2019	TPM10	Gas-Fired Space Heaters (25 MMBtu/hr)	0.0075	lb/MMBtu Individual Units	(Test methods EPA/OAR Mthd 201 and OTM 28) (BACT-PSD)
Nucor Steel Kankakee, Inc.	IL-0126	11/1/2018, updated 2/19/2019	TPM2.5	Gas-Fired Space Heaters (25 MMBtu/hr)	0.0075	lb/MMBtu Individual Units	(BACT-PSD)
Green Bay Packaging, Inc. - Shipping Container Division	WI-0266	9/6/2018, updated 2/19/2019	VOC	Natural gas-fired boiler (Boiler B01) (35 MMBtu/hr)	0.0055	lb/MMBtu	Good combustion practices, use only natural gas, equip boiler with Low NOx burners and flue gas recirculation
Green Bay Packaging, Inc. - Shipping Container Division	WI-0266	9/6/2018, updated 2/19/2019	CO2e	Natural gas-fired boiler (Boiler B01) (35 MMBtu/hr)	160	lb CO2e/1000 lb steam	Good combustion practices, use only natural gas, equip boiler with Low NOx burners and flue gas recirculation
Green Bay Packaging, Inc. - Shipping Container Division	WI-0266	9/6/2018, updated 2/19/2019	VOC	Space heaters (process P53) (40 MMBtu/hr)	0.0055	lb/MMBtu	Good combustion practices, use only natural gas, equip with Low NOx burners
Green Bay Packaging, Inc. - Shipping Container Division	WI-0266	9/6/2018, updated 2/19/2019	CO2e	Space heaters (process P53) (40 MMBtu/hr)	no numerical limit		Good combustion practices, use only natural gas, equip with Low NOx burners minimum design annual fuel utilization efficiency of 90%
CPV Three Rivers, LLC - Energy Center	IL-0129	7/30/2018, updated 2/19/2019	NOx	Auxiliary Boiler (96 MMBtu/hr) (used on an intemittent basis (up to 4000 hrs/yr)	0.011	lb/MMBtu 3-hr avg	Ultra-low NOx burners and flue gas recirculation, air preheater, automated combustion managment system with O2 trim system and automated water blowdown, and good combustion practices (LAER)
CPV Three Rivers, LLC - Energy Center	IL-0129	7/30/2018, updated 2/19/2019	NOx	Auxiliary Boiler (96 MMBtu/hr) (used on an intemittent basis (up to 4000 hrs/yr)	1.1	lb/hr	Permit Limit
CPV Three Rivers, LLC - Energy Center	IL-0129	7/30/2018, updated 2/19/2019	NOx	Auxiliary Boiler (96 MMBtu/hr) (used on an intemittent basis (up to 4000 hrs/yr)	2.2	ton/year	Permit Limit
CPV Three Rivers, LLC - Energy Center	IL-0129	7/30/2018, updated 2/19/2019	CO	Auxiliary Boiler (96 MMBtu/hr) (used on an intemittent basis (up to 4000 hrs/yr)	0.037	lb/MMBtu 3-hr avg	Good Combustion Practices(BACT-PSD)
CPV Three Rivers, LLC - Energy Center	IL-0129	7/30/2018, updated 2/19/2019	CO	Auxiliary Boiler (96 MMBtu/hr) (used on an intemittent basis (up to 4000 hrs/yr)	3.6	lb/hr	Permit Limit
CPV Three Rivers, LLC - Energy Center	IL-0129	7/30/2018, updated 2/19/2019	CO	Auxiliary Boiler (96 MMBtu/hr) (used on an intemittent basis (up to 4000 hrs/yr)	7.2	ton/year	Permit Limit
CPV Three Rivers, LLC - Energy Center	IL-0129	7/30/2018, updated 2/19/2019	TPM (PM, PM10 and PM2.5)	Auxiliary Boiler (96 MMBtu/hr) (used on an intemittent basis (up to 4000 hrs/yr)	0.0075	no units listed	Good Combustion Practices(BACT-PSD)
CPV Three Rivers, LLC - Energy Center	IL-0129	7/30/2018, updated 2/19/2019	TPM (PM, PM10 and PM2.5)	Auxiliary Boiler (96 MMBtu/hr) (used on an intemittent basis (up to 4000 hrs/yr)	0.72	lb/hr	Permit Limit
CPV Three Rivers, LLC - Energy Center	IL-0129	7/30/2018, updated 2/19/2019	TPM (PM, PM10 and PM2.5)	Auxiliary Boiler (96 MMBtu/hr) (used on an intemittent basis (up to 4000 hrs/yr)	1.44	ton/year	Permit Limit
CPV Three Rivers, LLC - Energy Center	IL-0129	7/30/2018, updated 2/19/2019	Sulfuric Acid (mist, vapors, etc)	Auxiliary Boiler (96 MMBtu/hr) (used on an intemittent basis (up to 4000 hrs/yr)	0.1	lb/hr	Good Combustion Practices(BACT-PSD)
CPV Three Rivers, LLC - Energy Center	IL-0129	7/30/2018, updated 2/19/2019	Sulfuric Acid (mist, vapors, etc)	Auxiliary Boiler (96 MMBtu/hr) (used on an intemittent basis (up to 4000 hrs/yr)	0.2	ton/year	Permit Limit
CPV Three Rivers, LLC - Energy Center	IL-0129	7/30/2018, updated 2/19/2019	CO2e	Auxiliary Boiler (96 MMBtu/hr) (used on an intemittent basis (up to 4000 hrs/yr)	22500	ton/year 12-month rolling avg	Good Combustion Practices(BACT-PSD)

Appendix A
KNO Restart - RBLC Summary

KNO Restart
RBLC Search Summary
Search: "boiler","heater" - All Results for boilers <100 MMBtu/hr, not included in startup
Unit 50- Waste Heat Boiler
Unit 51- Waste Heat Boiler
Unit 52- Waste Heat Boiler
Unit 53- Waste Heat Boiler
Unit 54- Waste Heat Boiler

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
CPV Three Rivers, LLC - Energy Center	IL-0129	7/30/2018, updated 2/19/2019	NOx	Fuel Heater (12.80 MMBtu/hr)	0.011	lb/MMBtu	LAER NSPS - Low NOx burners
CPV Three Rivers, LLC - Energy Center	IL-0129	7/30/2018, updated 2/19/2019	NOx	Fuel Heater (12.80 MMBtu/hr)	0.45	lb/hr	Permit Limit
CPV Three Rivers, LLC - Energy Center	IL-0129	7/30/2018, updated 2/19/2019	NOx	Fuel Heater (12.80 MMBtu/hr)	2.0	ton/year	Permit Limit
CPV Three Rivers, LLC - Energy Center	IL-0129	7/30/2018, updated 2/19/2019	CO	Fuel Heater (12.80 MMBtu/hr)	0.08	lb/hr	Good Combustion Practices(BACT-PSD)
CPV Three Rivers, LLC - Energy Center	IL-0129	7/30/2018, updated 2/19/2019	CO	Fuel Heater (12.80 MMBtu/hr)	1.02	lb/hr	Permit Limit
CPV Three Rivers, LLC - Energy Center	IL-0129	7/30/2018, updated 2/19/2019	CO	Fuel Heater (12.80 MMBtu/hr)	4.5	ton/year	Permit Limit
CPV Three Rivers, LLC - Energy Center	IL-0129	7/30/2018, updated 2/19/2019	TPM (PM, PM10 and PM2.5)	Fuel Heater (12.80 MMBtu/hr)	0.0075	lb/MMBtu	Good Combustion Practices(BACT-PSD)
CPV Three Rivers, LLC - Energy Center	IL-0129	7/30/2018, updated 2/19/2019	Sulfuric Acid (mist, vapors, etc)	Fuel Heater (12.80 MMBtu/hr)	0.014	lb/hr	Good Combustion Practices(BACT-PSD)
CPV Three Rivers, LLC - Energy Center	IL-0129	7/30/2018, updated 2/19/2019	CO2e	Fuel Heater (12.80 MMBtu/hr)	6600	ton/year 12-month rolling avg	Good Combustion Practices(BACT-PSD)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018, updated 2/19/2019	CO	EUAUXBOILER: Auxiliary Boiler (99.9 MMBtu/hr)	0.007	lb/mmbtu hourly	Good Combustion Practices, Low Sulfur Fuel (BACT-PSD SIP)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018, updated 2/19/2019	CO	EUAUXBOILER: Auxiliary Boiler (99.9 MMBtu/hr)	0.7	lb/hr hourly	Good Combustion Practices, Low Sulfur Fuel (BACT-PSD SIP)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018, updated 2/19/2019	NOx	EUAUXBOILER: Auxiliary Boiler (99.9 MMBtu/hr)	0.036	lb/mmbtu hourly	Low NOx Burners/Flue Gas Recirculation (SCR not cost effective) (BACT-PSD SIP)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018, updated 2/19/2019	NOx	EUAUXBOILER: Auxiliary Boiler (99.9 MMBtu/hr)	3.6	lb/hr hourly	Low NOx Burners/Flue Gas Recirculation (SCR not cost effective) (BACT-PSD SIP)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018, updated 2/19/2019	FPM	EUAUXBOILER: Auxiliary Boiler (99.9 MMBtu/hr)	0.007	lb/mmbtu hourly	Good Combustion Practices, Low Sulfur Fuel (BACT-PSD SIP)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018, updated 2/19/2019	FPM	EUAUXBOILER: Auxiliary Boiler (99.9 MMBtu/hr)	0.7	lb/hr hourly	Good Combustion Practices, Low Sulfur Fuel (BACT-PSD SIP)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018, updated 2/19/2019	TPM10	EUAUXBOILER: Auxiliary Boiler (99.9 MMBtu/hr)	0.007	lb/mmbtu hourly	Good Combustion Practices, Low Sulfur Fuel (BACT-PSD SIP)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018, updated 2/19/2019	TPM10	EUAUXBOILER: Auxiliary Boiler (99.9 MMBtu/hr)	0.7	lb/hr hourly	Good Combustion Practices, Low Sulfur Fuel (BACT-PSD SIP)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018, updated 2/19/2019	TPM2.5	EUAUXBOILER: Auxiliary Boiler (99.9 MMBtu/hr)	0.075	lb/mmbtu hourly	Good Combustion Practices (BACT-PSD SIP)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018, updated 2/19/2019	TPM2.5	EUAUXBOILER: Auxiliary Boiler (99.9 MMBtu/hr)	7.49	lb/hr hourly	Good Combustion Practices (BACT-PSD SIP)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018, updated 2/19/2019	VOC	EUAUXBOILER: Auxiliary Boiler (99.9 MMBtu/hr)	0.008	lb/mmbtu hourly	Good Combustion Controls (BACT-PSD SIP)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018, updated 2/19/2019	VOC	EUAUXBOILER: Auxiliary Boiler (99.9 MMBtu/hr)	0.8	lb/hr hourly	Good Combustion Controls (BACT-PSD SIP)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018, updated 2/19/2019	Sulfuric Acid (mist, vapors, etc)	EUAUXBOILER: Auxiliary Boiler (99.9 MMBtu/hr)	0.34	gr s/100 scf Fuel supplier records	Good Combustion Practices, Low Sulfur Fuel (BACT-PSD NSPS SIP)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018, updated 2/19/2019	CO2e	EUAUXBOILER: Auxiliary Boiler (99.9 MMBtu/hr)	25623	ton/year 12-month rolling time period	Energy Efficiency Measures, Use of Natural Gas (BACT-PSD)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018, updated 2/19/2019	CO	EUFUELHTR1: Natural gas fired fuel heater (20.80 MMBtu/hr)	0.77	lb/hr hourly	Good Combustion Controls (BACT-PSD SIP)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018, updated 2/19/2019	NOx	EUFUELHTR1: Natural gas fired fuel heater (20.80 MMBtu/hr)	0.75	lb/hr hourly	Low NOx Burners (BACT-PSD SIP)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018, updated 2/19/2019	FPM	EUFUELHTR1: Natural gas fired fuel heater (20.80 MMBtu/hr)	0.15	lb/hr hourly	Low Sulfur Fuel (BACT-PSD SIP)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018, updated 2/19/2019	TPM10	EUFUELHTR1: Natural gas fired fuel heater (20.80 MMBtu/hr)	0.15	lb/hr hourly	Low Sulfur Fuel (Oxidation catalyst is not economically feasible) (BACT-PSD SIP)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018, updated 2/19/2019	TPM2.5	EUFUELHTR1: Natural gas fired fuel heater (20.80 MMBtu/hr)	0.15	lb/hr hourly	Low Sulfur Fuel (BACT-PSD SIP)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018, updated 2/19/2019	VOC	EUFUELHTR1: Natural gas fired fuel heater (20.80 MMBtu/hr)	0.17	lb/hr hourly	Good Combustion Controls (BACT-PSD SIP)

KNO Restart
RBLC Search Summary
Search: "boiler","heater" - All Results for boilers <100 MMBtu/hr, not included in startup
Unit 50- Waste Heat Boiler
Unit 51- Waste Heat Boiler
Unit 52- Waste Heat Boiler
Unit 53- Waste Heat Boiler
Unit 54- Waste Heat Boiler

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018, updated 2/19/2019	Sulfuric Acid (mist, vapors, etc)	EUFUELHTR1: Natural gas fired fuel heater (20.80 MMBtu/hr)	0.34	gr s/100 scf Fuel supplier records	Low Sulfur Fuel (BACT-PSD SIP)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018, updated 2/19/2019	CO2e	EUFUELHTR1: Natural gas fired fuel heater (20.80 MMBtu/hr)	6310	ton/year 12-month rolling time period (combined EUFUELHTR1 and EUFUELHTR2)	Natural Gas Fuel (BACT-PSD)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018, updated 2/19/2019	CO	EUFUELHTR2: Natural gas fired fuel heater (3.80 MMBtu/hr)	0.14	lb/hr hourly	Good Combustion Controls (BACT-PSD SIP)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018, updated 2/19/2019	NOx	EUFUELHTR2: Natural gas fired fuel heater (3.80 MMBtu/hr)	0.14	lb/hr hourly	Low NOx Burners (BACT-PSD SIP)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018, updated 2/19/2019	FPM	EUFUELHTR2: Natural gas fired fuel heater (3.80 MMBtu/hr)	0.03	lb/hr hourly	Low Sulfur Fuel (BACT-PSD SIP)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018, updated 2/19/2019	TPM10	EUFUELHTR2: Natural gas fired fuel heater (3.80 MMBtu/hr)	0.03	lb/hr hourly	Low Sulfur Fuel (oxidation catalyst not economically feasible) (BACT-PSD SIP)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018, updated 2/19/2019	TPM2.5	EUFUELHTR2: Natural gas fired fuel heater (3.80 MMBtu/hr)	0.03	lb/hr hourly	BACT PSD SIP Low Sulfur Fuel (BACT-PSD SIP)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018, updated 2/19/2019	VOC	EUFUELHTR2: Natural gas fired fuel heater (3.80 MMBtu/hr)	0.03	lb/hr hourly	Good Combustion Controls (BACT-PSD SIP)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018, updated 2/19/2019	Sulfuric Acid (mist, vapors, etc)	EUFUELHTR2: Natural gas fired fuel heater (3.80 MMBtu/hr)	0.34	gr s/100 scf Fuel supplier records	Low Sulfur Fuel (BACT-PSD SIP)
DTE Electric Company - Belle River Combined Cycle Power Plant	MI-0435	7/16/2018, updated 2/19/2019	CO2e	EUFUELHTR2: Natural gas fired fuel heater (3.80 MMBtu/hr)	6310	ton/year 12-month rolling time period (combined EUFUELHTR1 and EUFUELHTR2)	Natural Gas Fuel (BACT-PSD)
Marshall Energy Center LLC - MEC North, LLC and MEC South, LLC	MI-0433	6/29/2018, updated 2/19/2019	CO	EUAUXBOILER (North Plant): Auxiliary Boiler (61.5 MMBtu/hr)	0.08	lb/MMBtu hourly	Good Combustion Practices (oxidation catalyst not economically feasible) (BACT-PSD SIP)
Marshall Energy Center LLC - MEC North, LLC and MEC South, LLC	MI-0433	6/29/2018, updated 2/19/2019	NOx	EUAUXBOILER (North Plant): Auxiliary Boiler (61.5 MMBtu/hr)	0.04	lb/MMBtu 30-day rolling avg time period	Low NOx Burners/flue gas recirculation and good combustion practices (SCR not economically feasible) (BACT-PSD SIP)
Marshall Energy Center LLC - MEC North, LLC and MEC South, LLC	MI-0433	6/29/2018, updated 2/19/2019	FPM	EUAUXBOILER (North Plant): Auxiliary Boiler (61.5 MMBtu/hr)	0.005	lb/MMBtu hourly	Good Combustion Practices (BACT-PSD SIP)
Marshall Energy Center LLC - MEC North, LLC and MEC South, LLC	MI-0433	6/29/2018, updated 2/19/2019	TPM10	EUAUXBOILER (North Plant): Auxiliary Boiler (61.5 MMBtu/hr)	0.46	lb/hr hourly	Good Combustion Practices (no control equipment economically feasible) (BACT-PSD SIP)
Marshall Energy Center LLC - MEC North, LLC and MEC South, LLC	MI-0433	6/29/2018, updated 2/19/2019	TPM2.5	EUAUXBOILER (North Plant): Auxiliary Boiler (61.5 MMBtu/hr)	0.46	lb/hr hourly	Good Combustion Practices (no control equipment economically feasible) (BACT-PSD SIP)
Marshall Energy Center LLC - MEC North, LLC and MEC South, LLC	MI-0433	6/29/2018, updated 2/19/2019	VOC	EUAUXBOILER (North Plant): Auxiliary Boiler (61.5 MMBtu/hr)	0.004	lb/MMBtu hourly	Good Combustion Practices (oxidation catalysts not economically feasible) (BACT-PSD SIP)
Marshall Energy Center LLC - MEC North, LLC and MEC South, LLC	MI-0433	6/29/2018, updated 2/19/2019	SO2	EUAUXBOILER (North Plant): Auxiliary Boiler (61.5 MMBtu/hr)	1.8	lb/MMscf monthly	Good Combustion Practices and use of pipeline quality natural gas (BACT-PSD NSPS SIP)
Marshall Energy Center LLC - MEC North, LLC and MEC South, LLC	MI-0433	6/29/2018, updated 2/19/2019	SO2	EUAUXBOILER (North Plant): Auxiliary Boiler (61.5 MMBtu/hr)	0.6	gr s/100 scf Fuel supplier records	Good Combustion Practices and use of pipeline quality natural gas (emission factor based on natural gas material limit of 2,000 grains of sulfur per MMSCF) (BACT-PSD NSPS SIP)
Marshall Energy Center LLC - MEC North, LLC and MEC South, LLC	MI-0433	6/29/2018, updated 2/19/2019	CO2e	EUAUXBOILER (North Plant): Auxiliary Boiler (61.5 MMBtu/hr)	31540	ton/year 12-month rolling time period	Energy efficiency measures and the use of a low carbon fuel (pipeline quality natural gas) (BACT-PSD)
Marshall Energy Center LLC - MEC North, LLC and MEC South, LLC	MI-0433	6/29/2018, updated 2/19/2019	CO	EUAUXBOILER (South Plant): Auxiliary Boiler (61.5 MMBtu/hr)	0.08	lb/MMBtu hourly	Good Combustion Practices (oxidation catalyst not economically feasible) (BACT-PSD SIP)
Marshall Energy Center LLC - MEC North, LLC and MEC South, LLC	MI-0433	6/29/2018, updated 2/19/2019	NOx	EUAUXBOILER (South Plant): Auxiliary Boiler (61.5 MMBtu/hr)	0.04	lb/MMBtu 30-day rolling avg time period	Low NOx Burners/flue gas recirculation and good combustion practices (SCR not economically feasible) (BACT-PSD SIP)
Marshall Energy Center LLC - MEC North, LLC and MEC South, LLC	MI-0433	6/29/2018, updated 2/19/2019	FPM	EUAUXBOILER (South Plant): Auxiliary Boiler (61.5 MMBtu/hr)	0.005	lb/MMBtu hourly	Good Combustion Practices (BACT-PSD SIP)
Marshall Energy Center LLC - MEC North, LLC and MEC South, LLC	MI-0433	6/29/2018, updated 2/19/2019	TPM10	EUAUXBOILER (South Plant): Auxiliary Boiler (61.5 MMBtu/hr)	0.46	lb/hr hourly	Good Combustion Practices (no control equipment economically feasible) (BACT-PSD SIP)
Marshall Energy Center LLC - MEC North, LLC and MEC South, LLC	MI-0433	6/29/2018, updated 2/19/2019	TPM2.5	EUAUXBOILER (South Plant): Auxiliary Boiler (61.5 MMBtu/hr)	0.46	lb/hr hourly	Good Combustion Practices (no control equipment economically feasible) (BACT-PSD SIP)
Marshall Energy Center LLC - MEC North, LLC and MEC South, LLC	MI-0433	6/29/2018, updated 2/19/2019	VOC	EUAUXBOILER (South Plant): Auxiliary Boiler (61.5 MMBtu/hr)	0.004	lb/MMBtu hourly	Good Combustion Practices (oxidation catalysts not economically feasible) (BACT-PSD SIP)

KNO Restart
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Unit 50- Waste Heat Boiler
Unit 51- Waste Heat Boiler
Unit 52- Waste Heat Boiler
Unit 53- Waste Heat Boiler
Unit 54- Waste Heat Boiler

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
Marshall Energy Center LLC - MEC North, LLC and MEC South, LLC	MI-0433	6/29/2018, updated 2/19/2019	SO2	EUAUXBOILER (South Plant): Auxiliary Boiler (61.5 MMBtu/hr)	1.8	lb/MMscf monthly	Good Combustion Practices and use of pipeline quality natural gas (BACT-PSD NSPS SIP)
Marshall Energy Center LLC - MEC North, LLC and MEC South, LLC	MI-0433	6/29/2018, updated 2/19/2019	SO2	EUAUXBOILER (South Plant): Auxiliary Boiler (61.5 MMBtu/hr)	0.6	gr s/100 scf Fuel supplier records	Good Combustion Practices and use of pipeline quality natural gas (emission factor based on natural gas material limit of 2,000 grains of sulfur per MMSCF) (BACT-PSD NSPS SIP)
Marshall Energy Center LLC - MEC North, LLC and MEC South, LLC	MI-0433	6/29/2018, updated 2/19/2019	CO2e	EUAUXBOILER (South Plant): Auxiliary Boiler (61.5 MMBtu/hr)	31540	ton/year 12-month rolling time period	Energy efficiency measures and the use of a low carbon fuel (pipeline quality natural gas) (BACT-PSD)
Dominion Energy Transmission, Inc. - Mockingbird Hill Compressor Station	WV-0031	6/14/2018, updated 9/24/2018	TPM2.5	WH-1 - Boiler (8.72 MMBtu/hr)	0.28	ton/year 12-month rolling	Limited to Natural Gas (Monitoring is limit to either fuel usage or tracking hours of operation) (BACT-PSD SIP)
Dominion Energy Transmission, Inc. - Mockingbird Hill Compressor Station	WV-0031	6/14/2018, updated 9/24/2018	TPM10	WH-1 - Boiler (8.72 MMBtu/hr)	0.28	ton/year 12-month rolling	Limited to Natural Gas (Monitoring is limit to either fuel usage or tracking hours of operation) (BACT-PSD SIP)
Dominion Energy Transmission, Inc. - Mockingbird Hill Compressor Station	WV-0031	6/14/2018, updated 9/24/2018	TPM	WH-1 - Boiler (8.72 MMBtu/hr)	0.28	ton/year 12-month rolling	Limited to Natural Gas (Monitoring is limit to either fuel usage or tracking hours of operation) (BACT-PSD SIP)
Dominion Energy Transmission, Inc. - Mockingbird Hill Compressor Station	WV-0031	6/14/2018, updated 9/24/2018	CO2e	WH-1 - Boiler (8.72 MMBtu/hr)	4468	ton/year 12-month rolling	Restricted to pipeline quality natural gas and tune-up the boiler once every five years (BACT-PSD)
ESC Harrison County Power, LLC - Harrison County Power Plant	WV-0029	3/27/2018, updated 6/25/2018	CO	Auxiliary Boiler (77.8 MMBtu/hr)	2.88	lb/hr	Good Combustion Practices (BACT-PSD)
ESC Harrison County Power, LLC - Harrison County Power Plant	WV-0029	3/27/2018, updated 6/25/2018	CO	Auxiliary Boiler (77.8 MMBtu/hr)	6.58	tons/year	Good Combustion Practices (BACT-PSD)
ESC Harrison County Power, LLC - Harrison County Power Plant	WV-0029	3/27/2018, updated 6/25/2018	CO	Auxiliary Boiler (77.8 MMBtu/hr)	0.037	lb/MMBtu	Good Combustion Practices (BACT-PSD)
ESC Harrison County Power, LLC - Harrison County Power Plant	WV-0029	3/27/2018, updated 6/25/2018	NOx	Auxiliary Boiler (77.8 MMBtu/hr)	0.86	lb/hr	Low NOx Burners/flue gas recirculation and good combustion practices (BACT-PSD)
ESC Harrison County Power, LLC - Harrison County Power Plant	WV-0029	3/27/2018, updated 6/25/2018	NOx	Auxiliary Boiler (77.8 MMBtu/hr)	1.96	tons/year	Low NOx Burners/flue gas recirculation and good combustion practices (BACT-PSD)
ESC Harrison County Power, LLC - Harrison County Power Plant	WV-0029	3/27/2018, updated 6/25/2018	NOx	Auxiliary Boiler (77.8 MMBtu/hr)	0.0011	lb/MMBtu	Low NOx Burners/flue gas recirculation and good combustion practices (BACT-PSD)
ESC Harrison County Power, LLC - Harrison County Power Plant	WV-0029	3/27/2018, updated 6/25/2018	TPM	Auxiliary Boiler (77.8 MMBtu/hr)	0.6	lb/hr	Low NOx Burners/flue gas recirculation and good combustion practices (BACT-PSD SIP)
ESC Harrison County Power, LLC - Harrison County Power Plant	WV-0029	3/27/2018, updated 6/25/2018	TPM	Auxiliary Boiler (77.8 MMBtu/hr)	1.38	tons/year	Low NOx Burners/flue gas recirculation and good combustion practices (BACT-PSD SIP)
ESC Harrison County Power, LLC - Harrison County Power Plant	WV-0029	3/27/2018, updated 6/25/2018	TPM	Auxiliary Boiler (77.8 MMBtu/hr)	0.008	lb/MMBtu	Low NOx Burners/flue gas recirculation and good combustion practices (BACT-PSD SIP)
ESC Harrison County Power, LLC - Harrison County Power Plant	WV-0029	3/27/2018, updated 6/25/2018	VOC	Auxiliary Boiler (77.8 MMBtu/hr)	0.62	lb/hr	Use of Natural Gas, Good Combustion Practices (BACT-PSD SIP)
ESC Harrison County Power, LLC - Harrison County Power Plant	WV-0029	3/27/2018, updated 6/25/2018	VOC	Auxiliary Boiler (77.8 MMBtu/hr)	1.42	tons/year	Use of Natural Gas, Good Combustion Practices (BACT-PSD SIP)
ESC Harrison County Power, LLC - Harrison County Power Plant	WV-0029	3/27/2018, updated 6/25/2018	VOC	Auxiliary Boiler (77.8 MMBtu/hr)	0.008	lb/MMBtu	Use of Natural Gas, Good Combustion Practices (BACT-PSD SIP)
ESC Harrison County Power, LLC - Harrison County Power Plant	WV-0029	3/27/2018, updated 6/25/2018	Sulfuric Acid (mist, vapors, etc)	Auxiliary Boiler (77.8 MMBtu/hr)	0.0132	lb/hr	Use of Natural Gas (BACT-PSD SIP)
ESC Harrison County Power, LLC - Harrison County Power Plant	WV-0029	3/27/2018, updated 6/25/2018	Sulfuric Acid (mist, vapors, etc)	Auxiliary Boiler (77.8 MMBtu/hr)	0.03	tons/year	Use of Natural Gas (BACT-PSD SIP)
ESC Harrison County Power, LLC - Harrison County Power Plant	WV-0029	3/27/2018, updated 6/25/2018	Sulfuric Acid (mist, vapors, etc)	Auxiliary Boiler (77.8 MMBtu/hr)	0.0002	lb/MMBtu	Use of Natural Gas (BACT-PSD SIP)
ESC Harrison County Power, LLC - Harrison County Power Plant	WV-0029	3/27/2018, updated 6/25/2018	CO2e	Auxiliary Boiler (77.8 MMBtu/hr)	9107	lb/hr emission limit	Use of Natural Gas (BACT-PSD)
ESC Harrison County Power, LLC - Harrison County Power Plant	WV-0029	3/27/2018, updated 6/25/2018	CO2e	Auxiliary Boiler (77.8 MMBtu/hr)	20837	tons/year emission limit	Use of Natural Gas (BACT-PSD)
ESC Harrison County Power, LLC - Harrison County Power Plant	WV-0029	3/27/2018, updated 6/25/2018	CO2e	Auxiliary Boiler (77.8 MMBtu/hr)	9107	lb/hr standard emission	Use of Natural Gas (BACT-PSD)
Florida Power and Light Company - Dania Beach Energy Center	FL-0363 (draft)	12/4/2017, updated 4/11/2018	CO	99.8 MMBtu/hr Auxiliary Boiler	0.08	lb/MMBtu	Clean Fuel (Compliance by initial and annual stack test (EPA/OER mthd 10), or manufacturer guarantee. CO also serves as proxy for VOC.) (BACT-PSD)
Florida Power and Light Company - Dania Beach Energy Center	FL-0363 (draft)	12/4/2017, updated 4/11/2018	SO2	99.8 MMBtu/hr Auxiliary Boiler	no numeric limit		Clean Fuel (May only fire natural gas with sulfur content less than 2 grains per 100 scf. This limits SO2, SAM, PM, PM10, and PM2.5) (BACT-PSD NSPS)

Appendix A
KNO Restart - RBLC Summary

KNO Restart
RBLC Search Summary
Search: "boiler","heater" - All Results for boilers <100 MMBtu/hr, not included in startup
Unit 50- Waste Heat Boiler
Unit 51- Waste Heat Boiler
Unit 52- Waste Heat Boiler
Unit 53- Waste Heat Boiler
Unit 54- Waste Heat Boiler

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
Florida Power and Light Company - Dania Beach Energy Center	FL-0363 (draft)	12/4/2017, updated 4/11/2018	Sulfuric Acid (mist, vapors, etc)	99.8 MMBtu/hr Auxiliary Boiler	no numeric limit		Clean Fuel (May only fire natural gas with sulfur content less than 2 grains per 100 scf. This limits SO2, SAM, PM, PM10, and PM2.5) (BACT-PSD NSPS)
Florida Power and Light Company - Dania Beach Energy Center	FL-0363 (draft)	12/4/2017, updated 4/11/2018	FPM	99.8 MMBtu/hr Auxiliary Boiler	no numeric limit		Clean Fuel (May only fire natural gas with sulfur content less than 2 grains per 100 scf. This limits SO2, SAM, PM, PM10, and PM2.5) (BACT-PSD NSPS)
Florida Power and Light Company - Dania Beach Energy Center	FL-0363 (draft)	12/4/2017, updated 4/11/2018	TPM10	99.8 MMBtu/hr Auxiliary Boiler	no numeric limit		Clean Fuel (May only fire natural gas with sulfur content less than 2 grains per 100 scf. This limits SO2, SAM, PM, PM10, and PM2.5) (BACT-PSD)
Florida Power and Light Company - Dania Beach Energy Center	FL-0363 (draft)	12/4/2017, updated 4/11/2018	TPM2.5	99.8 MMBtu/hr Auxiliary Boiler	no numeric limit		Clean Fuel (May only fire natural gas with sulfur content less than 2 grains per 100 scf. This limits SO2, SAM, PM, PM10, and PM2.5) (BACT-PSD)
Holland Board of Public Works - East 5th Street	**MI-0424 (draft) (update of MI-0412)**	12/5/2016, 7/31/17 update	CO	EUAUXBOILER (Auxiliary Boiler)	0.077	lb/MMBtu Test protocol will specify avg time	SIP - Good combustion practices (83.5 MMBtu/hr)
Holland Board of Public Works - East 5th Street	MI-0424 (draft)	12/5/2016, 7/31/17 update	NOx	EUAUXBOILER (Auxiliary Boiler)	0.05	lb/MMBtu Test protocol will specify avg time	SIP - Low NOx burners/Internal flue gas recirculation and good combustion practices (83.5 MMBtu/hr)
Holland Board of Public Works - East 5th Street	MI-0424 (draft)	12/5/2016, 7/31/17 update	FPM	EUAUXBOILER (Auxiliary Boiler)	0.0018	lb/MMBtu Test protocol will specify avg time	Good combustion practices (83.5 MMBtu/hr)
Holland Board of Public Works - East 5th Street	MI-0424 (draft)	12/5/2016, 7/31/17 update	TPM10	EUAUXBOILER (Auxiliary Boiler)	0.007	lb/MMBtu Test protocol will specify avg time	SIP - Good combustion practices (83.5 MMBtu/hr)
Holland Board of Public Works - East 5th Street	MI-0424 (draft)	12/5/2016, 7/31/17 update	TPM2.5	EUAUXBOILER (Auxiliary Boiler)	0.007	lb/MMBtu Test protocol will specify avg time	SIP - Good combustion practices (83.5 MMBtu/hr)
Holland Board of Public Works - East 5th Street	MI-0424 (draft)	12/5/2016, 7/31/17 update	VOC	EUAUXBOILER (Auxiliary Boiler)	0.008	lb/MMBtu Test protocol will specify avg time	Good combustion practices (83.5 MMBtu/hr)
Holland Board of Public Works - East 5th Street	MI-0424 (draft)	12/5/2016, 7/31/17 update	CO2e	EUAUXBOILER (Auxiliary Boiler)	43283	tpy 12-month rolling time period	Good combustion practices (83.5 MMBtu/hr)
Rextac, LLC - Odessa Petrochemical Plant	TX-0813 (draft)	11/22/2016, 12/1/16 update	VOC	Small Boiler	0.0005	MMBtu/hr	NSPS Dc - Best combustion practices (39.9 MMBtu/hr)
CPV Fairview, LLC - CPV Fairview Energy Center	PA-0310	9/2/16, 7/31/17 update	NOx	Auxilary boiler	0.11	Llb/MMBtu Avg of 3 1-hr test runs	NSPS - Ultra low NOx burners, FGR, good combustion practices (Operation of the auxiliary boiler shall not exceed 4000 hrs in any continuous 12-month period) (92.4 MMBtu/hr)
CPV Fairview, LLC - CPV Fairview Energy Center	PA-0310	9/2/16, 7/31/17 update	NOx	Auxilary boiler	2.03	tpy 12-month rolling basis	NSPS - Ultra low NOx burners, FGR, good combustion practices (Operation of the auxiliary boiler shall not exceed 4000 hrs in any continuous 12-month period) (92.4 MMBtu/hr)
CPV Fairview, LLC - CPV Fairview Energy Center	PA-0310	9/2/16, 7/31/17 update	CO	Auxilary boiler	0.037	lb/MMBtu Avg of 3 1-hr test runs	NSPS - ULSD and good combustion practices (Operation of the auxiliary boiler shall not exceed 4000 hrs in any continuous 12-month period) (92.4 MMBtu/hr)
CPV Fairview, LLC - CPV Fairview Energy Center	PA-0310	9/2/16, 7/31/17 update	CO	Auxilary boiler	6.84	tpy 12-month rolling basis	NSPS - ULSD and good combustion practices (Operation of the auxiliary boiler shall not exceed 4000 hrs in any continuous 12-month period) (92.4 MMBtu/hr)
CPV Fairview, LLC - CPV Fairview Energy Center	PA-0310	9/2/16, 7/31/17 update	TPM	Auxilary boiler	0.007	lb/MMBtu	NSPS - ULSD and good combustion practices (Operation of the auxiliary boiler shall not exceed 4000 hrs in any continuous 12-month period) (92.4 MMBtu/hr)
CPV Fairview, LLC - CPV Fairview Energy Center	PA-0310	9/2/16, 7/31/17 update	TPM	Auxilary boiler	1.29	tpy 12-month rolling basis	NSPS - ULSD and good combustion practices (Operation of the auxiliary boiler shall not exceed 4000 hrs in any continuous 12-month period) (92.4 MMBtu/hr)
CPV Fairview, LLC - CPV Fairview Energy Center	PA-0310	9/2/16, 7/31/17 update	TPM10	Auxilary boiler	0.007	lb/MMBtu	NSPS - ULSD and good combustion practices (Operation of the auxiliary boiler shall not exceed 4000 hrs in any continuous 12-month period) (92.4 MMBtu/hr)
CPV Fairview, LLC - CPV Fairview Energy Center	PA-0310	9/2/16, 7/31/17 update	TPM10	Auxilary boiler	1.29	tpy 12-month rolling basis	NSPS - ULSD and good combustion practices (Operation of the auxiliary boiler shall not exceed 4000 hrs in any continuous 12-month period) (92.4 MMBtu/hr)
CPV Fairview, LLC - CPV Fairview Energy Center	PA-0310	9/2/16, 7/31/17 update	TPM2.5	Auxilary boiler	0.007	lb/MMBtu	NSPS - ULSD and good combustion practices (Operation of the auxiliary boiler shall not exceed 4000 hrs in any continuous 12-month period) (92.4 MMBtu/hr)
CPV Fairview, LLC - CPV Fairview Energy Center	PA-0310	9/2/16, 7/31/17 update	TPM2.5	Auxilary boiler	1.29	tpy 12-month rolling basis	NSPS - ULSD and good combustion practices (Operation of the auxiliary boiler shall not exceed 4000 hrs in any continuous 12-month period) (92.4 MMBtu/hr)

KNO Restart
RBLC Search Summary
Search: "boiler","heater" - All Results for boilers <100 MMBtu/hr, not included in startup
Unit 50- Waste Heat Boiler
Unit 51- Waste Heat Boiler
Unit 52- Waste Heat Boiler
Unit 53- Waste Heat Boiler
Unit 54- Waste Heat Boiler

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
CPV Fairview, LLC - CPV Fairview Energy Center	PA-0310	9/2/16, 7/31/17 update	VOC	Auxilary boiler	0.004	lb/MMBtu Avg of 3 1-hr test runs	NSPS - ULSD and good combustion practices (Operation of the auxiliary boiler shall not exceed 4000 hrs in any continuous 12-month period) (92.4 MMBtu/hr)
CPV Fairview, LLC - CPV Fairview Energy Center	PA-0310	9/2/16, 7/31/17 update	VOC	Auxilary boiler	0.74	tpy 12-month rolling basis	NSPS - ULSD and good combustion practices (Operation of the auxiliary boiler shall not exceed 4000 hrs in any continuous 12-month period) (92.4 MMBtu/hr)
Stonegate Power, LLC - Middlesex Energy Center, LLC	NJ-0085	7/19/16, 11/3/16 update	NOx	Auxilary boiler	0.975	lb/hr avg of three 1-hour initial stack test	NSPS - Low Nox burners and FGR and use of natural gas as a clean burning fuel (97.5 MMBtu/hr)(4000.00 H/YR)
Stonegate Power, LLC - Middlesex Energy Center, LLC	NJ-0085	7/19/16, 11/3/16 update	NOx	Auxilary boiler	0.01	lb/MMBtu avg of three 1-hour initial stack test	NSPS - Low Nox burners and FGR and use of natural gas as a clean burning fuel (97.5 MMBtu/hr)(4000.00 H/YR)
Stonegate Power, LLC - Middlesex Energy Center, LLC	NJ-0085	7/19/16, 11/3/16 update	CO	Auxilary boiler	3.6	lb/hr avg of three 1-hour initial stack test	Use of natural gas as a clean burning fuel and good combustion practices (97.5 MMBtu/hr)(4000.00 H/YR)
Stonegate Power, LLC - Middlesex Energy Center, LLC	NJ-0085	7/19/16, 11/3/16 update	VOC	Auxilary boiler	0.488	lb/hr avg of three 1-hour initial stack tests initially	Use of natural gas as a clean burning fuel and good combustion practices (97.5 MMBtu/hr)(4000.00 H/YR)
Stonegate Power, LLC - Middlesex Energy Center, LLC	NJ-0085	7/19/16, 11/3/16 update	FPM	Auxilary boiler	0.181	lb/hr avg of three 1-hour initial stack tests initially	Use of natural gas as a clean burning fuel and good combustion practices (97.5 MMBtu/hr)(4000.00 H/YR)
Stonegate Power, LLC - Middlesex Energy Center, LLC	NJ-0085	7/19/16, 11/3/16 update	TPM10	Auxilary boiler	0.488	lb/hr avg of three 1-hour initial stack tests initially	Use of natural gas as a clean burning fuel and good combustion practices (97.5 MMBtu/hr)(4000.00 H/YR)
Stonegate Power, LLC - Middlesex Energy Center, LLC	NJ-0085	7/19/16, 11/3/16 update	TPM2.5	Auxilary boiler	0.488	lb/hr avg of three 1-hour initial stack tests initially	Use of natural gas as a clean burning fuel and good combustion practices (97.5 MMBtu/hr)(4000.00 H/YR)
Stonegate Power, LLC - Middlesex Energy Center, LLC	NJ-0085	7/19/16, 11/3/16 update	SO2	Auxilary boiler	0.128	lb/hr	Use of natural gas as a clean burning fuel low sulfur fuel (SUBJECT TO NJDEP STATE-OF-THE-ART REQUIREMENTS) (97.5 MMBtu/hr)(4000.00 H/YR)
Stonegate Power, LLC - Middlesex Energy Center, LLC	NJ-0085	7/19/16, 11/3/16 update	Sulfuric Acid (Mist, Vapors, etc)	Auxilary boiler	0.01	lb/hr	Use of natural gas as a clean burning fuel low sulfur fuel (97.5 MMBtu/hr)(4000.00 H/YR)
DTE Gas Company - Milford Compressor Station	MI-0420	6/3/16, 4/27/17 update	NOx	FGAUXBOILERS	14	ppmv at 15% O2; Test Protocol (each boiler)	SIP - Ultra Low NOx Burners and good combustion practices (2 boilers at 6 MMBtu/hr each)
DTE Gas Company - Milford Compressor Station	MI-0420	6/3/16, 4/27/17 update	CO	FGAUXBOILERS	0.08	lb/MMBtu each; Test Protocol	SIP - Good combustion practices and clean burn fuel (pipeline quality natural gas) (2 boilers at 6 MMBtu/hr each)
DTE Gas Company - Milford Compressor Station	MI-0420	6/3/16, 4/27/17 update	TPM10	FGAUXBOILERS	0.0075	lb/MMBtu each; Test Protocol	SIP - Good combustion practices and low sulfur fuel (pipeline quality natural gas) (2 boilers at 6 MMBtu/hr each)
DTE Gas Company - Milford Compressor Station	MI-0420	6/3/16, 4/27/17 update	TPM2.5	FGAUXBOILERS	0.0075	lb/MMBtu each; Test Protocol	SIP - Good combustion practices and low sulfur fuel (pipeline quality natural gas) (2 boilers at 6 MMBtu/hr each)
DTE Gas Company - Milford Compressor Station	MI-0420	6/3/16, 4/27/17 update	CO2e	FGAUXBOILERS	6155	tpy 12-month rolling time period	Use of pipeline quality natural gas and energy efficiency measures (2 boilers at 6 MMBtu/hr each)
PSEG Fossil LLC Sewaren Generating Station	NJ-0084	3/10/16, 7/25/16 update	NOx	Auxiliary Boiler firing natural gas	0.8	lb/hr avg of three 1-hour stack tests	NSPS - Low NOx burners and FGR (80 MMBtu/hr)
PSEG Fossil LLC Sewaren Generating Station	NJ-0084	3/10/16, 7/25/16 update	NOx	Auxiliary Boiler firing natural gas	0.01	lb/MMBtu avg of three 1-hour stack tests	NSPS - Low NOx burners and FGR (80 MMBtu/hr)
PSEG Fossil LLC Sewaren Generating Station	NJ-0084	3/10/16, 7/25/16 update	CO	Auxiliary Boiler firing natural gas	2.88	lb/hr avg of three 1-hour stack tests	Use of good combustion practices and use of natural gas a clean burning fuel (80 MMBtuhr)
PSEG Fossil LLC Sewaren Generating Station	NJ-0084	3/10/16, 7/25/16 update	VOC	Auxiliary Boiler firing natural gas	0.32	lb/hr avg of three 1-hour stack tests	Use of good combustion practices and use of natural gas a clean burning fuel (80 MMBtuhr)
PSEG Fossil LLC Sewaren Generating Station	NJ-0084	3/10/16, 7/25/16 update	FPM	Auxiliary Boiler firing natural gas	0.26	lb/hr avg of three 1-hour stack tests	Use of natural gas a clean burning fuel (80 MMBtuhr)
PSEG Fossil LLC Sewaren Generating Station	NJ-0084	3/10/16, 7/25/16 update	TPM10	Auxiliary Boiler firing natural gas	0.4	lb/hr avg of three 1-hour stack tests	Use of natural gas a clean burning fuel (80 MMBtuhr)
PSEG Fossil LLC Sewaren Generating Station	NJ-0084	3/10/16, 7/25/16 update	TPM2.5	Auxiliary Boiler firing natural gas	0.4	lb/hr avg of three 1-hour stack tests	Use of natural gas a clean burning fuel (80 MMBtuhr)
PSEG Fossil LLC Sewaren Generating Station	NJ-0084	3/10/16, 7/25/16 update	SO2	Auxiliary Boiler firing natural gas	0.12	lb/hr	Use of natural gas a low sulfur fuel (80 MMBtu/hr)
PSEG Fossil LLC Sewaren Generating Station	NJ-0084	3/10/16, 7/25/16 update	Sulfuric Acid (Mist, Vapors, etc)	Auxiliary Boiler firing natural gas	0.02	lb/hr	Use of natural gas a low sulfur fuel (80 MMBtu/hr)
Florida Power & Light - Okeechobee Clean Energy Center	FL-0356	3/9/16, 7/6/16 update	CO	Auxiliary Boiler, 99.8 MMBtu/hr	0.08	lb/MMBtu	Proper combustion prevents CO - only ng, limited to 2000 hours per year
Florida Power & Light - Okeechobee Clean Energy Center	FL-0356	3/9/16, 7/6/16 update	NOx	Auxiliary Boiler, 99.8 MMBtu/hr	0.05	lb/MMBtu	Low NOx burners - only ng, limited to 2000 hours per year
Florida Power & Light - Okeechobee Clean Energy Center	FL-0356	3/9/16, 7/6/16 update	TPM	Auxiliary Boiler, 99.8 MMBtu/hr	10	% Opacity	Use of natural gas with sulfur content less than 2 grains / 100 scf - only ng, limited to 2000 hours per year
Florida Power & Light - Okeechobee Clean Energy Center	FL-0356	3/9/16, 7/6/16 update	SO2	Auxiliary Boiler, 99.8 MMBtu/hr	2	gr s/100 scf gas	Use of low-sulfur gas - only ng, limited to 2000 hours per year

Appendix A
KNO Restart - RBLC Summary

KNO Restart
RBLC Search Summary
Search: "boiler","heater" - All Results for boilers <100 MMBtu/hr, not included in startup
Unit 50- Waste Heat Boiler
Unit 51- Waste Heat Boiler
Unit 52- Waste Heat Boiler
Unit 53- Waste Heat Boiler
Unit 54- Waste Heat Boiler

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
Florida Power & Light - Okeechobee Clean Energy Center	FL-0356	3/9/16, 7/6/16 update	CO2e	Auxiliary Boiler, 99.8 MMBtu/hr	No numeric limit	No numeric limit	Use of natural gas only - only ng, limited to 2000 hours per year
Florida Power & Light - Okeechobee Clean Energy Center	FL-0356	3/9/16, 7/6/16 update	NOx	Two Natural Gas Heaters	0.1	lb/MMBtu	Must have NOx emission design value less than 0.1 lb/MMBtu (fueled only with ng, may operate one at a time, 10 MMBtu/hr)
Florida Power & Light - Okeechobee Clean Energy Center	FL-0356	3/9/16, 7/6/16 update	SO2	Two Natural Gas Heaters	2	gr s/100 scf gas	Use of low-sulfur fuel (fueled only with ng, may operate one at a time, 10 MMBtu/hr)
Commercial Metals Company - CMC Steel Oklahoma	OK-0173	1/19/2016, 7/7/16 update	CO2e	Heaters (Gas-Fired)	120	lb/MMBtu	Natural Gas Fuel (Numerous gas-fired heaters will be installed. The application requested that the sizes all be kept confidential.)
Commercial Metals Company - CMC Steel Oklahoma	OK-0173	1/19/2016, 7/7/16 update	CO	Heaters (Gas-Fired)	0.084	lb/MMBtu	Natural Gas Fuel (Numerous gas-fired heaters will be installed. The application requested that the sizes all be kept confidential.)
Commercial Metals Company - CMC Steel Oklahoma	OK-0173	1/19/2016, 7/7/16 update	NOx	Heaters (Gas-Fired)	0.1	lb/MMBtu	Natural Gas Fuel (Numerous gas-fired heaters will be installed. The application requested that the sizes all be kept confidential.)
Commercial Metals Company - CMC Steel Oklahoma	OK-0173	1/19/2016, 7/7/16 update	TPM10	Heaters (Gas-Fired)	0.0076	lb/MMBtu	Natural Gas Fuel (Numerous gas-fired heaters will be installed. The application requested that the sizes all be kept confidential.)
Commercial Metals Company - CMC Steel Oklahoma	OK-0173	1/19/2016, 7/7/16 update	TPM2.5	Heaters (Gas-Fired)	0.0076	lb/MMBtu	Natural Gas Fuel (Numerous gas-fired heaters will be installed. The application requested that the sizes all be kept confidential.)
Commercial Metals Company - CMC Steel Oklahoma	OK-0173	1/19/2016, 7/7/16 update	VOC	Heaters (Gas-Fired)	0.0055	lb/MMBtu	Natural Gas Fuel (Numerous gas-fired heaters will be installed. The application requested that the sizes all be kept confidential.)
Equistar Chemicals, LP - Westlake Facility	LA-0295	7/12/16, 9/19/16 update	NOx	Firetube Boiler Nos. 1 and 2 (4-08, EQT 324 & 5-08, EQT 325)	2.75	lb/hr maximum	Flue gas recirculation and good combustion practices, including good equipment design, use of gaseous fuels for good mixing, and proper combustion techniques (63 MMBtu/hr - Natural Gas and Vent Gas). Aggregate NOx emissions from the boilers are capped at 10.05 TPY (GRP 11). Good combustion practices shall include monitoring of the flue gas oxygen content, combustion air flow, fuel consumption, and flue gas temperature. These parameters shall be maintained within the manufacturer's recommended operating guidelines or within a range that is otherwise indicative of proper operation of the emissions unit. The PSD permit also references the 30 ppmvd @ 3% O2 limit as a "three 1-hour testing average."
Equistar Chemicals, LP - Westlake Facility	LA-0295	7/12/16, 9/19/16 update	NOx	Firetube Boiler Nos. 1 and 2 (4-08, EQT 324 & 5-08, EQT 325)	30	ppmvd @ 3% O2 annual average	Flue gas recirculation and good combustion practices, including good equipment design, use of gaseous fuels for good mixing, and proper combustion techniques (63 MMBtu/hr - Natural Gas and Vent Gas). Aggregate NOx emissions from the boilers are capped at 10.05 TPY (GRP 11). Good combustion practices shall include monitoring of the flue gas oxygen content, combustion air flow, fuel consumption, and flue gas temperature. These parameters shall be maintained within the manufacturer's recommended operating guidelines or within a range that is otherwise indicative of proper operation of the emissions unit. The PSD permit also references the 30 ppmvd @ 3% O2 limit as a "three 1-hour testing average."
Equistar Chemicals, LP - Westlake Facility	LA-0295	7/12/16, 9/19/16 update	VOC	Firetube Boiler Nos. 1 and 2 (4-08, EQT 324 & 5-08, EQT 325)	0.21	lb/hr maximum	Oxidation catalyst and good combustion practices, including good equipment design, use of gaseous fuels for good mixing, and proper combustion techniques. (63 MMBtu/hr - Natural Gas and Vent Gas). Aggregate VOC emissions from the boilers are capped at 0.90 TPY (GRP 11). Good combustion practices shall include monitoring of the flue gas oxygen content, combustion air flow, fuel consumption, and flue gas temperature. These parameters shall be maintained within the manufacturer's recommended operating guidelines or within a range that is otherwise indicative of proper operation of the emissions unit. The PSD permit also references the 2.8 ppmvd @ 3% O2 limit as a "three 1-hour testing average."

Appendix A
KNO Restart - RBLC Summary

KNO Restart
RBLC Search Summary
Search: "boiler","heater" - All Results for boilers <100 MMBtu/hr, not included in startup
Unit 50- Waste Heat Boiler
Unit 51- Waste Heat Boiler
Unit 52- Waste Heat Boiler
Unit 53- Waste Heat Boiler
Unit 54- Waste Heat Boiler

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
Equistar Chemicals, LP - Westlake Facility	LA-0295	7/12/16, 9/19/16 update	VOC	Firetube Boiler Nos. 1 and 2 (4-08, EQT 324 & 5-08, EQT 325)	2.8	ppmvd @ 3% O2 annual average	Oxidation catalyst and good combustion practices, including good equipment design, use of gaseous fuels for good mixing, and proper combustion techniques. (63 MMBtu/hr - Natural Gas and Vent Gas). Aggregate VOC emissions from the boilers are capped at 0.90 TPY (GRP 11). Good combustion practices shall include monitoring of the flue gas oxygen content, combustion air flow, fuel consumption, and flue gas temperature. These parameters shall be maintained within the manufacturer's recommended operating guidelines or within a range that is otherwise indicative of proper operation of the emissions unit. The PSD permit also references the 2.8 ppmvd @ 3% O2 limit as a "three 1-hour testing average."
Flint Hills Resources Houson Chemical LLC - PL Propylene Houston Olefins Plant	TX-0803 (draft)	7/12/16. 8/31/16 update					Includes 5 turbines, 1 regen air heater, and one duct burner exhausting through one stack to provide regenerative hot air to catalyst beds
Subaru of Indiana Automotive, Inc.	IN-0239	2/18/16, 9/14/16 update	VOC	Boiler	0.005	lb/MMBtu	38 MMBtu/hr - Miscellaneous process heaters and boilers from (this is where the description ends…)
Pryor Plant Chemical Company	OK-0135	2/23/2009	CO	Boilers #1 and #2	6.6	lbs/hr 1 hour/8 hour	Good operating practices
Williams Refining & Marketing, L.L.C.	TN-0153	4/3/2002	CO	Boiler, NO. 9	0.09	lb/MMBtu	Unknown
Pryor Plant Chemical Company	OK-0135	2/23/2009	Formaldehyde	Boilers #1 and #2	0.1	lb/hr	unknown
Pryor Plant Chemical Company	OK-0135	2/23/2009	NOx	Boilers #1 and #2	4	lb/hr 3-H/168-H rolling cur	Low NOx burners and good combustion practices
Pryor Plant Chemical Company	OK-0135	2/23/2009	NOx	Boilers #1 and #2	0.2	lb/MMBtu state limit	Low NOx burners and good combustion practices
Williams Refining & Marketing, L.L.C.	TN-0153	4/3/2002	NOx	Boiler, NO. 9	0.084	lb/MMBtu	Unknown
Pryor Plant Chemical Company	OK-0135	2/23/2009	PM	Boilers #1 and #2	0.6	lb/hr	Unknown
Pryor Plant Chemical Company	OK-0135	2/23/2009	PM10	Boilers #1 and #2	0.5	lb/hr 24-hour	Unknown
Williams Refining & Marketing, L.L.C.	TN-0153	4/3/2002	PM10	Boiler, NO. 9	0.0075	lb/MMBtu	Unknown
Pryor Plant Chemical Company	OK-0135	2/23/2009	SO2	Boilers #1 and #2	0.2	lb/hr	Unknown
Pryor Plant Chemical Company	OK-0135	2/23/2009	SO2	Boilers #1 and #2	0.2	lb/MMBtu state limit	unknown
Pryor Plant Chemical Company	OK-0135	2/23/2009	VOC	Boilers #1 and #2	0.5	lb/hr	unknown

Notes:
Highlighted fields represent the lowest limit in common units (e.g., lb/MMBtu). Other units may be shown; however, there is not enough information to convert to common units or averaging times.

Appendix A
KNO Restart - RBLC Summary

KNO Restart
RBLC Search Summary

Unit 65 - Diesel Well Pump
Unit 66 - Gasoline Fire Pump

Facility Name	RBLC ID	Permit Issue Date	Pollutant	Process Name	Emission Limit	Emission Limit Units	BACT Determination
Did not update in 2017							
Entergy Louisiana LLC Ninemile Point Electric Generating Plant	LA-0254	8/16/2011	CH4	Emergency Fire Pump	0.0061	lb/MMBtu	Ultra low sulfur diesel and good combustion practices
Iowa Fertilizer Company	IA-0105	10/26/2012	CH4	Fire Pump	0.0001	g/kw-hr average of 3 stack tests	Good Combustion Practices
Duke Energy North America Duke Energy Washington County LLC	OH-0254	8/14/2003	CO	Emergency Diesel Fire Pump	2.76	lbs/hr	Low sulfur fuel, combustion control
Duke Energy North America Duke Energy Washington County LLC	OH-0254	8/14/2003	CO	Emergency Diesel Fire Pump	0.69	tons/year	Low sulfur fuel, combustion control
Entergy Louisiana LLC Ninemile Point Electric Generating Plant	LA-0254	8/16/2011	CO	Emergency Fire Pump	2.6	g/hp-hr	Utra low sulfur diesel and good combustion practices
Iowa Fertilizer Company	IA-0105	10/26/2012	CO	Fire Pump	3.5	g/kw-hr average of 3 stack tests	Good Combustion Practices
Iowa Fertilizer Company	IA-0105	10/26/2012	CO	Fire Pump	0.45	tons/year rolling 12 month total	Good Combustion Practices
Ohio Valley Resources, LLC	TBD	9/25/2013	CO	Diesel-Fired Emergency Firewater Pump	2.6	g/hp-hr 3 hour average	good combustion practices
Southeast Idaho Energy, LLC Power County Advanced Energy Center	ID-0017	2/10/2009	CO	500 KW emergency generator, fire pump	No Numeric Limit	No Numeric Limit	Good combustion practices. EPA certified per NSPS IIII
Entergy Louisiana LLC Ninemile Point Electric Generating Plant	LA-0254	8/16/2011	CO2	Emergency Fire Pump	163	lb/MMBtu	proper operation and good combustion practices
Iowa Fertilizer Company	IA-0105	10/26/2012	CO2	Fire Pump	1.55	g/kw-hr average of 3 stack tests	Good Combustion Practices
Ohio Valley Resources, LLC	TBD	9/25/2013	CO2	Diesel-Fired Emergency Firewater Pump	527.4	g/hp-hr 3 hour average	good combustion practices
Iowa Fertilizer Company	IA-0105	10/26/2012	CO2e	Fire Pump	91	tpy rolling 12 month total	Good Combustion Practices
Entergy Louisiana LLC Ninemile Point Electric Generating Plant	LA-0254	8/16/2011	N2O	Emergency Fire Pump	0.0014	lb/MMbtu	Ultra low sulfur diesel and good combustion practices
Duke Energy North America Duke Energy Washington County LLC	OH-0254	8/14/2003	NOx	Emergency Diesel Fire Pump	12.8	lbs/hr	Low sulfur fuel, combustion control
Duke Energy North America Duke Energy Washington County LLC	OH-0254	8/14/2003	NOx	Emergency Diesel Fire Pump	3.2	tons/year	Low sulfur fuel, combustion control
Iowa Fertilizer Company	IA-0105	10/26/2012	NOx	Fire Pump	3.75	g/kw-hr average of 3 stack tests	Good Combustion Practices
Iowa Fertilizer Company	IA-0105	10/26/2012	NOx	Fire Pump	0.49	tons/year rolling 12 month total	Good Combustion Practices
Ohio Valley Resources, LLC	TBD	9/25/2013	NOx	Diesel-Fired Emergency Firewater Pump	2.86	g/hp-hr 3 hour average	good combustion practices
Southeast Idaho Energy, LLC Power County Advanced Energy Center	ID-0017	2/10/2009	NOx	501 KW emergency generator, fire pump	No Numeric Limit	No Numeric Limit	Good combustion practices. EPA certified per NSPS IIII
Duke Energy North America Duke Energy Washington County LLC	OH-0254	8/14/2003	PM	Emergency Diesel Fire Pump	0.88	lbs/hr	Low sulfur fuel, combustion control
Duke Energy North America Duke Energy Washington County LLC	OH-0254	8/14/2003	PM	Emergency Diesel Fire Pump	0.22	tons/year	Low sulfur fuel, combustion control
Iowa Fertilizer Company	IA-0105	10/26/2012	PM	Fire Pump	0.2	g/kw-hr average of 3 stack tests	Good Combustion Practices
Iowa Fertilizer Company	IA-0105	10/26/2012	PM	Fire Pump	0.03	tons/year rolling 12 month total	Good Combustion Practices
Ohio Valley Resources, LLC	TBD	9/25/2013	PM	Diesel-Fired Emergency Firewater Pump	0.15	g/hp-hr 3 hour average	good combustion practices
Southeast Idaho Energy, LLC Power County Advanced Energy Center	ID-0017	2/10/2009	PM	503 KW emergency generator, fire pump	No Numeric Limit	No Numeric Limit	ULSD fuel, EPA certified per NSPS IIII
Entergy Louisiana LLC Ninemile Point Electric Generating Plant	LA-0254	8/16/2011	PM10	Emergency Fire Pump	0.15	g/hp-hr annual average	Ultra low sulfur diesel and good combustion practices
Iowa Fertilizer Company	IA-0105	10/26/2012	PM10	Fire Pump	0.2	g/kw-hr average of 3 stack tests	Good Combustion Practices
Iowa Fertilizer Company	IA-0105	10/26/2012	PM10	Fire Pump	0.03	tons/year rolling 12 month total	Good Combustion Practices
Ohio Valley Resources, LLC	TBD	9/25/2013	PM10	Diesel-Fired Emergency Firewater Pump	0.15	g/hp-hr 3 hour average	good combustion practices
Southeast Idaho Energy, LLC Power County Advanced Energy Center	ID-0017	2/10/2009	PM10	502 KW emergency generator, fire pump	No Numeric Limit	No Numeric Limit	ULSD fuel, EPA certified per NSPS IIII
Entergy Louisiana LLC Ninemile Point Electric Generating Plant	LA-0254	8/16/2011	PM2.5	Emergency Fire Pump	0.15	g/hp-hr annual average	Ultra low sulfur diesel and good combustion practices
Iowa Fertilizer Company	IA-0105	10/26/2012	PM2.5	Fire Pump	0.2	g/kw-hr average of 3 stack tests	Good Combustion Practices
Iowa Fertilizer Company	IA-0105	10/26/2012	PM2.5	Fire Pump	0.03	tons/year rolling 12 month total	Good Combustion Practices
Ohio Valley Resources, LLC	TBD	9/25/2013	PM2.5	Diesel-Fired Emergency Firewater Pump	0.15	g/hp-hr 3 hour average	good combustion practices
Duke Energy North America Duke Energy Washington County LLC	OH-0254	8/14/2003	SO2	Emergency Diesel Fire Pump	0.84	lbs/hr	Low sulfur fuel, combustion control
Duke Energy North America Duke Energy Washington County LLC	OH-0254	8/14/2003	SO2	Emergency Diesel Fire Pump	0.21	tons/year	Low sulfur fuel, combustion control
Iowa Fertilizer Company	IA-0105	10/26/2012	Visible Emissions	Fire Pump	5	% 6 minute average	Good Combustion Practices
Entergy Louisiana LLC Ninemile Point Electric Generating Plant	LA-0254	8/16/2011	VOC	Emergency Fire Pump	1	g/hp-hr annual average	Ultra low sulfur diesel and good combustion practices
Iowa Fertilizer Company	IA-0105	10/26/2012	VOC	Fire Pump	0.25	g/kw-hr average of 3 stack tests	Good Combustion Practices
Iowa Fertilizer Company	IA-0105	10/26/2012	VOC	Fire Pump	0.03	tons/year rolling 12 month total	Good Combustion Practices
Ohio Valley Resources, LLC	TBD	9/25/2013	VOC	Diesel-Fired Emergency Firewater Pump	0.141	g/hp-hr 3 hour average	good combustion practices

Notes:
Highlighted fields represent the lowest limit in common units (e.g., lb/MMBtu). Other units may be shown; however, there is not enough information to convert to common units or averaging times.

APPENDIX B COST ESTIMATES

Appendix B
KNO Restart
Oxidation Catalyst for CO&VOC Control
Package Boilers

VOC Control Efficiency (%)	80
CO Control Efficiency (%)	99

Facility Input Data

Item	Value	
Total Hours per year	8760	
Economic Life, years	10	
Interest Rate (%)	7	
CFR	0.1424	
SFF		
Source(s) Controlled	Package Boilers	
Rated Heat Input (MMBtu/hr)	243	
Total Flowrate (acfm)	161,157	
VOC Emission Rate (lb/hr)	1.30	
VOC Emissions (tpy)	5.69	
CO Emission Rate (lb/hr)	8.99	
CO Emissions (tpy)	39.38	
Site Specific Electricity Cost ($/kWh)	0.101	(Vendor provided in 2013 - Adjusted for 8.51% inflation)
Site Specific Operating Labor Cost ($/hr)	$48.83	(Vendor provided in 2013 - Adjusted for 8.51% inflation)
Site Specific Maint. Labor Cost ($/hr)	$48.83	(Vendor provided in 2013 - Adjusted for 8.51% inflation)

Capital Costs

	Value	Basis	
Direct Costs			
1.) Purchased Equipment Cost			
a.) Equipment cost + auxiliaries	$169,172	WE ENERGIES reference	(Vendor provided in 2013 - Adjusted for 8.51% inflation)
b.) Instrumentation	$16,900	0.10 x A	
c.) Sales taxes	$11,800	0.07 x A	
d.) Freight	$8,500	0.05 x A	
Total Purchased equipment cost, (PEC)	$206,372	B = 1.22 x A	
2.) Direct installation costs			
a.) Foundations and supports	$16,500	0.08 x B	
b.) Handling and erection	$28,900	0.14 x B	
c.) Electrical	$8,300	0.04 x B	
d.) Piping	$4,100	0.02 x B	
e.) Insulation for ductwork	$2,100	0.01 x B	
f.) Painting	$2,100	0.01 x B	
Total direct installation cost	$62,000	0.30 x B	
3.) Site preparation	NA	As Required, SP	
4.) Buildings	NA	As Required, Bldg.	
Total Direct Cost, DC	$268,400	1.30B + SP + Bldg.	
Indirect Costs (installation)			
5.) Engineering	$20,600	0.10 x B	
6.) Construction and field expenses	$10,300	0.05 x B	
7.) Contractor fees	$20,600	0.10 x B	
8.) Start-up	$4,100	0.02 x B	
9.) Performance test	$2,100	0.01 x B	
10.) Contingencies	$6,200	0.03 x B	
11.) Maintenance Cost			
Total Indirect Cost, IC	$63,900	0.31B + Other	
Total Capital Investment (TCI) = DC + IC	**$332,300**	**1.61B + SP + Bldg. + Other**	

CO Control Efficiency (%)	99

Annual Costs

Item	Value	Basis	Source	
1) Electricity				
Reagent Pump Requirement (kW)	1,000		Estimate	
Electric Power Cost ($/kWh)	0.10			
Cost ($/yr)	$884,009			
2) Operating Costs				
Operating Labor Requirement (hr/hours of o	0.5	Estimate - 1/2 hr/shift	N/A	
Unit Cost ($/hr)	$48.83	Estimate	N/A	
Labor Cost ($/yr)	$26,730	Calculation	N/A	
Total Operating Costs	**$910,739**		Estimate	
3) Supervisory Labor				
Cost ($/yr)	$4,010	15% Operating Labor	OAQPS	
4) Maintenance				
Maintenance Labor Req. (hr/year)	300.0		Estimate	
Catalyst Replacement Labor Req. (hr/yr)	560.0		Estimate	
Unit Cost ($/hr)	$48.83	Facility Data	Estimate	
Labor Cost ($/yr)	$41,990	Calculation	N/A	
Material Cost ($/yr)	$41,990	100% of Maintenance Labor	OAQPS	
Total Cost ($/yr)	$83,980	Calculation	N/A	
5) Catalyst Replacement				
Catalyst Cost ($)	$112,781		WE ENERGIES	(Vendor provided in 2013 - Adjusted for 8.51%
Sales Tax ($)	$0	0% Sales Tax	Estimate	
Catalyst Life (yrs)	5	n	Estimate	
Interest Rate (%)	7	i	Estimate	
Factor	0.174			
Annual Cost ($/yr)	$19,610	(Volume)(Unit Cost)(CRF)	N/A	
6) Indirect Annual Costs				
Overhead	$68,830	60% of O&M Costs	OAQPS	
Administration	$6,650	2% of Total Capital Investment	OAQPS	
Property Tax	$3,320	1% of Total Capital Investment	OAQPS	
Insurance	$3,320	1% of Total Capital Investment	OAQPS	
Capital Recovery	$31,250	20 yr life; 7% interest (-cat. cost)	OAQPS	
Total Indirect ($/yr)	$113,370			
Total Annualized Cost ($/yr)	**$1,131,700**			
Total VOC Controlled (tpy)	**4.555**			
Total CO Controlled (tpy)	**38.982**			
VOC Cost Effectiveness ($/ton)	**$248,400**			
CO Cost Effectiveness ($/ton)	**$29,000**			

Appendix B
KNO Restart
Oxidation Catalyst for CO&VOC Control
Waste Heat Boiler/Solar Turbine

VOC Control Efficiency (%)	80
CO Control Efficiency (%)	99

Facility Input Data

Item	Value	
Total Hours per year	8760	
Economic Life, years	10	
Interest Rate (%)	7	
CFR	0.1424	
SFF		
Source(s) Controlled	Waste Heat Boilers/Solar Turbines	
Rated Heat Input (MMBtu/hr)	102.172	
Total Flowrate (acfm)	46,750	Original flowrate from 2013 cost estimate
VOC Emission Rate (lb/hr)	0.37	
VOC Emissions (tpy)	1.61	
CO Emission Rate (lb/hr)	11.14	
CO Emissions (tpy)	48.78	
Site Specific Electricity Cost ($/kWh)	0.101	(Vendor provided in 2013 - Adjusted for 8.51% inflation)
Site Specific Operating Labor Cost ($/hr)	$48.83	(Vendor provided in 2013 - Adjusted for 8.51% inflation)
Site Specific Maint. Labor Cost ($/hr)	$48.83	(Vendor provided in 2013 - Adjusted for 8.51% inflation)

Capital Costs

	Value	Basis	
Direct Costs			
1.) Purchased Equipment Cost			
a.) Equipment cost + auxiliaries	$71,130	WE ENERGIES reference	(Vendor provided in 2013 - Adjusted for 8.51% inflation)
b.) Instrumentation	$7,100	0.10 x A	
c.) Sales taxes	$5,000	0.07 x A	
d.) Freight	$3,600	0.05 x A	
Total Purchased equipment cost, (PEC)	$86,830	B = 1.22 x A	
2.) Direct installation costs			
a.) Foundations and supports	$6,900	0.08 x B	
b.) Handling and erection	$12,200	0.14 x B	
c.) Electrical	$3,500	0.04 x B	
d.) Piping	$1,700	0.02 x B	
e.) Insulation for ductwork	$900	0.01 x B	
f.) Painting	$900	0.01 x B	
Total direct installation cost	$26,100	0.30 x B	
3.) Site preparation	NA	As Required, SP	
4.) Buildings	NA	As Required, Bldg.	
Total Direct Cost, DC	$112,900	1.30B + SP + Bldg.	
Indirect Costs (installation)			
5.) Engineering	$8,700	0.10 x B	
6.) Construction and field expenses	$4,300	0.05 x B	
7.) Contractor fees	$8,700	0.10 x B	
8.) Start-up	$1,700	0.02 x B	
9.) Performance test	$900	0.01 x B	
10.) Contingencies	$2,600	0.03 x B	
11.) Maintenance Cost			
Total Indirect Cost, IC	$26,900	0.31B + Other	
Total Capital Investment (TCI) = DC + IC	**$139,800**	**1.61B + SP + Bldg. + Other**	

Annual Costs

Item	Value	Basis	Source	
1) Electricity				
Reagent Pump Requirement (kW)	1,000		Estimate	
Electric Power Cost ($/kWh)	0.10			
Cost ($/yr)	$884,009			
2) Operating Costs				
Operating Labor Requirement (hr/hours of operation)	0.5	Estimate - 1/2 hr/shift	N/A	
Unit Cost ($/hr)	$48.83	Estimate	N/A	
Labor Cost ($/yr)	$26,730	Calculation	N/A	
Total Operating Costs	**$910,739**		Estimate	
3) Supervisory Labor				
Cost ($/yr)	$4,010	15% Operating Labor	OAQPS	
4) Maintenance				
Maintenance Labor Req. (hr/year)	300.0		Estimate	
Catalyst Replacement Labor Req. (hr/yr)	230.0		Estimate	
Unit Cost ($/hr)	$48.83	Facility Data	Estimate	
Labor Cost ($/yr)	$25,880	Calculation	N/A	
Material Cost ($/yr)	$25,880	100% of Maintenance Labor	OAQPS	
Total Cost ($/yr)	$51,760	Calculation	N/A	
5) Catalyst Replacement				
Catalyst Cost ($)	$47,420		WE ENERGIES	(Vendor provided in 2013 - Adjusted for 8.51% inflation)
Sales Tax ($)	$0	0% Sales Tax	Estimate	
Catalyst Life (yrs)	5	n	Estimate	
Interest Rate (%)	7	i	Estimate	
Factor	0.174			
Annual Cost ($/yr)	$8,250	(Volume)(Unit Cost)(CRF)	N/A	
6) Indirect Annual Costs				
Overhead	$49,500	60% of O&M Costs	OAQPS	
Administration	$2,800	2% of Total Capital Investment	OAQPS	
Property Tax	$1,400	1% of Total Capital Investment	OAQPS	
Insurance	$1,400	1% of Total Capital Investment	OAQPS	
Capital Recovery	$13,150	20 yr life; 7% interest (-cat. cost)	OAQPS	
Total Indirect ($/yr)	$68,250			
Total Annualized Cost ($/yr)	**$1,043,000**			
Total VOC Controlled (tpy)	**1.288**			
Total CO Controlled (tpy)	**48.292**			
VOC Cost Effectiveness ($/ton)	**$809,800**			
CO Cost Effectiveness ($/ton)	**$21,600**			

Appendix B
KNO Restart
Low NOx Burners for Waste Heat Boilers

Source	**Waste Heat Boiler**
Rated Heat Input (MMBtu/hr)	46.729
Baseline Emissions	20.1
Control Efficiency	7.20%

		COST (x $1000)	
	COST COMPONENT:	**COST (x $1000)**	
DIRECT COSTS			
	Purchased Equipment Costs (Included in TCI)		
	Initial Equipment Costs		
	Instrumentation		
	Freight		
	Taxes		
	Subtotal - Purchased Equipment Costs	**912.57**	(Vendor provided in 2013 - Adjusted for 8.51% infl
	Direct Installation Costs(Included in TCI)		
	Foundations & supports; handling & erection; electrical; piping; etc. (25% of PEC)		
	Site Preparation / Buildings (25% of PEC)		
	Subtotal - Direct Installation Costs	**214.85**	(Vendor provided in 2013 - Adjusted for 8.51% infl
TOTAL DIRECT COSTS (TDC)			
INDIRECT INSTALLATION COSTS			
	Engineering Costs (10% of Purchased Equip Costs)		
	Construct. & Field Expenses (5% of Purchased Equip Costs)		
	Contractor Fees (10% Purchased Equip Costs)		
	Start-up and Performance Test (2% of Purchased Equip Costs)		
	Contingency (3% of Purchased Equip Costs)		
TOTAL INDIRECT COSTS		**0.00**	
TOTAL CAPITAL INVESTMENT (TCI)		**1127.42**	

	COST COMPONENT:	**COST (x $1000)**
ANNUAL DIRECT COSTS		
Operation and Maintenance Labor		
	Operating Labor	0.00
	O&M Supervision	0.00
	Maintenance Labor and Material (2.75% of PEC)	
Subtotal - Operation and Maintenance Labor		**0.00**
Utilities		
Subtotal - Utilities		**0.00**
TOTAL ANNUAL DIRECT COSTS		**0.00**

	COST COMPONENT:		**COST (x $1000)**
INDIRECT COSTS			
	Overhead (not applicable)		0.00
	Property Tax (not applicable)		0.00
	Insurance (negligible)		0.00
	Administration (not applicable)		0.00
TOTAL INDIRECT COSTS			0.00
TOTAL ANNUAL O&M COSTS			**0.00**
CAPITAL RECOVERY FACTOR			
	Equipment Life (years) =	10	
	Interest Rate (%) =	7	
	Capital Recovery Factor		0.1424
CAPITAL RECOVERY COSTS			
	TOTAL CAPITAL REQUIREMENT		1127.42
	TOTAL ANNUAL CAPITAL REQUIREMENT		**160.52**
TOTAL ANNUALIZED COST ***(Total annual O&M cost and annualized capital cost)***			**160.52**
TONS OF POLLUTANT REMOVED PER YEAR (baseline * control efficiency)			**1.44**
COST-EFFECTIVENESS	**ENVIRONMENTAL BASIS** **($ per ton pollutant removed)**		**$111,105**

Baseline Emissions =
Heat Input Capacity (46.729 MMBtu/hr) * AP-42 CO Ef. Sm. Boiler (100 lb/10^6 scf) * (1 MMBtu/ 1,020 scf) * (8760 hrs/1 yr) * (1 ton/2000 lbs)

Appendix B
KNO Restart
Water injection for NOx control on Solar Turbines

Source	**Solar Turbine**
Rated Heat Input (MMBtu/hr)	55.443
Baseline Emissions	9.96
Control Efficiency	76.00%

	COST COMPONENT:	**COST (x $1000)**	
DIRECT COSTS			
	Purchased Equipment Costs (Included in TCI)		
	Initial Equipment Costs		
	Instrumentation		
	Freight		
	Taxes		
	Subtotal - Purchased Equipment Costs	**490.47**	(Vendor provided in 2013 - Adjusted for 8.51% inflation)
	Direct Installation Costs(Included in TCI)		
	Foundations & supports; handling & erection; electrical; piping; etc. (25% of PEC)		
	Site Preparation / Buildings (25% of PEC)		
	Subtotal - Direct Installation Costs	**0.00**	
TOTAL DIRECT COSTS (TDC)			
INDIRECT INSTALLATION COSTS			
	Engineering Costs (10% of Purchased Equip Costs)		
	Construct. & Field Expenses (5% of Purchased Equip Costs)		
	Contractor Fees (10% Purchased Equip Costs)		
	Start-up and Performance Test (2% of Purchased Equip Costs)		
	Contingency (3% of Purchased Equip Costs)		
TOTAL INDIRECT COSTS		**0.00**	
TOTAL CAPITAL INVESTMENT (TCI)		**490.47**	

	COST COMPONENT:	**COST (x $1000)**	
ANNUAL DIRECT COSTS			
	Operation and Maintenance Labor		
	Operating Labor	0.00	
	O&M Supervision	0.00	
	Maintenance Labor and Material	18.21	(Vendor provided in 2013 - Adjusted for 8.51% inflation)
	Subtotal - Operation and Maintenance Labor	**18.21**	
	Utilities		
	Power	4.96	(Vendor provided in 2013 - Adjusted for 8.51% inflation)
	Subtotal - Utilities	**4.96**	
TOTAL ANNUAL DIRECT COSTS		**23.17**	

	COST COMPONENT:		**COST (x $1000)**
INDIRECT COSTS			
	Overhead (not applicable)		0.00
	Property Tax (not applicable)		0.00
	Insurance (negligible)		0.00
	Administration (not applicable)		0.00
TOTAL INDIRECT COSTS			0.00
TOTAL ANNUAL O&M COSTS			**23.17**
CAPITAL RECOVERY FACTOR			
	Equipment Life (years) =	10	
	Interest Rate (%) =	7	
	Capital Recovery Factor		0.1424
CAPITAL RECOVERY COSTS			
	TOTAL CAPITAL REQUIREMENT		490.47
	TOTAL ANNUAL CAPITAL REQUIREMENT		**69.83**
TOTAL ANNUALIZED COST (Total annual O&M cost and annualized capital cost)			**93.00**
TONS OF POLLUTANT REMOVED PER YEAR (baseline * control efficiency)			**7.57**
COST-EFFECTIVENESS			
	ENVIRONMENTAL BASIS ($ per ton pollutant removed)		**$12,291**

Baseline Emissions =
Heat Input Capacity (55.443 MMBtu/hr) * SCR Controlled Emission Rate (0.041 lb/MMBtu) * (8760 hrs/1 yr) * (1 ton/2000 lbs)

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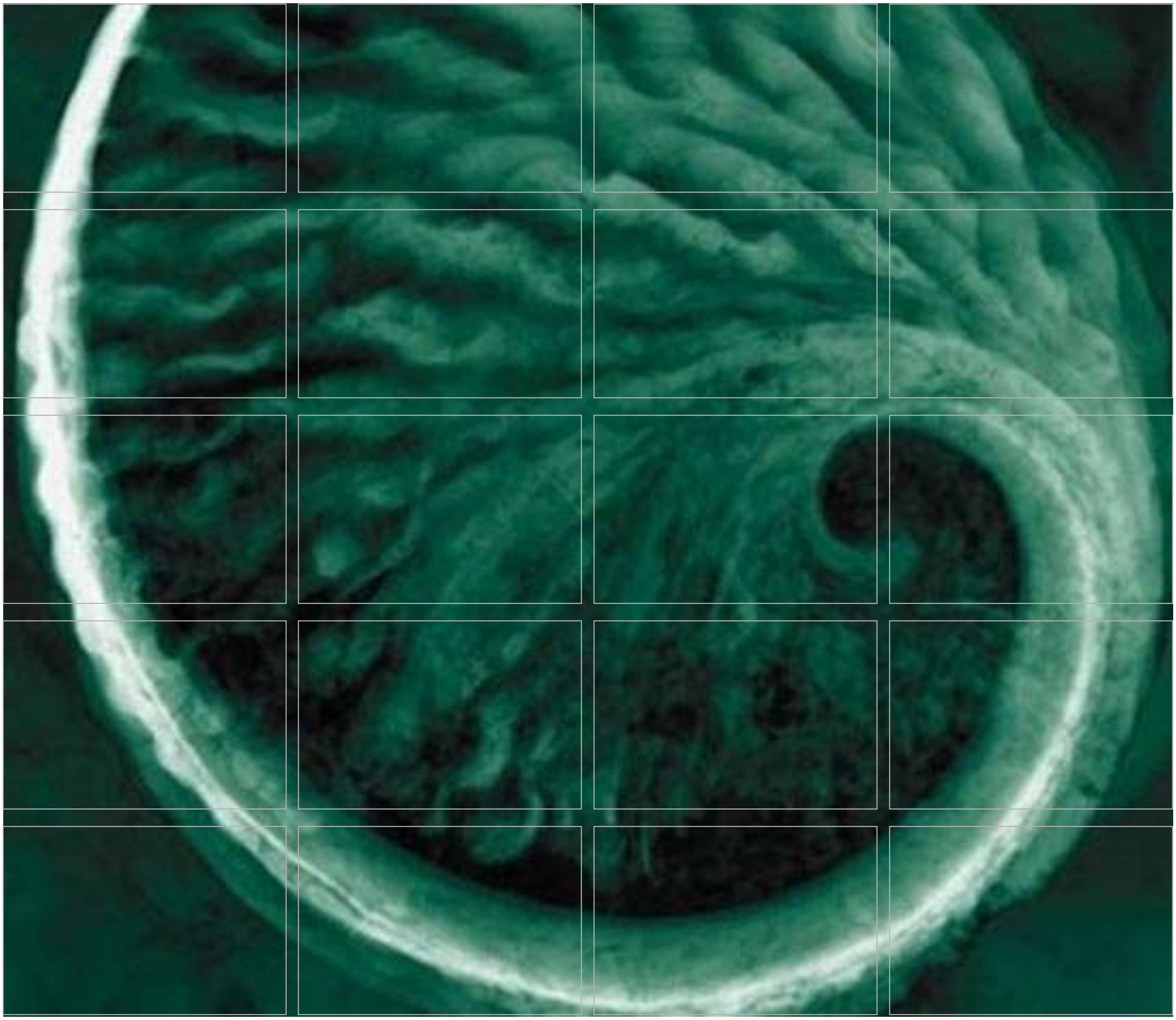
Attachment D
Modeling Analysis



Dispersion Modeling Analysis

Agrium KNO Facility

May 2019 (Revision 1.0)

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TABLE OF CONTENTS

LIST OF ATTACHMENTS

1.0 PROJECT DESCRIPTION

This report provides a Dispersion Modeling Analysis for a Prevention of Significant Deterioration (PSD) Construction Permit application for the Agrium Kenai Nitrogen Operations (KNO). This analysis is provided as an update to the Dispersion Modeling Analysis performed for the original PSD Construction Permit application for KNO, submitted in October 2014. This analysis provides updated modeling results which incorporates changes that have occurred since the original PSD permit was issued in January 2015. The modeling results are prepared in a format consistent with the modeling protocol for this project and consistent with the ADEC document "Air Quality Modeling Protocol Outline, PSD Permit Applications", Version 1.6, dated April 19, 2018. (ADEC 2018). This report incorporates specific information from the October 2014 modeling report as referenced in this document.

1.1 PROJECT CLASSIFICATION

KNO has determined that the restart of its facility will be regulated as a major source under PSD rules for NO_X, PM_{10}, $PM_{2.5}$, CO, and ozone. The site will also have ammonia (NH_3) emissions which are not identified as a regulated air pollutant under Prevention of Significant Deterioration (PSD) rules, but are regulated under State of Alaska rules. The site will also be regulated as a major source of greenhouse gas (GHG) emissions under PSD rules, however no air quality assessment is required to address GHG emissions.

1.2 POLLUTANTS AND AVERAGING TIMES

Maximum hourly and annual emissions are provided for all sources associated with the restart in the Construction Permit application that accompanies this document.

There were no other revisions made for this section. See Section 1.2 of the October 2014 report for a full description of pollutants and averaging times analyzed in the modeling analysis for KNO.

2.0 STATIONARY SOURCE DESCRIPTION

A general description of processes affected by the restart of sources at the KNO facility is provided in Section 1 with a discussion of specific emission units provided in Section 8.0. The restart of the KNO facility will not alter the locations of the present structures or EUs. A Facility Layout Drawing and 3D building depiction of existing structures, EUs, fence-lines, and the ambient air boundary are provided in Figures 2 and 3 located in Section 11.0 of this document.

3.0 PRE-CONSTURCTION MONITORING

No revisions were made to this section. See Section 3 of the October 2014 report for a description of the pre-construction monitoring analysis for KNO.

4.0 APPROACH

4.1 MODEL SELECTION

The air quality modeling analyses employed the AMS/EPA Regulatory Model (AERMOD), version 18081, to incorporate updates to AERMOD since the October 2014 report, which used version 14134. AERMOD allows for simulation of multiple sources (and source types) simultaneously, while making the correct accounting for building downwash and building cavity effects.

There were no changes to the pollutants modeled in the analysis. Please see Section 4.1 of the October 2014 report for a full description of pollutant selection.

4.2 MODEL OPTIONS

The following settings were be used in the AERMOD model:

- complex terrain – receptor elevations and hill scales
- rural dispersion coefficients
- regulatory default model parameters, including:
  - calm correction
  - buoyancy induced dispersion
  - final plume rise
  - default wind profile coefficients
  - default vertical potential temperature gradients
  - stack-tip downwash
  - direction specific building downwash

5.0 METEOROLOGY

The most recent five-year data set was used for the modeling analysis. The Surface Station ID is 26523 (Kenai Regional Airport, Kenai, AK), and the Upper Air Station ID is 26409 (Anchorage, AK). These data were updated by ADEC on October 23, 2015 after reprocessing the dataset with AERMINUTE 15272, and again on November 9, 2018 after reprocessing the dataset with AERMET 18081. Surface data from Kenai Regional Airport are believed to be representative of the project site because it is close by (approximately 10 miles to the south), and there is very little terrain/topographic differences between the project site and the airport site.

There were no other revisions made for this section. See Section 5 of the October 2014 report for a full description of meteorology.

Table 2- Annual Emissions

Stationary Sources															
Source ID	Tag Number	Source Description	Potential to Emit (tpy)												
			NO_x	CO	SO_2	PM (filterable)	PM_{10}	$PM_{2.5}$	VOC	NH_3	Pb	CO_2	CH_4	N_2O	CO_2e
22	B-502	Plants 4 and 5 Small Flare	0.4	2.0	3.22E-03	0.01	0.04	0.04	0.77	0.0	-	644.99	0.01	1.22E-03	645.65
23	B-501	Plants 4 and 5 Emergency Flare	0.2	0.6	1.03E-03	0.00	0.01	0.01	0.25	0.2	-	206.40	0.00	3.89E-04	206.61
11	B-609	Ammonia Tank Storage System Flare	0.4	2.0	3.22E-03	0.01	0.04	0.04	0.77	-		644.99	0.01	1.22E-03	12.00
12	B-201	Primary Reformer	118.3	251.9	3.5	11.0	44.1	44.1	31.9	-	2.9E-03	695,647.06	13.33	1.28E+01	699,780.94
13	B-200	Startup Heater	0.990	0.832	0.006	0.019	0.075	0.075	0.054	-	5.0E-06	1,188.24	0.02	0.02	1,195.30
14	D-207	CO_2 Vent	-	12.7	-	-	-	-	50.0	25.6	-	845,486.11	-	-	845,486.11
15	H-205	Organic Sulfur Removal Unit Vent	-	-	-	-	-	-	1.0E-02	-	-	-	-	-	-
16	H-269	Amine Fat Flasher Vent	-	4.6	-	-	-	-	0.964	2.1	-	13,739.00	-		13,739.00
17	F-263	PC Stripper Surge Tank Vent	-	-	-	-	-	-	0.237	0.1	-	-	-	-	-
19	C-200	H2 Vent Stack (dry gas vent)	-	126.9	-	-	-	-	-	50.0	-			-	
35	C-560A	Granulator A/B Scrubber Exhaust Vent Stack	-	-	-	43.8	43.8	43.8	1.8	200.8	-	-	-	-	-
36	C-560B	Granulator C/D Scrubber Exhaust Vent Stack	-	-	-	43.8	43.8	43.8	1.8	200.8	-	-	-	-	-
37	D- 515	Atmospheric Absorber Final Scrubber	-	-	-	-	-	-	0.096	91.1	-	73.00	-	-	73.00
38	D-511	Inerts Vent Scrubber				-	-	-	0.123	49.3		547.50	-	-	547.50
39	E-535	After Condenser Exchanger	-	-	-	-	-	-	-	-	-	-	-	-	-
40	E-711	Cooling tower	-	-	-	3.29	0.99	5.8E-03	-	2.9	-		-	-	-
41	D-514	Tank Scrubber	-	-	-	-	-	-	-	0.4	-	-	-	-	-
41A	D-513	Tank Scrubber							1.7E-04	0.9					
41B	F-209	MDEA Storage Tank							3.0E-05						
41C	F-615	MDEA Storage Tank							5.0E-06						
44	6B-708C	Package Boiler	10.6	39.4	0.6	2.0	7.9	7.9	5.7	9.4	5.2E-04	125,216.47	2.40	0.67	125,475.48
48	6B-708B	Package Boiler	10.6	39.4	0.6	2.0	7.9	7.9	5.7	9.4	5.2E-04	125,216.47	2.40	0.67	125,475.48
49	6B-708A	Package Boiler	10.6	39.4	0.6	2.0	7.9	7.9	5.7	9.4	5.2E-04	125,216.47	2.40	0.67	125,475.48
47	N/A	Urea Loading Wharf	-	-	-	0.5	0.5	0.2	-	-	-	-	-	-	-
47A		Urea Transfer				*	*	*							
47C		Urea Warehouse/Transfer (stack)				0.042	0.035	0.012							
47B		Urea Warehouse/Transfer (fugitive)				0.219	0.186	0.066							
47D		Urea Transfer				0.044	0.037	0.013							
50	B-705A	Waste Heat Boiler	1.6	22.3	1.2E-01	3.8E-01	1.5	1.5	1.1	7.36	1.0E-04	24,079.2	0.46	0.44	24,222.3
51	B-705B	Waste Heat Boiler	1.6	22.3	1.2E-01	3.8E-01	1.5	1.5	1.1	7.36	1.0E-04	24,079.2	0.46	0.44	24,222.3
52	B-705C	Waste Heat Boiler	1.6	22.3	1.2E-01	3.8E-01	1.5	1.5	1.1	7.36	1.0E-04	24,079.2	0.46	0.44	24,222.3
53	B-705D	Waste Heat Boiler	1.6	22.3	1.2E-01	3.8E-01	1.5	1.5	1.1	7.36	1.0E-04	24,079.2	0.46	0.44	24,222.3
54	B-705E	Waste Heat Boiler	1.6	22.3	1.2E-01	3.8E-01	1.5	1.5	1.1	7.36	1.0E-04	24,079.2	0.46	0.44	24,222.3
55	GGT-744A	Solar Turbine/Generator Set	13.4	26.5	0.8	1.8	1.8	1.8	0.5	-	-	2.67E+04	2.09	0.73	2.70E+04
56	GGT-744B	Solar Turbine/Generator Set	13.4	26.5	0.8	1.8	1.8	1.8	0.5	-	-	2.67E+04	2.09	0.73	2.70E+04
57	GGT-744C	Solar Turbine/Generator Set	13.4	26.5	0.8	1.8	1.8	1.8	0.5	-	-	2.67E+04	2.09	0.73	2.70E+04
58	GGT-744D	Solar Turbine/Generator Set	13.4	26.5	0.8	1.8	1.8	1.8	0.5	-	-	2.67E+04	2.09	0.73	2.70E+04
59	GGT-744E	Solar Turbine/Generator Set	13.4	26.5	0.8	1.8	1.8	1.8	0.5	-	-	2.67E+04	2.09	0.73	2.70E+04
60	F-791	Deaerator Vent	-	-	-	-	-	-	-	7.7	-	-	-	-	-
61	F-711	Degasifier Vent	-	-	-	-	-	-	-	0.1	-	-	-	-	-
65	GM-616D	Diesel Fired Well Pump	0.071	0.015	0.005	0.005	0.005	0.005	0.006	-	-	2.66	-	-	2.66
66	G-613B	Gasoline Fired Firewater Pump	0.103	0.062	5.3E-03	6.3E-03	6.3E-03	6.3E-03	0.006	-	-	9.70	-	-	9.70
Comp	N/A	Fugitive Ammonia from Components								2.2					
IEU	N/A	Building Heaters/Water Heaters	2.9	1.3E+00	1.9E-02	5.9E-02	2.4E-01	2.4E-01	1.7E-01	-	1.6E-05	3,750.83	0.07	0.07	3,773.12
Facility Total Potential to Emit			**230.6**	**764.9**	**10.1**	**119.7**	**174.2**	**172.7**	**114.1**	**634.1**	**5.0E-03**	**2.2E+06**	**3.3E+01**	**2.1E+01**	**2.2E+06**

6.0 TERRAIN AND LAND USE ANALYSIS

The terrain in the immediate vicinity of the project side is relatively flat, raised up from sea level to elevations at or around 130 feet ASL. Terrain elevations along the shoreline with the Cook Inlet rise quickly (within approximately 250 feet) from sea level to elevations of approximately 130 feet. The terrain elevations for sources and receptors were acquired using updated National Elevation Data (NED) and processed using AERMAP, version 18081. The NED had a resolution of 1/3 arc second.

7.0 EU INVENTORY

Changes made to tables and text are provided in this section. For further information on stationary source emissions, see Section 7 of the October 2014 report.

7.1 STATIONARY SOURCE EMISSIONS

The emissions inventory for KNO was identical with previous modeling with the exception of five (5) Solar Turbines and five (5) Waste Heat Boilers. Emission rates corresponding to the new Solar Turbines and Waste Heat Boilers were used in lieu of values used in previous modeling. Also, the package boilers will now employ SCR for control of NO_2; this will change the stack release parameters for diameter, temperature, and flow rate, as well as add ammonia emissions from ammonia slip.

All remaining sources were modeled using the same assumptions that were made in the October 2014 report. This includes assumptions on emission rates, stack parameters, building parameters, operating hours, and hoteling emissions from urea and ammonia ship loading activities. Hourly emission rates utilized in modeling are provided in Table 3.

Operating Scenarios

KNO performed short term modeling considering the four separate operating scenarios included in the October 2014 modeling analysis. A summary of each scenario and a description of any changes that were included in each are described below.

Normal Operations

The normal operations scenario included all emission units with emission rates identical to those included in the October 2014 modeling analysis with the exception of the five Solar Turbines, which were modeled with updated emission rates/bypass stack parameters, and the well pump engine and fire pump engine, which were modeled using an emission rate corresponding to 168 hours per year of operation.

Normal Operations with One Waste Heat Boiler Down

This scenario is identical with the Normal Operations scenario described above with the exception that one Solar Turbine was modeled venting through a bypass stack to simulate a situation during which the corresponding Waste Heat Boiler and SCR control system were out of service. A sensitivity analysis was performed to identify which Solar Turbine would result in the worst case offsite impact. Based on this analysis, the western-most unit (EU 55) was identified as the unit with the highest ambient impact. This unit was used in all evaluations of this operating scenario.

Reformer Startup

The parameters for this scenario were identical to those included in the October 2014 modeling analysis, with the exception that the Solar Turbine/Waste Heat Boiler emission rates were adjusted to reflect the larger Solar Turbines.

Turnaround

The parameters for this scenario were identical to those included in the October 2014 modeling analysis, with the exception that the Solar Turbine emission rates were adjusted to reflect the larger Solar Turbines.

7.2 *HOTELING EMISSIONS FROM MARINE VESSELS*

No revisions were made to this section.

7.3 *OTHER SECONDARY EMISSIONS*

No revisions were made to this section.

Table 3- Hourly Emissions

Stationary Sources															
Source ID	Tag Number	Source Description	Potential to Emit (lb/hr)												
			NO_x	CO	SO_2	PM (filterable)	PM_{10}	$PM_{2.5}$	VOC	NH_3	Pb	CO_2	CH_4	N_2O	CO_2e
22	B-502	Plants 4 and 5 Small Flare	2.2	2.0	0.0	0.0	0.0	0.0	0.8	6.0	-	147.26	2.78E-03	2.78E-04	147.41
23	B-501	Plants 4 and 5 Emergency Flare	54.0	0.6	0.0	0.0	0.0	0.0	0.2	150.0	-	47.12	8.89E-04	8.89E-05	47.17
11	B-609	Ammonia Tank Storage System Flare	0.1	0.5	0.0	0.0	0.0	0.0	0.2	-		147.41	0.00	2.78E-04	147.41
12	B-201	Primary Reformer	27.0	57.5	0.8	2.5	10.1	10.1	7.3	-	6.6E-04	1.59E+05	3.04E+00	2.91E+00	1.60E+05
13	B-200	Startup Heater	9.9	0.8	0.0	0.0	0.1	0.1	0.1	-	5.0E-06	11,882.35	0.23	0.22	11,952.96
14	D-207	CO_2 Vent	-	12.7	-	-	-	-	50.0	25.6	-	193,033.36	-	-	193,033.36
15	H-205	Organic Sulfur Removal Unit Vent	-	-	-	-	-	-	0.01	0.00	-	-	-	-	-
16	H-269	Amine Fat Flasher Vent	-	4.6	-	-	-	-	0.96	2.10	-	13,739.00	-		13,739.00
17	F-263	PC Stripper Surge Tank Vent	-	-	-	-	-	-	0.05	0.06	-	-	-	-	-
19	C-200	H2 Vent Stack (dry gas vent)	-	126.9	-	-	-	-	0.00	50.04	-			-	
35	C-560A	Granulator A/B Scrubber Exhaust Vent Stack	-	-	-	10.0	10.0	10.0	0.40	45.83	-	-	-	-	-
36	C-560B	Granulator C/D Scrubber Exhaust Vent Stack	-	-	-	10.0	10.0	10.0	0.40	45.83	-	-	-	-	-
37	D- 515	Atmospheric Absorber Final Scrubber	-	-	-	-	-	-	0.02	20.80	-	16.67	-	-	16.67
38	D-511	Inerts Vent Scrubber				-	-	-	0.03	11.25		125.00	-	-	125.00
39	E-535	After Condenser Exchanger	-	-	-	-	-	-	0.00	0.00	-	-	-	-	-
40	E-711	Cooling tower	-	-	-	0.75	0.23	1.3E-03	0.00	0.67	-	-	-	-	-
41	D-514	Tank Scrubber	-	-	-	-	-	-	0.00	0.10	-	-	-	-	-
41A	D-513	Tank Scrubber								0.20					
41B	F-209	MDEA Storage Tank													
41C	F-615	MDEA Storage Tank													
44	6B-708A	Package Boiler	2.4	9.0	0.1	0.5	1.8	1.8	1.31	2.146	1.2E-04	28,588.24	0.55	0.15	28,647.37
48	6B-708B	Package Boiler	2.4	9.0	0.1	0.5	1.8	1.8	1.31	2.146	1.2E-04	28,588.24	0.55	0.15	28,647.37
49	6B-708C	Package Boiler	2.4	9.0	0.1	0.5	1.8	1.8	1.31	2.146	1.2E-04	28,588.24	0.55	0.15	28,647.37
47	N/A	Urea Loading Wharf	-	-	-	1.3	1.1	0.4	0.00	0.00	-	-	-	-	-
47A		Urea Transfer				*	*	*							
47C		Urea Warehouse/Transfer (stack)				0.10	0.08	0.03							
47B		Urea Warehouse/Transfer (fugitive)				0.50	0.43	0.15							
47D		Urea Transfer				0.10	0.09	0.03							
50	B-705A	Waste Heat Boiler	0.4	5.1	0.03	0.09	0.35	0.35	0.25	1.68	2.3E-05	5,497.53	0.11	0.10	5,530.20
51	B-705B	Waste Heat Boiler	0.4	5.1	0.03	0.09	0.35	0.35	0.25	1.68	2.3E-05	5,497.53	0.11	0.10	5,530.20
52	B-705C	Waste Heat Boiler	0.4	5.1	0.03	0.09	0.35	0.35	0.25	1.68	2.3E-05	5,497.53	0.11	0.10	5,530.20
53	B-705D	Waste Heat Boiler	0.4	5.1	0.03	0.09	0.35	0.35	0.25	1.68	2.3E-05	5,497.53	0.11	0.10	5,530.20
54	B-705E	Waste Heat Boiler	0.4	5.1	0.03	0.09	0.35	0.35	0.25	1.68	2.3E-05	5,497.53	0.11	0.10	5,530.20
55	GGT-744A	Solar Turbine/Generator Set	36.4	6.0	0.19	0.41	0.41	0.41	0.12	0.00	-	6.10E+03	0.48	0.17	6.16E+03
56	GGT-744B	Solar Turbine/Generator Set	36.4	6.0	0.19	0.41	0.41	0.41	0.12	0.00	-	6.10E+03	0.48	0.17	6.16E+03
57	GGT-744C	Solar Turbine/Generator Set	2.3	6.0	0.19	0.41	0.41	0.41	0.12	0.00	-	6.10E+03	0.48	0.17	6.16E+03
58	GGT-744D	Solar Turbine/Generator Set	2.3	6.0	0.19	0.41	0.41	0.41	0.12	0.00	-	6.10E+03	0.48	0.17	6.16E+03
59	GGT-744E	Solar Turbine/Generator Set	2.3	6.0	0.19	0.41	0.41	0.41	0.12	0.00	-	6.10E+03	0.48	0.17	6.16E+03
60	F-791	Deaerator Vent	-	-	-	-	-	-	0.00	1.75	-	-	-	-	-
61	F-711	Degasifier Vent	-	-	-	-	-	-	0.00	0.03	-	-	-	-	-
65	GM-616D	Diesel Fired Well Pump	11.9	2.6	0.8	0.8	0.8	0.8	0.97	0.00	-	442.80	-	-	442.80
66	G-613B	Gasoline Fired Firewater Pump	3.4	2.1	1.8E-01	2.1E-01	2.1E-01	2.1E-01	0.21	0.00	-	323.40	-	-	323.40
Comp	N/A	Fugitive Ammonia from Components								0.50					
IEU	N/A	Building Heaters/Water Heaters	0.7	2.9E-01	4.3E-03	1.4E-02	5.4E-02	5.4E-02	3.9E-02	-	3.6E-06	856.35	0.02	0.02	861.44
Facility Total Potential to Emit			**198.1**	**293.2**	**3.3**	**30.2**	**42.4**	**41.1**	**67.4**	**360.7**	**1.1E-03**	**5.2E+05**	**7.8E+00**	**4.9E+00**	**5.2E+05**

8.0 EU RELEASE PARAMETERS

Changes made to tables and text are provided in this section. For further information on stationary source emissions, see Section 7 of the October 2014 report.

8.1 LOAD ANALYSIS

KNO evaluated the more significant emission units to be included in the model and identified those which had the capability of operating at a partial load (50% or 75% of full load) for an extended period of time. For units that could potentially operate at such loads, KNO performed a load analysis to identify the load resulting in the highest ground-level concentrations. The following emission unit/load combinations were added to this analysis:

- Solar Turbines/Waste Heat Boilers – These units were evaluated at 75% load and 100% load only, as the units will not operate at lower loads for extended periods.

All other emission unit/load combinations from the October 2014 report were also included in the analysis. This included the reformer, the urea granulators, and the package boilers.

The load evaluation was performed using a 1.0 g/sec emission rate to correspond to 100% load, a 0.75 g/sec emission rate to correspond to 75% load, and a 0.50 g/sec emission rate to correspond to 50% load. Stack gas flow rate was adjusted to correspond to the operating load under consideration.

Tables summarizing the results for each of the significant emission units identified above are provided in Attachment A. The results are discussed briefly below:

- Reformer – The maximum concentration for both one-hour and eight hour averaging periods occurred under the 100% load scenario. Although the maximum concentration for the 24-hour averaging period occurred under the 75% load scenario, the 100% load scenario was selected as the worst case operating load since both the one-hour and eight-hour averages were highest for this scenario.
- Urea Granulators – The maximum concentration occurred under the 100% load scenario for both urea granulators.
- Package Boilers – The maximum concentration occurred under the 100% load for all three package boilers.
- Solar Turbines/Waste Heat Boilers – The maximum concentration for all averaging periods was highest under the 100% operating load scenario for all five waste heat boilers.

Based on this assessment, the operating scenario with the maximum predicted ground level concentrations was the 100% load for all significant emission units.

8.2 *OPERATING LIMITS*

Proposed operating limits are discussed in Section 7.1.

8.3 *HORIZONTAL OR CAPPED STACKS*

Any stack which has a horizontal or obstructed release is assumed to be subject to downwash and was evaluated in AERMOD using the BETA option for the October 2014 modeling report. As a result of this, AERMOD assigned an exit velocity of 0.001 m/sec to these units. Based on current stack configurations, the two MDEA storage tanks (EU41B and EU41C), scrubber (EU41), Deaerator Vent (EU60), well pump engine (EU65), fire pump engine (EU66), and urea storage warehouse baghouse (EU47C and EU47D) all have horizontal exhausts and were modeled in this manner. The use of horizontal and/or capped stacks is now a default option in AERMOD. In the updated modeling analysis, stack parameters for these sources were modified with actual air flow rates and the appropriate AERMOD keyword for horizontal or capped stacks (POINTHOR or POINTCAP).

There were no other revisions to this section.

8.4 *HAUL ROADS, STOCK PILES AND OTHER FUGITIVE EMISSIONS*

No revisions were made to this section.

8.5 *INCREMENT MODELING CONSIDERATIONS*

As the facility will be restarting from a closed status, all KNO sources were considered increment consuming.

8.6 *OFFSITE EUS*

Off-site sources to be included in the analysis are discussed in Section 15.0.

8.7 *INTERMITTENT EMISSIONS*

No revisions were made to this section.

8.8 *SOURCE GROUPS*

No revisions were made to this section.

9.0 POLLUTANT SPECIFIC MODELING CONSIDERATIONS

Changes made to tables and text are provided in this section. For further information on pollutant specific modeling considerations, see Section 9 of the October 2014 report.

9.1 NITROGEN DIOXIDE (NO_2)

The Guideline on Air Quality Models (GAQM, Appendix W of 40 CFR Part 51), with clarification from the US EPA March 01, 2011 memorandum[1] provides a tiered approach for modeling NO_2 from NO_X emissions with increasing levels of refinement:

- Tier 1: full conversion of NO_X to NO_2;
- Tier 2: use of model default option ARM2 for the 1-hour NO_2 standard – no further justification needed;
- Tier 3: application of the Ozone Limiting Method (OLM) or the Plume Volume Molar Ratio Method (PVMRM).

As part of the 1-hour NO_2 analysis for the proposed Agrium KNO project, ERM utilized the ARM2 Tier 2 method to determine predicted concentrations of NO_2.

9.2 PARTICULATE MATTER

With regard to $PM_{2.5}$, the most recent guidance from EPA now allows that the 5-year average of the highest 8th high concentration of the maximum 24-hour or annual averages across the 5 year meteorological data set should be compared to the $PM_{2.5}$ NAAQS. This is now consistent with the form of the standard which is based upon the average of the 98th percentile of the 24-hour values averaged over three years of monitoring.

In a guidance document issued by EPA on May 20, 2014[2], EPA indicates that PSD modeling assessments for $PM_{2.5}$ must include an analysis of the impacts of secondary $PM_{2.5}$ formation on ambient $PM_{2.5}$ air quality levels. EPA suggests that these assessments may be qualitative or quantitative in nature, but does not provide any specific procedures to be followed for either approach. KNO performed a qualitative analysis of secondary $PM_{2.5}$ formation. This analysis is provided in Section 19.1.

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1 "ADDITIONAL CLARIFICATION REGARDING APPLICATION OF APPENDIX W MODELING GUIDANCE FOR THE 1-HOUR NO_2 NATIONAL AMBIENT AIR QUALITY STANDARD" FROM: TYLER FOX, LEADER, AIR QUALITY MODELING GROUP; TO: REGIONAL AIR DIVISION DIRECTORS. MARCH 1, 2011.

2 "GUIDANCE FOR PM2.5 PERMIT MODELING", STEPHEN D. PAGE, DIRECTOR, EPA OFFICE OF AIR QUALITY PLANNING AND STANDARDS, MAY 20, 2014.

9.3 PM_{10} DEPOSITION

PM_{10} deposition was not evaluated.

10.0 BUILDING DOWNWASH

No revisions were made to this section. See Section 10 of the October 2014 report for a description of the building downwash analysis for KNO.

FIGURE 2– PLAN VIEW OF KNO FACILITY STRUCTURES

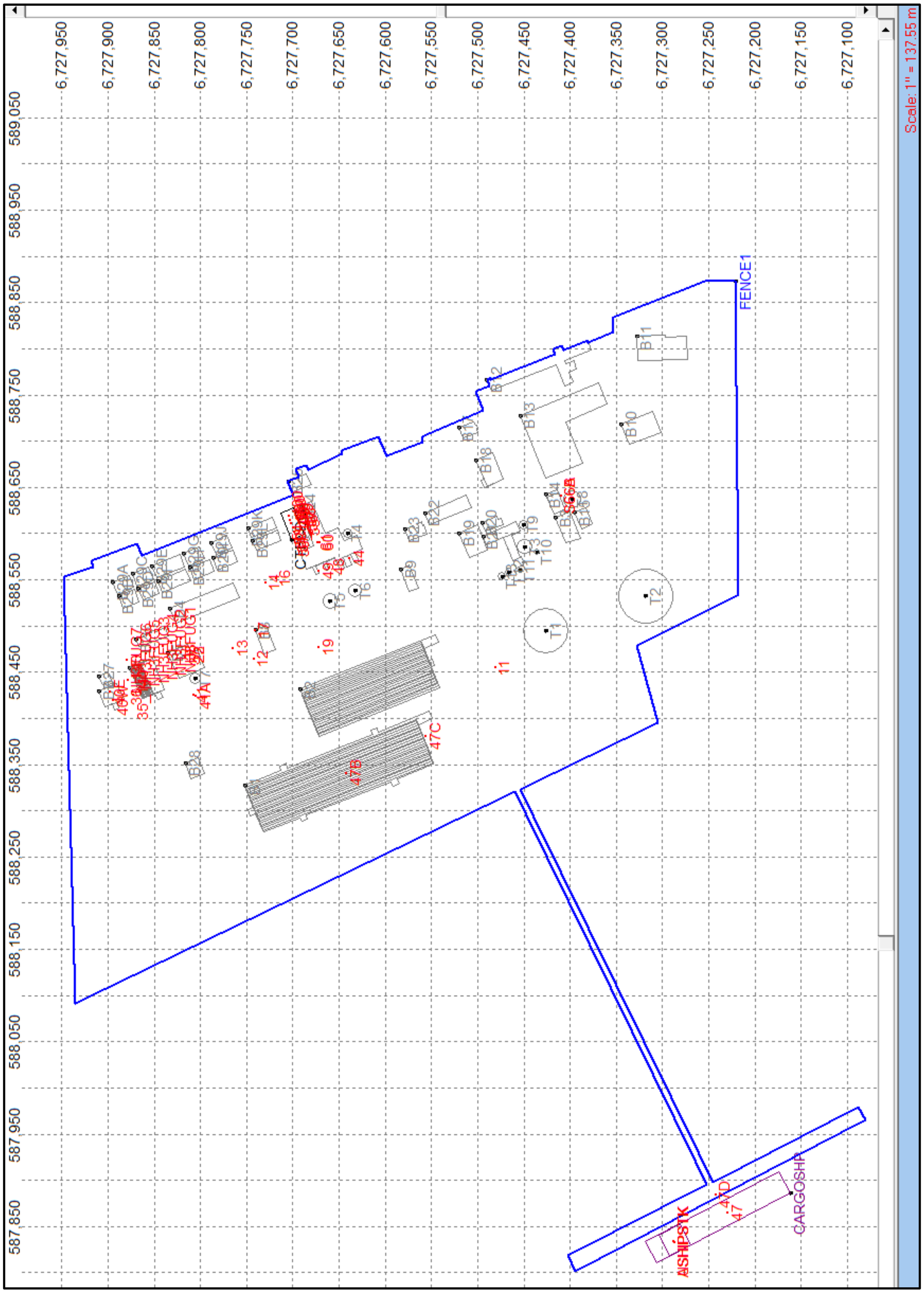
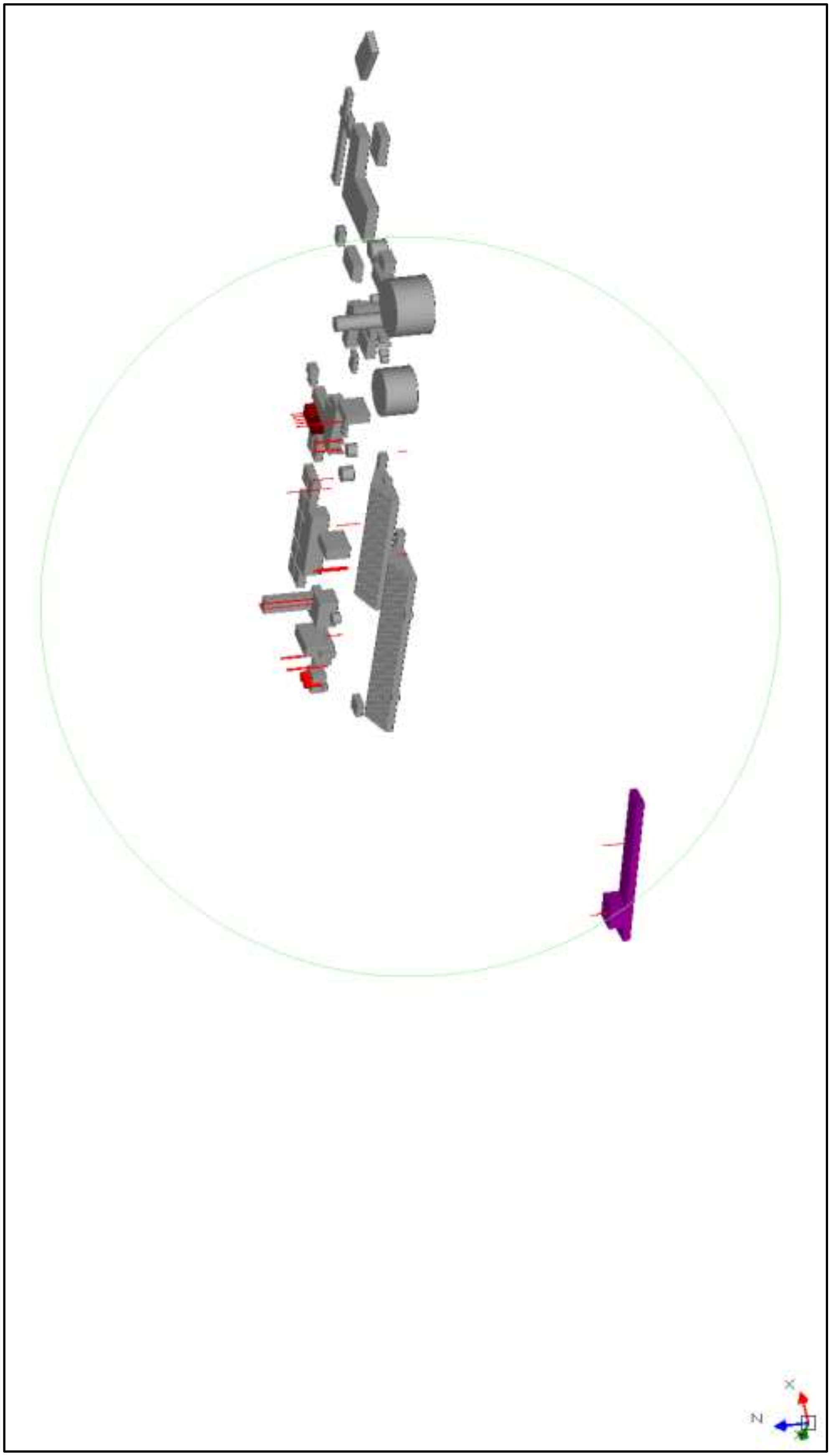


FIGURE 3- 3D VIEW OF KNO FACILITY STRUCTURES



11.0 AMBIENT AIR BOUNDARY

No revisions were made to this section. See Section 11 of the October 2014 report for a description of the ambient air boundary for KNO.

12.0 RECEPTORS

The modeling analysis used the same method for receptor placement that was used in the October 2014 report. The latest version of the AERMAP program (version 18081), with 1/3 arc second resolution NED terrain files were used to develop hill scale and terrain elevation inputs for each receptor.

There were no other revisions made to this section. See Section 12 of the October 2014 report for a full description of receptors.

13.0 OFF-SITE EUS AND BACKGROUND AIR QUALITY DATA

KNO performed an initial modeling analysis in the October 2014 modeling report to identify those pollutants that have predicted ambient concentrations above significant impact levels as defined in EPA guidance. For the current modeling analysis, it was assumed that there were no changes to the pollutants and averaging times with predicted ambient concentrations above significant impact levels. Therefore, the initial modeling analysis was not updated for this report.

KNO performed more detailed modeling analyses for pollutants with predicted ambient impacts that exceeded the significant impact concentrations summarized above. These analyses included consideration of interactive sources and background concentrations. Interactive source inventories were prepared by KNO based on an identification of sources within the potential area of concern and of permits issued to such sources. Per ADEC guidance, KNO utilized significant concentration gradients to identify the extent to which additional sources must be included in modeling analyses.

13.1 OFF-SITE EMISSION UNITS

Off-site emission units included in the October 2014 modeling analysis were also included in the updated modeling analysis. These included sources from the Conoco Phillips LNG Plant, Homer Electric Plant, Tesoro Refinery (Andeavor), and AE&EC Bernice Lake. In addition to these sources, an evaluation was completed to determine if any sources had been constructed, modified, or removed since the original modeling report was submitted. All permits issued the four facilities listed above by ADEC since October 2014 were reviewed. A table that summarizes the sources included and emissions data is provided in Attachment B.

13.2 BACKGROUND CONCENTRATIONS

Ambient Background concentrations for CO, NO_2, PM_{10}, and $PM_{2.5}$ were determined based on the AK LNG data collected in 2015. Table 24 summarizes the background values used in the updated modeling analysis.

Table 24 Ambient Background Concentrations

Pollutant	Averaging Period	Background Value (µg/m³)
CO	1-hour Average	1400
	8-hour Average	1000
NO2	98th Percentile 24-hr Average	30.6
	Annual Average	2.6
PM10	2nd High 24-hr Average	30.0
PM2.5	98th Percentile 24-hr Average	12.0
	Annual Average	3.6

The ammonia background concentration originally used in the October 2014 report to characterize existing ammonia air quality concentrations in the vicinity of the plant, 0.5 ppb, was also used in the updated modeling analysis.

13.3 INCREMENT CONSUMING SOURCES

In order to verify that PSD increments contained in §52.21(c) are protected, KNO included increment consuming sources from nearby sources in its modeling analysis. In addition to the sources included in the October 2014 modeling analysis, an evaluation was completed to determine if any sources had been constructed, modified, or removed since the original modeling report was submitted. A table that summarizes the sources included and emissions data is provided in Attachment B.

There were no other revisions to this section.

14.0 DESIGN CONCENTRATIONS

No revisions were made to this section. See Section 14 of the October 2014 report for a description of the design concentrations analysis for KNO.

15.0 POST-PROCESSING

No revisions were made to this section. This analysis does not include any updates to Class I analyses; therefore, no CALPUFF modeling or post-processing was completed.

16.0 MODELING RESULTS

16.1 SIGNIFICANT IMPACT LEVEL (SIL)

No revisions were made to this section. See Section 16.1 of the October 2014 report for the initial modeling analysis completed for KNO. The results of that analysis are also included as Table 12.

16.2 INCREMENT CONSUMPTION

Modeling was performed to determine the extent to which emissions from the project, in combination with other increment-consuming sources identified in Section 13.3 of this report, will consume air quality increment permitted for Class II areas. The results of this analysis are provided in Table 13. These results show that emissions from increment consuming sources in the vicinity of the plant will not exceed allowable Class II increments.

16.3 NAAQS ASSESSMENT

KNO performed detailed modeling analyses for pollutants with predicted ambient impacts that exceed the significant impact concentrations summarized above. These analyses included consideration of interactive sources and background concentrations. Interactive source inventories were prepared by KNO based on an identification of sources within the potential area of concern and of permits issued to such sources. Sources located in the vicinity of the site are illustrated on maps provided in Attachment C. Those included in the NAAQS assessment and modeled emission rates are summarized in Attachment B.

Results of the NAAQS modeling analysis are summarized in Table 14. These results show that the impact from KNO sources, in combination with other sources located in the area and background concentrations, will not result in an exceedance of the NAAQS.

Electronic copies of all input and output files for the modeling analyses performed will be provided to ADEC under separate cover.

16.4 SENSITIVITY ANALYSES

Sensitivity analyses provided in the October 2014 reflected operating scenarios that were not included in the complete modeling analysis. These scenarios were accounted for in this analysis, so the sensitivity analyses included in the October 2014 report are no longer necessary.

Table 12 SIL Summary
(All concentrations are in μg/m³)

Agrium KNO
SIL Summary

				Ammonia Ship at Dock					Urea Ship at Dock				
				Short-term					Short-term				
		Annual	SIL	S1 normal	S2 CT in bypass	S3 startup	S4 turnaround	Class II SIL	S1 normal	S2 CT in bypass	S3 startup	S4 turnaround	Class II SIL
NO2													
	Tier 3 OLM	7.01	1	416.1	416.1	416.1	416.1	8	298.2	298.2	298.2	298.2	8
PM10		1.49	1	17.6	17.6	17.6	17.6	5	21.6	21.6	21.7	21.6	5
PM2.5		0.89	0.3	7.69	7.69	7.70	7.67	1.2	7.69	7.69	7.70	7.67	1.2
CO													
	1-hr	- -	- -	995.7	995.7	10244.9	995.7	2000	996.0	996.0	10243.5	996.0	2000
	8-hr	- -	- -	278.5	278.5	3566.2	278.5	500	274.3	274.3	3566.2	274.3	500

Note: This Table is the same as was provided in the October 2014 modeling report. It has been provided again here for continuity.

Table 13 Increment Summary (All concentrations are in µg/m³)

Agrium KNO

INCREMENT Summary	Annual	Increment	Ammonia Ship at Dock Short-term S1 normal	S2 CT in bypass	S3 startup	S4 turnaround	Class II Increment	Urea Ship at Dock Short-term S1 normal	S2 CT in bypass	S3 startup	S4 turnaround	Class II Increment
NO2 Tier 2 ARM2	7.93	25	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
PM10	1.50	17	15.1	15.1	15.1	21.7	30	18.6	18.6	18.7	21.7	30
PM2.5	1.04	4	8.29	8.29	8.39	6.62	9	8.29	8.29	8.39	7.45	9

Table 14 NAAQS Summary
(All concentrations are in µg/m³)

Agrium KNO

AAQS Summary

Annual	Annual Conc	Bkgrnd	Total	AAQS	% of AAQS
NO2					
Tier 2 (ARM2)	14.42	2.6	17.02	100	17%
PM2.5	1.12	3.6	4.72	12	39%

Ammonia Ship at Dock

Short-term

	S1					S2					S3					S4				
SHORT-TERM	normal					CT in bypass					startup					turnaround				
	conc	Bkgrnd	total	AAQS	% of AAQS	conc	Bkgrnd	total	AAQS	% of AAQS	conc	Bkgrnd	total	AAQS	% of AAQS	conc	Bkgrnd	total	AAQS	% of AAQS
NO2 (1-hr)																				
Tier 2 (ARM2)	142.2	30.6	172.8	188	92%	149.0	30.6	179.6	188	96%	149.0	30.6	179.6	188	96%	149.0	30.6	179.6	188	96%
PM10																				
24-hr	13.4	30.0	43.4	150	29%	13.4	30.0	43.4	150	29%	13.4	30.0	43.4	150	29%	17.1	30.0	47.1	150	31%
PM2.5																				
24-hr	6.03	12.0	18.0	35	52%	5.93	12.0	17.9	35	51%	5.96	12.0	18.0	35	51%	5.83	12.0	17.8	35	51%
CO																				
1-hr	688.7	1400	2088.7	40000	5%	685.38	1400	2085.4	40000	5%	5476.7	1400	6876.7	40000	17%	685.4	1400	2085.4	40000	5%
8-hr	169.6	1000	1169.6	10000	12%	168.8	1000	1168.8	10000	12%	2803.0	1000	3803.0	10000	38%	168.7	1000	1168.7	10000	12%
Ammonia																				
8-hr	192.7	0.35	193.0	2100	9.2%	192.7	0.35	193.0	2100	9.2%	197.82	0.35	198.2	2100	9.4%	192.5	0.35	192.9	2100	9.2%

Urea Ship at Dock

Short-term

	S1					S2					S3					S4				
SHORT-TERM	normal					CT in bypass					startup					turnaround				
	conc	Bkgrnd	total	AAQS	% of AAQS	conc	Bkgrnd	total	AAQS	% of AAQS	conc	Bkgrnd	total	AAQS	% of AAQS	conc	Bkgrnd	total	AAQS	% of AAQS
NO2 (1-hr)																				
Tier 2 (ARM2)	168.0	incl	168.0	188	89%	168.0	incl	168.0	188	89%	168.0	incl	168.0	188	89%	168.0	incl	168.0	188	89%
PM10																				
24-hr	17.2	30.0	47.2	150	31%	17.2	30.0	47.2	150	31%	17.2	30.0	47.2	150	31%	19.2	30.0	49.2	150	33%
PM2.5																				
24-hr	6.03	12.0	18.1	35	52%	5.93	12.0	17.9	35	51%	5.96	12.0	18.0	35	51%	5.83	12.0	17.8	35	51%
CO																				
1-hr	688.7	1400	2088.7	40000	5%	685.43	1400	2085.4	40000	5%	5451.9	1400	6851.9	40000	17%	685.4	1400	2085.4	40000	5%
8-hr	169.6	1000	1169.6	10000	12%	168.8	1000	1168.8	10000	12%	2803.0	1000	3803.0	10000	38%	168.8	1000	1168.8	10000	12%
Ammonia																				
8-hr	192.7	0.35	193.0	2100	9.2%	192.7	0.35	193.0	2100	9.2%	197.82	0.35	198.2	2100	9.4%	192.5	0.35	192.9	2100	9.2%

17.0 OZONE IMPACTS

No revisions were made to this section. See Section 16 of the October 2014 report for ozone impacts for KNO.

18.0 QUALITATIVE ASSESSMENTS

Changes made to tables and text are provided in this section. For further information on stationary source emissions, see Section 16 of the October 2014 report.

18.1 QUALITATIVE ASSESSMENT OF SECONDARY PM2.5 FORMATION

Sections 18.1.1 and 18.1.2 describe changes made to Section 16.1 of the modeling report.

18.1.1 $PM_{2.5}$ Air Quality Data

There were no changes made to this section.

18.1.2 Assessment of Potential Secondary $PM_{2.5}$ Impact

Potential emissions of known $PM_{2.5}$ precursors from the Agrium KNO Facility are shown in Table 15, along with currently permitted potential emissions from other nearby major stationary sources. The potential emissions have been updated to reflect changes to KNO emission sources and permitted emissions from nearby sources. The $PM_{2.5}$ precursor emissions from Agrium KNO are also compared relative to the sum of the current permitted emissions from the nearby facilities.

Table 15 – $PM_{2.5}$ Precursor Emissions from Agrium KNO and Nearby Sources

Stationary Source	Potential Emissions (tpy)	
	NO_X	SO_2
Agrium KNO	230.63	10.13
Tesoro Alaska Company, LLC - Kenai Refinery[1]	706	104
Alaska Electric & Energy - Bernice Lake Combustion Turbine (BCT) Plant[2]	748	4.4
Alaska Electric & Energy Cooperative (AE&EC) - Nikiski Generation Plant[3]	695	26
Trans-Foreland Pipeline Company - Kenai LNG Plant[4]	1,513	4.9
Total Existing Kenai Sources:	**3,662**	**139**
KNO Emissions Expressed as Percent of Existing Kenai Sources:	**6.3%**	**7.3%**

[1] - Emissions from Statement of Basis of the terms and conditions for Permit No. AQ0035TVP02, Rev. 8, December 19, 2018, ADEC AQ/APP (Juneau)

[2] - Emissions from Statement of Basis of the terms and conditions for Permit No. AQ0086TVP03P, September 4, 2015, ADEC AQ/APP (Juneau)

[3] - Emissions from Statement of Basis of the terms and conditions for Permit No. AQ1190TVP01, September 30, 2009, ADEC AQ/APP (Juneau)

[4] - Emissions from Statement of Basis of the terms and conditions for Permit No. AQ0090TVP02P, Rev. 1, March 19, 2015, ADEC AQ/APP (Juneau)

Potential emissions of known $PM_{2.5}$ precursors from Agrium KNO are significantly less than the total of existing potential emissions from nearby stationary sources. Since the region is currently well in attainment of the 24-hr $PM_{2.5}$ NAAQS (well below 50 % of both the annual and 24-hour NAAQS), the minor increase in $PM_{2.5}$ precursors from Agrium KNO (in comparison to nearby emissions of $PM_{2.5}$ precursors) could not realistically pose a threat to the ongoing attainment of the $PM_{2.5}$ NAAQS in the region.

As noted earlier, ammonia emissions are assumed by EPA not to lead to secondary $PM_{2.5}$ formation unless a study has been performed showing that ammonia emissions in the area contribute to $PM_{2.5}$ concentrations in that area. Because ammonia is not a regulated air pollutant, there are no data available on potential ammonia emissions from other sources in the vicinity of the plant. Potential ammonia emissions from the project are 632 tons per year. Although no ammonia emissions information is available for other existing sources, the mass emissions of ammonia are relatively small in comparison to area-wide emissions of NO_x (17% of the total area-wide NO_x emissions). Due to the relatively low ammonia emissions in the area in comparison to NO_x emissions and the low existing ambient $PM_{2.5}$ air quality levels in the area, KNO does not believe that ammonia emissions pose a threat to attainment of the $PM_{2.5}$ NAAQS in the region.

18.2 *QUALITATIVE ASSESSMENT OF VOC AND NOX ON OZONE*

The Agrium KNO facility will have significant emissions of ozone precursors. Specifically, the potential to emit (PTE) for NO_X will be 230.63 tpy, and the PTE for VOC will be 114.12 tpy. Therefore, Agrium KNO must assess the emissions of these precursors with respect to possible ozone formation that may endanger the ozone NAAQS. Presently, USEPA does not have a recommended air quality modeling approach to assess ozone impacts in Alaska. Therefore, KNO evaluated ozone impacts using a qualitative approach by determining current ozone levels in the region, and comparing potential emissions of ozone precursors to currently permitted ozone precursor emissions from nearby stationary sources.

In order to assess potential impacts on ambient ozone, the current ozone levels in the region must be assessed. The current 8-hr ozone NAAQS is 70 ppb, based on the three year average of the 4th highest 8-hr ozone concentration annually. The current 2015-2017 USEPA ozone design value for the Denali CASTNET monitor (Monitor ID# 2-068-0003) is 51 ppb[3]. The 2018 4th highest ozone value for Denali is 53 ppb[4]; therefore the design value will not change significantly for 2016-2018, and would be expected to decrease to 50 ppb.

18.2.1 *Ozone Data Representativeness*

No revisions were made to this section. See Section 16.2.1 of the October 2014 report for the ozone data analysis for KNO.

[3] HTTP://WWW.EPA.GOV/AIRTRENDS/VALUES.HTML OZONE DETAILED INFORMATION - FEBRUARY 7, 2014

4 HTTP://WWW.EPA.GOV/AIRQUALITY/AIRDATA/

18.2.2 *Assessment of Potential Ozone Impacts*

Potential emissions of ozone precursors from the Agrium KNO Facility are shown in Table 16, along with currently permitted potential emissions from other nearby major stationary sources. The ozone precursor emissions from Agrium KNO are also compared relative to the sum of the current permitted emissions from the nearby facilities.

Table 16 – Ozone Precursor Emissions from Agrium KNO and Nearby Sources

Stationary Source	Potential Emissions (tpy)	
	NO_X	**VOC**
Agrium KNO	230.63	114.12
Tesoro Alaska Company, LLC - Kenai Refinery[1]	706	1,111
Alaska Electric & Energy - Bernice Lake Combustion Turbine (BCT) Plant[2]	748	9.2
Alaska Electric & Energy Cooperative (AE&EC) - Nikiski Generation Plant[3]	695	79
Trans-Foreland Pipeline Company - Kenai LNG Plant[4]	1,513	312
Total Existing Kenai Sources:	**3,662**	**1,511**
KNO Emissions Expressed as Percent of Existing Kenai Sources:	**6.3%**	**7.6%**

[1] - Emissions from Statement of Basis of the terms and conditions for Permit No. AQ0035TVP02, Rev. 8, December 19, 2018, ADEC AQ/APP (Juneau)

[2] - Emissions from Statement of Basis of the terms and conditions for Permit No. AQ0086TVP03P, September 4, 2015, ADEC AQ/APP (Juneau)

[3] - Emissions from Statement of Basis of the terms and conditions for Permit No. AQ1190TVP01, September 30, 2009, ADEC AQ/APP (Juneau)

[4] - Emissions from Statement of Basis of the terms and conditions for Permit No. AQ0090TVP02P, Rev. 1, March 19, 2015, ADEC AQ/APP (Juneau)

Potential emissions of ozone precursors from Agrium KNO are significantly less than the total of existing potential emissions from nearby stationary sources. Since the region is currently well in attainment of the 8-hr ozone NAAQS (the ozone USEPA design value is just under 70 % of the ozone NAAQS), the minor increase in ozone precursors from Agrium KNO (in comparison to nearby emissions of ozone precursors) could not realistically pose a threat to the ongoing attainment of the ozone NAAQS in the region.

19.0 CLASS II VISIBILITY AND OTHER IMPACTS

As part of the modeling analysis, PSD applicants must assess whether the emissions from their stationary source, including associated growth, will impair visibility. Visibility impairment means any humanly perceptible change in visibility (visual range, contrast, or coloration) from that which would have existed under natural conditions (40 CFR 51.301 Visibility impairment). Visibility impacts can be in the form of visible plumes ("plume blight") or in a general, area-wide reduction in visibility ("regional haze").

19.1 VISIBILITY IMPACTS

A visibility analysis, separate from the Class I area analysis, is required as part of the additional impacts analysis. These should be conducted for sensitive Class II areas (places of interest). Other than an update to the project emissions of particulates and NO_X, no parameters or characteristics were changed from the October 2014 VISCREEN analysis.

The updated project emissions of 174.2 tons per year of particulates and 230.6 tons per year of NO_X were used in the Level 1 VISCREEN analysis, also using the default values of zero emissions for primary NO_2, soot and SO_4.

Default particle characteristics were assumed, as default to the model, as well as the following parameters (using default ozone background level of 0.04 ppm (40 ppb):

Transport Scenario Specifications:

Background Ozone:	0.04 ppm
Background Visual Range:	250.00 km
Source-Observer Distance:	50.00 km
Min. Source-Class I Distance:	50.00 km
Max. Source-Class I Distance:	53.25 km
Plume-Source-Observer Angle:	11.25 degrees
Stability:	6
Wind Speed:	1.00 m/s

Results were compared to default Class I impact thresholds (Plume Perceptibility [Delta E] of 2.0, and Plume Contrast of 0.05). Results are provided for impacts “inside” and “outside” the Class I area. According to ADEC guidance, the impacts provided for “inside” the Class I area are indicative of whether the project plume may be perceptible; the impacts provided for “outside” the Class I area are to be ignored for the Class II analysis.

The results indicate that for low viewing angles (10 degrees), the VISCREEN-predicted plume parameters are above the Class I thresholds for plume perceptibility (2.0), and plume contrast (0.05). For high viewing angles (140 degrees), the predicted plume parameters were below the Class I thresholds.

These results indicate that the plume from the proposed KNO project may be visible in the Class I areas, and the integral vistas associated with these areas.

Attachment F provides the results file as produced by the VISCREEN model.

19.2 OTHER IMPACTS

As a part of a PSD analysis, the applicant must demonstrate that the project will not result in an adverse impact upon soils and vegetation in the area. KNO satisfied this requirement by demonstrating compliance with the secondary ambient air quality standards.

The applicant is also required to evaluate the impact that the project will have upon associated growth in the area of the project. When fully operational, the KNO facility will employ 140 people, raising the potential for some population growth in the area of the plant. The population of Kenai in 2017 was 7,790 while the population of neighboring Soldotna was 4,659. Thus, the number of employees for the plant in comparison to the overall population is relatively small (approximately one percent of the population of Kenai and Soldotna combined). Any impacts of growth on air quality in the area are expected to be correspondingly low. Thus, the project is not expected to result in an adverse impact on air quality in the area as a consequence of associated growth.

20.0 CLASS I ANALYSES

Air quality impacts on federally protected Class I areas must be assessed for projects meeting the criteria discussed in the 2010 Federal Land Managers' (FLM) Air Quality Related Values Work Group (FLAG) Phase I report. (Department of the Interior 2010) The 2010 FLAG Phase I report states:

"Generally, the permitting authority should notify the FLM of all new or modified major facilities proposing to locate within 100 km (62 miles) of a Class I area. In addition, the permitting authority should notify the FLM of "very large sources" with the potential to affect Class I areas proposing to locate at distances greater than 100 km. (Reference March 19, 1979, memorandum from EPA Assistant Administrator for Air, Noise, and Radiation to Regional Administrators, Regions I - X). Given the multitude of possible size/distance combinations, the FLMs cannot precisely define in advance what constitutes a "very large source" located more than 100 km away that may impact a particular Class I area. However, as discussed elsewhere in this report, the Agencies have adopted a size (Q)/distance (D) criteria to screen out from AQRV review those sources with relatively small amounts of emissions located a large distance from a Class I area. Consequently, as a minimum, the permitting authority should notify the FLM of all sources that exceed these Q/D criteria."

As required by the FLM, the Q/D analysis compares the ratio of the sum of proposed annualized maximum daily emission rates of all visibility impairing pollutants (in tons per year) and the distance to the nearest Class I area (in km) to a threshold value of 10.

The nearest Class I area to the proposed project site is Tuxedni National Wildlife Refuge. This area is 86.8 kilometers southwest of the project site. Also, Denali National Park is located 199.3 km to the north of the project site.

20.1 AQRV Q/D ANALYSIS

Per the 2010 FLAG Phase I report, the Q/D analysis must compare the ratio of the annualized 24-hour maximum allowable emissions of all visibility impairing pollutants (in tons per year, based on 24-hour maximum allowable emissions) and the distance to the nearest Class I area (in km) to a threshold value of 10.

The emissions data provided in the October 2014 report was also used in the updated Q/D analysis, with the exception of the Solar Turbines/Waste Heat Boilers. Since the Solar Turbines/Waste Heat Boilers operate intermittently, however, the following adjustments were made to intermittently operated emission units:

- EU55-59 – Solar Turbines: During normal operations, it is assumed that one Solar Turbine may be operated for as long as 24 consecutive hours in a bypass mode from the waste heat boilers (thus bypassing the SCR NO_X control system). During turnaround, it is assumed that up to two Solar Turbines could be operated in this fashion in any one 24-hour period.

As noted above, plant operations will occur under several different operating scenarios. Based on the adjustments described in the October 2014 report and above, the Q value for the proposed KNO restart is 792.7 tons per year. Using this value, the Q/D for Tuxedni is computed to be 9.1 and the Q/D value for Denali is 4.0. It should be noted, however, that this provides an unrealistic computation of Q since it is impossible for all emission units to operate in this fashion. More realistic computations of Q based on anticipated operating scenarios for KNO are:

- Normal Operations: During normal operations, the flares, startup heater, and bypass Solar Turbine emissions will not occur. This reduces Q by 366.2 tons/year to 426.5 tons/year. Using this value, the Q/D for Tuxedni is computed to be 4.9 and the Q/D value for Denali is 2.1.
- Normal Operations with One Solar Turbine on Bypass: This scenario is identical with Scenario #1 except that the excess emissions from one Solar Turbine are added to the total emissions, making Q for this scenario 571.0 tons/year. Using this value, the Q/D for Tuxedni is computed to be 6.6 and the Q/D value for Denali is 2.9.
- Startup: During the Startup operating scenario, the Startup Heater will be added to the total plant emissions, however no flares will be operated and no Solar Turbines will be operated in a bypass mode, making the total Q value 472.4 tons/year. Using this value, the Q/D for Tuxedni is computed to be 5.4 and the Q/D value for Denali is 2.4.
- Turnaround: During the Turnaround operating scenario, two Solar Turbines operating in bypass mode would be in operation, and the small flare or emergency flare could be in operation (both would not operate at the same time). The highest Q value would occur with operation of the emergency flare. The Startup Heater would not operate during Turnaround, nor would the Reformer (165.9 tons per year NOx, SO2, and PM10), any of the Waste Heat Boilers (16.4 tons per year NOx, SO2, and PM10) or any of the remaining Solar Turbines (48.2 tons per year NOx, SO2, and PM10). Total Q for this scenario would therefore be 400.2 tons per year. Using this value, the Q/D for Tuxedni is computed to be 4.6 and the Q/D value for Denali is 2.0.

Based on the fact that the Q/D value for all operating scenarios is below a value of 10, additional AQRV analyses are not required.

20.2 MODELING ANALYSIS AND PROCEDURES

KNO has proposed to rely on the previous Class I increment analysis that was provided in the October 2014 modeling analysis. An update to this analysis is not believed to be necessary for the following reasons:

- The change to larger Solar Turbines will have a negligible impact on $PM_{2.5}$ and PM_{10} emissions associated with the project, and thus the predicted impact for these pollutants will be unchanged from what was determined in the October 2014 modeling analysis
- The predicted NO_2 impact for the two Class I areas of concern, Denali National Park and Tuxedni National Wildlife Refuge, were well below the Class I NO_2 SIL (0.001 µg/m^3) for Denali and Tuxedni compared to the NO_2 SIL of 0.1 µg/m^3). The relatively small increase in NO_X emissions resulting from the larger Solar Turbines would not be expected to significantly change these results.

20.3 AMMONIA MODELING

Alaska Rule 18 AAC 50.010(8) contains an ambient air quality standard for ammonia of 2.1 mg/m3 for an 8-hour average, not to be exceeded more than once per year. KNO performed an air quality modeling analysis for sources involved in the restart to demonstrate that this standard will be met. The procedure followed was consistent with the procedures outlined above for other pollutants. Maximum hourly ammonia emissions were modeled for all sources included in the restart. Maximum hourly emissions are provided in Table 3. Results are summarized in Table 23 below:

Table 23 – Ammonia Modeling Results

Year	KNO Sources (mg/m3)	Background (mg/m3)	Total Ammonia Conc. (mg/m3)
2008	0.198	0.00035	0.1982
2009	0.194	0.00035	0.1941
2010	0.183	0.00035	0.1831
2011	0.196	0.00035	0.1961
2012	0.179	0.00035	0.1798

The October 2014 modeling report included a sensitivity analysis, which concluded that there was no impact from ammonia slip from the Reformer and the Solar Turbines/Waste Heat Boilers SCR. The current modeling was performed to include the ammonia slip from the Reformer, Waste Heat Boilers SCR, and the Package Boilers SCR units. The predicted impacts presented in Table 23 are inclusive of all ammonia sources at the facility.

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Attachment A
Load Analysis

Reformer

CO (lb/hr)	NO2 (lb/hr)	PM10 (lb/hr)	PM2.5 (lb/hr)
57.5	27	10.1	10.1

Average	Group	Rank	100% Chi/Q	75% Chi/Q	NO2 100% Conc	NO2 75% Conc	PM10 100% Conc	PM10 75% Conc	PM2.5 100% Conc	PM2.5 75% Conc	CO 100% Conc	CO 75% Conc
1-HR	12	1ST	5.08567	6.18754	1038.07	947.23					2210.7	2017.3
1-HR	12	1ST	4.80667	6.00626	981.12	919.48					2089.4	1958.2
1-HR	12	1ST	4.25581	5.82143	868.68	891.19					1850.0	1897.9
1-HR	12	1ST	5.26218	6.22942	**1074.10**	**953.65**					**2287.4**	**2030.9**
1-HR	12	1ST	4.58071	5.76826	935.00	883.05					1991.2	1880.6
8-HR	12	1ST	2.77339	3.4474							1205.6	1123.9
8-HR	12	1ST	2.46211	3.73855							1070.3	1218.8
8-HR	12	1ST	2.095	3.33071							910.7	1085.9
8-HR	12	1ST	3.47532	4.16681							**1510.7**	1358.5
8-HR	12	1ST	3.30668	4.44495							1437.4	**1449.1**
24-HR	12	1ST	0.92446	1.4037			70.59	80.38	70.59	80.38		
24-HR	12	1ST	0.86538	1.30691			66.08	74.84	66.08	74.84		
24-HR	12	1ST	1.03927	1.68578			79.35	96.54	79.35	96.54		
24-HR	12	1ST	1.15844	1.42511			88.45	81.61	88.45	81.61		
24-HR	12	1ST	2.306	3.23162			**176.07**	**185.06**	**176.07**	**185.06**		
24-HR	12	8TH	0.25788	0.34625					19.69	19.83		
24-HR	12	8TH	0.37531	0.61207					28.66	35.05		
24-HR	12	8TH	0.26636	0.42443					20.34	24.31		
24-HR	12	8TH	0.27164	0.58572					20.74	33.54		
24-HR	12	8TH	0.41323	0.84253					31.55	48.25		
									24.20	**32.19**	5-yr avg	

Granulator
35

CO (lb/hr)	NO2 (lb/hr)	PM10 (lb/hr)	PM2.5 (lb/hr)
0	0	10	10

Average	Group	Rank	100% Chi/Q	75% Chi/Q	NO2 100% Conc	NO2 75% Conc	PM10 100% Conc	PM10 75% Conc	PM2.5 100% Conc	PM2.5 75% Conc	CO 100% Conc	CO 75% Conc
1-HR	35	1ST	8.98677	10.44712	0	0					0	0
1-HR	35	1ST	8.5993	10.30399	0	0					0	0
1-HR	35	1ST	8.34609	10.25756	0	0					0	0
1-HR	35	1ST	9.11355	10.55432	0	0					0	0
1-HR	35	1ST	8.90196	10.79003	0	0					0	0
8-HR	35	1ST	5.04437	6.7766							0	0
8-HR	35	1ST	4.62582	6.00101							0	0
8-HR	35	1ST	4.80299	6.68238							0	0
8-HR	35	1ST	4.20401	4.94813							0	0
8-HR	35	1ST	4.2852	6.05376							0	0
24-HR	35	1ST	2.86137	3.76372			216.3	213.4	216.3	213.4		
24-HR	35	1ST	3.19463	3.77714			241.5	214.2	241.5	214.2		
24-HR	35	1ST	3.19774	4.226			241.7	239.6	241.7	239.6		
24-HR	35	1ST	3.28836	3.91472			**248.6**	222.0	**248.6**	222.0		
24-HR	35	1ST	3.06977	3.40858			232.1	193.3	232.1	193.3		
24-HR	35	8TH	1.11682	1.42377					84.4	80.7		
24-HR	35	8TH	1.4661	1.94834					110.8	110.5		
24-HR	35	8TH	1.67422	2.0808					126.6	118.0		
24-HR	35	8TH	1.27577	1.63928					96.4	92.9		
24-HR	35	8TH	1.2515	1.60541					94.6	91.0		
									102.6	98.6	5-yr avg	

Granulator
36

CO (lb/hr)	NO2 (lb/hr)	PM10 (lb/hr)	PM2.5 (lb/hr)
0	0	10	10

Average	Group	Rank	100% Chi/Q	75% Chi/Q	NO2 100% Conc	NO2 75% Conc	PM10 100% Conc	PM10 75% Conc	PM2.5 100% Conc	PM2.5 75% Conc	CO 100% Conc	CO 75% Conc	
1-HR	36	1ST	8.87953	9.97043	0	0					0	0	
1-HR	36	1ST	8.881	10.04693	0	0					0	0	
1-HR	36	1ST	8.23653	9.80833	0	0					0	0	
1-HR	36	1ST	8.8893	10.23747	0	0					0	0	
1-HR	36	1ST	8.19053	9.79761	0	0					0	0	
8-HR	36	1ST	5.9437	7.08113							0	0	
8-HR	36	1ST	6.3886	7.42285							0	0	
8-HR	36	1ST	6.1745	7.22985							0	0	
8-HR	36	1ST	6.40903	7.54591							0	0	
8-HR	36	1ST	5.76568	6.6215							0	0	
24-HR	36	1ST	3.56007	4.31729			269.1	244.8	269.1	244.8			
24-HR	36	1ST	3.70946	4.81422			280.4	273.0	280.4	273.0			
24-HR	36	1ST	3.81549	4.35032			288.4	246.7	288.4	246.7			
24-HR	36	1ST	3.89266	4.73777			294.3	268.6	294.3	268.6			
24-HR	36	1ST	4.57553	5.18791			**345.9**	294.1	**345.9**	294.1			
24-HR	36	8TH	1.76698	2.18552					133.6	123.9			
24-HR	36	8TH	2.16028	2.87407					163.3	163.0			
24-HR	36	8TH	2.34372	2.90816					177.2	164.9			
24-HR	36	8TH	1.99492	2.62184					150.8	148.7			
24-HR	36	8TH	2.02675	2.60157					153.2	147.5			
									155.6	149.6			5-yr avg

Package Boiler
44

CO (lb/hr)	NO2 (lb/hr)	PM10 (lb/hr)	PM2.5 (lb/hr)
9	2.4	1.8	1.8

Average	Group	Rank	100% Chi/Q	75% Chi/Q	50% Chi/Q	NO2 100% Conc	NO2 75% Conc	NO2 50% Conc	PM10 100% Conc	PM10 75% Conc	PM10 50% Conc	PM2.5 100% Conc	PM2.5 75% Conc	PM2.5 50% Conc	CO 100% Conc	CO 75% Conc	CO 50% Conc
1-HR	44	1ST	11.47037	13.37105	17.22873	208.1	182.0	156.3							780.4	682.3	586.1
1-HR	44	1ST	11.42826	13.36216	18.13651	207.4	181.8	**164.5**							777.6	681.9	**617.0**
1-HR	44	1ST	11.50374	13.3683	17.51915	**208.7**	181.9	158.9							**782.7**	682.2	596.0
1-HR	44	1ST	11.45581	13.53245	18.07492	207.9	**184.1**	164.0							779.4	**690.5**	614.9
1-HR	44	1ST	11.45335	13.16437	17.0752	207.8	179.1	154.9							779.3	671.8	580.9
8-HR	44	1ST	7.81401	9.08103	11.20998										531.7	463.4	381.4
8-HR	44	1ST	8.30733	9.36355	11.91757										565.2	477.8	405.4
8-HR	44	1ST	9.87611	11.19707	13.01138										672.0	571.4	442.6
8-HR	44	1ST	8.21978	9.77866	13.22309										559.3	499.0	449.8
8-HR	44	1ST	7.1212	8.71838	12.17328										484.5	444.9	414.1
24-HR	44	1ST	5.31825	6.36752	8.10187				72.4	65.0	55.1	72.4	65.0	55.1			
24-HR	44	1ST	6.61768	7.53133	8.91229				90.1	**76.9**	60.6	90.1	**76.9**	60.6			
24-HR	44	1ST	6.69349	7.25826	7.97945				**91.1**	74.1	54.3	**91.1**	74.1	54.3			
24-HR	44	1ST	5.85289	6.60717	8.5166				79.6	67.4	57.9	79.6	67.4	57.9			
24-HR	44	1ST	5.59541	7.21527	10.39182				76.1	73.6	**70.7**	76.1	73.6	**70.7**			
24-HR	44	8TH	2.80261	3.26523	4.53055							38.1	33.3	30.8			
24-HR	44	8TH	3.7328	4.54531	6.74319							50.8	46.4	45.9			
24-HR	44	8TH	3.92992	4.49209	5.48697							53.5	45.8	37.3			
24-HR	44	8TH	2.86528	3.80137	4.77712							39.0	38.8	32.5			
24-HR	44	8TH	2.65214	3.21762	4.7007							36.1	32.8	32.0			
												43.5	39.4	35.7	5-yr avg		

Package Boiler
48

CO (lb/hr)	NO2 (lb/hr)	PM10 (lb/hr)	PM2.5 (lb/hr)
9	2.4	1.8	1.8

Average	Group	Rank	100% Chi/Q	75% Chi/Q	50% Chi/Q	NO2 100% Conc	NO2 75% Conc	NO2 50% Conc	PM10 100% Conc	PM10 75% Conc	PM10 50% Conc	PM2.5 100% Conc	PM2.5 75% Conc	PM2.5 50% Conc	CO 100% Conc	CO 75% Conc	CO 50% Conc	
1-HR	48	1ST	14.23583	16.39814	22.94576	258.3	223.1	208.2							968.6	836.8	780.6	
1-HR	48	1ST	14.2604	16.30467	22.83121	**258.7**	221.9	207.1							**970.3**	832.0	776.7	
1-HR	48	1ST	14.22238	16.40393	23.32776	258.0	223.2	211.6							967.7	837.1	793.6	
1-HR	48	1ST	14.14826	16.4091	28.29708	256.7	**223.3**	**256.7**							962.6	**837.3**	**962.7**	
1-HR	48	1ST	14.10994	16.28267	22.60077	256.0	221.6	205.0							960.0	830.9	768.9	
8-HR	48	1ST	11.94682	14.32839	17.58211										812.8	**731.2**	**598.1**	
8-HR	48	1ST	11.73696	13.99643	17.14299										798.6	714.2	583.2	
8-HR	48	1ST	12.51657	14.04477	16.17753										**851.6**	716.7	550.4	
8-HR	48	1ST	11.31481	13.72435	17.14913										769.8	700.3	583.4	
8-HR	48	1ST	12.30756	13.52915	16.58804										837.4	690.4	564.3	
24-HR	48	1ST	10.34731	13.01771	15.75362				140.8	132.9	107.2	140.8	132.9	107.2				
24-HR	48	1ST	11.19142	13.57236	15.96055				152.3	**138.5**	**108.6**	152.3	**138.5**	**108.6**				
24-HR	48	1ST	9.95031	11.72529	14.11398				135.4	119.7	96.0	135.4	119.7	96.0				
24-HR	48	1ST	8.71715	10.28788	11.99696				118.6	105.0	81.6	118.6	105.0	81.6				
24-HR	48	1ST	11.33002	12.41397	13.75127				**154.2**	126.7	93.6	**154.2**	126.7	93.6				
24-HR	48	8TH	5.29119	6.41019	7.92769							72.0	65.4	53.9				
24-HR	48	8TH	6.5361	7.92328	9.37672							88.9	80.9	63.8				
24-HR	48	8TH	6.89658	7.70145	8.90042							93.8	78.6	60.6				
24-HR	48	8TH	5.48427	6.72626	8.66255							74.6	68.6	58.9				
24-HR	48	8TH	5.74067	6.26749	7.7998							78.1	64.0	53.1				
												81.5	71.5	58.1				5-yr avg

Package Boiler
49

CO (lb/hr)	NO2 (lb/hr)	PM10 (lb/hr)	PM2.5 (lb/hr)
9	2.4	1.8	1.8

Average	Group	Rank	100% Chi/Q	75% Chi/Q	50% Chi/Q	NO2 100% Conc	NO2 75% Conc	NO2 50% Conc	PM10 100% Conc	PM10 75% Conc	PM10 50% Conc	PM2.5 100% Conc	PM2.5 75% Conc	PM2.5 50% Conc	CO 100% Conc	CO 75% Conc	CO 50% Conc
1-HR	49	1ST	13.24517	15.31068	20.8254	240.3	208.3	188.9							901.2	781.3	708.5
1-HR	49	1ST	13.19848	15.30912	20.98919	239.5	208.3	190.4							898.0	781.2	714.0
1-HR	49	1ST	13.2789	15.27464	21.03923	240.9	207.9	190.9							903.5	779.5	715.7
1-HR	49	1ST	13.15321	15.38803	21.17845	238.6	**209.4**	**192.1**							894.9	**785.2**	**720.5**
1-HR	49	1ST	13.3117	15.23793	20.6718	**241.5**	207.4	187.5							**905.7**	777.6	703.2
8-HR	49	1ST	11.39604	12.91519	16.44441										775.4	659.1	**559.4**
8-HR	49	1ST	11.27587	12.52536	16.37864										767.2	639.2	557.2
8-HR	49	1ST	10.9022	12.71496	16.14175										741.8	648.8	549.1
8-HR	49	1ST	10.44327	11.6134	16.34112										710.5	592.6	555.9
8-HR	49	1ST	11.57	13.05446	14.71508										**787.2**	**666.2**	500.6
24-HR	49	1ST	7.83627	10.08525	15.02249				106.6	102.9	102.2	106.6	102.9	102.2			
24-HR	49	1ST	8.82918	11.71993	15.06875				120.1	**119.6**	**102.5**	120.1	**119.6**	**102.5**			
24-HR	49	1ST	9.40816	10.47647	14.30724				128.0	106.9	97.3	128.0	106.9	97.3			
24-HR	49	1ST	7.77521	9.64527	14.43906				105.8	98.4	98.2	105.8	98.4	98.2			
24-HR	49	1ST	10.06118	11.58077	13.12501				**136.9**	118.2	89.3	**136.9**	118.2	89.3			
24-HR	49	8TH	5.20856	6.64109	8.23921							70.9	67.8	56.1			
24-HR	49	8TH	5.81096	6.95046	8.87404							79.1	70.9	60.4			
24-HR	49	8TH	5.90749	7.4663	8.93281							80.4	76.2	60.8			
24-HR	49	8TH	4.96023	6.3612	7.79581							67.5	64.9	53.0			
24-HR	49	8TH	5.85741	7.12066	8.14262							79.7	72.7	55.4			
												75.5	70.5	57.1	5-yr avg		

Waste Heat Boiler / CT
50

CO (lb/hr)	NO2 (lb/hr)	PM10 (lb/hr)	PM2.5 (lb/hr)
5.1	0.4	0.35	0.35

Average	Group	Rank	100% Chi/Q	75% Chi/Q	NO2 100% Conc	NO2 75% Conc	PM10 100% Conc	PM10 75% Conc	PM2.5 100% Conc	PM2.5 75% Conc	CO 100% Conc	CO 75% Conc
1-HR	50	1ST	11.76241	14.19741	35.57	**32.20**					453.5	410.5
1-HR	50	1ST	11.4153	14.07677	34.52	31.93					440.1	407.1
1-HR	50	1ST	11.18734	13.63479	33.83	30.92					431.3	394.3
1-HR	50	1ST	11.93023	14.0729	**36.08**	31.92					**460.0**	406.9
1-HR	50	1ST	11.00756	13.5373	33.29	30.70					424.4	391.5
8-HR	50	1ST	8.57904	10.76846							330.8	311.4
8-HR	50	1ST	9.26261	11.22944							**357.1**	324.7
8-HR	50	1ST	8.47289	9.86355							326.7	285.2
8-HR	50	1ST	8.34011	10.36887							321.6	299.8
8-HR	50	1ST	8.27749	10.02558							319.1	289.9
24-HR	50	1ST	5.43472	6.8294			14.4	13.6	14.4	13.6		
24-HR	50	1ST	6.27755	8.10569			16.6	16.1	16.6	16.1		
24-HR	50	1ST	6.33729	7.63821			16.8	15.2	16.8	15.2		
24-HR	50	1ST	6.73475	8.69622			**17.8**	17.3	**17.8**	17.3		
24-HR	50	1ST	6.15594	8.94006			16.3	**17.7**	16.3	**17.7**		
24-HR	50	8TH	3.49391	4.92472					9.2	9.8		
24-HR	50	8TH	4.10774	5.40978					10.9	10.7		
24-HR	50	8TH	4.53105	5.73144					12.0	11.4		
24-HR	50	8TH	4.04209	5.11062					10.7	10.1		
24-HR	50	8TH	3.90679	5.17035					10.3	10.3		
									10.6	10.5	5-yr avg	

Waste Heat Boiler / CT
51

CO (lb/hr)	NO2 (lb/hr)	PM10 (lb/hr)	PM2.5 (lb/hr)
5.1	0.4	0.35	0.35

Average	Group	Rank	100% Chi/Q	75% Chi/Q	NO2 100% Conc	NO2 75% Conc	PM10 100% Conc	PM10 75% Conc	PM2.5 100% Conc	PM2.5 75% Conc	CO 100% Conc	CO 75% Conc
1-HR	51	1ST	11.681	14.10488	35.32	31.99					450.4	407.9
1-HR	51	1ST	11.89655	14.42453	35.97	32.71					458.7	417.1
1-HR	51	1ST	11.55038	14.4245	34.93	32.71					445.3	417.1
1-HR	51	1ST	12.20814	14.28141	**36.92**	32.39					**470.7**	413.0
1-HR	51	1ST	11.02962	13.75247	33.35	31.19					425.3	397.7
8-HR	51	1ST	8.69868	10.86723							335.4	314.2
8-HR	51	1ST	9.22596	11.11937							**355.7**	321.5
8-HR	51	1ST	8.2753	9.60772							319.1	277.8
8-HR	51	1ST	8.4645	10.18996							326.4	294.7
8-HR	51	1ST	8.04979	9.71905							310.4	281.0
24-HR	51	1ST	5.4819	6.66278			14.5	13.2	14.5	13.2		
24-HR	51	1ST	6.16961	7.91933			16.3	15.7	16.3	15.7		
24-HR	51	1ST	6.26951	7.54116			16.6	15.0	16.6	15.0		
24-HR	51	1ST	6.71327	8.63245			**17.8**	17.1	**17.8**	17.1		
24-HR	51	1ST	6.03758	8.67125			16.0	17.2	16.0	17.2		
24-HR	51	8TH	3.51036	4.76171					9.3	9.4		
24-HR	51	8TH	3.95444	5.28313					10.5	10.5		
24-HR	51	8TH	4.51944	5.68124					12.0	11.3		
24-HR	51	8TH	3.98083	5.07482					10.5	10.1		
24-HR	51	8TH	3.79301	5.08153					10.0	10.1		
									10.5	10.3	5-yr avg	

Waste Heat Boiler / CT
52

CO (lb/hr)	NO2 (lb/hr)	PM10 (lb/hr)	PM2.5 (lb/hr)
5.1	0.4	0.35	0.35

Average	Group	Rank	100% Chi/Q	75% Chi/Q	NO2 100% Conc	NO2 75% Conc	PM10 100% Conc	PM10 75% Conc	PM2.5 100% Conc	PM2.5 75% Conc	CO 100% Conc	CO 75% Conc
1-HR	52	1ST	12.07187	14.20327	36.50	32.21					465.4	410.7
1-HR	52	1ST	12.12414	14.88392	**36.66**	33.76					**467.5**	430.4
1-HR	52	1ST	11.74454	14.65994	35.51	33.25					452.8	423.9
1-HR	52	1ST	12.04584	14.20269	36.43	32.21					464.4	410.7
1-HR	52	1ST	11.21717	14.32839	33.92	32.50					432.5	414.3
8-HR	52	1ST	8.68568	10.82349							334.9	313.0
8-HR	52	1ST	9.07816	10.93877							**350.0**	316.3
8-HR	52	1ST	8.01599	9.51129							309.1	275.0
8-HR	52	1ST	8.91415	10.58074							343.7	306.0
8-HR	52	1ST	7.84445	9.48277							302.4	274.2
24-HR	52	1ST	5.47453	6.57122			14.5	13.0	14.5	13.0		
24-HR	52	1ST	6.0117	7.67767			15.9	15.2	15.9	15.2		
24-HR	52	1ST	6.16992	7.41467			16.3	14.7	16.3	14.7		
24-HR	52	1ST	6.65156	8.51515			**17.6**	16.9	**17.6**	16.9		
24-HR	52	1ST	5.97273	8.33246			15.8	16.5	15.8	16.5		
24-HR	52	8TH	3.46867	4.62819					9.2	9.2		
24-HR	52	8TH	3.95296	5.12948					10.5	10.2		
24-HR	52	8TH	4.45542	5.53389					11.8	11.0		
24-HR	52	8TH	3.86494	5.007					10.2	9.9		
24-HR	52	8TH	3.79555	5.31222					10.0	10.5		
									10.3	10.2	5-yr avg	

Waste Heat Boiler / CT
53

CO (lb/hr)	NO2 (lb/hr)	PM10 (lb/hr)	PM2.5 (lb/hr)
5.1	0.4	0.35	0.35

Average	Group	Rank	100% Chi/Q	75% Chi/Q	NO2 100% Conc	NO2 75% Conc	PM10 100% Conc	PM10 75% Conc	PM2.5 100% Conc	PM2.5 75% Conc	CO 100% Conc	CO 75% Conc	
1-HR	53	1ST	12.28899	14.47924	37.16	32.84					473.8	418.7	
1-HR	53	1ST	12.26521	14.76461	37.09	33.49					472.9	426.9	
1-HR	53	1ST	11.68645	14.64905	35.34	33.22					450.6	423.6	
1-HR	53	1ST	12.46308	14.72845	**37.69**	33.40					**480.5**	425.9	
1-HR	53	1ST	11.62812	14.82803	35.16	33.63					448.3	428.8	
8-HR	53	1ST	8.57637	10.7195							330.7	310.0	
8-HR	53	1ST	8.91083	10.68103							343.6	308.9	
8-HR	53	1ST	8.04906	9.74648							310.3	281.8	
8-HR	53	1ST	9.23268	10.94588							**356.0**	316.5	
8-HR	53	1ST	7.9587	9.63249							306.9	278.5	
24-HR	53	1ST	5.43221	6.5045			14.4	12.9	14.4	12.9			
24-HR	53	1ST	5.84547	7.59147			15.5	15.1	15.5	15.1			
24-HR	53	1ST	6.0492	7.26653			16.0	14.4	16.0	14.4			
24-HR	53	1ST	6.55316	8.36972			**17.3**	16.6	**17.3**	16.6			
24-HR	53	1ST	6.16519	7.99313			16.3	15.9	16.3	15.9			
24-HR	53	8TH	3.39392	4.54464					9.0	9.0			
24-HR	53	8TH	3.91814	5.05991					10.4	10.0			
24-HR	53	8TH	4.26803	5.43941					11.3	10.8			
24-HR	53	8TH	3.71501	4.94122					9.8	9.8			
24-HR	53	8TH	3.80706	5.35872					10.1	10.6			
									10.1	10.1			5-yr avg

Waste Heat Boiler / CT
54

CO (lb/hr)	NO2 (lb/hr)	PM10 (lb/hr)	PM2.5 (lb/hr)
5.1	0.4	0.35	0.35

Average	Group	Rank	100% Chi/Q	75% Chi/Q	NO2 100% Conc	NO2 75% Conc	PM10 100% Conc	PM10 75% Conc	PM2.5 100% Conc	PM2.5 75% Conc	CO 100% Conc	CO 75% Conc
1-HR	54	1ST	12.41894	15.01538	37.55	34.05					478.8	434.2
1-HR	54	1ST	12.55208	14.89606	37.96	33.78					483.9	430.7
1-HR	54	1ST	12.47213	14.52619	37.72	32.94					480.9	420.0
1-HR	54	1ST	12.69091	15.07786	**38.38**	34.20					**489.3**	436.0
1-HR	54	1ST	11.86372	14.84458	35.88	33.67					457.4	429.3
8-HR	54	1ST	8.38649	10.4395							323.3	301.9
8-HR	54	1ST	8.59463	10.32387							331.4	298.5
8-HR	54	1ST	8.1869	9.91225							315.6	286.6
8-HR	54	1ST	9.42575	11.17955							**363.4**	323.3
8-HR	54	1ST	8.07144	9.69772							311.2	280.4
24-HR	54	1ST	5.35017	6.38868			14.2	12.7	14.2	12.7		
24-HR	54	1ST	5.70578	7.6734			15.1	15.2	15.1	15.2		
24-HR	54	1ST	5.8983	7.08518			15.6	14.1	15.6	14.1		
24-HR	54	1ST	6.40798	8.16376			**17.0**	16.2	**17.0**	16.2		
24-HR	54	1ST	6.32956	7.74232			16.7	15.4	16.7	15.4		
24-HR	54	8TH	3.26252	4.47406					8.6	8.9		
24-HR	54	8TH	3.84028	4.92562					10.2	9.8		
24-HR	54	8TH	4.1013	5.54125					10.9	11.0		
24-HR	54	8TH	3.68628	4.81938					9.8	9.6		
24-HR	54	8TH	3.91276	5.31489					10.4	10.5		
									10.0	10.0	5-yr avg	

Attachment B
Sources Included in Area-Wide Analysis

Facility Name	Source Description	Source ID	Modeling Source ID	Easting (m)	Northing (m)	Base Elevation (ft)	Stack Height (ft)	Temperature (F)	Exit Velocity (fps)	Stack Diameter (ft)	ADEC AEI PM2.5 (tpy)	ADEC AEI PM10 (tpy)	ADEC AEI NOx (tpy)	ADEC AEI SO2 (tpy)	ADEC AEI CO (tpy)	ADEC AEI NH3 (tpy)	ADEC Permit PM2.5 (lb/hr)	ADEC Permit PM10 (lb/hr)	ADEC Permit NOx (lb/hr)	ADEC Permit SO2 (lb/hr)	ADEC Permit CO (lb/hr)	
Conoco Phillips LNG Plant																						
	Turbine Compressor Drive - Propane Cycle #151 (NG)	1	CP01			130	70	900	107	7	0	0	0	0	0		0.99858	0.99858	48.416	76.65	12.41	
	Turbine Compressor Drive - Propane Cycle #152 (NG)	2	CP02	588003.85	6728079.16	130	70	900	107	7	N/A	3.14	120	0.08	39		0.99858	0.99858	48.416	76.65	12.41	
	Turbine Compressor Drive - Ethylene Cycle #251 (NG)	3	CP03	588008.22	6728079.27	130	70	939	264	7	N/A	1.56	71.4	0.04	19.4		1.35102	1.35102	65.504	103.7	16.79	
	Turbine Compressor Drive - Ethylene Cycle #252 (NG)	4	CP04	588004.95	6728079.19	130	70	939	161	7	N/A	1.33	60.7	0.03	16.5		1.35102	1.35102	65.504	103.7	16.79	
	Turbine Compressor Drive - Methane Cycle #351 (NG)	5	CP05	588004.95	6728079.19	130	70	900	107	7	N/A	0.12	4.63	0	1.47		0.97878	0.97878	47.456	75.13	12.16	
	Turbine Compressor Drive - Methane Cycle #352 (NG)	6	CP06	588003.86	6728078.94	130	70	900	107	7	N/A	2.26	88.8	0.06	28.1		0.97878	0.97878	47.456	75.13	12.16	
	Turbine Compressor Drive - Fuel System #701 (NG)	7	CP07	588003.86	6728078.94	130	70	900	113	5	N/A	0.56	1.2	0.01	0.31		0.396	0.396	3.0385	30.4	8.865	
	Boiler #501 (NG)	8	CP08	588004.95	6728078.97	130	62	370	32	3	N/A	0.27	3.57	0.01	3.00		0.3572	0.3572	4.7	0.024	3.95	
	Boiler #502 (NG)	9	CP09	588004.95	6728078.97	130	62	370	32	3	N/A	0.36	4.75	0.01	3.99		0.3572	0.3572	4.7	0.024	3.95	
	Boiler #511 (NG)	10	CP10	588004.95	6728078.97	130	62	370	32	3	N/A	0.26	3.43	0.01	2.88		0.3572	0.3572	4.7	0.024	3.95	
	Emergency Generator (Diesel)	11	CP11	588004.95	6728078.97	130	14	890	108	1	N/A	0.01	0.16	0	0.03		1.03257	1.03257	14.55	32.85	3.135	
	Firewater Pump#2 (Diesel)	12	CP12	587996.21	6728078.75	130	12	890	153	1	N/A	0.01	0.13	0	0.03		0.825	0.825	11.625	26.25	2.505	
	Firewater Pump#3 (Diesel)	13	CP13	587996.24	6728077.86	130	12	890	153	1	N/A	0.01	0.13	0	0.03		0.825	0.825	11.625	26.25	2.505	
	Firewater Pump#4 (Diesel)	14	CP14	587996.24	6728077.86	130	12	890	95	1	N/A	0.01	0.08	0	0.02		0.5082	0.5082	7.161	16.17	1.543	
	Ground Flare (including pilot) (NG, propane, ethylene)	15	CP15	587991.05	6728111.16	130	203	1832	65.6	45	N/A	0.77	1.98	0	10.75		162.8	162.8	419.33	3124	2282	
	Turbine #151 Lube Oil Vent (emission point for compressor seal losses)	17	CP17	588004.95	6728079.19	130	1	30	0.1	0.1	N/A	0	0.04	0	0.01		0.1716	0.1716	2.418	5.46	0.521	
Homer Electric Plant																						
	GE Frame6 MS6001B CT	1	HEL01	588625.55	6727834.36	130	51	1017	1	10	0	0	0	0	0	0	2.88486	2.88486	111.4605	2.88486	0.47	
	GSE-1746 Detroit Diesel Startup Engine	2	HEL02	588628.2785	6727823.517	130	20	250	30	1	0	0	0	0	0	0	0.455	0.455	14.56	2.3205	3.8675	
	HRSG	3	HEL03	588625.55	6727834.36	130	51	1017	1	10							3.509412	3.509412	57.462	3.1086	37.68	no stack data, assume same stack as Frame6 CT
	2MW Tier 2 Engine	4	HEL04														1.043056	1.074948	64.32	1.08406	14.74	no stack data
	Emergency Firewater Pump	5	HEL05														0.33	0.33	4.65	0.3075	1.005	no stack data
	Glycol Heater	6	HEL06														0.010431	0.010431	0.137255	0.000824	0.115294	no stack data
Tesoro Refinery																						
	Crude Heater H-101A, Unit 0001	1	TR01	589014.04	6728820.53	131	52	624	22	5	2.46	2.46	90.74	1.00	0.06	0.66	0.700913	0.700913	35	4.200913	5.593607	
	Crude Heater H-101B, Unit 0002	2	TR02	589008.38	6728828.19	131	87	496	20	4	2.86	2.86	23.05	1.16	0.06	0.77	0.824201	0.824201	9.908676	4.954338	6.598174	
	Powerformer Preheater H-201, Unit 0003	3	TR03	589101.36	6728824.93	131	106	854	14	7	0.56	0.56	7.33	0.23	0.06	0.15	0.159817	0.159817	7.945205	0.958904	1.118721	
	Powerformer Preheater H-202, Unit 0004	4	TR04	589101.36	6728824.93	131	106	854	14	7	1.05	1.05	13.82	0.43	0.06	0.28	0.255708	0.255708	12.73973	1.52968	1.780822	
	Powerformer Preheater H-203, Unit 005	5	TR05	589101.36	6728824.93	131	106	854	14	7	0.49	0.49	6.5	0.2	0.06	0.13	0.139269	0.139269	6.986301	0.844749	0.981735	
	Powerformer Reheater H-204, Unit 0006	6	TR06	589095.67	6728833.7	131	152	500	20	5	0.76	0.76	8.15	0.31	0.06	0.2	0.269406	0.269406	4.315068	1.621005	1.872146	
	Powerformer Reheater H-205, Unit 0007	7	TR07	589095.67	6728833.7	129	152	500	20	5	0.45	0.45	4.8	0.18	0.06	0.12	0.244292	0.244292	3.90411	1.461187	1.712329	
	Hydrocracker Recycle Gas Heater, H-401, Unit 0008	8	TR08	589171.77	6728850.08	129	85	498	17	4	0.45	0.45	4.86	0.18	0.06	0.12	0.194064	0.194064	3.105023	1.164384	1.369863	
	Hydrocracker Recycle Gas Heater, H-402, Unit 0009	9	TR09	589166.28	6728851.06	129	77	456	10	4	0.36	0.36	3.87	0.15	0.06	0.1	0.189498	0.189498	3.03653	1.141553	1.324201	
	Hydrocracker Fractionater Reboiler, H-403, Unit 0010	10	TR10	589155.38	6728849.67	129	75	556	25	4	1.04	1.04	8.39	0.42	0.06	0.28	0.251142	0.251142	2.990868	1.506849	1.757991	
	Hydrocracker Fractionater Reboiler, H-404, Unit 0011	11	TR11	589149.92	6728849.53	129	77	551	18	5	1.15	1.15	12.4	0.47	0.06	0.31	0.321918	0.321918	5.159817	1.940639	2.260274	
	Hot Oil Heater, H-609, Unit 0012	12	TR12	588854.71	6728634.96	134	55	536	35	3	0.18	0.18	2.4	0.07	0.06	0.05	0.002283	13.99543	0.002283	1.689498	1.96347	
	Asphalt Plant Heater, H-650, Unit 0014	14	TR14	588689.56	6728904.98	125	7	700	2	1	0.08	0.08	0.99	0	0.06	0.03	0.020548	0.593607	0.020548	0.068493	0.136986	
	Fired Steam Generator, H-701, Unit 0015	15	TR15	589034.97	6728857.82	131	40	541	30	2	0.6	0.6	7.85	0.24	0.06	0.16	0.182648	5.114155	0.182648	0.365297	1.278539	
	Fired Steam Generator, H-702, Unit 0016	16	TR16	589024.05	6728857.55	131	40	541	30	2	0.6	0.6	7.85	0.24	0.06	0.16	0.182648	5.114155	0.182648	0.365297	1.278539	
	H-704 Natural Gas Supply Heater	17	TR17														0.009132	0.009132	0.205479	0.022831	0.068493	
	Fired Steam Generator, H-801, Unit 0018	18	TR18	589007.69	6728856.03	131	40	351	28	2	0.52	0.52	6.87	0.21	0.06	0.14	0.159817	0.159817	3.196347	0.319635	1.118721	
	Hot Glycol Heater, H-802, Unit 0019	19	TR19	589139.31	6728837.01	131	15	350	8	3	0.35	0.35	4.64	0	0.06	0.14	0.054795	0.054795	1.073059	0.114155	0.388128	
	Hydrogen Reformer Furnace, H-1001, Unit 0020	20	TR20	589226.02	6728865.91	130	70	344	69	4	1.23	1.23	13.17	0.01	0.06	0.49	0.762557	0.762557	12.19178	1.52968	6.09589	
	Heaters, H-1101-1106, Units 0021-0026	21	TR21	589226.02	6728865.91	130	100	350	3	3	0.01	0.01	0.12	0	0.06	0	0.038811	0.038811	0.776254	0.159817	0.296803	sum of 22-26
	H-1102 SRU No. 1 Reheater	22	TR22_26														0.009132	0.009132	0.159817	0.045662	0.068493	common stack for EU22-26, SEE TR21
	H-1103 SRU No. 2 Reheater	23	TR22_26														0.006849	0.006849	0.114155	0.045662	0.045662	common stack for EU22-26, SEE TR21
	H-1104 SRU No. 3 Reheater	24	TR22_26														0.004566	0.004566	0.114155	0.022831	0.045662	common stack for EU22-26, SEE TR21
	H-1105 SCOT Tail Gas Burner	25	TR22_26														0.009132	0.009132	0.205479	0	0.068493	common stack for EU22-26, SEE TR21
	H-1106 SRU No. 4 Reheater	26	TR22_26														0.009132	0.009132	0.182648	0.045662	0.068493	common stack for EU22-26, SEE TR21
	Prip Absorber Feed Furnace, H-1201/1203, Unit 0027	27	TR27	589100.78	6728848.31	131	46	601	2	3	0.17	0.17	2.33	0	0.06	0.07	0.052511	0.052511	1.050228	0.114155	0.205479	
	Prip Recycle H2 Furnace, H-1202, Unit 0028	28	TR28	589100.78	6728848.31	131	52	423	9	3	0.31	0.31	4.12	0	0.06	0.12	0.057078	0.057078	1.118721	0.114155	0.456621	
	Vacuum Tower Heater, H-1701, Unit 0029	29	TR29	588963.65	6728869.42	131	76	399	35	4	1.55	1.55	12.5	0.63	0.06	0.42	0.474886	0.474886	5.707763	2.853881	3.333333	
	Duct Burner for Steam Generation, E-1400, Unit 0030	30	TR30	589284.56	6728928.65	131	28	326	76	4	0.21	0.21	3.57	0	0.06	0.08	0.509132	0.509132	0	0.593607	0	
	Solar Centaur Turbine	31	TR31	589284.56	6728928.65	131	28	326	76	4	0.32	0.32	5.49	0	0.06	0.13	0.509132	0.509132	0	0.593607	0	
	Duct Burner for Steam Generation	32	TR32	589284.56	6728928.65	131	28	320	74	4	1.29	1.29	25.32	0.02	0.06	5.84	0.616438	0.616438	11.45	1.141553	5.5	
	Solar Centaur Turbine, GT-1410, Unit 0033	33	TR33	589284.56	6728928.65	131	28	320	74	4	0.7	0.7	13.84	0.01	0.06	0.32	0.616438	0.616438	11.45	1.141553	5.5	
	Electrical Generator CAT 3412, EG-704 Unit 0034	34	TR34	589040.21	6728866.87	131	10	620	160	1	0.07	0.07	0.96	0	0.06	0.01	0.027397	0.027397	0.365297	0.045662	0.091324	
	Stewart-Stevens Generator, EG-801, Unit 0035	35	TR35	589173.53	6728735.35	131	10	620	35	1	0.05	0.05	0.72	0	0.06	0.01	0.034247	0.034247	0.479452	0.045662	0.114155	
	North Caterpillar CAT G399, P-605A, Unit 0036	36	TR36	588881.57	6728653.46	134	15	620	105	1	0	0	0.47	0	0.06	0	0.004566	0.004566	2.716895	0.022831	0.342466	
	South Caterpillar CAT G399, P-605B, Unit 0037	37	TR37	588845.43	6728590.16	134	20	620	105	1		0	6.56	0	0.06		0.004566	0.004566	2.716895	0.022831	0.342466	
Fugitive	Upper Tank Farm CAT 3412DT, P-708C, Unit 0040	40	TR40	589323.28	6728909.56	131					0.18	0.18	2.56	0	0.55	0.03	0.070776	0.070776	1.004566	0.114155	0.228311	not sure if this one will be in model - need other source parameters for modeling
	Refinery Flare, J-801, Unit 0042	42	TR42	589362.87	6728855.95	131	100	350	3	1	0	0	0.06	0	0.05	0	0.015982	0.015982	0.388128	0.022831	0.114155	
	SRU Flare, Unit 0043	43	TR43	589215.09	6728865.64	130	103	624	22	5	0	0	0.06	0	0.05	0	0.009132	0.009132	0.251142	0.022831	0.068493	
AE&EC Bernice Lake																						
	AE&EC BL - Gen Unit 1	1	AEEC2	588065.67	6729768.74	154.2	250	374	56	12	7.60	7.60	368.62	0.19	94.46	0	1.736	1.736	84.160	0.044	21.566	
	AE&EC BL - Gen Unit 2	2	AEEC3	588065.67	6729768.74	154.2	250	374	56	12	52.56	52.56	342.95	0.24	405.07	0	12.000	12.000	78.300	0.054	92.483	
	AE&EC BL - Gen Unit 3	3	AEEC4	588065.67	6729768.74	154.2	250	374	56	12	52.56	52.56	410.41	0.24	281.42	0	12.000	12.000	93.700	0.054	64.251	

Attachment C
Maps of Off-Site Sources

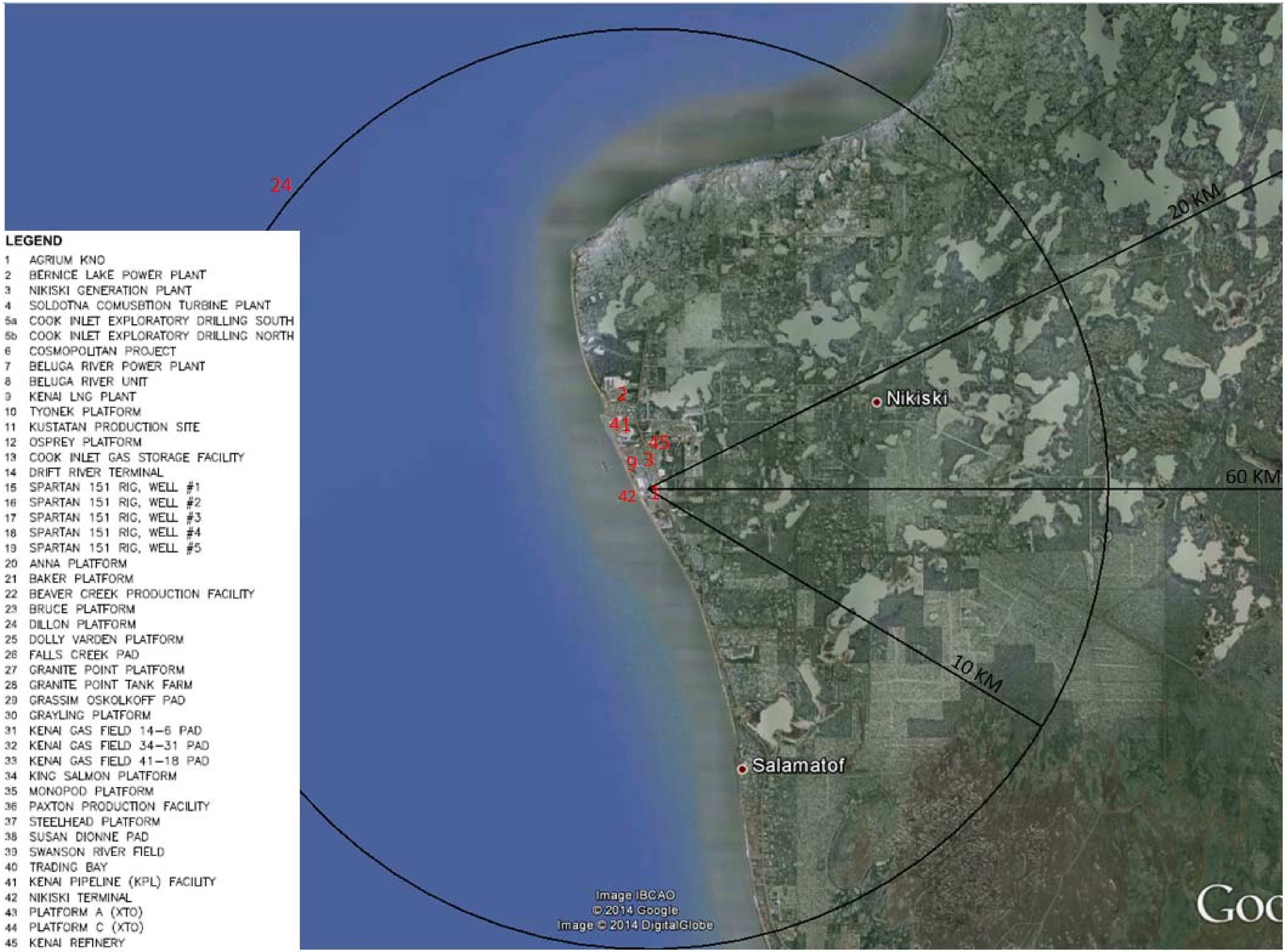
LEGEND
1 AGRIUM KNO
2 BERNICE LAKE POWER PLANT
3 NIKISKI GENERATION PLANT
4 SOLDOTNA COMUSBTION TURBINE PLANT
5a COOK INLET EXPLORATORY DRILLING SOUTH
5b COOK INLET EXPLORATORY DRILLING NORTH
6 COSMOPOLITAN PROJECT
7 BELUGA RIVER POWER PLANT
8 BELUGA RIVER UNIT
9 KENAI LNG PLANT
10 TYONEK PLATFORM
11 KUSTATAN PRODUCTION SITE
12 OSPREY PLATFORM
13 COOK INLET GAS STORAGE FACILITY
14 DRIFT RIVER TERMINAL
15 SPARTAN 151 RIG, WELL #1
16 SPARTAN 151 RIG, WELL #2
17 SPARTAN 151 RIG, WELL #3
18 SPARTAN 151 RIG, WELL #4
19 SPARTAN 151 RIG, WELL #5
20 ANNA PLATFORM
21 BAKER PLATFORM
22 BEAVER CREEK PRODUCTION FACILITY
23 BRUCE PLATFORM
24 DILLON PLATFORM
25 DOLLY VARDEN PLATFORM
26 FALLS CREEK PAD
27 GRANITE POINT PLATFORM
28 GRANITE POINT TANK FARM
29 GRASSIM OSKOLKOFF PAD
30 GRAYLING PLATFORM
31 KENAI GAS FIELD 14-6 PAD
32 KENAI GAS FIELD 34-31 PAD
33 KENAI GAS FIELD 41-18 PAD
34 KING SALMON PLATFORM
35 MONOPOD PLATFORM
36 PAXTON PRODUCTION FACILITY
37 STEELHEAD PLATFORM
38 SUSAN DIONNE PAD
39 SWANSON RIVER FIELD
40 TRADING BAY
41 KENAI PIPELINE (KPL) FACILITY
42 NIKISKI TERMINAL
43 PLATFORM A (XTO)
44 PLATFORM C (XTO)
45 KENAI REFINERY
24
20 KM
60 KM
10 KM
2
41
45
9
3
42
1
Nikiski
Salamatof
Image IBCAO
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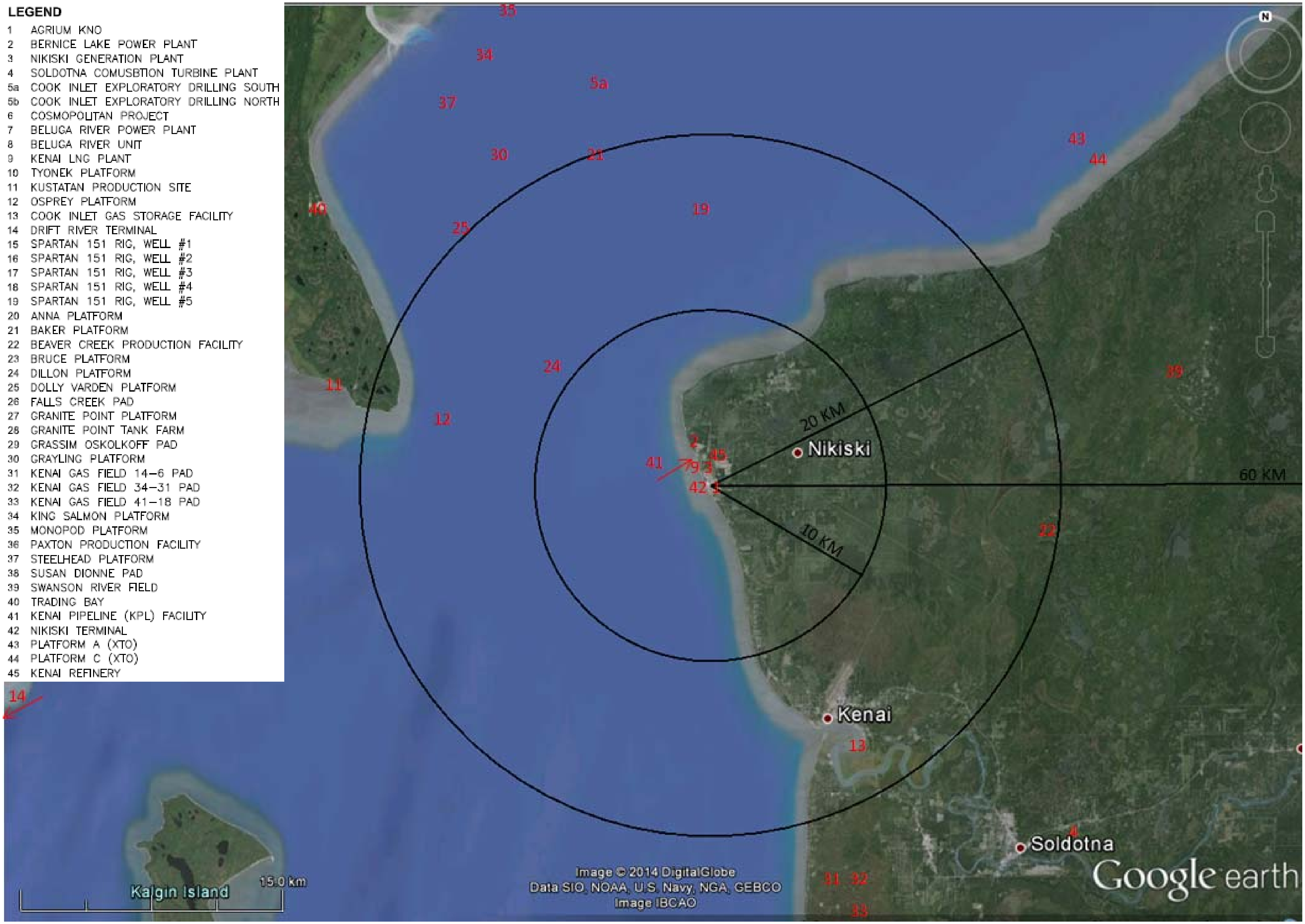
Image © 2014 DigitalGlobe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20 KM
10 KM
60 KM
Nikiski
Kenai
Soldotna
Kalgin Island
15.0 km
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