Cc: Byron, Joseph <Byron.Joseph@epa.gov>
Subject: FW: Application for New Construction (air permit) submittal

We received the MHA Greenhouse project permit application, so it needs to be processed and assigned a permit engineer.

Thanks,

Claudia

Claudia Young Smith | Environmental Scientist
(she/her/hers)
Air Permitting and Monitoring Branch
Air and Radiation Division, U.S. EPA Region 8
Tel: (303) 312-6520 | Email: mailto:smith.claudia@epa.gov
Web: http://www.epa.gov/caa-permitting/caa-permitting-epas-mountains-and-plains-region
Mail: 1595 Wynkoop Street, Mail Code 8ARD-PM, Denver, Colorado 80202

****

From: Nick Kuzmyak <nick.kuzmyak@bartwest.com>
Sent: Friday, April 9, 2021 3:22 PM
To: R8AirPermitting <R8AirPermitting@epa.gov>
Cc: Smith, Claudia <Smith.Claudia@epa.gov>
Subject: Application for New Construction (air permit) submittal

To whom it may concern,
Please see attached: a completed application plus supporting documentation for a permit for Proposed Construction of a New Source. This application is pursuant to 40 CFR 49.151 for construction of a greenhouse facility on the Fort Berthold Indian Reservation in Mountrail County, North Dakota. I've also included the inputs and outputs of the screening-level modeling performed as part of the AQIA.

The application and documentation should be complete according to our understanding of the instructions, but please let me know if anything is clearly missing of if there are any questions on the information submitted.

Thanks,

Nick Kuzmyak, P.E. | Senior Project Engineer | nick.kuzmyak@bartwest.com
Direct: (785) 330-7046 | Cell: (785) 304-1483

Bartlett & West

This e-mail and any files transmitted with it are confidential and intended solely for the use of the addressee. If you receive this transmission in error, please notify the sender and delete this e-mail. No employee or agent is authorized to conclude any binding agreement on behalf of Bartlett & West, Inc. with another party by e-mail.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
FEDERAL MINOR NEW SOURCE REVIEW PROGRAM IN INDIAN COUNTRY
40 CFR 49.151

Application for New Construction

(Form NEW)

Please check all that apply to show how you are using this form:

- ☑ **Proposed Construction of a New Source**
- ☐ **Proposed Construction of New Equipment at an Existing Source**
- ☐ **Proposed Modification of an Existing Source**
- ☐ **Other – Please Explain**

Use of this information request form is voluntary and not approved by the Office of Management and Budget. The following is a check list of the type of information that Region 8 will use to process information on your proposed project. While submittal of this form is not required, it does offer details on the information we will use to complete your requested approval and providing the information requested may help expedite the process. An application form approved by the Office of Management and Budget can be found online at https://www.epa.gov/sites/production/files/2015-12/documents/new_source_general_application_rev2017.pdf.

Please submit information to following two entities:

Federal Minor NSR Permit Coordinator
Air and Radiation Division
U.S. EPA, Region 8
1595 Wynkoop Street, 8ARD-PM
Denver, CO 80202-1129
R8airpermitting@epa.gov

The Tribal Environmental Contact for the specific reservation:

If you need assistance in identifying the appropriate Tribal Environmental Contact and address, please contact:
R8airpermitting@epa.gov

For more information, visit: http://www.epa.gov/caa-permitting/tribal-nsr-permitting-region-8

A. GENERAL SOURCE INFORMATION

1. (a) **Company Name** (Who owns this facility?) The Three Affiliated Tribes of North Dakota (b) **Operator Name** (Is the company that operates this facility different than the company that owns this facility? What is the name of the company?)	2. **Facility Name** Native Green Grow (NG2) Operated by Three Affiliated Tribes
3. Type of Operation Greenhouse agriculture	4. Portable Source? ☐ Yes ☑ No 5. Temporary Source? ☐ Yes ☑ No
6. NAICS Code 1114	7. SIC Code 0182
8. Physical Address (Or, home base for portable sources) None yet; facility has not yet been constructed	

9. Reservation* Fort Berthold Indian Reservation	10. County* Mountrail	11a. Latitude (decimal format)* 47.979877	11b. Longitude (decimal format)* -102.134883
12a. Quarter Quarter Section* Southwest	12b. Section* 13	12c. Township* 152N	12d. Range* 90W

*Provide all proposed locations of operation for portable sources

B. PREVIOUS PERMIT ACTIONS (Provide information in this format for each permit that has been issued to this source. Provide as an attachment if additional space is necessary)

Facility Name on the Permit
Permit Number (xx-xxx-xxxxx-xxxx.xx)
Date of the Permit Action

Facility Name on the Permit
Permit Number (xx-xxx-xxxxx-xxxx.xx)
Date of the Permit Action

Facility Name on the Permit
Permit Number (xx-xxx-xxxxx-xxxx.xx)
Date of the Permit Action

Facility Name on the Permit
Permit Number (xx-xxx-xxxxx-xxxx.xx)
Date of the Permit Action

Facility Name on the Permit
Permit Number (xx-xxx-xxxxx-xxxx.xx)
Date of the Permit Action

C. CONTACT INFORMATION

Company Contact (Who is the <u>primary</u> contact for the company that owns this facility?) Cynthia Monteau	Title Tax Director
Mailing Address 404 Frontage Road, New Town, ND 58763	
Email Address Cynthia.monteau@tax-mhanation.com	
Telephone Number 781-627-6132	Facsimile Number
Operator Contact (Is the company that operates this facility different than the company that owns this facility? Who is the <u>primary</u> contact for the company that operates this facility?)	Title Operator will be same as owner. No contact yet.
Mailing Address	
Email Address	
Telephone Number	Facsimile Number
Permitting Contact (Who is the person <u>primarily</u> responsible for Clean Air Act permitting for the company? We are seeking one main contact for the company. Please do not list consultants.) Cynthia Monteau	Title Tax Director
Mailing Address 404 Frontage Road, New Town, ND 58763	
Email Address Cynthia.monteau@tax-mhanation.com	
Telephone Number 781-627-6132	Facsimile Number
Compliance Contact (Is the person responsible for Clean Air Act compliance for this company different than the person responsible for Clean Air Act permitting? Who is the person <u>primarily</u> responsible for Clean Air Act compliance for the company? We are seeking one main contact for the company. Please do not list consultants.)	Title Same contact as for permitting.
Mailing Address	
Email Address	
Telephone Number	Facsimile Number

D. ATTACHMENTS

Include all of the following information (see the attached instructions)

*Please do not send Part 71 Operating Permit Application Forms in lieu of the check list below.

☐ **FORM SYNMIN -** New Source Review Synthetic Minor Limit Request Form, if synthetic minor limits are being requested.

☑ Narrative description of the proposed production processes. This description should follow the flow of the process flow diagram to be submitted with this application.

☑ Process flow chart identifying all proposed processing, combustion, handling, storage, and emission control equipment.

☑ A list and descriptions of all proposed emission units and air pollution-generating activities.

☑ Type and quantity of fuels, including sulfur content of fuels, proposed to be used on a daily, annual and maximum hourly basis.

☑ Type and quantity of raw materials used or final product produced proposed to be used on a daily, annual and maximum hourly basis.

☑ Proposed operating schedule, including number of hours per day, number of days per week and number of weeks per year.

☑ A list and description of all proposed emission controls, control efficiencies, emission limits, and monitoring for each emission unit and air pollution generating activity.

☑ **Criteria Pollutant Emissions -** Estimates of Current Actual Emissions, Current Allowable Emissions, Post-Change Uncontrolled Emissions, and Post-Change Allowable Emissions for the following air pollutants: particulate matter, PM_{10}, $PM_{2.5}$, sulfur oxides (SOx), nitrogen oxides (NOx), carbon monoxide (CO), volatile organic compound (VOC), lead (Pb) and lead compounds, fluorides (gaseous and particulate), sulfuric acid mist (H_2SO_4), hydrogen sulfide (H_2S), total reduced sulfur (TRS) and reduced sulfur compounds, including all calculations for the estimates.

These estimates are to be made for each emission unit, emission generating activity, and the project/source in total. Note, there are no insignificant emission units or activities in this permitting program, only exempted units and activities. Please see the regulation for a list of exempted units and activities.

☑ **Air Quality Review**

☑ **ESA (Endangered Species Act)**

☑ **NHPA (National Historic Preservation Act)**

E. TABLE OF ESTIMATED EMISSIONS

The following tables provide the total emissions in tons/year for all pollutants from the calculations required in Section D of this form, as appropriate for the use specified at the top of the form.

E(i) – Proposed New Source

Pollutant	Potential Emissions (tpy)	Proposed Allowable Emissions (tpy)	
PM	(see specific PM pollutants)	(see specific PM pollutants)	PM - Particulate Matter PM_{10} - Particulate Matter less than 10 microns in size $PM_{2.5}$ - Particulate Matter less than 2.5 microns in size SO_2 - Sulfur Dioxide NOx - Nitrogen Oxides CO - Carbon Monoxide VOC - Volatile Organic Compound Pb - Lead and lead compounds Fluorides - Gaseous and particulates H_2SO_4 - Sulfuric Acid Mist H_2S - Hydrogen Sulfide TRS - Total Reduced Sulfur RSC - Reduced Sulfur Compounds
PM_{10}	4.63	4.52	
$PM_{2.5}$	4.13	4.01	
SO_2	1.73	0.68	
NO_x	25.4	20.64	
CO	23.7	24.58	
VOC	31.5	31.5	
Pb	N/A	N/A	
Fluorides	N/A	N/A	
H_2SO_4	N/A	N/A	
H_2S	N/A	N/A	
TRS	N/A	N/A	
RSC	N/A	N/A	

Emissions calculations must include fugitive emissions if the source is one the following listed sources, pursuant to CAA Section 302(j):

(a) Coal cleaning plants (with thermal dryers);
(b) Kraft pulp mills;
(c) Portland cement plants;
(d) Primary zinc smelters;
(e) Iron and steel mills;
(f) Primary aluminum ore reduction plants;
(g) Primary copper smelters;
(h) Municipal incinerators capable of charging more than 250 tons of refuse per day;
(i) Hydrofluoric, sulfuric, or nitric acid plants;
(j) Petroleum refineries;
(k) Lime plants;
(l) Phosphate rock processing plants;
(m) Coke oven batteries;
(n) Sulfur recovery plants;
(o) Carbon black plants (furnace process);
(p) Primary lead smelters;
(q) Fuel conversion plants;
(r) Sintering plants;
(s) Secondary metal production plants;
(t) Chemical process plants
(u) Fossil-fuel boilers (or combination thereof) totaling more than 250 million British thermal units per hour heat input;
(v) Petroleum storage and transfer units with a total storage capacity exceeding 300,000 barrels;
(w) Taconite ore processing plants;
(x) Glass fiber processing plants;
(y) Charcoal production plants;
(z) Fossil fuel-fired steam electric plants of more that 250 million British thermal units per hour heat input, and
(aa) Any other stationary source category which, as of August 7, 1980, is being regulated under section 111 or 112 of the Act.

E(ii) – Proposed New Construction at an Existing Source or Modification of an Existing Source

Pollutant	Current Actual Emissions (tpy)	Current Allowable Emissions (tpy)	Post-Change Potential Emissions (tpy)	Post-Change Allowable Emissions (tpy)
PM				
PM_{10}				
$PM_{2.5}$				
SO_2				
NO_x				
CO				
VOC				
Pb				
Fluorides				
H_2SO_4				
H_2S				
TRS				
RSC				

PM - Particulate Matter
PM_{10} - Particulate Matter less than 10 microns in size
$PM_{2.5}$ - Particulate Matter less than 2.5 microns in size
SO_2 – Sulfur Dioxide
NOx - Nitrogen Oxides
CO - Carbon Monoxide
VOC - Volatile Organic Compound
Pb - Lead and lead compounds
Fluorides - Gaseous and particulates
H_2SO_4 - Sulfuric Acid Mist
H_2S - Hydrogen Sulfide
TRS - Total Reduced Sulfur
RSC - Reduced Sulfur Compounds

[Disclaimers] The public reporting and recordkeeping burden for this collection of information is estimated to average 20 hours per response, unless a modeling analysis is required. If a modeling analysis is required, the public reporting and recordkeeping burden for this collection of information is estimated to average 60 hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

Instructions

(Please do not include a copy of these instructions in the application you submit to us.)

Use of This Form

- Proposed new construction or modifications should first be evaluated to determine if the change is major under the major NSR program using the procedures at 40 CFR 52.21 (i.e., baseline actual to projected actual applicability test). If the proposed construction does not qualify as a major under that test, then it may be subject to the requirements of the minor NSR rule at 40 CFR 49.151.

Helpful Definitions from the Federal Minor NSR Rule (40 CFR 49) – This is not a comprehensive list.

- *40 CFR 49.152(d) - Modification* means any physical or operational change at a source that would cause an increase in the allowable emissions of the affected emissions units for any regulated NSR pollutant or that would cause the emission of any regulated NSR pollutant not previously emitted.

  The following exemptions apply:

  (1) A physical or operational change does not include routine maintenance, repair, or replacement.

  (2) An increase in the hours of operation or in the production rate is not considered an operational change unless such increase is prohibited under any federally-enforceable permit condition or other permit condition that is enforceable as a practical matter.

  (3) A change in ownership at a source is not considered a modification.

- *40 CFR 49.152(d) - Allowable emissions* means ''allowable emissions'' as defined in §52.21(b)(16), except that the allowable emissions for any emissions unit are calculated considering any emission limitations that are enforceable as a practical matter on the emissions unit's potential to emit.

- *52.21(b)(16) - Allowable emissions* means the emissions rate of a stationary source calculated using the maximum rated capacity of the source (unless the source is subject to federally enforceable limits which restrict the operating rate, or hours of operation, or both) and the most stringent of the following:

  (i) The applicable standards as set forth in 40 CFR parts 60 and 61;

  (ii) The applicable State Implementation Plan emissions limitation, including those with a future compliance date; or

  (iii) The emissions rate specified as a federally enforceable permit condition, including those with a future compliance date.

A. General Facility Information

1. Company Name & Operator Name (if the operator of the facility is different than the owner, please provide this information): Provide the complete company and operator names. For corporations, include divisions or subsidiary names, if any.

2. Facility Name: Provide the facility name. Please note that a facility is a site, place, location, etc… that may contain one or more air pollution emitting units.

3. Type of Operation: Indicate the generally accepted name for the operation (i.e., asphalt plant, gas station, dry cleaner, sand & gravel mining, oil and gas wellsite, tank battery, etc.).

4. Portable Source: Will this facility operate in more than one location? Some examples of portable sources include asphalt batch plants and concrete batch plants.

5. Temporary Source: A temporary source, in general, would have emissions that are expected last less than 12 months before ceasing operations permanently.

6. NAICS Code: North American Industry Classification System. The NAICS Code for your facility can be found at the following link → North American Industry Classification System (http://www.census.gov/epcd/naics/nsic2ndx.htm#S1).

7. SIC Code: Standard Industrial Classification Code. Although the new North American Industry Classification System (NAICS) has replaced the SIC codes, much of the Clean Air Act permitting processes continue to use these codes. The SIC Code for your facility can be found at the following link → Standard Industrial Classification Code (http://www.osha.gov/pls/imis/sic_manual.html).

8. Physical Address: Provide the actual address of where you are proposing to construct the new facility, not the mailing address. Include the State and the ZIP Code.

9. Reservation: Provide the name of the Indian reservation within which the facility will be constructed.

10. County: Provide the County within which the source will be constructed.

11a & 11b. Latitude & Longitude: These are GPS (global positioning system) coordinates. Decimal format is preferred.

12a – 12d. Section-Township-Range: Please provide these coordinates in 1/4 Section/Section/Township/Range. (e.g., SW ¼, NE ¼ S36/T10N/R21E).

B. Current Permit Information

Provide a list of all air quality permits that have been issued for this facility. This should include any Federal Minor New Source Review (MNSR), Prevention of Significant Deterioration (PSD) or Non-Attainment New Source Review (NA NSR) permits, in addition to the most recent Part 71 permit. The permit number must be included with each permit identified.

C. Contact Information

Please provide the information, requested, in full.

1. Company Contact: Provide the full name of the primary contact for the company that owns the facility.

2. Operator Contact: Provide the name of the primary contact for the company that operates the facility if the company operating the facility is different from the company that owns the facility.

3. Permitting Contact: Provide the name of primary contact, for permitting decisions, at the company that owns the facility or the company that operates the facility.

4. Compliance Contact: Provide the name of primary contact, responsible for compliance of the facility, at the company that owns the facility or the company that operates the facility. If this is the same as the Permitting Contact please note this on the form.

D. Attachments

This section lists the information needed to complete the requested approval. This information should be accompanied by the supporting information listed on the form and described below. The information should be presented in enough detail to document how the facility is currently operating and/or how it is proposed to be operated.

☐ **FORM SYNMIN**

If synthetic minor limits are being requested, a synthetic Minor Limit Application should be included with this application.

☑ Narrative description of the proposed production processes.

1. The narrative description should follow the flow of the process flow diagram to be submitted with this application. This needs to be as comprehensive as possible to help in understanding the proposed facility and how it will be operated. For example:

What are the raw materials?
What are the properties of the raw materials?
Does the production process include heating, drying, the application of chemicals, etc?
How will the raw materials be affected by this process?
What are the out puts from each step of the process (i.e., crushed ore, dry gas, water, etc…)?
Etc….

2. The proposed operating schedule presented in terms of hours per day, days per week, and weeks per year.
3. A list of the type and quantity of fuels and/or raw materials used. Each fuel and raw material should be described in enough detail to indicate its basic chemical components.

☑ A process flow chart identifying all proposed processing, combustion, handling, storage, and emission control equipment. This flow chart should illustrate the detailed narrative description requested above.

☑ List and describe all proposed units, emission units and air pollution-generating activities. At a minimum, provide the following:

1. The hourly, daily and annual maximum operating rates for each operating unit, production process, and activity.
2. The hourly, daily and annual maximum firing rates for each fuel and combustion equipment.
3. The capacity for storage units and the hourly, daily and annual maximum throughput of material in the storage units.
4. Material and product handling equipment and the hourly, daily and annual maximum throughput of material and product.

5. Tank designs, tank storage capacities, hourly, daily and annual maximum throughput of material and product.

☑ Type and quantity of fuels, including sulfur content of fuels, proposed to be used on a daily, annual and maximum hourly basis.

☑ Type and quantity of raw materials used or final product produced proposed to be used on a daily, annual and maximum hourly basis.

☑ Proposed operating schedule, including number of hours per day, number of days per week and number of weeks per year.

☑ A list and description of all proposed emission controls, control efficiencies, emission limits, and monitoring for each emission unit and air pollution generating activity.

1. Include manufacturer specifications and guarantees for each control device.

Criteria Pollutant Emissions Estimates

☑ Estimates of Current Actual Emissions, Current Allowable Emissions, Post-Change Uncontrolled Emissions, and Post-Change Allowable Emissions for the following air pollutants: particulate matter, PM_{10}, $PM_{2.5}$, sulfur oxides (SO_2), nitrogen oxides (NOx), carbon monoxide (CO), volatile organic compound (VOC), lead (Pb) and lead compounds, ammonia (NH_3), fluorides (gaseous and particulate), sulfuric acid mist (H_2SO_4), hydrogen sulfide (H_2S), total reduced sulfur (TRS) and reduced sulfur compounds, including all calculations for the estimates.

1. These estimates are to be made for each emission unit, emission generating activity, in addition to total emissions.

2. The information should include all of the supporting calculations, assumptions and references. Emission estimates must address all emission units and pollutants proposed and/or affected by the limitation and be presented in short term (e.g. pounds per hour) as well as annual (tons per year) units.

3. Any emission estimates submitted to the Regional Administrator must be verifiable using currently accepted engineering criteria. The following procedures are generally acceptable for estimating emissions from air pollution sources:

   - Unit-specific emission tests;
   - Mass balance calculations;
   - Published, verifiable emission factors that are applicable to the unit. (i.e. manufacturer specifications)
   - Other engineering calculations; or
   - Other procedures to estimate emissions specifically approved by the Regional Administrator.

4. Guidance for estimating emissions can be found at http://www.epa.gov/ttn/chief/efpac/index.html.

<u>Current Actual Emissions</u>: Current actual emissions for a pollutant is expressed in tpy and generally is calculated by multiplying the actual hourly emissions rate in pounds per hour (lbs/hr) times actual hours operated (which is the number of hours in a year) and dividing by 2,000 (which is the number of pounds in a ton).

1. For an **existing air pollution source (permitted and unpermitted)** that operated prior to the application submittal, the current actual emissions are the actual rate of emissions for the preceding calendar year and must be calculated using the actual operating hours, production rates, in-place control equipment, and types of materials processed, stored, or combusted during the preceding calendar year. The emission estimates must be based upon actual test data or, in the absence of such data, upon procedures acceptable to the Regional Administrator.

<u>Current Allowable Emissions</u>: Current allowable emissions for a pollutant is expressed in tpy and generally is calculated by multiplying the allowed hourly emissions rate in pounds per hour (lbs/hr) times allowed hours (which is the number of hours in a year) and dividing by 2,000 (which is the number of pounds in a ton).

1. "Allowed" means the source is restricted by permit conditions that limit its emissions and are enforceable as a practical matter (i.e., allowable emissions). The allowable emissions for any emissions unit are calculated considering any emissions limitations that are enforceable as a practical matter on the unit's PTE.

2. For an **existing permitted air pollution source** that operated prior to the application submittal, the current allowable emissions are the allowable rate of emissions for the preceding calendar year and must be calculated using the permitted operating hours, production rates, in-place control equipment, and types of materials processed, stored, or combusted during the preceding calendar year.

3. For an **existing air pollution source** that does not have an established allowable emissions level prior to the modification must report the pre-change uncontrolled emissions.

<u>Post-Change Potential Emissions (Potential uncontrolled emissions from proposed project):</u> This is the maximum capacity of a source to emit a pollutant under its physical and operational design. This is expressed in tpy and generally is calculated by multiplying the maximum hourly emissions rate in pounds per hour (lbs/hr) times 8,760 hours (which is the number of hours in a year) and dividing by 2,000 (which is the number of pounds in a ton).

<u>Post-Change Allowable Emissions</u>: A source's allowable emissions for a pollutant is expressed in tpy and generally is calculated by multiplying the allowed hourly emissions rate in pounds per hour (lbs/hr) times allowed hours (which is the number of hours in a year) and dividing by 2,000 (which is the number of pounds in a ton).

1. Unless the source is restricted by permit conditions or other requirements that are enforceable as a practical matter, the post-change allowable emissions would be equivalent to post-change uncontrolled emissions. For the post-change allowable emissions a lower level of allowable emissions may be proposed.

2. For physical or operational changes at minor sources and for minor physical or operational changes at major sources, the total increase in allowable emissions resulting from your proposed change would be the sum of following:

   - For each new emissions unit that is to be added, the emissions increase would be the potential to emit of each unit.
   - For each emissions unit with an allowable emissions limit that is to be changed or replaced, the emissions increase would be the allowable emissions of the emissions unit after the change or replacement minus the allowable emissions prior to the change or replacement. However,

this may not be a negative value. If the allowable emissions of an emissions unit would be reduced as a result of the change or replacement, use zero in the calculation.

- For each unpermitted emissions unit (i.e., a unit without any emissions limitations before the change) that is to be changed or replaced, the emissions increase would be the allowable emissions of the unit after the change or replacement minus the potential to emit prior to the change or replacement. However, this may not be a negative value. If the allowable emissions of an emissions unit would be reduced as a result of the change or replacement, use zero in the calculation.

☑ **Air Quality Review**

Qualitative Air Quality Assessment

Provide at least a narrative description of the current air quality conditions and the expected impact the permitted source would have on that air quality. Factors to include in the qualitative discussion are meteorology, terrain, elevation, distance to ambient air, expected emissions, stack heights, etc.

Your reviewing authority may require you to provide additional information used to determine impacts that may result from your new source or modification. You may be required to conduct and submit an Air Quality Impact Analysis (AQIA) using dispersion modeling in accordance with 40 CFR part 51, Appendix W, if there is reason to be concerned that new construction would cause or contribute to a National Ambient Air Quality Standard (NAAQS) or Prevention of Significant Deterioration (PSD) increment violation.

In addition, if the AQIA reveals that the new construction could cause or contribute to a NAAQS or PSD increment violation, the reviewing authority must require you to reduce or mitigate such impacts before a pre-construction permit can be issued.

Do I need to do a modeling analysis?

To facilitate the protection of the NAAQS and PSD Increment, EPA requests that those proposed activities that meet the following criteria perform an AQIA:

1. The proposed activity has air emissions that the Reviewing Authority determines has the potential to cause adverse air quality effects for which an air quality impact analysis is necessary for an accurate assessment of the environmental impact of the activities proposed.

2. Modeling of proposed emissions is usually warranted, even though the proposed activity does not meet the modeling requirements, above, if it is reasonable to believe the new activity may cause or contribute to a violation of applicable ambient air quality standards or increments in circumstances such as:

(a) A substantial portion of the new or modified emissions have poor dispersion characteristics (e.g., rain caps, horizontal stacks, fugitive releases, or building downwash) in close proximity to ambient air at the site boundary;

(b) The new or modified emissions are located in complex terrain (e.g., terrain above stack height in close proximity to the source); or

(c) The new or modified emissions are located in areas with existing air quality concerns.

(d) If you have questions about whether modeling may be necessary based on the 3rd criteria above, please contact the Reviewing Authority:

Claudia Smith
Federal Minor NSR Permit Coordinator
U.S. EPA, Region 8
1595 Wynkoop Street, 8P-AR
Denver, CO 80202-1129
(303) 312-6520
smith.claudia@epa.gov

What kind of Air Quality Modeling Analysis is Needed?

1. EPA considers a stepped or phased approach to modeling to be appropriate, as follows:

Step 1: Screening Analysis
Step 2: Preliminary Modeling Analysis (refined modeling)
Step 3: Full Impact Modeling Analysis (refined modeling)
Step 4: PSD Increment and NAAQS Analysis
Step 5: Additional Impact Analysis

2. Step 1: Screening Analysis

For proposed new or modified sources that meet the modeling requirement criteria identified above, protection of air quality from proposed emissions may be shown by using a simple screening technique (e.g., AERSCREEN). Screening models are available for download at the EPA SCRAM website: https://www.epa.gov/scram/air-quality-dispersion-modeling-screening-models. A pre-approved modeling protocol is not necessary prior to conducting a Screening Analysis.

3. If the proposed new or modified emission increases do not increase ambient concentrations of a pollutant by more than the significant impact levels, as compared to the SILs identified below, no further modeling is necessary.

Significant Impact Levels

Pollutant	Averaging Period	Class II Area SIL (ug/m^3)	Class I Area SIL (ug/m^3)
SO_2	1 hr	3 ppb or 7.8 ug/m^3 (interim)	----
	3 hr	25	1.0
	24 hr	5	0.2
	Annual	1	0.08
O_3	8-hour	1.0 ppb	1.0 ppb
$PM_{2.5}$	24 hr	1.2	1.2
	Annual	0.2	0.2
PM_{10}	24 hr	5	0.2
	Annual	1	0.08
NO_2	1 hr	4 ppb or 7.5 ug/m^3 (interim)	----
	Annual	1	0.08
CO	1 hr	2,000 ppb	
	8 hr	500 ppb	

Note: The Class I area SILs are provided as guidance and have not been formalized by EPA.

4. Sources that cannot demonstrate protection of air quality using a screening technique should continue to the modeling requirements in Step 2 through Step 5. Modeling in Steps 2 through 5 should be performed based on an approved protocol.

5. Applicants are encouraged to contact the reviewing authority prior to conducting any refined modeling analysis (Step 2 through Step 5) to obtain an approved protocol.

What Should I Include in My Application if Modeling is Necessary?

1. Approved Modeling Protocol

   In order to expedite the permitting process, it is recommended that you include a protocol that has already been approved. An application will not be deemed complete until the protocol has been approved.

2. Modeling Results

   In all cases, the modeling results should include the name of the model used, all input parameters, and the resulting output. Electronic copies of the modeling input/output files should be provided to the Reviewing Authority.

☑ **ESA**

The Endangered Species Act requires us, in consultation with the U.S. Fish and Wildlife Service and/or the NOAA Fisheries Service, to ensure that actions we authorize are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat of such species.

To expedite the approval of your proposed construction, we encourage you to identify any listed species that you may be readily aware of that could be affected by your proposal. The following website has been provided to assist you: http://www.fws.gov/endangered/

Simply enter the State and County in which you propose to construct to obtain a general listing.

☑ **NHPA**

The National Historic Preservation Act requires us, in consultation with State and/or Tribal Historic Preservation Officers to ensure that actions we authorize are not likely to affect cultural resources.

To expedite the approval of your proposed construction, we encourage you to identify any cultural resources that you may be readily aware of that could be affected by your proposal. The following website has been provided to assist you: https://www.nps.gov/subjects/nationalregister/database-research.htm

Simply enter the State and County in which you propose to construct to obtain a general listing.

Form NEW Attachments

The following documentation is provided as supporting information per section D. Attachments, listed in Form NEW.

Narrative Description of Process

Process Flow

The project being permitted (NG2) will be a greenhouse agriculture facility, with 3.35 acres of climate-controlled growing space for various fruits and vegetables. Power will be provided by grid electricity and two combined heat and power (CHP) engines, only one of which will be built during the first construction phase. Heat will be provided by the CHP engines, as well as one electric boiler and two gas-fired boilers for backup. For safety and emergency considerations, a diesel-powered fire pump and standby generator will be situated on site, though they do not otherwise fit into the process of heating and powering the greenhouse.

There are no "raw materials" as such, since the greenhouse is not necessarily a manufacturing facility. The only means of producing emissions on site is through combustion of fossil fuels, namely utility-grade natural gas and No. 2 diesel fuel. Generated heat is used to keep the greenhouses at an appropriate temperature for plant growth during colder months, and electricity is used at the facility for lighting and equipment operation. Excess electricity, expected over summer operation, will be sold back to the utility grid.

Refer to the attached process flow diagram (PFD) for the following process narrative:

- For natural gas-powered equipment:
    - Natural gas will be delivered to the NG2 site either by gathering pipelines or compressed gas tube trailers. The gas will either go directly to the CHPs and boilers (if from the pipeline) or to a set of 84 gas storage vessels (147 at full buildout, Phase 3). Gas from the storage system goes through a pressure reduction system to then feed the boilers or CHP engines.
    - Boilers
        - Gas combusted in the two backup boilers will heat water in a heating loop. Hot water (190°F) is then sent to a hot water storage tank or the greenhouse heating system based on the required thermal input.
        - Water is returned to the hot water storage tank or heating loop at 140-185°F, with a side loop to the ancillary buildings that can be bypassed.
    - CHP engines
        - Gas combusted in each CHP engine – only one of which will be built in Phase 1 – powers its associated generator to produce 2,000 kWe of electricity for use in powering and lighting the NG2 facility.
        - Heat from both the high-temperature engine jacket water and exhaust gas is captured via heat exchangers and used to power the same heating loop that the boilers are connected to. This hot water, also at 190°F, can be sent to the greenhouse or hot water storage tank, depending on the required thermal input.
        - As with the boilers, cooler water is sent back to the loop or storage tank at 140-185°F, with a side loop to the ancillary buildings that can be bypassed.

        - When the greenhouse does not need to be heated, the CHP engine will instead send heat to a waste heat radiator rated at 7.6 MMBtu/hr.
        - The CHP has a low-temperature engine jacket as well, but since there is no use for low-grade heat at the NG2 facility, this will be sent to a dedicated radiator rated at 0.43 MMBtu/hr.
        - Exhaust from the CHP engine – produced at 734°F – is sent through a silencer and exhaust gas catalyst system, then a heat exchanger to recover more thermal energy. An additional condenser cools the gas down to 120°F.
        - Once the exhaust has been cooled and a majority of pollutants are removed, it is safe to send to the greenhouse where it will provide CO_2 to enhance plant growth. An exhaust stack vents the majority of the stream to the atmosphere, while a CO_2 supply valve and blower direct an appropriate amount of gas to the greenhouses, likely just under 13,000 cubic feet per minute at 6% CO_2.
        - The second CHP engine, not slated for construction until Phase 3 (likely 2023) will operate in the same way as the initial engine.
    - Diesel-powered equipment
        - The fire pump and standby generator are not shown on the PFD because they do not contribute to the overall greenhouse operation process.
        - The diesel fire pump will only be used in a fire emergency to pressurize stored water and send it to sprinklers in the ancillary buildings.
        - The standby generator is only intended to be used when the natural gas and power grids are down *and* the CHP engine is out of service. Then, it will be used to power the electric boiler (shown on the PFD) while gas from onsite storage will be used for the natural gas boilers to keep the greenhouse warm.

Proposed Operating Schedule

The NG2 greenhouse facility is expected to require heating and power 24 hours a day, 365 days a year. Heat is required to keep growing plants in optimal conditions while also protecting the structure from extreme temperatures. Electric power is required to generate heat (in the case of the electric boiler) and power the lights, as well as ancillary electrical equipment like pumps. Actual growing operations are proposed to take place during normal work hours during weekdays, with occasional overtime or night-shift staffing depending on what stage of the growing cycle the crops are in.

As for emitting equipment, they will be run as follows:

- Combined heat and power engines: 50% of hours each day, alternating with the electric boiler. The electric boiler will run while Western Area Power Authority (WAPA) power rates are greatly reduced, and the CHP will run the rest of the time.
- Boilers: these are only expected to be run for a maximum of 1,000 hours during the coldest temperatures of the year, likely at night in January. Boilers are meant only as supplementary backup heat to the CHP system.
- Fire pump: No planned hours of operation, since this is emergency equipment.
- Standby generator: Same as for the fire pump.

Fuel and Raw Materials Usage

Fuel and material usage are presented separately in their respective sections, but are repeated here for completeness:

Fuel usage

The natural gas-fired equipment (CHPs and boilers) will require utility-grade natural gas, which will be delivered by gathering pipeline and compressed gas tube trailers. Composition is not yet confirmed, but is expected to contain negligible sulfur (<100 ppm H_2S), no natural gas liquids, and minimal components other than methane, with a higher heating value (HHV) of 1,020 Btu/scf. Based on the maximum consumption rate of the two CHPs and two gas-fired boilers at full load, operating all year at 95% up time, a total of 147,864 million cubic feet (MMCF) of natural gas may be used at the NG2 facility per year, averaging at 405 MMCF per day. The actual volume will be significantly lower since the CHPs are only expected to run 50% of the time, and the boilers are only meant as backup during extreme cold.

The diesel equipment will run on No. 2 diesel, with a conservatively estimated sulfur content of 4000 ppm. The actual sulfur content may be less, but this upper bound was used for calculating potential to emit. Based on the operating limits being requested for the fire pump and standby generator, a maximum of 27,150 gallons per year will be consumed, or an average of 74 gallons per day. Neither rates represent the likely real-world throughput, since both are emergency equipment that are likely to not be used in a given year.

Material usage

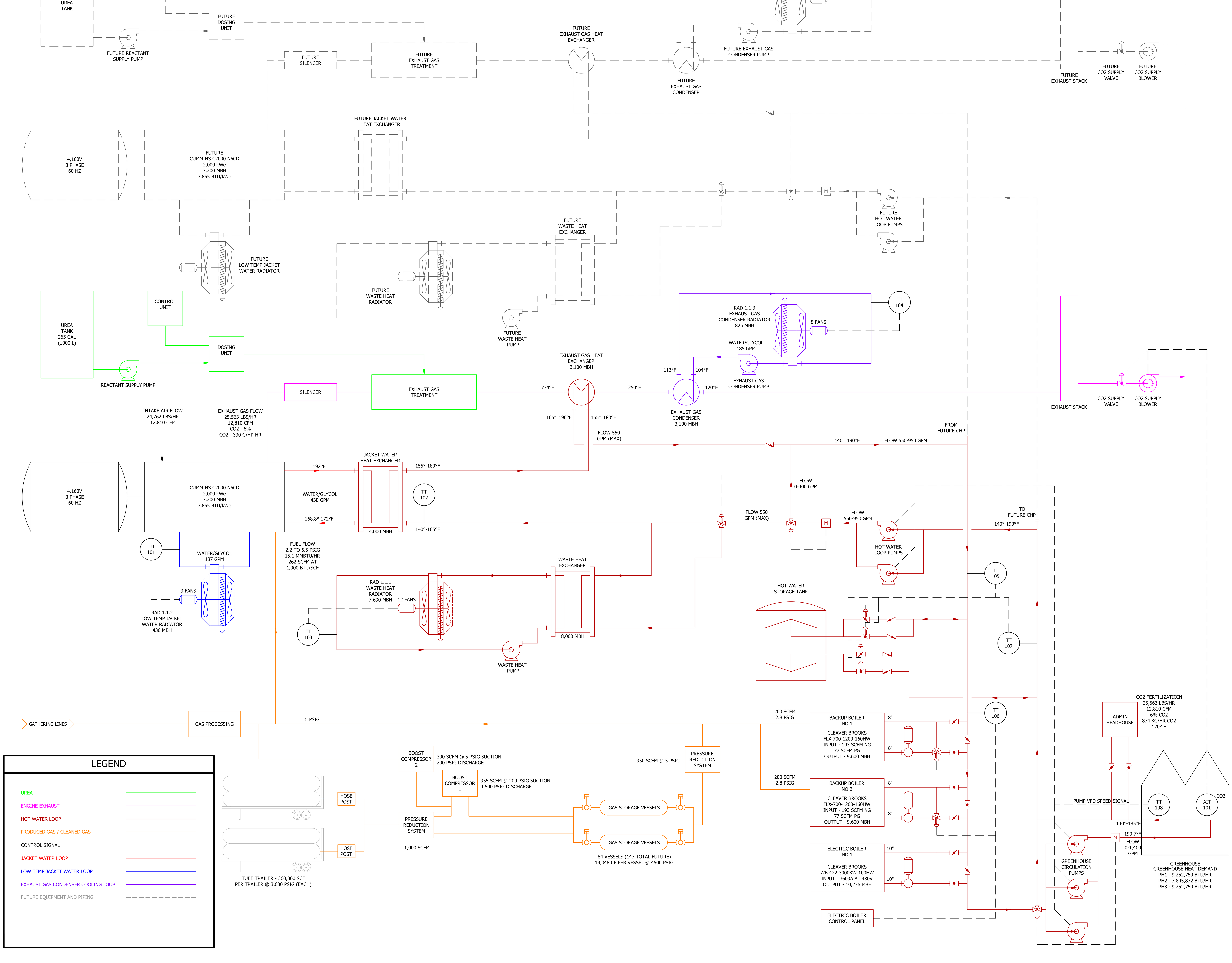
Other than fuel, the only other materials involved in the heating and power processes of the NG2 project are makeup water for the heating loop and exhaust catalyst. The catalyst system (COdiNOx) requires urea for pollution control. The urea is stored in a 265-gallon tank, and the expected usage will be up to 175,200 liters per year, 480 liters per day, and 20 liters per hour per CHP engine.

The greenhouse growing operation will require input materials such as growing medium and fertilizer, and will produce edible produce and plant waste as outputs, but none of these are relevant to the emissions producing equipment of the facility.

Process Flow Diagram

See attached process flow diagram (PFD). Note that the fire pump and standby generator are not included in the PFD because they are not part of the greenhouse heating loop.

MHA NATION
GAS CAPTURE GREENHOUSE - NG2
PROCESS FLOW DIAGRAM



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THREE AFFILIATED TRIBES OF NORTH DAKOTA

BID PACKAGE 3
-

JANUARY 2021

Project:

MHA NATION
GAS CAPTURE GREENHOUSE
NATIVE GREEN GROW NG2

Parshall, ND

Certification:

Revisions:

No.	Date	Description

Sheet Title:

PROCESS FLOW DIAGRAM

Sheet Number:

DHP-1.01

Proposed Emission Units

The NG2 greenhouse will be powered by both grid electricity and site-generated electricity from two CHP engines at full build-out. Heat will also be provided by the CHP engines, as well as two natural gas-fired boilers and an electric boiler. In addition to heat and power generating equipment, emissions are also expected from a fire pump and standby generator.

CHP Engines

The two natural gas-powered CHP engines will be installed in phases, with only one being installed during initial buildout. The second will not be installed until Phase 3, which will begin in 2023 at the earliest. These systems will provide both electricity and heat (recovered from exhaust and the engine), as well as CO_2 from scrubbed exhaust gas that will be pumped to the greenhouse to enhance plant growth. All exhaust gas will pass through a multi-stage catalyst unit (COdiNOx). This means that the exhaust emissions will be much lower than if this catalytic system was not used. The exhaust catalytic system cannot be bypassed while the engine is running.

The first CHP engine that will be installed and operated is a Cummins model C2000 N6CD rated for 2000 kW of electric power and 7.2 million BTU per hour (MMBTU/hr) of heat. The second engine will likely be the same model, but will not be purchased until later (approximately 2023).

The engines will be run at full load approximately 50% of the year (4,380 hours per year), since the electric boiler will be used during times when Western Area Power Administration (WAPA) power rates are low. Of this run time, the engines are expected to have a 95% uptime, for a total annual operation of 4,161 hours per year. However, no operating limits are being requested for the CHP engines.

Boilers

Apart from the electric boiler, which does not produce exhaust, the physical plant will house two natural gas-fired boilers. These will serve as backup boilers during Phase 1, in the rare event that both the electric boiler and CHP system are out of service. In later phases, they will provide supplemental and backup heat to the additional greenhouse acreage. The natural gas will be provided through agreements with local oil & gas operators and will be trucked and/or piped to the site and stored in compressed gas cylinders until needed.

Both boilers are Cleaver Brooks model FLX-700-1200-160HW (460/3/60)-SPC/CFG, rated at 9,600 MMBTU/hr each. They are expected to be used less than 500 hours per year each, but no operating limits are being requested.

Fire Pump

To ensure fire safety at the NG2 facility, a diesel fire pump is specified for reliable and quick response during a fire emergency. Though a pump has not yet been selected, it is likely to be a Cummins model CFP5E-F40 or similar. This is a 123-hp engine that consumes 6.3 gallons of No. 2 diesel fuel per hour at maximum load. Since this pump is only needed during emergencies, it is expected to be used less than 50 hours per year, though a more conservative operating limit of 500 hours per year is being requested.

Standby Generator

In the rare event that grid electricity is unavailable and the CHP engines are down at the same time (or cannot receive natural gas), a standby generator will be supplied to ensure loss of power does not result in loss of crops. This unit has not yet been purchased, but will likely be a Cummins model DQCB or similar. This is a 680 kW unit that consumes 48 gallons of diesel per hour at full load. As with the fire pump, this should only be used in extreme scenarios, so its use is estimated at less than 100 hours per year. No operating limits are being requested since EPA policy assumes that emergency generators are run for 500 hours per year.

Fuel Storage Tanks

Natural gas will be delivered to the NG2 site via gathering pipeline or compressed gas tube trailers, then either sent directly to the CHPs and boilers or stored in a bank of 84 compressed gas vessels. At full buildout after Phase 3, this bank is expected to include 147 vessels. The maximum gas storage capacity will be 19,048 cubic feet per vessel, stored at 4500 psig. This equates to a total storage capacity of 1.6 million cubic feet (MMCF) at Phase 1, and 2.8 MMCF at Phase 3.

Throughput is unknown at this time, but will not be more than 147,864 MMCF per year, which is the total consumption of the two CHPs and two boilers under full load for 95% of the year. This is a very unlikely situation, but represents a conservative upper bound of throughput.

Fuel Usage

The natural gas-fired equipment (CHPs and boilers) will require utility-grade natural gas, which will be delivered by gathering pipeline and compressed gas tube trailers. Composition is not yet confirmed, but is expected to contain negligible sulfur (<100 ppm H_2S), no natural gas liquids, and minimal components other than methane, with a higher heating value (HHV) of 1,020 Btu/scf. Based on the maximum consumption rate of the two CHPs and two gas-fired boilers at full load, operating all year at 95% up time, a total of 147,864 million cubic feet (MMCF) of natural gas may be used at the NG2 facility per year, averaging at 405 MMCF per day. The actual volume will be significantly lower since the CHPs are only expected to run 50% of the time, and the boilers are only meant as backup during extreme cold.

The diesel equipment will run on No. 2 diesel, with a conservatively estimated sulfur content of 4000 ppm. The actual sulfur content may be less, but this upper bound was used for calculating potential to emit. Based on the operating limits being requested for the fire pump and standby generator, a maximum of 27,150 gallons per year will be consumed, or an average of 74 gallons per day. Neither rates represent the likely real-world throughput, since both are emergency equipment that are likely to not be used in a given year.

Materials Usage

Other than fuel, the only other materials involved in the heating and power processes of the NG2 project are makeup water for the heating loop and exhaust catalyst. The catalyst system (COdiNOx) requires urea for pollution control. The urea is stored in a 265-gallon tank, and the expected usage will be up to 175,200 liters per year, 480 liters per day, and 20 liters per hour per CHP engine.

The greenhouse growing operation will require input materials such as growing medium and fertilizer, and will produce edible produce and plant waste as outputs, but none of these are relevant to the emissions producing equipment of the facility.

Proposed Operating Schedule

The NG2 greenhouse facility will be staffed during typical business hours on weekdays, but the facility will be powered and/or heated at all times. Therefore, the equipment detailed in this permit application will run on the following schedules:

- CHP engines are planned to be operated only 50% of the year with an estimated 95% uptime. An electric boiler will be used to heat the greenhouse when electric rates are inexpensive due to pricing from the Western Area Power Administration (WAPA). However, no operating limits are being requested for the CHP engines, which will provide flexibility if the operating protocol needs to change.
- The natural gas-fired boilers are only planned on being used for less than 1,000 hours per year each. These are essentially backup boilers, and are only meant as supplemental heating in Phase 1 for when the CHP is in use during extreme cold temperatures. As with the CHP engines, no operating limits are being requested to allow for potential operational flexibility.
- The diesel fire pump is only meant for fire emergencies, and therefore is not meant to operate on any predictable schedule. Usage is conservatively estimated at 50 hours per year, but an operating limit of 500 hours per year is requested to allow for operational flexibility; for example, if fire training were to require the use of the pump.
- The standby generator is also only meant for use in emergencies; specifically, when the CHP is out of service and when the natural gas and the electricity grid are unavailable. Usage has been conservatively estimated at 100 hours per year, but an operating limit of 500 hours per year will be used per EPA policy on emergency generators.

Proposed Emission Controls, Limits, and Monitoring

Emissions control for the CHP engines will consist of a catalytic exhaust system (COdiNOx) specifically designed for use with greenhouses. Manufacturer-provided pollutant concentrations for post-catalyst exhaust indicate that concentrations of nitrogen oxides and carbon monoxide are greatly reduced to 5 and 50 parts per million (ppm), respectively. There is no data on post-catalyst concentrations of other criteria pollutants, but it can be assumed that VOCs, SO_2, and PM are greatly reduced since the exhaust will be sent to an active working environment. Manufacturer literature for the COdiNOx system is included later in this file.

Exhaust from the CHP engine passes through a series of beds and filters to remove pollutants: an oxidation catalyst, two selective catalytic reduction beds, a final double layer of oxidation catalyst, then a heat exchanger for thermal energy recovery. The exhaust is then conveyed to the greenhouse to enhance plant growth by increasing CO_2 concentrations to around 1000 ppm. The greenhouse must be safe for workers, so gas detectors in the catalyst system and around the greenhouse monitor for any potential hazards. The CHP system is hardwired such that, if the catalyst system is out of commission, the engine itself will shut down.

The rest of the emitting equipment will not have controls on emissions other than requested operating limits (fire pump) and stacks to direct exhaust upward.

Criteria Pollutant Emissions

The site on which the NG2 project will be constructed is currently under cultivation for conventional grain agriculture, and therefore does not have any fixed sources of emissions. All sources will be new, and are presented in the following tables based on the project's potential to emit (PTE; i.e., maximum possible emissions) and proposed allowable emissions, which factor in expected uptime and operating limits (500 hrs/yr for the fire pump).

Pollutant	PTE – lbs/hr	PTE – tons/yr	Emission Factor source[3]
Combined Heat and Power Engines (each)			
NO_x (post catalyst)	0.13	0.56	Manufacturer data
VOCs	3.53	15.44	Manufacturer data
CO (post catalyst)	1.28	5.60	Manufacturer data
SO_2[1]	0.009	0.040	AP-42, Table 3.2-2
PM_{10}[1,2]	0.25	1.08	Manufacturer data
$PM_{2.5}$[1,2]	0.25	1.08	Manufacturer data
Total HAPs[1]	1.43	6.25	AP-42, Table 3.2-2
Natural Gas-Fired Boilers (each)			
NO_x	1.40	6.13	Manufacturer data
VOCs	0.052	0.23	Manufacturer data
CO	1.35	5.91	Manufacturer data
SO_2	0.071	0.037	Manufacturer data
PM_{10}[2]	0.21	0.92	Manufacturer data
$PM_{2.5}$[2]	0.21	0.92	Manufacturer data
Total HAPs	0.022	0.097	AP-42, Table 1.4-3
Fire Pump[4]			
NO_x	0.75	3.28	Manufacturer data
VOCs	0.020	0.089	Manufacturer data
CO	0.19	0.82	Manufacturer data
SO_2	0.25	1.10	AP-42, Table 3.3-1
$PM_{2.5}$[5]	0.027	0.12	Manufacturer data
PM_{10}[5]	0.027	0.12	Manufacturer data
Total HAPs	0.0033	0.015	AP-42, Table 3.3-1
Standby Generator			
NO_x	28.25	7.06	AP-42, Table 3.3-1
VOCs (as aldehydes)	0.42	0.11	AP-42, Table 3.3-1
CO	6.09	1.52	AP-42, Table 3.3-1
SO_2	1.87	0.47	AP-42, Table 3.3-1
PM_{10}	2.00	0.50	AP-42, Table 3.3-1
Total HAPs	0.025	0.0063	AP-42, Table 3.3-1

Notes:

1. Post-catalyst numbers not available for VOCs, SO_2, PM, and HAPs. All are likely much lower than the emission rates used, so these are conservative estimates.
2. PM_{10} and $PM_{2.5}$ are total values: filterable and condensable.

3. Where manufacturer information is available, it is used to calculate emissions instead of emissions factors from EPA AP-42.
4. Fuel is assumed to have 300-4000 ppm sulfur, as a conservative estimate.
5. Particulate emissions factors for fire pump are only given as generic PM, so this is conservatively used to estimate both $PM_{2.5}$ and PM_{10} as if the factors applied to both of them separately.

Proposed allowable emissions are only different from annual PTE, while short term emissions (lbs/hr) are the same regardless of percent uptime or requested operating limits.

Emission Unit	Proposed Allowable Emissions, tons per year							Limit Requested
	NO_x	VOCs	CO	SO_2	PM_{10}	$PM_{2.5}$	HAPs	
P-CHP-1	5.60	14.7	5.32	0.038	1.03	1.03	5.94	None
P-CHP-2	0.53	14.7	5.32	0.038	1.03	1.03	5.94	
P-BLR-2 (boiler)	0.24	0.088	0.23	0.0014	0.036	0.036	0.0038	
P-BLR-3 (boiler)	0.24	0.088	0.23	0.0014	0.036	0.036	0.0038	
P-Fire-1 (fire pump)	0.019	5.1E-04	0.0047	0.0063	6.8E-04	5.1E-04	8.3E-05	500 hrs/yr
P-GEN-1 (generator)	0.081	0.0012	0.017	0.0053	0.0057	N/A	7.2E-05	500 hrs/yr (EPA policy)

In order to calculate the above emissions rates for the new equipment, the following emission factors were utilized. Manufacturer data was available for many of the criteria pollutants from the equipment, and was used in lieu of EPA AP-42 factors where available. Italics indicate where emission factors used were manufacturer-provided.

Pollutant	Emission Factor by Equipment			
	CHP	Boiler	Fire Pump	Generator
NO_x	*5.0 ppm, post catalyst*	*0.117 lb/MMBtu*	*2.759 g/hp-hr*	0.031 lb/hp-hr
VOC	*0.570 g/hp-hr*	*0.004 lb/MMBtu*	*0.075 g/hp-hr*	4.63E-04 lb/hp-hr
CO	*50 ppm, post catalyst*	*0.112 lb/MMBtu*	*0.694 g/hp-hr*	6.68E-03 lb/hp-hr
SO_2	5.88E-04 lb/MMBtu	*0.0007 lb/MMBtu*	2.05E-03 lb/hp-hr	2.05E-03 lb/hp-hr
PM_{10}	0.040 g/hp-hr	*0.018 lb/MMBtu*	*0.100 g/hp-hr*	2.20E-03 lb/hp-hr
$PM_{2.5}$	0.040 g/hp-hr	*0.018 lb/MMBtu*	*0.100 g/hp-hr*	N/A
Hazardous Air Pollutants (HAPs), all in lb/MMBtu				
1,3-Butadiene			3.91E-05	3.91E-05
2-Methylnaphthalene		2.35E-08		
3-Methylchloranthrene		1.76E-09		
7,12-Dimethylbenz(a)anthracene		1.57E-08		

Acenaphthene	5.53E-06	1.76E-09	5.06E-06	5.06E-06
Acenaphthylene		1.76E-09		
Acetaldehyde	8.36E-03		7.67E-04	7.67E-04
Acrolein	5.14E-03		9.25E-05	9.25E-05
Anthracene		2.35E-09	1.87E-06	1.87E-06
Benzene	4.40E-04	2.06E-06	9.33E-04	9.33E-04
Benzo(a)anthracene		1.76E-09	1.68E-06	1.68E-06
Benzo(a)pyrene		1.18E-09		
Benzo(b)fluoranthene	1.66E-07	1.76E-09	1.55E-07	1.55E-07
Benzo(e)pyrene	4.15E-07			
Benzo(g,h,i)perylene	4.14E-07	1.18E-09	4.89E-07	4.89E-07
Benzo(k)fluoranthene		1.76E-09	1.55E-07	1.55E-07
Biphenyl	2.12E-04			
Carbon Tetrachloride	3.67E-05			
Chlorobenzene	3.04E-05			
Chloroform	2.85E-05			
Chrysene	6.93E-07	1.76E-09	3.53E-07	3.53E-07
Dibenzo(a,h)anthracene		1.18E-09	5.83E-07	5.83E-07
Dichlorobenzene		1.18E-06		
Ethylbenzene	3.97E-05			
Ethylene Dibromide	4.43E-05			
Fluoranthene	1.11E-06	2.94E-09	7.61E-06	7.61E-06
Fluorene	5.67E-06	2.75E-09	2.92E-05	2.92E-05
Formaldehyde	*1.80E-01*	7.35E-05	1.18E-03	1.18E-03
Indeno(1,2,3-cd)pyrene		1.76E-09	3.75E-07	3.75E-07
Methanol	2.50E-03			
Methylene Chloride	1.23E-03			
n-Hexane	1.11E-03	1.76E-03		
Naphthalene	7.44E-05	5.98E-07	8.48E-05	8.48E-05
PAHs	2.69E-05			
Phenanthrene	1.04E-05	1.67E-08	2.94E-05	2.94E-05
Phenol	2.40E-05			
Pyrene	1.36E-06	4.90E-09	4.78E-06	4.78E-06
Styrene	2.36E-05			
Tetrachloroethane	2.48E-06			
Toluene	4.08E-04	3.33E-06	4.09E-04	4.09E-04
Vinyl Chloride	1.49E-05			
Xylenes	1.84E-04		2.85E-04	2.85E-04

Finally, the following equations were utilized to calculate both potential to emit (PTE) and proposed allowable emissions.

$$Emission\ Rate\ \left(\frac{lbs}{hr}\right) = Emission\ Factor\ \left(\frac{lb}{MMscf}\right) * \left(1\,\frac{MMscf}{1020\ MMBtu}\right) * Heat\ Input\ \left(\frac{MMBtu}{hr}\right)$$

$$Emission\ Rate\ \left(\frac{lbs}{hr}\right) = Emission\ Factor\ \left(\frac{g}{hp * hr}\right) * Power\ (hp) * \frac{1\ lb}{453.592\ g}$$

$$Emission\ Rate\ \left(\frac{lbs}{hr}\right) = \frac{Emission\ Factor\ (ppm)}{1{,}000{,}000\ lbs\ exhaust} * Gas\ flow\ \left(\frac{lbs}{hr}\right)$$

$$Emission\ Rate\ \left(\frac{tons}{yr}\right) = Emissions\ \left(\frac{lbs}{hr}\right) * 8760\ \left(\frac{hrs}{yr}\right) \div 2000 \left(\frac{lbs}{ton}\right) * \%\ Uptime * \%\ Usage$$

Air Quality Review

The approved Modeling Protocol and results of AERSCREEN modeling for the NG2 project are included in this file, starting on the next page.

Modeling Protocol for Air Permit on Three Affiliated Tribes Greenhouse Project

Introduction

This protocol is intended to serve as an overall narrative for the scope of the construction and operating air permits that the Three Affiliated Tribes of North Dakota (herein referred to as the Mandan, Hidatsa, and Arikara – or MHA – Nation) are applying for. The permits are required to construct and operating heat and power generating infrastructure as well as ancillary equipment that will serve the greenhouse facility, referred to as Native Green Grow (NG2).

Project Overview

MHA Nation intends to construct and operate a greenhouse agriculture facility on tribal land near the town of Parshall, ND. The facility will be constructed in phases, with the first (and current) phase consisting of a 3.35-acre climate-controlled greenhouse, ancillary buildings for processing and storing harvested produce, an administrative building for office functions, and a physical plant that will house power and heat generation equipment. The greenhouse facility is meant to provide economic development and diversification for MHA Nation, and is intended as a transition away from reliance on revenue and employment based on the regional oil and gas industry. Growing food on the reservation also serves as a step towards tribal food sovereignty, which will not only increase the resilience of MHA due to lowered reliance on imported fruits and vegetables, but will improve public health by increasing availability of fresh produce and reducing air and light pollution from local gas flaring (gas will instead be used to power and heat the greenhouse).

Intended Permitting and Construction Schedules

Based on current design project and seasonal constraints on construction, the following timeline is anticipated, starting from fall of 2020; contracts most relevant to this permit are highlighted in light blue, and more details can be found in Appendix A – Preliminary Project Delivery Schedule.

<table>
<tr><th>Contract</th><th>Description</th><th>Bid</th><th>Award</th><th>Start</th><th>Finish</th></tr>
<tr><td>1</td><td>Earthwork</td><td>10/2020</td><td>1/2021</td><td>5/2021</td><td>12/2021</td></tr>
<tr><td rowspan="2">2</td><td>Physical Plant Building</td><td rowspan="2">3/2021</td><td rowspan="2">4/2021</td><td rowspan="2">6/2021</td><td rowspan="2">11/2021</td></tr>
<tr><td>Greenhouse Structure</td></tr>
<tr><td rowspan="4">3</td><td>Process Equipment</td><td rowspan="4">5/2021</td><td rowspan="4">6/2021</td><td rowspan="4">7/2021</td><td rowspan="4">6/2022</td></tr>
<tr><td>Greenhouse Growing Systems</td></tr>
<tr><td>Admin/Storefront Building</td></tr>
<tr><td>Site Development</td></tr>
<tr><td>4</td><td>Raw Gas Refinery Plant</td><td>TBD</td><td>TBD</td><td>TBD</td><td>TBD</td></tr>
<tr><td>5</td><td>Gas Pipeline Extension</td><td>TBD</td><td>TBD</td><td>TBD</td><td>TBD</td></tr>
</table>

As for permitting, based on the potential to emit from the proposed equipment, the facility qualifies for a True Minor NSR pre-construction permit, as no criteria pollutants are shown to be emitted at over 100 tons per year. Therefore, a maximum 180-day timeline is expected, with a 45-day review period to review completeness of the permit application and 135 days to review the application and issue the permit. This is an upper limit for review time, so construction of power- and heat-generating equipment is expected to be underway by mid-September 2021 at the latest.

One of the CHP engines, P-CHP-2, is not a part of this initial stage of construction (Phase 1), and will not be installed until the second greenhouse structure is erected in Phase 3. Therefore, the True Minor NSR application will request a delay of construction for this source, which is expected to be installed some time in 2023 at the very earliest.

Finally, the mention of “Raw Gas Refinery Plant” in the schedule should only be taken as a possible addition to the facility. This component, which would take raw field gas from the Bakken play and remove natural gas liquids (NGLs) before sending gas to equipment, is not even currently in discussion with MHA Nation leadership, but has been brought up previously as a possibility for expansion. Therefore, no refinery-related equipment is being considered at this time.

Description of Project

Native Green Grow, or NG2, is an upcoming greenhouse facility constructed by the Mandan, Hidatsa, and Arikara (MHA) Nation on tribal land within the Fort Berthold Indian Reservation (FBIR) near Parshall, ND. This project is meant to utilize locally available natural resources for economic development and food sovereignty. The FBIR is within the Bakken play – one of the most active oilfields in the US – and experiences significant amounts of natural gas flaring from oil and gas wells both on the reservation and outside the boundaries. This flaring contributes to air and light pollution, and represents a wasted resource but also an opportunity. MHA intends to capture this flared gas by working with area oil and gas operators to send it to a centralized location (within the NG2 site) where it will be compressed, stored, and utilized to run heat and power equipment for a greenhouse facility.

A single 3.35-acre (1.35 hectares) greenhouse will be built on the site, divided into multiple compartments growing different crops. This will occur in Phase 1, which is currently underway. Over time, subsequent construction phases will boost the total production area to about 4 hectares. The produce grown in the greenhouses provides multiple benefits to the MHA Nation:

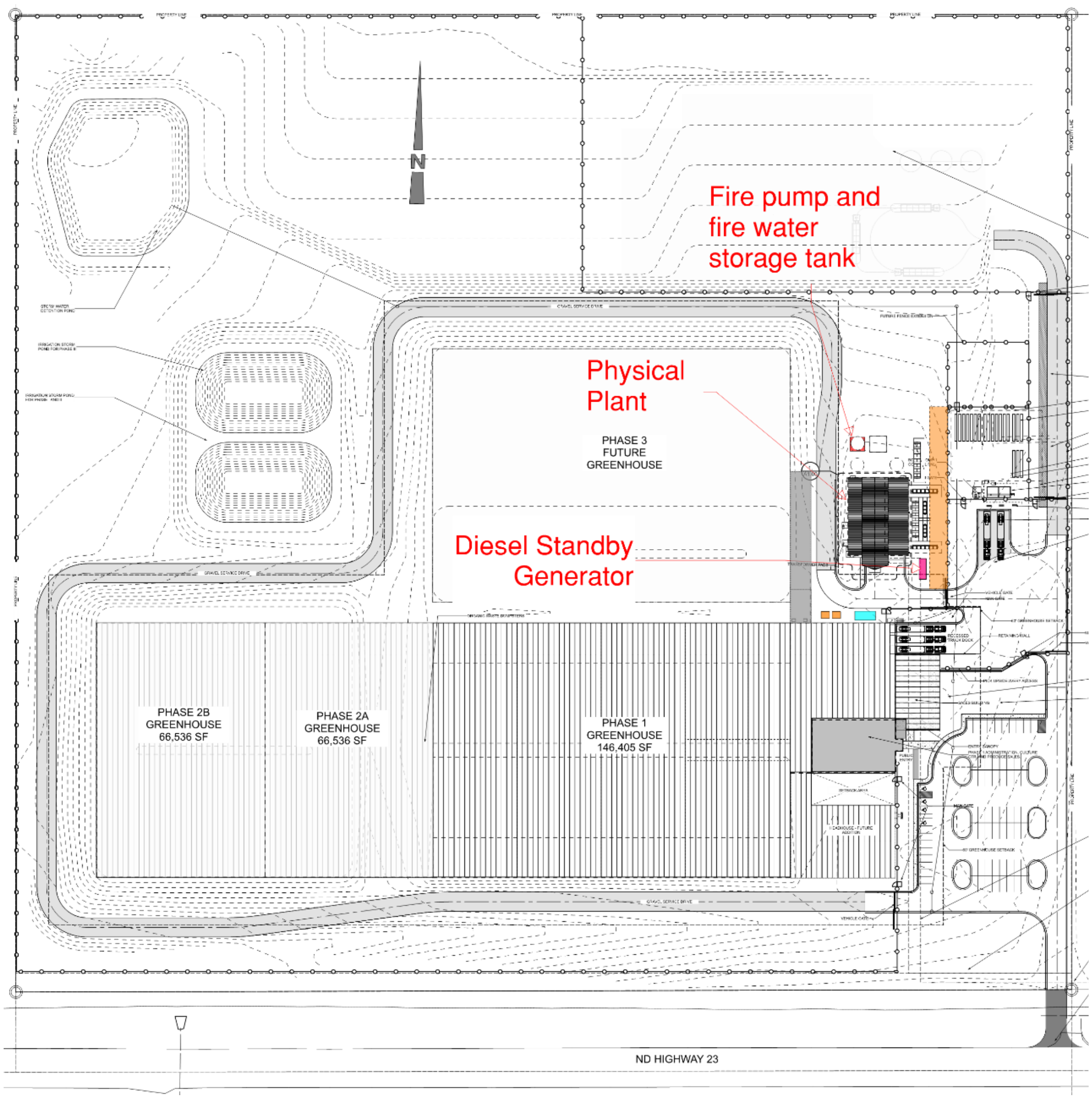
- Locally grown fresh produce that can feed the tribe and be sold outside the reservation.
- Diversified economy that pivots away from reliance on the oil and gas industry.
- Stable jobs that are not subject to the boom and bust cycles of the oilfield.
- Progress toward food sovereignty, where MHA does not have to rely on others for food production.

To power and heat the greenhouse (eventually multiple greenhouses), the NG2 project will utilize combined heat and power (CHP) engines, natural gas boilers, and an electric boiler. This suite of equipment provides layers of redundancy to ensure a short period of extreme cold or unexpected equipment downtime does not ruin entire crops. Gas-powered equipment is meant to utilize locally available resources, while electric-powered equipment will take advantage of favorable electricity rates from the Western Area Power Administration (WAPA). In addition to the equipment directly providing heat and power to the greenhouse, there will also be a standby generator and fire pump.

Facility Layout

The NG2 greenhouse facility is located on approximately 40 acres of tribally owned land about 1 mile north of Parshall, ND. This plot has been used for conventional grain agriculture in the past. Appendix B includes a larger version of the site layout, but the basic elements are described below and shown in the following figure:

- Climate-controlled greenhouses, to be built in phases. Phase 1 will be 3.36 acres, Phase 2A and 2B will be 1.5 acres each, and Phase 3 will be approximately 3 acres.
- Detention ponds for collecting rainwater and mitigating stormwater runoff.
- Physical Plant, which will house the heat and power generation equipment as well as ancillary equipment required to convey utilities throughout the complex.
- Compressed natural gas storage tanks that will enable NG2 to have seven days of reserve fuel.
- Various support structures for greenhouse operations: storage, processing, packaging, and maintenance.
- Administrative building hosting office and public-facing functions.



The fence line of the NG2 facility is generally at the property line, except for the parking lot and administrative building which are open to all employees and customers. Emissions sources are near the eastern edge of the property, and are clearly marked on the map. This includes:

- Inside the physical plant: Two CHP engines (one not built until Phase 3) and two natural gas-fired boilers.
- Separate from the plant: Fire pump, standby generator.

Project Source Units

The NG2 greenhouse will be powered by both grid electricity and site-generated electricity from two CHP engines at full build-out. Heat will also be provided by the CHP engines, as well as two natural gas-fired boilers and an electric boiler. In addition to heat and power generating equipment, emissions are also expected from a fire pump and standby generator.

CHP Engines

The two natural gas-powered CHP engines will be installed in phases, with only one being installed during initial buildout. The second will not be installed until Phase 3, which will begin in 2023 at the very earliest. These systems will provide both electricity and heat (recovered from exhaust and the engine), as well as CO_2 from scrubbed exhaust gas that will be pumped to the greenhouse to enhance plant growth. All exhaust gas will pass through a multi-stage catalyst unit (COdiNOx). This means that the exhaust emissions will be much less than if this catalytic system was not used; the exhaust catalytic system cannot be bypassed while the engine is running.

The first CHP engine that will be installed and operated is a Cummins model C2000 N6CD rated for 2000 kW of electricity and 7.2 million BTU per hour (MMBTU/hr) of heat. The second engine will likely be the same model, but will likely not be purchased until 2023. The engines are only planned to be run at 95% uptime for half of the year, generally during daytime hours, but no operating limits are being requested.

Boilers

Apart from the electric boiler, which will not emit any exhaust, the physical plant will house two natural gas-fired boilers. These will serve as backup boilers during Phase 1, in the rare event that both the electric boiler and CHP system are out of service. In later phases, they will provide supplemental and backup heat to the additional greenhouse acreage. The natural gas will be provided through agreements with local oil & gas operators and will be trucked and/or piped to the site and stored in compressed gas cylinders until needed.

Both boilers are Cleaver Brooks model FLX-700-1200-160HW (460/3/60)-SPC/CFG, rated at 9,600 MMBTU/hr each. They are expected to be used less than 500 hours per year each, but no operating limits are being requested.

Fire Pump

To ensure fire safety at the NG2 facility a diesel fire pump is needed for reliable and quick response during a fire emergency. Though a pump has not yet been selected, it is likely to be a Cummins model CFP5E-F40 or similar. This is a 123-hp engine that consumes 6.3 gallons of diesel fuel per hour at maximum load. Since this pump is only needed during emergencies, it is expected to be used less than 50 hours per year. However, an operating limit of 500 hrs/yr will be requested.

The fire pump will not be modeled with AERSCREEN because the unit is considered an intermittent source based on EPA guidance (https://www.epa.gov/sites/production/files/2015-07/documents/appwno2_2.pdf).

Standby Generator

In the rare event that grid electricity is unavailable and the CHP engines are down at the same time (or cannot receive natural gas), a standby generator will be supplied to ensure loss of power does not result in loss of crops. This unit has not yet been purchased, but will likely be a Cummins model DQCB or similar. This is a 680 kW unit that consumes 48 gallons of diesel per hour at full load. As with the fire pump, this should only be used in extreme scenarios, so its use is estimated at less than 100 hours per year. No operating limit will be requested, since EPA policy allows the potential to emit calculations of emergency/standby generators to be set at 500 hours per year (https://www.epa.gov/sites/production/files/2015-08/documents/emgen.pdf).

The generator will not be modeled with AERSCREEN because the unit is considered an intermittent source based on EPA guidance.

Determination of Applicable Pollutants

Based on understanding of federal new source review (NSR) policy, thresholds for criteria pollutants were as follows, in tons per year (tpy):

Criteria Pollutant	Minor NSR Threshold (tpy)	Major NSR Threshold (tpy)	Title V Operating Permit thresholds (tpy)
Carbon monoxide (CO)	10	250	100
Nitrogen oxides (NO_x)	10	250	100
Sulfur dioxide (SO_2)	10	250	100
Volatile organic compounds (VOCs)	5	250	100
Particulate matter (PM)	10	250	100
PM_{10}	5	250	100
$PM_{2.5}$	3	250	100
Lead	0.1	250	100

Any pollutant whose potential to emit (PTE) across the facility is greater than its Minor source threshold but less than its Major Source NSR threshold is subject to Minor New Source review for construction permitting. Additionally, any criteria pollutant with a potential to emit projected to be greater than 100 tons per year would trigger the requirement to obtain a Title V operating permit unless operating limits are imposed, creating a Synthetic Minor source with regard to Title V thresholds.

All criteria pollutants were calculated with emissions factors except lead, for which there were not any emissions factors either in the EPA's AP-42 publication nor the manufacturers' data.

The following assumptions were used when calculating emissions from the units:

- A higher heating value (HHV) for natural gas of 1,020 BTU/scf.
- Uptime of 95% for all units within their proposed operating hours.
- Manufacturer data takes precedence over AP-42 emissions factors.
- Use of total $PM_{2.5}$ and PM_{10} emissions by combining filterable and condensable particulates.
- Use of pre-catalyst emissions for pollutants that did not have any data on post-catalyst concentrations. This is a very conservative approach, as the multi-stage catalyst systems on the CHP engines will very likely remove virtually all pollutants except carbon dioxide. The exhaust must be clean enough to be pumped into a facility where workers will be present.
- Stack parameters are estimated based on industry experience, as they have not been designed yet.

Potential to emit calculations show no criteria pollutants over 100 tpy and therefore do not trigger either Major Source NSR or Title V, so no operational limits are being requested except for the fire pump, which will be limited to 500 hours per year of operation.

Description of AQIA

Due to concerns over particulate matter ($PM_{2.5}$ and PM_{10}) emission rates from this project in comparison to similar ones, the predicted air emissions from the NG2 project will be screened with EPA's AERSCREEN modeling software. Based on the most up-to-date emissions rates, EPA recommends modeling 24-hour $PM_{2.5}$ and PM_{10}, as well as 1-hour NO_2, in order to determine the maximum predicted impacts of the pollutants. Other pollutants and averaging periods are not anticipated to be of concern, so they will not be modeled and are only included in this protocol for context and completeness. These impacts will be compared to Significant Impact Levels (SILs) and the National Ambient Air Quality Standard (NAAQS) to determine if more detailed modeling is needed or if additional operational limitations should be put in place.

The table below outlines the applicable SILs and NAAQS for each criteria air pollutant and averaging period. Only pollutants in bold-face font will be modeled in AERSCREEN.

Pollutant	Standard	Level	Averaging Time	Threshold	Form
CO	SIL	NA	1-hour	2000 µg/m³	Maximum Impact
	NAAQS	Primary	1-hour	40,071 µg/m³	Not to be exceeded more than once per year
	SIL	NA	8-hour	500 µg/m³	Maximum Impact
	NAAQS	Primary	8-hour	10,304 µg/m³	Not to be exceeded more than once per year
NO_2	SIL	NA	1-hour	7.5 µg/m³	Maximum Impact
	NAAQS	Primary	1-hour	188 µg/m³	98th percentile of 1-hour daily maximum concentrations averaged over 3 years
	SIL	NA	Annual	1 µg/m³	Maximum Impact
	NAAQS	Primary & Secondary	Annual	99.7 µg/m³	Annual mean
Ozone	SIL	NA	8-hour	1 ppb	Maximum Impact
	NAAQS	Primary & Secondary	8-hour	70 ppb	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
$PM_{2.5}$	SIL	NA	Annual	0.2 µg/m³	Maximum Impact
	NAAQS	Primary	Annual	12.0 µg/m³	Annual mean, averaged over 3 years
	NAAQS	Secondary	Annual	15.0 µg/m³	Annual mean, averaged over 3 years

	SIL	NA	24-hour	1.2 µg/m³	Maximum Impact
	NAAQS	Primary & Secondary	24-hour	35 µg/m³	98th percentile, averaged over 3 years
PM_{10}	SIL	NA	24-hour	5 µg/m³	Maximum Impact
	NAAQS	Primary & Secondary	24-hour	150 µg/m³	Not to be exceeded more than once per year on average over 3 years
SO_2	SIL	NA	1-hour	7.8 µg/m³	Maximum Impact
	NAAQS	Primary	1-hour	196 µg/m³	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	SIL	NA	3-hour	25 µg/m³	Maximum Impact
	NAAQS	Secondary	3-hour	1309 µg/m³	Not to be exceeded more than once per year
	SIL	NA	24-hour	5 µg/m³	Maximum Impact
	NAAQS	Secondary	24-hour	365 µg/m³	Not to be exceeded more than once per year
	SIL	NA	Annual	1 µg/m³	Maximum Impact
	NAAQS	Secondary	Annual	80 µg/m³	Annual mean

Note: Lead is another NAAQS pollutant. Lead is not assessed in this analysis because it is not emitted from these sources. NA represents “Not Applicable”.

Source Characterization

Source Descriptions

The NG2 project will utilize various heat- and power-generating equipment to operate the greenhouse, as well as ancillary equipment for emergency situations. Equipment that generates emissions is described in the table below:

Source	Source Type	Fuel Type	Size	# of Units	Location
P-CHP-1 P-CHP-2	Internal combustion engine	Natural gas	2000 kWe, 15.71 MMBTU/hr input	2	Inside physical plant building
P-BLR-2 P-BLR-3	Boiler	Natural gas	12 MMBTU/hr input	2	Inside physical plant building
P-Fire-1	Internal combustion engine	No. 2 diesel	123 hp, 4.5 L	1	North side of physical plant
P-GEN-1	Internal combustion engine	No. 2 diesel	680 kW, 23 L	1	Southeast of physical plant

Note that the second CHP engine (P-CHP-2) will not be constructed in this first phase of the greenhouse project. It will be installed in Phase 3, which may not begin until 2023 or 2024.

Emissions Control

Emissions control will be utilized for the CHP engines (with only one CHP being constructed during Phase 1), consisting of a catalytic exhaust system (COdiNOx) specifically designed for use with greenhouses. Exhaust from the CHP engine passes through a series of beds and filters to remove pollutants: an oxidation catalyst, two selective catalytic reduction beds, and final double layer of oxidation catalyst, then a heat exchanger for thermal energy recovery. The exhaust is then conveyed to the greenhouse to enhance plant growth by increasing CO_2 concentrations to around 1000 ppm. The greenhouse must be safe for workers, so gas detectors in the catalyst system and around the greenhouse monitor for any potential hazards. The CHP system is hardwired such that, if the catalyst system is out of commission, the engine itself will shut down.

The rest of the emitting equipment will not have controls on emissions other than requested operating limits (fire pump) and stacks to direct exhaust upward.

Stack Parameters

The following table describes the stack parameters for all emitting equipment on the NG2 project site. Each piece of equipment will have its own stack. Note that the generator and fire pump have not yet been fully designed, so those parameters are proposed based industry experience.

Parameter	CHP engine (each)	Boiler (each)	Fire pump	Generator
Type	Vertical, uncovered	Vertical, rain cap	Vertical, with flap	Vertical, rain cap
Source Type	Point	Point	Point	Point
Height (ft)	39	39	15	15
Ground elevation (ft)	2,110	2,110	2,110	2,110
Diameter (in)	24	24	6	20
Velocity (fps)	68	12.83	59.2	86.7
Exhaust flow (lb/hr)	N/A	11,029	N/A	N/A
Exhaust flow (scfm)	12,818	2,418	706	11,345
Temperature (°F)	120	483	933	1,050

Urban/Rural Determination

The project site for the NG2 facility is in a rural location in Mountrail County, North Dakota. The site is one mile north of the town of Parshall, which has a population of approximately 1,000.

The surrounding terrain is relatively flat, so terrain heights will not be considered in the simulation.

Source Emissions

Summary of Emissions Calculations

Emissions rates were calculated for all emitting equipment that will eventually be installed for the NG2 greenhouse project. Potential to emit (PTE) rates assume the absolute maximum emissions that could result in running all equipment at 100% load, all day, all year, with the exception of the emergency generator which is calculated at 500 hrs/yr of operation. Proposed allowable rates account for the uptime each source is expected to run, though since all emissions are below the Major Source and Title V thresholds, these runtime limitations will not be requested. The following table summarizes the potential to emit for all new sources.

Pollutant	PTE – lbs/hr	PTE – tons/yr	Emission Factor source[3]
Combined Heat and Power Engines (each)			
NO_x (post catalyst)	0.13	0.56	Manufacturer data
VOCs	3.53	15.44	Manufacturer data

Pollutant	PTE – lbs/hr	PTE – tons/yr	Emission Factor source[3]
CO (post catalyst)	1.28	5.60	Manufacturer data
SO_2[1]	0.0092	0.040	AP-42, Table 3.2-2
PM_{10}[1,2]	0.25	1.08	Manufacturer data
$PM_{2.5}$[1,2]	0.25	1.08	Manufacturer data
Total HAPs[1]	1.43	6.25	AP-42, Table 3.2-2
Natural Gas-Fired Boilers (each)			
NO_x	1.40	6.13	Manufacturer data
VOCs	0.052	0.23	Manufacturer data
CO	1.35	5.91	Manufacturer data
SO_2	0.0084	0.037	Manufacturer data
PM_{10}[2]	0.21	0.92	Manufacturer data
$PM_{2.5}$[2]	0.21	0.92	Manufacturer data
Total HAPs	0.022	0.097	AP-42, Table 1.4-3
Fire Pump[4]			
NO_x	0.75	3.28	Manufacturer data
VOCs	0.020	0.089	Manufacturer data
CO	0.19	0.82	Manufacturer data
SO_2	0.25	1.10	AP-42, Table 3.3-1
$PM_{2.5}$[5]	0.027	0.12	Manufacturer data
PM_{10}[5]	0.027	0.12	Manufacturer data
Total HAPs	0.0033	0.015	AP-42, Table 3.3-1
Standby Generator			
NO_x	28.25	7.06	AP-42, Table 3.3-1
VOCs (as aldehydes)	0.42	0.11	AP-42, Table 3.3-1
CO	6.09	1.52	AP-42, Table 3.3-1
SO_2	1.87	0.47	AP-42, Table 3.3-1
PM_{10}	2.00	0.50	AP-42, Table 3.3-1
Total HAPs	0.025	0.0063	AP-42, Table 3.3-1

Notes:

1. Post-catalyst numbers not available for VOCs, SO_2, PM, and HAPs. All are likely much lower than the emission rates used, so these are conservative estimates.
2. PM_{10} and $PM_{2.5}$ are total values: filterable and condensable.
3. Where manufacturer information is available, it is used to calculate emissions instead of emissions factors from EPA AP-42.
4. Fuel is assumed to have 300-4000 ppm sulfur, as a conservative estimate.
5. Particulate emissions factors for fire pump are only given as generic PM, so this is conservatively used to estimate both $PM_{2.5}$ and PM_{10} as if the factors applied to both of them separately.

Though the equipment will not be operated all day throughout the year, no operational limits are being requested except for the fire pump, which will be limited to 500 hours per year.

Emission Unit	Proposed Allowable Emissions, tons per year							Limit Requested
	NO_x	VOCs	CO	SO_2	PM_{10}	$PM_{2.5}$	HAPs	
P-CHP-1	0.56	15.4	5.60	0.040	1.08	1.08	6.25	None

P-CHP-2	0.56	15.4	5.60	0.040	1.08	1.08	6.25	
P-BLR-2	6.13	0.23	5.91	0.037	0.92	0.92	0.0970	
P-BLR-3	6.13	0.23	5.91	0.037	0.92	0.92	0.0970	
P-Fire-1	0.19	0.0051	0.047	0.063	0.0068	0.0068	0.00083	500 hrs/yr
P-GEN-1	7.06	0.11	1.52	0.47	0.50	N/A	0.0063	500 hrs/yr (EPA policy

In addition to annual emissions factors, the short-term emissions of all new equipment was also calculated, as summarized in the table below.

Emission Unit	Potential to Emit, pounds per hour						
	NO_x	VOCs	CO	SO_2	PM_{10}	$PM_{2.5}$	HAPs
P-CHP-1	0.13	3.53	1.28	0.0092	0.25	0.25	1.43
P-CHP-2	0.13	3.53	1.28	0.0092	0.25	0.25	1.43
P-BLR-2	1.40	0.052	1.35	0.0084	0.21	0.21	0.022
P-BLR-3	1.40	0.052	1.35	0.0084	0.21	0.21	0.022
P-Fire-1	0.75	0.020	0.19	0.25	0.027	0.027	0.0033
P-GEN-1	28.25	0.42	6.09	1.87	2.0	N/A	0.025

Methodology for Calculating Emissions

Along with the aforementioned requested operating limits and assumptions around equipment uptime, controls, and fuel usage, the following information is presented as background for calculating emissions rates of all new equipment on the NG2 greenhouse project. The following table presents the emissions factors used to obtain predicted emissions from the various equipment. If both an AP-42 factor and manufacturer data were available, the latter was used, and is shown in *italics*.

Pollutant	Emission Factor by Equipment			
	CHP	Boiler	Fire Pump	Generator
NO_x	*5.0 ppm, post catalyst*	*0.117 lb/MMBtu*	*2.759 g/hp-hr*	0.031 lb/hp-hr
VOC	*0.570 g/hp-hr*	*0.004 lb/MMBtu*	*0.075 g/hp-hr*	4.63E-04 lb/hp-hr
CO	*50 ppm, post catalyst*	*0.112 lb/MMBtu*	*0.694 g/hp-hr*	6.68E-03 lb/hp-hr
SO_2	5.88E-04 lb/MMBtu	*0.0007 lb/MMBtu*	2.05E-03 lb/hp-hr	2.05E-03 lb/hp-hr
PM_{10}	0.040 g/hp-hr	*0.018 lb/MMBtu*	*0.100 g/hp-hr*	2.20E-03 lb/hp-hr
$PM_{2.5}$	0.040 g/hp-hr	*0.018 lb/MMBtu*	*0.100 g/hp-hr*	N/A
Hazardous Air Pollutants (HAPs), all in lb/MMBtu				
1,3-Butadiene			3.91E-05	3.91E-05
2-Methylnaphthalene		2.35E-08		
3-Methylchloranthrene		1.76E-09		
7,12-Dimethylbenz(a)anthracene		1.57E-08		
Acenaphthene	5.53E-06	1.76E-09	5.06E-06	5.06E-06
Acenaphthylene		1.76E-09		

Acetaldehyde	8.36E-03		7.67E-04	7.67E-04
Acrolein	5.14E-03		9.25E-05	9.25E-05
Anthracene		2.35E-09	1.87E-06	1.87E-06
Benzene	4.40E-04	2.06E-06	9.33E-04	9.33E-04
Benzo(a)anthracene		1.76E-09	1.68E-06	1.68E-06
Benzo(a)pyrene		1.18E-09		
Benzo(b)fluoranthene	1.66E-07	1.76E-09	1.55E-07	1.55E-07
Benzo(e)pyrene	4.15E-07			
Benzo(g,h,i)perylene	4.14E-07	1.18E-09	4.89E-07	4.89E-07
Benzo(k)fluoranthene		1.76E-09	1.55E-07	1.55E-07
Biphenyl	2.12E-04			
Carbon Tetrachloride	3.67E-05			
Chlorobenzene	3.04E-05			
Chloroform	2.85E-05			
Chrysene	6.93E-07	1.76E-09	3.53E-07	3.53E-07
Dibenzo(a,h)anthracene		1.18E-09	5.83E-07	5.83E-07
Dichlorobenzene		1.18E-06		
Ethylbenzene	3.97E-05			
Ethylene Dibromide	4.43E-05			
Fluoranthene	1.11E-06	2.94E-09	7.61E-06	7.61E-06
Fluorene	5.67E-06	2.75E-09	2.92E-05	2.92E-05
Formaldehyde	*1.80E-01*	7.35E-05	1.18E-03	1.18E-03
Indeno(1,2,3-cd)pyrene		1.76E-09	3.75E-07	3.75E-07
Methanol	2.50E-03			
Methylene Chloride	1.23E-03			
n-Hexane	1.11E-03	1.76E-03		
Naphthalene	7.44E-05	5.98E-07	8.48E-05	8.48E-05
PAHs	2.69E-05			
Phenanthrene	1.04E-05	1.67E-08	2.94E-05	2.94E-05
Phenol	2.40E-05			
Pyrene	1.36E-06	4.90E-09	4.78E-06	4.78E-06
Styrene	2.36E-05			
Tetrachloroethane	2.48E-06			
Toluene	4.08E-04	3.33E-06	4.09E-04	4.09E-04
Vinyl Chloride	1.49E-05			
Xylenes	1.84E-04		2.85E-04	2.85E-04

The following equations were utilized to calculate both PTE and proposed allowable emissions.

$$Emission\ Rate\ \left(\frac{lbs}{hr}\right) = Emission\ Factor\ \left(\frac{lb}{MMscf}\right) * \left(1\frac{MMscf}{1020\ MMBtu}\right) * Heat\ Input\ \left(\frac{MMBtu}{hr}\right)$$

$$Emission\ Rate\ \left(\frac{lbs}{hr}\right) = Emission\ Factor\ \left(\frac{g}{hp * hr}\right) * Power\ (hp) * \frac{1\ lb}{453.592\ g}$$

$$Emission\ Rate\ \left(\frac{lbs}{hr}\right) = \frac{Emission\ Factor\ (ppm)}{1{,}000{,}000\ lbs\ exhaust} * Gas\ flow\ \left(\frac{lbs}{hr}\right)$$

$$Emission\ Rate\ \left(\frac{tons}{yr}\right) = Emissions\ \left(\frac{lbs}{hr}\right) * 8760\ \left(\frac{hrs}{yr}\right) \div 2000 \left(\frac{lbs}{ton}\right) * \%\ Uptime * \%\ Usage$$

Summary for AERSCREEN

Based on the potential to emit for all equipment in pounds per hour – which is the same as proposed allowable emissions for an hourly basis – the following emission rates will be used in the AERSCREEN model. Note that this is the same table from Summary of Emissions Calculations, above.

Emission Unit	Potential to Emit, pounds per hour						
	NO_x	VOCs	CO	SO_2	PM_{10}	$PM_{2.5}$	HAPs
P-CHP-1	0.13	3.53	1.28	0.0092	0.25	0.25	1.43
P-CHP-2	0.13	3.53	1.28	0.0092	0.25	0.25	1.43
P-BLR-2	1.40	0.052	1.35	0.0084	0.21	0.21	0.022
P-BLR-3	1.40	0.052	1.35	0.0084	0.21	0.21	0.022
P-Fire-1	0.75	0.020	0.19	0.25	0.027	0.027	0.0033
P-GEN-1	28.25	0.42	6.09	1.87	2.0	N/A	0.025

AESCREEN will be run for each emission unit for 24-hour PM_{10} and $PM_{2.5}$, as well as 1-hour NO_2. This includes the two CHP engines and the two natural gas-fired boilers. The fire pump and standby generator will not be modeled because they are considered intermittent sources. The model results from each unit will be summed together (i.e., the sum of all four units) to determine the total predicted impacts for each pollutant. The total predicted impacts will be compared to the relevant SILs, as well as the relevant NAAQS once added to background concentrations. Note that the AERSCREEN results will be the same for 24-hour PM_{10} and $PM_{2.5}$ because the stack parameters and input assumptions are the same for both pollutants.

Domain and Receptors

The NG2 facility site, within which the physical plant and associated equipment are located, is considered the domain for this modeling procedure. The site itself is an approximately 38-acre plot in the SE quarter of Section 13 of Township 152N Range 90W in Mountrail County, North Dakota. The decimal coordinates of the physical plant (not quite the centroid) are 47.979877, -102.134883.

Per AERSCREEN default settings, receptors will begin at the source, since workers at the facility will be near the physical plant at times, and will extend out a default 5000 meters with 25-meter spacing.

Buildings, Stack Parameters, and Downwash

Buildings and building downwash will not be considered or used in AERSCREEN for this project.

Background Concentrations

Area background concentrations of criteria pollutants are not currently being considered since this is a rural site surrounded by field agriculture. However, if the predicted concentrations in the AERSCREEN output are above the Significant Impact Levels (SILs), then a representative background concentration will be considered in the analysis to account for any nearby sources.

Based on EPA's monitoring data, the average 24-hour $PM_{2.5}$ and PM_{10} and 1-hour NO_2 design values (from 2017-2019) in the area are approximately 16.8 $\mu g/m^3$, 51.6 $\mu g/m^3$, and 22.4 $\mu g/m^3$, respectively. This is based on data collected at monitoring sites at Lostwood (38-013-0004), Lake Ilo (38-025-0004), TRNP (38-053-0002), and Ryder (38-01-0003).

Meteorology

Though specific local meteorological data will not be provided for the AERSCREEN modeling simulation, the MAKEMET program will be utilized to generate an area-specific matrix of meteorological conditions. This configuration will include:

- Default maximum temperature of 100°F and an adjusted minimum temperature of -40°F.
- Default wind speed of 0.5 m/s and an anemometer height of 10 m will be assumed in the modeling.
- AERMET seasonal tables for surface characteristics using Grassland as the most representative surface option.
- Dominant climate profile of "Dry Conditions".
- No adjustment of variable u*, since the project does not align with conditions for using this option.

1-hour NO_2 Assumptions

For the 1-hour NO_2 AERSCREEN simulations, the following assumptions will be used to account for the NOx chemistry:

- Use of the ozone limiting method (OLM).
- An in-stack NO_2/NOx ratio of 0.5, which is based on EPA's national default ratio.
- An ambient ozone background concentration of 59.8 parts per billion, which is the average design value (2017-2019) for this area from data collected at monitoring sites at Lostwood (38-013-0004), Lake Ilo (38-025-0004), TRNP (38-053-0002), and Ryder (38-01-0003).

Air Quality Model System

EPA's AERSCREEN modeling system will be utilized to produce estimates of worst-case 1-hr concentrations for a single source. This is a high-level screening model, and does not require hourly meteorological data to produce concentration estimates that are equal to or greater than those simulated in AERMOD (which requires meteorological and terrain data). Therefore, this is a conservative simulation that is run to determine whether greater scrutiny – and more sophisticated modeling – is necessary to assess pollutants' concentration compared to SILs and NAAQS.

Version 16216 from 2016 is the latest AERSCREEN release, and will be used to model emissions the NG2 project. The model is based on EPA's AERMOD program and consists of two main components: the MAKEMET program which generates a site-specific matrix of meteorological conditions, and the AERSCREEN command-prompt interface program.

Beyond these two main components, AERSCREEN also interfaces with AERMAP and BPIPPRM to automate the processing of terrain and building information, respectively. Therefore, even though

AERSCREEN is meant as a simplistic model, significant building and terrain morphology can be input to ensure a reasonable level of concentration prediction.

Since the model is meant to be screening-level and conservative, AERSCREEN forces the maximum concentration of a contaminant plume (i.e., the plume centerline) in all directions regardless of the orientation of the source, receptors, or wind. This represents the worst-case scenario, and means that if pollutant SILs or NAAQS thresholds are not exceeded in AERSCREEN, then they do not need to be further investigated in AERMOD or other programs.

Documentation of AQIA Results

The results of AERSCREEN modeling were used to compare pollutant concentrations to relevant SILs and NAAQS. The maximum model results were used based on maximum emissions in lbs/hr, and the distance where those maximum impacts were located is shown in the output report. All input and output files for the AERSCREEN model will be included in the NSR permit application.

The following table has been completed with model results and will be included in the NEW permit application for the NG2 project. Note that the modeling did not predict any violation of NAAQS, and shows that emissions from the sources will not contribute to NAAQS violations or adverse impacts to air quality.

AERSCREEN AQIA

Pollutant	Averaging Period	Predicted Concentration [µg/m³]				Background Concentration [µg/m³]	Total Concentration [µg/m³]	Standard or Threshold [µg/m³]	Percent of Standard or Threshold [%]	Distance to Maximum Predicted Impact [m]
		P-CHP-1	P-CHP-2	P-BLR-2	P-BLR-3					
$PM_{2.5}$	24-hour SIL	1.941	1.941	1.485	1.485	NA	6.852	1.2	571%	151/82
	24-hour NAAQS	1.941	1.941	1.485	1.485	16.8	23.652	35	67.6%	151/82
PM_{10}	24-hour SIL	1.941	1.941	1.485	1.485	NA	6.852	5	137%	151/82
	24-hour NAAQS	1.941	1.941	1.485	1.485	51.6	58.452	150	38.9%	151/82
NO_2	1-hour SIL	1.514	1.514	14.85	14.85	NA	32.728	7.5	436%	151/82
	1-hour NAAQS	1.514	1.514	14.85	14.85	22.4	55.128	188	29.3%	151/82

Endangered Species Act

According to the US Fish and Wildlife Service's (US FWS) database of listed threatened and endangered species, the NG2 project is located within the habitat range of the following species:

Scientific Name	Common Name	Where Listed	Region	ESA Listing Status
Charadrius melodus	Piping Plover	[Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered.	5	Threatened
Calidris canutus rufa	Red knot	Wherever found	5	Threatened
Grus americana	Whooping crane	Wherever found, except where listed as an experimental population	2	Endangered
Scaphirhynchus albus	Pallid sturgeon	Wherever found (habitat does not coincide with NG2 site)	6	Endangered
Platanthera praeclara	Western prairie fringed Orchid	Wherever found (habitat does not coincide with NG2 site)	3	Threatened
Hesperia dacotae	Dakota Skipper	Wherever found (habitat does not coincide with NG2 site)	3	Threatened
Oarisma poweshiek	Poweshiek skipperling	Wherever found (habitat does not coincide with NG2 site)	3	Endangered
Myotis septentrionalis	Northern Long-Eared Bat	Wherever found	3	Threatened

National Historic Preservation Act

See the following page for correspondence MHA Nation's Tribal Historic Preservation Office (THPO) indicating that a Class I and II cultural resources survey of the Area of Potential Effect (APE) has been performed. THPO found that the land had been previously disturbed and advises the project managers to alert THPO as soon as possible if any cultural artifacts or remains are unearthed.

Form NEW Attachments

The following documentation is provided as supporting information per section D. Attachments, listed in Form NEW.

Narrative Description of Process

Process Flow

The project being permitted (NG2) will be a greenhouse agriculture facility, with 3.35 acres of climate-controlled growing space for various fruits and vegetables. Power will be provided by grid electricity and two combined heat and power (CHP) engines, only one of which will be built during the first construction phase. Heat will be provided by the CHP engines, as well as one electric boiler and two gas-fired boilers for backup. For safety and emergency considerations, a diesel-powered fire pump and standby generator will be situated on site, though they do not otherwise fit into the process of heating and powering the greenhouse.

There are no "raw materials" as such, since the greenhouse is not necessarily a manufacturing facility. The only means of producing emissions on site is through combustion of fossil fuels, namely utility-grade natural gas and No. 2 diesel fuel. Generated heat is used to keep the greenhouses at an appropriate temperature for plant growth during colder months, and electricity is used at the facility for lighting and equipment operation. Excess electricity, expected over summer operation, will be sold back to the utility grid.

Refer to the attached process flow diagram (PFD) for the following process narrative:

- For natural gas-powered equipment:
  - Natural gas will be delivered to the NG2 site either by gathering pipelines or compressed gas tube trailers. The gas will either go directly to the CHPs and boilers (if from the pipeline) or to a set of 84 gas storage vessels (147 at full buildout, Phase 3). Gas from the storage system goes through a pressure reduction system to then feed the boilers or CHP engines.
  - Boilers
    - Gas combusted in the two backup boilers will heat water in a heating loop. Hot water (190°F) is then sent to a hot water storage tank or the greenhouse heating system based on the required thermal input.
    - Water is returned to the hot water storage tank or heating loop at 140-185°F, with a side loop to the ancillary buildings that can be bypassed.
  - CHP engines
    - Gas combusted in each CHP engine – only one of which will be built in Phase 1 – powers its associated generator to produce 2,000 kWe of electricity for use in powering and lighting the NG2 facility.
    - Heat from both the high-temperature engine jacket water and exhaust gas is captured via heat exchangers and used to power the same heating loop that the boilers are connected to. This hot water, also at 190°F, can be sent to the greenhouse or hot water storage tank, depending on the required thermal input.
    - As with the boilers, cooler water is sent back to the loop or storage tank at 140-185°F, with a side loop to the ancillary buildings that can be bypassed.

        - When the greenhouse does not need to be heated, the CHP engine will instead send heat to a waste heat radiator rated at 7.6 MMBtu/hr.
        - The CHP has a low-temperature engine jacket as well, but since there is no use for low-grade heat at the NG2 facility, this will be sent to a dedicated radiator rated at 0.43 MMBtu/hr.
        - Exhaust from the CHP engine – produced at 734°F – is sent through a silencer and exhaust gas catalyst system, then a heat exchanger to recover more thermal energy. An additional condenser cools the gas down to 120°F.
        - Once the exhaust has been cooled and a majority of pollutants are removed, it is safe to send to the greenhouse where it will provide CO_2 to enhance plant growth. An exhaust stack vents the majority of the stream to the atmosphere, while a CO_2 supply valve and blower direct an appropriate amount of gas to the greenhouses, likely just under 13,000 cubic feet per minute at 6% CO_2.
        - The second CHP engine, not slated for construction until Phase 3 (likely 2023) will operate in the same way as the initial engine.
    - Diesel-powered equipment
        - The fire pump and standby generator are not shown on the PFD because they do not contribute to the overall greenhouse operation process.
        - The diesel fire pump will only be used in a fire emergency to pressurize stored water and send it to sprinklers in the ancillary buildings.
        - The standby generator is only intended to be used when the natural gas and power grids are down *and* the CHP engine is out of service. Then, it will be used to power the electric boiler (shown on the PFD) while gas from onsite storage will be used for the natural gas boilers to keep the greenhouse warm.

Proposed Operating Schedule

[Is this literally just the same content as in the other section of this name?]

Fuel and Raw Materials Usage

[Is this just the same as the other two similarly named sections?]

Process Flow Diagram

See attached process flow diagram (PFD). Note that the fire pump and standby generator are not included in the PFD because they are not part of the greenhouse heating loop.

Proposed Emission Units

The NG2 greenhouse will be powered by both grid electricity and site-generated electricity from two CHP engines at full build-out. Heat will also be provided by the CHP engines, as well as two natural gas-fired boilers and an electric boiler. In addition to heat and power generating equipment, emissions are also expected from a fire pump and standby generator.

CHP Engines

The two natural gas-powered CHP engines will be installed in phases, with only one being installed during initial buildout. The second will not be installed until Phase 3, which will begin in 2023 at the earliest. These systems will provide both electricity and heat (recovered from exhaust and the engine), as well as CO_2 from scrubbed exhaust gas that will be pumped to the greenhouse to enhance plant growth. All exhaust gas will pass through a multi-stage catalyst unit (COdiNOx). This means that the exhaust emissions will be much lower than if this catalytic system was not used. The exhaust catalytic system cannot be bypassed while the engine is running.

The first CHP engine that will be installed and operated is a Cummins model C2000 N6CD rated for 2000 kW of electric power and 7.2 million BTU per hour (MMBTU/hr) of heat. The second engine will likely be the same model, but will not be purchased until later (approximately 2023).

The engines will be run at full load approximately 50% of the year (4,380 hours per year), since the electric boiler will be used during times when Western Area Power Administration (WAPA) power rates are low. Of this run time, the engines are expected to have a 95% uptime, for a total annual operation of 4,161 hours per year. However, no operating limits are being requested for the CHP engines.

Boilers

Apart from the electric boiler, which does not produce exhaust, the physical plant will house two natural gas-fired boilers. These will serve as backup boilers during Phase 1, in the rare event that both the electric boiler and CHP system are out of service. In later phases, they will provide supplemental and backup heat to the additional greenhouse acreage. The natural gas will be provided through agreements with local oil & gas operators and will be trucked and/or piped to the site and stored in compressed gas cylinders until needed.

Both boilers are Cleaver Brooks model FLX-700-1200-160HW (460/3/60)-SPC/CFG, rated at 9,600 MMBTU/hr each. They are expected to be used less than 500 hours per year each, but no operating limits are being requested.

Fire Pump

To ensure fire safety at the NG2 facility, a diesel fire pump is specified for reliable and quick response during a fire emergency. Though a pump has not yet been selected, it is likely to be a Cummins model CFP5E-F40 or similar. This is a 123-hp engine that consumes 6.3 gallons of No. 2 diesel fuel per hour at maximum load. Since this pump is only needed during emergencies, it is expected to be used less than 50 hours per year, though a more conservative operating limit of 500 hours per year is being requested.

Standby Generator

In the rare event that grid electricity is unavailable and the CHP engines are down at the same time (or cannot receive natural gas), a standby generator will be supplied to ensure loss of power does not result in loss of crops. This unit has not yet been purchased, but will likely be a Cummins model DQCB or similar. This is a 680 kW unit that consumes 48 gallons of diesel per hour at full load. As with the fire pump, this should only be used in extreme scenarios, so its use is estimated at less than 100 hours per year. No operating limits are being requested since EPA policy assumes that emergency generators are run for 500 hours per year.

Fuel Storage Tanks

Natural gas will be delivered to the NG2 site via gathering pipeline or compressed gas tube trailers, then either sent directly to the CHPs and boilers or stored in a bank of 84 compressed gas vessels. At full buildout after Phase 3, this bank is expected to include 147 vessels. The maximum gas storage capacity will be 19,048 cubic feet per vessel, stored at 4500 psig. This equates to a total storage capacity of 1.6 million cubic feet (MMCF) at Phase 1, and 2.8 MMCF at Phase 3.

Throughput is unknown at this time, but will not be more than 147,864 MMCF per year, which is the total consumption of the two CHPs and two boilers under full load for 95% of the year. This is a very unlikely situation, but represents a conservative upper bound of throughput.

Fuel Usage

The natural gas-fired equipment (CHPs and boilers) will require utility-grade natural gas, which will be delivered by gathering pipeline and compressed gas tube trailers. Composition is not yet confirmed, but is expected to contain negligible sulfur (<100 ppm H_2S), no natural gas liquids, and minimal components other than methane, with a higher heating value (HHV) of 1,020 Btu/scf. Based on the maximum consumption rate of the two CHPs and two gas-fired boilers at full load, operating all year at 95% up time, a total of 147,864 million cubic feet (MMCF) of natural gas may be used at the NG2 facility per year, averaging at 405 MMCF per day. The actual volume will be significantly lower since the CHPs are only expected to run 50% of the time, and the boilers are only meant as backup during extreme cold.

The diesel equipment will run on No. 2 diesel, with a conservatively estimated sulfur content of 4000 ppm. The actual sulfur content may be less, but this upper bound was used for calculating potential to emit. Based on the operating limits being requested for the fire pump and standby generator, a maximum of 27,150 gallons per year will be consumed, or an average of 74 gallons per day. Neither rates represent the likely real-world throughput, since both are emergency equipment that are likely to not be used in a given year.

Materials Usage

Type and quantity of raw materials and final product

Other than fuel, the only other materials involved in the heating and power processes of the NG2 project are makeup water for the heating loop and exhaust catalyst. The catalyst system (COdiNOx) requires urea for pollution control. The urea is stored in a 265-gallon tank, and the expected usage will be up to 175,200 liters per year, 480 liters per day, and 20 liters per hour per CHP engine.

The greenhouse growing operation will require input materials such as growing medium and fertilizer, and will produce edible produce and plant waste as outputs, but none of these are relevant to the emissions producing equipment of the facility.

Proposed Operating Schedule

The NG2 greenhouse facility will be staffed during typical business hours on weekdays, but the facility will be powered and/or heated at all times. Therefore, the equipment detailed in this permit application will run on the following schedules:

- CHP engines are planned to be operated only 50% of the year with an estimated 95% uptime. An electric boiler will be used to heat the greenhouse when electric rates are inexpensive due to pricing from the Western Area Power Administration (WAPA). However, no operating limits are being requested for the CHP engines, which will provide flexibility if the operating protocol needs to change.
- The natural gas-fired boilers are only planned on being used for less than 1,000 hours per year each. These are essentially backup boilers, and are only meant as supplemental heating in Phase 1 for when the CHP is in use during extreme cold temperatures. As with the CHP engines, no operating limits are being requested to allow for potential operational flexibility.
- The diesel fire pump is only meant for fire emergencies, and therefore is not meant to operate on any predictable schedule. Usage is conservatively estimated at 50 hours per year, but an operating limit of 500 hours per year is requested to allow for operational flexibility; for example, if fire training were to require the use of the pump.
- The standby generator is also only meant for use in emergencies; specifically, when the CHP is out of service and when the natural gas and the electricity grid are unavailable. Usage has been conservatively estimated at 100 hours per year, but an operating limit of 500 hours per year will be used per EPA policy on emergency generators.

Proposed Emission Controls, Limits, and Monitoring

Emissions control for the CHP engines will consist of a catalytic exhaust system (COdiNOx) specifically designed for use with greenhouses. Manufacturer-provided pollutant concentrations for post-catalyst exhaust indicate that concentrations of nitrogen oxides and carbon monoxide are greatly reduced to 5 and 50 parts per million (ppm), respectively. There is no data on post-catalyst concentrations of other criteria pollutants, but it can be assumed that VOCs, SO_2, and PM are greatly reduced since the exhaust will be sent to an active working environment. Manufacturer literature for the COdiNOx system is included later in this file.

Exhaust from the CHP engine passes through a series of beds and filters to remove pollutants: an oxidation catalyst, two selective catalytic reduction beds, a final double layer of oxidation catalyst, then a heat exchanger for thermal energy recovery. The exhaust is then conveyed to the greenhouse to enhance plant growth by increasing CO_2 concentrations to around 1000 ppm. The greenhouse must be safe for workers, so gas detectors in the catalyst system and around the greenhouse monitor for any potential hazards. The CHP system is hardwired such that, if the catalyst system is out of commission, the engine itself will shut down.

The rest of the emitting equipment will not have controls on emissions other than requested operating limits (fire pump) and stacks to direct exhaust upward.

Criteria Pollutant Emissions

The site on which the NG2 project will be constructed is currently under cultivation for conventional grain agriculture, and therefore does not have any fixed sources of emissions. All sources will be new, and are presented in the following tables based on the project's potential to emit (PTE; i.e., maximum possible emissions) and proposed allowable emissions, which factor in expected uptime and operating limits (500 hrs/yr for the fire pump).

Pollutant	PTE – lbs/hr	PTE – tons/yr	Emission Factor source[3]
Combined Heat and Power Engines (each)			
NO_x (post catalyst)	0.13	0.56	Manufacturer data
VOCs	3.53	15.44	Manufacturer data
CO (post catalyst)	1.28	5.60	Manufacturer data
SO_2[1]	0.009	0.040	AP-42, Table 3.2-2
PM_{10}[1,2]	0.25	1.08	Manufacturer data
$PM_{2.5}$[1,2]	0.25	1.08	Manufacturer data
Total HAPs[1]	1.43	6.25	AP-42, Table 3.2-2
Natural Gas-Fired Boilers (each)			
NO_x	1.40	6.13	Manufacturer data
VOCs	0.052	0.23	Manufacturer data
CO	1.35	5.91	Manufacturer data
SO_2	0.071	0.037	Manufacturer data
PM_{10}[2]	0.21	0.92	Manufacturer data
$PM_{2.5}$[2]	0.21	0.92	Manufacturer data
Total HAPs	0.022	0.097	AP-42, Table 1.4-3
Fire Pump[4]			
NO_x	0.75	3.28	Manufacturer data
VOCs	0.020	0.089	Manufacturer data
CO	0.19	0.82	Manufacturer data
SO_2	0.25	1.10	AP-42, Table 3.3-1
$PM_{2.5}$[5]	0.027	0.12	Manufacturer data
PM_{10}[5]	0.027	0.12	Manufacturer data
Total HAPs	0.0033	0.015	AP-42, Table 3.3-1
Standby Generator			
NO_x	28.25	7.06	AP-42, Table 3.3-1
VOCs (as aldehydes)	0.42	0.11	AP-42, Table 3.3-1
CO	6.09	1.52	AP-42, Table 3.3-1
SO_2	1.87	0.47	AP-42, Table 3.3-1
PM_{10}	2.00	0.50	AP-42, Table 3.3-1
Total HAPs	0.025	0.0063	AP-42, Table 3.3-1

Notes:

1. Post-catalyst numbers not available for VOCs, SO_2, PM, and HAPs. All are likely much lower than the emission rates used, so these are conservative estimates.
2. PM_{10} and $PM_{2.5}$ are total values: filterable and condensable.

3. Where manufacturer information is available, it is used to calculate emissions instead of emissions factors from EPA AP-42.
4. Fuel is assumed to have 300-4000 ppm sulfur, as a conservative estimate.
5. Particulate emissions factors for fire pump are only given as generic PM, so this is conservatively used to estimate both $PM_{2.5}$ and PM_{10} as if the factors applied to both of them separately.

Proposed allowable emissions are only different from annual PTE, while short term emissions (lbs/hr) are the same regardless of percent uptime or requested operating limits.

Emission Unit	Proposed Allowable Emissions, tons per year							Limit Requested
	NO_x	VOCs	CO	SO_2	PM_{10}	$PM_{2.5}$	HAPs	
P-CHP-1	5.60	14.7	5.32	0.038	1.03	1.03	5.94	None
P-CHP-2	0.53	14.7	5.32	0.038	1.03	1.03	5.94	
P-BLR-2 (boiler)	0.24	0.088	0.23	0.0014	0.036	0.036	0.0038	
P-BLR-3 (boiler)	0.24	0.088	0.23	0.0014	0.036	0.036	0.0038	
P-Fire-1 (fire pump)	0.019	5.1E-04	0.0047	0.0063	6.8E-04	5.1E-04	8.3E-05	500 hrs/yr
P-GEN-1 (generator)	0.081	0.0012	0.017	0.0053	0.0057	N/A	7.2E-05	500 hrs/yr (EPA policy)

In order to calculate the above emissions rates for the new equipment, the following emission factors were utilized. Manufacturer data was available for many of the criteria pollutants from the equipment, and was used in lieu of EPA AP-42 factors where available. Italics indicate where emission factors used were manufacturer-provided.

Pollutant	Emission Factor by Equipment			
	CHP	Boiler	Fire Pump	Generator
NO_x	*5.0 ppm, post catalyst*	*0.117 lb/MMBtu*	*2.759 g/hp-hr*	0.031 lb/hp-hr
VOC	*0.570 g/hp-hr*	*0.004 lb/MMBtu*	*0.075 g/hp-hr*	4.63E-04 lb/hp-hr
CO	*50 ppm, post catalyst*	*0.112 lb/MMBtu*	*0.694 g/hp-hr*	6.68E-03 lb/hp-hr
SO_2	5.88E-04 lb/MMBtu	*0.0007 lb/MMBtu*	2.05E-03 lb/hp-hr	2.05E-03 lb/hp-hr
PM_{10}	0.040 g/hp-hr	*0.018 lb/MMBtu*	*0.100 g/hp-hr*	2.20E-03 lb/hp-hr
$PM_{2.5}$	0.040 g/hp-hr	*0.018 lb/MMBtu*	*0.100 g/hp-hr*	N/A
Hazardous Air Pollutants (HAPs), all in lb/MMBtu				
1,3-Butadiene			3.91E-05	3.91E-05
2-Methylnaphthalene		2.35E-08		
3-Methylchloranthrene		1.76E-09		
7,12-Dimethylbenz(a)anthracene		1.57E-08		

Acenaphthene	5.53E-06	1.76E-09	5.06E-06	5.06E-06
Acenaphthylene		1.76E-09		
Acetaldehyde	8.36E-03		7.67E-04	7.67E-04
Acrolein	5.14E-03		9.25E-05	9.25E-05
Anthracene		2.35E-09	1.87E-06	1.87E-06
Benzene	4.40E-04	2.06E-06	9.33E-04	9.33E-04
Benzo(a)anthracene		1.76E-09	1.68E-06	1.68E-06
Benzo(a)pyrene		1.18E-09		
Benzo(b)fluoranthene	1.66E-07	1.76E-09	1.55E-07	1.55E-07
Benzo(e)pyrene	4.15E-07			
Benzo(g,h,i)perylene	4.14E-07	1.18E-09	4.89E-07	4.89E-07
Benzo(k)fluoranthene		1.76E-09	1.55E-07	1.55E-07
Biphenyl	2.12E-04			
Carbon Tetrachloride	3.67E-05			
Chlorobenzene	3.04E-05			
Chloroform	2.85E-05			
Chrysene	6.93E-07	1.76E-09	3.53E-07	3.53E-07
Dibenzo(a,h)anthracene		1.18E-09	5.83E-07	5.83E-07
Dichlorobenzene		1.18E-06		
Ethylbenzene	3.97E-05			
Ethylene Dibromide	4.43E-05			
Fluoranthene	1.11E-06	2.94E-09	7.61E-06	7.61E-06
Fluorene	5.67E-06	2.75E-09	2.92E-05	2.92E-05
Formaldehyde	*1.80E-01*	7.35E-05	1.18E-03	1.18E-03
Indeno(1,2,3-cd)pyrene		1.76E-09	3.75E-07	3.75E-07
Methanol	2.50E-03			
Methylene Chloride	1.23E-03			
n-Hexane	1.11E-03	1.76E-03		
Naphthalene	7.44E-05	5.98E-07	8.48E-05	8.48E-05
PAHs	2.69E-05			
Phenanthrene	1.04E-05	1.67E-08	2.94E-05	2.94E-05
Phenol	2.40E-05			
Pyrene	1.36E-06	4.90E-09	4.78E-06	4.78E-06
Styrene	2.36E-05			
Tetrachloroethane	2.48E-06			
Toluene	4.08E-04	3.33E-06	4.09E-04	4.09E-04
Vinyl Chloride	1.49E-05			
Xylenes	1.84E-04		2.85E-04	2.85E-04

Finally, the following equations were utilized to calculate both potential to emit (PTE) and proposed allowable emissions.

$$Emission\ Rate\ \left(\frac{lbs}{hr}\right) = Emission\ Factor\ \left(\frac{lb}{MMscf}\right) * \left(1\,\frac{MMscf}{1020\ MMBtu}\right) * Heat\ Input\ \left(\frac{MMBtu}{hr}\right)$$

$$Emission\ Rate\ \left(\frac{lbs}{hr}\right) = Emission\ Factor\ \left(\frac{g}{hp * hr}\right) * Power\ (hp) * \frac{1\ lb}{453.592\ g}$$

$$Emission\ Rate\ \left(\frac{lbs}{hr}\right) = \frac{Emission\ Factor\ (ppm)}{1{,}000{,}000\ lbs\ exhaust} * Gas\ flow\ \left(\frac{lbs}{hr}\right)$$

$$Emission\ Rate\ \left(\frac{tons}{yr}\right) = Emissions\ \left(\frac{lbs}{hr}\right) * 8760\ \left(\frac{hrs}{yr}\right) \div 2000 \left(\frac{lbs}{ton}\right) * \%\ Uptime * \%\ Usage$$

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The approved Modeling Protocol and results of AERSCREEN modeling for the NG2 project are included in this file, starting on the next page.

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According to the US Fish and Wildlife Service's (US FWS) database of listed threatened and endangered species, the NG2 project is located within the habitat range of the following species:

Scientific Name	Common Name	Where Listed	Region	ESA Listing Status
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Calidris canutus rufa	Red knot	Wherever found	5	Threatened
Grus americana	Whooping crane	Wherever found, except where listed as an experimental population	2	Endangered
Scaphirhynchus albus	Pallid sturgeon	Wherever found (habitat does not coincide with NG2 site)	6	Endangered
Platanthera praeclara	Western prairie fringed Orchid	Wherever found (habitat does not coincide with NG2 site)	3	Threatened
Hesperia dacotae	Dakota Skipper	Wherever found (habitat does not coincide with NG2 site)	3	Threatened
Oarisma poweshiek	Poweshiek skipperling	Wherever found (habitat does not coincide with NG2 site)	3	Endangered
Myotis septentrionalis	Northern Long-Eared Bat	Wherever found	3	Threatened

National Historic Preservation Act

See the following page for correspondence MHA Nation's Tribal Historic Preservation Office (THPO) indicating that a Class I and II cultural resources survey of the Area of Potential Effect (APE) has been performed. THPO found that the land had been previously disturbed and advises the project managers to alert THPO as soon as possible if any cultural artifacts or remains are unearthed.

Form NEW Attachments

The following information is provided as supporting information per section D. Attachments, listed in Form NEW.

Narrative Description of Process

Process Flow

The project being permitted (NG2) will be a greenhouse agriculture facility, with 3.35 acres of climate-controlled growing space for various fruits and vegetables. Power will be provided by grid electricity and two combined heat and power (CHP) engines, only one of which will be built during the first construction phase. Heat will be provided by the CHP engines, as well as one electric boiler and two gas-fired boilers for backup. For safety and emergency considerations, a diesel-powered fire pump and standby generator will be situated on site, though they do not otherwise fit into the process of heating and powering the greenhouse.

There are no "raw materials" as such, since the greenhouse is not necessarily a manufacturing facility. The only means of producing emissions on site is through combustion of fossil fuels, namely utility-grade natural gas and No. 2 diesel fuel. Generated heat is used to keep the greenhouses at an appropriate temperature for plant growth during colder months, and electricity is used at the facility for lighting and equipment operation. Excess electricity, expected over summer operation, will be sold back to the utility grid.

Refer to the attached process flow diagram (PFD) for the following process narrative:

- For natural gas-powered equipment:
  - Natural gas will be delivered to the NG2 site either by gathering pipelines or compressed gas tube trailers. The gas will either go directly to the CHPs and boilers (if from the pipeline) or to a set of 84 gas storage vessels (147 at full buildout, Phase 3). Gas from the storage system goes through a pressure reduction system to then feed the boilers or CHP engines.
  - Boilers
    - Gas combusted in the two backup boilers will heat water in a heating loop. Hot water (190°F) is then sent to a hot water storage tank or the greenhouse heating system based on the required thermal input.
    - Water is returned to the hot water storage tank or heating loop at 140-185°F, with a side loop to the ancillary buildings that can be bypassed.
  - CHP engines
    - Gas combusted in each CHP engine – only one of which will be built in Phase 1 – powers its associated generator to produce 2,000 kWe of electricity for use in powering and lighting the NG2 facility.
    - Heat from both the high-temperature engine jacket water and exhaust gas is captured via heat exchangers and used to power the same heating loop that the boilers are connected to. This hot water, also at 190°F, can be sent to the greenhouse or hot water storage tank, depending on the required thermal input.
    - As with the boilers, cooler water is sent back to the loop or storage tank at 140-185°F, with a side loop to the ancillary buildings that can be bypassed.

    - When the greenhouse does not need to be heated, the CHP engine will instead send heat to a waste heat radiator rated at 7.6 MMBtu/hr.
    - The CHP has a low-temperature engine jacket as well, but since there is no use for low-grade heat at the NG2 facility, this will be sent to a dedicated radiator rated at 0.43 MMBtu/hr.
    - Exhaust from the CHP engine – produced at 734°F – is sent through a silencer and exhaust gas catalyst system, then a heat exchanger to recover more thermal energy. An additional condenser cools the gas down to 120°F.
    - Once the exhaust has been cooled and a majority of pollutants are removed, it is safe to send to the greenhouse where it will provide CO_2 to enhance plant growth. An exhaust stack vents the majority of the stream to the atmosphere, while a CO_2 supply valve and blower direct an appropriate amount of gas to the greenhouses, likely just under 13,000 cubic feet per minute at 6% CO_2.
    - The second CHP engine, not slated for construction until Phase 3 (likely 2023) will operate in the same way as the initial engine.
  - Diesel-powered equipment
    - The fire pump and standby generator are not shown on the PFD because they do not contribute to the overall greenhouse operation process.
    - The diesel fire pump will only be used in a fire emergency to pressurize stored water and send it to sprinklers in the ancillary buildings.
    - The standby generator is only intended to be used when the natural gas and power grids are down *and* the CHP engine is out of service. Then, it will be used to power the electric boiler (shown on the PFD) while gas from onsite storage will be used for the natural gas boilers to keep the greenhouse warm.

Proposed Operating Schedule

[Is this literally just the same content as in the other section of this name?]

Fuel and Raw Materials Usage

[Is this just the same as the other two similarly named sections?]

Process Flow Diagram

See attached process flow diagram (PFD). Note that the fire pump and standby generator are not included in the PFD because they are not part of the greenhouse heating loop.

Proposed Emission Units

The NG2 greenhouse will be powered by both grid electricity and site-generated electricity from two CHP engines at full build-out. Heat will also be provided by the CHP engines, as well as two natural gas-fired boilers and an electric boiler. In addition to heat and power generating equipment, emissions are also expected from a fire pump and standby generator.

CHP Engines

The two natural gas-powered CHP engines will be installed in phases, with only one being installed during initial buildout. The second will not be installed until Phase 3, which will begin in 2023 at the earliest. These systems will provide both electricity and heat (recovered from exhaust and the engine), as well as CO_2 from scrubbed exhaust gas that will be pumped to the greenhouse to enhance plant growth. All exhaust gas will pass through a multi-stage catalyst unit (COdiNOx). This means that the exhaust emissions will be much lower than if this catalytic system was not used. The exhaust catalytic system cannot be bypassed while the engine is running.

The first CHP engine that will be installed and operated is a Cummins model C2000 N6CD rated for 2000 kW of electric power and 7.2 million BTU per hour (MMBTU/hr) of heat. The second engine will likely be the same model, but will not be purchased until later (approximately 2023).

The engines will be run at full load approximately 50% of the year (4,380 hours per year), since the electric boiler will be used during times when Western Area Power Administration (WAPA) power rates are low. Of this run time, the engines are expected to have a 95% uptime, for a total annual operation of 4,161 hours per year. However, no operating limits are being requested for the CHP engines.

Boilers

Apart from the electric boiler, which does not produce exhaust, the physical plant will house two natural gas-fired boilers. These will serve as backup boilers during Phase 1, in the rare event that both the electric boiler and CHP system are out of service. In later phases, they will provide supplemental and backup heat to the additional greenhouse acreage. The natural gas will be provided through agreements with local oil & gas operators and will be trucked and/or piped to the site and stored in compressed gas cylinders until needed.

Both boilers are Cleaver Brooks model FLX-700-1200-160HW (460/3/60)-SPC/CFG, rated at 9,600 MMBTU/hr each. They are expected to be used less than 500 hours per year each, but no operating limits are being requested.

Fire Pump

To ensure fire safety at the NG2 facility, a diesel fire pump is specified for reliable and quick response during a fire emergency. Though a pump has not yet been selected, it is likely to be a Cummins model CFP5E-F40 or similar. This is a 123-hp engine that consumes 6.3 gallons of No. 2 diesel fuel per hour at maximum load. Since this pump is only needed during emergencies, it is expected to be used less than 50 hours per year, though a more conservative operating limit of 500 hours per year is being requested.

Standby Generator

In the rare event that grid electricity is unavailable and the CHP engines are down at the same time (or cannot receive natural gas), a standby generator will be supplied to ensure loss of power does not result in loss of crops. This unit has not yet been purchased, but will likely be a Cummins model DQCB or similar. This is a 680 kW unit that consumes 48 gallons of diesel per hour at full load. As with the fire pump, this should only be used in extreme scenarios, so its use is estimated at less than 100 hours per year. No operating limits are being requested since EPA policy assumes that emergency generators are run for 500 hours per year.

Fuel Storage Tanks

Natural gas will be delivered to the NG2 site via gathering pipeline or compressed gas tube trailers, then either sent directly to the CHPs and boilers or stored in a bank of 84 compressed gas vessels. At full buildout after Phase 3, this bank is expected to include 147 vessels. The maximum gas storage capacity will be 19,048 cubic feet per vessel, stored at 4500 psig. This equates to a total storage capacity of 1.6 million cubic feet (MMCF) at Phase 1, and 2.8 MMCF at Phase 3.

Throughput is unknown at this time, but will not be more than 147,864 MMCF per year, which is the total consumption of the two CHPs and two boilers under full load for 95% of the year. This is a very unlikely situation, but represents a conservative upper bound of throughput.

Fuel Usage

The natural gas-fired equipment (CHPs and boilers) will require utility-grade natural gas, which will be delivered by gathering pipeline and compressed gas tube trailers. Composition is not yet confirmed, but is expected to contain negligible sulfur (<100 ppm H_2S), no natural gas liquids, and minimal components other than methane, with a higher heating value (HHV) of 1,020 Btu/scf. Based on the maximum consumption rate of the two CHPs and two gas-fired boilers at full load, operating all year at 95% up time, a total of 147,864 million cubic feet (MMCF) of natural gas may be used at the NG2 facility per year, averaging at 405 MMCF per day. The actual volume will be significantly lower since the CHPs are only expected to run 50% of the time, and the boilers are only meant as backup during extreme cold.

The diesel equipment will run on No. 2 diesel, with a conservatively estimated sulfur content of 4000 ppm. The actual sulfur content may be less, but this upper bound was used for calculating potential to emit. Based on the operating limits being requested for the fire pump and standby generator, a maximum of 27,150 gallons per year will be consumed, or an average of 74 gallons per day. Neither rates represent the likely real-world throughput, since both are emergency equipment that are likely to not be used in a given year.

Materials Usage

Type and quantity of raw materials and final product

Other than fuel, the only other materials involved in the heating and power processes of the NG2 project are makeup water for the heating loop and exhaust catalyst. The catalyst system (COdiNOx) requires urea for pollution control. The urea is stored in a 265-gallon tank, and the expected usage will be up to 175,200 liters per year, 480 liters per day, and 20 liters per hour per CHP engine.

The greenhouse growing operation will require input materials such as growing medium and fertilizer, and will produce edible produce and plant waste as outputs, but none of these are relevant to the emissions producing equipment of the facility.

Proposed Operating Schedule

The NG2 greenhouse facility will be staffed during typical business hours on weekdays, but the facility will be powered and/or heated at all times. Therefore, the equipment detailed in this permit application will run on the following schedules:

- CHP engines are planned to be operated only 50% of the year with an estimated 95% uptime. An electric boiler will be used to heat the greenhouse when electric rates are inexpensive due to pricing from the Western Area Power Administration (WAPA). However, no operating limits are being requested for the CHP engines, which will provide flexibility if the operating protocol needs to change.
- The natural gas-fired boilers are only planned on being used for less than 1,000 hours per year each. These are essentially backup boilers, and are only meant as supplemental heating in Phase 1 for when the CHP is in use during extreme cold temperatures. As with the CHP engines, no operating limits are being requested to allow for potential operational flexibility.
- The diesel fire pump is only meant for fire emergencies, and therefore is not meant to operate on any predictable schedule. Usage is conservatively estimated at 50 hours per year, but an operating limit of 500 hours per year is requested to allow for operational flexibility; for example, if fire training were to require the use of the pump.
- The standby generator is also only meant for use in emergencies; specifically, when the CHP is out of service and when the natural gas and the electricity grid are unavailable. Usage has been conservatively estimated at 100 hours per year, but an operating limit of 500 hours per year will be used per EPA policy on emergency generators.

Proposed Emission Controls, Limits, and Monitoring

Emissions control for the CHP engines will consist of a catalytic exhaust system (COdiNOx) specifically designed for use with greenhouses. Manufacturer-provided pollutant concentrations for post-catalyst exhaust indicate that concentrations of nitrogen oxides and carbon monoxide are greatly reduced to 5 and 50 parts per million (ppm), respectively. There is no data on post-catalyst concentrations of other criteria pollutants, but it can be assumed that VOCs, SO_2, and PM are greatly reduced since the exhaust will be sent to an active working environment. Manufacturer literature for the COdiNOx system is included later in this file.

Exhaust from the CHP engine passes through a series of beds and filters to remove pollutants: an oxidation catalyst, two selective catalytic reduction beds, a final double layer of oxidation catalyst, then a heat exchanger for thermal energy recovery. The exhaust is then conveyed to the greenhouse to enhance plant growth by increasing CO_2 concentrations to around 1000 ppm. The greenhouse must be safe for workers, so gas detectors in the catalyst system and around the greenhouse monitor for any potential hazards. The CHP system is hardwired such that, if the catalyst system is out of commission, the engine itself will shut down.

The rest of the emitting equipment will not have controls on emissions other than requested operating limits (fire pump) and stacks to direct exhaust upward.

Criteria Pollutant Emissions

The site on which the NG2 project will be constructed is currently under cultivation for conventional grain agriculture, and therefore does not have any fixed sources of emissions. All sources will be new, and are presented in the following tables based on the project's potential to emit (PTE; i.e., maximum possible emissions) and proposed allowable emissions, which factor in expected uptime and operating limits (500 hrs/yr for the fire pump).

Pollutant	PTE – lbs/hr	PTE – tons/yr	Emission Factor source[3]
Combined Heat and Power Engines (each)			
NO_x (post catalyst)	0.13	0.56	Manufacturer data
VOCs	3.53	15.44	Manufacturer data
CO (post catalyst)	1.28	5.60	Manufacturer data
SO_2[1]	0.009	0.040	AP-42, Table 3.2-2
PM_{10}[1,2]	0.25	1.08	Manufacturer data
$PM_{2.5}$[1,2]	0.25	1.08	Manufacturer data
Total HAPs[1]	1.43	6.25	AP-42, Table 3.2-2
Natural Gas-Fired Boilers (each)			
NO_x	1.40	6.13	Manufacturer data
VOCs	0.052	0.23	Manufacturer data
CO	1.35	5.91	Manufacturer data
SO_2	0.071	0.037	Manufacturer data
PM_{10}[2]	0.21	0.92	Manufacturer data
$PM_{2.5}$[2]	0.21	0.92	Manufacturer data
Total HAPs	0.022	0.097	AP-42, Table 1.4-3
Fire Pump[4]			
NO_x	0.75	3.28	Manufacturer data
VOCs	0.020	0.089	Manufacturer data
CO	0.19	0.82	Manufacturer data
SO_2	0.25	1.10	AP-42, Table 3.3-1
$PM_{2.5}$[5]	0.027	0.12	Manufacturer data
PM_{10}[5]	0.027	0.12	Manufacturer data
Total HAPs	0.0033	0.015	AP-42, Table 3.3-1
Standby Generator			
NO_x	28.25	7.06	AP-42, Table 3.3-1
VOCs (as aldehydes)	0.42	0.11	AP-42, Table 3.3-1
CO	6.09	1.52	AP-42, Table 3.3-1
SO_2	1.87	0.47	AP-42, Table 3.3-1
PM_{10}	2.00	0.50	AP-42, Table 3.3-1
Total HAPs	0.025	0.0063	AP-42, Table 3.3-1

Notes:

1. Post-catalyst numbers not available for VOCs, SO_2, PM, and HAPs. All are likely much lower than the emission rates used, so these are conservative estimates.
2. PM_{10} and $PM_{2.5}$ are total values: filterable and condensable.

3. Where manufacturer information is available, it is used to calculate emissions instead of emissions factors from EPA AP-42.
4. Fuel is assumed to have 300-4000 ppm sulfur, as a conservative estimate.
5. Particulate emissions factors for fire pump are only given as generic PM, so this is conservatively used to estimate both $PM_{2.5}$ and PM_{10} as if the factors applied to both of them separately.

Proposed allowable emissions are only different from annual PTE, while short term emissions (lbs/hr) are the same regardless of percent uptime or requested operating limits.

Emission Unit	Proposed Allowable Emissions, tons per year							Limit Requested
	NO_x	VOCs	CO	SO_2	PM_{10}	$PM_{2.5}$	HAPs	
P-CHP-1	5.60	14.7	5.32	0.038	1.03	1.03	5.94	None
P-CHP-2	0.53	14.7	5.32	0.038	1.03	1.03	5.94	
P-BLR-2 (boiler)	0.24	0.088	0.23	0.0014	0.036	0.036	0.0038	
P-BLR-3 (boiler)	0.24	0.088	0.23	0.0014	0.036	0.036	0.0038	
P-Fire-1 (fire pump)	0.019	5.1E-04	0.0047	0.0063	6.8E-04	5.1E-04	8.3E-05	500 hrs/yr
P-GEN-1 (generator)	0.081	0.0012	0.017	0.0053	0.0057	N/A	7.2E-05	500 hrs/yr (EPA policy)

In order to calculate the above emissions rates for the new equipment, the following emission factors were utilized. Manufacturer data was available for many of the criteria pollutants from the equipment, and was used in lieu of EPA AP-42 factors where available. Italics indicate where emission factors used were manufacturer-provided.

Pollutant	Emission Factor by Equipment			
	CHP	Boiler	Fire Pump	Generator
NO_x	*5.0 ppm, post catalyst*	*0.117 lb/MMBtu*	*2.759 g/hp-hr*	0.031 lb/hp-hr
VOC	*0.570 g/hp-hr*	*0.004 lb/MMBtu*	*0.075 g/hp-hr*	4.63E-04 lb/hp-hr
CO	*50 ppm, post catalyst*	*0.112 lb/MMBtu*	*0.694 g/hp-hr*	6.68E-03 lb/hp-hr
SO_2	5.88E-04 lb/MMBtu	*0.0007 lb/MMBtu*	2.05E-03 lb/hp-hr	2.05E-03 lb/hp-hr
PM_{10}	0.040 g/hp-hr	*0.018 lb/MMBtu*	*0.100 g/hp-hr*	2.20E-03 lb/hp-hr
$PM_{2.5}$	0.040 g/hp-hr	*0.018 lb/MMBtu*	*0.100 g/hp-hr*	N/A
Hazardous Air Pollutants (HAPs), all in lb/MMBtu				
1,3-Butadiene			3.91E-05	3.91E-05
2-Methylnaphthalene		2.35E-08		
3-Methylchloranthrene		1.76E-09		
7,12-Dimethylbenz(a)anthracene		1.57E-08		

Acenaphthene	5.53E-06	1.76E-09	5.06E-06	5.06E-06
Acenaphthylene		1.76E-09		
Acetaldehyde	8.36E-03		7.67E-04	7.67E-04
Acrolein	5.14E-03		9.25E-05	9.25E-05
Anthracene		2.35E-09	1.87E-06	1.87E-06
Benzene	4.40E-04	2.06E-06	9.33E-04	9.33E-04
Benzo(a)anthracene		1.76E-09	1.68E-06	1.68E-06
Benzo(a)pyrene		1.18E-09		
Benzo(b)fluoranthene	1.66E-07	1.76E-09	1.55E-07	1.55E-07
Benzo(e)pyrene	4.15E-07			
Benzo(g,h,i)perylene	4.14E-07	1.18E-09	4.89E-07	4.89E-07
Benzo(k)fluoranthene		1.76E-09	1.55E-07	1.55E-07
Biphenyl	2.12E-04			
Carbon Tetrachloride	3.67E-05			
Chlorobenzene	3.04E-05			
Chloroform	2.85E-05			
Chrysene	6.93E-07	1.76E-09	3.53E-07	3.53E-07
Dibenzo(a,h)anthracene		1.18E-09	5.83E-07	5.83E-07
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Ethylbenzene	3.97E-05			
Ethylene Dibromide	4.43E-05			
Fluoranthene	1.11E-06	2.94E-09	7.61E-06	7.61E-06
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Formaldehyde	*1.80E-01*	7.35E-05	1.18E-03	1.18E-03
Indeno(1,2,3-cd)pyrene		1.76E-09	3.75E-07	3.75E-07
Methanol	2.50E-03			
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Naphthalene	7.44E-05	5.98E-07	8.48E-05	8.48E-05
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Phenanthrene	1.04E-05	1.67E-08	2.94E-05	2.94E-05
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Pyrene	1.36E-06	4.90E-09	4.78E-06	4.78E-06
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Toluene	4.08E-04	3.33E-06	4.09E-04	4.09E-04
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TRIBAL HISTORIC PRESERVATION
Mandan Hidatsa Arikara
Mary Baker, Interim Director and Tribal Historic
Preservation Officer.
404 Frontage Road,
New Town, North Dakota 58763
Ph. 701-421-3032 fax/701-862-2490
marybaker@mhanation.com

Date: April 7, 2021

To: Cynthia Monteau, Director MHA Nation Tax Department and Special Projects

The TAT – THPO Office has reviewed the documents provided for the proposed:
Project: MHA Nation Green House Project
Location: T/R/S: SW ¼ of the SW ¼ of T152N R90W Sec 13

And has conducted a class I & II cultural resources survey of the Area of potential Effect (APE) and offers a determination of "No Historic Properties Affected" for this project. This land has previously been disturbed. As always, should any cultural artifacts or human remains be unearthed during development / construction, please contact the TAT – THPO Office as soon as possible at any of the numbers listed below. Construction must halt immediately, notify the county sheriff and MHA Nation law enforcement.

Please call me at your convenience for any further questions or comments.

Mary Baker
TAT – THPO
701.862.2474
701.421.3032