

Technical Support Document
Air Quality Construction Permit - Final
Permit No. MIN-WE-27087R0001-2013-01

This document sets forth the legal and factual basis for permit conditions, with references to applicable statutory and regulatory provisions, including provisions under the federal tribal New Source Review (NSR) program, 40 C.F.R. §§ 49.151 – 49.161.

1. GENERAL INFORMATION

a. Applicant and Stationary Source Information

Owner and Address	White Earth Nation of the Minnesota Chippewa Tribe 777 South Casino Road Mahnomen, Minnesota 56557
Facility Name and Address	Shooting Star Casino and Event Center 777 South Casino Road Mahnomen, Minnesota 56557
County	Mahnomen
Reservation	White Earth Nation
SIC Code	7011, Hotels and Motels
NAICS Code	721120, Casino Hotels

b. Contact Information

Facility Contact: Gerald "Mike" Smith
Phone: (218) 936-2640
Fax: (218) 935-2206

Permit Contact: Frederick Tornatore
TSS Consultants
Phone: (916) 601-0531

c. Facility Description

The Shooting Star Casino and Event Center (SSC) is an existing facility owned and operated by the White Earth Nation (Permittee). The facility is located on the White Earth Nation's tribal reservation in Mahnomen, Minnesota.

SSC is composed of three main areas: the casino, the hotel, and the event center. The Permittee operates two 4.18 MMBTU/hr fuel oil-fired boilers to provide space heating for the casino complex and some of the hotel area and two 2.78 MMBTU/hr propane-fired boilers to heat the event center and the remaining hotel space. The two

fuel oil boilers share the same exhaust stack. The propane boilers each have their own stack.

d. Emission Units and Process Description

The facility currently operates the following emission units:

- Two 4.18 MMBTU/hr fuel-oil fired boilers
- Two 2.78 MMBTU/hr propane-fired boilers

The fuel oil boilers share the same exhaust stack behind the main casino. The propane boilers, located behind the event center, each has its own stack.

e. Area Classification

SSC is located within the exterior boundary of the White Earth Nation's tribal reservation. The EPA is responsible for issuing and enforcing any air quality permits for sources on the reservation unless and until White Earth Nation has EPA approval to do so.

The facility is located in Mahnommen County which is designated attainment with National Ambient Air Quality Standards for all criteria pollutants.

There are no mandatory Prevention of Significant Deterioration (PSD) Class I areas within 100 kilometers of SSC or the White Earth Nation reservation. Additionally, this permit action is not considered "major" for PSD. Therefore, consultation with federal land managers is not required.

2. PROJECT DESCRIPTION

a. Description of Permit Action

The Permittee proposes to install a 5 MMBTU/hr woody biomass-fired boiler system to offset energy currently provided by the fuel oil- and propane-fired boilers at the SSC. The biomass-fired boiler system will be installed in an existing room directly adjacent to the room that houses the fuel oil-fired boilers and will share the existing exhaust stack with the fuel oil-fired boilers.

The biomass-fired boiler is designed to combust wood chips as its fuel source. Wood chips are stored on site in the biomass storage building, which is enclosed and is capable of storing up to 1 week's worth of wood chips. Wood chips are retrieved from the biomass storage building through the use of automated screw augers. The wood chips are conveyed from the storage area to the metering bin via flat and inclined conveyor belts. Before reaching the metering bin, the wood chips are screened to remove any material that is larger than the feedstock specifications. Once screened, the wood chips are deposited into a metering bin. The metering bin is a

hopper that holds the wood chips and feeds the boiler. It is capable of holding approximately one ton of wood chips, which corresponds to one to two hours of feedstock. The wood chips are combusted in the biomass boiler. The heat produced during combustion is captured by the hot water boiler, producing hot water. The ash that results from combustion is automatically removed by the ash removal system for safe disposal.

The biomass-fired boiler system will also include the installation and operation of two emission control devices. An air heater will be used to preheat incoming air into the boiler, allowing for efficient combustion and reduced carbon monoxide emissions. The air heater is also capable of capturing and collecting some particulate matter. A high-efficiency multiclone will also be used to remove up to 99% of coarse and fine particulate matter.

The Permittee proposes to operate the new biomass-fired boiler system at up to 70% capacity, or 6,132 hours per 12 consecutive month period. SSC expects that operating the new biomass-fired boiler at up to 70% capacity will replace up to 90% of the SSC's annual fossil fuel consumption. The Permittee also proposes to operate the four existing fuel oil- and propane-fired boilers at up to 90% capacity, or 7,884 hours per 12 consecutive month period as a backup to the new biomass-fired boiler. The high capacity allowance provides for heating with the fossil-fuel boilers in the case of operations challenges with the biomass-fired unit, such as malfunction or delayed biomass fuel deliveries.

Based on the information submitted by the Permittee in its permit application, this permit authorizes the following:

- i. New construction of a SolaGen Under Feed Stoker 5 MMBTU/hr biomass-fired boiler and the following systems:
 1. Biomass storage in an enclosed building with a footprint of less than 2,000 square feet.
 2. A biomass conveyance system, including automated screw augers, flat conveyor belts, and inclined conveyor belts.
 3. A biomass screening system.
 4. A metering bin.
 5. An ash removal system.
 6. Emission control devices, including an air heater and a high-efficiency multiclone.
- ii. Operation of the newly-constructed biomass-fired boiler system for 6,132 hours per 12 consecutive month period. This is equivalent to 70% annual capacity factor of this boiler.
- iii. Operation of the four existing fuel oil- and propane-fired boilers for up to 7,884 hours per 12 consecutive month period, each. This is equivalent to a 90% annual capacity factor for these boilers.

The minor construction permit being considered in this permit action is the first federally-enforceable air permit being issued to the facility.

b. Emission Factors and Sample Calculations

Emission factors used to calculate the potential to emit (PTE) pollutants were taken primarily from AP-42, Volume 1, 5th Edition, available on the internet at <http://www.epa.gov/ttnchie1/ap42/>. All emission factors used to determine the PTE, calculations, and an explanation of the method used to calculate the PTE are included as an attachment to this technical support document.

c. Total Facility Potential to Emit Before Controls and Limits

The unrestricted PTE of the new biomass-fired boiler is given in the following table.

Emission Unit	CO	NOx	SO ₂	PM	PM ₁₀	PM _{2.5}	Lead	VOC
SolaGen 5 MMBTU/hr Biomass Boiler	18.77	6.88	0.78	6.88	6.26	3.75	0.00	0.53

Pursuant to 40 C.F.R. § 49.153, the installation of the new biomass boiler is a modification at an existing source because the potential to emit carbon monoxide (CO), particulate matter smaller than 10 microns (PM₁₀) and particulate matter smaller than 2.5 microns (PM_{2.5}) exceeds the minor NSR threshold for attainment areas. This project is not a major modification at an existing source because the unrestricted increase in PTE of all pollutants is below the major source threshold, as defined in 40 C.F.R. § 52.21.

SSC is an existing facility that operates two distillate fuel oil- and two propane-fired boilers. Since the construction permit being considered in this permit action will be the first federally-enforceable permit issued to the Permittee for the SSC, there are no federally-enforceable limits on the operations of these existing boilers. Therefore, the unrestricted PTE for these boilers assumes 8,760 hours of operation per year.

The PTE of the existing boilers, in tons per year, is given in the following table.

Emission Unit	CO	NOx	SO ₂	PM	PM ₁₀	PM _{2.5}	Lead	VOC
2 Fuel oil-fired Boilers	1.61	6.46	0.07	0.65	0.65	0.65	0.00	0.11
2 Propane-fired Boilers	2.41	4.17	0.48	0.22	0.22	0.22	0.00	0.26
Total PTE of existing boilers	4.02	10.63	0.55	0.87	0.87	0.87	0.00	0.37

Based on the above PTE of the new and existing boilers, the total PTE of the facility before federally-enforceable controls and limits, in tons per year, is given in the following table.

CO	NOx	SO ₂	PM	PM ₁₀	PM _{2.5}	Lead	VOC
22.79	17.51	1.33	7.75	7.13	4.62	0.00	0.90

d. Potential to Emit After Federally-Enforceable Limits

The PTE of the facility after permit issuance takes into account federally-enforceable limits, such as operating hour restrictions. The facility is electing to limit the number of hours each boiler may operate in any 12 consecutive month period. For the existing fuel oil- and propane-fired boilers, the facility will have an annual capacity factor of 90%. In hours, this means that the boilers may run for 90% of the year, meaning that the boilers will run for no more than 7,884 hours in any 12 consecutive month period. The new SolaGen biomass-fired boiler will have an annual capacity factor of 70%, meaning that this boiler will operate for no more than 6,132 hours in any given 12 consecutive month period. Based on these federally-enforceable limitations, the PTE of the facility, in tons per year, is given in the following table.

Emission Unit	CO	NOx	SO ₂	PM	PM ₁₀	PM _{2.5}	Lead	VOC
2 Fuel oil-fired Boilers	1.45	5.81	0.06	0.58	0.58	0.58	0.00	0.01
2 Propane-fired Boilers	2.16	3.75	0.43	0.20	0.20	0.20	0.00	0.23
SolaGen Biomass-fired Boiler	13.14	4.82	0.55	4.82	4.38	2.63	0.00	0.37
Total Facility PTE	16.76	14.38	1.04	5.60	5.16	3.41	0.00	0.70

e. Greenhouse Gas (GHG) Potential to Emit

The GHG PTE at the facility, before application of the operating hour restrictions and other requirements contained in this minor NSR permit, is given in the following table.

GHG PTE Before Permit Issuance (tons/yr)	CO ₂	CH ₄	N ₂ O	CO ₂ e
2 Fuel Oil-Fired Boilers	7484.61	0.30	0.06	7509.90
2 Propane-Fired Boilers	3976.26	0.06	0.01	3979.81
1 Biomass-Fired Boiler	6469.68	2.21	0.29	6611.18
TOTAL, Before Permit Issuance	17930.55	2.57	0.36	18100.89

The GHG PTE at the facility, considering permit restrictions and requirements, is given in the following table.

GHG PTE After Permit Issuance (tons/yr)	CO ₂	CH ₄	N ₂ O	CO ₂ e
2 Fuel Oil-Fired Boilers	6736.15	0.27	0.05	6758.91
2 Propane-Fired Boilers	3578.64	0.06	0.01	3581.83
1 Biomass-Fired Boiler	4528.77	1.54	0.20	4627.83
TOTAL, After Permit Issuance	14843.56	1.87	0.26	14968.57

Based on the GHG PTE, this project is not considered major for GHGs because the project does not have the potential to emit more than 100,000 tons of carbon dioxide equivalents (CO₂e) per year.

f. Enforcement Issues

There are no active enforcement issues against SSC.

g. Pollution Control Equipment

The facility does not currently have pollution control equipment on any of its existing boilers.

After construction, a high-efficiency multiclone, designed to capture and remove particulate matter from the SolaGen biomass boiler's exhaust, will be operated to minimize particulate matter emissions. Since the permit will restrict the facility's PTE through operating limitations, there are no specific particulate matter emission limits in the permit. However, the permit will require operation of the multiclone while the biomass-fired boiler is in operation.

An air heater will also be used to preheat the incoming air into the biomass-fired boiler. This will allow for more efficient combustion and will help minimize carbon monoxide emissions. The air heater also has the capability of removing some particulate matter from the exhaust of the biomass-fired boiler. Since the permit will restrict the facility's PTE through operating limitations, there are no specific particulate matter or carbon monoxide emission limits within the permit. However, the permit will require operation of the air heater while the biomass-fired boiler is in operation.

3. APPLICABLE REQUIREMENTS

a. 40 C.F.R. § 52.21: Prevention of Significant Deterioration (PSD)

A modification of an existing source that does not have the potential to emit more than 250 tons per year of any regulated air pollutant is a modification to a minor source. Since SSC does not have the potential to emit 250 tons or more per year of any regulated air pollutant, and since the new construction authorized in the permit does not itself have the potential to emit more than 250 tons per year of any regulated pollutant, SSC is a minor source, and the proposed modification is a minor modification and thus is not subject to the PSD program at 40 C.F.R. § 52.21.

b. 40 C.F.R. §§ 49.151-161: Federal Minor New Source Review Program in Indian Country

40 C.F.R. § 49.152(d) defines a true minor source as, among other things, a source that has the potential to emit regulated NSR pollutants in amounts that are less than or equal to the major source thresholds of 40 C.F.R. § 52.21 but equal to or greater than the minor NSR thresholds in 40 C.F.R. § 49.153 without an enforceable restriction to reduce its potential to emit to such levels. SSC does not have the potential to emit any regulated NSR pollutant at a level exceeding the major source threshold. However, the new biomass-fired boiler has the potential to emit CO, PM₁₀ and PM_{2.5} at levels exceeding the minor NSR threshold for attainment areas as listed in Table 1 to section 49.153. Therefore, SSC is a true minor source, and, pursuant to 40 C.F.R. § 49.153(a)(1), construction of the new biomass-fired boiler is subject to the federal minor NSR program at 40 C.F.R. §§ 49.151-161 for CO, PM₁₀, and PM_{2.5}.

c. New Source Performance Standards (NSPS)

The Permittee currently operates two 4.18 MMBTU/hr fuel oil-fired boilers and two 2.78 MMBTU/hr propane-fired boilers. This permit authorizes the construction and operation of a 5 MMBTU/hr biomass-fired boiler. There are no other emission units at the facility.

Pursuant to 40 C.F.R. §§ 60.40, 60.40Da, 60.40b, and 60.40c, none of the boilers are subject to 40 C.F.R. Part 60, Subparts D, Da, Db or Dc because each boiler has a designed heat capacity less than 10 MMBTU/hr.

Pursuant to 40 C.F.R. § 60.530(a) and (h)(2), the boilers are not subject to 40 C.F.R. Part 60, Subpart AAA because they are owned by a commercial owner for commercial use and because they are boilers, not residential wood heaters.

None of the boilers are subject to 40 C.F.R. Part 60, Subparts AAAA, BBBB, or CCCC because the boilers are not municipal waste combustors or incinerators.

d. National Emission Standards for Hazardous Air Pollutants (NESHAP)

SSC has the potential to emit less than 10 tons per year of any single hazardous air pollutant (HAP) and less than 25 tons per year of all HAPs combined. Pursuant to 40 C.F.R. § 63.2, SSC is an area source for HAPs. Since SSC is an area source for HAPs, no major source NESHAP applies to SSC.

Pursuant to 40 C.F.R. § 63.11193, the fuel oil- and biomass-fired boilers are subject to 40 C.F.R. Part 63, Subpart JJJJJ because the facility is an area source of HAPs that operates commercial boilers, as defined at 40 C.F.R. § 63.11237. Section 63.11194(a)(1), (a)(2), (b), (c) and (f) identifies affected sources that are subject to Subpart JJJJJ. The requirements of this subpart apply to the new biomass and existing fuel oil-fired boilers because they are affected sources. The biomass boiler is a new source because it will be constructed after June 4, 2010. *See* 40 C.F.R. §§ 63.11200(b); 63.11237. The fuel oil-fired boilers are existing sources because they were constructed prior to June 4, 2010. *See* 40 C.F.R. §§ 63.11200(c); 63.11237.

Section 63.11195(e) exempts gas-fired boilers, such as the existing propane-fired boilers at the facility, from the requirements of Subpart JJJJJJ. The following regulations from Subpart JJJJJJ apply to the facility:

- i. 40 C.F.R. § 63.11196(a)(1) and (c) establishes the compliance dates for each new and existing affected source. Existing affected sources must comply with the requirements of Subpart JJJJJJ by March 21, 2014; thus, the fuel oil-fired boilers must comply with Subpart JJJJJJ by March 21, 2014. New affected sources such as the biomass boiler must comply with the requirements of this subpart upon startup of the affected source.
- ii. 40 C.F.R. § 63.11201 provides that a source must comply with requirements in Tables 1, 2, and 3 to Subpart JJJJJJ, as applicable. Section 63.11201(b) and (d) refers to Table 2, which establishes work practice requirements that apply to the biomass- and fuel oil-fired boilers at all times that an affected boiler is operating.
- iii. 40 C.F.R. § 63.11205(a) provides that the facility must operate the biomass- and fuel oil-fired boilers consistent with safety and good air control practices for minimizing emissions. Section 63.11205(b) and (c), and any other subsections of Subpart JJJJJJ that apply to boilers that are subject to emissions limits, do not apply because the boilers at SSC are not subject to emissions limits under Table 1 to Subpart JJJJJJ.
- iv. 40 C.F.R. § 63.11210(c) and (f) applies because it establishes the initial compliance requirements for the new biomass- and existing fuel oil-fired boilers, which have applicable work practice standards, management practices, or emission reduction measures.
- v. 40 C.F.R. § 63.11214(b) requires the facility to submit a Notification of Compliance Status report after completing a performance tune-up of the new biomass- and existing oil-fired boilers.
- vi. 40 C.F.R. § 63.11223(a) and (b) applies to the biomass- and fuel oil-fired boilers because they are subject to work practice and management practice standards. The exemptions in Section 63.11223(c) – (f) do not apply to the SSC boilers.
- vii. 40 C.F.R. § 63.11225 applies to all facilities that are subject to Subpart JJJJJJ.
- viii. Table 2 to Subpart JJJJJJ of 40 C.F.R. Part 63, entries 4 and 7 apply because the facility operates a new biomass-fired boiler and existing oil-fired boilers with a heat input capacity greater than 5 MMBTU/hr that do not meet the definition of seasonal boiler or limited-use boiler, and do not use an oxygen trim system that maintains an optimum air-to-fuel ratio.
- ix. Table 8 to Subpart JJJJJJ of 40 C.F.R. Part 63 applies because it lists the applicability of the General Provisions to Subpart JJJJJJ.
- x. 40 C.F.R. § 11194(f) exempts the Permittee from the obligation to obtain a Title V operating permit for the SSC under 40 C.F.R. Part 71 as the result of applicability of Subpart JJJJJJ. However, despite this exemption, the Permittee must comply with Part 71 if the facility is subject for any other reason, and must continue to comply with the provisions of Subpart JJJJJJ.

e. Endangered Species Act (ESA)

Section 7 of the ESA requires the EPA, as a federal agency, to use its authority to conserve listed endangered and threatened species. To support this requirement, section 7(a)(2) of the ESA requires EPA to ensure that an agency action, such as the issuance of air permits, is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat for such species. In order to demonstrate whether an agency action will affect endangered or threatened species or critical habitat, EPA must determine whether species or critical habitat is present in the action area, whether authorized activities within the action area will affect species or critical habitat, and whether the effect, if any, will have an adverse effect on species or critical habitat. If an agency action may adversely affect a species or critical habitat, further consultation may be required.

Based on the October 2013 County Distribution of Federally-Listed Threatened, Endangered, Proposed, and Candidate Species for Minnesota, Mahnomen County has two proposed endangered species: the northern long-eared bat and the Poweshiek skipperling. Mahnomen County also has proposed critical habitat for the Poweshiek skipperling. The northern long-eared bat was proposed as an endangered species in the *Federal Register* on October 2, 2013. The Poweshiek skipperling was proposed as an endangered species in the *Federal Register* on October 24, 2013. Although these species are only proposed as endangered species, this analysis will conservatively treat these species as already listed as endangered species. For the purpose of this analysis, the "action area" of this action is SSC and the surrounding land within Mahnomen County.

This permit authorizes the construction of a new biomass-fired boiler and establishes federally-enforceable operating limitations on the new and existing boilers at the facility. The new boiler will use existing space within the existing structure of the facility and will not require breaking new ground to build an expansion to the facility. After issuance of this permit, federally-enforceable operating limits will limit the facility's potential to emit CO, NO_x, SO₂, PM, PM₁₀, PM_{2.5}, and VOC.

The northern long-eared bat is a proposed endangered species because bat populations have been affected by loss of hibernacula (caves and mines where the bat hibernates during the winter), loss of summer habitat (such as the bark of live or dead trees) due to construction, wind farm operations, and disease. The issuance of this permit will not cause further loss of hibernacula within the action area because construction at the facility will not affect the facility's existing footprint. The issuance of this permit will not cause further loss of summer habitat within the action area because it will not affect forested-areas near the facility. The issuance of this permit will have no effect on wind farm operations and disease affecting the bat. For these reasons, the issuance of this permit will have "no effect" on the northern long-eared bat or its critical habitat.

The Poweshiek skipperling is a proposed endangered species because skipperling populations have been affected by the loss of its habitat, mainly tallgrass prairie land. Poweshiek skipperling proposed critical habitat is located within the action area. The issuance of this permit will not cause further loss of tallgrass prairie land because construction of new emission units at the facility will use space within the existing facility. Although the facility's potential to emit most pollutants increases following the issuance of this permit, the increase is smaller than 10 tons per year for each pollutant and should have no noticeable additional effect on existing tallgrass prairie in itself. Issuance of this permit establishes federally-enforceable operating limits that limit the overall amount of pollutants that the facility can emit. For these reasons, the issuance of this permit will have "no effect" on the Poweshiek skipperling or its critical habitat.

Since the issuance of this permit will have "no effect" on any species or critical habitat, issuing this permit will not adversely affect proposed or listed species or critical habitat. Pursuant to ESA section 7's implementing regulations at 50 C.F.R. § 402.13(a), further formal consultation is not necessary and no further action is required.

f. National Historic Preservation Act (NHPA)

Section 106 of the NHPA requires the EPA to take into account the effect of any action undertaken by the EPA, such as issuing air construction permits, on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places. EPA is required to consult with the state historical preservation officer (SHPO), the tribal historical preservation officer (THPO), and members of the public to receive and consider their views and concerns about historic preservation when making a final permit decision.

SSC is a facility originally constructed 21 years ago. The existing facility is not listed on the National Register of Historic Places. Although the permit authorizes the construction of a new biomass-fired boiler, the physical footprint of the facility will not be affected because the biomass-fired boiler and supporting systems will be constructed in existing spaces within the facility. Thus, construction of the new biomass-fired boiler will not affect any existing places listed on or eligible to be listed on the National Register of Historic Places, if any are present near the facility.

For these reasons, EPA has determined the issuance of this minor NSR permit will have "no potential effect on historic properties." Pursuant to NHPA Section 106's implementing regulations at 36 C.F.R. § 800.3(a)(1), EPA has no further consultation obligation under Section 106 of the NHPA.

Unrestricted Potential to Emit of Existing Emission Units, Before Permit Issuance (tons/yr)								
Emission Unit	CO	NOx	SO ₂	PM	PM ₁₀	PM _{2.5}	Lead	VOC
2 Fuel oil-fired Boilers	1.61	6.46	0.07	0.65	0.65	0.65	0.00	0.11
2 Propane-fired Boilers	2.41	4.17	0.48	0.22	0.22	0.22	0.00	0.26
Total PTE of existing emission units	4.02	10.63	0.55	0.87	0.87	0.87	0.00	0.37

Unrestricted Potential to Emit of New Biomass-Fired Boiler, Before Permit Issuance (tons/yr)								
Emission Unit	CO	NOx	SO ₂	PM	PM ₁₀	PM _{2.5}	Lead	VOC
1 Biomass-fired Boiler	18.77	6.88	0.78	6.88	6.26	3.75	0.00	0.53

Facility-wide Potential to Emit, Before Permit Issuance								
Emission Unit	CO	NOx	SO ₂	PM	PM ₁₀	PM _{2.5}	Lead	VOC
Total Unrestricted PTE of facility	22.79	17.51	1.33	7.75	7.13	4.62	0.00	0.90

Facility-wide Potential to Emit, After Permit Issuance (tons/yr)								
Emission Unit	CO	NOx	SO ₂	PM	PM ₁₀	PM _{2.5}	Lead	VOC
2 Fuel oil-fired Boilers	1.45	5.81	0.06	0.58	0.58	0.58	0.00	0.10
2 Propane-fired Boilers	2.16	3.75	0.43	0.20	0.20	0.20	0.00	0.23
1 Biomass-fired Boiler	13.14	4.82	0.55	4.82	4.38	2.63	0.00	0.37
Total Facility PTE, Enforceable	16.76	14.38	1.04	5.60	5.16	3.41	0.00	0.70

GHG PTE Before Permit Issuance (tons/yr)	CO ₂	CH ₄	N ₂ O	CO ₂ e
2 Fuel Oil-Fired Boilers	7484.61	0.30	0.06	7509.90
2 Propane-Fired Boilers	3976.26	0.06	0.01	3979.81
1 Biomass-Fired Boiler	6469.68	2.21	0.29	6611.18
TOTAL, Before Permit Issuance	17930.55	2.57	0.36	18100.89

GHG PTE After Permit Issuance (tons/yr)	CO ₂	CH ₄	N ₂ O	CO ₂ e
2 Fuel Oil-Fired Boilers	6736.15	0.27	0.05	6758.91
2 Propane-Fired Boilers	3578.64	0.06	0.01	3581.83
1 Biomass-Fired Boiler	4528.77	1.54	0.20	4627.83
TOTAL, After Permit Issuance	14843.56	1.87	0.26	14968.57

Nominal Heat Rate: 4.18 MMBtu/hr
 System Efficiency: 81 %
 Energy Input [1]: 5.160494 MMBtu/hr

Capacity Factor - After Issuance 90 %
 Unrestricted Hours of Operation 8760 hr/yr
 Restricted Hours of Operation [2] 7884 hr/yr

Fuel Oil Heating Value [3] 140 MMBTU/1000 gal
 Fuel Oil Sulfur Content (by weight) 0.0015 %

	CO	NOx	SO ₂ [6]	PM	PM ₁₀	PM _{2.5}	Lead	VOC
AP-42 - Fuel Oil (lb/1000 gal) [4]	5	20	142	2	2	2	0.00151	0.34
Fuel Oil Emission Factor (lb/MMBTU) [5]	0.0357143	0.142857	0.0015214	0.014286	0.014286	0.014286	1.08E-05	0.002429
Unrestricted Boiler PTE (ton/yr) [7]	0.8072487	3.228995	0.0343888	0.322899	0.322899	0.322899	0.000244	0.054893
Restricted Boiler PTE (ton/yr) [7]	0.7265238	2.906095	0.0309499	0.29061	0.29061	0.29061	0.000219	0.049404

Unrestricted PTE, 2 Boilers (tons/yr) [8]	1.6144974	6.457989	0.0687776	0.645799	0.645799	0.645799	0.000488	0.109786
Restricted PTE, 2 Boilers (tons/yr) [8]	1.4530476	5.81219	0.0618998	0.581219	0.581219	0.581219	0.000439	0.098807

Notes and Calculation Methodology

[1]	Energy Input (MMBTU/hr) = Nominal Heat Rate (MMBTU/hr) / System Efficiency (%)
[2]	Restricted Hours of Operation = 8760 hrs * Capacity Factor (%)
[3]	AP-42, Volume 1, 5th Edition, Page 1.3-8
[4]	AP-42, Volume 1, 5th Edition, Table 1.3-1, 1.3-3, and 1.3-11
[5]	Emission Factor (lb/MMBTU) = AP-42 factor (lb/1000 gal) / Fuel Heating Value (MMBTU/1000 gal)
[6]	SO ₂ Emission Factor (lb/MMBTU) = AP42 factor (lb/1000 gal) * Sulfur Content (%) / Fuel Heating Value (MMBTU/1000 gal)
[7]	PTE (tons/yr) = Emission Factor (lb/MMBTU) * Energy Input (MMBTU/hr) * Hours of Operation (hr) / 2000 (lb/ton)
[8]	PTE for 2 boilers (tons/yr) = Boiler PTE (tons/yr) * 2 boilers

Nominal Heat Rate: 2.68 MMBtu/hr
System Efficiency: 80 %
Energy Input [1]: 3.35 MMBtu/hr

Capacity Factor - After Issuance 90 %
Unrestricted Hours of Operation 8760 hr/yr
Restricted Hours of Operation [2] 7884 hr/yr

Propane Heating Value [3] 91.5 MMBTU/1000 gal
Propane Sulfur Content 15 gr/100 cf

	CO	NOx	SO ₂ [6]	PM	PM ₁₀	PM _{2.5}	Lead	VOC
AP-42 - Propane (lb/1000 gal) [4]	7.5	13	0.1	0.7	0.7	0.7	0	0.8
Propane Emission Factor (lb/MMBTU) [5]	0.0819672	0.142077	0.0163934	0.00765	0.00765	0.00765	0	0.008743
Unrestricted Boiler PTE (ton/yr) [7]	1.2027049	2.084689	0.240541	0.112252	0.112252	0.112252	0	0.128289
Restricted Boiler PTE (ton/yr) [7]	1.0824344	1.87622	0.2164869	0.101027	0.101027	0.101027	0	0.11546

Unrestricted PTE, 2 Boilers (tons/yr) [8]	2.4054098	4.169377	0.481082	0.224505	0.224505	0.224505	0	0.256577
Restricted PTE, 2 Boilers (tons/yr) [8]	2.1648689	3.752439	0.4329738	0.202054	0.202054	0.202054	0	0.230919

Notes and Calculation Methodology

[1]	Energy Input (MMBTU/hr) = Nominal Heat Rate (MMBTU/hr) / System Efficiency (%)
[2]	Restricted Hours of Operation = 8760 hrs * Capacity Factor (%)
[3]	AP-42, Volume 1, 5th Edition, Table 1.5-1, Note a
[4]	AP-42, Volume 1, 5th Edition, Table 1.5-1
[5]	Emission Factor (lb/MMBTU) = AP-42 factor (lb/1000 gal) / Fuel Heating Value (MMBTU/1000 gal)
[6]	SO ₂ Emission Factor (lb/MMBTU) = AP-42 factor * Sulfur Content (gr/100 cf) / Fuel Heating Value (MMBTU/1000 gal)
[7]	PTE (tons/yr) = Emission Factor (lb/MMBTU) * Energy Input (MMBTU/hr) * Hours of Operation (hr) / 2000 (lb/ton)
[8]	PTE for 2 boilers (tons/yr) = Boiler PTE (tons/yr) * 2 boilers

Nominal Heat Rate: 5 MMBtu/hr
 System Efficiency: 70 %
 Energy Input [1]: 7.142857 MMBtu/hr

Capacity Factor - After Issuance 70 %
 Unrestricted Hours of Operation 8760 hr/yr
 Restricted Hours of Operation [2] 6132 hr/yr

	CO	NOx	SO ₂	PM [4]	PM ₁₀ [4]	PM _{2.5} [4]	Lead	VOC
AP-42 - Biomass Emission Factor (lb/MMBTU) [3]	0.6	0.22	0.025	0.22	0.2	0.12	4.80E-05	0.017
Unrestricted Boiler PTE (ton/yr) [5]	18.771429	6.882857	0.7821429	6.882857	6.257143	3.754286	0.001502	0.531857
Restricted Boiler PTE (ton/yr) [5]	13.14	4.818	0.5475	4.818	4.38	2.628	0.001051	0.3723

Notes and Calculation Methodology

[1]	Energy Input (MMBTU/hr) = Nominal Heat Rate (MMBTU/hr) / System Efficiency (%)
[2]	Restricted Hours of Operation = 8760 hrs * Capacity Factor (%)
[3]	AP-42, Volume 1, 5th Edition, Tables 1.6-1, 1.6-2, 1.6-3, and 1.6-4
[4]	PM Emission Factors assume a mechanical collector (multiclone) will be used to control particulate matter.
[5]	PTE (tons/yr) = Emission Factor (lb/MMBTU) * Energy Input (MMBTU/hr) * Hours of Operation (hr) / 2000 (lb/ton)

Fuel Oil Heat Input per boiler 5.160493827 MMBTU/hr
Propane Heat Input per boiler 3.35 MMBTU/hr
Biomass Heat Input per boiler 7.142857143 MMBTU/hr

Fuel Oil Boiler Capacity Factor 90 %
Propane Boiler Capacity Factor 90 %
Boimass Boiler Capacity Factor 70 %

Unrestricted Hours of Operation 8760 hr/yr
Fuel Oil Boiler Limited Hours 7884 hr/yr
Propane Boiler Limited Hours 7884 hr/yr
Biomass Boiler Limited Hours 6132 hr/yr

GHG Emission Factors by Fuel Type, in kg/MMBTU [1]				Global Warming Potentials [2]	
Fuel Type	CO ₂	CH ₄	N ₂ O	CO ₂	
Fuel Oil [3]		75.1	3.00E-03	6.00E-04	Methane (CH ₄) 25
Propane [4]		61.46	1.00E-03	1.00E-04	Nitrous Oxide (N ₂ O) 298
Biomass		93.8	3.20E-02	4.20E-03	

GHG PTE, before permit issuance, tons/yr [5]				
Emission Unit	CO ₂	CH ₄	N ₂ O	CO ₂ e [6]
2 Fuel Oil Boilers	7484.61	0.30	0.06	7509.90
2 Propane Boilers	3976.26	0.06	0.01	3979.81
1 Biomass Boiler	6469.68	2.21	0.29	6611.18
FACILITY TOTAL	17930.55	2.57	0.36	18100.89

GHG PTE, after permit issuance, tons/yr [7]				
Emission Unit	CO ₂	CH ₄	N ₂ O	CO ₂ e [6]
2 Fuel Oil Boilers	6736.15	0.27	0.05	6758.91
2 Propane Boilers	3578.64	0.06	0.01	3581.83
1 Biomass Boiler	4528.77	1.54	0.20	4627.83
FACILITY TOTAL	14843.56	1.87	0.26	14968.57

Notes

[1]	40 CFR 98, Subpart C, Table C-1 and C-2
[2]	40 CFR 98, Subpart A, Table A-1. GWP values from 11/29/2013 GWP revision.
[3]	For CO ₂ , assumes residual #6 since it has the highest emission factor
[4]	For propane CH ₄ and N ₂ O emission factors, assumes natural gas
[5]	GHG PTE (tons/yr) = Heat Input (MMBTU/hr) * 8760 hrs/yr * GHG EF (kg/MMBTU) * 2.20462(lb/kg) / 2000 (lb/ton)
[6]	CO ₂ e = CO ₂ (tons/yr) * CO ₂ GWP (1) + CH ₄ (tons/yr) * CH ₄ GWP (21) + N ₂ O (tons/yr) * N ₂ O GWP (310)
[7]	GHG PTE (tons/yr) = Heat Input (MMBTU/hr) * operating hours (hrs/yr) * GHG EF (kg/MMBTU) * 2.20462(lb/kg) / 2000 (lb/ton)