Statement of Basis

Title V Air Quality Operating Permit Renewal

POET Biorefining – Big Stone
Big Stone City, South Dakota

South Dakota Department of Agriculture and Natural Resources

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1.0 Background

On March 8, 2018, the South Dakota Department of Agriculture and Natural Resources (DANR) renewed POET Biorefining – Big Stone's (POET) Title V air quality operating permit #28.0502-29. The Title V air quality operating permit has been revised as follows:

- November 27, 2018 – Modification to add a tenth fermentation tank, roller mill, increase and establish new short-term limits, increase operation limits, and combine units;
- January 4, 2019 – Administrative Amendment to revise the facility name; and
- May 27, 2022 – Modification to increase short term limits, install a tenth fermentation tank, install a roller mill, and remove Unit #26.

DANR received a renewal application September 2, 2022. The application was deemed complete February 10, 2025.

1.1 Existing Equipment

Table 1-1 provides a list of the units presently permitted which was derived from the current Title V air quality operating permit issued May 27, 2022.

Table 1-1 – Description of Permitted Units, Operations, and Processes

Unit	Description	Maximum Operating Rate	Control Device
#1	Grain receiving, grain transfer via enclosed conveyor belt systems, and storage bin loading. Trucks and railcars transport grain to the ethanol plant and dump grain into receiving pits located in a partially enclosed building. Elevator legs transport the grain from the receiving pit to grain storage bins.	Transfer rate equals 840 tons of grain per hour Permanent grain storage capacity is 2,810,000 bushels	Baghouse
	Dried distiller grain and solubles load out by truck, railcar or container loadout.	220 tons of dried distiller grain and solubles per hour	
#2	Grain cleaning, grain transfer, and surge bin loading. The grain is transferred from the grain storage bins to a grain cleaner. The cleaned grain is transferred to a surge bin.	150 tons of grain per hour	Baghouse
#4	Fermentation system. Ethanol is produced from the fermentation process. The fermentation process consists of ten fermentation tanks and the liquid beer is stored in a beer well.	485 tons of mash per hour	Wet scrubber. The owner or operator shall route the exhaust gases from Units #4a and #4b to the regenerative thermal oxidizer associated with Unit
	Distillation Process A. The distillation process distills the liquid beer from the fermentation process. The distillation	51,000 gallons of beer per hour	

Unit	Description	Maximum Operating Rate	Control Device
	process consists of a beer stripper, rectifier, side stripper, one set of molecular sieves, and evaporation system. Distillation Process B. The distillation process distills the liquid beer from the fermentation process. The distillation process consists of a beer stripper, rectifier, side stripper, on set of molecular sieves, and evaporation system.	51, 000 gallons of beer per hour	#6, except as allowed under the terms of this permit.
#4a	2001 Broin and Associates	Not Applicable	
#4b	2006 Broin and Associates	Not Applicable	
#6	Dryer system – Two ICM dried distiller grains and solubles dryers operated in parallel and a ring dryer operated in series with the two ICM dryers. The two ICM dryers include an ICM multi-cyclone to collect product. The ring dryer includes a Barr-Rosin multi-cyclone to collect product. All three dryers are fired with natural gas.	52 tons of dried distiller grains and solubles per hour. The two ICM dryers rated at 55 million Btus per hour per dryer. The ring dryer rated at 60 million Btus per hour.	Seven chambered regenerative thermal oxidizer
	Exhaust gases from Unit #4 and #26.	See applicable unit	
	Seven chambered regenerative thermal oxidizer fired with natural gas	42 million Btus per hour	
#6a	Seven centrifuges used to separate the thin stillage and solids fractions of the wet distiller grain	Five at 150 gallons per minute and two at 300 gallons per minute	Emissions shall be routed to the regenerative thermal oxidizer associated with nit #6 except as allowed in this permit
#7	Dried distiller grains and solubles receiver system.	52 tons per hour	MAC baghouse
#8	Dried distiller grains and solubles silo loading process.	52 tons per hour	MAC baghouse
#9	Industrial cooling tower #1 – 5 cell towers	30,000 gallons per minute	Not applicable
#10	Boiler #1 – 2001 Johnston steam boiler, Model #PFTS2000-3G150S, fired with natural gas and diesel.	81 million Btus per hour heat input.	Low NO_X burner
#11	Boiler #2 – 2001 Johnston steam boiler, Model #PFTS2000-3G150S, fired with	81 million Btus per hour heat input.	Low NO_X burner

Unit	Description	Maximum Operating Rate	Control Device
	natural gas and diesel.		
#15	Tank #1 – 2001 aboveground ethanol storage tank.	180,000 gallons	Internal floating roof
#16	Tank #2 – 2001 aboveground denaturant (natural gasoline) storage tank.	180,000 gallons	Internal floating roof
#17	Tank #3 – 2001 aboveground undenatured ethanol storage tank.	1,000,000 gallons	Internal floating roof
#18	Tank #4 – 2001 aboveground undenatured ethanol storage tank.	1,000,000 gallons	Internal floating roof
#19	Tank #5 – 2001 aboveground denaturant (natural gasoline) storage tank.	65,000 gallons	Internal floating roof
#20	Submerged truck loading rack	39,000 gallons of denatured or undenatured ethanol per hour.	Air-assisted flare. The owner or operator shall route the exhaust gases from the truck loading rack to the flare, except as allowed under the terms of this permit.
	Air-assisted flare	6.4 million Btus per hour heat input	
#21	Rail car loading rack	150,000 gallons of denatured or undenatured ethanol per hour.	The owner or operator shall route the exhaust gases from the rail car loading rack to the flare associated with Unit #20, except as allowed under the terms of this permit.
#22	Hammer mill #1	25 tons per hour	Baghouse
#23	Hammer mill #2	25 tons per hour	Baghouse
#24	Hammer mill #3	25 tons per hour	Baghouse
#25	Hammer mill #4	25 tons per hour	Baghouse
#27	Hammer mill #5	25 tons per hour	Baghouse
#28	Hammer mill #6	25 tons per hour	Baghouse
#29	Fluid bed cooler for the dried distiller grains and solubles.	52 tons of dried distiller grains and solubles per hour	Baghouse. The owner or operator nay route the exhaust gases from the baghouse to the ring dryer associated with Unit #6.

Unit	Description	Maximum Operating Rate	Control Device
#30	Dried distiller grains and solubles silo.	3,000 ton capacity. Loading rate of 52 tons per hour.	Baghouse
#31	Industrial cooling tower #2 – 2 cell towers	11,160 gallons per minute	Not applicable
#32	Boiler #3 fired with natural gas	81 million Btus per hour	Low NOx burner
#33	Tank #6 – 2016 aboveground ethanol storage tank.	2,000,000 gallons	Internal floating roof
#35	2018 or Newer Roller Mill	150 tons per hour	Baghouse

1.2 Proposed Revisions

In the renewal application, POET stated Unit #35 has not been constructed and will not be. The facility requested it be removed from the permit. DANR will not include Unit #35 in this permit review. Unit #6 lists that the dryer system exhausts to Units #4 and #26. This should list Units #4a and #4b. DANR will include this language update in the renewed permit. During discussions with POET, the facility mentioned Unit #31 was combined into Unit #9 a few permit reviews ago. Therefore, DANR will not include #31 in this permit review. During discussions with POET, the facility stated the operating rate description for Unit #6a should state "five at 150 gallons per minute discharge and two at 300 gallons per minute feed". DANR will include this language update in the reviewed permit.

2.0 New Source Performance Standards

DANR reviewed the New Source Performance Standards listed in 40 CFR Part 60 and determined the following standards may be applicable to POET.

2.1 Standards for Grain Elevators – Subpart DD

The provisions under 40 CFR Part 60, Subpart DD is applicable to the following grain elevators:

1. The provisions of this subpart are applicable to any grain terminal elevator, which has a permanent grain storage capacity of 2,500,000 bushels. A grain terminal storage elevator means any grain elevator except those located at animal food manufacturers, pet food manufactures, cereal manufacturers, breweries, and livestock feedlots; or
2. The provisions of this subpart are applicable to any grain storage elevator, which has a permanent grain storage capacity of 1,000,000 bushels. A grain storage elevator means any grain elevator located at any wheat flour mill, wet corn mill, dry corn mill (human consumption), rice mill, or soybean oil extraction plant; and
3. Commences construction, modification, or reconstruction after August 3, 1978.

POET is considered a grain terminal elevator. The permanent grain storage capacity for this plant is 2,810,000 bushels. The permanent grain storage capacity for this plant is greater than 2,500,000 bushels. Therefore, POET is applicable to Subpart DD.

2.2 Standards for Synthetic Organic Chemical Manufacturing – VV, VVa, and VVb

There are two New Source Performance Standards for synthetic organic chemical manufacturing industries. The two standards are applicable to the following:

1. 40 CFR Part 60, Subpart VV is applicable to affected facilities in the synthetic organic chemical manufacturing industry, of which ethanol is included; and commence construction, reconstruction or modification after January 5, 1981, but before November 8, 2006 and the capacity of the plant is more than 1,000 megagrams per year of ethanol;
2. 40 CFR Part 60, Subpart VVa is applicable to affected facilities in the synthetic organic chemical manufacturing industry that commence construction, reconstruction, or modification after November 7, 2006 and the capacity of the plant is more than 1,000 megagrams per year of ethanol; and
3. 40 CFR Part 60, Subpart VVb is applicable to affected facilities in synthetic organic chemical manufacturing industry that commence construction, reconstruction, or modification after April 25, 2023.

POET's facility was constructed prior to April 25, 2023, and has not been modified. Therefore, POET is not applicable to Subpart VVb.

It has already been determined in previous reviews that POET will voluntarily comply with 40 CFR Part 60, Subpart VVa.

2.3 Standards Applicable to Storage Tanks – Subparts K, Ka, Kb, and Kc

There are four New Source Performance Standards for storage vessels. The three standards are applicable to the following storage vessels:

1. 40 CFR Part 60, Subpart K: applicable to storage vessels for petroleum liquids capable of storing greater than 40,000 gallons and commenced construction after June 11, 1973 but prior to May 19, 1978;
2. 40 CFR Part 60, Subpart Ka: applicable to storage vessels for petroleum liquids capable of storing greater than 40,000 gallons and commenced construction after May 18, 1978;
3. 40 CFR Part 60, Subpart Kb: applicable to storage vessels for volatile organic liquids capable of storing 75 cubic meters (approximately 19,813 gallons) or greater and commenced construction after July 23, 1984; and
4. 40 CFR Part 60, Subpart Kc: applicable to storage vessels for volatile organic liquids with a storage capacity greater than 20,000 gallons (approximately 75.7 cubic meters), for which construction, reconstruction, or modification commenced after October 4, 2023.

Subparts K and Ka are not applicable because POET commenced construction of its storage tanks after July 23, 1984. Subpart Kc is not applicable to POET as all tanks have been constructed prior to October 4, 2023.

The provisions of Subpart Kb are applicable to each storage vessel with a capacity greater than or equal to 75 cubic meters that is used to store volatile organic liquids for which construction, reconstruction, or modification is commenced after July 23, 1984. This subpart does not apply to storage vessels with a capacity greater than or equal to 151 cubic meters storing a liquid with a maximum true vapor pressure less than 3.5 kilopascals or with a capacity greater than or equal to 75 cubic meters but less than 151 cubic meters storing a liquid with a maximum true vapor pressure less than 15.0 kilopascals. See Table 2-1 for tank size and the true vapor pressure of the liquids being stored in the tanks.

Table 2-1 – Tank and Volatile Organic Liquid Specifications

Unit	Tank	Capacity		True Vapor Pressure (Kilo Pascal)	Subpart Kb Applicable
		Gallons	Cubic meters		
#15	**#1**	**250,000**	946	5.4	Yes
#16	**#2**	**250,000**	946	5.4	Yes
#17	**#3**	**1,500,000**	5,678	5.5	Yes
#18	**#4**	**1,500,000**	5,678	5.5	Yes
#19	**#5**	**126,000**	477	35	Yes
#33	**#6**	**2,000,000**	7571	5.5	Yes

Based on Table 2-1, Units #15 through #19 and #33 are applicable to Subpart Kb.

2.4 Standards Applicable to Boilers – Subparts D, Da, Db, and Dc

There are three New Source Performance Standards for fossil fuel-fired steam generators. The three standards are applicable to the following steam generators:

1. 40 CFR Part 60, Subpart D: applicable to a steam generator with a maximum operating rate of 250 million Btus per hour or more and commenced construction after August 17, 1971;
2. 40 CFR Part 60, Subpart Da: Standards for Electric Utility Steam Generating Units. This subpart is applicable to each utility generating unit that is capable of combusting more than 73 megawatts (250 million Btu per hour) heat input of fossil fuel (either alone or in combination with any other fuel) that commenced construction, modification, or reconstruction after September 18, 1978;
3. 40 CFR Part 60, Subpart Db: applicable to a steam generator with a maximum operating rate of 100 million Btus per hour or more and commenced construction after June 19, 1984; and
4. 40 CFR Part 60, Subpart Dc: applicable to a steam generator with a minimum design heat input capacity equal to or greater than 10 million Btus per hour but less than or equal to 100 million Btus per hour and commenced construction after June 9, 1989.

Units #10, #11, and #32 all have maximum heat inputs of 81 million Btus per hour. The boilers were constructed after June 19, 1984, and have maximum input capacities equal to or greater than 10 million Btus per hour but less than or equal to 100 million Btus per hour. Therefore, Units #10, #11, and #32 are applicable to Subpart Dc but not applicable to Subparts D, Da, or Db.

2.5 Other Applicable New Source Performance Standards

DANR reviewed the other New Source Performance Standards and determined there are no other standards applicable to POET.

3.0 New Source Review

In accordance with Administrative Rules of South Dakota (ARSD) 74:36:10:01, the new source review regulations apply to areas of the state which are designated as nonattainment pursuant to the Clean Air Act for any pollutant regulated under the Clean Air Act. POET is located near Big Stone City, South Dakota, which is in attainment or unclassifiable for all the criteria air pollutants regulated under the Clean Air Act. Therefore, POET is not subject to a new source review.

4.0 Prevention of Significant Deterioration

A prevention of significant deterioration review applies to new major stationary sources and major modifications to existing major stationary sources in areas designated as attainment under Section 107 of the Clean Air Act for any regulated air pollutant. The following is a list of regulated air pollutants under the Prevention of Significant Deterioration program:

1. Total suspended particulate (PM);
2. Particulate with a diameter less than or equal to 10 microns (PM10);
3. Particulate with a diameter less than or equal to 2.5 microns (PM2.5);
4. Sulfur dioxide (SO_2);
5. Nitrogen oxides (NOx);
6. Carbon monoxide (CO);
7. Ozone – measured as volatile organic compounds (VOCs);
8. Lead;
9. Fluorides;
10. Sulfuric acid mist;
11. Hydrogen sulfide;
12. Reduced sulfur compounds;
13. Total reduced sulfur; and
14. Greenhouse gases (carbon dioxide, methane, nitrous oxide, etc.).

If the source is considered one of the 28 named Prevention of Significant Deterioration source categories listed in Section 169 of the federal Clean Air Act, the major source threshold is 100

tons per year of any regulated air pollutant, except for greenhouse gases. The major source threshold for all other sources is 250 tons per year of any regulated air pollutant, except for greenhouse gases.

On June 2, 2007, the EPA implemented a final rule that no longer lists ethanol plants as a chemical manufacturing plant. Therefore, POET is not classified as a chemical manufacturing. POET is one of the 28 listed source categories for Prevention of Significant Deterioration regulations under fossil-fuel boilers (or combination thereof) totaling more than 250 million British thermal units per hour heat input. POET has a combined fossil fuel fired boiler heat input of 243 million Btu per hour, which is less than 250 million Btus per hour. Therefore, the major source threshold for the facility is 250 tons per year of any regulated air pollutant.

4.1 Potential to Emit Criteria Pollutants

The current permit contains enforceable permit conditions to ensure actual emissions from the ethanol plant do not exceed the major source threshold under the Prevention of Significant Deterioration program. POET has short term emission limits that restrict the facility's potential emissions to less than 238 tons per year. The permit also contains a plant wide emission limit for each criteria air pollutant of 238 tons per 12-month rolling total. Table 4-1 lists POET's short-term emission limits as derived from the current Title V air quality operating permit.

Table 4-1 – Short Term Emission Limits (pounds per hour)

Unit	Description	TSP	PM_{10}	$PM_{2.5}$	SO_2	NOx	CO	VOC
#1	Grain receiving	1.0	1.0	1.0				1.6.
#2	Grain cleaning	0.1	0.1	0.1				
#4	Fermentation #1							20.0
#4a	Fermentation and distillation process #1							32.0
#4b	Fermentation and distillation process #2							27.0
#6	Regenerative thermal oxidizer	15.0	15.0	15.0	4.2	28.0	30.0	10.0
#6a	Centrifuges Bypass							5.0
#7	DDG and solubles receiver	1.2	1.2	1.2				0.4
#8	DDG and solubles silo loading	0.1	0.1	0.1				0.4
#10	Boiler #1 (natural gas)	0.6	0.6	0.6	0.1	3.6	3.2	0.4
	Boiler #1 (distillate oil)	2.0	2.0	2.0	42.2	11.8	6.5	0.8
#11	Boiler #2 (natural gas)	0.6	0.6	0.6	0.1	3.6	3.2	0.4
	Boiler #2 (distillate	2.0	2.0	2.0	42.2	11.8	6.5	0.8

Unit	Description	TSP	PM_{10}	$PM_{2.5}$	SO_2	NOx	CO	VOC
	oil)							
#22	Hammer mill #1	0.5	0.5	0.5				
#23	Hammer mill #2	0.5	0.5	0.5				
#24	Hammer mill #3	0.5	0.5	0.5				
#25	Hammer mill #4	0.5	0.5	0.5				
#27	Hammer mill #5	0.5	0.5	0.5				
#28	Hammer mill #6	0.5	0.5	0.5				
#29	Fluid bed cooler	1.5	1.5	1.5				7.0
#30	DDG and solubles silo	0.1	0.1	0.1				0.4
#32	Boiler #3	0.6	0.6	0.6	0.1	3.6	3.2	0.4

In addition to the short-term and long-term limits, POET accepted operational limits that restrict the operation of certain units. Table 4-2 provides a summary of the operational limits taken from the current Title V air quality operating permit.

Table 4-2 – Current Operational Limits

Unit	Description	Operational Limit
#4	Operational scenarios	A. The emissions from Unit #4 are routed to Units #4a and #4b, which control the emissions in parallel. The emissions from both Units #4a and Unit #4b are routed to the regenerative thermal oxidizer associated with Unit #6, and the emissions from the regenerative thermal oxidizer are routed to ambient air. This is normal operation and there is no limit on the hours of operation per year.
		B. All emissions from Unit #4 are routed to Unit #4a. The emissions from Unit #4a are routed to the regenerative thermal oxidizer associated with Unit #6, and the emissions from the regenerative thermal oxidizer are routed to ambient air. Scenario B and C are limited to a combined 1,000 hours per 12-month rolling period.
		C. All emissions from Unit #4 are routed to Unit #4b. The emissions from Unit #4b are routed to the regenerative thermal oxidizer associated with Unit #6, and the emissions from the regenerative thermal oxidizer are routed to ambient air. Scenario C and B are limited to a combined 1,000 hours per 12-month rolling period.
		D. The emissions from Units #4 are routed to Unit #4a and Unit #4b, which control the emission in parallel. The emissions from both Unit #4a and Unit #4b are routed to ambient air. Scenarios D, E, and F are limited to a combined 1,000 hour per 12-month rolling period.
		E. All emissions from Unit #4 are routed to Unit #4a. The emissions from Unit #4a are routed to ambient air. Scenarios D, E, and F are limited to a combined 1,000 hour

Unit	Description	Operational Limit
		per 12-month rolling period.
		F. All emissions from Unit #4 are routed to Unit #4b. The emissions from Unit #4b are routed to ambient air. Scenarios D, E, and F are limited to a combined 1,000 hour per 12-month rolling period.
#6		The owner or operator shall limit the time the seven centrifuges associated Unit #6 may vent to the atmosphere when the regenerative thermal oxidizer associated with Unit #6 is not operating to 500 hours or less during any 12-month rolling period.
#10	Boiler #1	The owner or operator shall not operate Unit #10 and #11 for greater than a combined 3,600 hours per 12-month rolling period while firing with diesel.
#11	Boiler #2	
#20	Ethanol truck loadout	The owner or operator shall not load out by truck more than 50,000,000 gallons of denatured or undenatured ethanol combined during any 12-month rolling period. Of the 50,000,000 gallons of denatured or undenatured ethanol, no more than 2,510,000 gallons of E-85 shall be loaded out during any 12-month rolling period. The 12-month rolling total for the E-85 shall begin on the issuance of this permit.
	Flare	The owner or operator shall limit the amount of denatured or undenatured ethanol that may be loaded in trucks or railcars during a malfunction of the flare and/or when the flare is not in operation to 1,000,000 gallons of denatured or undenatured ethanol or less combined during any 12-month rolling period.
-	DDGS truck loadout	The owner or operator shall not load out by truck more than 148,395 tons of dried distiller grains and solubles during any 12-month rolling period.
-	Plant wide	The owner or operator shall not emit greater than or equal to 9.5 tons of a single hazardous air pollutant or 23.8 tons of a combination of hazardous air pollutants from permitted units and fugitive sources per 12-month rolling period.
-	Plant wide	The owner or operator shall not produce more than 128 million gallons of undenatured ethanol during any 12-month rolling period.
-	Plant wide	The owner or operator shall not process more than 1,308,029 tons of grain during any 12-month rolling period.
-	Plant wide	The owner or operator shall not produce more than 431,650 tons of dried distiller grains and solubles during any 12-month rolling period.

4.2 Potential Emissions

DANR will use the short-term limits and operational limits to calculate potential emissions. When short term and operational limits are not applicable, DANR uses stack test results to

determine air emissions whenever stack test data is available from the source or a similar source. When stack test results are not available, DANR relies on manufacturing data, material balance, EPA's Compilation of Air Pollutant Emission Factors (AP-42, Fifth Edition, Volume 1) document, the applicant's application, or other methods to determine potential air emissions.

4.2.1 Potential Emissions – Receiving

Potential emissions from grain receiving (Unit #1) are calculated based on the short-term emission limits in Table 4-1 and Equation 4.1. The results are shown in Table 4-7.

Equation 4.1 – Potential Emissions from Short Term Emission Limit

$$Potential\ Emissions\left(\frac{tons}{year}\right) = \frac{Emission\ Factor\left(\frac{pounds}{hour}\right) \times 8{,}760\left(\frac{hours}{year}\right)}{2{,}000\left(\frac{pounds}{ton}\right)}$$

4.2.2 Potential Emissions – Grain Cleaning

Potential emissions from grain storage (Unit #2) are calculated based on the short-term emission limits in Table 4-1 and Equation 4.1. The results are shown in Table 4-7.

4.2.3 Potential Emissions – Fermentation, Distillation

POET's fermentation and distillation (Units #4, #4a, and #4b) process operates under six operating scenarios. Normal operation (operating scenario A) occurs when emissions from Unit #4 are routed to Units #4a and #4b, which control emissions in parallel. Emissions are then outed to the thermal oxidizer, Unit #6. The five other operating scenarios are described in Table 4-2 and summarized below:

- **Scenario B:** All emissions from Unit #4 are routed to Unit #4a. The emissions from Unit #4a are routed to the regenerative thermal oxidizer associated with Unit #6, and the emissions from the regenerative thermal oxidizer are routed to ambient air. Scenario B and C are limited to a combined 1,000 hours per 12-month rolling period.
- **Scenario C:** All emissions from Unit #4 are routed to Unit #4b. The emissions from Unit #4b are routed to the regenerative thermal oxidizer associated with Unit #6, and the emissions from the regenerative thermal oxidizer are routed to ambient air. Scenario C and B are limited to a combined 1,000 hours per 12-month rolling period.
- **Scenario D:** The emissions from Units #4 are routed to Unit #4a and Unit #4b, which control the emission in parallel. The emissions from both Unit #4a and Unit #4b are routed to ambient air. Scenarios D, E, and F are limited to a combined 1,000 hour per 12-month rolling period.
- **Scenario E:** All emissions from Unit #4 are routed to Unit #4a. The emissions from Unit #4a are routed to ambient air. Scenarios D, E, and F are limited to a combined 1,000 hour per 12-month rolling period.

- **Scenario F:** All emissions from Unit #4 are routed to Unit #4b. The emissions from Unit #4b are routed to ambient air. Scenarios D, E, and F are limited to a combined 1,000 hour per 12-month rolling period.

Operating scenarios B and C have a combined hourly limit of 1,000 hours and short-term volatile organic compound emission limit of 32.0 pounds per hour, as shown in Table 4-1. Operating scenarios D, E, and F have a combined hourly limit of 1,000 hours and a short-term volatile organic compound emission limit of 27.0 pounds per hour, as shown in Table 4-1. The potential volatile organic compound emissions from the fermentation process operating scenarios (Units #4a and #4b) are calculated using Equation 4.2, the bypass hourly limit of 1,000 hours from Table 4-2, and the short-term emission limits in Table 4-1. The potential volatile organic compound emissions are shown in Table 4-7.

Equation 4.2 – Potential Emissions from Operating Scenarios B, C, D, E, and F

$$Potential\left(\frac{tons}{year}\right) = \frac{1{,}000\left(\frac{hours}{year}\right) \times Emission\ Factors\left(\frac{pounds}{hour}\right)}{2{,}000\left(\frac{pounds}{ton}\right)}$$

The operating scenario, A, has no hourly limit, i.e. can operate at all times under this operating scenario. However, POET's current permit has hourly limits for operating scenarios (B, C, D, E, and F) that have emission limits that are greater than the emission limit for scenario A. Therefore, potential emissions from Unit #4 are calculated based on the short-term emission limit in Table 4-1, Equation 4.3, and the difference in operating hours. The results are shown in Table 4-7.

Equation 4.3 – Potential Emissions from Operating Scenario A

$$Potential\left(\frac{tons}{year}\right) = \frac{(8{,}760 - 2{,}000)\left(\frac{hours}{year}\right) \times Emission\ Factors\left(\frac{pounds}{hour}\right)}{2{,}000\left(\frac{pounds}{ton}\right)}$$

4.2.4 Potential Emissions – Dryer System

Potential emissions from dryer system, Unit #6, are calculated based on the short-term emission limit in Table 4-1 and Equation 4.1. The results are shown in Table 4-7.

4.2.5 Potential Emissions – Centrifuge Bypass

The centrifuge bypass, Unit #6a, has an hourly limit as well as a short-term emission limit. Potential emissions from the centrifuge bypass (Unit #6a) are calculated based on the short-term emission limit in Table 4-1, the hourly limit from Table 4-2, and Equation 4.4. The results are shown in Table 4-7.

Equation 4.4 – Potential Emissions from Centrifuge Bypass

$$Potential\ Emissions\left(\frac{tons}{year}\right) = \frac{5.0\left(\frac{pounds}{hour}\right) \times 500\left(\frac{hours}{year}\right)}{2{,}000\left(\frac{pounds}{ton}\right)}$$

4.2.6 Potential Emissions – DDGS Receiver

Potential emissions from DDGS receiver, Unit #7, are calculated based on the short-term emission limit in Table 4-1 and Equation 4.1. The results are shown in Table 4-7.

4.2.7 Potential Emissions – DDGS Silos

Potential emissions from DDGS silos, Units #8 and #30, are calculated based on the short-term emission limit in Table 4-1 and Equation 4.1. The results are shown in Table 4-7.

4.2.8 Potential Emissions – Cooling Towers

POET operates one cooling tower, Units #9. The application stated the cooling tower has a drift loss of 0.005%. Emission factors for cooling towers are derived from AP-42, 13.4, Table 13.4-1, January 1995, and are shown in Table 4-3.

Table 4-3 – Emission Factors for Cooling Towers

	TSP	PM_{10}	$PM_{2.5}$
Pounds per 1,000 gallons	0.019	0.019	0.019

Potential emissions from the cooling tower are calculated using Equation 4.5, the flow rate from Table 1-1, the emission factors from Table 4-3, and the drift loss. The results are shown in Table 4-7.

Equation 4.5 – Potential Emissions from Cooling Towers

$$Potential\ Emissions\left(\frac{tons}{year}\right) = \frac{Flow\ Rate\left(\frac{gallons}{minute}\right) \times Emission\ Factor\left(\frac{pounds}{10^3 gallons}\right) \times 60\left(\frac{minutes}{hour}\right) \times 8{,}760\left(\frac{hours}{year}\right) \times 0.005\%}{2{,}000\left(\frac{pounds}{ton}\right) \times 1{,}000\left(\frac{gallons}{10^3 gallons}\right)}$$

4.2.9 Potential Emissions – Boilers

POET operates three boilers, Units #10, #11, and #32. Units #10 and #11 are fueled with natural gas and distillate oil. Unit #32 is fueled with natural gas.

Units #10 and #11 are limited to firing with diesel to no more than 3,600 hours per 12-month rolling period, combined. DANR will calculate potential emissions for the boilers using diesel based each boiler operating 1,800 hours, the emission limits from Table 4-4, and using Equation 4.6. The results are summarized in Table 4-7.

Equation 4.6 – Potential Emissions from Boilers firing Diesel

$$Potential\left(\frac{tons}{year}\right) = \frac{1{,}800\left(\frac{hours}{year}\right) \times Emission\ Factors\left(\frac{pounds}{hour}\right)}{2{,}000\left(\frac{pounds}{ton}\right)}$$

Units #10 and #11 have no hour limit for operating on natural gas. DANR will calculate potential emissions for the boilers using natural gas based each boiler operating 6,960 hours, the emission limits from Table 4-4, and using Equation 4.7. The results are summarized in Table 4-7.

Equation 4.7 – Potential Emissions from Boilers firing Natural Gas

$$Potential\left(\frac{tons}{year}\right) = \frac{(8{,}760 - 1{,}800)\left(\frac{hours}{year}\right) \times Emission\ Factors\left(\frac{pounds}{hour}\right)}{2{,}000\left(\frac{pounds}{ton}\right)}$$

The facility also operates a natural gas fired boiler, Unit #32. Potential emissions from Unit #32 are calculated based on the short-term emission limit in Table 4-1 and Equation 4.1. The results are shown in Table 4-7.

4.2.10 Potential Emissions – Tanks

POET provided emissions estimates for the storage tanks (#15, #16, #17, #18, #19, and 33). The emissions were determined using EPA Tanks 4.0 program. DANR agrees with the emissions estimates which are shown in Table 4-7.

4.2.11 Potential Emissions – Loading Rack, truck and rail

POET has an ethanol production limit of 128 million gallons of undenatured ethanol per 12-month rolling period. A flare is operated when loading out ethanol by truck and by rail. POET is limited to 50,000,000 gallons of undenatured or denatured ethanol being loaded out truck, combined, in a 12-month period. Of the 50,000,000 gallons, POET is also limited to unloading no more than 2,510,000 gallons of E-85 per 12-month period. POET also has a limit allowing only 1,000,000 gallons of undenatured or denatured ethanol can be loaded out when the flare is not operated. Therefore, DANR will calculate the controlled and uncontrolled emissions for ethanol loadout based on the limits.

POET included denatured ethanol loadout emission factors in a renewal application. The emission factors are shown in Table 4-4.

Table – 4-4 – Emission Factors for Denatured Ethanol Loadout (pounds per 1,000 gallons)

	VOC
Uncontrolled truck denatured loadout	0.40
Uncontrolled rail denatured loadout	0.40
Controlled truck denatured loadout	0.01
Controlled rail denatured loadout	0.01
Uncontrolled E-85 loadout	1.19

	VOC
Controlled E-85 loadout	0.02

Throughput data for the loading rack was provided in the 2022 renewal application. According to POET's application the denaturant (gasoline) increases the volume of the undenatured ethanol by 5.0% for a total throughput from 128,000,000 gallons to 134,400,000 gallons per year of denatured ethanol.

POET has a loadout limit for E-85. The loadout limit is not specific to controlled or uncontrolled. Therefore, DANR will calculate the emission for E-85 loadout based on the worst case which is uncontrolled. Potential uncontrolled emissions will be calculated using the uncontrolled E-85 loadout emission factor from Table 4-5 and the E-85 loadout limit from Table 4-2 using Equation 4.8. The results are shown in Table 4-6.

Equation 4.8 – Uncontrolled Potential Emissions from Truck Loadout

$$Potential\ Emissions\left(\frac{tons}{year}\right) = \frac{2{,}510{,}000\left(\frac{gallons}{year}\right) \times Emission\ Factor\left(\frac{pounds}{1{,}000\ gallons}\right)}{1{,}000\left(\frac{gallons}{1{,}000\ gallons}\right) \times 2{,}000\left(\frac{pounds}{ton}\right)}$$

POET has an uncontrolled loadout limit of 1,000,000 gallons. Based on Table 4-5, the uncontrolled emission rate for truck and rail loadout are the same. Therefore, potential uncontrolled emissions will be calculated using the uncontrolled truck loadout emission factor from Table 4-5 and the uncontrolled loadout limit from Table 4-2 using Equation 4.9. The results are shown in Table 4-6.

Equation 4.9 – Uncontrolled Potential Emissions from Truck Loadout

$$Potential\ Emissions\left(\frac{tons}{year}\right) = \frac{1{,}000{,}000\left(\frac{gallons}{year}\right) \times Emission\ Factor\left(\frac{pounds}{1{,}000\ gallons}\right)}{1{,}000\left(\frac{gallons}{1{,}000\ gallons}\right) \times 2{,}000\left(\frac{pounds}{ton}\right)}$$

Potential controlled emissions are calculated using the controlled truck loadout emission factor from Table 4-5 and Equation 4.10. The results are shown in Table 4-6.

Equation 4.10 – Controlled Potential Emissions from Truck Loadout

$$Potential\ Emissions\left(\frac{tons}{year}\right) = \frac{(134{,}000{,}000 - 3{,}510{,}000)\left(\frac{gallons}{year}\right) \times Emission\ Factor\left(\frac{pounds}{1{,}000\ gallons}\right)}{1{,}000\left(\frac{gallons}{1{,}000\ gallons}\right) \times 2{,}000\left(\frac{pounds}{ton}\right)}$$

Flare emissions from burning natural gas may also contribute to increased potential emissions. The flare, Unit #20, has a maximum operating rate of 6.4 million Btus per hour and is fueled with natural gas. Emission factors for natural gas combustion are derived from AP-42, 1.4, Tables 1.4-1 and 1.4-2, July 1998 and are shown in Table 4-5.

Table 4-5 – Emission Factors Natural Gas Combustion

	TSP	PM_{10}	$PM_{2.5}$	SO_2	NOx	CO	VOC
Pounds per million cubic feet[1]	7.6	7.6	7.6	0.6	100	84	5.5
Pounds per million Btu	0.0075	0.0075	0.0075	0.0006	0.098	0.082	0.0054

[1] – To convert from pounds per million gallons to pounds per million Btu, divide by 1,020.

Potential emissions are calculated using Equation 4.11, the heat input, annual operation of 8,760 hours per year, and the emission factors from Table 4-4. The results are shown in Table 4-6.

Equation 4.11 – Potential Emissions

$$Potential\ Emissions\left(\frac{tons}{year}\right) = \frac{Operating\ Rate\left(\frac{MMBtus}{hour}\right) \times Emission\ Factor\left(\frac{pounds}{MMBtu}\right) \times 8{,}760\left(\frac{hours}{year}\right)}{2{,}000\left(\frac{pounds}{ton}\right)}$$

Table 4-6 – Potential Emissions from Ethanol Loadout

Unit	Description	TSP	PM_{10}	$PM_{2.5}$	SO_2	NOx	CO	VOC
#20/ #21	Uncontrolled	-	-	-	-	-	-	0.20
	Controlled	-	-	-	-	-	-	1.30
	E-85							1.49
	Flare	0.21	0.21	0.21	0.02	2.75	2.30	0.15
Total		**0.21**	**0.21**	**0.21**	**0.02**	**2.75**	**2.30**	**3.14**

4.2.12 Potential Emissions – Grain Milling

Potential emissions from the six hammermills (Units #22, #23, #24, #25, #27, and #28) are calculated based on the short-term emission limits in Table 4-1 and Equation 4.1. The results are shown in Table 4-7.

4.2.13 Potential Emissions – Fluid Bed Cooler

Potential emissions from the fluid bed cooler (Unit #29) are calculated based on the short-term emission limit in Table 4-1 and Equation 4.1. The results are shown in Table 4-7.

4.2.14 Summary of Potential Emissions

The potential emissions are summarized in Table 4-7.

Table 4-7 – Facility-wide Potential Emissions (tons per year)

Unit	Description	TSP	PM_{10}	$PM_{2.5}$	SO2	NOx	CO	VOC
#1	Grain receiving	4.38	4.38	4.38				7.01
#2	Grain cleaning	0.44	0.44	0.44				
#4[1]	Fermentation #1							67.6
#4a	Fermentation and distillation							16

Unit	Description	TSP	PM_{10}	$PM_{2.5}$	SO2	NOx	CO	VOC
	process #1							
#4b	Fermentation and distillation process #2							13.5
#6	Regenerative thermal oxidizer	65.7	65.7	65.7	18.40	123	131	43.8
#6a	Centrifuge bypass							1.25
#7	DDGS receiver	5.26	5.26	5.26				1.75
#8	DDGS silo loading	0.44	0.44	0.44				1.75
#9	Cooling tower	0.007	0.007	0.007				
#10[2]	Boiler #1 (natural gas)	2.09	2.09	2.09	0.35	12.53	11.14	1.40
#10[3]	Boiler #1 (distillate oil)	1.80	1.80	1.80	37.98	10.62	5.85	0.72
#11[2]	Boiler #2 (natural gas)	2.09	2.09	2.09	0.35	12.53	11.14	1.40
#11[3]	Boiler #2 (distillate oil)	1.80	1.80	1.80	37.98	10.62	5.85	0.72
#15	Tank #1							0.48
#16	Tank #2							0.86
#17	Tank #3							0.18
#18	Tank #4							0.18
#19	Tank #5							0.73
#20	Truck loading rack	0.21	0.21	0.21	0.02	2.75	2.30	3.14
#21	Rail car loading rack							
#22	Hammermill #1	2.19	2.19	2.19				
#23	Hammermill #2	2.19	2.19	2.19				
#24	Hammermill #3	2.19	2.19	2.19				
#25	Hammermill #4	2.19	2.19	2.19				
#27	Hammermill #5	2.19	2.19	2.19				
#28	Hammermill #6	2.19	2.19	2.19				
#29	Fluid bed cooler	6.57	6.57	6.57				30.66
#30	DDGS silo	0.44	0.44	0.44				1.75
#32	Boiler #3	2.63	2.63	2.63	0.44	15.77	14.02	1.75
#33	Tank #6							0.18
Total		**107**	**107**	**107**	**96**	**188**	**181**	**187**

[1] – Potential emissions based on 8,760 hours per year – 1,000 hours per year – 1,000 hours per year = 6,760 hours per 12-month rolling period;

[2] – Potential emissions are based on 8,760 hours per year – 1,800 hours per year = 6960 hours per year operating on natural gas; and

[3] – Potential emissions are based on the operational limit of 3,600 hours per year/2 units = 1,800 hours per year per unit.

4.3 Prevention of Significant Deterioration Summary

Based on Table 4-7, POET's potential criteria pollutant emissions are less than 250 tons per year. Therefore, POET is considered a minor source and is not applicable to the Prevention of Significant Deterioration program. Because POET is not applicable to the Prevention of Significant Deterioration program, a review for greenhouse gas emissions is not warranted or required.

5.0 National Emission Standards for Hazardous Air Pollutants

DANR reviewed the national emission standards for hazardous air pollutants under 40 CFR Part 61 and determined that there are no requirements applicable to POET's operation.

6.0 Maximum Achievable Control Technology Standards

The federal Maximum Achievable Control Technology Standards are applicable to both major and area sources of hazardous air pollutants. A major source of hazardous air pollutants is defined as having the potential to emit 10 tons or more per year of a single hazardous air pollutant or 25 tons per year or more of a combination of hazardous air pollutants. An area source is a source that is not a major source of hazardous air pollutants.

6.1 Potential Hazardous Air Pollutant Emissions

DANR uses stack test results to determine air emissions whenever stack test data is available from the source or a similar source. When stack test results are not available, DANR relies on manufacturing data, material balance, EPA's Compilation of Air Pollutant Emission Factors (AP-42, Fifth Edition, Volume 1) document, the applicant's application, or other methods to determine potential air emissions.

Table 6-1 provides a summary of the most recent stack test results per permitted unit for hazardous air pollutants.

Table 6-1 – Summary of Stack Test Results

Unit	Date	Pollutant	Results
#1	**08/05/2019**	Acetaldehyde	0.09 pounds per hour
	08/05/2019	Acrolein	0.03 pounds per hour
	08/05/2019	Methanol	0.04 pounds per hour
	08/05/2019	Formaldehyde	0.01 pounds per hour
#4a	**07/31/2019**	Acetaldehyde	3.22 pounds per hour
	07/31/2019	Acrolein	0.03 pounds per hour

Unit	Date	Pollutant	Results
	07/31/2019	Methanol	0.02 pounds per hour
	07/31/2019	Formaldehyde	0.01 pounds per hour
#4b	**08/07/2019**	Acetaldehyde	2.77 pounds per hour
	07/30/2019	Acrolein	0.02 pounds per hour
	07/30/2019	Methanol	0.03 pounds per hour
	08/07/2019	Formaldehyde	0.01 pounds per hour
#6	**08/02/2019**	Acetaldehyde	0.45 pounds per hour
	08/02/2019	Acrolein	0.15 pounds per hour
	08/02/2019	Methanol	0.51 pounds per hour
	08/03/2019	Formaldehyde	0.07 pounds per hour
#6a	**01/25/2017**	Acetaldehyde	0.004 pounds per hour
	01/25/2017	Acrolein	0.0002 pounds per hour
	01/25/2017	Methanol	0.0001 pounds per hour
	01/25/2017	Formaldehyde	0.00001 pounds per hour
#7	**08/06/2019**	Acetaldehyde	0.11 pounds per hour
	08/06/2019	Acrolein	0.03 pounds per hour
	08/06/2019	Methanol	0.04 pounds per hour
	08/06/2019	Formaldehyde	0.01 pounds per hour
#29	**02/17/2011**	Acetaldehyde	0.06 pounds per hour
	02/17/2011	Acrolein	0.01 pounds per hour
	02/17/2011	Methanol	0.06 pounds per hour
	02/17/2011	Formaldehyde	0.02 pounds per hour
#30	**08/06/2019**	Acetaldehyde	0.02 pounds per hour
	08/06/2019	Acrolein	0.02 pounds per hour
	08/06/2019	Methanol	0.01 pounds per hour
	08/06/2019	Formaldehyde	0.001 pounds per hour

6.1.1 Potential Hazardous Air Pollutant Emissions – Receiving

Grain receiving, Unit #1, does emit hazardous air pollutants. Potential hazardous air pollutant emissions will be calculated based on the most recent stack test results from Table 6-1 and Equation 4.1. The results are shown in Table 6-6.

6.1.2 Potential Emissions – Grain Cleaning

Grain cleaning, Unit #2, does not emit hazardous air pollutants. Therefore, potential hazardous air pollutant emissions will not be evaluated.

6.1.3 Potential Emissions – Fermentation, Distillation

POET's fermentation and distillation (Units #4, #4a, and #4b) process operates under six operating scenarios. Normal operation occurs when emissions from Unit #4 are routed to Units #4a and #4b, which control emissions in parallel. Emissions are then routed to the thermal

oxidizer, Unit #6. Potential hazardous air pollutant emissions for Unit #4 under normal operations are calculated for Unit #6. Unit #4a is calculated based on the stack test results in Table 6-1, the 1,000-hour limit, and Equation 4.2. The results are shown in Table 6-1. Unit #4b is calculated based on the stack test results in Table 6-1, the 1,000-hour limit, and Equation 4.2. The results are shown in Table 6-6.

6.1.4 Potential Emissions – Dryer System

Potential hazardous air pollutant emissions from dryer system, Unit #6, are calculated based on the results of the most recent stack test from Table 6-1 and using Equation 4.1. The results are shown in Table 6-6.

6.1.5 Potential Emissions – Centrifuge Bypass

Potential hazardous air pollutant emissions from the centrifuge bypass, Unit #6a, are calculated based on the hour limit in Table 4-2, and the most recent stack test from Table 6-1 using Equation 4.4. The results are shown in Table 6-6.

6.2.6 Potential Emissions – DDGS Receiver

Potential hazardous air pollutant emissions from DDGS receiver, Unit #7, are calculated based on the results of the most recent stack test from Table 6-1 and using Equation 4.1. The results are shown in Table 6-6.

6.1.7 Potential Emissions – DDGS Silos

The DDGS silos, Units #8 and #30, are very similar. Unit #30 was tested recently; Unit #8 has not been tested. DANR will use the stack test results for unit #30 to calculate potential hazardous air pollutant emissions for Unit #8. Potential hazardous air pollutant emissions from DDGS silos, Units #8 and #30, are calculated based on the results of the most recent stack test from Table 6-1 and using Equation 4.1. The results are shown in Table 6-6.

6.1.8 Potential Emissions – Cooling Towers

The cooling tower, Units #9, does not emit hazardous air pollutants. Therefore, potential hazardous air pollutant emissions will not be evaluated.

6.1.9 Potential Emissions – Boilers

POET operates three boilers, Units #10, #11, and #32. Units #10 and #11 are fueled with natural gas and distillate oil. Unit #32 is fueled with natural gas. The hazardous air pollutant emission factor for natural gas combustion is derived from AP-42, 1.4, Table 1.4-3, July 1998, and are displayed in Table 6-2. The hazardous air pollutant emission factor for distillate oil combustion is derived from AP-42, 1.3, Table 1.3-9, May 2010, and are shown in Table 6-3.

Table 6-2 – Emission Factors Natural Gas Combustion

	HAPs
Pounds per million cubic feet[1]	1.882
Pounds per million Btu	0.0018

[1] – To convert from pounds per million cubic feet to pounds per million Btu, divide by 1,020.

Table 6-3 – Emission Factors Distillate Oil Combustion

	HAPs
Pounds per 1,000 gallons[1]	0.041
Pounds per million Btu	0.0003

[1] – To convert from pounds per 1,000 gallons to pounds per million Btu, divide by 149.

Units #10 and #11 are limited to firing with diesel to no more than 3,600 hours per 12-month rolling period, combined. DANR will calculate potential hazardous air pollutant emissions for the boilers using diesel based on each boiler operating 1,800 hours, the emission factor from Table 6-3, the maximum operating rate from Table 1-1, and using Equation 4.6. The results are summarized in Table 6-6.

Units #10 and #11 have no hour limit for operating on natural gas. DANR will calculate potential hazardous air pollutant emissions for the boilers using natural gas based on each boiler operating 6,960 hours, the emission factor from Table 6-2, the maximum operating rate from Table 1-1, and using Equation 4.7. The results are summarized in Table 6-6.

The facility also operates a natural gas fired boiler, Unit #32. The hazardous air pollutant emission factor for natural gas combustion is derived from AP-42, 1.4, Table 1.4-3, July 1998, and are displayed in Table 6-2. Potential hazardous air pollutant emissions from Unit #32 are calculated using Equation 6.1, the emission factor from Table 6-4, the maximum operating rate of from Table 1-1, and the conversion factor of 2,000 pounds per ton. The results are summarized in Table 6-6.

Equation 6.1 – Potential Hazardous Air Pollutant Emissions

$$Potential\ Emissions\left(\frac{tons}{year}\right) = \frac{Operating\ Rate\left(\frac{MMBtus}{hour}\right) \times Emission\ Factor\left(\frac{pounds}{MMBtu}\right) \times 8{,}760\left(\frac{hours}{year}\right)}{2{,}000\left(\frac{pounds}{ton}\right)}$$

6.1.10 Potential Emissions – Tanks

POET provided emissions estimates for the storage tanks (#15, #16, #17, #18, #19, and 33). The emissions were determined using EPA Tanks 4.0 program. DANR agrees with the emissions estimates which are shown in Table 6-6.

6.1.11 Potential Emissions – Loading Rack, truck and rail

The majority of hazardous air pollutant emissions from the load out of ethanol are from the denaturant. As discussed above in Section 4.2.10, POET's denatured ethanol throughput is 134,400,000 gallons per year, of which 128 million gallons is undenatured ethanol and 6,400,000

gallons of denaturant. Table 6-4 displays the hazardous air pollutant content of the denaturant and ethanol as a percentage of volatile organic compound emissions.

Table 6-4 – Hazardous Air Pollutant Content Based on Volatile Organic Compound Emissions

Hazardous Air Pollutant	Denaturant Content	Ethanol Content
Acetaldehyde	-	0.04%
Benzene	5%	-
Hexane	45%	-
Ethylbenzene	5%	-
Toluene	5%	-
Xylenes	15%	-

Potential hazardous air pollutant emissions from the ethanol content are calculated using Equation 6.2, the ethanol yearly throughput of 128 million gallons, the hazardous air pollutant content from Table 6-4, and the uncontrolled volatile organic compound emission factor from Table 4-4. The results are shown in Table 6-5.

Equation 6.2 – Potential Hazardous Air Pollutant Emissions: Ethanol

$$Potential\ Emissions\left(\frac{tons}{year}\right) = \frac{128{,}000{,}000\left(\frac{gallons}{year}\right) \times 0.40\left(\frac{pounds}{1{,}000\ gallons}\right) \times HAP\ Content(\%)}{1{,}000\left(\frac{gallons}{1{,}000\ gallons}\right) \times 2{,}000\left(\frac{pounds}{ton}\right)}$$

Potential hazardous air pollutant emissions from the denaturant content are calculated using Equation 6.3, the denaturant yearly throughput of 6,400,000 gallons, the hazardous air pollutant content from Table 6-4, and the uncontrolled volatile organic compound emission factor from Table 4-4. The results are shown in Table 6-5.

Equation 6.3 – Potential Hazardous Air Pollutant Emissions: Denaturant

$$Potential\ Emissions\left(\frac{tons}{year}\right) = \frac{6{,}400{,}000\left(\frac{gallons}{year}\right) \times 0.40\left(\frac{pounds}{1{,}000\ gallons}\right) \times HAP\ Content(\%)}{1{,}000\left(\frac{gallons}{1{,}000\ gallons}\right) \times 2{,}000\left(\frac{pounds}{ton}\right)}$$

Table 6-5 – Hazardous Air Pollutant Emissions (tons per year)

Hazardous Air Pollutant	(tons per year)
Acetaldehyde	0.010
Benzene	0.064
Hexane	0.576
Ethylbenzene	0.064
Toluene	0.064
Xylenes	0.192
Total	**1.62**

POET operates a flare to control emissions from the loadout. Flare hazardous air pollutant emissions from burning natural gas may also contribute to increased potential emissions. The flare, Unit #20, has a maximum operating rate of 6.4 million Btus per hour and is fueled with

natural gas. Emission factors for natural gas combustion are derived from AP-42, 1.4, Table 1.4-3, July 1998 and are shown in Table 6-2.

Potential emissions are calculated using Equation 4.11, the heat input, annual operation of 8,760 hours per year, and the hazardous air pollutant emission factor from Table 6-2. The results are shown in Table 6-6.

6.1.12 Potential Emissions – Grain Milling

The hammermills, Units #22, #23, #24, #25, #27, and #28, do not emit hazardous air pollutants. Therefore, potential hazardous air pollutant emissions will not be evaluated.

6.1.13 Potential Emissions – Fluid Bed Cooler

Potential hazardous air pollutant emissions from the fluid bed cooler (Unit #29) are calculated based on the results of the most recent stack test from Table 6-1 and using Equation 4.1. The results are shown in Table 6-6.

6.1.14 Summary of Potential Hazardous Air Pollutant Emissions

Table 6-6 provides a summary of hazardous air pollutant emissions for POET's operations.

Table 6-6 – Facility Potential Emissions (tons per year)

Unit	Description	Acetaldehyde	Acrolein	Methanol	Formaldehyde	Total HAPs
#1	Grain receiving	0.39	0.13	0.18	0.04	-
#4a	Fermentation and distillation process #1	1.61	0.02	0.01	0.01	
#4b	Fermentation and distillation process #2	1.39	0.01	0.02	0.01	
#6	Regenerative thermal oxidizer	1.97	0.66	2.23	0.31	-
#6a	Centrifuges	0.001	0.00005	0.00003	0.000003	-
#7	DDGS receiver	0.48	0.13	0.18	0.04	-
#8	DDGS silo loading	0.09	0.09	0.04	0.004	-
#10	Boiler #1 (natural gas)	-	-	-	-	0.51
	Boiler #1 (distillate oil)	-	-	-	-	0.02
#11	Boiler #2 (natural gas)	-	-	-	-	0.51
	Boiler #2 (distillate oil)	-	-	-	-	0.02
#15	Tank #1	0.0001	0.000007	0.00001	0.00001	-
#16	Tank #2	-	-	-	-	0.019
#17	Tank #3	0.00004	0.000002	0.000004	0.000005	-
#18	Tank #4	0.00004	0.000002	0.000004	0.000005	-
#19	Tank #5	-	-	-	-	0.016

Unit	Description	Acetaldehyde	Acrolein	Methanol	Formaldehyde	Total HAPs
#20	Flare	-	-	-	-	0.05
#21	Ethanol loadout	-	-	-	-	1.62
#29	Fluid Bed Cooler	0.26	0.04	0.26	0.09	-
#30	DDGS silo	0.09	0.09	0.04	0.004	-
#32	Boiler #3	-	-	-	-	0.64
#33	Tank #6	0.00004	0.000003	0.000004	0.000005	-
Total		**4.89**	**1.17**	**2.96**	**0.51**	**3.41**
		12.94				

Based on Table 6-6, POET is considered an area source of hazardous air pollutants. POET accepted operational limits to ensure their potential to emit does not exceed the major source threshold under the Title V air quality operating permit program for hazardous air pollutants.

6.2 Maximum Achievable Control Technology Standards

DANR reviewed the Maximum Achievable Control Technology Standards under 40 CFR Part 63 and determined the following standards may be applicable to POET.

6.2.1 Standards for Miscellaneous Organic Chemical Processing Plants – Subpart FFFF

On November 10, 2003, EPA finalized the maximum achievable control technology standard under 40 CFR Part 63, Subpart FFFF. This rule applies to the following chemical processing plants:

1. Those facilities that produce chemicals classified using the 1987 Standard Industrial Classification Manual of a code indicated by 282, 283, 284, 285, 286, 287, 289, or 386; and
2. Those facilities that are a major source of hazardous air pollutants. A major source of hazardous air pollutants has the potential to emit 10 tons of a single hazardous air pollutant and/or 25 tons of all hazardous air pollutants.

POET's Standard Industrial Classification code is 2869, which falls underneath the code of 286. POET's current permit has an emission limitation that requires POET to maintain its hazardous air pollutant emissions less than the major source thresholds. Therefore, POET is not applicable to Subpart FFFF.

6.2.2 Standards for Industrial, Commercial, and Institutional Boilers – Subpart DDDDDD

40 CFR Part 63, Subpart DDDDD establishes national emission and operating limits for hazardous air pollutants emitted from industrial, commercial, and institutional boilers and process heaters located at a major source of hazardous air pollutant emissions.

Due to emission and operational limits, POET is considered an area source of hazardous air pollutants. Therefore, POET's boilers are not subject to this subpart.

6.2.3 Standards for Industrial, Commercial and Institutional Boilers – Subpart JJJJJJ

On March 21, 2011, EPA finalized the maximum achievable control technology standard under 40 CFR Part 63, Subpart JJJJJJ. This rule applies to all new or existing industrial, commercial, and institutional boilers located at an area source of hazardous air pollutants. An existing boiler is defined as a boiler where construction or reconstruction occurred prior to June 4, 2010.

POET operates two boilers that were constructed prior to June 4, 2010 and one boiler constructed after June 4, 2010. Units #10 and #11 have a rated capacity of 81 million Btus per hour and are fired with natural gas and diesel fuel. Unit #32 has a rated capacity of 81 million Btus per hour and is only fired with natural gas. The potential hazardous air pollutant emissions from POET classify it as an area source of hazardous air pollutants. Therefore, Units #10 and #11 are subject to this subpart.

In accordance with 40 CFR § 63.11195(e), a gas-fired boiler is exempt from the requirements of this subpart. A gas-fired boiler is defined as "…any boiler that burns gaseous fuels not combined with any solid fuels, burns liquid fuel only during periods of gas curtailment, gas supply emergencies, or periodic testing on liquid fuel." Gaseous fuels include natural gas. Therefore, Unit #32 is not subject to this subpart provided natural gas is the only fuel burned in Unit #32.

6.2.4 Standards Applicable to Industrial Process Cooling Towers – Subpart Q

The national emission standard for industrial process cooling towers in 40 CFR Part 63 Subpart Q prohibits the use of chromium based water treatment chemicals in industrial process cooling towers. In accordance with 40 CFR § 63.400, this subpart is only applicable to major sources of hazardous air pollutants. POET is considered an area source of hazardous air pollutants and not subject to this subpart.

6.2.5 Standards for Chemical Manufacturing Area Sources – Subpart VVVVVV

On October 29, 2009, EPA finalized the Maximum Achievable Control Technology standard under 40 CFR Part 63, Subpart VVVVVV. This rule applies to all new or existing chemical manufacturing process units located at an area source of hazardous air pollutants that meet the following:

1. The chemical manufacturing process unit uses as feedstock, generates as byproducts, or produces as products any of the hazardous air pollutants listed in Table 1 of the subpart;
2. The chemical manufacturing process unit is located at an area source of hazardous air pollutants; and
3. The hazardous air pollutants listed in the Table of the subpart are present in the feedstock or generated or produced in the chemical manufacturing process unit and present in process fluid, at concentrations greater than 0.1 percent for carcinogens, as defined by the Occupational Safety and Health Administration at 29 CFR § 1910.1200(d)(4), and greater than 1.0 percent for non-carcinogens.

A chemical manufacturing process unit includes all process vessels, equipment, and activities necessary to operate a chemical manufacturing process that produces a material or a family of materials described by North American Industry Classification System (NAICS) code 325. A chemical manufacturing process unit consists of one or more unit operations and any associated recovery devices. It also includes each storage tank, transfer operation, surge control vessel, and bottoms receiver associated with the production of such NAICS code 325 materials. NAICS code 325193 – Ethyl Alcohol Manufacturing, is comprised primarily in manufacturing denatured alcohol and non-potable ethyl alcohol, ethanol, or grain alcohol. An existing chemical manufacturing process unit is defined as a chemical manufacturing facility where construction or reconstruction occurred prior to October 6, 2008.

POET's operation was constructed in 2001 and produces non-potable ethanol. POET is considered an existing area source and produces acetaldehyde as a byproduct during its operations, which is considered a carcinogenic. Subpart VVVVVV requires that concentration of carcinogenic compounds be equal to or less than 0.1 percent or 1,000 parts per million. On April 12, 2012, POET submitted documentation of testing of acetaldehyde in their stack tests and using industry standards, they show their process concentrations are less than 54.45 parts per million which is less than 1,000 parts per million. Table 6-1 summarizes past stack test results for acetaldehyde. Therefore, this subpart is not applicable to POET.

6.2.6 Other Maximum Achievable Control Technology Standards

DANR reviewed the other Maximum Achievable Control Technology Standards and determined there are no other standards applicable to POET.

7.0 State Requirements

7.1 Permit Type

Any source operating in South Dakota that meets the definition of a major source for any criteria pollutant is required to obtain a Title V air quality operating permit. A major source is defined as having the potential to emit greater than 100 tons per year of a criteria pollutant or greater than or equal to 10 tons per year of a single hazardous air pollutant, or greater than or equal to 25 tons per year of a combination of hazardous air pollutants. In addition, sources subject to a New Source Performance Standard or National Emission Standard for Hazardous Air Pollutants must obtain a Title V air quality operating permit, unless otherwise noted in the state or federal rule. POET's potential emissions are greater than the major source threshold for criteria air pollutants and subject to several New Source Performance Standards and Maximum Achievable Control Technology Standards. Therefore, POET is required to obtain a Title V air quality operating permit.

7.2 State Emission Limits

Administrative Rules of South Dakota (ARSD) 74:36:06:02 establishes state emission limits for total suspended particulate matter and sulfur dioxide. State emission limits are applicable to fuel

burning and process industry units. Cooling towers and flares are not considered process industry units or fuel burning units. Therefore, Units #20 and #31 is not applicable to the state emission limits.

Units #4, #4a, #4b, #6a, #15 through #19, and Unit #33 do not emit particulate matter and therefore, are not applicable to the state emission limit.

Units #1, # 2, #4, #4a, #4b, #6a, #7, #8, #9, #15 through #19, #22 through #25, #27 through #31, and Unit #33 do not emit sulfur dioxide, and therefore are not applicable to the state emission limit.

Units that are applicable to short term emissions limits for particulate matter are not applicable to the state particulate matter emission limits. Therefore, Units #1, #2, #6, #7, #8, #10, #11, #22 through #25, #27 through #30, and #32 are not applicable to the state emission limit.

Visible emissions are applicable to units that discharge into the ambient air. In accordance with Administrative Rules of South Dakota (ARSD) 74:36:12, a facility may not discharge into the ambient air more than 20 percent opacity for all units. POET must control the opacity at less than 20 percent for all units.

7.3 Performance Tests

In previous Title V air quality operating permits and construction permits, POET was required to conduct performance tests to verify compliance with the permitted short-term limits. Table 7-1 summarizes the applicable test results.

Table 7-1 – Summary of Performance Test Results (pounds per hour)

Unit	Pollutant	Short-Term Limit	Stack Test		Percentage of Short-Term Limit
			Date	Results	
#1	PM	1.0	11/02/2017	0.01	1%
	VOC	1.6	08/05/2019	0.36	23%
#2	PM	0.1	11/02/2017	0.002	2%
#4	VOC	20.0	10/24/2017	13.30	67%
#4a	VOC (#1)	32.0	07/31/2019	29.45	92%
	VOC (#2)	32.0	08/01/2019	26.28	82%
#4b	VOC (#1)	27.0	07/30/2019	23.47	87%
	VOC (#2)	27.0	08/07/2019	18.31	68%
#6	PM	15.0	11/01/2017	5.6	37%
	SO_2	4.2	Not Tested	-	-
	NOx	28.0	10/26/2017	16.82	60%
	CO	30.0	10/26/2017	18.17	61%
	VOC	10.0	08/02/2019	5.49	55%
#6a	VOC	5.0	01/25/2017	1.08	22%
#7	PM	1.2	10/31/2017	0.40	33%
	VOC	0.4	Not Tested	-	-
#8	PM	0.1	11/01/2017	0.0006	0.6%

Unit	Pollutant	Short-Term Limit	Stack Test		Percentage of Short-Term Limit
			Date	Results	
	VOC	0.4	Not Tested	-	-
#10 – Natural Gas	PM	0.6	08/01/ 2012	0.025	4%
	SO_2	0.1	Not Tested	-	-
	NOx	3.6	01/14/2003	3.162	88%
	CO	3.2	01/14/2003	0.0172	0.54%
	VOC	0.4	01/14/2003	0.13	33%
#10 – Distillate Oil[1]	PM	2.0	09/03/2015	0.21	11%
	SO_2	42.2	Not Tested	-	-
	NOx	11.8	09/03/2015	5.47	46%
	CO	6.5	09/03/2015	0.75	12%
	VOC	0.8	01/14/2003	0.17	21%
#11 – Natural Gas	PM	0.6	01/01/2012	0.025	4%
	SO_2	0.1	Not Tested	-	-
	NOx	3.6	01/14/2003	2.65	74%
	CO	3.2	01/14/2003	0.03	0.94%
	VOC	0.4	01/14/2003	0.13	33%
#11 – Distillate Oil[1]	PM	2.0	09/03/2015	0.21	11%
	SO_2	42.2	Not Tested	-	-
	NOx	11.8	09/03/2015	5.47	46%
	CO	6.5	09/03/2015	0.75	12%
	VOC	0.8	01/14/ 2003	0.17	21%
#22	PM	0.5	10/25/2017	0.003	0.6%
#23	PM	0.5	10/25/2017	0.003	0.6%
#24	PM	0.5	10/25/2017	0.003	0.6%
#25	PM	0.5	10/25/2017	0.003	0.6%
#27	PM	0.5	10/25/2017	0.003	0.6%
#28	PM	0.5	10/25/2017	0.003	0.6%
#29	PM	1.5	10/26/2017	0.11	7%
	VOC	7.0	10/31/2017	2.50	36%
#30	PM	0.1	11/01/2017 [1]	0.0006	0.6%
	VOC	0.4	Not Tested	-	-
#32	PM	0.6	08/31/2019	0.17	28%
	SO_2	0.1	Not Tested	-	-
	NOx	3.6	08/31/2019	2.95	82%
	CO	3.2	08/31/2019	0.07	2%
	VOC	0.4	Not Tested	-	-

[1] – Stack Test conducted on Unit #8 is representative of Unit #30.

Based on the test results in Table 7-1, POET is in compliance with the short-term emission limits accepted to avoid a Prevention of Significant Deterioration review. Due to how close some of the test results are to the limits, and how long ago the tests have been conducted, DANR will require the following tests be conducted:

1. Particulate matter: Units #1, #2, #6, #7, #8, #22, #23, #24, #25, #27, #28, #29, #30, and #32. Units #10 and #11 must also be tested for particulate matter while burning natural gas.
2. Nitrogen oxide: Units #6 and #32. Units #10 and #11 must also be tested for nitrogen oxide while burning natural gas.
3. Carbon monoxide: Units #6 and #32. Units #10 and #11 must also be tested for carbon monoxide while burning natural gas.
4. Volatile organic compounds: Units #1, #4, #6, #6a, #7, #8, #30, and #32. Units #10 and #11 must also be tested for volatile organic compounds while burning natural gas. All operating scenarios must be tested for Units #4a and #4b.
5. Hazardous air pollutants: Units #1, #4, #6, #6a, #7, #8, #30, and #32. Units #10 and #11 must also be tested for hazardous air pollutants while burning natural gas. All operating scenarios must be tested for Units #4a and #4b except scenario C and B based on the results of scenarios E and F, the higher one would be used.

Units #10 and #11 rarely burn distillate oil. Therefore, DANR is not requiring a performance test be conducted on Units #10 and #11 while burning distillate oil.

7.4 Compliance Assurance Monitoring

Compliance assurance monitoring is applicable to permit applications received on or after April 20, 1998, from major sources applying for a Title V air quality permit. POET's application was received on August 22, 2016. Therefore, compliance assurance monitoring is applicable to any unit that meets the following criteria:

1. The unit is subject to an emission limit or standard for the applicable regulated air pollutant;
2. The unit uses a control device to achieve compliance with any such emission limit or standard; and
3. The unit has potential uncontrolled emissions of the applicable regulated air pollutant that are equal to or greater than 100 percent of the amount, in tons per year, required for a source to be classified as a major source.

40 CFR § 64.1 defines a control device as equipment other than inherent process equipment, that is used to destroy or remove air pollutant(s) prior to discharge to the atmosphere. A control device does not include passive control measures that act to prevent pollutants from forming, such as the use of seals, lids, or roofs to prevent the release of pollutants, use of low-polluting fuel or feedstock, or the use of combustion or other process design features or characteristics.

The floating roofs on the storage tanks (Units #15 through #19, and #33) are not considered control devices. Units #10, #11, #20, #21, and #32 do not use a control device to meet an emission limit. Therefore, Units #10, #11, #20, #21, and #32 are not applicable to compliance assurance monitoring.

The operations that may be applicable to compliance assurance monitoring are Units #1, #2, #7, #8, #22, #23, #24, #25, #27, #28, #29, and #30 which all use a baghouse to control particulate

matter emissions, Units #4 and #26 both use wet scrubbers and Unit #6 uses a thermal oxidizer to control volatile organic compounds and hazardous air pollutants.

Based on the September 2006 Statement of Basis, Units #1, #2, #7, #8, #22, #23, #24, #25, #27, #28, #29, and #30 do not have the potential to emit uncontrolled emissions greater than 100 tons per year. Therefore, Units #1, #2, #7, #8, #22, #23, #24, #25, #27, #28, #29, and #30 are not applicable to compliance assurance monitoring.
Based on the September 2006 Statement of Basis, Units #4, #6, and #26 do have the potential to emit uncontrolled volatile organic compounds greater than 100 tons per year. Therefore, Units #4, #6, and #26 are applicable to compliance assurance monitoring.

The fermentation systems (Units #4 and #26) are currently subject to a volatile organic compound emission limit, are controlled by wet scrubbers, and compliance assurance monitoring is based on establishing a flow rate and chemical injection rates that demonstrates compliance and continuously monitoring those rates. In accordance with the permit, if POET intends to modify the water flow and chemical injection rates below the rates demonstrated during the latest stack test, POET will conduct a performance test to demonstrate compliance with the short-term volatile organic compound emission limit at the lower flow.

Compliance with the regenerative thermal oxidizer system (Unit #6) is based on the temperature which is established during the most recent stack performance test and continuously monitored.

7.5 Periodic Monitoring

Periodic monitoring is required for each emission unit that is subject to an applicable requirement at a source subject to Title V of the federal Clean Air Act. POET is required to meet particulate matter, nitrogen oxide, sulfur dioxide, volatile organic compound, carbon monoxide and hazardous air pollutant emission limits. To ensure these limits are maintained, the following periodic monitoring procedures are required.

Periodic monitoring for opacity and particulate matter emissions will be based on periodic visible emission readings or evaluations. In addition, periodic monitoring of particulate matter emissions will consist of the proper operation and maintenance of all pollution control devices.

Units #1, #2, #6, #7, #8, #9, #10, #22, #23, #24, #25, #27, #28, #29, #30, and #32 are subject to periodic monitoring for particulate matter. Periodic monitoring for the units may consist of visible emission readings, pressure drop readings for the appropriate control device, or implementation of a maintenance plan for the appropriate control device. A permit condition will be placed in the permit requiring POET to perform periodic visible emission readings.
Units #4, #6 and #26 are subject to periodic monitoring for volatile organic compounds and/or hazardous air pollutants. Periodic monitoring will consist of establishing and recording the water flow rate of for the wet scrubber system and establishing and recording the temperature of the regenerative thermal oxidizer.

The equipment that is in volatile organic compounds service will be subject to periodic monitoring for volatile organic compound leaks. The volatile organic compound emissions from

equipment leaks are covered by the requirements of 40 CFR Part 60 Subpart VVa, which is incorporated in the permit.

Unit #6 is subject to periodic monitoring for sulfur dioxide, nitrogen oxide, carbon monoxide. Periodic monitoring for sulfur dioxide is not required when burning natural gas. Periodic monitoring of nitrogen oxide and carbon monoxide emissions will be based on good combustion practices.
Units #10 and #11 are subject to periodic monitoring for sulfur dioxide, nitrogen oxide, carbon monoxide. Periodic monitoring for sulfur dioxide is not required when burning natural gas. Periodic monitoring for sulfur dioxide will be based on the sulfur content of the distillate oil. If a fuel supplier's certificate is not obtained, the facility will be required to test the sulfur content of the distillate oil in the storage tanks after each shipment has been unloaded. Periodic monitoring of nitrogen oxide and carbon monoxide emissions will be based on good combustion practices.
Unit #32 is subject to periodic monitoring for sulfur dioxide, nitrogen oxide, and carbon monoxide. Periodic monitoring for sulfur dioxide is not required when burning natural gas. Periodic monitoring of nitrogen oxide and carbon monoxide will be based on good combustion practices.

The flare on Unit #20 is used to reduce volatile organic compound emissions. Even though the flare does not have a specific volatile organic compound limit, to verify that the flare on Unit #20 is operating properly, the requirements in 40 CFR 60.18 will be used as periodic monitoring for its operations.

In the September 2006 Statement of Basis, POET indicated the exhaust gases from the fluid bed cooler (Unit #29) as the combustion air source for the ring dryer associated with Unit #6, which reduce volatile organic compounds and hazardous air pollutant emissions. DANR required POET to install and monitor a combustion air valve on Unit #29. Therefore, POET will be required to monitor the air flow rate and the combustion air valve for the ring dryer associated with Unit #6.

7.6 Air Fees

Sources subject to the Title V air quality operating permit program are subject to an annual air quality fee. The fee consists of an administrative fee and a per ton fee based on the actual tons per year of pollutant emitted. The pollutants charged for are particulate matter, sulfur dioxides, nitrogen oxides, volatile organic compounds, and hazardous air pollutants. The actual emissions are calculated by DANR based on operational information provided by the source.

8.0 Recommendation

Based on the above findings, POET is required to operate within the requirements stipulated in the following regulations:

- ARSD 74:36:05 – Operating Permits for Part 70 Sources;
- ARSD 74:36:06 – Regulated Air Pollutant Emissions;
- ARSD 74:36:07 – New Source Performance Standards;

- ARSD 74:36:08 – National Emission Standards for Hazardous Air Pollutants;
- ARSD 74:36:11 – Stack Performance Testing;
- ARSD 74:36:12 – Control of Visible Emissions;
- ARSD 74:36:13 – Continuous emission monitoring systems; and
- SDCL 34A-1-58.1 – Air pollution control program fees.

Based on the information submitted in the air quality permit application, DANR recommends conditional approval to renew POET's Title V air quality operating permit. Questions regarding this permit review should be directed to Samantha Olmstead, Engineer III, Department of Agriculture and Natural Resources – Air Quality Program.