FACT SHEET FOR: CP26-001 **DATE: DRAFT**

NDEE ID: 124544

Name of Source: JEP Digester

Source Classification: Minor New Source Review (NSR) source at time of issuance
Area Source of Hazardous Air Pollutants (HAPs)

Regulatory changes may supersede information in this document. If the source should add or change equipment or change processes such that a NESHAP or NSPS subpart becomes an applicable requirement, it is the source's obligation to comply with that subpart and applicable requirements whether or not they are identified in the associated permitting action or Title 129. Also note that the NESHAP and NSPS subparts are subject to change. Detailed information related to NESHAP and NSPS subparts can be found on the NDWEE Air Toxics Notebook and NDWEE NSPS Notebook located on the NDWEE website (http://dee.ne.gov/). The NDWEE website can also be used to find other permit related and facility specific information that is not identified in this fact sheet.

DESCRIPTION OF THE SOURCE OR ACTIVITY:

JEP Digester is a proposed anaerobic digester facility near Juniata, Nebraska. According to information submitted with the application, the facility plans to process beef manure only from Gottsch Feeding Corporation-Juniata (FID 119), Gottsch Feeding Corporation-Red Cloud (FID 47515), and North Platte Livestock Feeders, LLC (FID 34671). The digesters will be sealed shell design and all gases generated from the anaerobic digestion process will be processed into renewable natural gas (RNG). The facility plans to produce Carbon dioxide (CO_2) from the resulting tail gas after the RNG production. The calculation sheet submitted with the application indicates that the facility is designed to process 3,975 MMscf of biogas per year.

PERMIT ACTION:

On January 7, 2026, the Department received a construction permit application (#26-001) from JEP Digester for the construction of a new anaerobic digester in Juniata, Nebraska. The Department had a meeting with the facility on April 15, 2026. After the meeting, the facility submitted an addendum to the application on April 28, 2026. From the meeting and addendum, the facility confirmed the following:

- The feedstock material will be composed of beef manure only.
- Names of feedlots where the facility will source its feedstock material.
- ThioSolv desulfurization unit is the main desulfurization unit for the tail gas and raw biogas. The H_2S polishing filters will be used to desulfurize the tail gas or raw biogas when the ThioSolv desulfurization unit is not operating.
- The maximum volumetric concentration of H_2S in gas stream at the outlet of both the ThioSolv desulfurization unit and H_2S polishing filters will be 147 ppm.

Equipment and processes at the site include the following:

RNG Production:

EP-1.1 through EP-1.3, Amine Boilers and CE-3/PE-3, Amine System:

JEP Digester proposes twelve (12) Hydrolysis Tanks (EU-1.01 through EU-1.12), eight (8) Main Fermenters (EU-2.01 through EU-2.08), twelve (12) Post Fermenters (EU-3.01 through EU-3.12), and two (2) Fermentation Residue Tanks (EU-4.01 and EU-4.02), or thirty-four (34) digester tanks in total.

The digester tanks will generate raw biogas from manure recovered from three (3) nearby feedlots. The raw biogas H_2S concentration produced by the 34 total tanks, as prescribed, is limited to 5,000 parts per million on a dry basis (ppmvd).

Raw biogas generated from the digestion at this facility will be further processed using an amine absorption and stripping process, the Amine system (CE-3, PE-3). This process works by routing the raw biogas through an enclosed absorber column where the acidic gases saturate the amine solution. The saturated amine solution is pumped to a regeneration column. The amine solution is heated using the Amine Boilers (EP-1.1 through EP-1.3), where the absorbed gases are stripped from the amine solution, which is pumped back to the absorber column.

As proposed in the application, the source will be installing three (3) Amine Boilers with an individual capacity of 27.9 MMBtu/hr fired by natural gas. The proposed Amine boilers are designed to be used to regenerate the amine solution and heat the influent and offset heat loss from the digester tanks.

The product of this process is anticipated to be primarily methane, known as renewable natural gas (RNG) product gas. For the RNG production process, the Amine system (CE-3) is considered control equipment. The upgrading process will remove VOCs, H_2S, and CO_2 from the raw biogas. After the Amine system (CE-3), the H_2S concentration of the RNG product gas, as prescribed, is limited to 4 ppmvd.

EP-2.1 TEG Reboiler:

Triethylene Glycol (TEG) Dryer will be used to absorb water vapor from the RNG product gas. The TEG Dryer uses TEG to remove the moisture from the RNG product gas stream prior to entering the pipeline.

The moisture rich stream is then routed to the TEG reboiler (EP-2.1), a 0.4 MMBtu/hr unit fired by natural gas, where the moisture is evaporated and the TEG is recovered back into the process.

EP-7.1a through EP-7.3a, Startup Flares:

Three (3) enclosed ground flares each with a design capacity of 100 MMBtu/hr will be used to combust RNG product gas and raw biogas. The flares each have two (2) burners, a startup burner and a bypass burner, and two (2) natural gas pilots. The startup burner for the Startup flares (EP-7.1a, EP-7.2a, and EP-7.3a) will receive RNG product gas and the bypass burner for the Bypass flares (EP-7.1b, EP-7.2b, and EP-7.3b) will receive raw biogas. Emissions from the two (2) burners in each flare will be vented out of the same stack (EP-7.1, EP-7.2, and EP-7.3).

When the Amine system (CE-3) is online, the startup flare burners will have access to the RNG product gas stream. The purpose of the startup flare burners is to combust RNG product gas that does not meet pipeline specifications, which is usually during startup or commissioning. Emissions for the Startup flares (EP-7.1a, EP-7.2a, and EP-7.3a) were calculated based on the flare capacity of 100 MMBtu/hr each. Emissions of SO_X were calculated based on the concentration of hydrogen sulfide in the RNG product gas, 4 ppm. While the Amine system (CE-3) is online the bypass flare burners will not have access to fuel. All six (6) pilots will operate continuously.

Ammonium Bisulfate (ABS) Synthesis, Ammonium Thiosulfate (ATS) Production and CO_2 Production:

A by-product of raw biogas being routed to the Amine system is a H_2S rich stream called “tail gas”. The tail gas from the Amine System consists of 97.3% carbon dioxide, 1.5% hydrogen sulfide and less than 1% methane.

CE-1, ThioSolv BioSWAATS Unit:

The tail gas stream and the raw biogas that bypasses the amine system will flow through the ThioSolv BioSWAATS Unit (CE-1) which will be used to remove the H_2S from the gas streams. This desulfurization process is part of the overall ThioSolv process. The ThioSolv process involves the following steps:

1. A sulfur burner (EU-5) combusts elemental sulfur with intake air, producing SO_2 gas. Concurrently, an ammonia stripper volatilizes ammonia (NH_3) from the liquid digestate stream, producing an NH_3 gas stream.

2. The SO_2 and NH_3 gases pass upward through a trickling bed media vessel, reacting to produce an ammonium bisulfate ($(NH_4)HSO_3$ or ABS) solution. The ABS is recycled within the ABS synthesis vessel, with excess volume extracted for use in step 4.

3. The unreacted SO_2 and air from the first vessel enter a second ABS synthesis vessel to react with additional NH_3 gas. Additional ABS is generated, and the unreacted SO_2 and NH_3 is vented from this second ABS synthesis vessel and exits via the ABS synthesis vent (EP-6). The ABS is recycled within the ABS synthesis vessel, with excess volume extracted for use in step 4.

4. In the third vessel, the collected ABS trickles through a media bed while NH_3 and raw biogas or tail gas rich in H_2S flows up through the vessel. The H_2S, NH_3, and ABS react within the vessel to yield a liquid ammonium thiosulfate solution ($(NH_4)_2S_2O_3$, or "ATS"), which is trucked off site as fertilizer. This process desulfurizes the raw biogas or tail gas to a maximum allowable H_2S concentration of 147 ppm in the exiting stream. This third vessel is referred to as the ThioSolv BioSWAATS Unit (CE-1).

CE-2a and CE-2b, H_2S Polishing Filter Train #1 and CE-2c and CE-2d, H_2S Polishing Filter Train #2:

From discussions and communications with the facility, the facility plans to use sacrificial H_2S Polishing Filters as an additional desulfurization unit. The H_2S Polishing Filters can also serve as the only desulfurization unit for the tail gas and raw biogas in the event the ThioSolv BioSWAATS Unit (CE-1) is not operating. The H_2S Polishing process consists of two H_2S Polishing Filter Trains, H_2S Polishing Filter Train #1 (CE-2a and CE-2b) and H_2S Polishing Filter Train #2 (CE-2c and CE-2d). Each train consists of two H_2S Polishing filters. From the specification sheet attached to the application, the H_2S Polishing Filter will consist of activated carbon.

EP-6, ABS Synthesis Vent:

The unreacted Sulfur Dioxide (SO_2) from the sulfur burner (EU-5) and ammonia (NH_4) will be vented to atmosphere through the ABS Synthesis vent (EP-6) from the second ABS synthesis vessel.

EP-5, Startup Vent:

The Tail gas stream and Raw biogas stream will be controlled by the ThioSolv BioSWAATS Unit (CE-1) and/or the H_2S polishing filters (CE-2a and CE-2b) and/or the H_2S polishing filters (CE-2c and CE-2d) to limit the H_2S concentration to 147 ppmvd.

The Tail gas will be vented through startup vent (EP-5) during startup and when the CO_2 production system is not operating.

EP-2.2 TEG Reboiler:

The desulfurized CO_2 product gas stream containing >99% CO_2 will enter an electric motor-driven compressor and be sent through a Triethylene Glycol (TEG) Dryer which will be used to absorb water vapor from the CO_2 product gas. The TEG Dryer uses TEG to remove the moisture from the CO_2 product gas stream prior to being sent to storage for trucking off-site, for CO_2 production.

The moisture rich stream is then routed to the TEG reboiler (EP-2.2), a 0.4 MMBtu/hr unit fired by natural gas, where the moisture is evaporated and the TEG is recovered back into the process.

Raw Biogas Bypass:

When the Amine system (CE-3/PE-3) is offline or is bypassed for another reason, the raw biogas stream will be desulfurized by the ThioSolv BioSWAATS Unit (CE-1) and/or the H_2S Polishing Filter Train #1 (CE-2a and CE-2b) and/or the H_2S Polishing Filter Train #2 (CE-2c and CE-2d) and routed to the Bypass flares (EP-7.1b, EP-7.2b, and EP-7.3b).

EP-7.1b through EP-7.3b, Bypass Flares:

Three (3) enclosed ground flares each with a design capacity of 100 MMBtu/hr will be used to combust RNG product gas and raw biogas. The flares each have two (2) burners, a startup burner and a bypass

burner, and two (2) natural gas pilots. The startup burner for the Startup flares (EP-7.1a, EP-7.2a, and EP-7.3a) will receive RNG product gas and the bypass burner for the Bypass flares (EP-7.1b, EP-7.2b, and EP-7.3b) will receive raw biogas. Emissions from the two (2) burners in each flare will be vented out of the same stack (EP-7.1, EP-7.2, and EP-7.3).

When the Amine system (CE-3) is offline, the bypass flare burners will have access to the raw biogas stream. The purpose of the bypass flare burners is to combust raw biogas while the Amine system is offline and RNG product gas is not generated. Emissions for the Bypass flares (EP-7.1b, EP-7.2b, and EP-7.3b) were calculated based on the flare capacity of 100 MMBtu/hr each. Emissions of SO_X were calculated based on the concentration of hydrogen sulfide in the raw biogas after being desulfurized, 147 ppm. While the Amine system is offline the startup flare burners will not have access to fuel. All six (6) pilots will operate continuously.

Other Auxiliary Equipment:

EP-3.01 through EP-3.12, Building Heaters:

JEP Digester proposes twelve (12) 1.0 MMBtu/hr building heaters (EP-3.01 through EP-3.12) fired by natural gas that will be used to heat the buildings onsite.

EP-4.01 through EP-4.20, Linear Generators:

JEP Digester proposes twenty (20) 250 kW linear generators (EP-4.01 through EP-4.20) fueled by natural gas that will be used as the facility's power supply. The generators use compressed fuel and air mixture that reacts in a non-combustion low temperature reaction. The generators each use two (2) opposing reciprocating cores to compress the fuel and air mixture with air springs. This reaction produces low NO_x emissions compared to traditional combustion engines, with a recommended emission factor for NO_x from the manufacturer of 0.0092 lb/MMBtu.

TYPE AND QUANTITY OF AIR CONTAMINANT EMISSIONS ANTICIPATED:

The change in emissions for this project, including fugitive emissions, is shown in the potential to emit (PTE) table below:

Regulated Pollutant	Project PTE (ton/yr)
Particulate Matter (PM)	27.22
PM smaller than or equal to 10 microns (PM_{10})	25.90
PM smaller than or equal to 2.5 microns ($PM_{2.5}$)	25.60
Sulfur Dioxide (SO_2)	50.62
Oxides of Nitrogen (NO_x)	227.57
Carbon Monoxide (CO)	237.32
Volatile Organic Compounds (VOC)	22.13
Hazardous Air Pollutants (HAPs)	
Highest Individual HAP: Formaldehyde	1.04
Total HAPs	3.19

SUPPLEMENTAL INFORMATION:

Title 129, Chapter 2 – Ambient Air Quality Standards (AAQS)

1.0 General Discussion

Under the Clean Air Act, EPA's Office of State Air Partnerships (OSAP) is responsible for setting standards, also known as the National Ambient Air Quality Standards (NAAQS), for pollutants which are considered harmful to people and the environment. There are two types of standards: primary and secondary. Primary standards protect against adverse health effects; secondary standards protect against welfare effects, such as damage to farm crops and vegetation, and damage to buildings.

The NAAQS prescribed in 40 CFR §50 are identical to the majority of Nebraska's Ambient Air Quality Standards (AAQS) and include Carbon Monoxide (CO), Nitrogen Dioxide (NO_2), Sulfur Dioxide (SO_2), Particulate Matter ($PM_{2.5}$ and PM_{10}), Lead (Pb), and Ozone (O_3). Nebraska's AAQS also includes a standard for Total Reduced Sulfur (TRS) where human exposure to TRS occurs.

Federal and state air pollution control regulations ensure that ambient air quality, including background concentrations and emissions from new and existing sources are in compliance with the NAAQS.

To meet that goal, air dispersion modeling is required for any new or existing source that intends to increase their emission rate(s) greater than or equal to the Significant Emission Rate (SER) listed in the table below:

Table 1.0a: Significant Emission Rate (SER)

Pollutant	SER[1] (tpy)	Project Emissions (tpy)	Modeling Required
CO	100	237.32	Yes
NO_2	40	227.57	Yes
SO_2	40	50.62	Yes
PM_{10}	15	25.53	Yes
$PM_{2.5}$	10	25.53	Yes
Pb	0.6	2.09E-04	No
Ozone[2]	40 tpy of VOC or 40 tpy NO_2	-	No
Total Reduced Sulfur (including H_2S)	10	0.04	No

[1] As prescribed in 40 CFR §52.21(b)(23).

[2] Ozone is not emitted directly into the air but is formed through chemical reactions between natural and anthropogenic emissions of nitrogen oxides (NO_X) and volatile organic compounds (VOCs) in the presence of sunlight. NDWEE's *"Ambient Air Impact Analysis Guideline"* (August, 2017) does not require ozone to be consider for minor sources.

Facilities that are proposing to increase emissions above the SER can model the emission increase and compare the predicted impacts to the Significant Impact Level (SIL), a screening tool provided by the EPA to help identify which new pollutant increases have the potential to significantly impact air quality. All criteria air pollutants except O_3 and Pb have SIL values.

If the predicted impact of the new or modified source is less than the SIL for a particular pollutant and averaging period, then the impact is considered "insignificant" for that pollutant and averaging period. However, if the predicted impact of the new or modified source is equal to or greater than the SIL for a particular pollutant and averaging period, then further evaluation is required. The SIL values for pollutants and averaging periods are listed in the table below:

Table 1.0b: Significant Impact Level[1] Modeling Results

Pollutant	Averaging Period	Modeled Concentration	SIL	Exceeds SIL?
		($\mu g/m^3$)		
CO	1-hour	447.41	2000	No
	8-hour	281.08	500	No
NO_2	1-hour[2]	138.46	7.5	Yes
	Annual	13.39	1.0	Yes
PM_{10}	24-hour	14.06	5	Yes
$PM_{2.5}$	24-hour	10.34	1.2	Yes
	Annual[3]	1.66	0.13	Yes

Table 1.0b: Significant Impact Level[1] Modeling Results				
Pollutant	**Averaging Period**	**Modeled Concentration**	**SIL**	**Exceeds SIL?**
		($\mu g/m^3$)		
SO_2	1-hour	194.28	7.8	Yes

[1] Unless otherwise noted, significance levels are prescribed in 40 CFR §51.165(b)(2).
[2] EPA's Tyler Fox Memorandum entitled "*Additional Clarification Regarding Application of Appendix W modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard*" dated March 1, 2011.
[3] EPA's Richard Wayland and Scott Mathias Memorandum entitled "*Supplement to the Guidance on Significant Impact Levels for Ozone and Fine Particles in the Prevention of Significant Deterioration Permitting Program*" dated April 30, 2024.

2.0 Modeling Approach and Significant Impact Analysis

Per Permit Condition III. (A)(3)(b) the JEP Digester facility is required to route all raw biogas for RNG production to the Amine System and Permit Condition III. (B)(3)(b) requires that all raw biogas stream intended for CO_2 production also be routed to the Amine System. These routing requirements were foundational assumptions in the air dispersion modeling analysis. Accordingly, the modeling evaluated two distinct operating scenarios: (1) operation of the bypass flare and (2) operation of the startup vent and startup flare.

These scenarios were modeled independently to reflect the permit-required mutually exclusive operation of these emission sources. Emissions of all pollutants were identical between the bypass flare and startup vent/startup flare, with the exception of SO_2 emissions.

Predicted impacts equal to or greater than the SIL are required to do further evaluation, called a cumulative impact analysis (CIA). A CIA must include emissions from the proposed new source, new and existing emissions from the proposed modification of an existing source, plus existing nearby sources that can cause a significant concentration gradient, and background concentration. An appropriate background concentration is added to the predicted ambient air impacts to include pollutant contributions from unidentified sources in the vicinity of the project, regional transport contributions from distant sources, and concentrations attributable to natural sources.

The concentration predicted by a CIA is then compared to the NAAQS for those pollutants with concentrations above its respective SIL. For reference:

Table 2.0: Nebraska & National Ambient Air Quality Standards (NAAQS) for NO_2 and $PM_{2.5}$					
Pollutant	**Averaging Period**	**Primary/ Secondary**	**NAAQS ($\mu g/m^3$)**	**Design Value Form**	**Reference**
NO_2	1-hour	primary and secondary	188	Highest eighth high (H8H) of the 98th percentile of the annual distribution of maximum daily 1-hour concentrations, averaged across five years	U.S. EPA MCHM[1], June 28, 2010a & U.S. EPA MCHM[1], March 1, 2011d
	annual	primary and secondary	100	Highest first high (H1H) annual average concentration, each year analyzed separately	40 CFR Appendix W 9.1 (d) 2016
$PM_{2.5}$	Annual	primary	9	Highest first High (H1H) of the modeled annual averages, averaged across five years	40 CFR Appendix W 7.2.1 (U.S. EPA, 2005)

Table 2.0: Nebraska & National Ambient Air Quality Standards (NAAQS) for NO_2 and $PM_{2.5}$					
Pollutant	**Averaging Period**	**Primary/ Secondary**	**NAAQS ($\mu g/m^3$)**	**Design Value Form**	**Reference**
	24-hour	primary	35	Highest eighth high (H8H) of the 98th percentile of the annual distribution of 24-hour concentrations, averaged across five years	U.S. EPA MCHM[1], March 4, 2013
PM_{10}	24-hour	primary and secondary	150	Highest sixth high (H6H) concentration for the five years modeled	40 CFR Appendix W 7.2.1 (U.S. EPA, 2005)
SO_2	1-hour	primary	196	Highest fourth high (H4H) of the 99th percentile of the annual distribution of maximum daily 1-hour concentrations, averaged across five years	U.S. EPA MCHM[1], August 23, 2010

[1] Modelers Clearinghouse Memos, https://www.epa.gov/scram/air-quality-models-clarification-memos-dispersion-models
[2] Permit applicants may demonstrate compliance with the 2010 primary 1-hour SO2 NAAS to satisfy the demonstration requirements of all three current SO_2 NAAQS (*EPA memorandum "Alternative Demonstration Approach for 1971 Secondary 3-hour Sulfur Dioxide NAAQS" dated October 10, 2025*).

For this project, CIAs were conducted for NO_2, PM_{10}, $PM_{2.5}$, and SO_2. The required analyses were conducted in accordance with Appendix W of 40 CFR 51, 40 CFR 52.2, EPA's "*Guideline on Air Quality Models*" (March, 2025), NDWEE's "*Ambient Air Impact Analysis Guideline*" (August, 2017) and as described in the Air Quality Modeling Protocol submitted to NDWEE on February 27, 2026.

The EPA-recommended AERMOD model (AERMOD version 24142 and AERMAP version 24142) were used to perform the air dispersion modeling. Air dispersion modeling was conducted to evaluate worst-case meteorological and operating conditions in an effort to predict the design concentration impact for each pollutant and averaging period.

The Air Quality Modeling Protocol along with supporting air dispersion modeling information is available via the NDWEE's website under "Public Records Search" using the facility ID number for JEP Digester: 124544.

3.0 Meteorology

At the time the permit application was received, there were ten automated surface observing system (ASOS) stations with sufficient data to process 5-year meteorological (met) datasets in the State of Nebraska.

The Grand Island Central NE airport ASOS (WBAN ID 14935) station is approximately 40 km from the JEP Digester facility location. The next closest met station is approximately 131 km away, located in Custer County. The Grand Island Central NE airport ASOS station is the station closest in proximity to the project site, and therefore, the most representative of JEP Digester's climate.

The 2017 through 2020 and 2022 dataset was processed by the NDWEE using AERMET v. 24142, AERSURFACE v. 20060, and AERMINUTE v. 24142. These years represent the most recent and complete data set available for the project. The 2021 and 2023-2024 meteorological data was not included in the analysis because the years did not meet the data completeness requirements.

4.0 Background Concentrations

Appendix W Section 8.3 – Background Concentrations

When choosing a monitor to use as background concentration, Appendix W to 40 CFR 51 Section 8.3.2.(b) prescribes:

"*The EPA recommends use of the most recent quality assured air quality monitoring data collected in the vicinity of the source to determine the background concentration for the averaging times of concern."*

"(...) If there are no monitors located in the vicinity of the new or modifying source, a "regional site" maybe used to determine background concentrations. A regional site is one that is located away from the area of interest but is impacted by similar or adequately representative sources."

In addition, NWDEE looks for representative nearby population, land use, terrain, climate, and the existence of large nearby sources, and traffic patterns that may be impacting the monitor. Also, consideration is given to the pollutant's residence time and how inert or reactive that pollutant is in the atmosphere.

The JEP Digester facility is located northwest of Hastings, Nebraska in Adams County. Based on an evaluation of the surrounding area, the source site is categorized as rural. The population of Hastings, Nebraska is approximately 25,000 people. Wind roses for the Hastings area are primarily out of the south, with secondary wind roses from the northwest and northeast. Calm conditions occur approximately 6% of the time, and average wind speeds are around 11 mph.

4.1 PM_{10}:

PM_{10} background concentrations have longer residence times ranging from hours to several days depending on meteorological stability, wind speed, and precipitation. The PM_{10} monitor in Weeping Water, Nebraska (ID#31-025-0002) was chosen to represent background PM_{10} concentration. This site was selected because it shares similar climate, terrain, and prevailing wind patterns with JEP. This monitor is located at the City Sanitation Building in Weeping Water, Nebraska, approximately 200 km northeast of the JEP facility.

4.2 $PM_{2.5}$:

$PM_{2.5}$ background concentrations tend to remain in the atmosphere for relatively long periods, allowing them to disperse widely and form more uniform spatial patterns– especially when evaluated as annual averages. In contrast, 24-hour $PM_{2.5}$ concentrations are more heavily affected by local conditions, such as traffic levels, population density, and nearby land use, leading to greater short term variability. The $PM_{2.5}$ monitoring site in Grand Island, Nebraska (ID#31-079-0005) was selected to represent the background $PM_{2.5}$ concentration. This monitor is located at 3305 W Old Potash Hwy, Grand Island, Nebraska, approximately 33 km north of the JEP project location.

4.3 NO_2:

As the State of Nebraska operates only a NO_X monitor rather than a NO_2 monitor, the NDWEE selected a NO_2 monitoring site located in the State of Kansas to determine background concentrations. The Ellis, Kansas monitor (ID#20-195-0001) was selected based on its similarity in land use, climate, terrain, and prevailing wind patterns, which are representative of the facility's surrounding area. The Ellis, Kansas monitor (ID#20-195-0001) is located in Trego County, Kansas, with a population of 2,800 people. Primary wind roses are from the south-southeast and secondary wind roses from the northwest; calm conditions occur approximately 5.6% of the time. This monitor is about 233 km southwest of the JEP project location.

4.4 SO_2:

The SO_2 monitor in Ellis, Kansas, (ID#20-195-0001) was chosen to represent background SO_2 concentration. This site was selected because it shares similar climate, terrain, and prevailing wind patterns with the JEP project location. This monitor is located at the Cedar Bluff Reservoir, Trego, Kansas, approximately 232 km southwest of the JEP project location.

The table below depicts background concentrations from the monitors selected:

Table 4.0: Monitor Background Concentrations			
Pollutant	**Averaging Time**	**2022-24 DV Monitor location & ID#**	**Background Concentration ($\mu g/m^3$)**
PM_{10}	24-hour	Weeping Water, Nebraska (31-025-0002)	100.60
$PM_{2.5}$	24-hour	Grand Island, Nebraska (31-079-0005)	19.30
	Annual		6.60
NO_2	1-hour	Ellis, Kansas (20-195-0001)	15.70
	Annual		3.20
SO_2	1-hour	Ellis, Kansas (20-195-0001)	6.12

5.0 Nearby Sources

5.1 NAAQS

NDWEE takes into consideration all facilities within a 50 km radius of a project location as modeling domain. NDWEE utilizes the procedure described in the July 22, 1985 letter to EPA Region IV entitled "Screening Threshold" Method for PSD Modeling" from the North Carolina Air Quality Section to eliminate any nearbys that are unlikely to have a significant impact within the modeling domain.

The screening method takes into account the relationship between Q and D.

Where:

Q: is the most recent two-year average actual emission rate, representative of normal operations, obtained from NDWEE's Emission Inventory, in tons per year.

D: is the distance from the center of the project location to the center the possible nearby, in kilometers; 20D is twenty times this distance.

When Q (in tpy) > 20D (in km), the nearby is included in the NAAQS modeling analysis. This screening method identified no nearbys for $PM_{2.5}$ and PM_{10}. One nearby was identified and included in the NO_2 and SO_2 refined modeling.

Table 5.1: Nearby Exercise for JEP Digester FID 124544									
FID	**Source**	**County**	**State**	**Pollutant**	**Q_1 (tpy)**	**Q_2 (tpy)**	**Q_{Avg} (tpy)**	**D (km)**	**20D (km)**
58048	Whelan Energy Center	Adams	NE	NO_x	964.8	792.1	878.45	16.2	323.9
58048	Whelan Energy Center	Adams	NE	SO_2	2,125	2,009	2,067	16.2	323.9

6.0 Analysis Results

This ambient air quality impact analysis takes into account the combined impacts of emissions from the proposed JEP Digester facility, contributions from nearby major and minor sources, and background concentrations due to distant major and minor sources and natural sources.

The modeling evaluated two distinct operating scenarios: (1) operation of the bypass flare and (2) operation of the startup vent and startup flare. These scenarios were modeled independently to reflect the permit-required mutually exclusive operation of these emission sources. Emissions of all pollutants were identical between the bypass flare and startup vent/startup flare, with the exception of SO_2 emissions.

Based on the potential emissions from the proposed facility and other sources' allowable emissions, this analysis demonstrates that the facility is expected to be in compliance with the NAAQS and increment standards for NO_2, PM_{10}, $PM_{2.5}$, SO_2, and TRS.

6.1 NO_2 Results

The NO_2 results for NAAQS compliance for the Bypass and Startup scenarios are shown in the following tables for 1-hour and annual concentrations, including contributions from existing sources of NO_2 emissions in the project area.

Table 6.1a: Bypass and Startup 1-Hour NO_2 NAAQS Concentration 98th Percentile, 1-Hour Daily Maximum Averaged Over 5-Years (H8H)				
Met Years	**Background ($\mu g/m^3$)**	**Modeled Impact ($\mu g/m^3$)**	**Total ($\mu g/m^3$)**	**NAAQS ($\mu g/m^3$)**
2017-2020, 2022	15.70	133.85	149.55	188

Table 6.1b: Bypass and Startup Annual Mean NO_2 NAAQS Concentration Not To Be Exceeded as a Highest First High (H1H)				
Met Years	**Background ($\mu g/m^3$)**	**Modeled Impact ($\mu g/m^3$)**	**Total ($\mu g/m^3$)**	**NAAQS ($\mu g/m^3$)**
2017	3.20	14.08	17.28	100
2018	3.20	14.18	17.38	100
2019	3.20	12.58	15.78	100
2020	3.20	13.83	17.03	100
2022	3.20	12.61	15.81	100

6.2 $PM_{2.5}$ Results

The $PM_{2.5}$ results for NAAQS compliance for the Bypass and Startup scenarios are shown in the following tables for 24-hour and annual concentrations, including contributions from existing sources of $PM_{2.5}$ emissions in the project area.

Table 6.2a: Bypass and Startup 24-Hour $PM_{2.5}$ NAAQS Concentration 98th Percentile Daily Maximum Averaged Over 5-Years (H8H)				
Met Years	**Background ($\mu g/m^3$)**	**Modeled Impact ($\mu g/m^3$)**	**Total ($\mu g/m^3$)**	**NAAQS ($\mu g/m^3$)**
2017-2020, 2022	19.30	7.18	26.48	35

Table 6.2b: Bypass and Startup Annual $PM_{2.5}$ NAAQS Concentration Daily Maximum Averaged Over 5-Years (H1H)				
Met Years	**Background ($\mu g/m^3$)**	**Modeled Impact ($\mu g/m^3$)**	**Total ($\mu g/m^3$)**	**NAAQS ($\mu g/m^3$)**
2017-2020, 2022	6.60	1.65	8.25	9

6.3 PM_{10} Results

The PM_{10} results for NAAQS compliance for the Bypass and Startup scenarios are shown in table 6.3a for the 24-hour concentration, including contributions from existing sources of PM_{10} emissions in the project area.

Table 6.3a: Bypass and Startup 24-Hour PM_{10} NAAQS Concentration Not To Be Exceeded More Than Once Per Year On Average Over 5 Years (H6H)				
Met Years	**Background ($\mu g/m^3$)**	**Modeled Impact ($\mu g/m^3$)**	**Total ($\mu g/m^3$)**	**NAAQS ($\mu g/m^3$)**
2017-2020, 2022	100.6	10.16	110.76	150

6.4 SO_2 Results

Separate SO_2 modeling analyses were conducted for each operating scenario to reflect the differences in SO_2 emissions between the bypass flare and startup vent/startup flare to remain consistent with the permit conditions.

The SO_2 results for 1-hour NAAQS compliance are shown in table 6.4a below, including contributions from existing sources of SO_2 emissions in the project area.

Table 6.4a: Bypass 1-Hour SO_2 NAAQS Concentration 99th Percentile Daily Maximum Averaged Over 5-Years (H4H)				
Met Years	**Background ($\mu g/m^3$)**	**Modeled Impact ($\mu g/m^3$)**	**Total ($\mu g/m^3$)**	**NAAQS ($\mu g/m^3$)**
2017-2020, 2022	6.12	147.72	154.84	196

The SO_2 results for NAAQS compliance for the Startup scenario is shown in table 6.4b below, including contributions from existing sources of SO_2 emissions in the project area.

Table 6.4a: Startup 1-Hour SO_2 NAAQS Concentration 99th Percentile Daily Maximum Averaged Over 5-Years (H4H)				
Met Years	**Background ($\mu g/m^3$)**	**Modeled Impact ($\mu g/m^3$)**	**Total ($\mu g/m^3$)**	**NAAQS ($\mu g/m^3$)**
2017-2020, 2022	6.12	182.69	188.81	196

The results for the ambient air quality impact analysis for NO_2, $PM_{2.5}$, PM_{10}, and SO_2 are less than the NAAQS and therefore this project is expected to demonstrate compliance with the NAAQS.

Title 129, Chapter 4 - Prevention of Significant Deterioration (PSD)

JEP Digester's biogas processing facility does not belong to one of the listed source categories in 40 CFR § 52.21; the proposed boilers do belong to one of the listed source categories in 40 CFR § 52.21. However, JEP Digester does not contain a nested source of fossil-fuel boiler (or combination thereof) totaling more than 250 million British thermal units per hour heat input.

At the time of this permit JEP Digester is not required to include fugitives from any source when determining major New Source Review (NSR) status. Thus, JEP Digester is a Minor Stationary Source because the PTE for all NSR pollutants do not exceed 250 tons per year.

Title 129, Chapter 12 - New Source Performance Standards (NSPS)

The following NSPS Subparts have been identified as applicable to JEP Digester:

Subpart A – General Provisions: This subpart, adopted by reference in Title 129, Chapter 12, Section 001.01, applies to those units subject to another NSPS subpart. JEP Digester is subject to Subpart A because it is subject to Subpart Dc.

Subpart Dc – Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units: This subpart, adopted by reference in Title 129, Chapter 12, Section 001.05, applies to steam generating units with a design rate greater than 10 MMBtu/hr but less than or equal to 100 MMBtu/hr, installed after June 9, 1989. A steam-generating unit is defined as any device which combusts any fuel to produce steam, heat water, or heat any heat transfer medium. This does not include process heaters, which are devices with the primary purpose of heating materials to initiate or promote a chemical reaction in which the heated material participates as a reactant or catalyst. A heat transfer medium is any material which is used to transfer heat from one point to another point.

JEP Digester has three boilers, EP-1.1, EP-1.2, and EP-1.3, with design rates of 27.90 MMBtu/hr. Therefore, the boilers are subject to this subpart.

A review of the potential applicability of IIII, JJJJ, and OOOOb follows:

Subpart IIII - Standards of Performance for Stationary Compression Ignition Internal Combustion Engines: This subpart, adopted by reference in Title 129, Chapter 12, Section 001.80, applies to new, modified and reconstructed compression ignition (CI) internal combustion engines (ICE). New engines are subject to this subpart if construction of the CI ICE commenced after July 11, 2005, and if the engine was manufactured after April 1, 2006, for CI ICE that are not fire pump engines, or after July 1, 2006, for CI ICE that are fire pump engines.

Subpart JJJJ - Standards of Performance for Stationary Spark Ignition Internal Combustion Engines:

This subpart, adopted by reference in Title 129, Chapter 12, Section 001.81, applies to new, modified, and reconstructed spark ignition (SI) internal combustion engines (ICE). New engines are subject to this subpart if construction of the SI ICE commenced after June 12, 2006, and if the engine was manufactured after July 1, 2007, for SI ICE rated at greater than or equal to 500 hp; after January 1, 2007, for lean burn SI ICE rated at greater than or equal to 500 hp but less than 1,350 hp; after July 1, 2008, for SI ICE rated less than 500 hp; and after January 01, 2009, for emergency engines.

In October 2020, Mainspring Energy, Inc. asked EPA about the NSPS applicability of their linear generator technology. On January 19, 2021, EPA responded with the following statement, "Based on our initial review of the additional information provided by Mainstream, we cannot at this time conclusively determine whether Mainspring's linear generator is covered by either of the NSPS for stationary internal combustion engines". Since the engines, EP-4.01 through EP-4.20, use this linear generator technology, NDWEE, currently, does not consider the engines to be CI ICE or SI ICE. Therefore, JEP Digester is not subject to NSPS Subparts IIII or JJJJ.

Subpart OOOOb – Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After December 6, 2022: This subpart, not yet adopted by reference in Title 129, establishes emission standards and compliance schedules for the control of the pollutant GHGs. The standard in this subpart is in the form of a limitation on emissions of methane from affected facilities in the crude oil and natural gas source category that commenced construction, modification, or reconstruction after December 6, 2022. This subpart also establishes emissions standards and compliance schedules for the control of VOCs and SO_2 emissions from affected facilities that commence construction, modification, or reconstruction after December 6, 2022.

As defined in §63.5430b, the natural gas portion of the crude oil and natural gas source category means "Natural gas production, processing, transmission, and storage, which include the well and extend to, but do not include, the local distribution company custody transfer station." Furthermore, "Well" is defined in §63.5430b as "a hole drilled for purpose of producing natural gas, or a well into which fluids are injected." By definition, the natural gas source category must include a well that is used in the natural gas production process. JEP Digester does not utilize a well as defined in the rule and is therefore not part of the crude oil and natural gas source category. As such, JEP Digester is not subject to this subpart.

JEP Digester must comply with all applicable NSPS subparts and requirements regardless of their inclusion in this permitting action or Title 129. These rules are subject to change. Additional and updated information on all NSPS is available on the NDWEE NSPS Notebook, which can be located by visiting the NDWEE website at http://dwee.nebraska.gov, by first selecting "Menu" at the top of the page, then the "Air" dropdown menu tab, then the "NSPS Program" dropdown menu tab, and then "NSPS Notebook".

Title 129, Chapter 13 - National Emission Standards for Hazardous Air Pollutants (NESHAP)

JEP Digester is considered an area source for NESHAP because potential emissions of any individual HAP are less than 2.5 tpy and potential emissions of total HAPs are less than 10 tpy. Although JEP Digester is not subject to Subparts, HH, HHH, and JJJJJJ, the NDWEE is including a review, which follows:

Subpart HH – Oil and Natural Gas Production Facilities: This subpart, adopted by reference in Title 129, Chapter 13, Section 002.22, applies to owners and operators of specified emission points at oil and natural gas production facilities that are major sources of HAPs. This subpart does not apply to the facility because

JEP Digester will not be a major source of HAPs. Furthermore, §63.761 defines "natural gas" as a naturally occurring mixture of hydrocarbon and nonhydrocarbon gases found in geologic formations beneath the earth's surface. Therefore, JEP Digester is not a natural gas production facility under the NESHAP.

Subpart HHH – Natural Gas Transmission and Storage Facilities: This subpart, adopted by reference in Title 129, Chapter 13, Section 002.43, applies to major sources of HAPs that transport of store natural gas prior to entering the pipeline to a local distribution company or to a final end user. JEP Digester is not a major source of HAPs. Therefore, this subpart does not apply to JEP Digester.

Subpart JJJJJJ – National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources: This subpart, adopted by reference in Title 129, Chapter 13, Section 002.101, applies to owners and operators of industrial, commercial, and institutional boilers located at area sources of HAPs. As identified in 40 CFR §63.11195, gas-fired boilers are not subject to this subpart. Since the boilers at JEP Digester are natural gas fired, this subpart is not applicable.

JEP Digester must comply with all applicable NESHAP requirements regardless of their inclusion in this permitting action or Title 129. These rules are subject to change. Information regarding NESHAP is available on the NDWEE Air Toxics Notebook, which can be located by visiting the NDWEE website at http://dwee.nebraska.gov, by first selecting "Menu" at the top of the page, the "Air" dropdown menu tab, then the "Air Toxics Program" dropdown menu tab, and then "Air Toxics Notebook".

Title 129, Chapter 15, Section 001 - Particulate Emissions; Limitations and Standards

Process Weight Rate (Section 001.01)

Title 129, Chapter 15, Section 001.01, limits PM (filterable) emissions to the amounts shown in Table 15-1 during any one hour. These process weight rate limits, which are based on throughput of the emission units, vary as throughputs change. Since the potential to emit for each emission point is less than the process weight rate limitations, these PM limitations were not included in Condition III of this permit.

Particulate Emissions from Combustion Sources (Section *001.02*)

All of the PM emission points subject to the Chapter 15, Section 001.02 limitations are in compliance with those limitations, as the PTE for each emission point is less than the limitations. Therefore, these PM limitations were not included in any Specific Condition of this permit.

Opacity Limitations from Emission Units (Section *001.04*)

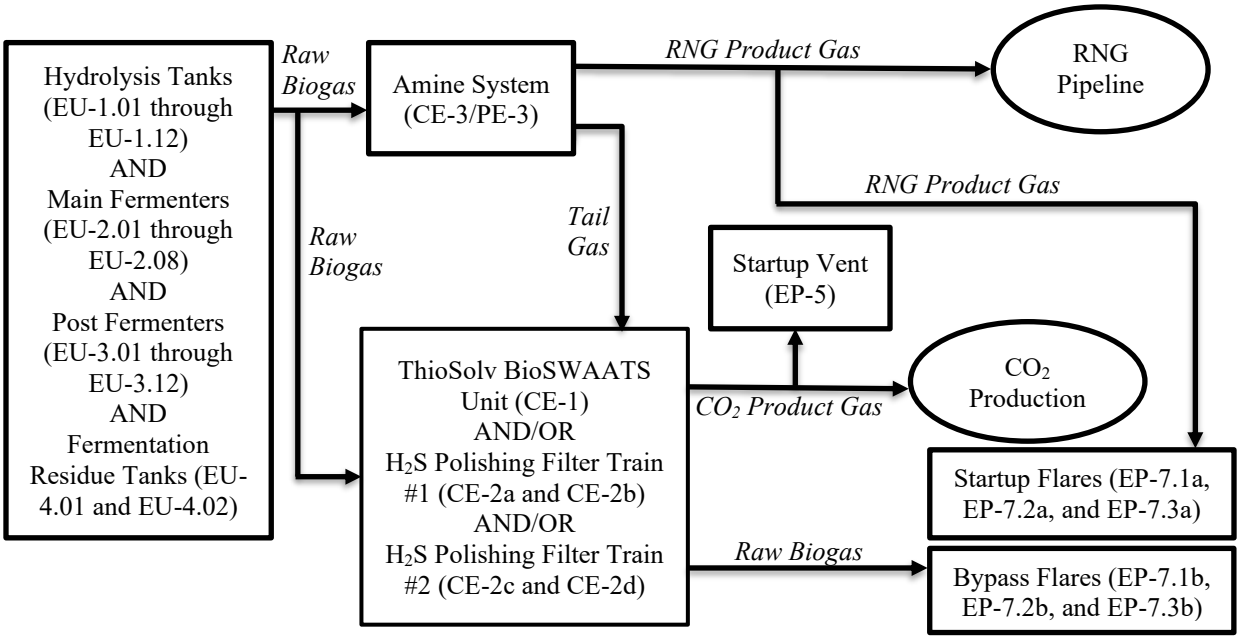
Specific Condition I.(J) specifies that no person shall cause or allow emissions, from any source, which has an opacity equal to or greater than twenty percent (20%). Opacity must be determined using an EPA-approved method or recorded by a continuous opacity monitoring system which has been operated and maintained pursuant to 40 CFR Part 60 Appendix B except as provided for in Chapter 15, Sections 001.05 and 001.06 (Title 129, Chapter 15, Section 001.04). Therefore, while not specifically stated in Condition III., this requirement is still applicable to all emission units at the source.

SPECIFIC PERMIT CONDITIONS DISCUSSION:

Condition III. includes conditions that are specific to the emissions units and emission points listed in each respective condition.

The diagram below shows the emission units, emission points, and control equipment related to the treatment of the biogas and labels the biogas streams. Under normal operating conditions the raw biogas will be treated by the Amine system and split into the RNG product gas and Tail gas streams. The RNG product gas stream will be injected into the RNG pipeline or flared by the Startup flares. The Tail gas stream is desulfurized by the ThioSolv BioSWAATS Unit and/or the H_2S polishing filter train #1 and/or H_2S polishing filter train #2 and is redefined as CO_2 product gas. The CO_2 product gas will be sent to storage to be trucked offsite or vented out of the Startup vent. If the Amine system is not operating, the raw biogas

will be bypassed to be desulfurized by the ThioSolv BioSWAATS Unit and/or the H_2S polishing filter train #1 and/or H_2S polishing filter train #2. The desulfurized raw biogas will be flared by the bypass flares.



(A) RNG Production

Condition III.(A)(1) prescribes the construction of Hydrolysis Tanks (EU-1.01 through EU-1.12), Main Fermenters (EU-2.01 through EU-2.08), Post Fermenters (EU-3.01 through EU-3.12) and Fermentation Residue Tanks (EU-4.01 and EU-4.02) as emission units. This condition then prescribes the construction of Amine System (CE-3) as a control device for the RNG production. This condition also prescribes the construction of RNG TEG Reboiler (EP-2.1) and Startup Flares (EP-7.1a, EP-7.2a and EP-7.3a) as emission points. In the RNG production, Amine System is prescribed as a control device because the Amine System reduces the H_2S concentration of the raw biogas to 4 ppmvd in the RNG product gas.

Condition III.(A)(2)(a) prescribes the SO_2 emission limitations for each Startup Flare. This permit prescribes the maximum volumetric concentration of Hydrogen Sulfide (H_2S) in the product RNG in Condition III.(A)(2)(c). This was used to calculate for SO_2 emission from the flare, assuming ninety-eight percent conversion of H_2S to SO_2. This limitation was prescribed because of satisfactorily modeling of the Startup Flares based on this SO_2 emission. Performance testing was not prescribed because Condition III.(A)(3)(d) of this permit prescribes the installation of H_2S monitors to check the H_2S volumetric concentration of the RNG product gas.

Condition III.(A)(2)(b) prescribes the maximum volumetric concentration of Hydrogen Sulfide (H_2S) in raw biogas from the Hydrolysis Tanks (EU-1.01 through EU-1.12), Main Fermenters (EU-2.01 through EU-2.08), Post Fermenters (EU-3.01 through EU-3.12), and Fermentation Residue Tanks (EU-4.01 and EU-4.02) combined. The limit placed on the H_2S content in the biogas at the outlet will be at or below 5,000 ppmvd.

Condition III.(A)(2)(c) prescribes the maximum volumetric concentration of Hydrogen Sulfide (H_2S) in the RNG product gas at the outlet of the Amine System (CE-3). The limit placed on the H_2S content in the tail gas at the outlet will be at or below 4 ppmvd.

Condition III.(A)(3)(a) prescribes the raw material to be used to be only cow manure and where the facility can source raw materials.

Condition III.(A)(3)(b) prescribes all raw biogas stream for RNG production shall be routed to the Amine System (CE-3).

Condition III.(A)(3)(c) and (d) prescribe the continuous monitoring of H_2S concentrations for raw biogas at outlet of the Hydrolysis Tanks (EU-1.01 through EU-1.12), Main Fermenters (EU-2.01 through EU-2.08), Post Fermenters (EU-3.01 through EU-3.12) and Fermentation Residue Tanks (EU-4.01 and EU-4.02) combined, and for RNG product gas at the outlet of the Amine system (CE-3). Measuring concentrations ensure compliance with PTE calculations for SO_2 for the startup flares (EP-7.1a, EP-7.2a, and EP-7.3a).

Condition III.(A)(3)(e) prescribes an RNG product gas flow rate limit of 2,653.74 MMscf per year routed to the startup flares (EP-7.1a, EP-7.2a, and EP-7.3a) combined. The flow rate limit is based on the flares' capacity of 100 MMBtu/hr each. This ensures that the digesters are not producing more raw biogas than the flares could control and validates assumptions used for PTE calculations.

Condition III.(A)(5)(a) to (f) prescribe record keeping requirements for RNG product gas production.

(B) ABS Synthesis, ATS Production, and CO_2 Production

Condition III.(B)(1) prescribes the construction of Hydrolysis Tanks (EU-1.01 through EU-1.12), Main Fermenters (EU-2.01 through EU-2.08), Post Fermenters (EU-3.01 through EU-3.12), Fermentation Residue Tanks (EU-4.01 and EU-4.02) and Sulfur Burner (EU-5) as emission units. This condition then prescribes the construction of Amine System (PE-3) as a process equipment. This condition prescribes the construction of ThioSolv BioSWAATS Unit (CE-1) and H_2S Polishing Filters (CE-2a, CE-2b, CE-2c, and CE-2d) as control devices. This condition also prescribes the construction of CO_2 TEG Reboiler (EP-2.2), Startup Vent (EP-5) and ABS Synthesis Vent (EP-6) as emission points. In the ABS Synthesis, ATS Production, and CO_2 production, Amine System is prescribed as a process equipment because the Amine System increases the H_2S concentration of the raw biogas to 15,000 ppmvd in the tail gas.

Condition III.(B)(2)(a) prescribes the SO_2 emissions limitation of Startup Vent and ABS Synthesis Vent. In this permit, Condition (III).(B)(2)(d) prescribes 147 ppmvd H_2S concentration limitation in the CO_2 product gas and Condition (III).(B)(2)(c) prescribes 15,000 ppmvd H_2S concentration limitation in the tail gas. Assumption of ninety-eight percent conversion of H_2S to SO_2 and satisfactory modeling results served as the basis for the SO_2 limitations of the Startup Vent and ABS Synthesis Vent taking into account the H_2S concentration of the CO_2 product gas and tail gas respectively. Performance testing was not prescribed because Condition III.(B)(3)(d) and (e) of this permit prescribes the installation of H_2S monitors to check the H_2S volumetric concentration of the tail gas and CO_2 product gas respectively.

Condition III.(B)(2)(b) prescribes the maximum volumetric concentration of Hydrogen Sulfide (H_2S) in raw biogas from the Hydrolysis Tanks (EU-1.01 through EU-1.12), Main Fermenters (EU-2.01 through EU-2.08), Post Fermenters (EU-3.01 through EU-3.12), and Fermentation Residue Tanks (EU-4.01 and EU-4.02) combined. The limit placed on the H_2S content in the biogas at the outlet will be at or below 5,000 ppmvd.

Condition III.(B)(2)(c) prescribes the maximum volumetric concentration of Hydrogen Sulfide (H_2S) in the tail gas at the outlet of the Amine System (PE-3). The limit placed on the H_2S content in the tail gas at the outlet will be at or below 15,000 ppmvd.

Condition III.(B)(2)(d) prescribes the maximum volumetric concentration of Hydrogen Sulfide (H_2S) in the CO_2 product gas at the outlet of either the ThioSolv BioSWAATS Unit (CE-1), H_2S Polishing Filter Train #1 (CE-2a and CE-2b) or H_2S Polishing Filter Train #2 (CE-2c and CE-2d). The limit placed on the H_2S content in the biogas at the outlet will be at or below 147 ppmvd.

Condition III.(B)(3)(a) prescribes the raw material to be used to be only cow manure and where the facility can source raw materials.

Condition III.(B)(3)(b) prescribes all raw biogas stream for CO_2 production shall be routed to the Amine System (CE-3).

Condition III.(B)(3)(c), (d), and (e) prescribe the continuous monitoring of H_2S concentrations for raw biogas at outlet of the Hydrolysis Tanks (EU-1.01 through EU-1.12), Main Fermenters (EU-2.01 through EU-2.08), Post Fermenters (EU-3.01 through EU-3.12) and Fermentation Residue Tanks (EU-4.01 and EU-4.02) combined, for Tail gas at the outlet of the Amine system (PE-3), and for CO_2 product gas at the outlet of ThioSolv BioSWAATS Unit (CE-1), at the outlet of H_2S Polishing Filter Train #1 (CE-2a and CE-2b), and at the outlet of H_2S Polishing Filter Train #2 (CE-2c and CE-2d). Measuring concentrations ensure compliance with PTE calculations for SO_2 for the startup vent (EP-5).

Condition III.(B)(3)(f) prescribes a CO2 product gas flow rate limit of 130,306 scf per hour routed to the startup vent (EP-5).

Condition III.(B)(3)(g) prescribes tail gas shall be controlled by ThioSolv BioSWAATS Unit (CE-1) and/or the H_2S Polishing Filter Train #1(CE-2a and CE-2b) and/or H_2S Polishing Filter Train #2 (CE-2c and CE-2d).

Condition III.(B)(3)(h) and (i) prescribe operation and maintenance for the ThioSolv BioSWAATS Unit and H_2S Polishing Filter Trains respectively.

Condition III.(B)(5) prescribes record keeping requirements for ABS Synthesis, ATS Production, and CO_2 Production.

(C) Raw Biogas Bypass

Condition III.(C)(1) prescribes the construction of Hydrolysis Tanks (EU-1.01 through EU-1.12), Main Fermenters (EU-2.01 through EU-2.08), Post Fermenters (EU-3.01 through EU-3.12) and Fermentation Residue Tanks (EU-4.01 and EU-4.02) as emission units. This condition prescribes the construction of ThioSolv BioSWAATS Unit (CE-1) and H_2S Polishing Filters (CE-2a, CE-2b, CE-2c, and CE-2d) as control devices. This condition also prescribes the construction of Bypass Flares (EP-7.1b, EP-7.2b, and EP-7.3b) as emission points.

Condition III.(C)(2)(a) prescribes the SO_2 emission limitations for each Bypass Flare. This permit prescribes the maximum volumetric concentration of Hydrogen Sulfide (H_2S) in the raw biogas exiting either the ThioSolv BioSWAATS Unit (CE-1), H_2S Polishing Filter Train #1 (CE-2a and CE-2b) or H_2S Polishing Filter Train #2 (CE-2c and CE-2d) in Condition III.(C)(2)(c). This was used to calculate for SO_2 emission from the flare, assuming ninety-eight percent conversion of H_2S to SO_2. This limitation was prescribed because of satisfactorily modeling results of the Bypass Flares based on this SO_2 emission. Performance testing was not prescribed because Condition III.(A)(3)(d) of this permit prescribes the installation of H_2S monitors to check the H_2S volumetric concentration of the RNG product gas.

Condition III.(C)(2)(b) prescribes the maximum volumetric concentration of Hydrogen Sulfide (H_2S) in raw biogas from the Hydrolysis Tanks (EU-1.01 through EU-1.12), Main Fermenters (EU-2.01 through EU-2.08), Post Fermenters (EU-3.01 through EU-3.12), and Fermentation Residue Tanks (EU-4.01 and EU-4.02) combined. The limit placed on the H_2S content in the biogas at the outlet will be at or below 5,000 ppmvd.

Condition III.(C)(2)(c) prescribes the maximum volumetric concentration of Hydrogen Sulfide (H_2S) in the raw biogas at the outlet of either the ThioSolv BioSWAATS Unit (CE-1), H_2S Polishing Filter Train #1 (CE-2a and CE-2b) or H_2S Polishing Filter Train #2 (CE-2c and CE-2d). The limit placed on the H_2S content in the biogas at the outlet will be at or below 147 ppmvd.

Condition III.(C)(3)(a) prescribes the raw material to be used to be only cow manure and where the facility can source raw materials.

Condition III.(C)(3)(b) and condition III.(C)(3)(c) prescribe the continuous monitoring of H_2S concentrations for raw biogas at outlet of the Hydrolysis Tanks (EU-1.01 through EU-1.12), Main Fermenters (EU-2.01 through EU-2.08), Post Fermenters (EU-3.01 through EU-3.12) and

Fermentation Residue Tanks (EU-4.01 and EU-4.02) combined, at the outlet of ThioSolv BioSWAATS Unit (CE-1), at the outlet of H_2S Polishing Filter Train #1 (CE-2a and CE-2b), and at the outlet of H_2S Polishing Filter Train #2 (CE-2c and CE-2d). Measuring concentrations ensure compliance with PTE calculations for SO_2 for the bypass flares (EP-7.1b, EP-7.2b, and EP-7.3b).

Condition III.(C)(3)(d) prescribes a raw biogas flow rate limit of 453,721 scf per hour routed to the bypass flares (EP-7.1b, EP-7.2b, and EP-7.3b) combined. The flow rate limit is based on the flares' capacity of 100 MMBtu/hr each. This ensures that the digesters are not producing more raw biogas than the flares could control and validates assumptions used for PTE calculations.

Condition III.(C)(3)(e) prescribes that Raw biogas shall be controlled by the ThioSolv BioSWAATS Unit (CE-1) and/or the H_2S Polishing Filter Train #1 (CE-2a and CE-2b) and/or H_2S Polishing Filter Train #2 (CE-2c and CE-2d).

Condition III.(C)(3)(f) and condition III.(C)(3)(g) prescribe operational and maintenance requirements for the ThioSolv BioSWAATS Unit (CE-1), the H_2S Polishing Filter Train #1 (CE-2a and CE-2b), and H_2S Polishing Filter Train #2 (CE-2c and CE-2d).

Condition III.(C)(5)(a) prescribes recordkeeping requirements for H_2S concentrations of raw biogas at the outlet of the Hydrolysis Tanks (EU-1.01 through EU-1.12), Main Fermenters (EU-2.01 through EU-2.08), Post Fermenters (EU-3.01 through EU-3.12) and Fermentation Residue Tanks (EU-4.01 and EU-4.02) combined, at the outlet of ThioSolv BioSWAATS Unit (CE-1), at the outlet of H_2S Polishing Filter Train #1 (CE-2a and CE-2b), and at the outlet of H_2S Polishing Filter Train #2 (CE-2c and CE-2d) to demonstrate compliance with Condition III.(C)(3)(b), and Condition III.(C)(3)(c).

Condition III.(C)(5)(b) prescribes reporting and recordkeeping requirements for calibration records.

Condition III.(C)(5)(c) through condition III.(C)(5)(e) prescribes recordkeeping requirements of the observations, maintenance, and equipment failures for the ThioSolv BioSWAATS Unit (CE-1) and the H_2S Polishing Filters (CE-2a, CE-2b, CE-2c, and CE-2d).

Condition III.(C)(5)(f) prescribes recordkeeping requirements for documenting the flow rate of Raw biogas routed to the bypass flares (EP-7.1b, EP-7.2b, and EP-7.3b).

(D) Flares

Condition III.(D) prescribes that a flame shall always be present at the startup flares when RNG product gas is being routed to the startup flares (EP-7.1a, EP-7.2a, and EP-7.3a) and shall always be present at the bypass flares (EP-7.1b, EP-7.2b, and EP-7.3b) when raw biogas is being routed to the bypass flares. There is no hour limitation on the pilots or biogas routing associated with any flares; PTE was calculated assuming 8,760 hours per year at the maximum RNG product gas flow rate of 302,939 scf per hour for the startup flares (EP-7.1a, EP-7.2a, and EP-7.3a) and maximum raw biogas flow rate of 453,721 scf per hour for the bypass flares (EP-7.1b, EP-7.2b, and EP-7.3b). NDWEE assumed a 98% conversion of H_2S into SO_2.

Fact Sheet Attachment

PTE Summary

Facility-Wide PTE (ton/yr)											
Emission Point	**Description**	**PM**	**PM_{10}**	**$PM_{2.5}$**	**NO_X**	**SO_X**	**CO**	**VOC**	**Largest HAP (Formaldehyde)**	**Total HAPs**	**CO_2e[1]**
EP-1.1 through EP-1.3	Amine Boilers	2.73	2.73	2.73	35.94	0.22	30.19	1.98	0.03	0.68	42,929
EP-2.1 through EP-2.2	TEG Reboilers	0.03	0.03	0.03	0.34	2.06E-03	0.29	0.02	2.58E-04	6.49E-03	410
EP-3.01 through EP-3.12	Building Heaters	0.39	0.39	0.39	5.15	0.03	4.33	0.28	3.86E-03	0.10	6,155
EP-4.01 through EP-4.20	Linear Generators	0.28	0.28	0.28	1.73	2.18	5.09	2.49	1.01	1.56	24,847
EP-5[2]	Startup Vent	-	-	-	-	12.72	-	0.88	-	-	71,912
EP-6	ABS Synthesis Vent	-	-	-	0.05	3.89	-	-	-	-	-
EP-7.1 through EP-7.3	Flares (Combustion)	22.07	22.07	22.07	183.96	44.29	197.10	17.34	-	0.84	257,518
	Flares (Pilot)	0.03	0.03	0.03	0.39	2.32E-03	0.32	0.02	2.90E-04	7.30E-03	466
Haul Roads	-	1.69	0.37	0.07	-	-	-	-	-	-	-
Total:		**27.22**	**25.90**	**25.60**	**227.57**	**50.62**	**237.32**	**22.13**	**1.04**	**3.19**	**332,324**
Total (Excluding Fugitives):		**25.53**	**25.53**	**25.53**	**227.57**	**50.62**	**237.32**	**22.13**	**1.04**	**3.19**	**332,324**

[1] tons CO_2e per year = [(ton/yr CO_2)*1] or [(ton/yr CH_4)*25] or [(ton/yr N_2O)*298]; CO_2e are found in 40 CFR Part 98 Subpart A Table A-1 Global Warming Potentials published on April 25, 2024. The CO_2e for CO_2 = 1, for CH_4 = 28, and for N_2O = 265.

[2] Startup vent emissions excluded from total PTE because operation of the startup vent and the flare (bypass) are mutually exclusive in operation. Compared to the startup vent, the bypass flare has the maximum emissions. Hence, the bypass flare emissions were added to the total PTE.

Fact Sheet Attachment

Emission Point: EP-1.1 through EP-1.3 Amine Boilers

Total Heat Input Capacity:	27.9	MMBtu/hr (each)
Number of Units	3	
Heat Content of Natural Gas:	1,020	MMBtu/MMscf
Conversion using 1,020 Btu/scf:	0.08	MMscf/hr
Annual Hours of Operation:	8,760	hr
Potential Natural Gas Throughput:	718.84	MMscf/yr

Pollutant	Emission Factor[1] (lb/MMscf)	Emission Factor units	PTE (lb/hr)	PTE (ton/yr)
PM	7.60	lb/MMscf	0.62	2.73
PM_{10}	7.60	lb/MMscf	0.62	2.73
$PM_{2.5}$	7.60	lb/MMscf	0.62	2.73
NO_x	100.00	lb/MMscf	8.21	35.94
SO_2[2]	0.60	lb/MMscf	0.05	0.22
CO	84.00	lb/MMscf	6.89	30.19
VOC	5.50	lb/MMscf	0.45	1.98
Individual Hazardous Air Pollutants (HAP)[1]				
Benzene	2.10E-03	lb/MMscf	1.72E-04	7.55E-04
Dichlorobenzene	1.20E-03	lb/MMscf	9.85E-05	4.31E-04
Formaldehyde	7.50E-02	lb/MMscf	6.15E-03	0.03
Hexane	1.80	lb/MMscf	0.15	0.65
Lead Compounds	5.00E-04	lb/MMscf	4.10E-05	1.80E-04
Naphthalene	6.10E-04	lb/MMscf	5.01E-05	2.19E-04
Toluene	3.40E-03	lb/MMscf	2.79E-04	1.22E-03
Arsenic Compounds	2.00E-04	lb/MMscf	1.64E-05	7.19E-05
Beryllium Compounds	1.20E-05	lb/MMscf	9.85E-07	4.31E-06
Cadmium Compounds	1.10E-03	lb/MMscf	9.03E-05	3.95E-04
Chromium Compounds	1.40E-03	lb/MMscf	1.15E-04	5.03E-04
Cobalt Compounds	8.40E-05	lb/MMscf	6.89E-06	3.02E-05
Manganese Compounds	3.80E-04	lb/MMscf	3.12E-05	1.37E-04
Mercury Compounds	2.60E-04	lb/MMscf	2.13E-05	9.34E-05
Nickel Compounds	2.10E-03	lb/MMscf	1.72E-04	7.55E-04
Selenium Compounds	2.40E-05	lb/MMscf	1.97E-06	8.63E-06
Total HAPs	-	-	0.15	0.68
GHGs[2]				
CO_2	53.06	kg/MMBtu	9,791.00	42,884.56
CH_4	1.00E-03	kg/MMBtu	0.18	0.81
N_2O[3]	1.00E-04	kg/MMBtu	0.02	0.08
GHGs (mass basis)	-	-	9,791.20	42,885.45
CO_2e[4]	-	-	9,801.05	42,928.61

[1] Emission Factors are from AP-42 Tables 1.4-1, 1.4-2, 1.4-3, and 1.4-4 (7/98) unless otherwise specified.

[2] Emission factors for Greenhouse Gases (GHG) are default values from 40 CFR 98 Tables C-1 and C-2. This PTE summary follows the methodologies prescribed in 40 CFR Part 98.

[3] GHG (lbs/hr) = [Emission Factor (kg/MMBtu)] x (Potential Heat Input Capacity (MMBtu/hr)]/(907.185 kg/tons)*(2000 lbs/ton)

[4] tons CO_2e per year = [(ton/yr CO_2)*1] or [(ton/yr CH_4)*25] or [(ton/yr N_2O)*298]; CO_2e are found in 40 CFR Part 98 Subpart A Table A-1 Global Warming Potentials published on April 25, 2024. The CO_2e for CO_2 = 1, for CH_4 = 28, and for N_2O = 265.

Fact Sheet Attachment

Emission Point: EP-2.1 through EP-2.2 TEG Reboilers

Total Heat Input Capacity:	0.4	MMBtu/hr (each)
Number of Units	2	
Heat Content of Natural Gas:	1,020	MMBtu/MMscf
Conversion using 1,020 Btu/scf:	0.0008	MMscf/hr
Annual Hours of Operation:	8,760	hr
Potential Natural Gas Throughput:	6.87	MMscf/yr

Pollutant	Emission Factor[1] (lb/MMscf)	Emission Factor units	PTE (lb/hr)	PTE (ton/yr)
PM	7.60	lb/MMscf	5.96E-03	0.03
PM_{10}	7.60	lb/MMscf	5.96E-03	0.03
$PM_{2.5}$	7.60	lb/MMscf	5.96E-03	0.03
NO_x	100.00	lb/MMscf	0.08	0.34
SO_2[2]	0.60	lb/MMscf	4.71E-04	2.06E-03
CO	84.00	lb/MMscf	0.07	0.29
VOC	5.50	lb/MMscf	4.31E-03	0.02
Individual Hazardous Air Pollutants (HAP)[1]				
Benzene	2.10E-03	lb/MMscf	1.65E-06	7.21E-06
Dichlorobenzene	1.20E-03	lb/MMscf	9.41E-07	4.12E-06
Formaldehyde	7.50E-02	lb/MMscf	5.88E-05	2.58E-04
Hexane	1.80	lb/MMscf	1.41E-03	6.18E-03
Lead Compounds	5.00E-04	lb/MMscf	3.92E-07	1.72E-06
Naphthalene	6.10E-04	lb/MMscf	4.78E-07	2.10E-06
Toluene	3.40E-03	lb/MMscf	2.67E-06	1.17E-05
Arsenic Compounds	2.00E-04	lb/MMscf	1.57E-07	6.87E-07
Beryllium Compounds	1.20E-05	lb/MMscf	9.41E-09	4.12E-08
Cadmium Compounds	1.10E-03	lb/MMscf	8.63E-07	3.78E-06
Chromium Compounds	1.40E-03	lb/MMscf	1.10E-06	4.81E-06
Cobalt Compounds	8.40E-05	lb/MMscf	6.59E-08	2.89E-07
Manganese Compounds	3.80E-04	lb/MMscf	2.98E-07	1.31E-06
Mercury Compounds	2.60E-04	lb/MMscf	2.04E-07	8.93E-07
Nickel Compounds	2.10E-03	lb/MMscf	1.65E-06	7.21E-06
Selenium Compounds	2.40E-05	lb/MMscf	1.88E-08	8.24E-08
Total HAPs	-	-	1.48E-03	6.49E-03
GHGs[2]				
CO_2	53.06	kg/MMBtu	93.58	409.89
CH_4	1.00E-03	kg/MMBtu	1.76E-03	7.72E-03
N_2O[3]	1.00E-04	kg/MMBtu	1.76E-04	7.72E-04
GHGs (mass basis)	-	-	93.58	409.90
CO_2e[4]	-	-	93.68	410.31

[1] Emission Factors are from AP-42 Tables 1.4-1, 1.4-2, 1.4-3, and 1.4-4 (7/98) unless otherwise specified.

[2] Emission factors for Greenhouse Gases (GHG) are default values from 40 CFR 98 Tables C-1 and C-2. This PTE summary follows the methodologies prescribed in 40 CFR Part 98.

[3] GHG (lbs/hr) = [Emission Factor (kg/MMBtu)] x (Potential Heat Input Capacity (MMBtu/hr)]/(907.185 kg/tons)*(2000 lbs/ton)

[4] tons CO_2e per year = [(ton/yr CO_2)*1] or [(ton/yr CH_4)*25] or [(ton/yr N_2O)*298]; CO_2e are found in 40 CFR Part 98 Subpart A Table A-1 Global Warming Potentials published on April 25, 2024. The CO_2e for CO_2 = 1, for CH_4 = 28, and for N_2O = 265.

Fact Sheet Attachment

Emission Point: EP-3.01 through EP-3.12 Building Heaters

Total Heat Input Capacity:	1	MMBtu/hr (each)
Number of Units	12	
Heat Content of Natural Gas:	1,020	MMBtu/MMscf
Conversion using 1,020 Btu/scf:	0.012	MMscf/hr
Annual Hours of Operation:	8,760	hr
Potential Natural Gas Throughput:	103.06	MMscf/yr

Pollutant	Emission Factor[1] (lb/MMscf)	Emission Factor units	PTE (lb/hr)	PTE (ton/yr)
PM	7.60	lb/MMscf	0.09	0.39
PM_{10}	7.60	lb/MMscf	0.09	0.39
$PM_{2.5}$	7.60	lb/MMscf	0.09	0.39
NO_x	100.00	lb/MMscf	1.18	5.15
SO_2[2]	0.60	lb/MMscf	7.06E-03	0.03
CO	84.00	lb/MMscf	0.99	4.33
VOC	5.50	lb/MMscf	0.06	0.28
Individual Hazardous Air Pollutants (HAP)[1]				
Benzene	2.10E-03	lb/MMscf	2.47E-05	1.08E-04
Dichlorobenzene	1.20E-03	lb/MMscf	1.41E-05	6.18E-05
Formaldehyde	0.08	lb/MMscf	8.82E-04	3.86E-03
Hexane	1.80	lb/MMscf	0.02	0.09
Lead Compounds	5.00E-04	lb/MMscf	5.88E-06	2.58E-05
Naphthalene	6.10E-04	lb/MMscf	7.18E-06	3.14E-05
Toluene	3.40E-03	lb/MMscf	4.00E-05	1.75E-04
Arsenic Compounds	2.00E-04	lb/MMscf	2.35E-06	1.03E-05
Beryllium Compounds	1.20E-05	lb/MMscf	1.41E-07	6.18E-07
Cadmium Compounds	1.10E-03	lb/MMscf	1.29E-05	5.67E-05
Chromium Compounds	1.40E-03	lb/MMscf	1.65E-05	7.21E-05
Cobalt Compounds	8.40E-05	lb/MMscf	9.88E-07	4.33E-06
Manganese Compounds	3.80E-04	lb/MMscf	4.47E-06	1.96E-05
Mercury Compounds	2.60E-04	lb/MMscf	3.06E-06	1.34E-05
Nickel Compounds	2.10E-03	lb/MMscf	2.47E-05	1.08E-04
Selenium Compounds	2.40E-05	lb/MMscf	2.82E-07	1.24E-06
Total HAPs	-	-	0.02	0.10
GHGs[2]				
CO_2	53.06	kg/MMBtu	1,403.73	6,148.32
CH_4	1.00E-03	kg/MMBtu	0.03	0.12
N_2O[3]	1.00E-04	kg/MMBtu	2.65E-03	1.16E-02
GHGs (mass basis)	-	-	1,403.76	6,148.45
CO_2e[4]	-	-	1,405.17	6,154.64

[1] Emission Factors are from AP-42 Tables 1.4-1, 1.4-2, 1.4-3, and 1.4-4 (7/98) unless otherwise specified.

[2] Emission factors for Greenhouse Gases (GHG) are default values from 40 CFR 98 Tables C-1 and C-2. This PTE summary follows the methodologies prescribed in 40 CFR Part 98.

[3] GHG (lbs/hr) = [Emission Factor (kg/MMBtu)] x (Potential Heat Input Capacity (MMBtu/hr)]/(907.185 kg/tons)*(2000 lbs/ton)

[4] tons CO_2e per year = [(ton/yr CO_2)*1] or [(ton/yr CH_4)*25] or [(ton/yr N_2O)*298]; CO_2e are found in 40 CFR Part 98 Subpart A Table A-1 Global Warming Potentials published on April 25, 2024. The CO_2e for CO_2 = 1, for CH_4 = 28, and for N_2O = 265.

Fact Sheet Attachment

Emission Point: EP-4.01 through EP-4.20 Linear Generators

Engine Power Output[1] :	250	kW (each)	
Maximum fuel consumption[1] :	2.15	MMBtu/hr (each)	2,108 CFH
Engine Max Capacity:	35.13	scfm (each)	
Annual Operating Hours:	8,760	hr/yr	
Number of Engines:	20		
Natural Gas Throughput:	43	(each)	
Natural Gas Throughput:	376,680	MMBtu/yr	

Pollutant	Emission Factor[2]	Units	PTE (lb/hr)	PTE (ton/yr)
$PM_{condensible}$	1.50E-03	lb/MMBtu	0.06	0.28
PM_{10}	1.50E-03	lb/MMBtu	0.06	0.28
$PM_{2.5}$	1.50E-03	lb/MMBtu	0.06	0.28
SO_x	1.16E-02	lb/MMBtu	0.50	2.18
CO[2]	0.03	lb/MMBtu	1.16	5.09
VOC[2]	1.32E-02	lb/MMBtu	0.57	2.49
NO_x[2]	9.20E-03	lb/MMBtu	0.40	1.73
Hazardous Air Pollutants				
1,3-Butadiene	1.07E-04	lb/MMBtu	4.60E-03	0.02
Acetaldehyde	8.83E-04	lb/MMBtu	0.04	0.17
Benzene	1.95E-03	lb/MMBtu	0.08	0.37
Formaldehyde	5.35E-03	lb/MMBtu	0.23	1.01
Naphthalene	7.90E-05	lb/MMBtu	3.40E-03	1.49E-02
Total HAPs			0.36	1.56
Greenhouse Gases			**(lb/hr)**	**(ton/yr)**
CO_2	117.00	lb/MMBtu	5,031.00	22,035.78
CH_4	0.53	lb/MMBtu	22.92	100.39
GHGs (mass basis)		-	5,053.92	22,136.17
CO_2e[3]		-	5,672.73	24,846.57

[1] Provided by source in application

[2] Emission factors provided by equipment manufacturer

[3] tons CO_2e per year = [(ton/yr CO_2)*1] or [(ton/yr CH_4)*25] or [(ton/yr N_2O)*298]; CO_2e are found in 40 CFR Part 98 Subpart A Table A-1 Global Warming Potentials published on April 25, 2024. The CO_2e for CO_2 = 1, for CH_4 = 28, and for N_2O = 265.

Fact Sheet Attachment

Emission Point: EP-5 Startup Vent

Tail Gas Flow Rate:	2,172	scfm
Tail Gas Flow Rate:	0.130	MMscf/hr
Hours of Operation:	8,760	hr/yr
Total Tail Gas:	1141.48	MMscf/yr
Specific Volume of Air at STP:	379.34	scf/lb-mole

Pollutant	Emission Factors[1]	Potential Emissions	
	lb/MMscf	(lb/hr)	(ton/yr)
SO_2[2]	22.29	2.90	12.72
VOC	1.54	0.20	0.88
CH_4	411.37	53.60	234.79
CO_2	114,479.78	14,917.40	65,338.22
Total GHGs (mass basis)	-	14,971.01	65,573.01
Total GHGs (tons CO_2e/yr)[3]	-	16,257.51	71,912.26

[1] Emission factors based on molecular mass conversion

[2] Sulfur Dioxide Calculation: SO_2 emissions are based on the amount of H_2S in the gas (see calculations next page).

[3] tons CO_2e/yr = [(tons/yr CO_2)*1] or [(tons/yr CH_4)*28] or [(tons/yr N_2O)*265]; CO_2 equivalents are found in 40 CFR Part 98 Subpart A Table A-1 Global Warming Potentials published on January 1, 2014. The CO_2e for CO_2 = 1, for CH_4 = 28, and for N_2O = 265.

Pollutant	Molecular Weight	Concentration[3]
	lb/lb-mol	%
CH_4	16.04	0.97%
CO_2	44.01	98.68%
TRS	34.10	0.0167%
SO_2	64.07	-
VOC	58.59	0.0010%

[4] Concentrations provided by the source in the application

Fact Sheet Attachment

H_2S Mass Balance

H_2S Content:	147	ppmv
H_2S Concentration:	ppmv*M/V_m	10^{-6} g/L or µg/L

Where V_m = standard molar volume of ideal gas or 22.71108 L/mol @std temperature and pressure (STP)

And M = molecular weight of gas or 34.1 g/mol for H_2S[a]

Or H_2S Content:	221	µg/L
Converts to:	2.20716E-07	kg/L
Conversion:	2.2046	lb/kg
Conversion:	28.31684659	L/ft^3
or Concentration @STP	1.38E-05	lb/ft^3
Standard Temp:	491.67	ºR
Operating Temp:	559.67	ºR (100 ºF)
Actual Concentration:	1.21E-05	lb/ft^3
Assume 98% conversion of H_2S to SO_2[b]		
H_2S Concentration:	1.21E-05	lb/ft^3
Conversion:	98%	
Equals:	1.19E-05	lb/ft^3 H_2S
Converts to[b][c]:	2.23E-05	lb/ft^3 SO_2

[a] Texas Commission on Environmental Quality (TCEQ) *Publication RG-360A* , Revised January 2007

[b] Molecular Weight of H_2S is:	34.1	g/mol
[c] Molecular Weight of SO_2 is:	64.07	g/mol

Fact Sheet Attachment

Emission Point: EP-6 ABS Synthesis Vent

Exhaust Flow Rate:	1,720	scfm
Exhaust Flow Rate:	0.103	MMscf/hr
Hours of Operation:	8,760	hr/yr
Total Annual Flow:	904.03	MMscf/yr
Specific Volume of Air at STP:	379.34	scf/lb-mole

Pollutant	Emission Factors[1]	Potential Emissions	
	lb/MMscf	(lb/hr)	(ton/yr)
NO_x	0.12	1.25E-02	0.05
TRS[2]	0.09	9.28E-03	0.04
SO_2[2]	8.44	0.89	3.89

[1] Emission factors based on molecular mass conversion

[2] TRS is primarily H2S and was used as such in the applicant's dispersion model. Because H2S is not a criteria pollutant but readily converts to SO2 in the atmosphere, this mass of sulfur has been converted to SO2 for the purposes of PTE.

Pollutant	Molecular Weight	Concentration[3]
	lb/lb-mol	%
NO_x	46.01	0.0001%
NH_3	17.03	0.0100%
TRS	34.10	0.0001%
SO_2	64.07	0.0050%

[3] Concentrations provided by the source in the application from gas process designer.

Fact Sheet Attachment

Emission Point: EP-7.1a, EP-7.2a, EP-7.3a, EP-7.1b, EP-7.2b, and EP-7.3b Startup/Bypass Flares

Number of flares: 3

	UNIT	BYPASS FLARES[1]	STARTUP FLARES[1]
Biogas Flow Rate	scf/ hr	453,721	302,939
Operating Hours Per Year	hr/yr	8,760	8,760
Total Annual Flow	scf/yr	3,974,591,652	2,653,741,291
Design Heating Rate	MMBtu/hr	300	300
Design Exhaust Rate	scfm	90,744	60,588
Heating Value	Btu/scf	661.2	990.3

[1] Provided by source in application.

Pollutant	Concentration[1]	
	BYPASS FLARE (%)	STARTUP FLARE (%)
CH_4	65.29%	97.84%
CO_2	33.10%	-
O_2	0.20%	0.30%
N_2	1.00%	1.51%
NH_3	0.03%	0.03%
TRS	0.05%	4.00E-06
VOC	3.00E-06	-

[1] Provided by source in application.

Pollutant	BYPASS FLARES (EP-7.1b, EP-7.2b, and EP-7.3b)				STARTUP FLARES (EP-7.1a, EP-7.2a, and EP-7.3a)				MAX PTE
	Emission Factor	Emission Factor	PTE		Emission Factor	Emission Factor	PTE		
	Value	Unit	(lb/hr)	(ton/yr)	Value	Unit	(lb/hr)	(ton/yr)	(ton/yr)
PM[1]	17.00	lb/10^6scf CH4	5.04	22.06	17.00	lb/10^6scf CH4	5.04	22.07	22.10
PM_{10}[1]	17.00	lb/10^6scf CH4	5.04	22.06	17.00	lb/10^6scf CH4	5.04	22.07	22.10
$PM_{2.5}$[1]	17.00	lb/10^6scf CH4	5.04	22.06	17.00	lb/10^6scf CH4	5.04	22.07	22.10
NOx[2]	0.14	lb/MMBtu	42.00	183.96	0.14	lb/MMBtu	42.00	183.96	184.35
SO_2[3]	22.29	lb/10^6scf Biogas	10.11	44.29	0.61	lb/10^6scf Biogas	0.18	0.80	44.30
CO[2]	0.15	lb/MMBtu	45.00	197.10	0.15	lb/MMBtu	45.00	197.10	197.42
VOC[4]	0.66	lb/MMBtu Biogas	3.96	17.34	0.66	lb/MMBtu Biogas	3.96	17.34	17.37
CO_2	114,125.35	lb/10^6scf CH4	51,781.01	226,800.82	113,487.39	lb/10^6scf CH4	34,379.70	150,583.08	227,264.59
CH_4	845.50	lb/10^6scf CH4	250.47	1,097.04	827.24	lb/10^6scf CH4	245.19	1,073.93	1,097.05
CO_2e[4]	-	-	58,794.07	257,518.01	-	-	41,245.00	180,653.10	257,984.27
Largest HAP									0.05
Total HAPs									0.85

[1] Emission factor from AP-42 table 2.4 for landfill gas

[2] Manufacturer data

[3] Sulfur Dioxide Calculation: SO2 emissions are based on the amount of H2S in the gas (see calculations next page).

[4] AP-42 Section 13.5, Tables 13.5-2 (February 2018) in lb/MMBtu.VOC assumes 98% destruction efficiency.

[5] tons CO_2e/yr = [(tons/yr CO_2)*1] or [(tons/yr CH_4)*28] or [(tons/yr N_2O)*265]; CO_2 equivalents are found in 40 CFR Part 98 Subpart A Table A-1 Global Warming Potentials published on January 1, 2014. The CO_2e for CO_2 = 1, for CH_4 = 28, and for N_2O = 265.

Individual HAP[1]	BYPASS FLARES				STARTUP FLARES				MAX PTE
	Molecular Weight[1]	Default Concentration[1]	Emission Factor	Controlled PTE	Molecular Weight[1]	Default Concentration[1]	Emission Factor	Controlled PTE	
		ppmv	lb/10^6scf	ton/yr		ppmv	lb/10^6scf	ton/yr	(ton/yr)
1,1,1-Trichloroethane (methyl chloroform)	133.41	0.48	0.11	4.44E-03	133.41	0.48	0.11	2.96E-03	4.44E-03
1,1,2,2-Tetrachloroethane	167.85	1.11	0.32	1.29E-02	167.85	1.11	0.32	8.62E-03	1.29E-02
1,1-Dichloroethane (ethylidene dichloride)	98.97	2.35	0.41	0.02	98.97	2.35	0.41	1.08E-02	0.02
1,1-Dichloroethene (vinylidene chloride)	96.94	0.20	0.03	1.34E-03	96.94	0.20	0.03	8.97E-04	1.34E-03
1,2-Dichloroethane (ethylene dichloride)	98.96	0.41	0.07	2.81E-03	98.96	0.41	0.07	1.88E-03	2.81E-03
1,2-Dichloropropane (propylene dichloride)	112.99	0.18	0.04	1.41E-03	112.99	0.18	0.04	9.41E-04	1.41E-03
Acrylonitrile	53.06	6.33	0.59	0.02	53.06	6.33	0.59	0.02	0.02
Benzene	78.11	1.91	0.26	1.03E-02	78.11	1.91	0.26	6.91E-03	1.03E-02
Carbon disulfide	76.13	0.58	0.08	3.06E-03	76.13	0.58	0.08	2.04E-03	3.06E-03
Carbon tetrachloride	153.84	4.00E-03	1.07E-03	4.27E-05	153.84	4.00E-03	1.07E-03	2.85E-05	4.27E-05
Carbonyl sulfide	60.07	0.49	0.05	2.04E-03	60.07	0.49	0.05	1.36E-03	2.04E-03
Chlorobenzene	112.56	0.25	0.05	1.95E-03	112.56	0.25	0.05	1.30E-03	1.95E-03
Chloroethane (ethyl chloride)	64.52	1.25	0.14	5.59E-03	64.52	1.25	0.14	3.73E-03	5.59E-03
Chloroform	119.39	0.03	0.01	2.48E-04	119.39	0.03	0.01	1.66E-04	2.48E-04
Dichloromethane (methylene chloride)	84.94	14.30	2.12	0.08	84.94	14.30	2.12	0.06	0.08
Dichlorobenzene	147.00	0.21	0.05	2.14E-03	147.00	0.21	0.05	1.43E-03	2.14E-03
Ethylbenzene	106.16	4.61	0.85	0.03	106.16	4.61	0.85	0.02	0.03
Hexane	86.18	6.57	0.99	0.04	86.18	6.57	0.99	0.03	0.04
Hydrogen Chloride	36.46	42.00	2.67	0.11	36.46	42.00	2.67	0.07	0.11
Mercury (total)	200.61	2.92E-04	1.02E-04	4.06E-06	200.61	2.92E-04	1.02E-04	2.71E-06	4.06E-06
Methyl ethyl ketone	72.11	7.09	0.89	0.04	72.11	7.09	0.89	0.02	0.04
Methyl isobutyl ketone	100.16	1.87	0.33	1.30E-02	100.16	1.87	0.33	8.67E-03	1.30E-02
Perchloroethylene (tetrachloroethylene)	165.83	3.73	1.08	0.04	165.83	3.73	1.08	0.03	0.04
Trichloroethylene (trichloroethene)	131.4	2.82	0.65	0.03	131.4	2.82	0.65	0.02	0.03
Toulene	92.13	39.30	6.32	0.25	92.13	39.30	6.32	0.17	0.25
Vinyl chloride	62.5	7.34	0.80	0.03	62.5	7.34	0.80	0.02	0.03
Xylenes	106.16	12.10	2.24	0.09	106.16	12.10	2.24	0.06	0.09
Total HAPS				0.84				0.56	0.84

[1] HAP, molecular weight, and default concentrations from AP42 Chapter 2.4, Table 2.4-1 (August 2024). Methyl Ethyl Ketone has been delisted and removed from the list.

Fact Sheet Attachment

H_2S Mass Balance

Bypass Flare (EP-7.1b, EP-7.2b, and EP-7.3b)

H_2S Content:	147	ppmv
H_2S Concentration: ppmv*M/V_m		10^{-6} g/L or µg/L

Where V_m = standard molar volume of ideal gas or 22.71108 L/mol @std temperature and pressure (STP)

And M = molecular weight of gas or 34.1 g/mol for H_2S[a]

Or H_2S Content:	221	µg/L
Converts to:	2.20716E-07	kg/L
Conversion:	2.2046	lb/kg
Conversion:	28.31684659	L/ft^3
or Concentration @STP	1.38E-05	lb/ft^3
Standard Temp:	491.67	ºR
Operating Temp:	559.67	ºR (100 ºF)
Actual Concentratio	1.21E-05	lb/ft^3

Assume 98% conversion of H_2S to SO_2[b]

H_2S Concentration:	1.21E-05	lb/ft^3
Conversion:	98%	
Equals:	1.19E-05	lb/ft^3 H_2S
Converts to[b][c]:	2.23E-05	lb/ft^3 SO_2

[a] Texas Commission on Environmental Quality (TCEQ) *Publication RG-360A* , Revised January 2007

[b] Molecular Weight of H_2S is: 34.1 g/mol

[c] Molecular Weight of SO_2 is: 64.07 g/mol

Startup Flare (EP-7.1a, EP-7.2a, and EP-7.3a)

H_2S Content:	4	ppmv
H_2S Concentration: ppmv*M/V_m		10^{-6} g/L or µg/L

Where V_m = standard molar volume of ideal gas or 22.71108 L/mol @std temperature and pressure (STP)

And M = molecular weight of gas or 34.1 g/mol for H_2S[a]

Or H_2S Content:	6	µg/L
Converts to:	6.00588E-09	kg/L
Conversion:	2.2046	lb/kg
Conversion:	28.31684659	L/ft^3
or Concentration @STP	3.75E-07	lb/ft^3
Standard Temp:	491.67	ºR
Operating Temp:	559.67	ºR (100 ºF)
Actual Concentratio	3.29E-07	lb/ft^3

Assume 98% conversion of H_2S to SO_2[b]

H_2S Concentration:	3.29E-07	lb/ft^3
Conversion:	98%	
Equals:	3.23E-07	lb/ft^3 H_2S
Converts to[b][c]:	6.06E-07	lb/ft^3 SO_2

[a] Texas Commission on Environmental Quality (TCEQ) *Publication RG-360A* , Revised January 2007

[b] Molecular Weight of H_2S is: 34.1 g/mol

[c] Molecular Weight of SO_2 is: 64.07 g/mol

Fact Sheet Attachment

Flares EP-7.1, EP-7.2, and EP-7.3 (pilot)

0.9 MMBtu/hr (all)

Natural gas flowrate 8.82E-04 MMscf/hr (all)

Pollutant	Emission Factor [1] (lb/MMscf)	Potential Uncontrolled Emissions (lb/hr)	Potential Uncontrolled Emissions (ton/yr)
PM	7.6	6.71E-03	0.03
PM_{10}	7.6	6.71E-03	0.03
$PM_{2.5}$	7.6	6.71E-03	0.03
SO_2	0.6	5.29E-04	2.32E-03
NO_X	100	0.09	0.39
CO	84	0.07	0.32
VOC	5.5	4.85E-03	0.02
CO_2	120,000	105.88	463.76
CH_4	2.3	2.03E-03	8.89E-03
N_2O	2.2	1.94E-03	8.50E-03
CO_2e	-	106.45	466.27
Individual HAP			
Arsenic	2.00E-04	1.76E-07	7.73E-07
Benzene	2.10E-03	1.85E-06	8.12E-06
Beryllium	1.20E-05	1.06E-08	4.64E-08
Cadmium	1.10E-03	9.71E-07	4.25E-06
Chromium	1.40E-03	1.24E-06	5.41E-06
Cobalt	8.40E-05	7.41E-08	3.25E-07
Dichlorobenzene	1.20E-03	1.06E-06	4.64E-06
Formaldehyde	0.08	6.62E-05	2.90E-04
n-Hexane	1.8	1.59E-03	6.96E-03
Lead	5.00E-04	4.41E-07	1.93E-06
Manganese	3.80E-04	3.35E-07	1.47E-06
Mercury	2.60E-04	2.29E-07	1.00E-06
Naphthalene	6.10E-04	5.38E-07	2.36E-06
Nickel	2.10E-03	1.85E-06	8.12E-06
POM	8.82E-05	7.78E-08	3.41E-07
Selenium	2.40E-05	2.12E-08	9.28E-08
Toluene	3.40E-03	3.00E-06	1.31E-05
Total HAP		**1.67E-03**	**7.30E-03**

[1] The emission factors are from AP-42, Chapter 1.4 (July, 1998).

Fact Sheet Attachment

Emission Point: FUG-001

Paved roads {AP-42 Chapter 13.2.1 (1/11)}

Equation (2): $$E = k \times (sL)^{0.91} \times (W)^{1.02} \times \left(1 - \frac{P}{4 \times 365}\right)$$

	k
PM	1.10E-02
PM_{10}	2.20E-03
$PM_{2.5}$	5.40E-04

Unpaved roads {AP-42 Chapter 13.2.2 (11/06)}

Equation (1a): (Modified) $$E = k \times \left(\frac{sC}{12}\right)^{a} \times \left(\frac{W}{3}\right)^{b} \times \left(\frac{365 - P}{365}\right) \times \left(\frac{S}{30}\right)^{d} \times (1 - CE)$$

	k	*a*	*b*	*d*
PM	4.90	0.7	0.45	0.3
PM_{10}	1.50	0.9	0.45	0.5
$PM_{2.5}$	0.15	0.9	0.45	0.5

Haul Road / Traffic Parameters

Activity / Road Description	Road Type / Silt Value		Roundtrip Length (feet)		Truck Weight (ton)			Ave. Speed (mph)	Unrestricted Maximum Throughput (unit/yr)	Ave. Truck Capacity (unit/truck)		Annual VMT
			empty	full	empty	full	Ave.					
Goettsch Raw Delivery	u	6.00	200	150	15.00	40.00	25.71	30.00	9,610	25	ton	25
Goettsch Raw Delivery	p	6.00	700	800	15.00	40.00	28.33	30.00	9,610	25	ton	109
Red Cloud Raw Delivery	u	6.00	825	875	15.00	40.00	27.87	30.00	9,610	25	ton	124
Red Cloud Raw Delivery	p	6.00	700	750	15.00	40.00	27.93	30.00	9,610	25	ton	106
N. Platte Raw Delivery	p	6.00	2,225	1,890	15.00	40.00	26.48	30.00	9,610	25	ton	300
Fertilizer Shipping	p	6.00	2,650	2,850	15.00	40.00	27.95	30.00	25,550	25	ton	1,065
												-
												-
												-
												-

Emission Calculations

Activity / Road Description	Emission Factors (lb/VMT)			Potential Emissions (tons/yr)		
	PM	PM_{10}	$PM_{2.5}$	PM	PM_{10}	$PM_{2.5}$
Goettsch Raw Delivery	5.98	1.59	0.16	0.08	0.02	2.03E-03
Goettsch Raw Delivery	1.60	0.32	0.08	0.09	0.02	4.28E-03
Red Cloud Raw Delivery	6.20	1.65	0.17	0.38	0.10	1.02E-02
Red Cloud Raw Delivery	1.57	0.31	0.08	0.08	0.02	4.08E-03
N. Platte Raw Delivery	1.49	0.30	0.07	0.22	0.04	1.10E-02
Fertilizer Shipping	1.57	0.31	0.08	0.84	0.17	0.04
Total Annual Emissions:				**1.69**	**0.37**	**0.07**

Description of Constants/Variables

E: haul road emissions (lb/VMT)

k, d: dimensionless constants from AP-42 Chapter 13.2.1 (paved roads)

k, a, b, c, d: dimensionless constants from AP-42 Tables 13.2.1-1 & 13.2.2-2 (unpaved)

sL: silt loading (g/m^2) of paved road surface

sC: silt content (%) of unpaved road surface

P: days/yr with at least 0.01" of precipitation

P = 90 default = 90

S: mean vehicle speed on road (mph) default = 30, minimum =15

CE: unpaved road, dust control efficiency

CE = 0 % default = 0%

VMT: vehicle miles traveled

Fact Sheet Attachment

Title 129, Chapter 15, Section 001.02

Total Heat Input (MMBtu/hr)	Maximum Allowable Emissions of PM (lbs/MMBtu)
10 or less	0.6
Between 10 and 10,000	$1.026/I^{0.233}$ Where I = total heat input in MMBtu/hr.
10,000 or more	0.12

Chapter 15, Section 001.02 Calculations

Emission Point	Description	Rating	Individual Emission Rate	Allowable PM, Individual Emissions
		MMBtu/hr	lb/MMBtu	lb/MMBtu
EP-1	Amine Boiler(s)	83.70	2.48E-03	0.37
EP-2	TEG Reboilers	0.80	3.71E-03	0.60
EP-3	Building Heaters	12.00	6.19E-04	0.58
EP-4	Linear Generators	43.00	7.50E-05	0.43
EP-7	Flares	300.00	1.68E-02	0.27