WBI ENERGY TRANSMISSION, INC.

North Bakken Expansion Project

Resource Report 9
Air Quality and Noise

Final

Docket No.
CP20-52-000

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WBI ENERGY TRANSMISSION, INC.
NORTH BAKKEN EXPANSION PROJECT
RESOURCE REPORT 9 – AIR QUALITY AND NOISE

Minimum Filing Requirements for Environmental Reports:	**Addressed in:**
1. Describe existing air quality in the vicinity of the project – Title 18 of the Code of Federal Regulations (CFR) Part § 380.12(k)(1) - Identify criteria pollutants that may be emitted above U.S. Environmental Protection Agency (EPA)-identified significance levels	Section 9.1.2
2. Quantify the existing noise levels (day-night sound level (Ldn) and other applicable noise parameters) at noise sensitive areas and at other areas covered by relevant state and local noise ordinances - 18 CFR § 380.12(k)(2) - If new compressor station sites are proposed, measure or estimate the existing or ambient sound environment based on current land uses and activities - For existing compressor stations (operated at full load), include the results of a sound level survey at the site property line and nearby noise-sensitive areas - Include a plot plan that identifies the locations and duration of noise measurements - All surveys must identify the time of day, weather conditions, wind speed and direction, engine load, and other noise sources present during each measurement	Section 9.2.3 and Appendix 9F
3. Quantify existing and proposed emissions of compressor equipment, plus construction emissions, including nitrogen oxides (NOx) and carbon monoxide (CO), and the basis for these calculations. Summarize anticipated air quality impacts for the project - 18 CFR § 380.12(k)(3) - Provide the emission rate of NOx from existing and proposed facilities, expressed in pounds per hour and tons per year for maximum operating conditions, including supporting calculations, emission factors, fuel consumption rate, and annual hours of operation	Sections 9.1.4.1 and 9.1.4.2
4. Describe the existing compressor units at each station where new, additional, or modified compression units are proposed, including the manufacturer, model number, and horsepower of the compressor units. For proposed, new, additional, or modified compressor units, include horsepower, type, and energy source – 18 CFR § 380.12(k)(4)	Section 9.1.4.2
5. Identify any nearby noise-sensitive area by distance and direction from the proposed compressor unit building/enclosure - 18 CFR § 380.12(k)(4)	Section 9.2.3
6. Identify any applicable state or local noise regulations - 18 CFR § 380.12(k)(4) Specify how the facility will meet the regulations	Section 9.2.2
7. Calculate the noise impact at noise-sensitive areas of the proposed compressor unit modifications or additions, specifying how the impact was calculated, including manufacturer's data and proposed noise control equipment - 18 CFR § 380.12(k)(4)	Sections 9.2.4-9.2.6

Additional Information:	**Addressed in:**
Provide copies of application for state air permits and agency determinations, as appropriate	Appendix 9B
For major sources of air emissions (as defined by the EPA), provide copies of applications for permits to construct (and operate, if applicable) or for applicability determinations under regulations for the prevention of significant air quality deterioration and subsequent determinations	Not Applicable
Describe measures and manufacturer's specifications for equipment proposed to mitigate impact to air and noise quality, including emission control systems, installation of filters, mufflers, or insulation of piping and building, and orientation of equipment from noise-sensitive areas	Sections 9.1.4..2 and 9.2.4-9.2.6

Federal Energy Regulatory Commission's January 17, 2020 Environmental Information Request:	**Addressed in:**
1. Provide a summary of how capturing vented/flared gas for the project would affect air quality.	Section 9.1

WBI ENERGY TRANSMISSION, INC.
NORTH BAKKEN EXPANSION PROJECT
RESOURCE REPORT 9 – AIR QUALITY AND NOISE

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ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
AAQS	Ambient Air Quality Standards
CAA	Clean Air Act
CAAA	CAA Amendments
CFR	Code of Federal Regulations
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalents
dB	decibel
dBA	A-weighted scale
Department	North Dakota Department of Environmental Quality - Division of Air Quality
FERC	Federal Energy Regulatory Commission
EPA	U.S. Environmental Protection Agency
ESD	emergency shutdown
GHG	greenhouse gas
GWP	global warming potential
H_2S	hydrogen sulfide
HAP	hazardous air pollutant
HDD	horizontal directional drill
hp	horsepower
L_{dn}	day-night sound level
L_{eq}	equivalent sound level
MMBtu/hr	million British thermal units per hour
MP	milepost
mph	miles per hour
NDAC	North Dakota Administrative Code
NDDEQ	North Dakota Department of Environmental Quality
NCEI	National Centers for Environmental Information
NESHAP	National Emission Standards for Hazardous Air Pollutant
NAAQS	National Ambient Air Quality Standards
NMNEHC	non-methane non-ethane hydrocarbon
NNSR	Nonattainment New Source Review
NO_2	nitrogen dioxide
Northern Border	Northern Border Pipeline Company
NOx	nitrogen oxides
NSA	Noise Sensitive Area
NSPS	New Source Performance Standards
NWS	National Weather Service
O_3	ozone
Pb	lead
PM	particulate matter
$PM_{2.5}$	particulate matter with an aerodynamic diameter less than or equal to 2.5 microns
PM_{10}	particulate matter with an aerodynamic diameter less than or equal to 10 microns

Project	North Bakken Expansion Project
PSD	Prevention of Significant Deterioration
RFFA	reasonably foreseeable future action
scf	standard cubic feet
SIP	State Implementation Plan
SO_2	sulfur dioxide
tpy	tons per year
USGCRP	U.S. Global Change Research Program
VOC	volatile organic compound
WBI Energy	WBI Energy Transmission, Inc.

WBI ENERGY TRANSMISSION, INC.
NORTH BAKKEN EXPANSION PROJECT

9.0 RESOURCE REPORT 9 – AIR QUALITY AND NOISE

WBI Energy Transmission, Inc. (WBI Energy) proposes to construct and operate the North Bakken Expansion Project (or Project), which consists of an approximately 61.9-mile-long, new 24-inch-diameter natural gas pipeline from new facilities at WBI Energy's Tioga Compressor Station near Tioga, North Dakota, to a new compressor station (Elkhorn Creek Compressor Station) southeast of Watford City, North Dakota.

The Project also involves construction of approximately 0.3 mile of new 24-inch-diameter natural gas pipeline between the proposed Elkhorn Creek Compressor Station to a new interconnect with Northern Border Pipeline Company, approximately 20.4 miles of new 12-inch-diameter natural gas pipeline looping along WBI Energy's Line Section 25, approximately 9.4 miles of new 12-inch-diameter natural gas pipeline looping along WBI Energy's Line Section 30, approximately 0.5 mile of new 20-inch-diameter receipt lateral to the Tioga Compressor Station, and uprating of WBI Energy's Line Section 25. The Project includes additional horsepower at the Tioga Compressor Station; the installation of new and modifications to existing delivery, receipt, and transfer stations along WBI Energy's pipeline routes; the replacement of small segments of pipeline facilities; and the installation of block valves, pig launcher/receiver stations, and other associated appurtenances. Figure 1.1-1 of Resource Report 1 provides an overview of the proposed pipeline system and associated facilities.

In accordance with Title 18 of the Code of Federal Regulations (CFR) Part 380.12(k), Resource Report 9 describes the existing air and noise environment that may be affected by WBI Energy's proposed Project. The report addresses the impacts of the Project on the existing air and noise environment, and measures that will be implemented to mitigate the impacts. Resource Report 1 provides a detailed Project description.

9.1 AIR QUALITY

Construction and operation of the Project could affect air quality in the Project vicinity. Aboveground facilities associated with the Project that will generate emissions are the existing Tioga Compression Station, which is to be expanded to add additional compression capacity, and the new Elkhorn Creek Compressor Station. Construction of additional pipeline facilities will also impact air quality on a short-term basis in the immediate area during the duration of construction activities. The operation and maintenance of proposed pipeline facilities will have minor, but additional, impact to air quality.

As described in section 1.1.1 of Resource Report 1, producers in the Project area currently focus on high-value oil, and flare or vent any associated gas. The purpose and need for the Project is to provide a mechanism to transport natural gas captured at the oil production well heads that is currently being flared. Flaring at the well head is wasteful and an inefficient method of combustion. Further, natural gas flared at the wellhead is "rich gas," which often contains other hydrocarbons and compounds beyond just methane (CH_4). One of the barriers to capturing the flared gas in the region is lack of gas processing and transportation options. Although the natural gas to be captured and transported as part of this Project will likely also eventually be combusted, this ultimate combustion would occur in a more controlled and efficient manner, burning a refined natural gas product with fewer air pollutants, and the resultant energy will be used for a purpose. The end result is lower air emissions from not wasting a resource.

The regional climate, regulatory requirements for air emission sources, and air quality impacts from construction and operation of this Project are discussed in the sections that follow.

9.1.1 Local Climate

WBI Energy accessed National Weather Service (NWS) meteorological station information nearest to each of the two compressor station locations to determine representative climate information for the Project. The regional climate discussion is organized by compressor station.

Long-term temperature and precipitation values used the National Centers for Environmental Information's (NCEI) annual and seasonal climate normals that were calculated for the 30-year period from 1981 to 2010, which are the NCEI's latest 3-decade averages.

9.1.1.1 Tioga Compressor Station – Williams County

The NWS Meteorological Station (USC00328737) in Tioga, North Dakota, was selected to obtain local climate information due to its proximity (about 0.64 mile south) to the Tioga Compressor Station. The average maximum and minimum daily temperatures are 54.6 degrees Fahrenheit (°F) and 28.9°F, respectively. The average annual precipitation is 14.93 inches (NCEI, 2019). The NWS Meteorological Station at the Williston Sloulin Field International Airport (WBAN - 72767094014), about 37.2 miles southwest of Tioga Compressor Station, was selected to obtain wind data because such data was not available at the closer meteorological station. The average annual wind speed is 9.2 miles per hour (mph), predominantly out of the north, with a peak wind gust of 79 mph (NCEI, 2019). Information about wind patterns is based on the available hourly data from calendar years 1989 to 2018.

9.1.1.2 Elkhorn Creek Compressor Station – McKenzie County

The NWS Meteorological Station (USC00329246) in Watford City, North Dakota, was selected to obtain local climate information due to its proximity (about 5.5 miles south) to the Elkhorn Creek Compressor Station. The average maximum and minimum daily temperatures are 56.6°F and 31.3°F, respectively. The average annual precipitation is 15.75 inches (NCEI, 2019). The NWS Meteorological Station at the Williston Sloulin Field International Airport (WBAN - 72767094014), about 39.5 miles northwest of Elkhorn Creek Compressor Station, was selected to obtain wind data because wind data was not available at the closer meteorological station. The average annual wind speed is 9.2 mph, predominantly out of the north, with a peak wind gust of 79 mph (NCEI, 2019). Information about wind patterns is based on the available hourly data from calendar years 1989 to 2018.

9.1.2 Existing Air Quality

The U.S. Environmental Protection Agency (EPA), as required by the Clean Air Act (CAA) of 1970, has established National Ambient Air Quality Standards (NAAQS) to protect public health and welfare (referred to as primary standards), and to protect plant and animal life, buildings, and other features in the public interest (referred to as secondary standards) (EPA, 2015a). States have the authority to adopt more stringent Ambient Air Quality Standards (AAQS) for other pollutants. North Dakota has adopted the federal primary and secondary NAAQS for the six principal pollutants described below. In addition, North Dakota has established AAQS for hydrogen sulfide (H_2S).

Standards have been set for six principal pollutants, called "criteria pollutants": ground-level ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), respirable and fine particulate matter (PM) (inhalable particulate matter with an aerodynamic diameter less than or equal to 10 microns [PM_{10}] and less than or equal to 2.5 microns [$PM_{2.5}$]), and airborne lead (Pb).

O_3 develops as a result of a chemical reaction between nitrogen oxides (NO_X) and volatile organic compounds (VOC) in the presence of sunlight. Accordingly, NO_X and VOCs are often referred to as O_3 precursors. $PM_{2.5}$ may be directly emitted and can also be secondarily formed in the atmosphere as a result of SO_2 and NO_X emissions. SO_2 and NO_X are also referred to as $PM_{2.5}$ precursors. Table 9.1.2-1 lists NAAQS for the criteria pollutants described above.

TABLE 9.1.2-1

North Bakken Expansion Project
U.S. Environmental Protection Agency National Ambient Air Quality Standards

Criteria Pollutant	Primary/ Secondary	Averaging Time	Level	Form of Air Quality Standard
CO	Primary	8 hours	9 ppm	Not to be exceeded more than once per year
	Primary	1 hour	35 ppm	Not to be exceeded more than once per year
Pb	Primary and Secondary	Rolling 3-month average	0.15 μg/m³ [a]	Not to be exceeded
NO_2	Primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	Primary and Secondary	1 year	53 ppb [b]	Annual mean
O_3	Primary and Secondary	8 hours	0.070 ppm [c]	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Particle Pollution				
$PM_{2.5}$	Primary	1 year	12 μg/m³	Annual mean, averaged over 3 years
	Secondary	1 year	15 μg/m³	Annual mean, averaged over 3 years
	Primary and Secondary	24 hours	35 μg/m³	98th percentile, averaged over 3 years
PM_{10}	Primary and Secondary	24 hours	150 μg/m³	Not to be exceeded more than once per year on average over 3 years
SO_2	Primary	1 hour	75 ppb [d]	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years

Source: EPA, 2015a

μg/m³ = micrograms per cubic meter; ppb = parts per billion; ppm = parts per million

[a] In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 μg/m³ as a calendar quarter average) also remain in effect.

[b] The annual NO_2 standard is 0.053 ppm. It is shown here in terms of parts per billion (ppb) for the purposes of clearer comparison to the 1-hour standard level.

[c] Final rule published October 1, 2015, and effective December 28, 2015. The previous (2008) O_3 standards additionally remain in effect in some areas. Revocation of the previous (2008) O_3 standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.

[d] The two prior primary standards of 140 ppb evaluated over 24 hours and 30 ppb evaluated over 1 year, codified at 40 CFR 50.4, remain applicable. However, the EPA is not currently designating areas on the basis of either of these two primary standards. Similarly, the secondary standard for SO_2, set at 500 ppb evaluated over 3 hours has not been revised, and the EPA is also not currently designating areas on the basis of the secondary standard.

Note: Title 40 CFR 50.4(e) provides that the two prior primary NAAQS will no longer apply to an area 1 year after its designation under the 2010 NAAQS, except that for areas designated nonattainment under the prior NAAQS as of August 22, 2010, and areas not meeting the requirements of a State Implementation Plan (SIP) Call under the prior NAAQS, the prior NAAQS will apply until that area submits and EPA approves a SIP providing for attainment of the 2010 NAAQS. North Dakota contains no such areas.

Table 9.1.2-2 lists the North Dakota AAQS for H_2S.

TABLE 9.1.2-2

North Bakken Expansion Project
North Dakota Ambient Air Quality Standards

Criteria Pollutant	Averaging Time	Level	Form of Air Quality Standard
H_2S	Instantaneous	14,000 μg/m^3	Not to be exceeded
	1 hour	280 μg/m^3	Not to be exceeded more than once per month
	24 hour	140μg/m^3	Not to be exceeded more than once per year
	Quarter	28 μg/m^3	Not to be exceeded

μg/m^3 = micrograms per cubic meter

Revisions to Section 107 of the CAA in 1977 required the states and EPA to identify areas of the country that meet and do not meet the NAAQS. Areas meeting the NAAQS are called "attainment areas," and areas not meeting the NAAQS are called "nonattainment areas." The designation of an area is made on a pollutant-by-pollutant basis. The EPA maintains a list of attainment/nonattainment designations for all criteria pollutants (EPA, 2019). No counties in North Dakota are currently listed as nonattainment areas for any criteria pollutants.

Greenhouse gas (GHG) emissions from the largest stationary sources were, for the first time, covered by the Prevention of Significant Deterioration (PSD) and Title V Operating Permit Programs beginning on January 2, 2011. On June 23, 2014, the U.S. Supreme Court issued its decision in *Utility Air Regulatory Group v. EPA*, 134 S. Ct. 2427 (2014) that the EPA may not treat GHGs as an air pollutant for purposes of determining whether a source is a major source required to obtain a PSD or Title V permit.

Some gases have a higher warming effect on the atmosphere than other gases. For each GHG, a Global Warming Potential (GWP) has been calculated to reflect how long it remains in the atmosphere, on average, and how strongly it absorbs energy. Gases with a higher GWP absorb more energy, per pound, than gases with a lower GWP, and thus contribute more to warming the Earth. The GWP of various gases are found in 40 CFR Appendix Table A-1 to Subpart A of Part 98 – Global Warming Potentials. For example, CH_4 has a GWP 25 times that of carbon dioxide (CO_2). The term “carbon dioxide equivalent” (or CO_2e) is used to compare the emissions from various GHGs on the basis of their GWB by converting the amounts of other gases to the equivalent amount of CO_2. For example 1 ton of CH_4 would be equivalent to 25 tons of CO_2 for purposes of evaluating GHG emissions.

9.1.3 Regulatory Requirements for Air Quality

The Project was reviewed for the applicability of federal and state level requirements for sources of air emissions. The analysis is presented in the sections that follow.

9.1.3.1 Federal Requirements

The CAA of 1970, as amended in 1977 and 1990, is the basic federal statute governing air quality. The provisions of the CAA that are potentially applicable to construction and operation of the Project include the following:

- PSD/Nonattainment New Source Review (NNSR);

- Federal Class I Area Protection;
- New Source Performance Standards (NSPS);
- National Emission Standards for Hazardous Air Pollutants (NESHAP);
- Mandatory GHG Reporting;
- Title V Operating Permits; and
- Conformity of General Federal Actions.

The following is a brief description of these regulations and their requirements.

Prevention of Significant Deterioration/Nonattainment New Source Review

The CAA requires any new major stationary source of air pollution, or existing source proposing major modification, to obtain an air pollution permit before commencing construction. Air construction permits for major sources or modifications in an attainment area are issued under the PSD regulations, whereas air construction permits for sources in a nonattainment area are issued under the NNSR program. The entire program, including both PSD and NNSR permitting, is referred to as the New Source Review program. This Project area is classified as attainment, and therefore NNSR will not apply.

Title I of the CAA establishes guidelines for the preconstruction/modification review of large air emission sources. To be classified as a new major PSD source, the potential emissions from the source must either be greater than 100 tons per year (tpy) for any individual pollutant regulated by the EPA under the CAA for sources that are among the 28 source categories listed in Section 169 of the CAA, or greater than 250 tpy for any individual pollutant for sources that are not among the 28 source categories. Additionally, GHG emissions of 100,000 tpy trigger PSD review. Best Available Control Technology analyses and detailed dispersion modeling are required if a new source is classified as a major PSD source.

Natural gas compressor stations are not identified in the list of 28 source categories in Section 169 of the CAA; therefore, the applicability threshold for PSD review for the proposed compressor stations is 250 tpy for each pollutant. Fugitive emissions, such as component leaks and pipeline venting for maintenance, do not count toward the PSD threshold because the compressor stations are not considered one of the 28 sources categories. CH_4 is the primary fugitive emission at the compressor stations.

The EPA's May 13, 2010, GHG Tailoring Rule is intended to limit the number of affected sources that account for an estimated 70 percent of GHG emissions from stationary sources while shielding smaller sources such as apartment buildings and schools. As of July 1, 2011, a new industrial facility that is a major source for at least one non-GHG pollutant and will emit or has the potential to emit at least 75,000 tpy of CO_2e is subject to PSD. Alternatively, a new industrial facility that has the potential to emit 100,000 tpy of CO_2e and will exceed the applicable major source regulation on a mass basis for GHGs will be subject to PSD. In addition, PSD for CO_2e is only triggered if the compressor stations are "anyway sources," which means triggering PSD for one of the other regulated PSD pollutants. Even if the compressor stations are above the PSD threshold for CO_2e (100,000 tpy), PSD would not be triggered if none of the other pollutants exceed the PSD threshold.

The Tioga Compressor Station is not subject to PSD. Applicability of the PSD rule was determined for the proposed expansion of the Tioga Compressor Station and construction of the new Elkhorn Creek Compression Station. Neither of these facilities will exceed 250 tpy for any criteria air pollutant or 100,000 tpy of GHG emissions.

Construction and operation of the proposed compressor stations will not trigger PSD requirements.

Federal Class I Area Protection

The U.S. Congress designated certain lands as Mandatory Federal Class I areas in 1977. Class I areas were designated because the air quality was considered a special feature of the area (e.g., in national parks or wilderness areas). These Class I areas, as well as any other areas that have been re-designated Class I since 1977, are given special protection under the PSD program. This program establishes air pollution increment increases that are allowed by new or modified air emission sources. If the new source is a major PSD source and is near (within 100 kilometers [km] of) a Class I area, the source is required to determine its impacts on the Class I area. The source also is required to notify the appropriate federal land manager for the nearby Class I area. There are three Class I areas within 100 km of the proposed compressor stations: Theodore Roosevelt National Park, the Lostwood Wilderness Area, and the Medicine Lake Wildlife Refuge. Table 9.1.3-1 provides the distance and direction of each of the nearest Class I areas to each compressor station. Figures 9.1.3-1 and 9.1.3-2 in appendix 9A show the locations of Federal Class I Areas in relation to the compressor stations.

TABLE 9.1.3-1

North Bakken Expansion Project
Nearest Class I Areas to Compressor Stations

Class 1 Area, State	Elkhorn Creek Compressor Station (miles/direction)	Tioga Compressor Station (miles/direction)
Theodore Roosevelt National Park, ND	4.3 miles southwest (6.85 km)	56.6 miles southwest (91.1 km)
Lost Wood Wilderness, ND	68.0 miles northeast (109 km)	21.0 miles northeast (33.8 km)
Medicine Lake Wildlife Refuge, MT	73.2 miles northwest (118 km)	58.8 miles west (94.6 km)

Source: 40 CFR 52.21
ND = North Dakota; MT = Montana

Neither of the compressor stations associated with the Project are considered major PSD sources that would trigger an impact analysis for Class I areas by EPA.

New Source Performance Standards

The NSPS, codified in 40 CFR 60, establishes pollutant emissions limits and monitoring, reporting, and recordkeeping requirements for various emissions sources based on source type and size. The NSPS apply to new, modified, or reconstructed sources. The potentially applicable NSPS are described below, subparts that do not apply to the Project are not listed below.

NSPS Subpart JJJJ applies to all new stationary spark ignition internal combustion engines. The Tioga Compressor Station will install six 3,750 horsepower (hp) spark ignition internal combustion engines to drive compressors and one 1,380 hp backup engine. The Elkhorn Creek Compressor Station will install one 3,750 hp spark ignition internal combustion engine to drive a compressor. The new spark ignition natural gas-fired engines will meet emission standards for NO_x, CO, and VOCs. The engines to be purchased by WBI Energy will be certified to meet the requirements of this NSPS. Subpart JJJJ requirements will be included in the applicable state air quality permits.

NSPS Subpart OOOO applies to onshore affected facilities including natural gas wells, centrifugal compressors, reciprocating compressors, pneumatic controllers, storage vessels, equipment within process units, and sweetening units. Subpart OOOO only regulates equipment between the wellhead and point of custody transfer to the natural gas transmission and storage segment. Compressors that are associated with natural gas transmission are not subject to Subpart OOOO. This subpart does not apply to the Project.

EPA amended Subpart OOOO to add new regulations affecting CH_4 and VOC emissions. The amended subpart is codified as Subpart OOOOa. WBI Energy will meet the requirements of Subpart OOOOa for the Project. Affected sources operated by WBI Energy are fugitive emissions from the compressor stations and the reciprocating compressors.

National Emission Standards for Hazardous Air Pollutants

The NESHAPs, codified in 40 CFR Parts 61 and 63, regulate hazardous air pollutants (HAP) emissions. Part 61, which was promulgated prior to the 1990 CAA Amendments (CAAA), regulates eight types of hazardous substances: asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic, mercury, radionuclides, and vinyl chloride. The 1990 CAAA established a list of 189 HAPs, resulting in the promulgation of Part 63. This part, also known as the Maximum Achievable Control Technology standards, regulates HAP emissions from major sources of HAP emissions and specific source categories of non-major (area) sources that emit HAPs. Part 63 defines a major source of HAPs as any source that has the potential to emit 10 tpy of any single HAP or 25 tpy of HAPs in aggregate.

Both of the compressor stations will be classified as area sources of HAPs because the potential emissions of HAPs are below the major source thresholds. The NESHAP Subpart ZZZZ for reciprocating internal combustion engines will apply to each of the engines at both compressor stations; however, at an area source of HAPs compliance with Subpart ZZZZZ is demonstrated by complying with NSPS Subpart JJJJ. The engines to be installed as part of this Project will comply with Subpart JJJJ, and as such will comply with Subpart ZZZZ.

Each of the compressor stations will have small natural gas-fired boilers to be used for comfort heating. NESHAP Subpart JJJJJJ sets HAP emission standards for boilers at area sources; however, natural gas-fired boilers firing only natural gas are exempt.

During construction, it is anticipated that insignificant amounts of HAPs will be emitted through the use of diesel and gasoline fired construction equipment and tail pipe emissions from vehicles; however, NESHAPs are not applicable to mobile sources. Construction emissions are discussed in more detail in section 9.1.4.1.

Mandatory Greenhouse Gas Reporting

On October 30, 2009, the EPA published a rule for mandatory reporting (codified in 40 CFR 98) of GHG from sources that emit 25,000 metric tons or more of CO_2e per year. The collection of data is intended to provide a better understanding of the GHG sources and to guide the development of policies and programs to reduce emissions. However, this rule does not require permitting or mitigation measures to be implemented. GHG emissions from each facility will have the potential to exceed the reporting threshold. WBI Energy will monitor actual emissions to determine on an annual basis if reporting is required and comply with the GHG reporting rule and its applicable subparts in the event that actual GHG emissions meet the reporting thresholds.

Title V Operating Permits

Title V of the 1990 CAAA required states to establish an air operating permit program in an effort to standardize air quality permits across the United States. The requirements of Title V are outlined in 40 CFR 70, and the permits required by these regulations are often referred to as Part 70 or Title V permits. North Dakota has promulgated these requirements under North Dakota Administrative Code (NDAC) 33.1-15-14-06, *Title V Permit to Operate*.

If a facility's potential to emit exceeds the criteria pollutant or HAP thresholds, the facility is considered a major source. The Title V major source threshold level for an air emission source is 100 tpy for criteria pollutants. The major source HAP thresholds for a source are 10 tpy of any single HAP or 25 tpy of HAPs in aggregate.

Modifications to the Tioga Compressor Station will cause the compressor station to exceed the major source threshold for criteria pollutants; therefore, the modifications will require a permit to construct and a Title V Operating Permit. The Elkhorn Creek Compressor Station will not exceed the major source threshold, and does not require a Title V Operating Permit.

Conformity of General Federal Actions

A conformity analysis must be conducted by the lead federal agency if a federal action would generate emissions that exceed the conformity threshold levels (*de minimis*) of the pollutant(s) for which an air basin is in nonattainment. According to section 176(c)(1) of the CAA (40 CFR section 51.853), a federal agency cannot approve or support activity that does not conform to an approved State Implementation Plan (SIP). As stated previously, the Project area is designated as attainment for the NAAQS; consequently, a general conformity determination is not required.

9.1.3.1 State Regulations

North Dakota air emissions are regulated by the North Dakota Department of Environmental Quality (NDDEQ)[1] Division of Air Quality, also referred to as the Department, under NDAC 33-15. Listed below are the applicable air quality regulations from the NDAC that apply to the Project, as well as required air impact reviews (dispersion modeling).

Applicable North Dakota Air Quality Regulations

NDAC 33.1-15-01 sets the general provisions pertaining to all state-level regulations, including definitions of terms used by the regulations.

NDAC 33-15-02 establishes AAQS that are identical to the NAAQS promulgated by the EPA, with the exception of an additional state standard for H_2S. Emissions of H_2S associated

[1] The NDDEQ became an independent agency on April 29, 2019. Previously, the NDDEQ was part of the North Dakota Department of Health. Air permitting is a function of the Division of Air Quality) within the NDDEQ organization.

with the proposed Project are included with the emissions inventory that is part of the state permit to construct applications, which are included in appendix 9B for reference. Emissions of H_2S are considered negligible.

NDAC 33.1-15-03 restricts emissions of visible air contaminants. This regulation applies to both point sources and fugitive sources of visible emissions. WBI Energy will maintain equipment to not exceed opacity standards and perform construction to minimize dust. Appendix 1F contains the Project's *Fugitive Dust Control Plan*.

NDAC 33.1-15-04 establishes restrictions on open burning. No open burning is planned; however, if the need arises, WBI Energy will follow all requirements stipulated in 33.1-15-04 for permissible open burning.

NDAC 33.1-15-05 addresses emission requirements of PM from industrial processes. Emissions of PM during operations of the Project will not exceed any of the emission limitations set forth in NDAC 33.1-15-05 table 3.

NDAC 33.1-15-07-01 and 33.1-15-07-02 address emission requirements for VOCs. Per 33.1-15.07-02, no person is allowed to emit organic compound gases and vapors, except from an emergency vapor blowdown system or emergency relief system, unless these gases and vapors are burned by flares, or an equally effective control device as approved by the Department. Minor sources, as determined by the Department and not subject to NSPS, may be granted exemptions to this subsection. Each flare is required to equip and operate an automatic igniter or a continuous burning pilot.

NDAC 33.1-15-08 addresses operation and control of internal combustion engines. WBI Energy will comply with the requirements of NDAC 33-15-08-1 and 33-15-08-02 by operating internal combustion engines and exhaust emission control devices in a reasonable and appropriate manner according to manufacturer specifications.

NDAC 33.1-15-17 restricts fugitive emissions from any source, including emissions of particulates (dust) and various gaseous emissions such as those subject to an AAQS or PSD increment, an odorous substance, or those subject to the restrictions of a visible air contaminant. WBI Energy will comply with the applicable requirements of this regulation during Project construction and operation. Information regarding specific techniques for the control of fugitive dust during construction is included in the Project's *Fugitive Dust Control Plan* (see appendix 1F).

NDAC 33.1-15-22 address emission standards for HAPs. Emission standards for this chapter are the federal NESHAPs incorporated by reference. WBI Energy will comply with NDAC 33.1-15-22 by complying with the federal NESHAPs, which are addressed above.

North Dakota Dispersion Modeling and Air Toxics Review

In North Dakota, air dispersion modeling is required to obtain a permit to construct compressor engines pursuant to a memorandum from the Department dated January 23, 2015, unless all of the following certain conditions are met.

- Emissions from all compressor engines are controlled with a catalytic emission control system (or an equivalent control technology that is designed to reduce non-methane hydrocarbons emissions by at least 50 percent).

- Emissions from all compressor engines at the facility are vented from a stack height that is greater than or equal to 1.5 times the nearest building height.

- If the facility is located less than 0.25 mile from a residence, then the combined air toxics emissions from the entire facility are less than 10 tpy, benzene emissions are less than 2 tpy, and formaldehyde emissions are less than 2 tpy. If the facility is located at least 0.25 mile from a residence, then the combined air toxics emissions from the entire facility are less than 10 tpy, benzene emissions are less than 3 tpy, and formaldehyde emissions are less than 3 tpy.

The compressor engines at each of the compressor stations are equipped with an oxidation catalyst that reduces non-methane hydrocarbon emission by at least 50 percent.

At the Tioga Compressor Station, the nearest building peak roof height is 32.5 feet and the compressor stack height is 43 feet from ground level (less than 1.5 times the nearest building height). The emissions for criteria pollutants are above the thresholds for sources that contain stacks with heights less than 1.5 times the nearest building height. The nearest residence is greater than 0.4 mile east of the facility, which is further than 0.25 mile away. The HAP emissions at the facility are above the modeling thresholds. Air dispersion modeling is required for NO_2 per the NDDEQ publication *Criteria Pollutant Modeling Requirements for a Permit to Construct* published on October 6, 2014. Air dispersion modeling is required for HAP emissions per the NDDEQ publication *Dispersion Modeling Requirements – Compressor Engines and Glycol Dehydration Units* published on January 23, 2015.

Based on consultation with NDDEQ about the Tioga Compressor Station, it was determined that only 1-hour NO_2 would require criteria pollutant air dispersion modeling. According to the NDDEQ *Criteria Pollutant Modeling Requirements for a Permit to Construct* memo published on October 6, 2014, the potential emissions from the facility for CO, PM_{10}, $PM_{2.5}$, and SO_2 were below the significant levels for projects not subject to PSD, and therefore no modeling was required for these pollutants. Additional detail on the air dispersion modeling completed to support the permit to construct application for the Tioga Compressor Station is contained in the permit to construct application for the facility in appendix 9B.

The nearest building peak roof height at the Elkhorn Creek Compressor station is 32.5 feet and the compressor stack height is 43 feet from ground level (less than 1.5 times the nearest building height). However, the emissions for criteria pollutants at the Elkhorn Creek Compressor Station do not exceed the thresholds for sources that contain stacks with heights less than 1.5 times the nearest building height. The nearest residence is approximately 0.7 mile west-southwest of the facility, which is further than 0.25 mile away. The HAP emissions at the facility do not exceed the modeling thresholds. Therefore, no air dispersion modeling is required for criteria pollutants per the NDDEQ publication *Criteria Pollutant Modeling Requirements for a Permit to Construct* published on October 6, 2014.

North Dakota also requires an air toxics review for any source that is required to submit a permit to construct that has the potential to emit HAPs. The air toxics review is a stepped approach of comparing HAP concentrations to acceptable values by reviewing the maximum individual carcinogenic risk. The analysis allows the Department to determine if the emission sources require additional review. An air toxics review was completed as part of the permit to construct applications for each of the compressor stations. Detailed review information is contained in the permit to construct applications in appendix 9B. Both compressor stations demonstrate compliance with the air toxics review requirements.

State Permitting

Both compressor stations will require a permit to construct from the Department. The Tioga Compressor Station will require a Title V permit, while the Elkhorn Creek Compressor Station will be considered a synthetic minor source and will require a minor source operating permit. "Synthetic minor source" is a term used by NDDEQ to describe a source that is accepting federally enforceable emission limits to stay under Title V permitting thresholds. In North Dakota, facilities requiring air permits first apply and receive permits to construct, followed by a permit to operate once construction has been completed. The permit to operate ensures a facility stays in compliance with air quality control rules.

The Tioga Compressor Station was determined by the NDDEQ to be a facility of minor significance for air pollution, and a permit to construct was not required per Subdivision 33.1-15-14-02 of the North Dakota Air Pollution Control Rules. The Department's review was summarized in a letter dated August 5, 2016, to WBI Energy. The expansion of the Tioga Compressor Station will require a permit to construct and subsequently a permit to operate from the Department. The expanded Tioga Compressor Station will have potential emissions above the Title V permitting threshold and will require a Title V Operating Permit.

The proposed new Elkhorn Creek Compressor Station will require a permit to construct and a permit to operate from the Department, but will fall below Title V permitting thresholds because of the use of oxidation catalysts to lower potential emissions from the engines. The Elkhorn Creek Compressor Station will be classified as a synthetic minor source by NDDEQ.

WBI Energy will apply for the operating permit after construction of the Project is complete. WBI Energy filed the permit to construct applications for the compressor stations in February 2020. The permit to construct applications are provided in appendix 9B.

9.1.4 Air Emissions Impacts

This section describes the emission rates and air quality impacts associated with construction and operation of the proposed Project.

9.1.4.1 Construction Emissions

Air quality impacts associated with construction of the Project will include emissions from fossil-fueled construction equipment, vehicle traffic exhaust, and fugitive dust. However, such air quality impacts will generally be temporary, short-term, and localized and will not significantly affect regional air quality.

Emissions from construction equipment will depend on the duration and type of construction activity, together with the number and type of vehicles and engine-powered equipment in use at any point in time. Earth-moving equipment and other mobile sources may be powered by diesel or gasoline engines that are sources of combustion-related emissions including NO_X, CO, VOCs, SO_2, PM_{10}, $PM_{2.5}$, GHGs, and minimal amounts of HAPs. Emissions from equipment will be short-term and localized in an area as equipment and activities move along the route. For example, each of the compressor stations is expected to take 198 days from start of construction to completion. Construction of the pipeline facilities will progress along the linear pipeline corridors, and likely crews will be at any given location along the route for a few days to weeks. The construction days associated with each pipeline segment are listed in the detailed construction emission calculations included in appendix 9C.

Fugitive dust emissions may result from vehicular traffic exhaust and soil disturbance associated with land clearing, grading, excavation, and backfilling. The amount of fugitive dust generated will depend on a variety of factors including duration and type of construction activity; moisture content and type of soils that will be disturbed; wind speed and frequency of precipitation; and the number and types of vehicles traveling over the construction areas and commuting to and from the work site.

WBI Energy will implement industry-standard procedures to reduce fugitive dust. These procedures may include spraying disturbed areas or dirt/gravel roads with water; covering areas susceptible to fugitive dust with mulch or a suitable biodegradable or water soluble chemical; installing fencing in areas susceptible to dust to reduce wind speeds; modifying the speed of truck and equipment traffic in disturbed areas or on dirt/gravel roads; and/or removing dirt tracked onto paved roads by construction equipment. Detailed information on these measures are included in the *Fugitive Dust Control Plan* (see appendix 1F).

In order to minimize vehicular and equipment exhaust and crankcase emissions from gasoline and diesel engines, WBI Energy will comply with the applicable EPA mobile source emissions performance standards by using modern, well-maintained vehicles, and equipment will be shut down when not in use to minimize idling emissions.

No open burning is anticipated. If that were to change, WBI Energy will obtain all necessary permits and follow any applicable local and state regulations as stipulated in NDAC 33.1-15-04.

Blowdown activities will occur as part of the commissioning activities for the compressor stations before the equipment is brought fully online. Even though these emissions can be considered part of construction, the emissions are accounted for as part of the operational emission calculations summarized below. “Blowdown” is the term used to describe the release of high-pressure gas within the compressors and piping between isolation valves that will be vented to the atmosphere or to a flare in order to allow for testing, maintenance, or emergency activities.

Pipeline construction activities are considered temporary and transient in nature and are not expected to cause or contribute to any significant degradation of air quality. Likewise, emissions from construction activities associated with the compressor stations will be temporary. Project construction is anticipated to take place from March 2021 through October 2021, with all facilities being placed in service in November 2021. Table 9.1.4-1 presents the expected air pollutant emissions from Project construction. Detailed construction calculations are included in appendix 9C.

TABLE 9.1.4-1

North Bakken Expansion Project [a]
Total Construction-Related Emissions for the Project (tpy)

Construction Activity	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOCs	HAPs	CO_2e
2021 EMISSIONS								
Tioga Compressor Station								
Diesel non-road equipment	1.14	1.34	0.10	0.09	0.00	0.20	0.05	5.74
Diesel and gas on-road equipment	0.40	0.04	0.00	0.00	0.00	0.03	0.00	35.62
Construction activity fugitive dust	N/A	N/A	1.04	0.16	N/A	N/A	N/A	N/A
Roadway fugitive dust	N/A	N/A	0.00	0.00	N/A	N/A	N/A	N/A
Subtotal	**1.54**	**1.37**	**1.14**	**0.25**	**0.00**	**0.23**	**0.05**	**41.36**
Elkhorn Creek Compressor Station								
Diesel non-road equipment	1.01	1.17	0.09	0.08	0.00	0.17	0.05	5.0
Diesel and gas on-road equipment	0.55	0.05	0.00	0.00	0.00	0.04	0.00	50.45
Construction activity fugitive dust	N/A	N/A	1.29	0.19	N/A	N/A	N/A	N/A
Roadway fugitive dust	N/A	N/A	0.00	0.00	N/A	N/A	N/A	N/A
Subtotal	**1.57**	**1.22**	**1.38**	**0.28**	**0.00**	**0.21**	**0.05**	**55.45**
Tioga-Elkhorn Creek Pipeline Segment								
Diesel non-road equipment	12.76	17.94	1.22	1.18	0.06	1.82	1.01	335.79
Diesel and gas on-road equipment	1.47	0.24	0.01	0.01	0.00	0.11	0.01	155.07
Construction activity fugitive dust	N/A	N/A	122.70	17.04	N/A	N/A	N/A	N/A
Roadway fugitive dust	N/A	N/A	19.45	1.95	N/A	N/A	N/A	N/A
Subtotal	**14.23**	**18.18**	**143.38**	**20.18**	**0.06**	**1.94**	**1.01**	**490.86**
Line Section 25 Loop Pipeline Segment								
Diesel non-road equipment	2.89	4.88	0.31	0.25	0.02	0.42	0.16	66.24
Diesel and gas on-road equipment	1.11	0.18	0.01	0.01	0.00	0.09	0.01	115.52
Construction activity fugitive dust	N/A	N/A	33.32	4.61	N/A	N/A	N/A	N/A
Roadway fugitive dust	N/A	N/A	3.46	0.35	N/A	N/A	N/A	N/A
Subtotal	**4.00**	**5.06**	**37.10**	**5.21**	**0.02**	**0.51**	**0.17**	**181.76**
Line Section 30 Loop Pipeline Segment								
Diesel non-road equipment	2.12	3.45	0.21	0.21	0.01	0.29	0.17	38.33
Diesel and gas on-road equipment	0.15	0.04	0.00	0.00	0.00	0.01	0.00	17.71
Construction activity fugitive dust	N/A	N/A	15.32	2.11	N/A	N/A	N/A	N/A
Roadway fugitive dust	N/A	N/A	0.27	0.03	N/A	N/A	N/A	N/A
Subtotal	**2.27**	**3.48**	**15.80**	**2.35**	**0.01**	**0.30**	**0.17**	**56.04**
Tioga Lateral Pipeline Segment								
Diesel non-road equipment	1.05	1.07	0.07	0.07	0.00	0.14	0.06	7.84
Diesel and gas on-road equipment	0.07	0.02	0.00	0.00	0.00	0.01	0.00	8.86
Construction activity fugitive dust	N/A	N/A	0.78	0.11	N/A	N/A	N/A	N/A
Roadway fugitive dust	N/A	N/A	0.01	0.00	N/A	N/A	N/A	N/A
Subtotal	**1.12**	**1.09**	**0.86**	**0.18**	**0.00**	**0.14**	**0.06**	**16.70**

TABLE 9.1.4-1 (cont'd)

North Bakken Expansion Project [a]
Total Construction-Related Emissions for the Project (tpy)

Construction Activity	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOCs	HAPs	CO_2e
Uprate Line Section 25								
Diesel non-road equipment	1.04	0.98	0.07	0.07	0.00	0.13	0.04	7.42
Diesel and gas on-road equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.45
Construction activity fugitive dust	N/A	N/A	1.89	0.28	N/A	N/A	N/A	N/A
Roadway fugitive dust	N/A	N/A	0.11	0.01	N/A	N/A	N/A	N/A
Subtotal	**1.04**	**0.98**	**2.07**	**0.36**	**0.00**	**0.13**	**0.04**	**7.87**
Lake Sakakawea Horizontal Directional Drill (HDD)								
Diesel non-road equipment	0.93	3.46	0.15	0.14	0.01	0.15	0.15	13.91
Diesel and gas on-road equipment	0.01	0.02	0.00	0.00	0.01	0.00	0.00	5.67
Construction activity fugitive dust	N/A	N/A	**0.93**	**0.14**	N/A	N/A	N/A	N/A
Unpaved roadway fugitive dust	N/A	N/A	**0.00**	**0.00**	N/A	N/A	N/A	N/A
Subtotal	**0.93**	**3.49**	**1.08**	**0.28**	**0.01**	**0.16**	**0.15**	**19.58**
Total Construction Emissions	**26.70**	**34.88**	**202.82**	**29.09**	**0.11**	**3.62**	**1.71**	**869.92**

N/A = not applicable
[a] The numbers in this table have been rounded for presentation purposes. As a result, the totals may not reflect the sum of the addends.

9.1.4.2 Operational Emissions

Potential to Emit – General

Sources of emissions during Project operation include the emission units located at the Tioga Compressor Station and Elkhorn Creek Compressor Station. Other operational emissions will be from pipeline fugitive emissions and venting emissions from pig launchers/receivers located outside of the compressor stations (Norse Transfer Station and Lignite Plant Receipt/Town Border Station). Some natural gas will be vented to the atmosphere each time a pig device is removed from or inserted into the pipeline. Pigging is scheduled to occur once every 10 years. Some fugitive emissions leaks will also be expected from leaking components at aboveground facilities along the pipeline.

The compressor stations will be covered by Standard Industrial Classification 4922 and will have the potential to operate 7 days per week, 24 hours per day. All combustion units will be fired only with natural gas.

Each of the compressor engines will be equipped with an oxidation catalyst that will reduce the emissions of non-methane non-ethane hydrocarbon (NMNEHC), CO, and formaldehyde. The oxidation catalyst will also reduce other volatile HAPs, but the potential emissions are not based on receiving any reduction credit for any HAP other than formaldehyde. Potential engine generator emissions of NO_X, CO, and VOCs are based on NSPS Subpart JJJJ limitations.

Except as indicated above, potential emissions for each combustion unit are based on the following emission factors.

- Potential CO_2e emissions are based on emission factors and GWPs specified in 40 CFR Part 98.

- Emissions of formaldehyde from the Caterpillar Engines are based on manufacturer information for the oxidation catalyst, and the remaining HAPs are based on AP-42 emission factors.

- All heater emissions are based on AP-42 Chapter 1.4 Natural Gas Combustion emission factors.

Three underground storage tanks will be installed at each of the compressor stations. One for pipeline fluids removed through filtration, one for waste engine oil, and one to collect wastewater from building floor drains. The wastewater collected by the storm drains could contain engine oil from drips. Emissions estimates were determined using the EPA's AP-42 Chapter 7 emission calculations for fixed-roof tanks.

The potential emissions for each compressor station are summarized under the appropriate compressor station headings below. The detailed emission calculations are provided in appendix 9B as part of the permit to construct applications. Table 9.1.4-6 summarizes the operational emissions from sources outside of the compressor stations. The detailed emission calculations for sources outside of a compressor station and not requiring air permits are provided in appendix 9D.

Modeling Analysis – General

Air dispersion modeling was performed for the proposed expansion of the Tioga Compressor Station (including the existing facilities and proposed equipment) and the proposed Elkhorn Compressor Station using version 18081 of AERMOD, EPA's preferred and recommended air dispersion modeling system. The meteorological data was processed through the AERMOD meteorological preprocessor (AERMET), the purpose of which is to compute boundary layer parameters used to estimate profiles of wind, turbulence, and temperature. AERMINUTE is a program within AERMET used to process 1-minute Automated Surface Observing Systems wind data available from the National Climatic Data Center to generate hourly-averaged wind speed and wind direction observations or values to supplement the standard hourly observations; AERMINUTE was used to process the meteorological data used with AERMOD for each compressor station. The air dispersion modeling summary reports are included in appendix 9E. Results of the modeling analysis are provided under the appropriate compressor station headings below.

Tioga Compressor Station

The NDDEQ previously determined that a permit to construct was not required per NDAC 33.1-15-14-02 of the North Dakota Air Pollution Control Rules for the existing Tioga Compressor Station. The Tioga Compressor Station is comprised of one electric driven natural gas compressor, one small natural gas-fired boiler (0.78 million British thermal units per hour [MMBtu/hr]) for comfort heating, and a few natural gas-fired space heaters also for comfort heating. There are also some fugitive emissions from leaking components at the Tioga Compressor Station.

The proposed expansion of the Tioga Compressor Station will involve the installation of the following equipment, and will be subject to a permit to construct with NDDEQ:

- six Caterpillar 3612 natural gas-fired engines (3,750 hp each) coupled to a KBZ-4 compressor unit;
- one Waukesha natural gas-fired engine generator (1,380 hp) with a 980-kilowatt backup power generator;
- four pig launcher and receivers;
- comfort heating: Two Weil-McLain LGB-10 (2.47 MMBtu/hr) and one unit heater (0.25 MMBtu/hr);
- one underground 3,000 gallon pipeline liquids storage tank;
- one underground 3,000 gallon waste oil storage tank; and
- one underground 3,000 gallon floor drain tank to collect wastewater.

Annual operational emissions from proposed expansion of the Tioga Compressor Station are listed in table 9.1.4-2. Pigging of the pipeline will only occur every 5 to 10 years depending on the line but pigging emissions are reported as annual as if all pigging occurs in the same year.

TABLE 9.1.4-2

North Bakken Expansion Project
Tioga Compressor Station Emission Calculation Results

Emission Unit	NO_X (tpy)	CO (tpy)	VOCs (tpy)	$PM_{10}/PM_{2.5}$ (tpy)	SO_2 (tpy)	CO_2e (tpy)	Largest Single HAP [a] (tpy)	Total HAPs (tpy)
Caterpillar 3612 [b]	36.21	18.11	18.11	1.23/1.23	0.07	16.961	1.45	3.83
Caterpillar 3612	36.21	18.11	18.11	1.23/1.23	0.07	16.961	1.45	3.83
Caterpillar 3612	36.21	18.11	18.11	1.23/1.23	0.07	16.961	1.45	3.83
Caterpillar 3612	36.21	18.11	18.11	1.23/1.23	0.07	16.961	1.45	3.83
Caterpillar 3612	36.21	18.11	18.11	1.23/1.23	0.07	16.961	1.45	3.83
Caterpillar 3612	36.12	18.11	18.11	1.23/1.23	0.07	16.961	1.45	3.830
Waukesha Generator	13.33	26.65	9.33	1.02/1.02	0.03	6,136	0.13	0.76
Comfort Heating [c]	2.23	1.87	0.12	0.17/0.17	0.01	2,661	0.07	0.08
Pipeline Liquids Tank	N/A	N/A	0.006	N/A	N/A	N/A	N/A	N/A
Wastewater Tank	N/A	N/A	0.006	N/A	N/A	N/A	N/A	N/A
Waste Oil Tank	N/A	N/A	0.000	N/A	N/A	N/A	N/A	N/A
Equipment Leaks	N/A	N/A	0.83	N/A	N/A	203	N/A	0.0002
Pig Launching & Receiving	N/A	N/A	24.22	N/A	N/A	4,648	N/A	N/A
Blowdowns [d]	N/A	N/A	7.90	N/A	N/A	1,931	N/A	0.03
TOTAL Proposed PTE [e]	**232.82**	**137.15**	**150.22**	**8.55/8.55**	**0.48**	**117,143**	**8.82**	**23.97**
Existing Emissions PTE	**0.35**	**0.28**	**0.16**	**0.01**	**0.002**	**427**	**not listed**	**0.01**
Existing and Proposed PTE	**233.17**	**137.43**	**150.38**	**8.56/8.56**	**0.48**	**117,570**	**8.82**	**23.97**

N/A = not applicable; PTE = potential to emit

a Largest single HAP is formaldehyde at the compressor station. The largest single HAP from the engine generator is methanol but formaldehyde is listed for this unit because the largest single HAP for the compressor station as a whole is formaldehyde.

b Caterpillar engines are equipped with oxidation catalysts for reducing emissions of NMNEHC (VOCs), CO, and formaldehyde.

c Comfort heating includes: two Weil-McLain LGB-10 (2.47 MMBtu/hr) and one unit heater (0.25 MMBtu/hr).

d This includes emissions from commissioning of the station prior to commercial operation. The commission blowdown will not be part of annual ongoing emissions. The standard cubic feet (scf) from commissioning and startup is estimated at 600,000 scf, and annual operation will be 4,325,000 scf.

e Excludes fugitive emissions (equipment leak) as compressor stations are not one of the 28 listed source categories. The above table includes these sources but they are not included in the Total PTE because they are not to be compared to permitting thresholds.

Note: Short tons (2,000 pounds), not long or metric tons, are used in PSD applicability calculations. Metric tons are used in the GHG reporting rule.

Results of the modeling analysis, including the existing and proposed equipment at the Tioga Compressor Station, are provided in table 9.1.4-3.

TABLE 9.1.4-3

North Bakken Expansion Project
Tioga Compressor Station AERMOD Results and NAAQS Compliance Summary

Pollutant	Averaging Period	Project Impact (μg/m^3)	Background [a] (μg/m^3)	Total (μg/m^3)	NAAQS (μg/m^3)	Percent of NAAQS
NO_2 [b]	1-hour	115.14	35	150.14	188	79.9%
	Annual	8.31	5	13.31	100	13.3%
CO	1-hour	183.68	1,149	1,332.68	40,000	3.3%
	8-hour	115.09	1,149	1,264.09	10,000	12.6%
PM_{10}	24-hour	3.68	30	33.68	150	22.5%
$PM_{2.5}$	24-hour	2.19	13.7	15.89	35	45.4%
	Annual	0.32	4.75	4.75	12	39.6%
SO_2	1-hour	0.27	13	13.27	196	6.8%

μg/m^3 = micrograms per cubic meter
[a] Background data
[b] The modeled NO_2 impact represents the EPA Tier 2 method, assuming an 80% NO_2/NO_X ratio.

Elkhorn Creek Compressor Station

The proposed new Elkhorn Creek Compressor Station will involve installation of the following equipment.

- one Caterpillar 3612 natural gas-fired engine (3,750 hp) coupled to a KBZ-4 compressor unit;
- comfort heating: one Weil-McLain LGB-12 gas boiler (1.69 MMBtu/hr), one water heater (2.08 MMBtu/hr), and one building unit heater (0.25 MMBtu/hr);
- one pig launcher and receiver;
- one underground 2,000 gallon pipeline liquids storage tank;
- one underground 2,000 gallon waste oil storage tank; and
- one underground 2,000 gallon floor drain tank to collect wastewater.

Annual operational emissions from the new Elkhorn Creek Compressor Station are listed in table 9.1.4-4. Pigging of the pipeline will occur every 10 years depending on the line, but pigging emissions are reported as annual as if all pigging occurs in the same year.

TABLE 9.1.4-4

North Bakken Expansion Project
Elkhorn Creek Compressor Station Emission Calculation Results

Emission Unit	NO_X (tpy)	CO (tpy)	VOCs (tpy)	$PM_{10}/PM_{2.5}$ (tpy)	SO_2 (tpy)	CO_2e (tpy)	Largest Single HAP [a] (tpy)	Total HAPs (tpy)
Caterpillar 3612 [b]	36.21	18.11	18.11	1.23/1.23	0.07	16,961	1.72	4.10
Comfort Heating [c]	1.73	1.45	0.09	0.13/0.13	0.01	2,061	0.06	0.06
Pipeline Liquids Tank	N/A	N/A	0.002	N/A	N/A	N/A	N/A	N/A
Wastewater Tank	N/A	N/A	0.002	N/A	N/A	N/A	N/A	N/A
Waste Oil Tank	N/A	N/A	0.000	N/A	N/A	N/A	N/A	N/A
Equipment Leaks (fugitive)	N/A	N/A	0.30	N/A	N/A	73.2	N/A	N/A
Pig Launching & Receiving	N/A	N/A	60.96	N/A	N/A	14,896	N/A	0.01
Blowdowns [d]	N/A	N/A	3.01	N/A	N/A	735	N/A	N/A
TOTAL PTE [e]	**37.94**	**19.56**	**82.17**	**1.36/1.36**	**0.08**	**34,654**	**1.78**	**4.17**

N/A = not applicable; PTE = potential to emit
[a] Largest single HAP is formaldehyde.
[b] Caterpillar engines are equipped with oxidation catalysts for reducing emissions of NMNEHC (VOCs), CO, and formaldehyde.
[c] Comfort Heating: one Weil-McLain LGB-12 gas boiler (1.69 MMBtu/hr), one water heater (2.08 MMBtu/hr), and one building unit heater (0.25 MMBtu/hr)
[d] This includes emissions from commissioning of the station prior to commercial operation. The commission blowdown will not be part of annual ongoing emissions. The standard cubic feet (scf) from commissioning and startup is estimated at 448,000 scf, and annual operation will be 1,428,000 scf.
[e] Excludes fugitive emissions (equipment leaks) as compressor stations are not one of the 28 listed source categories. The above table includes these sources but they are not included in the Total PTE because they are not to be compared to permitting thresholds.
Note: Short tons (2,000 pounds), not long or metric tons, are used in PSD applicability calculations. Metric tons are used in the GHG reporting rule.

Results of the modeling analysis are provided in table 9.1.4-5.

TABLE 9.1.4-5

North Bakken Expansion Project
Elkhorn Creek Compressor Station AERMOD Results and NAAQS Compliance Summary

Pollutant	Averaging Period	Project Impact (μg/m^3)	Background [a] (μg/m^3)	Total (μg/m^3)	NAAQS (μg/m^3)	Percent of NAAQS
NO_2 [b]	1-hour	52.35	35	87.35	188	46.5%
	Annual	0.90	5	5.90	100	5.9%
CO	1-hour	27.03	1,149	1,176.03	40,000	2.9%
	8-hour	20.21	1,149	1,169.21	10,000	11.7%
PM_{10}	24-hour	0.60	30	30.60	150	20.4%
$PM_{2.5}$	24-hour	0.26	13.7	13.96	35	39.9%
	Annual	0.026	4.75	4.78	12	39.8%
SO_2	1-hour	0.086	13	13.09	196	6.7%

μg/m^3 = micrograms per cubic meter
[a] Background data
[b] The modeled NO_2 impact represents the EPA Tier 2 method, assuming an 80% NO_2/NO_X ratio.

Pipeline Operational Emissions

Pipelines have some losses due to leaks across the length of line. To calculate the losses, the methodology contained in 40 CFR Part 98 Subpart W was used. The emission calculations, which depend on the pipeline material and the length of pipe, use factors contained in table W-7 to Subpart W of Part 98 – *Default Methane Emission Factors for Natural Gas Distribution*. The total length of pipeline to be installed for the Project is 92.2 miles. The emission factor for protected steel is 0.35 standard cubic feet (scf) of CH_4 per hour per mile of pipeline.

- 92.2 miles of pipeline x 0.35 CH_4 scf/hour = 32.27 scf CH_4/hour
- 32.27 scf CH_4/hour x 8,760 hours/year = 282,685 scf CH_4/year
- 282,685 scf CH_4 x 0.03 pounds/scf CH_4 = 8,480 pounds CH_4/year

WBI Energy used a GWP for CH_4 of 25, based on the values provided in table A-1 to Subpart A of 40 CFR Part 98.

- 8,480 pounds CH_4 x 25 GWP = 212,000 pounds CO_2e/year (106 tons)

The emissions from these activities are shown in table 9.1.4-6 below. Pigging along the pipeline for maintenance will occur every 10 years depending on the location. Emissions from pig launching and receiving that take place at a compressor station are quantified with the compressor station. The pig launching and receiving emissions not at a compressor stations are included with the pipeline operational emission calculations. Detailed emission calculations for pipeline operation emissions are provided in appendix 9D. Pigging emissions are reported as annual as if all pigging occurs in the same year.

TABLE 9.1.4-6

North Bakken Expansion Project
Pipeline Operational Emissions

Emission Unit	NO_X (tpy)	CO (tpy)	VOCs (tpy)	$PM_{10}/PM_{2.5}$ (tpy)	SO_2 (tpy)	CO_2e (tpy)	Total HAPs (tpy)
Aboveground Facilities (fugitive leaks)	N/A	N/A	8.83	N/A	N/A	2,159	0.002
Tioga-Elkhorn Creek, 104th Avenue NW, (MP 6.1)	N/A	N/A	60.96	N/A	N/A	14,896	0.014
Line Section 25 Loop, Norse Transfer Station, (MP 20.4)	N/A	N/A	5.21	N/A	N/A	1,274	0.001
Line Section 30 Loop, Nesson Valve Setting, (MP 0.0)	N/A	N/A	3.53	N/A	N/A	862	0.001
Tioga Compressor Lateral, Tioga Plant Receipt Station, (MP 0.0)	N/A	N/A	0.24	N/A	N/A	59	0.000
Uprate Line Section 25, Norse Transfer Station	N/A	N/A	2.25	N/A	N/A	549	0.001
Uprate Line Section 25, Lignite Border Station	N/A	N/A	2.25	N/A	N/A	549	0.001
Uprate Line Section 25, Norse Transfer Station	N/A	N/A	1.44	N/A	N/A	353	0.000
Pipeline Length (fugitive leaks)	N/A	N/A	N/A	N/A	N/A	106	N/A
TOTAL	**N/A**	**N/A**	**84.71**	**N/A**	**N/A**	**20,807**	**0.02**

N/A = not applicable

9.2 NOISE

9.2.1 Principles of Noise

Sound is a sequence of waves of pressure that propagates through compressible media such as air or water. When sound becomes excessive, annoying, or unwanted, it is often referred to as noise.

The ambient sound level of a region is defined by the total noise generated within the specific environment, and usually comprises natural and man-made sounds. At any location, both the magnitude and frequency of environmental noise may vary considerably over the course of a day and throughout the year. This variation may be caused in part by changing weather conditions and seasonal changes in vegetative cover.

Sound levels, measured in decibels (dB), are perceived differently, depending on length of exposure and time of day. Two measurements used to relate the time-varying quality of environmental noise to its known effects on people are the equivalent sound level (L_{eq}) and the day-night sound level (L_{dn}). L_{eq} is a sound level over a specific time period corresponding to the same sound energy as measured for an instantaneous sound level, assuming it is a constant noise source. L_{dn} is a sound level that takes into account the duration and time the noise is encountered. Specifically, in the calculation of the L_{dn}, late night (after 10:00 p.m.) and early morning (prior to 7:00 a.m.), noise levels are penalized by adding 10 dB to account for people's greater sensitivity to sound during nighttime hours. To account for the human ear being less sensitive to low and high frequencies than to mid-range frequencies, dB levels are corrected using the A-weighted scale (dBA). A 3 dB change of sound level is threshold of a perceptible change by the human ear. A 6 dB change of sound level is considered clearly noticeable, and a 10 dB change is perceived as if the sound level has doubled or halved.

Table 9.2.1-1 demonstrates the relative dBA levels of common sounds measured in the environment and industry, and their loudness relative to the sound level associated with a conversation at a distance of 3 feet.

TABLE 9.2.1-1

North Bakken Expansion Project
Sound Levels (dBA) and Relative Loudness [a]

Description of Sound	Sound Level (dBA)	Relative Loudness
Threshold of pain	140	256
Jet taking off (200 feet away)	130	128
Operating heavy equipment	120	64
Night club (with music)	110	32
Construction site	100	16
Boiler room	90	8
Freight train (100 feet away)	80	4
Classroom chatter	70	2
Conversation (3 feet away)	60	1
Urban residence	50	1/2
Soft whisper (5 feet away)	40	1/4
North rim of grand canyon	30	1/8
Silent study room	20	1/16
Threshold of human hearing (1,000 Hertz)	0	1/64

[a] Adapted from U.S. Department of Labor, 2016

9.2.2 Noise Regulations

In 1974, the EPA published a document entitled *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin on Safety* (EPA 1974). This publication evaluated the effects of environmental noise with respect to health and safety. As set forth in that publication, the EPA has determined that noise levels should not exceed an L_{dn} of 55 dBA, which is the level that protects the public from indoor and outdoor activity interference. This noise level has been useful for state and federal agencies to establish noise limitations for various noise sources. A 55 dBA L_{dn} noise level equates to a L_{eq} of 48.6 dBA (i.e., a facility that does not exceed a continuous noise impact of 48.6 dBA will not exceed 55 dBA L_{dn}).

In addition to the EPA publication, WBI Energy's proposed compressor station must comply with the Federal Energy Regulatory Commission's (FERC) noise regulations for interstate pipelines at 18 CFR 380.12(k)(4)(v). These regulations state the following.

- The noise attributable to any new compressor station, compression added to an existing station, or any modification, upgrade, or update of an existing station, must not exceed a L_{dn} of 55 dBA at any pre-existing Noise Sensitive Area (NSA). NSAs include but are not limited to residences, schools and day-care facilities, hospitals, long-term care facilities, places of worship, and libraries. NSAs may also include campgrounds, parks, and wilderness areas valued specifically for their solitude and tranquility.

- New compressor stations or modifications of existing stations shall not result in a perceptible increase in vibration at any NSA.

WBI Energy construction activities should comply with FERC guidelines for construction noise. FERC Guidelines state the following: "Construction activity that would or may occur during nighttime hours should be performed with the goal that the activity contribute noise levels below 55 dBA L_{dn} and 48.6 Leq, or no more than 10 dBA over background if ambient noise levels are above 55 dBA L_{dn}" (FERC, 2017).

North Dakota regulates noise using public nuisance laws, but does not impose property-line noise limits for new facilities. McKenzie and Burke Counties do not regulate noise. Williams County maintains noise regulations with maximum noise standards by district, which are listed in table 9.2.2-1 (Williams County, 2015).

TABLE 9.2.2-1

North Bakken Expansion Project
Williams County Maximum Noise Standards by District

Zone of Property Receiving Noise	Maximum Noise Level dB, L_{eq}
Residential Districts: Urban Residential (UR), Rural Residential (RR)	60
Commercial Districts: Urban Commercial (UC), Rural Residential (RC)	65
Industrial Districts: Light Industrial (LI), Heavy Industrial (HI)	70
Planned Development:	Planned unit development in accordance with base district

Additionally, Williams County Code states, "The noise standards above shall be modified as follows to account for the effects of time and duration on the impact of noise levels:

- in the [Urban Residential] and [Rural Residential] districts, the noise standards shall be 5 dB lower between 10:00 p.m. and 7:00 a.m.; and
- noise that is produced for no more than a cumulative period of five minutes in any hour may exceed the standards above by 10 dB." (Williams County, 2015)

Zoning designations are not available for the NSAs located in Williams County. However, because the identified NSAs are houses, it is assumed that the "Residential Districts" regulation of a 60 dB maximum noise level applies. Williams County's noise regulations are less strict than FERC's requirements for operational noise and FERC's guidance for nighttime construction noise; therefore, meeting FERC's 55 dBA L_{dn} criteria will be sufficient to meet Williams County's noise regulations.

9.2.3 Existing Ambient Noise Levels

An ambient noise survey was performed the week of July 22 to 26, 2019, at NSAs within a 1-mile radius of the Tioga Compressor Station and proposed Elkhorn Creek Compressor Station. Ambient noise surveys were also completed within a 0.5-mile radius of the Lake Sakakawea north and south horizontal directional drill (HDD) entry locations.[2] The resulting *Pre-Construction Noise Survey and Acoustical Analysis Report* is included in appendix 9G. Receipt and transfer station locations had not yet been finalized at the time of the ambient noise survey; therefore, an ambient noise survey was not conducted at the proposed station locations. However, only the Norse Plant Receipt and Transfer Stations and the Robinson Lake Plant Receipt Station have NSAs within 0.5 mile. Ambient sound levels for this station were estimated using noise measurements of similar land use in the Project area.

The L_{dn} at each NSA was calculated using the following formula:

$$L_{dn} = 10 * \log\left(\frac{15 * 10^{\frac{L_{eq\,day}}{10}} + 9 * 10^{\frac{L_{eq\,night}+10}{10}}}{24}\right)$$

9.2.3.1 Tioga Compressor Station

The Tioga Compressor Station will be located in an industrial area with agricultural and residential properties surrounding the compressor station site. There are seven NSAs within 1 mile of the compressor station site. As shown in figure 9.2.3-1 in appendix 9A, the closest NSA to the compressor station is a residence located 2,546 feet to the east. Table 9.2.3-1 lists the nearest NSAs, their proximity to the compressor station, and ambient noise survey results.

[2] WBI Energy proposes to cross Lake Sakakawea via the HDD intersect method, in which drilling will occur from both ends of the crossing and intersect near the middle of the lake. Due to this proposed method, both ends will be considered entry sites (i.e., the north and south HDD entry sites).

TABLE 9.2.3-1

North Bakken Expansion Project
Noise Sensitive Areas near Tioga Compressor Station

NSA Name (type)	Distance and Direction to NSA from Project Area	Surveyed Daytime Ambient Noise Level [a] (L_{eq}) dBA	Surveyed Nighttime Ambient Noise Level [b] (L_{eq}) dBA	Calculated Ambient L_{dn} at NSA dBA	Calculated Ambient L_{dn} at NSA not Associated with Existing Compressor Station [c] dBA
NSA 1 (residential)	3,974 feet north	57.6	46.5	57.2	56.6
NSA 2 (residential)	4,076 feet northeast	46.0	52.3	58.2	57.8
NSA 3 (residential)	4,920 feet east	50.6	46.9	54.0	53.2
NSA 4 (residential)	2,221 feet east	55.3	46.0	55.6	N/A
NSA 5 (residential)	4,940 feet southeast	50.6	46.9	54.0	53.2
NSA 6 (residential)	5,229 feet west	60.5	52.3	61.3	61.1
NSA 7 (residential)	4,862 feet northwest	60.5	52.3	61.3	61.1

N/A = not applicable
[a] Daytime noise survey duration was 1 hour.
[b] Nighttime noise survey duration was 15 minutes.
[c] Calculated assuming that all nighttime noise at NSA 4 was due to the existing compressor station. This provides the lowest estimate for ambient noise levels not associated with existing compressor station operation.

As seen in table 9.2.3-1, the ambient L_{dn} at many of the NSAs was above 55 dBA during the preconstruction noise survey. With the exception of NSA 4, where the existing compressor station was the predominant source of noise, other noise sources such as insects and traffic were the largest contributors to ambient L_{dn} values above 55 dBA. By subtracting the nighttime noise level at NSA 4, where compressor station noise was most audible, the ambient L_{dn} associated with other noise sources was estimated. This analysis shows that where ambient noise is above 55 dBA L_{dn}, it is caused by sources other than the existing compressor station.

9.2.3.2 Elkhorn Creek Compressor Station

The Elkhorn Creek Compressor Station will be located in a rural area with residential, agricultural, and industrial properties surrounding the compressor station site. There are three NSAs within 1 mile of the compressor station site. As shown in figure 9.2.3-2 in appendix 9A, the closest NSA to the compressor station is a residence located 3,916 feet to the east. Table 9.2.3-2 lists the nearest NSAs, their proximity to the compressor station, and ambient noise survey results.

TABLE 9.2.3-2

North Bakken Expansion Project
Noise Sensitive Areas near Elkhorn Creek Compressor Station

NSA Name (type)	Distance and Direction to NSA from Project Area	Surveyed Daytime Ambient Noise Level[a] (L_{eq}) dBA	Surveyed Nighttime Ambient Noise Level[b] (L_{eq}) dBA	Calculated Ambient L_{dn} at NSA dBA
NSA 1 (residential)	4,253 feet southwest	57.2	40.0	55.6
NSA 2 (residential)	3,465 feet east	36.6	34.2	41.0
NSA 3 (residential)	3,895 feet northeast	36.6	34.2	41.0

[a] Daytime noise survey duration was 1 hour.
[b] Nighttime noise survey duration was 15 minutes.

9.2.3.3 Lake Sakakawea Horizontal Directional Drill Crossing

The area surrounding the Lake Sakakawea north and south HDD entry site locations is primarily agricultural and residential. As shown in figures 9.2.3-3 and 9.2.3-4 in appendix 9A, the closest NSA to the south HDD entry site is a residence located 2,240 feet to the southwest, and the closest NSA to the north HDD entry site is a group of 13 residences to the southeast, with the closest residence 492 feet away. Table 9.2.3-3 lists the nearest NSAs, their proximity to the entry sites, and ambient noise survey results.

TABLE 9.2.3-3

North Bakken Expansion Project
Noise Sensitive Areas near Lake Sakakawea Horizontal Directional Drill Crossing

Entry Site	NSA Name (type)	Distance and Direction to NSA from Project Area	Surveyed Daytime Ambient Noise Level[a] (L_{eq}) dBA	Surveyed Nighttime Ambient Noise Level[b] (L_{eq}) dBA	Calculated Ambient L_{dn} at NSA dBA
South	NSA 1 (residential)	2,240 feet southwest	54.9	44.3	54.7
North	NSA 1 (13 residences)	492 feet southeast	43.9	35.7	44.7
	NSA 2 (residential)	2,597 feet northwest	43.0	42.1	48.7

a Daytime noise survey duration was 1 hour.
b Nighttime noise survey duration was 15 minutes.

9.2.3.4 Tioga Plant Receipt Station

The Tioga Plant Receipt Station will be located in a primarily industrial area. As shown in figure 9.2.3-5 in appendix 9A, there are no NSAs within 0.5 mile of the receipt station; therefore, the Tioga Plant Receipt Station will not be discussed further.

9.2.3.5 Springbrook Plant Receipt Station

The Springbrook Plant Receipt Station will be located in a primarily agricultural area. As shown in figure 9.2.3-6 in appendix 9A, there are no NSAs within 0.5 mile of the receipt station; therefore, the Springbrook Plant Receipt Station will not be discussed further.

9.2.3.6 Northern Border Interconnect

Northern Border Interconnect will be located in a primarily agricultural area. As shown in figure 9.2.3-6 in appendix 9A, there are no NSAs within 0.5 mile of the delivery/receipt station; therefore, the Northern Border Interconnect will not be discussed further.

9.2.3.7 Norse Plant Receipt and Transfer Stations

The Norse Plant Receipt and Transfer Stations will be located on adjacent parcels in a primarily agricultural area. As shown in figure 9.2.3-8 in appendix 9A, the closest NSA is a residence located 2,478 feet to the north. Table 9.2.3-4 lists the nearest NSA and its proximity to the stations.

TABLE 9.2.3-4

North Bakken Expansion Project
Noise Sensitive Areas near Norse Plant Receipt and Transfer Stations

NSA Name (type)	Distance and Direction to NSA from Project Area	Estimated Ambient L_{dn} at NSA(dBA)[a]
NSA 1 (residential)	2,478 feet north	48.7

[a] Receipt/transfer station location had not been determined at the time of the ambient noise survey. The ambient L_{dn} was estimated to be similar to the L_{dn} at NSA 2 at the Lake Sakakawea north HDD entry site due to similar land use in the surrounding area.

9.2.3.8 Lignite Plant Receipt Station and Lignite Town Border Station

The Lignite Plant Receipt Station and Lignite Town Border Station will be located in a primarily agricultural area. As shown in figure 9.2.3-9 in appendix 9A, there are no NSAs within 0.5 mile of the receipt station; therefore, the Lignite Plant Receipt Station and Lignite Town Border Station will not be discussed further.

9.2.3.9 Robinson Lake Plant Receipt Station

The Robinson Lake Plant Receipt Station will be located in a primarily agricultural area. As shown in figure 9.2.3-8 in appendix 9A, the closest NSA is a residence located 892 feet to the southwest. Table 9.2.3-5 lists the nearest NSAs and their proximity to the station.

TABLE 9.2.3-5

North Bakken Expansion Project
Noise Sensitive Areas near Robinson Lake Plant Receipt Station

NSA Name (type)	Distance and Direction to NSA from Project Area	Estimated Ambient L_{dn} at NSA(dBA)[a]
NSA 1 (residential)	892 feet southwest	48.7
NSA 2 (residential)	1,572 feet west	48.7
NSA 3 (residential)	2,174 feet west	48.7
NSA 4 (residential)	1,610 feet southwest	48.7

[a] Receipt/transfer station locations had not been determined at the time of the ambient noise survey. Ambient L_{dn} was estimated to be similar to the L_{dn} at NSA 2 at the Lake Sakakawea north HDD entry site due to similar land use in the surrounding area.

9.2.4 Construction Noise Impacts

The principal noise sources associated with construction of the Project will be operation of heavy equipment (e.g., bulldozers, backhoes, cranes, rollers, and trucks). As referenced in table 9.2.4-1 below, noise from the heavy equipment typically ranges from 55 to 85 dBA at a distance of 50 feet from the source. Noise will be intermittent during most of the 8-month construction period and will occasionally exceed background noise levels that currently characterize the area. The majority of construction activities will take place during the day (7:00 a.m. to 7:00 p.m.) and will not have an impact on nighttime sounds levels; however, nighttime construction activities outlined in section 1.2 of Resource Report 1, may be carried out 24 hours a day until completed.

TABLE 9.2.4-1

North Bakken Expansion Project
Noise Levels of Predominant Noise-Producing Construction Equipment

Construction Equipment Type	Sound Pressure Levels at 50 feet (dBA)
Trucks	85
Cranes	85
Rollers	80
Bulldozers	85
Pickup trucks	55
Backhoes	80

Source: U.S. Department of Transportation, 2006

Noise associated with construction of the pipeline facilities will be short term and temporary at any given location because of the assembly-line method of pipeline installation. While the noise levels attributable to construction equipment could noticeably increase ambient noise levels at the NSAs nearest the workspace, this noise will be temporary and localized. With the exception nighttime construction activities outlined in section 1.2 of Resource Report 1, construction activities will be limited to daytime hours. Therefore, most construction noise will not have impacts on residents near the pipeline corridor between the hours of 7:00 pm and 7:00 am. Additionally, due to the temporary nature of these activities, no associated long-term impacts on noise levels are anticipated.

WBI Energy proposes to cross Lake Sakakawea via the HDD intersect method, in which drilling will occur from both ends of the crossing and intersect near the middle of the lake. Noise associated with HDD entry site construction is typically greater than noise associated with HDD exit site operations. Because drilling will occur from both ends of the crossing, both ends are considered entry sites for the purposes of the noise impact analysis.

Construction activities at the HDD location are expected to occur for 5 months. Operations are expected to occur for 12 to 14 hours per day, 7 days per week, unless site conditions require operation 24 hours per day. Working 24 hours per day will be required during pullback operations, which should not exceed 1 week. Additional nighttime activities may occur as necessary based on site conditions. Therefore, HDD construction may have nighttime impacts on residents near HDD locations.

HDD construction involves various equipment and activities including power generation, mobile equipment, and mixing pumps. The following sound sources are expected to be significant contributors:

- drilling rig and associated engine-driven power unit;
- engine-driven mud pumps and engine-driven generator sets;
- mud mixing and mud cleaning equipment;

- crane, sidebooms, backhoe, frontloader, forklift, and/or trucks; and
- engine-driven light plants (used for nighttime operation).

An estimate of noise impacts at nearby NSAs is provided in table 9.2.4-2.

TABLE 9.2.4-2

North Bakken Expansion Project
Noise Quality Analysis for the Lake Sakakawea Horizontal Directional Drill Crossing

NSA Name and Location	Distance and Direction of NSA	Calculated Ambient L_{dn} (dBA)	Unmitigated HDD Operations L_{dn} (dBA)	Unmitigated HDD Operations L_{dn} Plus Ambient L_{dn} (dBA)	Mitigated HDD Operations L_{dn} Plus Ambient L_{dn} (dBA)	Potential Increase Above Ambient (dB) with Mitigation
NSA 1 – South Side	2,240 feet southwest	54.7	70.4	70.4	64.4	9.7
NSA 1 – North Side	492 feet southeast	44.7	84.8	84.8	78.3	33.6
NSA 2 – North Side	2,597 feet southeast	48.7	69.1	69.1	62.8	14.1

In an effort to mitigate impacts at nearby NSAs, WBI Energy will require the HDD contractor to install at least a 16-foot Sound Transmission Class 32 barrier within the line of sight of each NSA and all major noise-producing equipment. Noise reduction associated with a barrier is shown in table 9.2.4-2 above. Due to the high sound power level of the HDD equipment and proximity to NSAs, noise barriers alone would likely not reduce the HDD L_{dn} at NSAs to below 55 dBA. WBI Energy will also require the HDD contractor to install at least residential-grade silencers or mufflers on all engines, which typically reduce exhaust noise by 15 to 20 dB. To ensure compliance with FERC limits, WBI Energy will also perform on-site acoustical monitoring during HDD startup to evaluate the actual noise impact on the nearby NSAs and evaluate potential additional noise mitigation measures to reduce the noise impact to below 55 dBA L_{dn}, or 10 dBA over ambient, at the NSAs. WBI Energy will submit an HDD mitigation plan prior to construction to further address procedures and specific mitigation measures to be used in the event that the on-site monitoring determines that the noise impact exceeds the FERC limit criterion. If 24-hour HDD activity is required for more than 1 week, and reducing noise impacts at NSAs to below 55 dBA L_{dn} or 10 dBA over ambient is not feasible, WBI Energy plans to establish a supervised hotline to address landowner complaints regarding increased noise levels, including offers to compensate landowners for temporary relocation if necessary. If nighttime HDD activity will only occur during the pullback operation, which is estimated to last less than 1 week, temporary relocation, or compensation for relocation, of residents may be a viable option in place of physical mitigation measures.

9.2.5 Operational Noise Impacts

9.2.5.1 Tioga Compressor Station

WBI Energy proposes to install additional compression, equipment, and facilities at the Tioga Compressor Station. It is currently anticipated that about 22,500 hp will be added to the existing compressor station. The following equipment are expected to be potential noise contributors:

- six reciprocating compressor units;
- six 3,750-hp gas-fired engines;
- six gas coolers; and
- six auxiliary coolers.

The calculated noise impact associated with operation of the modified Tioga Compressor Station at the nearby NSAs is provided in table 9.2.5-1.

TABLE 9.2.5-1

North Bakken Expansion Project
Noise Analysis for Operation of Tioga Compressor Station

NSAs	Distance and Direction of NSA	Surveyed Ambient Noise Level (L_{dn}) dBA	Estimated L_{dn} of the Station Upgrades at Full Load (dBA)	L_{dn} of Station Upgrades Plus Ambient L_{dn} (dBA)	Estimated Noise Increase (dB)
NSA 1 (residential)	3,974 feet north	57.2	49.5	58.0	0.8
NSA 2 (residential)	4,076 feet northeast	58.2	49.3	58.8	0.6
NSA 3 (residential)	4,920 feet east	54.0	47.7	55.0	1.0
NSA 4 (residential)	2,221 feet east	55.6	54.6	58.2	2.8
NSA 5 (residential)	4,940 feet southeast	54.0	47.6	55.0	1.0
NSA 6 (residential)	5,229 feet west	61.3	47.2	61.4	0.1
NSA 7 (residential)	4,862 feet northwest	61.3	47.8	61.4	0.1

Operational noise contributed by the modifications to the compressor station is not expected to exceed the 55 dBA L_{dn} requirement at any of the NSAs. WBI will conduct a noise survey within 60 days of placing the modified compressor station into service to verify that noise attributable to the additional operational equipment does not exceed 55 dBA L_{dn} at any of the NSAs, or to identify any noise controls required to be installed.

9.2.5.2 Elkhorn Creek Compressor Station

WBI Energy proposes to construct one new 3,750-horsepower greenfield compressor station on an approximately 10.9-acre site near milepost (MP) 61.9 in McKenzie County. The following sound sources are expected to be potential noise contributors:

- one reciprocating compressor unit;
- one 3,750 hp gas-fired engine;
- one gas cooler; and
- one auxiliary cooler.

The calculated noise impact associated with operation of the proposed Elkhorn Creek Compressor Station at the nearby NSAs is provided in table 9.2.5-2.

TABLE 9.2.5-2

North Bakken Expansion Project
Noise Analysis for Operation of Elkhorn Creek Compressor Station

NSA Name (type)	Distance and Direction of NSA	Calculated Ambient Noise Level (L_{dn}) dBA	Estimated L_{dn} of the Station at Full Load (dBA)	L_{dn} of Station Plus Ambient L_{dn} (dBA)	Estimated Noise Increase (dB)
NSA 1 (residential)	4,253 feet southwest	55.6	41.1	55.7	0.1
NSA 2 (residential)	3,465 feet east	41.0	42.9	45.1	4.1
NSA 3 (residential)	3,895 feet northeast	41.0	41.9	44.5	3.5

Operational noise contributed by the proposed compressor station is not expected to exceed the 55 dBA L_{dn} requirement at any of the NSAs. WBI will conduct a noise survey within 60 days of placing the compressor station into service to verify that noise attributable to operational equipment does not exceed 55 dBA L_{dn} at any of the NSAs, or to identify any noise controls required to be installed.

9.2.5.3 Norse Plant Receipt and Transfer Station

WBI Energy proposes to upgrade the meter, station piping and associated facilities at the existing Norse Plant Receipt Station at the existing location at about MP 20.4 of the proposed Line Section 25 Loop to accommodate incremental volumes associated with the Project. However, there are no potential sound sources at the Norse Plant Receipt Station.

WBI Energy also proposes to construct the Norse Transfer Station on a new tract of land adjacent to and south of the existing Norse Plant Receipt Station at about MP 20.4 of the proposed Line Section 25 Loop. The new station would provide overpressure protection to facilities operated at a Maximum Allowable Operating Pressure (MAOP) of 700 pound per square inch gauge from the uprated Line Section 25 MAOP of 1,098 pound per square inch gauge north of the Norse Transfer Station. Up to four regulation control valves are potential sound sources from this facility.

The regulation control valves will be located within a single building. The valves will be designed such that the interior sound level will not exceed 100 dBA. The analysis was developed utilizing this interior sound level and a building constructed of 24-gauge sheet steel with acoustically absorptive interior walls and ceiling. The calculated noise impact associated with operation of the Norse Plant Receipt Station at the nearby NSA is provided in table 9.2.5-3.

TABLE 9.2.5-3

North Bakken Expansion Project
Noise Analysis for Operation of Norse Plant Receipt and Transfer Station

Nearest NSA Name (type)	Distance and Direction of NSA	Estimated Ambient Noise Level [a] (L_{dn}) dBA	Estimated L_{dn} of the Transfer Station (dBA)	L_{dn} of Station Plus Ambient L_{dn} (dBA)	Estimated Noise Increase (dB)
NSA 1 (residential)	2,478	48.7	38.5	49.1	0.4

[a] Receipt/transfer station locations had not been determined at the time of the ambient noise survey. Ambient L_{dn} was estimated to be similar to the L_{dn} at NSA 2 at the Lake Sakakawea north HDD site due to similar land use in the surrounding area.

Operational noise contributed by the proposed receipt and transfer station is not expected to exceed the 55 dBA L_{dn} requirement at the NSA.

9.2.5.4 Robinson Lake Plant Receipt Station

WBI Energy proposes to upgrade the meter, station piping and associated facilities at the existing Robinson Lake Plant Receipt Station at its current location along Line Section 7 about 1.5 miles southeast of Stanley, North Dakota. The upgrades would be required to accommodate incremental volumes associated with the Project.

No sound sources at the Robinson Lake Receipt Station are expected to be significant. Therefore, no noise impacts at the nearby NSAs are anticipated.

9.2.6 Blowdown Events

Blowdown events of varying duration will occur at compressor stations during startup and commissioning, annual operation, and emergencies. The sound levels associated with high-pressure gas venting are a function of initial blowdown pressure, the diameter and type of blowdown valve, and the diameter and arrangement of the downstream vent piping. Blowdown sound levels are loudest at the beginning of the blowdown event, and they decrease as the blowdown pressure decreases.

9.2.6.1 Tioga Compressor Station

Twelve to 32 blowdown events will occur at Tioga Compressor Station during startup and commissioning: 2 full-station blowdowns and 10 to 30 compressor unit blowdowns. Blowdowns will not occur simultaneously.

During annual operation of the compressor station, there will be approximately 36 total scheduled preventative maintenance compressor unit blowdowns and 1 scheduled emergency shutdown (ESD) test full-station blowdown. Scheduled blowdowns will take place during daytime hours, and nearby residents will be notified prior to the blowdown occurring. Additional unscheduled compressor unit blowdowns will occur approximately 108 times per year (in total between the 6 compressor units). Additional ESD blowdowns could occur as a result of a real emergency, but their frequency is unpredictable.

An evaluation of the noise associated with blowdown events at the Tioga Compressor Station is provided in table 9.2.6-1. Mitigation measures for blowdown events are not necessary as blowdown noise will be less than 55 dBA at NSAs with the exception of NSA 4, where ambient noise levels are greater than 55 dBA and blowdown noise will not contribute greater than a 10 dBA increase in noise.

TABLE 9.2.6-1

North Bakken Expansion Project
Noise Quality Analysis for Blowdown Events at Tioga Compressor Station

NSA Name (type)	Distance and Direction of NSA	Surveyed Ambient Noise Level (Ldn) dBA	Estimated L_{dn} of Station Blowdown (dBA)	L_{dn} of Blowdown Plus Ambient L_{dn} (dBA)	Potential Noise Increase (dB)
NSA 1 (residential)	3,974 feet north	57.2	54.0	58.9	1.7
NSA 2 (residential)	4,076 feet northeast	58.2	53.7	59.5	1.3
NSA 3 (residential)	4,920 feet east	54.0	52.1	56.2	2.2
NSA 4 (residential)	2,221 feet east	55.6	59.0	60.6	5.0
NSA 5 (residential)	4,940 feet southeast	54.0	52.1	56.2	2.2
NSA 6 (residential)	5,229 feet west	61.3	51.6	61.7	0.4
NSA 7 (residential)	4,862 feet northwest	61.3	52.2	61.8	0.5

9.2.6.2 Elkhorn Creek Compressor Station

Four to seven blowdown events will occur at Elkhorn Creek Compressor Station during startup and commissioning, consisting of two full-station blowdowns and two to five compressor unit blowdowns. Blowdowns will not occur simultaneously.

During annual operation of the compressor station, there will be approximately six scheduled preventative maintenance compressor unit blowdowns and one scheduled ESD test full-station blowdown. Scheduled blowdowns will take place during daytime hours, and nearby residents will be notified prior to the blowdown occurring. Additional unscheduled compressor unit operations will occur approximately 18 times per year, and additional ESD blowdowns could occur as a result of a real emergency, but their frequency is unpredictable.

An evaluation of the noise associated with blowdown events at the Elkhorn Creek Compressor Station is provided in table 9.2.6-2. Potential mitigation measures for blowdown events are still under consideration.

TABLE 9.2.6-2

North Bakken Expansion Project
Noise Quality Analysis for Blowdown Events at Elkhorn Creek Compressor Station

NSA Name (type)	Distance and Direction of NSA	Surveyed Ambient Noise Level (Ldn) dBA	Estimated L_{dn} of Station Blowdown (dBA)	L_{dn} of Blowdown Plus Ambient L_{dn} (dBA)	Potential Noise Increase (dB)
NSA 1 (residential)	4,338 feet southwest	55.6	53.2	57.6	2.0
NSA 2 (residential)	3,538 feet east	41.0	55.0	55.1	14.1
NSA 3 (residential)	4,386 feet northeast	41.0	53.9	54.1	13.1

9.2.7 Vibration

Operation of the compressor stations and construction equipment can cause ground vibrations that spread through the ground and diminish in strength with distance. Due to (1) the presence of unconsolidated soil conditions, (2) no work being completed on competent bedrock, and (3) mitigation measures to minimize vibration built into the compressor stations' design, it is not anticipated that construction or operation of the compressor stations will cause measureable vibrations at NSAs. WBI Energy will comply with the FERC requirement that new compressor stations or modifications of existing stations shall not result in a perceptible increase in vibration at any NSA (18 CFR § 380.12(k)(4)(v)).

9.3 CUMULATIVE IMPACTS

Cumulative impacts are the result of the incremental impacts of an action that, when added to the impacts of other past, present, and reasonably foreseeable future actions (RFFA), would affect the same resources, regardless of what agency or person undertakes those actions (40 CFR 1508.7). Compliance with National Environmental Policy Act requires an analysis of these cumulative impacts (40 CFR 1508.25(a) (2) and 40 CFR 1508.25(c) (3)). An RFFA should have a realistic probability of occurring. These cumulative impacts can derive not only from projects currently under the review of federal regulatory agencies, but also major projects that are being proposed to state or local governments.

WBI Energy has identified projects that have been considered for potential cumulative impacts. These projects were identified by searching publically available information within and in the vicinity of the Project Study Area. Appendix 1J to Resource Report 1 identifies the location, schedule, and general scope of each RFFA project or activity that may cumulatively impact resources affected by construction of the Project.

9.3.1 Air

As discussed in section 1.10 of Resource Report 1, the geographic scope for cumulative air quality analysis is within 0.25 mile of construction work areas because air emissions during construction would be limited to vehicle and construction equipment emissions and dust, and would be highly localized to the project construction sites and within 50 km (31.1 miles) of operating air emission sources because 50 km is the baseline radius of impact used by the EPA for PSD modeling.

The Project expects new permanent impacts on air quality due to the expansion of the Tioga Compressor Station and operation of the proposed Elkhorn Creek Compressor Station. There will also be temporary air quality impacts at all construction locations due to fugitive dust, elevated levels of ambient pollutants, and air emissions from mobile sources and construction equipment during the construction period.

9.3.1.1 Construction Emissions Impacts

Construction emissions from the proposed Project and the Western Area Water Supply Project could potentially fall within or reasonably extend to within 0.25 mile of the construction footprint. Although the timing of construction of the Western Area Water Supply Project is unknown, if the construction occurs at the same time as the proposed Project, impacts would include emissions from construction equipment, operation, and fugitive dust. Similar to the proposed Project construction, construction of the water transmission line would result in air impacts that are temporary and transient in nature and are not expected to cause or contribute to any significant degradation of air quality. WBI Energy will operate equipment properly and minimize potential fugitive dust impacts by adhering to the Department's requirements to monitor dust emissions and provide water trucks. Construction emissions will not extend significantly beyond the project site and no significant cumulative impacts are anticipated with other nearby construction activities.

9.3.1.2 Operational Emissions Impacts

The Project will have a permanent, minor impact on the existing air quality. Several RFFA projects would cumulatively contribute to long-term operational air quality impacts in the region; however, these facilities are expected to operate within compliance of all state and federal air quality regulations. The following operational facilities may cumulatively contribute to the operational air quality impacts in the region.

- Oil and gas developments including well pads, directional drill (horizontal) wells, and associated facilities are planned throughout Mackenzie County. Oil and gas development can result in emissions that affect ambient concentrations of PM, O_3, and NOx from production activities and, in some fields, concentrations of SO_2 can be affected. HAPs may also be emitted from oil and gas operations, including well drilling, well completion, and venting. However, no ambient standards have been established for HAPs associated with oil and gas development in this area and ambient monitoring data is not available. Oil and gas production sources have the potential to release air pollutant emissions that contribute to O_3 formation, regional haze, atmospheric deposition, or contribute to increased global concentration of GHGs.

- Six natural gas processing plant developments or expansions are planned within 50 km of the Project. Operational emissions of equipment such as gas-driven compressors, heaters, storage tanks, flares, and other ancillary equipment would be subject to state and federal air quality regulations.

- Emissions from the Williston Basin International Airport are expected to be below *de minimis* thresholds for NAAQS. The proposed action would increase GHG emissions by 2,666 metric tons of CO_2 per year over the baseline conditions, which is an increase of 26 percent.

- Emissions of criteria pollutants from vehicles using the proposed U.S. Route 85/ Interstate 94 to Watford City Bypass may be attenuated by eliminating the need for passing maneuvers and reducing roadway congestion. However, the addition of passing lanes along ND 1804 from Red Mike Area to CR 42 (Epping Road) is expected to increase vehicle use and associated emissions. With the federal requirements for on- and off-road engines and continued fugitive dust management practices, fugitive dust and criteria pollutant emissions from vehicles traveling on the existing roadway are anticipated to be minor and are not expected to adversely impact North Dakota's reasonable progress goals of 2018. Traffic along the roadway would also contribute toward the United States and North Dakota GHG inventories.

Although permanent minor operational impacts may contribute cumulatively to air emissions, all sources are expected to comply with state and federal air quality standards. The Project and RFFAs will have a permanent but minor cumulative impact on the existing air quality.

9.3.1.3 Climate Change

The U.S. Global Change Research Program (USGCRP[3]), which is the leading U.S. scientific body on climate change, and the Intergovernmental Panel on Climate Change have recognized the following:

- globally, GHG has been accumulating in the atmosphere since the beginning of the industrial era (circa 1750);
- combustion of fossil fuels (coal, petroleum, and natural gas), combined with agriculture and clearing of forests, is primarily responsible for the accumulation of GHG;
- anthropogenic GHG emissions are the primary contributing factor to climate change; and
- impacts extend beyond atmospheric climate change alone and include changes to water resources, transportation, agriculture, ecosystems, and human health.

In 2017 and 2018, the USGCRP issued its *Climate Science Special Report: Fourth National Climate Assessment, Volumes I and II* (Fourth Assessment Report) (USGCRP, 2017 and 2018, respectively). The Fourth Assessment Report states that climate change has resulted in a wide range of impacts across every region of the country, and the impacts extend beyond atmospheric climate change alone and include changes to water resources, transportation, agriculture, ecosystems, and human health. These changes are driven by the accumulation of GHGs in the atmosphere from the combustion of fossil fuels (coal, petroleum, and natural gas) combined with agriculture, clearing of forests, and other natural sources. These impacts have accelerated throughout the end of the 20th and into the 21st century (USGCRP, 2018).

Observations of environmental impacts attributed to climate change for the Northern Great Plains region include (USGCRP, 2017):

- an increase in average annual temperatures in the region by 1.7°F from 1986 to 2016, with greater changes occurring during the winter season;
- a decrease in the severity of cold extremes, with the coldest daily temperature increasing by 4.4°F, and a decrease in the number of cold extreme days;
- increases in precipitation throughout the year, with the greatest increase seen in the fall (15 percent) and the smallest increase seen in the winter (2 percent);
- decreases in snowfall alongside earlier seasonal snowmelt; and
- an increase in the length of the growing season and the frost-free period (11 days).

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[3] The following departments comprise the USGCRP: EPA, U.S. Department of Energy, U.S. Department of Commerce, U.S. Department of Defense, U.S. Department of Agriculture, U.S. Department of the Interior; U.S. Department of State, Pipeline and Hazardous Materials Safety Administration, Department of Health and Human Services, National Aeronautics and Space Administration, National Science Foundation, Smithsonian Institution, and Agency for International Development.

The following climate change impacts in the project region are presented with a high or very high level of confidence (USGCRP, 2017 and 2018):

- warming rates in this region are likely to be higher than for those at lower latitudes (approximately 9.7°F for the late century [2071 to 2100] under a high-emissions scenario);
- extreme precipitation events are likely to increase in frequency and intensity;
- surface soil moisture deficits (especially related to evapotranspiration increases due to increased temperatures);
- risk to existing infrastructure (including transportation and energy) from climate change effects and the risk of cascading infrastructure failures;
- risk to agriculture due to increased temperature extremes, changing precipitation patterns, and changing distribution and incidence of pests and diseases for crops and livestock; and
- risks to human health and wellbeing due to increased heat events, water excess or shortage, and other extreme weather events.

Currently, there is no standard methodology to determine how a project's relatively small incremental contribution to GHGs will translate into physical effects on the global environment. GHGs will be emitted during construction of the Project through the use of diesel and gasoline-fired construction equipment and worker vehicles. There will be sources of combustion emissions associated with the operation of the Project, and there will be emissions of CH_4 and CO_2 as a result of component leaks and occasional blowdown events or pigging operations. Emissions of GHGs during construction and operation of the Project will cause an incremental increase to the existing inventory of GHG emissions; however, the significance of the incremental increase is unknown.

In addition, the downstream end use of transported natural gas would result in GHG emissions. The Project will help satisfy natural gas demand in the midcontinent region of the United States, but the ultimate end use is not known as the gas will be directed to other pipeline systems. The gas could be used to replace existing gas sources, replace higher carbon sources such as oil and coal, be used as an industrial feedstock, or be directed to a liquefied natural gas facility and shipped overseas. Additionally, the Project will result in reductions of GHG emissions associated with the capture and efficient transport and burning of refined gas that is typically vented/flared at the production fields. Accordingly, it is not a given that the Project's increase in transportation capacity will result in a proportional increase in end-use GHG emissions. As the ultimate end use of the gas transmitted is not known and is not causally related to the proposed action, no downstream emissions are considered as part of this assessment.

9.3.2 Noise

As discussed in section 1.10 of Resource Report 1, the geographic scope for cumulative noise analysis is 0.25 mile for daytime construction and 0.5 mile for nighttime or 24-hour construction because areas in the immediate proximity of construction activities have the potential to be affected by construction noise. The geographic scope for cumulative operational noise impacts is areas within 1 mile of an aboveground facility because noise from the Project's permanent facilities is not anticipated to have an impact beyond 1 mile.

It is expected that the Project will have new permanent impacts on noise quality due to the installation and operation of the compressor stations. There will also be temporary noise impacts due to sound emissions from mobile sources and construction equipment during the construction period. These impacts will be minimized to the extent possible by complying with federal and local noise standards.

9.3.2.1 Construction Noise Impacts

There are five RFFAs within the geographic and temporal scope of the Project that may cumulatively affect noise during construction: Aurora Wind Electric Transmission Line, Cenex Pipeline, Western Area Water Supply Project, Pine Ridge Development, and a new elementary school in Watford City.

While increases over existing ambient sound levels may occur at nearby NSAs, noise generated by pipeline construction will be short term and transient, lasting for short durations at any nearby NSAs. Additionally, it is unlikely that simultaneous construction of all RFFA projects will occur at any given location along the proposed Project areas. No significant or long-term cumulative construction noise impacts are therefore expected to occur.

9.3.2.2 Operational Noise Impacts

No RFFAs were identified within 1 mile of the aboveground facilities for the proposed Project. Noise generated by past and present actions is part of the measured ambient noise levels, and have therefore already been taken into account.

9.4 REFERENCES

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NORTH BAKKEN EXPANSION PROJECT

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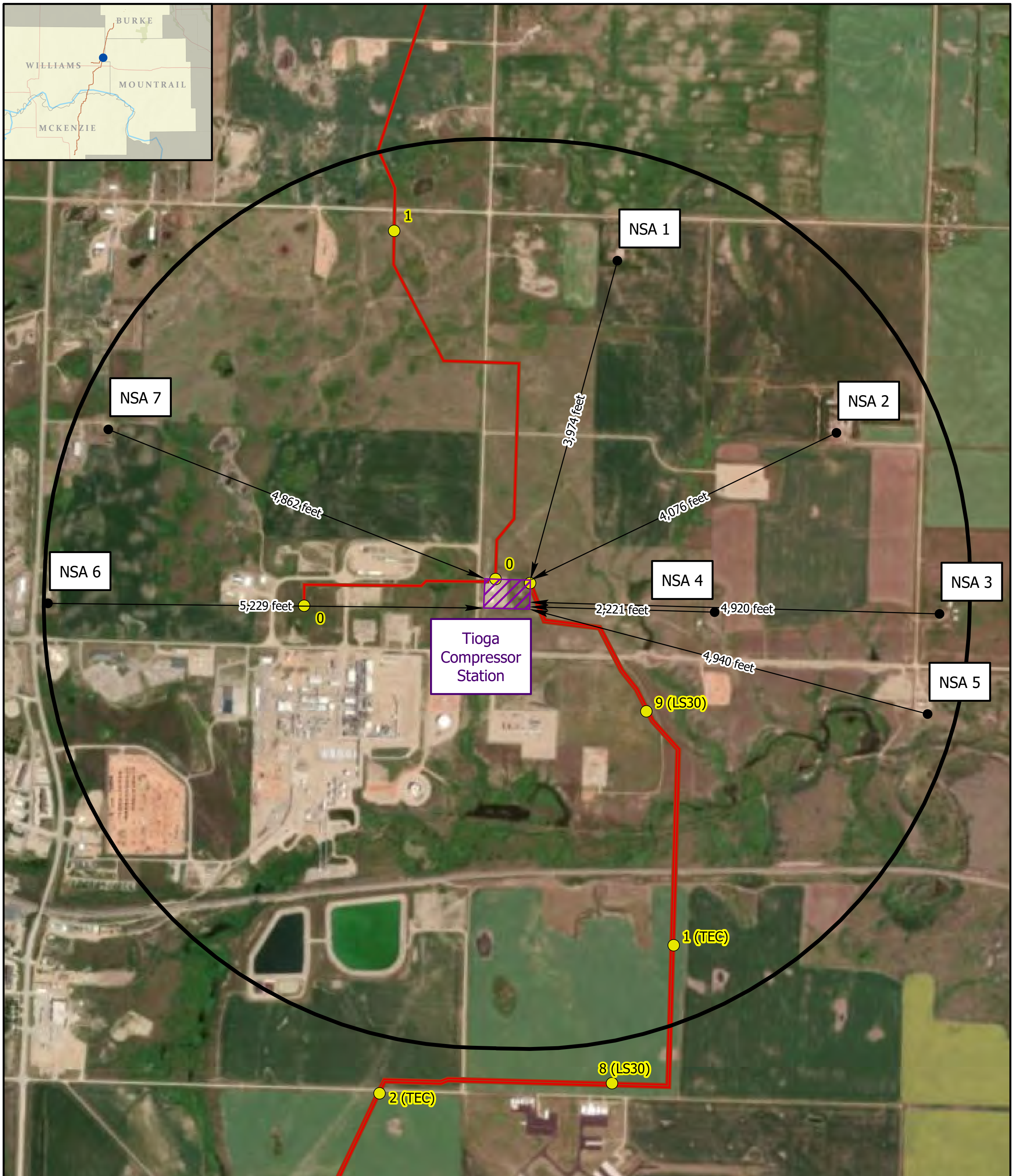
APPENDIX 9A
FIGURES



Milepost
NSA Point
NSA Radius
Preliminary Route
Aboveground Facility

N

0.15 0.07 0 0.15
Miles

9.2.3-1
NSAs within 1.0 mile of Tioga Compressor Station North Bakken Expansion Project
Williams County, North Dakota

WBI ENERGY TRANSMISSION

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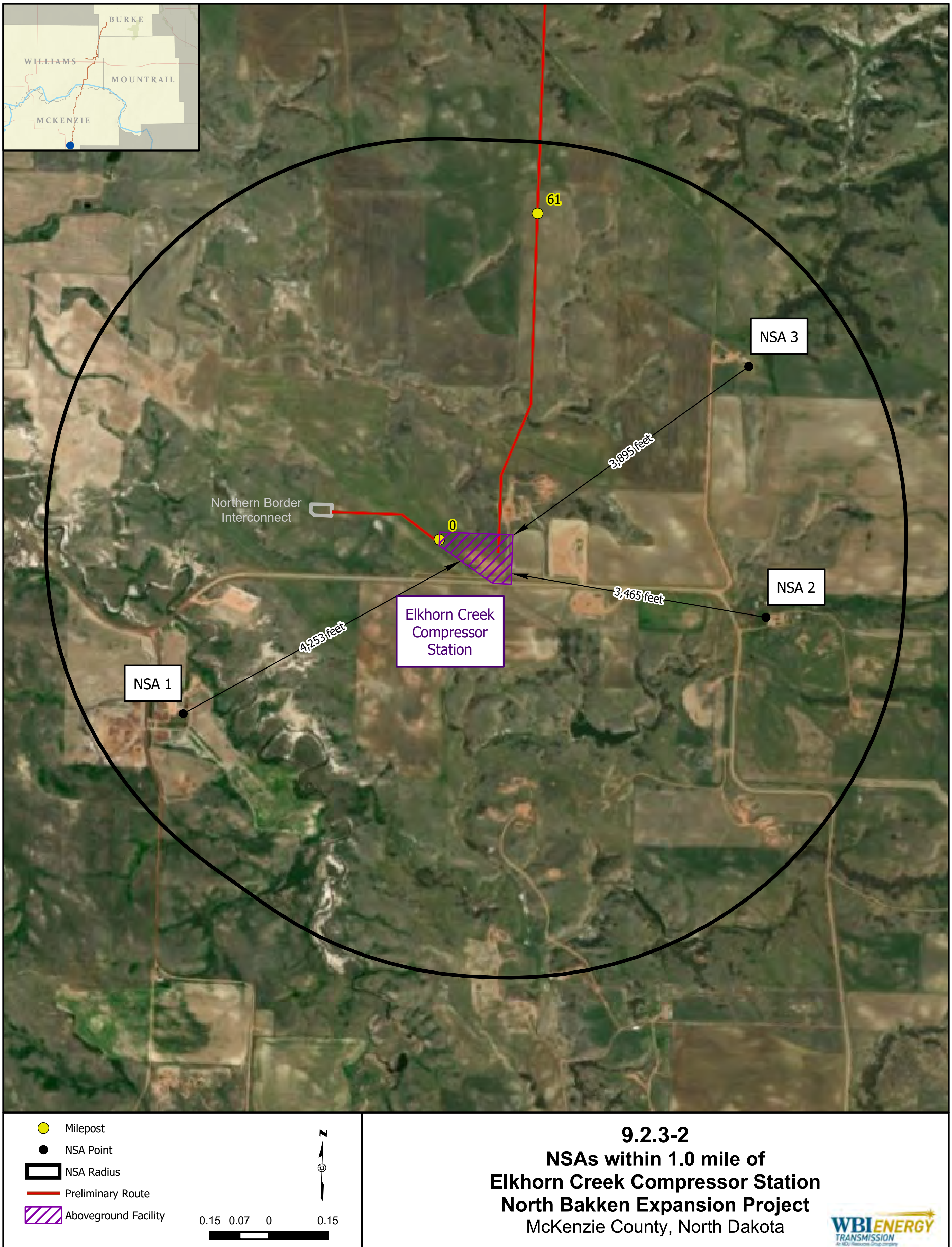

9.2.3-2
NSAs within 1.0 mile of
Elkhorn Creek Compressor Station
North Bakken Expansion Project
McKenzie County, North Dakota

WBI ENERGY TRANSMISSION

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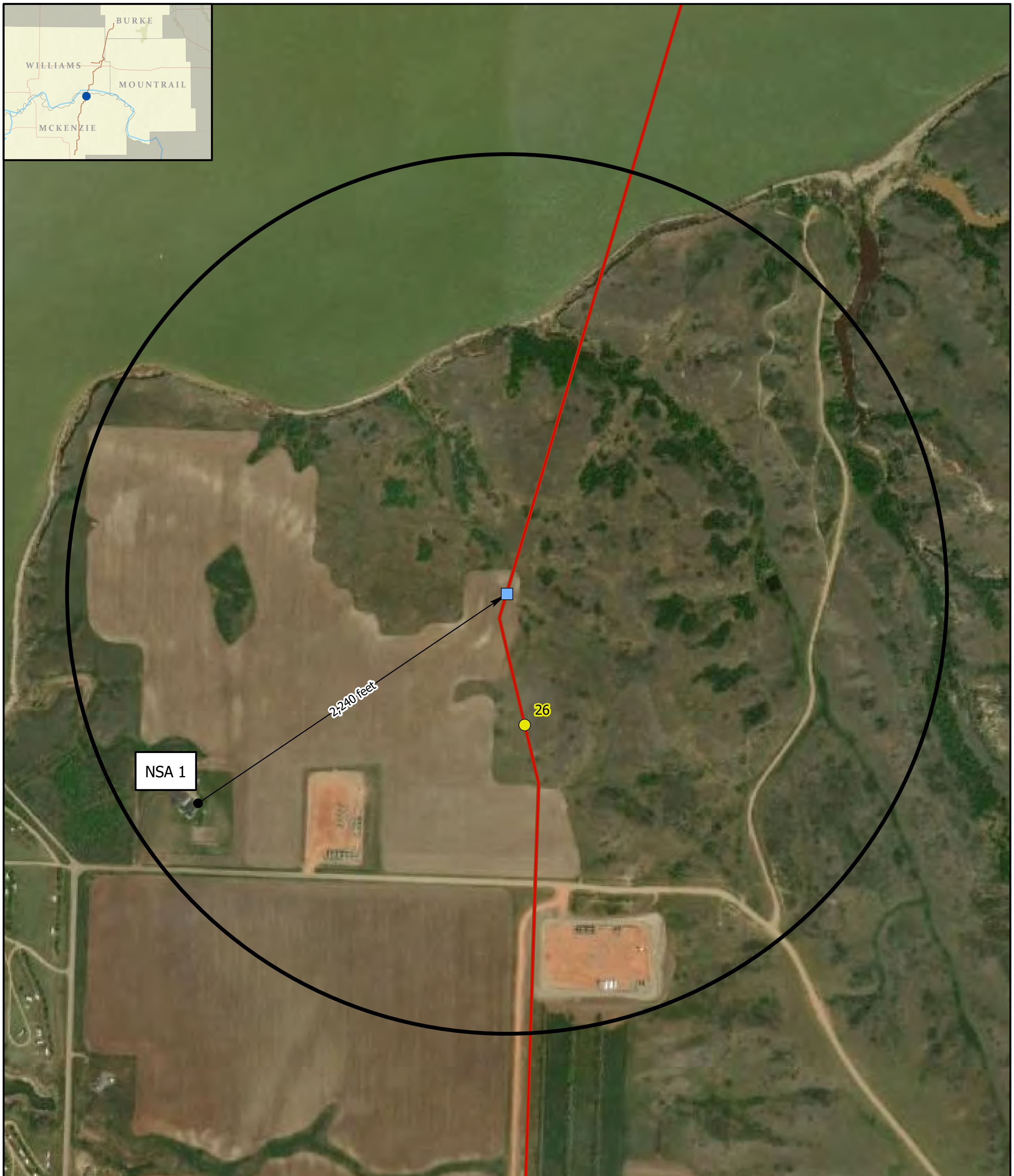

HDD Site
Milepost
NSA Point
NSA Radius
Preliminary Route
Aboveground Facility

0.07 0.04 0 0.07
Miles

9.2.3-3
NSAs within 0.5 mile of
Lake Sakakawea HDD – South Side
North Bakken Expansion Project
McKenzie County, North Dakota

WBI ENERGY TRANSMISSION

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9.2.3-4
NSAs within 0.5 mile of Lake Sakakawea HDD – North Side North Bakken Expansion Project
Williams County, North Dakota

WBI ENERGY TRANSMISSION

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Milepost
NSA Radius
Preliminary Route
Aboveground Facility

0.07 0.04 0 0.07
Miles

9.2.3-5
NSAs within 0.5 mile of
Tioga Plant Receipt Station
North Bakken Expansion Project
Williams County, North Dakota

WBI ENERGY TRANSMISSION

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NSA Radius
Aboveground Facility

0.07 0.04 0 0.07
Miles

9.2.3-6
NSAs within 0.5 mile of
Springbrook Plant Receipt Station
North Bakken Expansion Project
Williams County, North Dakota

WBI ENERGY TRANSMISSION

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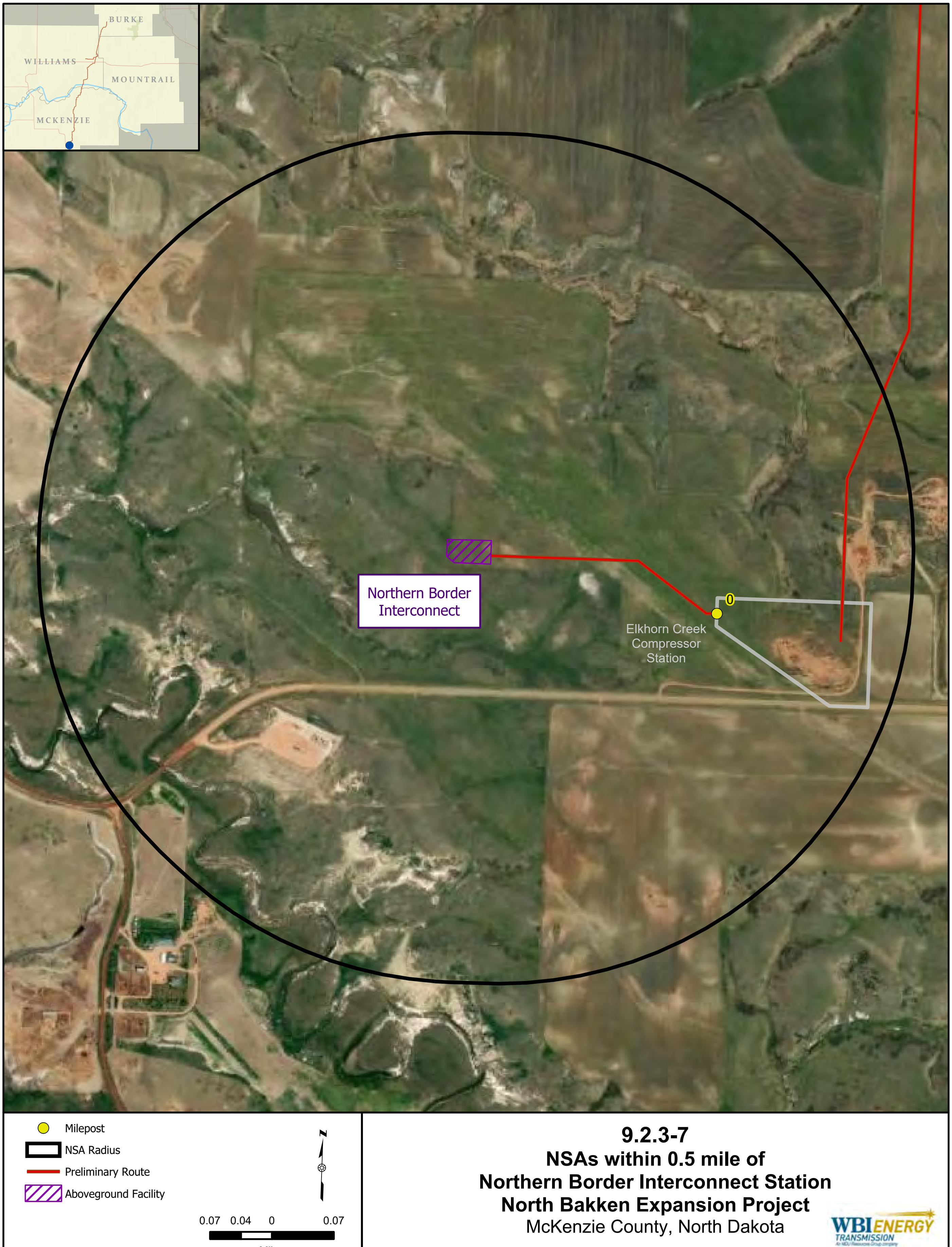

9.2.3-7
NSAs within 0.5 mile of
Northern Border Interconnect Station
North Bakken Expansion Project
McKenzie County, North Dakota

WBI ENERGY TRANSMISSION

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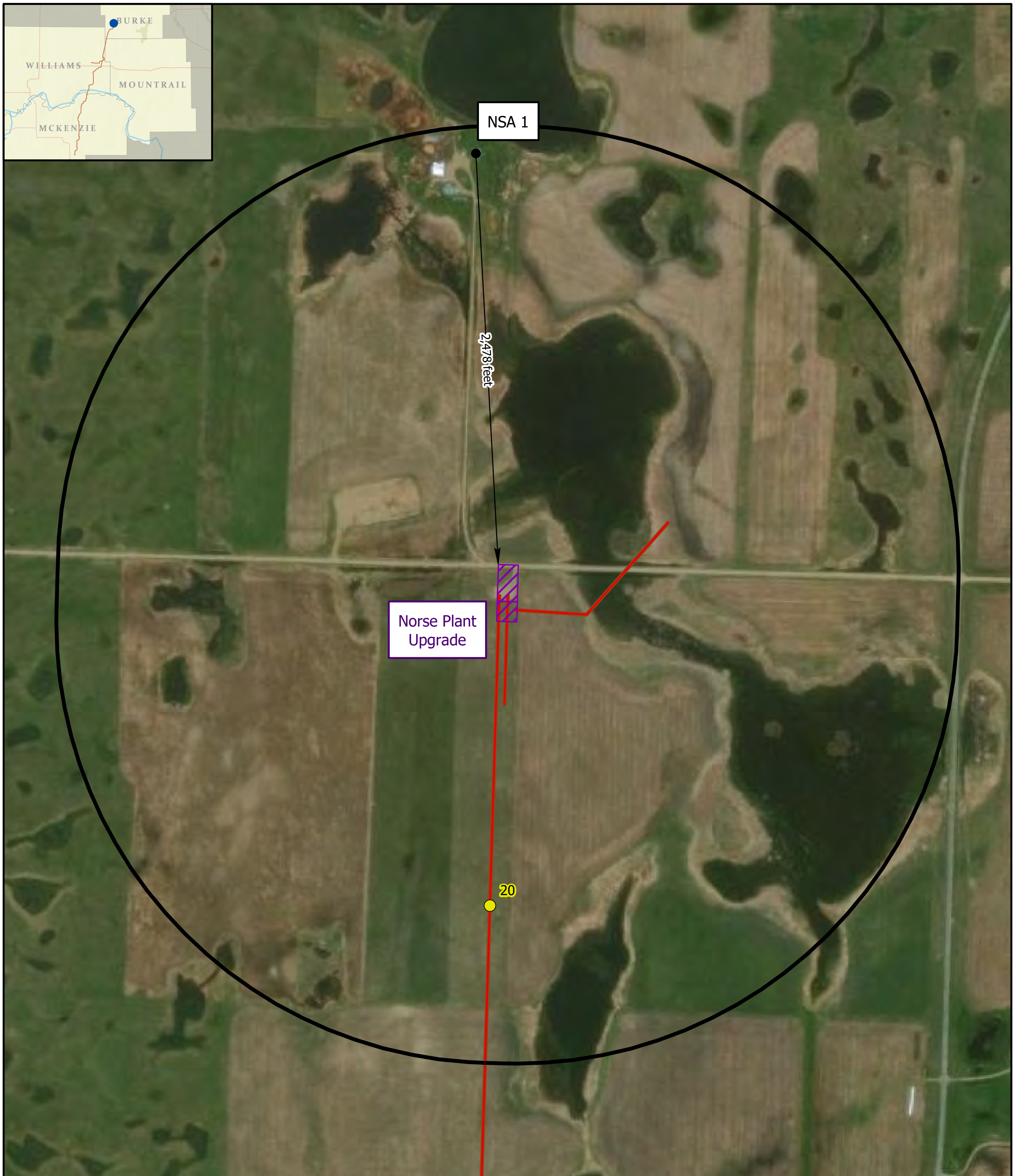

Milepost
NSA Point
NSA Radius
Preliminary Route
Aboveground Facility

0.07 0.04 0 0.07
Miles

9.2.3-8
NSAs within 0.5 mile of
Norse Plant and Transfer Station
North Bakken Expansion Project
Burke County, North Dakota

File: M:\Clients\V-X\WBI\North_Bakken_Expansion_ArcGIS\FERC_ResourceReportMaps_FERC_RR_FERC_RR.aprx | Revised: 1/15/2020 | Scale 1:10,000

Drawn By: RJC

9.2.3-9
NSAs within 0.5 mile of
Lignite Plant Receipt Station and Lignite Town Border Station
North Bakken Expansion Project
Burke County, North Dakota

WBI ENERGY TRANSMISSION

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9.2.3-10
NSAs within 0.5 mile of
Robinson Lake Plant Receipt Station
North Bakken Expansion Project
Mountrail County, North Dakota

WBI ENERGY TRANSMISSION

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NORTH BAKKEN EXPANSION PROJECT

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APPENDIX 9B
AIR PERMIT TO CONSTRUCT APPLICATIONS

WBI Energy Transmission

Williams County, North Dakota

Application for
Permit to Construct
Tioga Compressor Station

Prepared for:

WBI Energy Transmission
2010 Montana Avenue
Glendive, MT 59330

Prepared by:

ERM
1000 IDS Center
80 South Eighth Street
Minneapolis, MN 55402

February 2020

WBI Energy Transmission
Application for Permit to Construct
Tioga Compressor Station

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1.0 INTRODUCTION

WBI Energy Transmission (WBI) is proposing to add additional compression capacity to the existing Tioga Compressor Station in order to support the North Bakken Expansion Project (or Project), which includes the construction of an approximately 62-mile-long, 24-inch-diameter natural gas pipeline from WBI Energy's existing Tioga Compressor Station near Tioga, North Dakota, to a new interconnect with Northern Border Pipeline Company's mainline southeast of Watford City, North Dakota. The existing compression is electrical driven and the proposed compression will be driven by natural gas-fired engines. A site location map is located in Appendix A.

The existing Tioga Compressor Station was determined by the North Dakota Department of Environmental Quality (NDDEQ) to be a facility of minor significance for air pollution and a Permit to Construct was not required per Subdivision 33.1-15-14-02 of the North Dakota Air Pollution Control Rules. The review by the Department was summarized in a letter dated August 5, 2016 to WBI Energy. The existing Tioga Compressor Station is comprised of one electric driven natural gas compressor, one small natural gas-fired boiler (0.78 MMBtu/hour) for comfort heating, and a few natural gas-fired space heaters also for comfort heating. Fugitive emissions from leaking components (0.15 tons of VOC) are also associated with the existing Tioga Compressor Station.

The proposed expansion to the Tioga Compressor Station will involve the installation of the following equipment:

- Six (6) Caterpillar 3612 natural gas-fired engines [3,750 horsepower (hp)], each coupled to a KBZ-4 compressor unit;
- one (1) Waukesha natural gas-fired generator (1,380 hp);
- comfort heating: two Weil-McLain LGB-10 (2.47 MMBtu/hr) and one Unit Heater (0.25);
- one (1) pig launcher and receiver;
- one (1) underground 3,000 gallon pipeline liquids storage tank;
- one (1) underground 3,000 gallon waste oil storage tank; and
- one (1) underground 3,000 gallon floor drain tank to collect wastewater.

The expansion of the Tioga Compressor Station will require a permit to construct and subsequently a Title V permit to operate from the NDDEQ. Under North Dakota Administrative Code (NDAQ) 33.1-15-14-02.13, the tanks and the comfort heating unit are exempt from permitting requirements. Other sources of emissions at the compressor station will be blowdown activities and fugitive emissions from leaking components. Pigging activities for pipeline maintenance occur on a 5 to 10 year cycle depending on the pipeline undergoing maintenance. Detailed emission calculations, including emissions from sources exempt from permitting are attached in Appendix B.

1.1 Change in Potential Emissions

Table 1.1-1 summarizes the potential emissions as the facility is currently permitted and the proposed potential emissions after the permit amendment.

Annual operational emissions from the Tioga Compressor Station expansion are listed in Table 1.1-1. Pigging of the pipeline will only occur every 5 to 10 years depending on the line, but pigging emissions are reported as annual as if all pigging occurs in the same year.

TABLE 1.1-1

Tioga Compressor Station Emission Calculation Results

Emission Unit	NO_X (TPY)	CO (TPY)	VOC (TPY)	$PM_{10}/PM_{2.5}$ (TPY)	SO_2 (TPY)	CO_2e (TPY)	Formaldehyde [a](TPY)	Total HAPs (TPY)
Caterpillar 3612 Engine [b]	36.21	18.11	18.11	1.23/1.23	0.07	16,961	1.45	3.83
Caterpillar 3612 Engine [b]	36.21	18.11	18.11	1.23/1.23	0.07	16,961	1.45	3.83
Caterpillar 3612 Engine [b]	36.21	18.11	18.11	1.23/1.23	0.07	16,961	1.45	3.83
Caterpillar 3612 Engine [b]	36.21	18.11	18.11	1.23/1.23	0.07	16,961	1.45	3.83
Caterpillar 3612 Engine [b]	36.21	18.11	18.11	1.23/1.23	0.07	16,961	1.45	3.83
Caterpillar 3612 Engine [b]	36.21	18.11	18.11	1.23/1.23	0.07	16,961	1.45	3.83
Waukesha Generator	13.33	26.65	9.33	1.02	0.03	6,136	0.13	0.76
Comfort Heating[c]	2.23	1.87	0.12	0.17	0.01	2,661	0.07	0.08
Pipeline Liquids Tank	N/A	N/A	0.0058	N/A	N/A	N/A	N/A	N/A
Wastewater Tank	N/A	N/A	0.0058	N/A	N/A	N/A	N/A	N/A
Waste Oil Tank	N/A	N/A	0.00	N/A	N/A	N/A	N/A	N/A
Equipment Leaks (fugitive)	N/A	N/A	0.83	N/A	N/A	203	N/A	N/A
Pig Launching & Receiving	N/A	N/A	24.22	N/A	N/A	4,648	N/A	N/A
Blowdowns [d]	N/A	N/A	7.90	N/A	N/A	1,931	N/A	
TOTAL PTE [e]	**232.82**	**137.15**	**150.22**	**8.55**	**0.48**	**117,143**	**8.82**	**23.97**
Title V Threshold	**100**	**100**	**100**	**100**	**100**	**N/A**	**10**	**25**
PSD Major Source Threshold [f]	**250**	**250**	**250**	**250**	**250**	**100,000**	**N/A**	**N/A**

N/A = not applicable; TBD = to be determined

[a] Largest single HAP is methanol from the engine generator but formaldehyde is listed in the table because it is the largest single HAP at the compressor station.

[b] Caterpillar Engines are equipped with oxidation catalysts for reducing emissions of NMNEHC (VOC), CO, and formaldehyde.

[c] comfort heating includes: two Weil-McLain LGB-10 (2.47 MMBtu/hr) and one Unit Heater (0.25 MMBtu/hr)

[d] This includes emissions from commissioning of the station prior to commercial operation. The commission blowdown will not be part of annual ongoing emissions. The standard cubic feet (scf) from commissioning and startup is estimated at 448,000 scf and annual operation will be 1,428,000 scf.

[e] Excludes fugitive emissions (equipment leaks) as compressor stations are not one of the 28 listed source categories. The above table includes these sources but they are not included in the Total PTE because they are not to be compared to permitting thresholds.

[f] PSD for CO_2e would only be triggered if the compressor station was an “anyway source” which means triggering PSD for one of the other regulated PSD pollutants. The compressor station is below the PSD threshold for CO_2e. Even if CO_2e was above the threshold, PSD would not be triggered because none of the other pollutants exceed the PSD threshold.

TABLE 1.1-1

Tioga Compressor Station Emission Calculation Results

Emission Unit	NO_X (TPY)	CO (TPY)	VOC (TPY)	$PM_{10}/PM_{2.5}$ (TPY)	SO_2 (TPY)	CO_2e (TPY)	Formaldehyde [a](TPY)	Total HAPs (TPY)

Note: Short tons (2,000 lbs), not long or metric tons, are used in PSD applicability calculations. Metric tons are used in the GHG reporting rule.

TPY	tons per year
NO_X	nitrogen oxide
CO	carbon monoxide
VOC	volatile organic compound
PM	particulate matter
PM_{10}	particulate matter less than or equal to 10 microns in aerodynamic diameter
$PM_{2.5}$	particulate matter less than or equal to 2.5 microns in aerodynamic diameter
SO_2	sulfur dioxide
Pb	lead
CO_2e	carbon dioxide equivalent
HAP	hazardous air pollutant
PTE	potential to emit

1.2 Permit to Construct Application

The detailed emission calculations are included in Appendix B. The required permit to construct application forms are included in Appendix C. The forms completed for this application include: SFN 8516, seven (7) individual SFN8891, seven (7) individual SFN 8532, and seven (7) individual SFN 8329. No permit forms are included for the small storage tanks or boiler as these are exempt per North Dakota Administrative Code (NDAQ) 33.1-15-14-02.13. No permit form was included for the pig launch/receiving, as it did not seem to fit any obvious form/format. It should be noted that the total facility emissions shown on Form SFN 8516 are inclusive of the compressor engine as well as the tanks, blowdown and pig launch/receiving.

The manufacturer specifications for the natural gas-fired engine and the engine generator are included in Appendix D. The air toxics review completed for this project, in accordance with the Policy for the Control of Hazardous Air Pollutant Emissions in North Dakota (Air Toxics Policy) was performed using the American Meteorological Society/ Environmental Protection Agency Regulatory Model (AERMOD), version 19191. AERMOD is a US Environmental Protection Agency (EPA)-approved, steady state Gaussian plume model approved for industrial sources. The electronic modeling archive, which contains all files associated with the air dispersion modeling analysis completed for the Tioga Compressor Station, will be provided to the NDDEQ in electronic format upon request.

2.0 REGULATORY APPLICABILITY

The Project was reviewed for the applicability of Federal and State level requirements for sources of air emissions. The analysis is presented in the sections that follow.

2.1 Federal Requirements

The CAA of 1970, as amended in 1977 and 1990, is the basic federal statute governing air quality. The provisions of the CAA that are potentially applicable to construction and operation of the Project are:

- Prevention of Significant Deterioration (PSD)/Non-Attainment New Source Review (NNSR);
- Federal Class I Area Protection;
- New Source Performance Standards (NSPS);
- National Emission Standards for Hazardous Air Pollutants (NESHAP); and
- State Regulations.

The following is a brief description of these regulations and their requirements.

Prevention of Significant Deterioration/Non-Attainment New Source Review

The CAA requires any new major stationary source of air pollution, or existing source proposing major modification, to obtain an air pollution permit before commencing construction. Air construction permits for major sources or modifications in an attainment areas are issued under the PSD regulations, whereas air construction permits for sources in a nonattainment area are issued under the NNSR program. The entire program, including both PSD and NNSR permitting, is referred to as the New Source Review program.

Title I of the CAA establishes guidelines for the preconstruction/modification review of large air emission sources. Construction of sources in attainment areas must be reviewed in accordance with the PSD regulations. To be classified as a new major PSD source, the potential emissions from the source must either be greater than 100 tons per year (tpy) for any pollutant regulated by the EPA under the CAA for sources that are among the 28 source categories listed in section 169 of the CAA, or greater than 250 tpy for sources that are not among the 28 source categories. Additionally, greenhouse gas (GHG) emissions of 100,000 tpy also trigger PSD review. Best Available Control Technology analyses and detailed dispersion modeling are required if a new source is classified as a major PSD source.

Natural gas compressor stations are not identified in the list of 28 source categories in section 169 of the CAA; therefore, the applicability threshold for PSD review for the proposed compressor stations is 250 tpy. Fugitive emissions, such as component leaks and pipeline venting for maintenance, do not count toward the PSD threshold because the compressor stations are not considered one of the 28 sources categories. Listed sources are required to consider fugitive emissions to evaluate PSD applicability. The primary fugitive emissions at the compressor stations are methane (CH_4) and GHG.

The EPA's May 13, 2010 GHG Tailoring Rule is intended to limit the number of affected sources that account for an estimated 70 percent of GHG emissions from stationary sources while shielding smaller sources such as apartment buildings and schools. As of July 1, 2011, a new industrial facility that is a major source for at least one non-GHG pollutant and will emit or has the potential to emit at least 75,000 tpy of carbon dioxide equivalents (CO_2e) is subject to PSD. Alternatively, a new industrial facility that has the potential to emit 100,000 tpy of CO_2e and will exceed the applicable major source regulation on a mass basis for GHGs will be subject to PSD. In addition, PSD for CO_2e would only be triggered if the compressor stations were "anyway sources" which means triggering PSD for one of the other regulated PSD pollutants. Although compressor station is above the PSD threshold for CO_2e (100,000 tpy), PSD would not be triggered if none of the other pollutants exceed the PSD threshold.

The existing Tioga Compressor Station is not subject to PSD. Applicability of the PSD rule was determined for the proposed expansion of the Tioga Compressor but emissions will not exceed 250 tpy for any criteria air pollutant.

Modification and operation of the Tioga Compressor Station will not trigger PSD requirements.

New Source Performance Standards

The NSPS, codified in 40 CFR 60, establishes pollutant emissions limits and monitoring, reporting, and recordkeeping requirements for various emissions sources based on source type and size. The NSPS apply to new, modified, or reconstructed sources. The potentially applicable NSPS are described below, subparts that do not apply to the Project are not listed below.

NSPS subpart JJJJ applies to all new stationary spark ignition internal combustion engines. The Tioga Compressor Station will be installing six 3,750 horsepower (hp) spark ignition internal combustion engines to drive compressors and one 1,380 hp natural gas-fired generator. The new spark ignition natural gas-fired engine will meet emission standards for NO_x, CO, and VOC. The engines and generator to be purchased by WBI Energy will be certified to meet the requirements of this NSPS. Subpart JJJJ requirements will be included in the applicable state air quality permits.

NSPS Subpart OOOO applies to onshore affected facilities including natural gas wells, centrifugal compressors, reciprocating compressors, pneumatic controllers, storage vessels, equipment within process units, and sweetening units. Subpart OOOO only regulates equipment between the wellhead and point of custody transfer to the natural gas transmission and storage segment. Compressors that are associated with natural gas transmission are not subject to Subpart OOOO. This subpart does not apply to the Project.

EPA amended Subpart OOOO to add new regulations affecting CH_4 and VOC emissions. The amended subpart is codified as subpart OOOOa. WBI Energy will meet the requirements of Subpart OOOOa for the Project. Affected sources operated by WBI Energy are fugitive emissions from the compressor station and the reciprocating compressor.

National Emission Standards for Hazardous Air Pollutants

The NESHAPs, codified in 40 CFR Parts 61 and 63, regulate hazardous air pollutants (HAP) emissions. Part 61, which was promulgated prior to the 1990 CAA Amendments (CAAA), regulates only eight types of hazardous substances: asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic, mercury, radionuclides, and vinyl chloride. The 1990 CAAA established a list of 189 HAPs, resulting in the promulgation of Part 63. This part, also known as the Maximum Achievable Control Technology standards, regulates HAP emissions from major sources of HAP emissions and specific source categories of non-major (area) sources that emit HAPs. Part 63 defines a major source of HAPs as any source that has the potential to emit 10 tpy of any single HAP or 25 tpy of HAPs in aggregate.

The compressor station is not a major source of HAPs since the potential emissions of HAPs will be less than the major source thresholds. The NESHAP subpart ZZZZ for reciprocating internal combustion engines will apply to the engines at the compressor station but for area sources of HAPs, compliance with Subpart ZZZZ is demonstrated by complying with NSPS Subpart JJJJ.

The compressor station will have two small natural gas-fired boilers that will be used for comfort heating. These boilers will be subject to the area source boiler NESHAP subpart JJJJJJ. However, the subpart provides an exemption for boilers only firing natural gas.

Title V Operating Permits

Title V of the 1990 CAA required states to establish an air operating permit program in an effort to standardize air quality permits across the United States. The requirements of Title V are outlined in 40 CFR 70, and the permits required by these regulations are often referred to as Part 70 or Title V permits. North Dakota has promulgated these requirements under North Dakota Administrative Code (NDAC) 33.1-15-14-06 "Title V Permit to Operate."

If a facility's potential to emit exceeds the criteria pollutant or HAP thresholds, the facility is considered a major source. The Title V major source threshold level for an air emission source is 100 tpy for criteria pollutants. The major source HAP thresholds for a source are 10 tpy of any single HAP or 25 tpy of all HAPs in aggregate.

The Tioga Compressor will have emissions above major source thresholds and will be required to obtain a Title V permit for operations.

2.2 State Regulations

North Dakota air emissions are regulated by the NDDEQ Division of Air Quality, also referred to as the Department, under NDAC 33-15. Listed below are the applicable air quality regulations from the NDAC that apply to the Project as well as required air impact reviews (dispersion modeling).

Applicable North Dakota Air Quality Regulations

NDAC 33.1-15-01 sets the general provisions pertaining to all state level regulations including definitions of terms used by the regulations.

NDAC 33-15-02 establishes ambient air quality standards (AAQS) which are identical to the National Ambient Air Quality Standards (NAAQS) promulgated by the EPA, with the exception of an additional state standard for hydrogen sulfide (H_2S). Emissions of H_2S for the Tioga Compressor Station are negligible.

NDAC 33.1-15-03 restricts emission of visible air contaminants. This regulation applies to both point sources and fugitive sources of visible emissions. WBI will maintain equipment to not exceed opacity standards and perform construction to minimize dust.

NDAC 33.1-15-04 establishes restrictions on open burning. No open burning is planned; however if the need arises, WBI will follow all requirements stipulated in 33.1-15-04 for permissible open burning.

NDAC 33.1-15-05 addresses emission requirements of PM from industrial processes. Emissions of PM during operations of the Project would not exceed any of the emission limitations set forth in NDAC 33.1-15-05 table 3.

NDAC 33.1-15-07-01 & 02 addresses emission requirements for VOC. Per 33.1-15-07-01, all pumps and compressors that handle VOC material will be equipped and operated with properly maintain seals designed for their specific service and operating conditions. Per 33.1-15.07-02 no person is allowed to emit organic compound gases and vapors, except from an emergency vapor blowdown system or emergency relief system, unless these gases and vapors are burned by flares, or an equally effective control device as approved by the Department. Minor sources, as determined by the department and not subject to NSPS, may be granted exemptions to this subsection. If required, each flare is required to be equipped and operated with an automatic igniter or a continuous burning pilot.

NDAC 33.1-15-08 addresses operation and control of internal combustion engines. WBI Energy will comply with the requirements of NDAC 33-15-08-1 and 33-15-08-02 by operating internal combustion engines and exhaust emission control devices in a reasonable and appropriate manner according to manufacturer specifications.

NDAC 33.1-15-17 restricts fugitive emissions from any source, including emissions of particulate (dust) and various gaseous emissions including those subject to an AAQS or PSD increment, an odorous substance, or those subject to the restrictions of a visible air contaminant. WBI Energy will comply with the applicable requirements of this regulation during construction and operation of the Project. Information regarding specific techniques for the control of fugitive dust during construction is included in the Project's *Fugitive Dust Control Plan* (see appendix 1F).

NDAC 33.1-15-22 address emission standards for HAPs. Emission standards for this chapter are the federal NESHAPs incorporated by reference. WBI Energy will comply with NDAC 33.1-15-22 by complying with the federal NESHAPs which were previously addressed in this document.

2.3 North Dakota Dispersion Modeling

In North Dakota, air dispersion modeling is required to obtain a permit to construct for compressor engines pursuant to a Department January 23, 2015 memorandum unless all of the following certain conditions are met.

- Emissions from all compressor engines are controlled with a catalytic emission control system (or an equivalent control technology which is designed to reduce non-methane hydrocarbons emissions by at least 50 percent.
- Emissions from all compressor engines at the facility are vented from a stack height which is greater than or equal to 1.5 times the nearest building height.

- If the facility is located less than 1/4 mile from a residence: combined air toxics emissions from the entire facility are less than 10 tpy, benzene emissions are less than 2 tpy, and formaldehyde emissions are less than 2 tpy. If the facility is located at least 1/4 mile from a residence: combined air toxics emissions from the entire facility are less than 10 tons per year, benzene emissions are less than 3 tpy, and formaldehyde emissions are less than 3 tpy.

The compressor engines at the Tioga Compressor Station are equipped with an oxidation catalyst that reduces non-methane hydrocarbon emission by at least 50 percent. The nearest building peak roof height is 32.5 feet and the compressor stack is at a height of 43 feet from ground level (less than 1.5 times the nearest building height). The emissions for criteria pollutants are above the thresholds for sources that contain stacks with heights less than 1.5 times the nearest building height. The nearest residence is approximately 0.42 miles east of the facility, which is further than a quarter mile away. The HAP emissions at the facility are above the modeling thresholds. Air dispersion modeling is required for NO_2 per the NDDEQ publication *Criteria Pollutant Modeling Requirements for a Permit to Construct* published on October 6, 2014. Air dispersion modeling is required for HAP emissions per the NDDEQ publication *Dispersion Modeling Requirements – Compressor Engines and Glycol Dehydration Units*, published on January 23, 2015.

Through conversations with NDDEQ, it was determined that only 1-hour NO_2 would require criteria pollutant air dispersion modeling. According to the NDDEQ *Criteria Pollutant Modeling Requirements for a Permit to Construct* memo published on October 6, 2014, the potential emissions from the facility for CO, PM_{10}, $PM_{2.5}$, and SO_2 were below the significant levels for projects not subject to PSD, and therefore no modeling was required for these pollutants.

Description of the Air Quality Dispersion Model

The modeling was performed using AERMOD, version 19191. AERMOD is a US EPA-approved, steady state Gaussian plume model approved for industrial sources and capable of modeling multiple sources in simple and complex terrain. Regulatory default options were used in the analysis.

Receptor Grid

To ensure that the area of maximum effects was accurately sampled, a multi-tier receptor grid extending out to 50 kilometers (km) was used in the model. The configuration of receptor points was as follows:

- 25-meter (m) spacing along the facility fence/property line;
- 50-m spacing from the fence/property line to 500 m;
- 100-m spacing from 500 m to 2 km;
- 250-m spacing from 2 km to 5 km; and
- 500-m spacing from 5 km to 50km.

Public access at the facility will be impeded by fencing and gates.

Terrain

Terrain heights were generated using publicly available ground elevation data from the United States Geological Survey (USGS) National Elevation Data set (USGS 2017). The USGS terrain data selected has 1/3 arcsecond (10-meter) grid spacing to provide sufficient spatial resolution of terrain features. These data were processed for use in AERMOD using the AERMAP (version 18081) processor program. To process the data, a selection of rural or urban land use is required. Urban land use, in the context of the AERMAP analysis, is applicable to city centers and industrial areas that are characterized by multi-story buildings and large areas of land covered with impermeable surfaces such as concrete or asphalt. Rural land use is appropriate for areas ranging from suburban areas predominantly characterized by single family homes, moderately populated rural residential areas, and other areas with land use areas with a mix of vegetative cover and moderate development. Rural land use was selected due to Tioga Compressor Station's location in an area that fits the rural land use definition; the station will not be located in an urban population center.

Meteorology

EPA air quality modeling guidance recommends the use of one year of onsite meteorological data or five years of representative off-site data. Since onsite data were not available for the Station, meteorological data from the National Weather Service was used in this analysis.

The AERMOD-ready meteorological data sets were developed by using the surface hourly observations from Williston Airport, North Dakota (KISN, WBAN: 94014), along with concurrent twice-daily radiosonde observations from Glasgow Airport, Montana (MT) (GGW, WBAN 94008) for the years 2009-2013. NDDEQ provides the pre-processed data for these years on their website.

Surface Data

Williston Airport is located at latitude 48.195º N, longitude 103.642º W, and elevation 580.6 meters above mean sea level. The station was commissioned as an Automated Surface Observing System (ASOS) station on April 1, 1996. The anemometer height is 10 meters above ground level. The 2009-2013 surface data KISN were provided by NDDEQ. The data is archived in Central Standard Time (GMT-6).

Data for the entire modeling period (43,484 hours) was processed with AERMET stage 1 to assess the data coverage for the following meteorological variable:

Cloud cover	99.95%
Temperature	99.69%
Winds	99.30% (without sub-hourly winds)
Calm	16.81% (without sub-hourly winds)

To improve the wind observation coverage and better resolve the light wind conditions, 1- and 5-minute wind observations were included into the data processing stream in AERMET – stage 2. The 1-minute observations for use with AERMINUTE are provided by NCEI[1] and represent the 2-minute averages of 6-second observations assigned to the ending minute. Five-minute wind observations were added to complete the sub-hourly data set, specifically needed in for the months June to December 2013. KISN was equipped with a sonic anemometer on April 1, 2007, therefore the sub-hourly wind observations were fully incorporated in the entire modeling period.

1 ftp://ftp.ncdc.noaa.gov/pub/data/asos-onemin/, ftp://ftp.ncdc.noaa.gov/pub/data/asos-fivemin/

After incorporating the sub-hourly wind observations the wind data coverage increased to 99.93 percent and the fraction of calm hours decreased to 1.75 percent.

Upper Air Data

Twice-daily upper air observations from Glasgow, MT airport were provided by NDDEQ in FSL format. The GGW station is located at 48.214º N, 106.621º W and identified with WBAN 94008.

The data was processed with a time shift of 6 hours to match the time zone of the surface station (GMT-6). AERMET Data coverage by atmospheric level is listed in Table 2.3-1.

TABLE 2.3-1

AERMET Data Coverage

Atmospheric Level (km)	Temperature Coverage (%)	Wind Coverage (%)
SURFACE	99.51%	95.16%
0.0 – 0.5 km	99.93%	22.98%
0.5 – 1.0 km	100.00%	40.28%
1.0 – 1.5 km	100.00%	0.00%
1.5 – 2.0 km	100.00%	0.00%
2.0 – 2.5 km	100.00%	38.70%
2.5 – 3.0 km	99.98%	0.61%
3.0 – 3.5 km	99.91%	0.00%
3.5 – 4.0 km	99.70%	0.00%
> 4.0 km	95.74%	21.81%

Notes:

km = kilometer
% = percentage

A total of 3 missing afternoon soundings were found within the modeling period – January 7, 2010, May 16, 2010, and August 25, 2013. The gaps were not filled.

Surface Parameters

Surface parameters - albedo, Bowen ratio, and surface roughness length - are needed input for dispersion calculations. These parameters are based on the land use features and moisture conditions, and experience seasonal variations. They are calculated as part of the hourly meteorological data processing with AERSURFACE and AERMET.

The surface parameters for this application were calculated using AERSURFACE version. The land use map is part of the 1992 Nationals Land Cover Data state-wide archive, provided by the USGS, and has 30-meter resolution. AERSURFACE was processed with options recommended by NDDEQ[2]:

The domain was centered at the location of the airport in Williston, North Dakota. The resulting surface parameters are summarized in Table 2.3-2.

[2] Recommended AERSURFACE Inputs, North Dakota (March 2017)," https://www.deq.nd.gov/publications/AQ/policy/Modeling/AERSURFACE_InputsND.pdf

TABLE 2.3-2

Seasonal Surface Parameters at Williston Airport, North Dakota

Circular Sector (°)	Winter with snow	Winter with no snow	Spring	Summer	Fall
Albedo (10 x 10 km Domain) [1]					
0 - 360	0.58	0.19	0.17	0.18	0.18
Bowen Ratio (10 x 10 km Domain) - Average Moisture [2]					
0 - 360	0.49	0.83	0.38	0.63	0.83
Surface Roughness Length (m) (1km-radius domain) [3]					
0 - 30	0.007	0.014	0.038	0.095	0.095
30 - 60	0.010	0.021	0.051	0.110	0.110
60 - 90	0.007	0.014	0.039	0.094	0.094
90 - 120	0.007	0.013	0.040	0.096	0.096
120 - 150	0.006	0.013	0.039	0.096	0.096
150 - 180	0.007	0.014	0.034	0.086	0.086
180 - 210	0.007	0.013	0.039	0.099	0.099
210 - 240	0.008	0.016	0.042	0.097	0.097
240 - 270	0.008	0.015	0.055	0.116	0.116
270 - 300	0.019	0.032	0.083	0.146	0.146
300 - 330	0.008	0.016	0.038	0.093	0.093
330 - 360	0.008	0.016	0.032	0.099	0.099

Notes:

[1] Albedo is a non-dimensional measure of the solar reflectivity of a surface.

[2] Bowen Ratio is a non-dimensional measure of the heat transfer for a surface under moisture conditions. Surfaces with higher moisture conditions will result in a lower Bowen Ratio. Typical values range from 0.10 for thick deciduous forest to 0.90 for fresh snow.

[3] Surface Roughness Length is the height (in meters) at which the mean horizontal wind speed is zero.

° = degrees
km = kilometer
m = meter

Model Versions and Modeling Options

The latest versions of all the meteorological processors included in the AERMOD system were used. The default modeling options were selected in all cases.

AERMET v.19191 was used. There are three stages to processing the data in AERMET. In the first stage, meteorological data was extracted from archive data files and the surface hourly and upper air twice-daily data were processed for the entire modeling period 2009 to 2013. In the second stage, the sub-hourly ASOS wind data extracted and processed in AERMINUTE v.15272 was added and all meteorological data were merged together in a single file. In the third stage, the merged data were processed and the appropriate surface parameters were incorporated for use by AERMOD, as calculated with AERSURFACE v.13016. A threshold of 0.5 meters per second (m/s) was set for the ASOS wind speed as recommended by EPA Guidelines. The wind speed was considered a scalar quantity and the appropriate adjustment of the friction velocity (ADJ_U*) was applied.

As show in Table 2.3-3, the resulting 5-year data set provides more than 99 percent coverage of the meteorological conditions.

TABLE 2.3-3

5-Year Meteorological Data Set Coverage

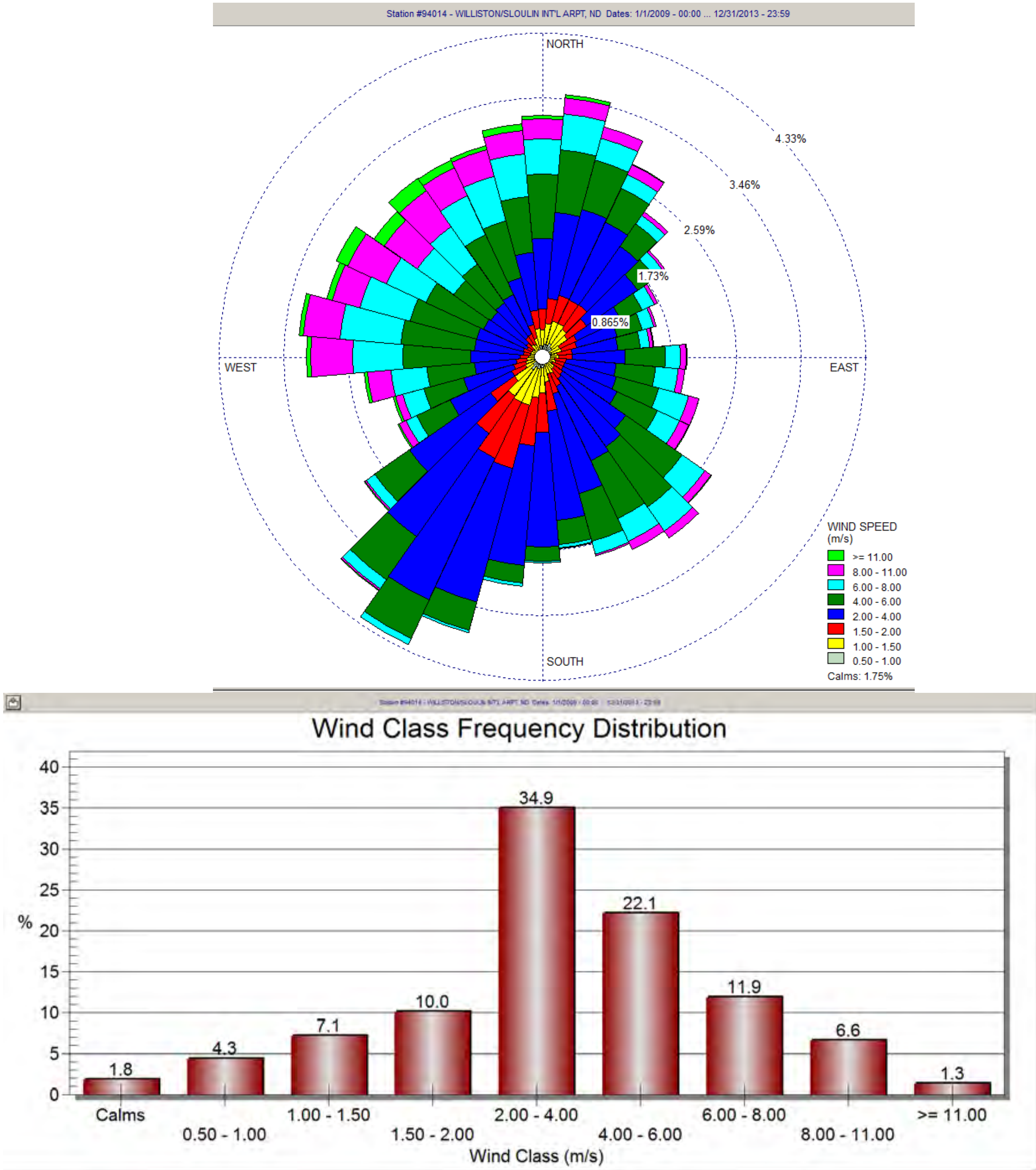
Year	Missing Hours	Total Coverage [1] (%)
2009	0	100.0
2010	18	99.79
2011	14	99.84
2012 [2]	4	99.95
2013	42	99.52

Notes:
[1] Percent coverage is calculated by removing the missing hours from the total hours in a year (8,760)
[2] Total hours in 2012 was 8,784.

% = percentage

Figure 2.3-1 shows the wind rose and wind class and frequency distribution for the 5-year meteorological data set.

Figure 2.3 1 2009-2013 Wind Rose and Distribution from KISN



Building Downwash

The US EPA's Building Profile Input Program (BPIP), version 04274, was used to calculate downwash effects for all emission sources. Building and structure configurations and locations relative to the modeled sources were obtained from WBI. All point source release points at the facility are expected to be below the greater of the GEP formula height calculated by BPIP or 65 m (213 feet). The detailed structure element coordinates and dimensions for all onsite buildings are included in Table 2.3-4. Terrain elevations for all buildings were assigned using survey data.

TABLE 2.3-4

Tioga Compressor Station Building Locations

Building ID	Building Description	Location (Southwest Corner)[1,2] X (m E)	Y (m N)	X-Length (ft)	Y-Length (ft)	Eave Height (ft)	Peak Height (ft)
TRNBLDG1	Transfer Building #1	654909.64	5363293.39	50	50	12	13
TRNBLDG2	Transfer Building #2	654938.54	5363305.65	60	100	12	13
U1COMP	Unit #1 Compressor Building	654941.00	5363277.21	28	26	11	11
METER	Meter Building	654914.37	5363262.46	7.5	7.5	10	10
OFCSHOP	Office/Shop	654909.64	5363253.33	60	40	15	17.3
COMPBLDG1	Compressor Building #1	654958.41	5363357.14	60	100	30	32.5
COMPBLDG2	Compressor Building #2	655006.84	5363356.97	60	100	30	32.5
COMPBLDG3	Compressor Building #3	655006.54	5363285.09	60	100	30	32.5
AUX	Auxiliary Building	654922.36	5363354.92	40	60	12	13.66
SCRUB	Scrubber Building	654971.94	5363305.55	20	50	12	12

Notes:
1 Based on site plot plans.
2 Estimated using Google Earth.

m E = meters Easting
m N = meters Northing
ft = feet

Significant Impact Level Results

Model simulations for 1-hour NO_2 emissions were performed with the AERMOD model using the 5-year meteorological database. The Ambient Ratio Method Version 2 (ARM2), which incorporates a variable ambient ratio in order to calculate an estimated atmospheric conversion of NO_X to NO_2, was used for 1-hour NO_2 dispersion modeling, using default parameters. The maximum value over 5 years for the applicable time averaging period was compared to the appropriate significant impact level (SIL). For the SIL analysis, the highest, first-high concentration averaged over 5 years of meteorology was compared with the SIL value in Table 2.3-5.

For impacts from the project sources exceeding the SILs for a given pollutant, the significant impact area (SIA) for 1-hour NO_2 was determined by calculating the maximum distance to which impacts are greater than the SIL. The grid spacing is resolved to within 50 meters around the maximum predicted project-only impact to assure that the maximum impact value and location had been identified.

Table 2.3-5 summarizes the results of the SIL and SIA analysis.

TABLE 2.3-5

Summary of Project-Only Impacts and SIL/SIA Analysis

Pollutant	Averaging Period	Project Impact ($\mu g/m^3$)	SIA (km)	SIL ($\mu g/m^3$)	SIL Exceeded and Additional Modeling Required?
NO_2	1-hour	124.42	50.0	7.5	Yes

Notes:

SIA = significant impact area
SIL = significant impact level
$\mu g/m^3$ = micrograms per cubic meter
km = kilometer

As shown in the table above, the maximum predicted 1-hour NO_2 concentration is 124.42 $\mu g/m^3$. This concentration is above the corresponding SIL of 7.5 $\mu g/m^3$, thus, additional dispersion modeling analyses are required for the 1-hour averaging period. The 1-hour NO_2 SIA extends approximately 50.0 km from the facility.

NAAQS Results

A NAAQS analysis, using five years of meteorological data, was performed for 1-hour NO_2. The ARM2 approach for modeling ambient NO_2 impacts was used in the cumulative analysis; this is a U.S. EPA-approved default model option. The NAAQS analyses are carried out by modeling facility-wide source parameters and emission rates and adding the representative background concentrations to modeled concentrations for comparison with the NAAQS. Through discussions with NDDEQ, it was determined that nearby sources with NO_2 emissions would not be included in the analysis unless further analysis with these sources is requested by NDDEQ.

As identified in Table 2.3-5, the project-only impacts exceed the SIL for 1-hour NO_2. As such, impacts from the facility, in combination with the background concentration, were evaluated for 1-hour NO_2 for comparison with the NAAQS. Although the Tioga Compressor Station is an existing facility, there were no NO_2 emissions from any of the existing emission units located at the facility. Therefore, only the project-related sources were included in the NO_2 cumulative analysis. For the cumulative analysis, the highest, eighth-high concentration averaged over 5 years of meteorology was compared, after adding the background concentration, with the NAAQS value in Table 2.3-6.

Modeling results show that the 1-hour NO_2 NAAQS is not exceeded. Therefore, the Tioga Compressor Station demonstrates compliance with the NAAQS.

Table 2.3-6 summarizes the results of the cumulative NAAQS modeling for 1-hour NO_2 with maximum impacts that exceeded the SILs.

TABLE 2.3-6 **Summary of Cumulative NAAQS Analysis**						
Pollutant	Averaging Period	Facility Impact (µg/m^3)	Background (µg/m^3)	Total Impact (µg/m^3)	NAAQS (µg/m^3)	NAAQS Exceeded?
NO_2	1-hour	115.14	35	150.14	188	No

Notes:

NAAQS = National Ambient Air Quality Standards
µg/m^3 = micrograms per cubic meter
km = kilometer

2.4 North Dakota Air Toxics Review

North Dakota also requires an air toxics review to be evaluated for applicability for any source that is required to submit a permit to construct that has the potential to emit HAPs. Since the compressor stack is less than 1.5 times higher than the nearest building height, the air toxics analysis is required. The air toxics review is a stepped approach of comparing HAP concentrations to acceptable values by reviewing the maximum individual carcinogenic risk. The analysis allows the Department to determine if the emission sources require additional review.

2.4.1 Tiered Analysis

Tier 1 Analysis

For Tier 1 of the air toxics review, the HAP emissions from all facility sources were compared to the look-up tables in Appendix A and Appendix B provided in Policy for the Control of Hazardous Air Pollutant Emissions in North Dakota (Air Toxics Policy). Using steps 1 through 11 of the Air Toxics Policy, each HAP was evaluated for its health effects. All HAPs were compared to the applicable 1-hour and 8-hour concentrations for each pollutant as found in Appendix A. In addition, HAPs classified as carcinogenic were compared to the Unit Risk Factors in Appendix B of the Air Toxics Policy. If the emission rate was below the guideline concentration as found in Table 1 of the Air Toxics Policy, the pollutant was screened out from further analysis.

The result of the Tier 1 review for non-carcinogenic pollutants indicated that several specific pollutants (ammonia, acetaldehyde, acrolein, benzene, and formaldehyde) were above their respective 1-hour or 8-hour guideline concentrations. These pollutants were then reviewed per the Tier 2 or Tier 3 analysis. All other pollutants were below their respective guideline concentrations for non-carcinogenic impacts and did not require additional analysis.

For carcinogenic pollutants, the total calculated maximum individual carcinogenic risk (MICR) was summed and compared to the MICR threshold of 1×10^{-5} (0.00001). The total MICR for the facility was calculated as 3.58×10^{-4} which is above the MICR threshold of 1×10^{-5}. Specific carcinogenic HAPs were individually above the MICR threshold of 1×10^{-5} and these compounds were individually evaluated further in a Tier 3 analysis. This Tier 3 analysis is presented later in this section.

Table 2.4-1 summarizes the Tier 1 air toxics analysis. Note that values shown in red/italics indicate that the air toxics analysis for that pollutant was advanced to the Tier 3 assessment.

TABLE 2.4-1

Tier 1 Air Toxics Analysis

Pollutant	Averaging Time	Emissions (g/s)	1-hr Concentration (mg/m³)	1-hr Guideline Conc. [1] (mg/m³)	1-hr HI [3]	8-hr Concentration (mg/m³)	8-hr Guideline Conc. [1] (mg/m³)	8-hr HI [3]	Annual Concentration (µg/m³)	URF [2] (m³/µg)	MICR [4]
Ammonia	1-hr, 8-hr	3.43E-01	2.12E+00	0.488	***4.34*** [6]	1.48	3.48E-01	***4.26*** [6]	N/A	N/A	N/A
1,1,2,2-Tetrachloroethane	8-hr	8.86E-04	5.19E-03	N/A	N/A	3.63E-03	2.83E-02	0.13	N/A	N/A	N/A
1,1,2-Trichloroethane	8-hr	6.97E-04	3.99E-03	N/A	N/A	2.79E-03	1.09E+00	2.56E-03	N/A	N/A	N/A
1,1-Dichloroethane	8-hr	5.17E-04	2.96E-03	N/A	N/A	2.07E-03	8.10E+00	2.56E-04	N/A	N/A	N/A
1,3,5-Trimethylbenzene	8-hr	7.17E-04	3.77E-03	N/A	N/A	2.64E-03	2.46E+00	1.07E-03	N/A	N/A	N/A
1,3-Butadiene	annual	6.66E-03	4.88E-02	N/A	N/A	N/A	N/A	N/A	3.91	3.00E-05	***1.17E-04*** [6]
1,3-Dichloropropene	annual	5.79E-04	3.31E-03	N/A	N/A	2.32E-03	N/A	N/A	0.26	4.00E-06	1.06E-06
2-Methylnaphthalene	8-hr	7.04E-04	3.71E-03	N/A	N/A	2.60E-03	5.20E-02	0.050	N/A	N/A	N/A
Acetaldehyde	1-hr, annual	1.81E-01	1.01E+00	0.901	***1.12*** [6]	N/A	N/A	N/A	81.09	2.20E-06	***1.78E-04*** [6]
Acrolein	1-hr	1.13E-01	6.49E-01	0.00459	***141.48*** [6]	N/A	N/A	N/A	N/A	N/A	N/A
Benzene	1-hr, 8-hr, annual	1.17E-02	9.44E-02	0.16	0.59	0.066	3.19E-02	***2.07*** [6]	7.55	7.80E-06	***5.89E-05*** [6]
Benzo(b)fluoranthene	annual	3.52E-06	1.85E-05	N/A	N/A	N/A	N/A	N/A	0.0015	1.10E-04	1.63E-07
Carbon Tetrachloride	1-hr, 8-hr, annual	8.05E-04	4.61E-03	1.258	0.0037	3.22E-03	6.29E-01	5.13E-03	0.37	6.00E-06	2.21E-06
Chlorobenzene	8-hr	6.64E-04	3.76E-03	N/A	N/A	2.64E-03	9.21E-01	2.86E-03	N/A	N/A	N/A
Chloroform	8-hr, annual	6.25E-04	3.58E-03	N/A	N/A	2.50E-03	9.77E-01	2.56E-03	0.29	2.30E-05	6.58E-06
Chrysene	annual	1.47E-05	7.74E-05	N/A	N/A	N/A	N/A	N/A	0.0062	1.10E-05	6.81E-08
Cyclopentane	8-hr	4.81E-03	2.54E-02	N/A	N/A	0.018	3.44E+01	5.16E-04	N/A	N/A	N/A
Ethylbenzene	1-hr, 8-hr, annual	8.79E-04	5.14E-03	10.855	4.7E-05	3.60E-03	8.68E+00	4.15E-04	0.41	2.50E-06	1.03E-06
Ethylene Dibromide	annual	9.72E-04	5.56E-03	N/A	N/A	N/A	N/A	N/A	0.44	6.00E-04	***2.67E-04*** [6]
Formaldehyde	1-hr, annual	2.54E-01	1.39E+00	0.00737	***188.5*** [6]	N/A	N/A	N/A	111.16	1.30E-05	***1.45E-03*** [6]
Methanol	1-hr, 8-hr	5.76E-02	3.67E-01	6.552	0.056	0.26	5.24E+00	0.049	N/A	N/A	N/A
Methylcyclohexane	8-hr	2.61E-02	1.37E-01	N/A	N/A	0.10	3.21E+01	3.00E-03	N/A	N/A	N/A
Methylene Chloride	8-hr, annual	4.86E-04	3.41E-03	N/A	N/A	2.39E-03	3.47E+00	6.89E-04	0.27	4.70E-07	1.28E-07
Hexane	8-hr	2.35E-02	1.24E-01	N/A	N/A	0.087	3.53E+00	0.025	N/A	N/A	N/A
Nonane	8-hr	2.33E-03	1.23E-02	N/A	N/A	8.60E-03	2.10E+01	4.10E-04	N/A	N/A	N/A
Octane	8-hr	7.44E-03	3.92E-02	N/A	N/A	0.027	2.80E+01	9.80E-04	N/A	N/A	N/A
Pentane	8-hr	5.51E-02	2.90E-01	N/A	N/A	0.20	3.54E+01	5.74E-03	N/A	N/A	N/A
Naphthalene	1-hr, 8-hr, annual	1.72E-03	1.11E-02	1.573	0.0071	7.76E-03	1.05E+00	7.39E-03	0.89	3.40E-05	***3.02E-05*** [6]
PAH [5]	annual	7.83E-04	7.04E-03	N/A	N/A	N/A	N/A	N/A	0.56	1.20E-03	***6.76E-04*** [6]
Phenol	8-hr	5.09E-04	2.26E-03	N/A	N/A	1.58E-03	3.85E-01	4.10E-03	N/A	N/A	N/A

TABLE 2.4-1

Tier 1 Air Toxics Analysis

Pollutant	Averaging Time	Emissions (g/s)	1-hr Concentration (mg/m^3)	1-hr Guideline Conc. [1] (mg/m^3)	1-hr HI [3]	8-hr Concentration (mg/m^3)	8-hr Guideline Conc. [1] (mg/m^3)	8-hr HI [3]	Annual Concentration ($\mu g/m^3$)	URF [2] ($m^3/\mu g$)	MICR [4]
Styrene	1-hr, 8-hr	5.18E-04	2.98E-03	3.408	8.7E-04	2.08E-03	1.70E+00	1.23E-03	N/A	N/A	N/A
Toluene	8-hr	9.49E-03	6.16E-02	N/A	N/A	0.043	1.51E+00	0.029	N/A	N/A	N/A
Vinyl Chloride	8-hr, annual	3.27E-04	1.87E-03	N/A	N/A	1.31E-03	5.11E-02	0.026	0.15	8.80E-06	1.32E-06
Xylene	1-hr, 8-hr	4.20E-03	2.61E-02	13.026	0.0020	0.018	8.68E+00	2.11E-03	N/A	N/A	N/A
										Total Facility MICR	**2.79E-03**

Notes:

[1] From Appendix A of the Policy for the Control of Hazardous Air Pollutant Emissions in North Dakota.

[2] From Appendix B of the Policy for the Control of Hazardous Air Pollutant Emissions in North Dakota.

[3] Hazard Index (HI) = Facility Concentration (mg/m^3) ÷ Guideline Concentration (mg/m^3). If HI<1, pollutant is screened out. If HI≥1, pollutant requires further analysis.

[4] MICR = Maximum Individual Cancer Risk = annual concentration ($\mu g/m^3$) x URF ($m^3/\mu g$). Dimensionless. If MICR<1.0E-05, pollutant is screened out. If MICR≥1.0E-05, pollutant requires further analysis.

[5] PAH analysis was completed by using the URF for dibenz(a,h)anthracene, which is one of the pollutants that make up PAH.

[6] ***Pollutants with HI and/or MCIR listed in red/italics did not pass the Tier 1 analysis and required further analysis.***

PAH = Polycyclic Aromatic Hydrocarbons
N/A = Not Applicable
g/s = grams per second
mg/m^3 = milligrams per cubic meter

Tier 2 Analysis

According to the Air Toxics Policy, the Tier 2 analysis involves the use of the EPA SCREEN3 computer screening model. The screening model predicts the highest 1-hour concentration of a pollutant from a matrix of predictions for all plausible meteorological conditions. Instead of running a screen model, a refined air dispersion model as specified in the Tier 3 approach was used.

Tier 3 Analysis

The Tier 3 analysis predicts the health effect of each HAP with a refined EPA computer model by using hour-by-hour meteorological data to determine a maximum concentration. This concentration is then compared to a state-level toxics standard to evaluate the potential risk to human health and the environment. Through guidance with NDDEQ air quality division, the Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values from the California Air Resources Board, last updated in September 2019 (Table 1 in Appendix L), was used to determine compliance with the Air Toxics Policy.

Receptor Grid

To ensure that the area of maximum effects was accurately sampled, a multi-tier receptor grid extending out to 15 kilometers (km) was used in the model. The configuration of receptor points was as follows:

- 25-meter (m) spacing along the facility fence/property line;
- 50-m spacing from the fence/property line to 500 m;
- 100-m spacing from 500 m to 2 km;
- 250-m spacing from 2 km to 5 km; and
- 500-m spacing from 5 km to 15km.

Public access at the facility will be impeded by fencing and gates.

Modeling Results

Modeling was conducted to further assess non-carcinogenic impacts for 1-hour acetaldehyde, 1-hour acrolein, 1-hour and 8-hour ammonia, 8-hour benzene, and 1-hour formaldehyde, using a Tier 3 approach per NDDEQ guidelines. The predicted maximum non-carcinogenic impacts for all compounds, except 1-hour acrolein, are below their respective OEHHA/ARB approved risk assessment health values.

The detailed results summary is presented in Table 2.4-2.

TABLE 2.4-2

AERMOD Results and Tier 3 Air Toxics Compliance Summary – Non-carcinogenic impacts

Pollutant	Averaging Period	Project Impact ($\mu g/m^3$)	OEHHA/ARB Risk Assessment Health Value[1] ($\mu g/m^3$)	Hazard Index (HI) [3]
Acetaldehyde	1-hour	4.26	470	0.009
Acrolein	1-hour	2.65	2.5	1.06
Ammonia	1-hour	9.71	3,200	0.003
	8-hour	7.47	3,200 [2]	0.002
Benzene	8-hour	0.40	27	0.015
Formaldehyde	1-hour	5.97	55	0.11

Notes:
1 From the California Air Resources Board – Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values, updated September 19, 2019, Table 1 in Appendix L
2 There is no 8-hour inhalation health value for ammonia in the OEHHA/ARB Risk Assessment Consolidated Table. The 8-hour ammonia project impact was instead compared to the acute inhalation health value.
3 Hazard Index (HI) = Facility Concentration (mg/m^3) ÷ Guideline Concentration (mg/m^3). If HI<1, analysis is complete. If HI≥1, pollutant requires further analysis.

$\mu g/m^3$ = micrograms per cubic meter

Further review was conducted for assessing the 1-hour impacts of acrolein. This review examine the areal extents of the 1-hour impacts of acrolein to confirm that the hazard index at any existing residence was below a hazard index of 1.0. The nearest existing residence is 0.42 miles (2221 feet) east of the Tioga Compressor Station. The furthest extend of 1-hour acrolein impacts only extend to less than 700 feet beyond the property boundary. Therefore, pursuant to the NDDEQ Air Toxics Modeling guidance (NDDEQ memo date January 23, 2015, Section III), the predicted impacts of non-carcinogens are within acceptable limits. A figure depicting the acrolein impacts and nearest residence is attached in Appendix E

Modeling was conducted to further assess carcinogenic impacts for acetaldehyde, 1,3-butadiene, benzene, ethylene dibromide, formaldehyde, and PAH. The predicted MICR for each compound are below the MICR threshold of 1 $x10^{-5}$.

The detailed results summary is presented in Table 2.4-3.

TABLE 2.4-3

AERMOD Results and Tier 3 Air Toxics Compliance Summary - Carcinogenic impacts

Pollutant	Averaging Period	Project Impact ($\mu g/m^3$)	OEHHA/ARB Inhalation Unit Risk Value[1] $(\mu g/m^3)^{-1}$	RISK
Acetaldehyde	Annual	0.20611	2.70E-06	5.56E-07
1,3-Butadiene	Annual	0.01117	1.70E-04	1.90E-06
Benzene	Annual	0.02405	2.90E-05	6.97E-07
Chloroform	Annual	0.00073	5.30E-06	3.87E-09
Ethylene Dibromide	Annual	0.00114	7.10E-05	8.09E-08
Formaldehyde	Annual	0.28168	6.00E-06	1.69E-06
Naphthalene	Annual	0.00231	3.40E-05	7.85E-08
PAH	Annual	0.00200	1.10E-03	2.20E-06

Notes:
1 From the California Air Resources Board – Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values, updated September 19, 2019, Table 1 in Appendix L

$\mu g/m^3$ = micrograms per cubic meter

Based on this analysis, the emissions of HAPs from the Tioga Compressor Station do not cause potentially hazardous impacts to existing surrounding residential areas. As such, the Tioga Compressor Station demonstrates compliance with the North Dakota Air Toxics Policy.

Appendix A

Site Location Map and Site Plot Plan

Fence Line

Property Line

0 500 1000 2000 Feet

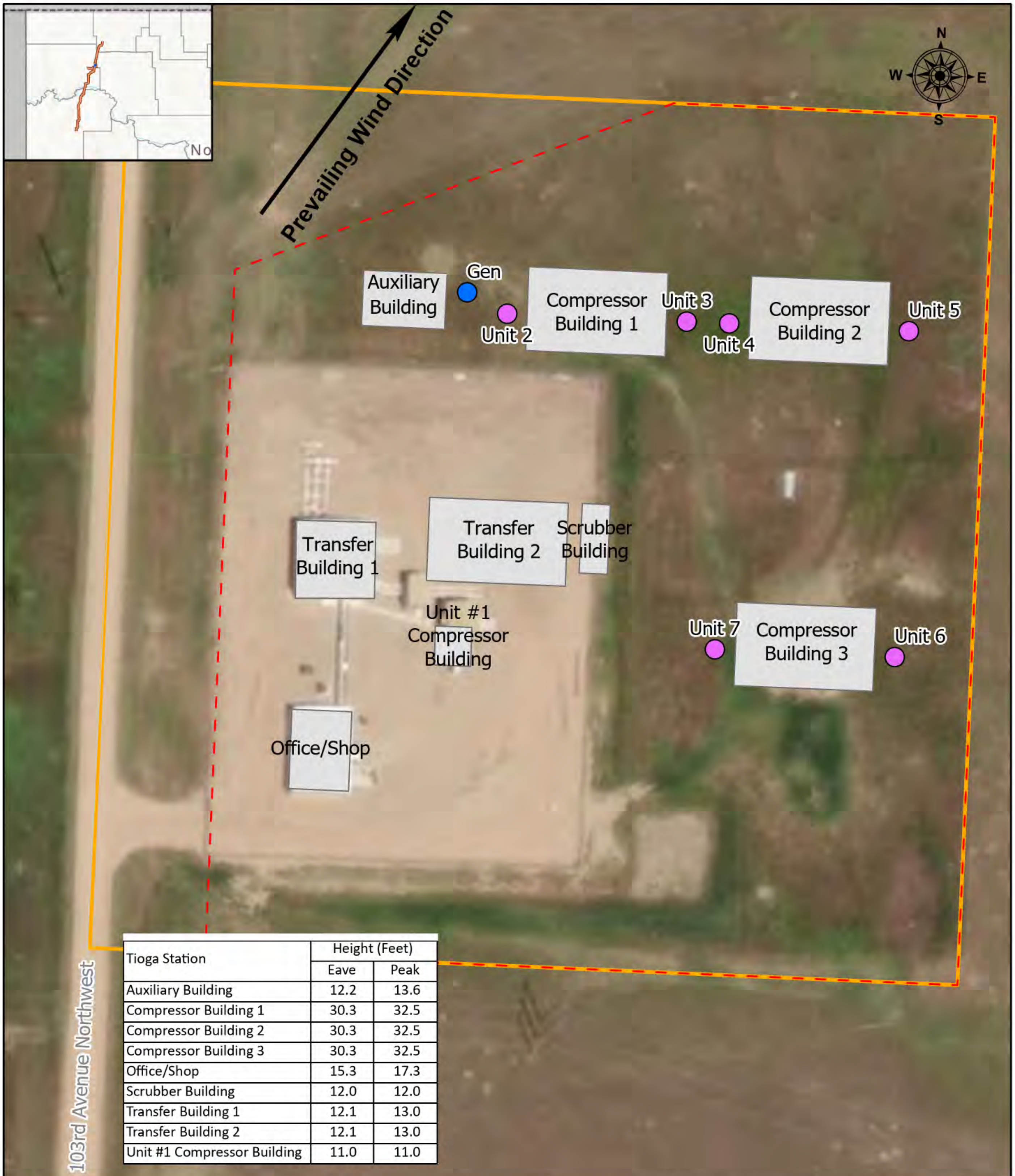
WBI Energy Transmission
Application for Permit to Construct
Tioga Compressor Station
Site Location Map

1:12,000

WBI ENERGY TRANSMISSION

File: M:\Clients\V-X\WBI\North_Bakken_Expansion_ArcGIS\2020\01\Air_PermitMaps\AirPermit_CompressorStations\AirPermit_CompressorStations_v2.aprx | Revised: 1/27/2020

Drawn By: 0239



Tioga Station	Height (Feet)	
	Eave	Peak
Auxiliary Building	12.2	13.6
Compressor Building 1	30.3	32.5
Compressor Building 2	30.3	32.5
Compressor Building 3	30.3	32.5
Office/Shop	15.3	17.3
Scrubber Building	12.0	12.0
Transfer Building 1	12.1	13.0
Transfer Building 2	12.1	13.0
Unit #1 Compressor Building	11.0	11.0

Compressor Engine Stack
Generator Stack
Fence Line
Property Line
Building

0 50 100 200 Feet

WBI Energy Transmission
Application for Permit to Construct
Tioga Compressor Station
Site Plan

1:1,200

WBI ENERGY TRANSMISSION

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Drawn By: 0239

Appendix B

Potential to Emit Calculations

ERM The business of sustainability

Facility Name: Tioga Compressor Station
Subject: Potential to Emit Calculations
Task: Potential to Emit Summary

Prepared: AMC
Reviewed: CAB
Date: 2-Jan-20

Emission Unit	Pollutant (TPY[1])										
	NO_X	CO	VOC	PM	PM_{10}	$PM_{2.5}$	SO_2	Lead	Total HAPs	Largest Single HAP (Formaldehyde)	CO_2e
Engine/Compressor #2	36.21	18.11	18.11	1.23	1.23	1.23	0.07	---	3.83	1.45	16,961
Engine/Compressor #3	36.21	18.11	18.11	1.23	1.23	1.23	0.07	---	3.83	1.45	16,961
Engine/Compressor #4	36.21	18.11	18.11	1.23	1.23	1.23	0.07	---	3.83	1.45	16,961
Engine/Compressor #5	36.21	18.11	18.11	1.23	1.23	1.23	0.07	---	3.83	1.45	16,961
Engine/Compressor #6	36.21	18.11	18.11	1.23	1.23	1.23	0.07	---	3.83	1.45	16,961
Engine/Compressor #7	36.21	18.11	18.11	1.23	1.23	1.23	0.07	---	3.83	1.45	16,961
Generator	13.33	26.65	9.33	1.02	1.02	1.02	0.031	---	0.76	0.13	6,136
Pig Launching and Receiving	---	---	24.22	---	---	---	---	---	0.10	NA	4,648
Station Blowdowns	---	---	7.90	---	---	---	---	---	0.03	NA	1,931
Three (3) Tanks	---	---	0.012	---	---	---	---	---	0.01	NA	NA
Comfort Heating	2.23	1.87	0.12	0.17	0.17	0.17	0.01	1.11E-05	0.08	0.071	2,661
Fugitive Emissions Equipment Leaks	---	---	0.83	---	---	---	---	---	0.0002	---	203
Total Facility Unlimited Emissions:	**232.82**	**137.15**	**151.04**	**8.55**	**8.55**	**8.55**	**0.48**	**1.11E-05**	**23.97**	**8.90**	**117,346**
Total Facility Unlimited Emissions without Fugitives:	232.82	137.15	150.22	8.55	8.55	8.55	0.48	NA	23.97	8.82	117,143

[1] TPY - Tons Per Year

ERM the business of sustainability

Facility Name: Tioga Compressor Station
Subject: Potential to Emit Calculations
Task: Caterpillar 3612 w/Arial Compressor

Prepared: AMC
Reviewed: CAB
Date: 2-Jan-20

Engine/Compressor #2	
Assumptions:	
Natural Gas Fired	
Max. Rated Capacity, bhp	3,750
Fuel Consumption[1], Btu/bhp-hr	7,480
Max. Rated Capacity, MMBtu/hr	28.05
Fuel Consumption Rate, cf/hr	23,521
Conversion Factors:	
lb/ton	2,000
lb/kg	2.204
grams to pounds	453.6
Btu/MMBtu	1,000,000
CO_2 to CO_2e	1
CH_4 to CO_2e	25
N_2O to CO_2e	298
hours/yr	8,760
Btu/scf (based on gas analysis)[2]	1,193

Pollutant	Emission Factors[3]		Uncontrolled Hourly Emissions[4] (lb/hr)	Uncontrolled Annual Emissions (TPY)	Catalyst Factors[5]		Post Oxidation Catalyst Hourly Emissions (lb/hr)	Post Oxidation Catalyst Annual Emissions (TPY)
NO_X	1.00	grams/bhp-hr	8.27	36.21	NA	NA	NA	NA
CO	2.00	grams/bhp-hr	16.53	72.42	0.50	grams/bhp-hr	4.13	18.11
VOC	0.70	grams/bhp-hr	5.79	25.35	0.50	grams/bhp-hr	4.13	18.11
PM	0.010	lb/MMBtu	0.28	1.23	NA	NA	NA	NA
PM_{10}	0.010	lb/MMBtu	0.28	1.23	NA	NA	NA	NA
$PM_{2.5}$	0.010	lb/MMBtu	0.28	1.23	NA	NA	NA	NA
SO_2	0.00	lb/MMBtu	0.02	0.07	NA	NA	NA	NA
CO_2e[6]	468.1	lb/MMBtu	3,872	16,961	NA	NA	NA	NA
CO_2[7]	468.0	grams/bhp-hr	3,869	16,946	NA	NA	NA	NA
CH_4[8]	0.002	lb/MMBtu	0.06	0.27	NA	NA	NA	NA
N_2O[8]	0.0002	lb/MMBtu	0.01	0.03	NA	NA	NA	NA
Ammonia[9]	18	lb/MMscf	0.42	1.85	NA	NA	NA	NA
Total HAPs	7.54E-02	lb/MMBtu	2.12	9.26	NA	NA	0.88	3.83
1,1,2,2-Tetrachloroethane	4.00E-05	lb/MMBtu	1.12E-03	4.91E-03	NA	NA	NA	NA
1,1,2-Trichloroethane	3.18E-05	lb/MMBtu	8.92E-04	3.91E-03	NA	NA	NA	NA
1,1-Dichloroethane	2.36E-05	lb/MMBtu	6.62E-04	2.90E-03	NA	NA	NA	NA
1,2-Dichloropropane	*2.69E-05*	*lb/MMBtu*	*7.55E-04*	*3.30E-03*	NA	NA	NA	NA
1,3,5-Trimethylbenzene	*3.38E-05*	*lb/MMBtu*	*9.48E-04*	*4.15E-03*	NA	NA	NA	NA
1,3-Butadiene	2.67E-04	lb/MMBtu	7.49E-03	3.28E-02	NA	NA	NA	NA
1,3-Dichloropropene	2.64E-05	lb/MMBtu	7.41E-04	3.24E-03	NA	NA	NA	NA
2-Methylnaphthalene	3.32E-05	lb/MMBtu	9.31E-04	4.08E-03	NA	NA	NA	NA
2,2,4-Trimethylpentane	2.50E-04	lb/MMBtu	7.01E-03	3.07E-02	NA	NA	NA	NA
Acenaphthene	1.25E-06	lb/MMBtu	3.51E-05	1.54E-04	NA	NA	NA	NA
Acenaphthylene	5.53E-06	lb/MMBtu	1.55E-04	6.79E-04	NA	NA	NA	NA
Acetaldehyde	8.36E-03	lb/MMBtu	2.34E-01	1.03E+00	NA	NA	NA	NA
Acrolein	5.14E-03	lb/MMBtu	1.44E-01	6.31E-01	NA	NA	NA	NA
Benzene	4.40E-04	lb/MMBtu	1.23E-02	5.41E-02	NA	NA	NA	NA
Benzo(b)fluoranthene	*1.66E-07*	*lb/MMBtu*	*4.66E-06*	*2.04E-05*	NA	NA	NA	NA
Biphenyl	2.12E-04	lb/MMBtu	5.95E-03	2.60E-02	NA	NA	NA	NA
Carbon Tetrachloride	3.67E-05	lb/MMBtu	1.03E-03	4.51E-03	NA	NA	NA	NA
Chlorobenzene	3.04E-05	lb/MMBtu	8.53E-04	3.73E-03	NA	NA	NA	NA
Chloroethane	1.87E-06	lb/MMBtu	5.25E-05	2.30E-04	NA	NA	NA	NA
Chloroform	2.85E-05	lb/MMBtu	7.99E-04	3.50E-03	NA	NA	NA	NA
Chrysene	*6.93E-07*	*lb/MMBtu*	*1.94E-05*	*8.51E-05*	NA	NA	NA	NA
Cyclopentane	*2.27E-04*	*lb/MMBtu*	*6.37E-03*	*2.79E-02*	NA	NA	NA	NA
Ethylbenzene	3.97E-05	lb/MMBtu	1.11E-03	4.88E-03	NA	NA	NA	NA
Ethylene Dibromide	4.43E-05	lb/MMBtu	1.24E-03	5.44E-03	NA	NA	NA	NA
Formaldehyde (CH_2O)	**1.90E-01**	**grams/bhp-hr**	**1.57**	**6.88**	**0.04**	**grams/bhp-hr**	**0.33**	**1.45**
Methanol	2.50E-03	lb/MMBtu	7.01E-02	3.07E-01	NA	NA	NA	NA
Methylcyclohexane	*1.23E-03*	*lb/MMBtu*	*3.45E-02*	*1.51E-01*	NA	NA	NA	NA
Methylene Chloride	2.00E-05	lb/MMBtu	5.61E-04	2.46E-03	NA	NA	NA	NA
Hexane	1.11E-03	lb/MMBtu	3.11E-02	1.36E-01	NA	NA	NA	NA
Nonane	*1.10E-04*	*lb/MMBtu*	*3.09E-03*	*1.35E-02*	NA	NA	NA	NA
Octane	*3.51E-04*	*lb/MMBtu*	*9.85E-03*	*4.31E-02*	NA	NA	NA	NA
Pentane	*2.60E-03*	*lb/MMBtu*	*7.29E-02*	*3.19E-01*	NA	NA	NA	NA
Naphthalene	7.44E-05	lb/MMBtu	2.09E-03	9.14E-03	NA	NA	NA	NA
PAH	2.69E-05	lb/MMBtu	7.55E-04	3.30E-03	NA	NA	NA	NA
Phenanthrene	1.04E-05	lb/MMBtu	2.92E-04	1.28E-03	NA	NA	NA	NA
Phenol	2.40E-05	lb/MMBtu	6.73E-04	2.95E-03	NA	NA	NA	NA
Styrene	2.36E-05	lb/MMBtu	6.62E-04	2.90E-03	NA	NA	NA	NA
Toluene	4.08E-04	lb/MMBtu	1.14E-02	5.01E-02	NA	NA	NA	NA
Vinyl Chloride	1.49E-05	lb/MMBtu	4.18E-04	1.83E-03	NA	NA	NA	NA
Xylene	1.84E-04	lb/MMBtu	5.16E-03	2.26E-02	NA	NA	NA	NA

ERM The business of sustainability

Facility Name: Tioga Compressor Station	Prepared: AMC
Subject: Potential to Emit Calculations	Reviewed: CAB
Task: Caterpillar 3612 w/Arial Compressor	Date: 2-Jan-20

[1] Fuel consumption from Caterpillar G3612 Gas Engine Site Specific Technical Data sheet, maximum rating at 100% load.

[2] Heating value of natural gas taken from WBI Energy gas analysis

[3] Emission factors for NOx, CO and VOC based on compliance with 40 CFR Part 60 Subpart JJJJ. All other factors based on AP-42 emission factors for an uncontrolled 4-stroke lean burn engines, AP-42 Chapter 3.2 Natural Gas-fired Reciprocating Engines, Table 3.2-2, July 2000.

[4] Hourly emissions are based on the maximum design heat input.

[5] Catalyst emission factors taken from Miratech specification sheet for oxidation system specifications to be used with Caterpillar G3612 LE A4 Engine. The catalyst emission rates for CO,VOC, and formaldehyde include a safety factor.

[6] CO_2e emissions are based on global warming potential of CO_2=1, CH_4=25, and N_2O=298.

[7] CO_2 emission factor from 40 CFR 98 Subpart C Table C-1 (53.06 kg CO_2/MMBtu), November 29, 2013.

[8] CH_4 and N_2O emission factors from 40 CFR 98 Subpart C, Table C-2 (CH_4 = 0.001 kg CH_4/MMBtu and N_2O = 0.0001 kg N_2O/MMBtu), November 29, 2013.

[9] Ammonia emission factor is based on FIRE factor for SCC 20200253.

Pollutants listed in *italics* have listed emission factors in AP-42, but are not HAPs as define Section 112(b) of the Clean Air Act and are not included in the Total HAP emission factor.

Largest single facility-wide HAP shown in bold.

ERM The business of sustainability

Facility Name: Tioga Compressor Station
Subject: Potential to Emit Calculations
Task: Caterpillar 3612 w/Arial Compressor

Prepared: AMC
Reviewed: CAB
Date: 2-Jan-20

Engine/Compressor #3	
Assumptions:	
Natural Gas Fired	
Max. Rated Capacity, bhp	3,750
Fuel Consumption[1], Btu/bhp-hr	7,480
Max. Rated Capacity, MMBtu/hr	28.05
Fuel Consumption Rate, cf/hr	23,521
Conversion Factors:	
lb/ton	2,000
lb/kg	2.204
grams to pounds	453.6
Btu/MMBtu	1,000,000
CO_2 to CO_2e	1
CH_4 to CO_2e	25
N_2O to CO_2e	298
hours/yr	8,760
Btu/scf (based on gas analysis)[2]	1,193

Pollutant	Emission Factors[3]		Uncontrolled Hourly Emissions[4] (lb/hr)	Uncontrolled Annual Emissions (TPY)	Catalyst Factors[5]		Post Oxidation Catalyst Hourly Emissions (lb/hr)	Post Oxidation Catalyst Annual Emissions (TPY)
NO_X	1.00	grams/bhp-hr	8.27	36.21	NA	NA	NA	NA
CO	2.00	grams/bhp-hr	16.53	72.42	0.50	grams/bhp-hr	4.13	18.11
VOC	0.70	grams/bhp-hr	5.79	25.35	0.50	grams/bhp-hr	4.13	18.11
PM	0.010	lb/MMBtu	0.28	1.23	NA	NA	NA	NA
PM_{10}	0.010	lb/MMBtu	0.28	1.23	NA	NA	NA	NA
$PM_{2.5}$	0.010	lb/MMBtu	0.28	1.23	NA	NA	NA	NA
SO_2	0.00	lb/MMBtu	0.02	0.07	NA	NA	NA	NA
CO_2e[6]	468.1	lb/MMBtu	3,872	16,961	NA	NA	NA	NA
CO_2[7]	468.0	grams/bhp-hr	3,869	16,946	NA	NA	NA	NA
CH_4[8]	0.002	lb/MMBtu	0.06	0.27	NA	NA	NA	NA
N_2O[8]	0.0002	lb/MMBtu	0.01	0.03	NA	NA	NA	NA
Ammonia[9]	18	lb/MMscf	0.42	1.85	NA	NA	NA	NA
Total HAPs	7.54E-02	lb/MMBtu	2.12	9.26	NA	NA	0.88	3.83
1,1,2,2-Tetrachloroethane	4.00E-05	lb/MMBtu	1.12E-03	4.91E-03	NA	NA	NA	NA
1,1,2-Trichloroethane	3.18E-05	lb/MMBtu	8.92E-04	3.91E-03	NA	NA	NA	NA
1,1-Dichloroethane	2.36E-05	lb/MMBtu	6.62E-04	2.90E-03	NA	NA	NA	NA
1,2-Dichloropropane	*2.69E-05*	*lb/MMBtu*	*7.55E-04*	*3.30E-03*	NA	NA	NA	NA
1,3,5-Trimethylbenzene	*3.35E-05*	*lb/MMBtu*	*9.40E-04*	*4.12E-03*	NA	NA	NA	NA
1,3-Butadiene	2.67E-04	lb/MMBtu	7.49E-03	3.28E-02	NA	NA	NA	NA
1,3-Dichloropropene	2.64E-05	lb/MMBtu	7.41E-04	3.24E-03	NA	NA	NA	NA
2-Methylnaphthalene	3.32E-05	lb/MMBtu	9.31E-04	4.08E-03	NA	NA	NA	NA
2,2,4-Trimethylpentane	2.50E-04	lb/MMBtu	7.01E-03	3.07E-02	NA	NA	NA	NA
Acenaphthene	1.25E-06	lb/MMBtu	3.51E-05	1.54E-04	NA	NA	NA	NA
Acenaphthylene	5.53E-06	lb/MMBtu	1.55E-04	6.79E-04	NA	NA	NA	NA
Acetaldehyde	8.36E-03	lb/MMBtu	2.34E-01	1.03E+00	NA	NA	NA	NA
Acrolein	5.14E-03	lb/MMBtu	1.44E-01	6.31E-01	NA	NA	NA	NA
Benzene	4.40E-04	lb/MMBtu	1.23E-02	5.41E-02	NA	NA	NA	NA
Benzo(b)fluoranthene	*1.66E-07*	*lb/MMBtu*	*4.66E-06*	*2.04E-05*	NA	NA	NA	NA
Biphenyl	2.12E-04	lb/MMBtu	5.95E-03	2.60E-02	NA	NA	NA	NA
Carbon Tetrachloride	3.67E-05	lb/MMBtu	1.03E-03	4.51E-03	NA	NA	NA	NA
Chlorobenzene	3.04E-05	lb/MMBtu	8.53E-04	3.73E-03	NA	NA	NA	NA
Chloroethane	1.87E-06	lb/MMBtu	5.25E-05	2.30E-04	NA	NA	NA	NA
Chloroform	2.85E-05	lb/MMBtu	7.99E-04	3.50E-03	NA	NA	NA	NA
Chrysene	*6.93E-07*	*lb/MMBtu*	*1.94E-05*	*8.51E-05*	NA	NA	NA	NA
Cyclopentane	*2.27E-04*	*lb/MMBtu*	*6.37E-03*	*2.79E-02*	NA	NA	NA	NA
Ethylbenzene	3.97E-05	lb/MMBtu	1.11E-03	4.88E-03	NA	NA	NA	NA
Ethylene Dibromide	4.43E-05	lb/MMBtu	1.24E-03	5.44E-03	NA	NA	NA	NA
Formaldehyde (CH_2O)	**1.90E-01**	**grams/bhp-hr**	**1.57**	**6.88**	**0.04**	**grams/bhp-hr**	**0.33**	**1.45**
Methanol	2.50E-03	lb/MMBtu	7.01E-02	3.07E-01	NA	NA	NA	NA
Methylcyclohexane	*1.23E-03*	*lb/MMBtu*	*3.45E-02*	*1.51E-01*	NA	NA	NA	NA
Methylene Chloride	2.00E-05	lb/MMBtu	5.61E-04	2.46E-03	NA	NA	NA	NA
Hexane	1.11E-03	lb/MMBtu	3.11E-02	1.36E-01	NA	NA	NA	NA
Nonane	*1.10E-04*	*lb/MMBtu*	*3.09E-03*	*1.35E-02*	NA	NA	NA	NA
Octane	*3.51E-04*	*lb/MMBtu*	*9.85E-03*	*4.31E-02*	NA	NA	NA	NA
Pentane	*2.60E-03*	*lb/MMBtu*	*7.29E-02*	*3.19E-01*	NA	NA	NA	NA
Naphthalene	7.44E-05	lb/MMBtu	2.09E-03	9.14E-03	NA	NA	NA	NA
PAH	2.69E-05	lb/MMBtu	7.55E-04	3.30E-03	NA	NA	NA	NA
Phenanthrene	1.04E-05	lb/MMBtu	2.92E-04	1.28E-03	NA	NA	NA	NA
Phenol	2.40E-05	lb/MMBtu	6.73E-04	2.95E-03	NA	NA	NA	NA
Styrene	2.36E-05	lb/MMBtu	6.62E-04	2.90E-03	NA	NA	NA	NA
Toluene	4.08E-04	lb/MMBtu	1.14E-02	5.01E-02	NA	NA	NA	NA
Vinyl Chloride	1.49E-05	lb/MMBtu	4.18E-04	1.83E-03	NA	NA	NA	NA
Xylene	1.84E-04	lb/MMBtu	5.16E-03	2.26E-02	NA	NA	NA	NA

Facility Name: Tioga Compressor Station
Subject: Potential to Emit Calculations
Task: Caterpillar 3612 w/Arial Compressor

Prepared: AMC
Reviewed: CAB
Date: 2-Jan-20

[1] Fuel consumption from Caterpillar G3612 Gas Engine Site Specific Technical Data sheet, maximum rating at 100% load.
[2] Heating value of natural gas taken from WBI Energy gas analysis
[3] Emission factors for NOx, CO and VOC based on compliance with 40 CFR Part 60 Subpart JJJJ. All other factors based on AP-42 emission factors for an uncontrolled 4-stroke lean burn engines, AP-42 Chapter 3.2 Natural
[4] Hourly emissions are based on the maximum design heat input.
[5] Catalyst emission factors taken from Miratech specification sheet for oxidation system specifications to be used with Caterpillar G3612 LE A4 Engine. The catalyst emission rates for CO,VOC, and formaldehyde include a safety factor.
[6] CO_2e emissions are based on global warming potential of CO_2=1, CH_4=25, and N_2O=298.
[7] CO_2 emission factor from 40 CFR 98 Subpart C Table C-1 (53.06 kg CO_2/MMBtu), November 29, 2013.
[8] CH_4 and N_2O emission factors from 40 CFR 98 Subpart C, Table C-2 (CH_4 = 0.001 kg CH_4/MMBtu and N_2O = 0.0001 kg N_2O/MMBtu), November 29, 2013.
[9] Ammonia emission factor is based on FIRE factor for SCC 20200253.
Pollutants listed in *italics* have listed emission factors in AP-42, but are not HAPs as define Section 112(b) of the Clean Air Act and are not included in the Total HAP emission factor.
Largest single facility-wide HAP shown in bold.

ERM The business of sustainability

Facility Name: Tioga Compressor Station
Subject: Potential to Emit Calculations
Task: Caterpillar 3612 w/Arial Compressor

Prepared: AMC
Reviewed: CAB
Date: 2-Jan-20

Engine/Compressor #4	
Assumptions:	
Natural Gas Fired	
Max. Rated Capacity, bhp	3,750
Fuel Consumption[1], Btu/bhp-hr	7,480
Max. Rated Capacity, MMBtu/hr	28.05
Fuel Consumption Rate, cf/hr	23,521
Conversion Factors:	
lb/ton	2,000
lb/kg	2.204
grams to pounds	453.6
Btu/MMBtu	1,000,000
CO_2 to CO_2e	1
CH_4 to CO_2e	25
N_2O to CO_2e	298
hours/yr	8,760
Btu/scf (based on gas analysis)[2]	1,193

Pollutant	Emission Factors[3]		Uncontrolled Hourly Emissions[4] (lb/hr)	Uncontrolled Annual Emissions (TPY)	Catalyst Factors[5]		Post Oxidation Catalyst Hourly Emissions (lb/hr)	Post Oxidation Catalyst Annual Emissions (TPY)
NO_X	1.00	grams/bhp-hr	8.27	36.21	NA	NA	NA	NA
CO	2.00	grams/bhp-hr	16.53	72.42	0.50	grams/bhp-hr	4.13	18.11
VOC	0.70	grams/bhp-hr	5.79	25.35	0.50	grams/bhp-hr	4.13	18.11
PM	0.010	lb/MMBtu	0.28	1.23	NA	NA	NA	NA
PM_{10}	0.010	lb/MMBtu	0.28	1.23	NA	NA	NA	NA
$PM_{2.5}$	0.010	lb/MMBtu	0.28	1.23	NA	NA	NA	NA
SO_2	0.00	lb/MMBtu	0.02	0.07	NA	NA	NA	NA
CO_2e[6]	468.1	lb/MMBtu	3,872	16,961	NA	NA	NA	NA
CO_2[7]	468.0	grams/bhp-hr	3,869	16,946	NA	NA	NA	NA
CH_4[8]	0.002	lb/MMBtu	0.06	0.27	NA	NA	NA	NA
N_2O[8]	0.0002	lb/MMBtu	0.01	0.03	NA	NA	NA	NA
Ammonia[9]	18	lb/MMscf	0.42	1.85	NA	NA	NA	NA
Total HAPs	7.54E-02	lb/MMBtu	2.12	9.26	NA	NA	0.88	3.83
1,1,2,2-Tetrachloroethane	4.00E-05	lb/MMBtu	1.12E-03	4.91E-03	NA	NA	NA	NA
1,1,2-Trichloroethane	3.18E-05	lb/MMBtu	8.92E-04	3.91E-03	NA	NA	NA	NA
1,1-Dichloroethane	2.36E-05	lb/MMBtu	6.62E-04	2.90E-03	NA	NA	NA	NA
1,2-Dichloropropane	*2.69E-05*	*lb/MMBtu*	*7.55E-04*	*3.30E-03*	NA	NA	NA	NA
1,3,5-Trimethylbenzene	*3.38E-05*	*lb/MMBtu*	*9.48E-04*	*4.15E-03*	NA	NA	NA	NA
1,3-Butadiene	2.67E-04	lb/MMBtu	7.49E-03	3.28E-02	NA	NA	NA	NA
1,3-Dichloropropene	2.64E-05	lb/MMBtu	7.41E-04	3.24E-03	NA	NA	NA	NA
2-Methylnaphthalene	3.32E-05	lb/MMBtu	9.31E-04	4.08E-03	NA	NA	NA	NA
2,2,4-Trimethylpentane	2.50E-04	lb/MMBtu	7.01E-03	3.07E-02	NA	NA	NA	NA
Acenaphthene	1.25E-06	lb/MMBtu	3.51E-05	1.54E-04	NA	NA	NA	NA
Acenaphthylene	5.53E-06	lb/MMBtu	1.55E-04	6.79E-04	NA	NA	NA	NA
Acetaldehyde	8.36E-03	lb/MMBtu	2.34E-01	1.03E+00	NA	NA	NA	NA
Acrolein	5.14E-03	lb/MMBtu	1.44E-01	6.31E-01	NA	NA	NA	NA
Benzene	4.40E-04	lb/MMBtu	1.23E-02	5.41E-02	NA	NA	NA	NA
Benzo(b)fluoranthene	*1.66E-07*	*lb/MMBtu*	*4.66E-06*	*2.04E-05*	NA	NA	NA	NA
Biphenyl	2.12E-04	lb/MMBtu	5.95E-03	2.60E-02	NA	NA	NA	NA
Carbon Tetrachloride	3.67E-05	lb/MMBtu	1.03E-03	4.51E-03	NA	NA	NA	NA
Chlorobenzene	3.04E-05	lb/MMBtu	8.53E-04	3.73E-03	NA	NA	NA	NA
Chloroethane	1.87E-06	lb/MMBtu	5.25E-05	2.30E-04	NA	NA	NA	NA
Chloroform	2.85E-05	lb/MMBtu	7.99E-04	3.50E-03	NA	NA	NA	NA
Chrysene	*6.93E-07*	*lb/MMBtu*	*1.94E-05*	*8.51E-05*	NA	NA	NA	NA
Cyclopentane	*2.27E-04*	*lb/MMBtu*	*6.37E-03*	*2.79E-02*	NA	NA	NA	NA
Ethylbenzene	3.97E-05	lb/MMBtu	1.11E-03	4.88E-03	NA	NA	NA	NA
Ethylene Dibromide	4.43E-05	lb/MMBtu	1.24E-03	5.44E-03	NA	NA	NA	NA
Formaldehyde (CH_2O)	**1.90E-01**	**grams/bhp-hr**	**1.57**	**6.88**	**0.04**	**grams/bhp-hr**	**0.33**	**1.45**
Methanol	2.50E-03	lb/MMBtu	7.01E-02	3.07E-01	NA	NA	NA	NA
Methylcyclohexane	*1.23E-03*	*lb/MMBtu*	*3.45E-02*	*1.51E-01*	NA	NA	NA	NA
Methylene Chloride	2.00E-05	lb/MMBtu	5.61E-04	2.46E-03	NA	NA	NA	NA
Hexane	1.11E-03	lb/MMBtu	3.11E-02	1.36E-01	NA	NA	NA	NA
Nonane	*1.10E-04*	*lb/MMBtu*	*3.09E-03*	*1.35E-02*	NA	NA	NA	NA
Octane	*3.51E-04*	*lb/MMBtu*	*9.85E-03*	*4.31E-02*	NA	NA	NA	NA
Pentane	*2.60E-03*	*lb/MMBtu*	*7.29E-02*	*3.19E-01*	NA	NA	NA	NA

ERM The business of sustainability

Facility Name: Tioga Compressor Station
Subject: Potential to Emit Calculations
Task: Caterpillar 3612 w/Arial Compressor

Prepared: AMC
Reviewed: CAB
Date: 2-Jan-20

Pollutant	Emission Factors[3]		Uncontrolled Hourly Emissions[4] (lb/hr)	Uncontrolled Annual Emissions (TPY)	Catalyst Factors[5]		Post Oxidation Catalyst Hourly Emissions (lb/hr)	Post Oxidation Catalyst Annual Emissions (TPY)
Naphthalene	7.44E-05	lb/MMBtu	2.09E-03	9.14E-03	NA	NA	NA	NA
PAH	2.69E-05	lb/MMBtu	7.55E-04	3.30E-03	NA	NA	NA	NA
Phenanthrene	1.04E-05	lb/MMBtu	2.92E-04	1.28E-03	NA	NA	NA	NA
Phenol	2.40E-05	lb/MMBtu	6.73E-04	2.95E-03	NA	NA	NA	NA
Styrene	2.36E-05	lb/MMBtu	6.62E-04	2.90E-03	NA	NA	NA	NA
Toluene	4.08E-04	lb/MMBtu	1.14E-02	5.01E-02	NA	NA	NA	NA
Vinyl Chloride	1.49E-05	lb/MMBtu	4.18E-04	1.83E-03	NA	NA	NA	NA
Xylene	1.84E-04	lb/MMBtu	5.16E-03	2.26E-02	NA	NA	NA	NA

1 Fuel consumption from Caterpillar G3612 Gas Engine Site Specific Technical Data sheet, maximum rating at 100% load.

2 Heating value of natural gas taken from WBI Energy gas analysis

3 Emission factors for NOx, CO and VOC based on compliance with 40 CFR Part 60 Subpart JJJJ. All other factors based on AP-42 emission factors for an uncontrolled 4-stroke lean burn engines, AP-42 Chapter 3.2 Natural

4 Hourly emissions are based on the maximum design heat input.

5 Catalyst emission factors taken from Miratech specification sheet for oxidation system specifications to be used with Caterpillar G3612 LE A4 Engine. The catalyst emission rates for CO,VOC, and formaldehyde include a safety factor.

6 CO_2e emissions are based on global warming potential of CO_2=1, CH_4=25, and N_2O=298.

7 CO_2 emission factor from 40 CFR 98 Subpart C Table C-1 (53.06 kg CO_2/MMBtu), November 29, 2013.

8 CH_4 and N_2O emission factors from 40 CFR 98 Subpart C, Table C-2 (CH_4 = 0.001 kg CH_4/MMBtu and N_2O = 0.0001 kg N_2O/MMBtu), November 29, 2013.

9 Ammonia emission factor is based on FIRE factor for SCC 20200253.

Pollutants listed in *italics* have listed emission factors in AP-42, but are not HAPs as define Section 112(b) of the Clean Air Act and are not included in the Total HAP emission factor.

Largest single facility-wide HAP shown in bold.

ERM The business of sustainability

Facility Name: Tioga Compressor Station
Subject: Potential to Emit Calculations
Task: Caterpillar 3612 w/Arial Compressor

Prepared: AMC
Reviewed: CAB
Date: 2-Jan-20

Engine/Compressor #5	
Assumptions:	
Natural Gas Fired	
Max. Rated Capacity, bhp	3,750
Fuel Consumption[1], Btu/bhp-hr	7,480
Max. Rated Capacity, MMBtu/hr	28.05
Fuel Consumption Rate, cf/hr	23,521
Conversion Factors:	
lb/ton	2,000
lb/kg	2.204
grams to pounds	453.6
Btu/MMBtu	1,000,000
CO_2 to CO_2e	1
CH_4 to CO_2e	25
N_2O to CO_2e	298
hours/yr	8,760
Btu/scf (based on gas analysis)[2]	1,193

Pollutant	**Emission Factors[3]**		**Uncontrolled Hourly Emissions[4] (lb/hr)**	**Uncontrolled Annual Emissions (TPY)**	**Catalyst Factors[5]**		**Post Oxidation Catalyst Hourly Emissions (lb/hr)**	**Post Oxidation Catalyst Annual Emissions (TPY)**
NO_X	1.00	grams/bhp-hr	8.27	36.21	NA	NA	NA	NA
CO	2.00	grams/bhp-hr	16.53	72.42	0.50	grams/bhp-hr	4.13	18.11
VOC	0.70	grams/bhp-hr	5.79	25.35	0.50	grams/bhp-hr	4.13	18.11
PM	0.010	lb/MMBtu	0.28	1.23	NA	NA	NA	NA
PM_{10}	0.010	lb/MMBtu	0.28	1.23	NA	NA	NA	NA
$PM_{2.5}$	0.010	lb/MMBtu	0.28	1.23	NA	NA	NA	NA
SO_2	0.00	lb/MMBtu	0.02	0.07	NA	NA	NA	NA
CO_2e[6]	468.1	lb/MMBtu	3,872	16,961	NA	NA	NA	NA
CO_2[7]	468.0	grams/bhp-hr	3,869	16,946	NA	NA	NA	NA
CH_4[8]	0.002	lb/MMBtu	0.06	0.27	NA	NA	NA	NA
N_2O[8]	0.0002	lb/MMBtu	0.01	0.03	NA	NA	NA	NA
Ammonia[9]	18	lb/MMscf	0.42	1.85	NA	NA	NA	NA
Total HAPs	7.54E-02	lb/MMBtu	2.12	9.26	NA	NA	0.88	3.83
1,1,2,2-Tetrachloroethane	4.00E-05	lb/MMBtu	1.12E-03	4.91E-03	NA	NA	NA	NA
1,1,2-Trichloroethane	3.18E-05	lb/MMBtu	8.92E-04	3.91E-03	NA	NA	NA	NA
1,1-Dichloroethane	2.36E-05	lb/MMBtu	6.62E-04	2.90E-03	NA	NA	NA	NA
1,2-Dichloropropane	*2.69E-05*	*lb/MMBtu*	*7.55E-04*	*3.30E-03*	NA	NA	NA	NA
1,3,5-Trimethylbenzene	*3.38E-05*	*lb/MMBtu*	*9.48E-04*	*4.15E-03*	NA	NA	NA	NA
1,3-Butadiene	2.67E-04	lb/MMBtu	7.49E-03	3.28E-02	NA	NA	NA	NA
1,3-Dichloropropene	2.64E-05	lb/MMBtu	7.41E-04	3.24E-03	NA	NA	NA	NA
2-Methylnaphthalene	3.32E-05	lb/MMBtu	9.31E-04	4.08E-03	NA	NA	NA	NA
2,2,4-Trimethylpentane	2.50E-04	lb/MMBtu	7.01E-03	3.07E-02	NA	NA	NA	NA
Acenaphthene	1.25E-06	lb/MMBtu	3.51E-05	1.54E-04	NA	NA	NA	NA
Acenaphthylene	5.53E-06	lb/MMBtu	1.55E-04	6.79E-04	NA	NA	NA	NA
Acetaldehyde	8.36E-03	lb/MMBtu	2.34E-01	1.03E+00	NA	NA	NA	NA
Acrolein	5.14E-03	lb/MMBtu	1.44E-01	6.31E-01	NA	NA	NA	NA
Benzene	4.40E-04	lb/MMBtu	1.23E-02	5.41E-02	NA	NA	NA	NA
Benzo(b)fluoranthene	*1.66E-07*	*lb/MMBtu*	*4.66E-06*	*2.04E-05*	NA	NA	NA	NA
Biphenyl	2.12E-04	lb/MMBtu	5.95E-03	2.60E-02	NA	NA	NA	NA
Carbon Tetrachloride	3.67E-05	lb/MMBtu	1.03E-03	4.51E-03	NA	NA	NA	NA
Chlorobenzene	3.04E-05	lb/MMBtu	8.53E-04	3.73E-03	NA	NA	NA	NA
Chloroethane	1.87E-06	lb/MMBtu	5.25E-05	2.30E-04	NA	NA	NA	NA
Chloroform	2.85E-05	lb/MMBtu	7.99E-04	3.50E-03	NA	NA	NA	NA
Chrysene	*6.93E-07*	*lb/MMBtu*	*1.94E-05*	*8.51E-05*	NA	NA	NA	NA
Cyclopentane	*2.27E-04*	*lb/MMBtu*	*6.37E-03*	*2.79E-02*	NA	NA	NA	NA
Ethylbenzene	3.97E-05	lb/MMBtu	1.11E-03	4.88E-03	NA	NA	NA	NA
Ethylene Dibromide	4.43E-05	lb/MMBtu	1.24E-03	5.44E-03	NA	NA	NA	NA
Formaldehyde (CH_2O)	**1.90E-01**	**grams/bhp-hr**	**1.57**	**6.88**	**0.04**	**grams/bhp-hr**	**0.33**	**1.45**
Methanol	2.50E-03	lb/MMBtu	7.01E-02	3.07E-01	NA	NA	NA	NA
Methylcyclohexane	*1.23E-03*	*lb/MMBtu*	*3.45E-02*	*1.51E-01*	NA	NA	NA	NA
Methylene Chloride	2.00E-05	lb/MMBtu	5.61E-04	2.46E-03	NA	NA	NA	NA
Hexane	1.11E-03	lb/MMBtu	3.11E-02	1.36E-01	NA	NA	NA	NA
Nonane	*1.10E-04*	*lb/MMBtu*	*3.09E-03*	*1.35E-02*	NA	NA	NA	NA
Octane	*3.51E-04*	*lb/MMBtu*	*9.85E-03*	*4.31E-02*	NA	NA	NA	NA
Pentane	*2.60E-03*	*lb/MMBtu*	*7.29E-02*	*3.19E-01*	NA	NA	NA	NA

ERM The business of sustainability

Facility Name: Tioga Compressor Station
Subject: Potential to Emit Calculations
Task: Caterpillar 3612 w/Arial Compressor

Prepared: AMC
Reviewed: CAB
Date: 2-Jan-20

Pollutant	Emission Factors[3]		Uncontrolled Hourly Emissions[4] (lb/hr)	Uncontrolled Annual Emissions (TPY)	Catalyst Factors[5]		Post Oxidation Catalyst Hourly Emissions (lb/hr)	Post Oxidation Catalyst Annual Emissions (TPY)
Naphthalene	7.44E-05	lb/MMBtu	2.09E-03	9.14E-03	NA	NA	NA	NA
PAH	2.69E-05	lb/MMBtu	7.55E-04	3.30E-03	NA	NA	NA	NA
Phenanthrene	1.04E-05	lb/MMBtu	2.92E-04	1.28E-03	NA	NA	NA	NA
Phenol	2.40E-05	lb/MMBtu	6.73E-04	2.95E-03	NA	NA	NA	NA
Styrene	2.36E-05	lb/MMBtu	6.62E-04	2.90E-03	NA	NA	NA	NA
Toluene	4.08E-04	lb/MMBtu	1.14E-02	5.01E-02	NA	NA	NA	NA
Vinyl Chloride	1.49E-05	lb/MMBtu	4.18E-04	1.83E-03	NA	NA	NA	NA
Xylene	1.84E-04	lb/MMBtu	5.16E-03	2.26E-02	NA	NA	NA	NA

1 Fuel consumption from Caterpillar G3612 Gas Engine Site Specific Technical Data sheet, maximum rating at 100% load.
2 Heating value of natural gas taken from WBI Energy gas analysis
3 Emission factors for NOx, CO and VOC based on compliance with 40 CFR Part 60 Subpart JJJJ. All other factors based on AP-42 emission factors for an uncontrolled 4-stroke lean burn engines, AP-42 Chapter 3.2 Natural
4 Hourly emissions are based on the maximum design heat input.
5 Catalyst emission factors taken from Miratech specification sheet for oxidation system specifications to be used with Caterpillar G3612 LE A4 Engine. The catalyst emission rates for CO,VOC, and formaldehyde include a safety factor.
6 CO_2e emissions are based on global warming potential of CO_2=1, CH_4=25, and N_2O=298.
7 CO_2 emission factor from 40 CFR 98 Subpart C Table C-1 (53.06 kg CO_2/MMBtu), November 29, 2013.
8 CH_4 and N_2O emission factors from 40 CFR 98 Subpart C, Table C-2 (CH_4 = 0.001 kg CH_4/MMBtu and N_2O = 0.0001 kg N_2O/MMBtu), November 29, 2013.
9 Ammonia emission factor is based on FIRE factor for SCC 20200253.
Pollutants listed in *italics* have listed emission factors in AP-42, but are not HAPs as define Section 112(b) of the Clean Air Act and are not included in the Total HAP emission factor.
Largest single facility-wide HAP shown in bold.

Facility Name: Tioga Compressor Station
Subject: Potential to Emit Calculations
Task: Caterpillar 3612 w/Arial Compressor

Prepared: AMC
Reviewed: CAB
Date: 2-Jan-20

Engine/Compressor #6	
Assumptions:	
Natural Gas Fired	
Max. Rated Capacity, bhp	3,750
Fuel Consumption[1], Btu/bhp-hr	7,480
Max. Rated Capacity, MMBtu/hr	28.05
Fuel Consumption Rate, cf/hr	23,521
Conversion Factors:	
lb/ton	2,000
lb/kg	2.204
grams to pounds	453.6
Btu/MMBtu	1,000,000
CO_2 to CO_2e	1
CH_4 to CO_2e	25
N_2O to CO_2e	298
hours/yr	8,760
Btu/scf (based on gas analysis)[2]	1,193

Pollutant	Emission Factors[3]		Uncontrolled Hourly Emissions[4] (lb/hr)	Uncontrolled Annual Emissions (TPY)	Catalyst Factors[5]		Post Oxidation Catalyst Hourly Emissions (lb/hr)	Post Oxidation Catalyst Annual Emissions (TPY)
NO_X	1.00	grams/bhp-hr	8.27	36.21	NA	NA	NA	NA
CO	2.00	grams/bhp-hr	16.53	72.42	0.50	grams/bhp-hr	4.13	18.11
VOC	0.70	grams/bhp-hr	5.79	25.35	0.50	grams/bhp-hr	4.13	18.11
PM	0.010	lb/MMBtu	0.28	1.23	NA	NA	NA	NA
PM_{10}	0.010	lb/MMBtu	0.28	1.23	NA	NA	NA	NA
$PM_{2.5}$	0.010	lb/MMBtu	0.28	1.23	NA	NA	NA	NA
SO_2	0.00	lb/MMBtu	0.02	0.07	NA	NA	NA	NA
CO_2e[6]	468.1	lb/MMBtu	3,872	16,961	NA	NA	NA	NA
CO_2[7]	468.0	grams/bhp-hr	3,869	16,946	NA	NA	NA	NA
CH_4[8]	0.002	lb/MMBtu	0.06	0.27	NA	NA	NA	NA
N_2O[8]	0.0002	lb/MMBtu	0.01	0.03	NA	NA	NA	NA
Ammonia[9]	18	lb/MMscf	0.42	1.85	NA	NA	NA	NA
Total HAPs	7.54E-02	lb/MMBtu	2.12	9.26	NA	NA	0.88	3.83
1,1,2,2-Tetrachloroethane	4.00E-05	lb/MMBtu	1.12E-03	4.91E-03	NA	NA	NA	NA
1,1,2-Trichloroethane	3.18E-05	lb/MMBtu	8.92E-04	3.91E-03	NA	NA	NA	NA
1,1-Dichloroethane	2.36E-05	lb/MMBtu	6.62E-04	2.90E-03	NA	NA	NA	NA
1,2-Dichloropropane	*2.69E-05*	*lb/MMBtu*	*7.55E-04*	*3.30E-03*	NA	NA	NA	NA
1,3,5-Trimethylbenzene	*3.38E-05*	*lb/MMBtu*	*9.48E-04*	*4.15E-03*	NA	NA	NA	NA
1,3-Butadiene	2.67E-04	lb/MMBtu	7.49E-03	3.28E-02	NA	NA	NA	NA
1,3-Dichloropropene	2.64E-05	lb/MMBtu	7.41E-04	3.24E-03	NA	NA	NA	NA
2-Methylnaphthalene	3.32E-05	lb/MMBtu	9.31E-04	4.08E-03	NA	NA	NA	NA
2,2,4-Trimethylpentane	2.50E-04	lb/MMBtu	7.01E-03	3.07E-02	NA	NA	NA	NA
Acenaphthene	1.25E-06	lb/MMBtu	3.51E-05	1.54E-04	NA	NA	NA	NA
Acenaphthylene	5.53E-06	lb/MMBtu	1.55E-04	6.79E-04	NA	NA	NA	NA
Acetaldehyde	8.36E-03	lb/MMBtu	2.34E-01	1.03E+00	NA	NA	NA	NA
Acrolein	5.14E-03	lb/MMBtu	1.44E-01	6.31E-01	NA	NA	NA	NA
Benzene	4.40E-04	lb/MMBtu	1.23E-02	5.41E-02	NA	NA	NA	NA
Benzo(b)fluoranthene	*1.66E-07*	*lb/MMBtu*	*4.66E-06*	*2.04E-05*	NA	NA	NA	NA
Biphenyl	2.12E-04	lb/MMBtu	5.95E-03	2.60E-02	NA	NA	NA	NA
Carbon Tetrachloride	3.67E-05	lb/MMBtu	1.03E-03	4.51E-03	NA	NA	NA	NA
Chlorobenzene	3.04E-05	lb/MMBtu	8.53E-04	3.73E-03	NA	NA	NA	NA
Chloroethane	1.87E-06	lb/MMBtu	5.25E-05	2.30E-04	NA	NA	NA	NA
Chloroform	2.85E-05	lb/MMBtu	7.99E-04	3.50E-03	NA	NA	NA	NA
Chrysene	*6.93E-07*	*lb/MMBtu*	*1.94E-05*	*8.51E-05*	NA	NA	NA	NA
Cyclopentane	*2.27E-04*	*lb/MMBtu*	*6.37E-03*	*2.79E-02*	NA	NA	NA	NA
Ethylbenzene	3.97E-05	lb/MMBtu	1.11E-03	4.88E-03	NA	NA	NA	NA
Ethylene Dibromide	4.43E-05	lb/MMBtu	1.24E-03	5.44E-03	NA	NA	NA	NA
Formaldehyde (CH_2O)	**1.90E-01**	**grams/bhp-hr**	**1.57**	**6.88**	**0.04**	**grams/bhp-hr**	**0.33**	**1.45**
Methanol	2.50E-03	lb/MMBtu	7.01E-02	3.07E-01	NA	NA	NA	NA
Methylcyclohexane	*1.23E-03*	*lb/MMBtu*	*3.45E-02*	*1.51E-01*	NA	NA	NA	NA
Methylene Chloride	2.00E-05	lb/MMBtu	5.61E-04	2.46E-03	NA	NA	NA	NA
Hexane	1.11E-03	lb/MMBtu	3.11E-02	1.36E-01	NA	NA	NA	NA
Nonane	*1.10E-04*	*lb/MMBtu*	*3.09E-03*	*1.35E-02*	NA	NA	NA	NA
Octane	*3.51E-04*	*lb/MMBtu*	*9.85E-03*	*4.31E-02*	NA	NA	NA	NA
Pentane	*2.60E-03*	*lb/MMBtu*	*7.29E-02*	*3.19E-01*	NA	NA	NA	NA

ERM The business of sustainability

Facility Name: Tioga Compressor Station
Subject: Potential to Emit Calculations
Task: Caterpillar 3612 w/Arial Compressor

Prepared: AMC
Reviewed: CAB
Date: 2-Jan-20

Pollutant	Emission Factors[3]		Uncontrolled Hourly Emissions[4] (lb/hr)	Uncontrolled Annual Emissions (TPY)	Catalyst Factors[5]		Post Oxidation Catalyst Hourly Emissions (lb/hr)	Post Oxidation Catalyst Annual Emissions (TPY)
Naphthalene	7.44E-05	lb/MMBtu	2.09E-03	9.14E-03	NA	NA	NA	NA
PAH	2.69E-05	lb/MMBtu	7.55E-04	3.30E-03	NA	NA	NA	NA
Phenanthrene	1.04E-05	lb/MMBtu	2.92E-04	1.28E-03	NA	NA	NA	NA
Phenol	2.40E-05	lb/MMBtu	6.73E-04	2.95E-03	NA	NA	NA	NA
Styrene	2.36E-05	lb/MMBtu	6.62E-04	2.90E-03	NA	NA	NA	NA
Toluene	4.08E-04	lb/MMBtu	1.14E-02	5.01E-02	NA	NA	NA	NA
Vinyl Chloride	1.49E-05	lb/MMBtu	4.18E-04	1.83E-03	NA	NA	NA	NA
Xylene	1.84E-04	lb/MMBtu	5.16E-03	2.26E-02	NA	NA	NA	NA

[1] Fuel consumption from Caterpillar G3612 Gas Engine Site Specific Technical Data sheet, maximum rating at 100% load.
[2] Heating value of natural gas taken from WBI Energy gas analysis
[3] Emission factors for NOx, CO and VOC based on compliance with 40 CFR Part 60 Subpart JJJJ. All other factors based on AP-42 emission factors for an uncontrolled 4-stroke lean burn engines, AP-42 Chapter 3.2 Natural
[4] Hourly emissions are based on the maximum design heat input.
[5] Catalyst emission factors taken from Miratech specification sheet for oxidation system specifications to be used with Caterpillar G3612 LE A4 Engine. The catalyst emission rates for CO,VOC, and formaldehyde include a safety factor.
[6] CO_2e emissions are based on global warming potential of CO_2=1, CH_4=25, and N_2O=298.
[7] CO_2 emission factor from 40 CFR 98 Subpart C Table C-1 (53.06 kg CO_2/MMBtu), November 29, 2013.
[8] CH_4 and N_2O emission factors from 40 CFR 98 Subpart C, Table C-2 (CH_4 = 0.001 kg CH_4/MMBtu and N_2O = 0.0001 kg N_2O/MMBtu), November 29, 2013.
[9] Ammonia emission factor is based on FIRE factor for SCC 20200253.
Pollutants listed in *italics* have listed emission factors in AP-42, but are not HAPs as define Section 112(b) of the Clean Air Act and are not included in the Total HAP emission factor.
Largest single facility-wide HAP shown in bold.

Facility Name: Tioga Compressor Station
Subject: Potential to Emit Calculations
Task: Caterpillar 3612 w/Arial Compressor

Prepared: AMC
Reviewed: CAB
Date: 2-Jan-20

Engine/Compressor #7	
Assumptions:	
Natural Gas Fired	
Max. Rated Capacity, bhp	3,750
Fuel Consumption[1], Btu/bhp-hr	7,480
Max. Rated Capacity, MMBtu/hr	28.05
Fuel Consumption Rate, cf/hr	23,521
Conversion Factors:	
lb/ton	2,000
lb/kg	2.204
grams to pounds	453.6
Btu/MMBtu	1,000,000
CO_2 to CO_2e	1
CH_4 to CO_2e	25
N_2O to CO_2e	298
hours/yr	8,760
Btu/scf (based on gas analysis)[2]	1,193

Pollutant	Emission Factors[3]		Uncontrolled Hourly Emissions[4] (lb/hr)	Uncontrolled Annual Emissions (TPY)	Catalyst Factors[5]		Post Oxidation Catalyst Hourly Emissions (lb/hr)	Post Oxidation Catalyst Annual Emissions (TPY)
NO_X	1.00	grams/bhp-hr	8.27	36.21	NA	NA	NA	NA
CO	2.00	grams/bhp-hr	16.53	72.42	0.50	grams/bhp-hr	4.13	18.11
VOC	0.70	grams/bhp-hr	5.79	25.35	0.50	grams/bhp-hr	4.13	18.11
PM	0.010	lb/MMBtu	0.28	1.23	NA	NA	NA	NA
PM_{10}	0.010	lb/MMBtu	0.28	1.23	NA	NA	NA	NA
$PM_{2.5}$	0.010	lb/MMBtu	0.28	1.23	NA	NA	NA	NA
SO_2	0.00	lb/MMBtu	0.02	0.07	NA	NA	NA	NA
CO_2e[6]	468.1	lb/MMBtu	3,872	16,961	NA	NA	NA	NA
CO_2[7]	468.0	grams/bhp-hr	3,869	16,946	NA	NA	NA	NA
CH_4[8]	0.002	lb/MMBtu	0.06	0.27	NA	NA	NA	NA
N_2O[8]	0.0002	lb/MMBtu	0.01	0.03	NA	NA	NA	NA
Ammonia[9]	18	lb/MMscf	0.42	1.85	NA	NA	NA	NA
Total HAPs	7.54E-02	lb/MMBtu	2.12	9.26	NA	NA	0.88	3.83
1,1,2,2-Tetrachloroethane	4.00E-05	lb/MMBtu	1.12E-03	4.91E-03	NA	NA	NA	NA
1,1,2-Trichloroethane	3.18E-05	lb/MMBtu	8.92E-04	3.91E-03	NA	NA	NA	NA
1,1-Dichloroethane	2.36E-05	lb/MMBtu	6.62E-04	2.90E-03	NA	NA	NA	NA
1,2-Dichloropropane	*2.69E-05*	*lb/MMBtu*	*7.55E-04*	*3.30E-03*	NA	NA	NA	NA
1,3,5-Trimethylbenzene	*3.38E-05*	*lb/MMBtu*	*9.48E-04*	*4.15E-03*	NA	NA	NA	NA
1,3-Butadiene	2.67E-04	lb/MMBtu	7.49E-03	3.28E-02	NA	NA	NA	NA
1,3-Dichloropropene	2.64E-05	lb/MMBtu	7.41E-04	3.24E-03	NA	NA	NA	NA
2-Methylnaphthalene	3.32E-05	lb/MMBtu	9.31E-04	4.08E-03	NA	NA	NA	NA
2,2,4-Trimethylpentane	2.50E-04	lb/MMBtu	7.01E-03	3.07E-02	NA	NA	NA	NA
Acenaphthene	1.25E-06	lb/MMBtu	3.51E-05	1.54E-04	NA	NA	NA	NA
Acenaphthylene	5.53E-06	lb/MMBtu	1.55E-04	6.79E-04	NA	NA	NA	NA
Acetaldehyde	8.36E-03	lb/MMBtu	2.34E-01	1.03E+00	NA	NA	NA	NA
Acrolein	5.14E-03	lb/MMBtu	1.44E-01	6.31E-01	NA	NA	NA	NA
Benzene	4.40E-04	lb/MMBtu	1.23E-02	5.41E-02	NA	NA	NA	NA
Benzo(b)fluoranthene	*1.66E-07*	*lb/MMBtu*	*4.66E-06*	*2.04E-05*	NA	NA	NA	NA
Biphenyl	2.12E-04	lb/MMBtu	5.95E-03	2.60E-02	NA	NA	NA	NA
Carbon Tetrachloride	3.67E-05	lb/MMBtu	1.03E-03	4.51E-03	NA	NA	NA	NA
Chlorobenzene	3.04E-05	lb/MMBtu	8.53E-04	3.73E-03	NA	NA	NA	NA
Chloroethane	1.87E-06	lb/MMBtu	5.25E-05	2.30E-04	NA	NA	NA	NA
Chloroform	2.85E-05	lb/MMBtu	7.99E-04	3.50E-03	NA	NA	NA	NA
Chrysene	*6.93E-07*	*lb/MMBtu*	*1.94E-05*	*8.51E-05*	NA	NA	NA	NA
Cyclopentane	*2.27E-04*	*lb/MMBtu*	*6.37E-03*	*2.79E-02*	NA	NA	NA	NA
Ethylbenzene	3.97E-05	lb/MMBtu	1.11E-03	4.88E-03	NA	NA	NA	NA
Ethylene Dibromide	4.43E-05	lb/MMBtu	1.24E-03	5.44E-03	NA	NA	NA	NA
Formaldehyde (CH_2O)	**1.90E-01**	**grams/bhp-hr**	**1.57**	**6.88**	**0.04**	**grams/bhp-hr**	**0.33**	**1.45**
Methanol	2.50E-03	lb/MMBtu	7.01E-02	3.07E-01	NA	NA	NA	NA
Methylcyclohexane	*1.23E-03*	*lb/MMBtu*	*3.45E-02*	*1.51E-01*	NA	NA	NA	NA
Methylene Chloride	2.00E-05	lb/MMBtu	5.61E-04	2.46E-03	NA	NA	NA	NA

ERM The business of sustainability

Facility Name: Tioga Compressor Station
Subject: Potential to Emit Calculations
Task: Caterpillar 3612 w/Arial Compressor

Prepared: AMC
Reviewed: CAB
Date: 2-Jan-20

Pollutant	Emission Factors[3]		Uncontrolled Hourly Emissions[4] (lb/hr)	Uncontrolled Annual Emissions (TPY)	Catalyst Factors[5]		Post Oxidation Catalyst Hourly Emissions (lb/hr)	Post Oxidation Catalyst Annual Emissions (TPY)
Hexane	1.11E-03	lb/MMBtu	3.11E-02	1.36E-01	NA	NA	NA	NA
Nonane	*1.10E-04*	*lb/MMBtu*	*3.09E-03*	*1.35E-02*	NA	NA	NA	NA
Octane	*3.51E-04*	*lb/MMBtu*	*9.85E-03*	*4.31E-02*	NA	NA	NA	NA
Pentane	*2.60E-03*	*lb/MMBtu*	*7.29E-02*	*3.19E-01*	NA	NA	NA	NA
Naphthalene	7.44E-05	lb/MMBtu	2.09E-03	9.14E-03	NA	NA	NA	NA
PAH	2.69E-05	lb/MMBtu	7.55E-04	3.30E-03	NA	NA	NA	NA
Phenanthrene	1.04E-05	lb/MMBtu	2.92E-04	1.28E-03	NA	NA	NA	NA
Phenol	2.40E-05	lb/MMBtu	6.73E-04	2.95E-03	NA	NA	NA	NA
Styrene	2.36E-05	lb/MMBtu	6.62E-04	2.90E-03	NA	NA	NA	NA
Toluene	4.08E-04	lb/MMBtu	1.14E-02	5.01E-02	NA	NA	NA	NA
Vinyl Chloride	1.49E-05	lb/MMBtu	4.18E-04	1.83E-03	NA	NA	NA	NA
Xylene	1.84E-04	lb/MMBtu	5.16E-03	2.26E-02	NA	NA	NA	NA

1 Fuel consumption from Caterpillar G3612 Gas Engine Site Specific Technical Data sheet, maximum rating at 100% load.
2 Heating value of natural gas taken from WBI Energy gas analysis
3 Emission factors for NOx, CO and VOC based on compliance with 40 CFR Part 60 Subpart JJJJ. All other factors based on AP-42 emission factors for an uncontrolled 4-stroke lean burn engines, AP-42 Chapter
4 Hourly emissions are based on the maximum design heat input.
5 Catalyst emission factors taken from Miratech specification sheet for oxidation system specifications to be used with Caterpillar G3612 LE A4 Engine. The catalyst emission rates for CO,VOC, and formaldehyde include a safety factor.
6 CO_2e emissions are based on global warming potential of CO_2=1, CH_4=25, and N_2O=298.
7 CO_2 emission factor from 40 CFR 98 Subpart C Table C-1 (53.06 kg CO_2/MMBtu), November 29, 2013.
8 CH_4 and N_2O emission factors from 40 CFR 98 Subpart C, Table C-2 (CH_4 = 0.001 kg CH_4/MMBtu and N_2O = 0.0001 kg N_2O/MMBtu), November 29, 2013.
9 Ammonia emission factor is based on FIRE factor for SCC 20200253.
Pollutants listed in *italics* have listed emission factors in AP-42, but are not HAPs as define Section 112(b) of the Clean Air Act and are not included in the Total HAP emission factor.
Largest single facility-wide HAP shown in bold.

ERM The business of sustainability

Facility Name: Tioga Compressor Station
Subject: Potential to Emit Calculations
Task: Waukesha Generator (L5794GSI)

Reviewed: CAB
Date: 2-Jan-20

Generator, Waukesha gas engines L5794GSI	
Assumptions:	
Natural Gas Fired	
Standby Power Rated Capacity, kW	1,340
Fuel Consumption[1], Btu/bhp-hr	8,672
Max. Rated Capacity, MMBtu/hr	12
Fuel Consumption Rate, cf/hr	10,035
Horsepower, hp	1,380
Conversion Factors:	
lb/ton	2,000
lb/kg	2.204
grams to pounds	453.6
Btu/MMBtu	1,000,000
CO_2 to CO_2e	1
CH_4 to CO_2e	25
N_2O to CO_2e	298
hours/yr	8,760
Btu/scf (based on gas analysis)[2]	1,193

Pollutant	Emission Factors[3]		Hourly Emissions[4] (lb/hr)	Unlimited Annual Emissions (TPY)
NO_X	1.00	grams/bhp-hr	3.04	13.33
CO	2.00	grams/bhp-hr	6.08	26.65
VOC (NMHC)	0.70	grams/bhp-hr	2.13	9.33
PM	0.02	lb/MMBtu	0.23	1.02
PM_{10}	0.02	lb/MMBtu	0.23	1.02
$PM_{2.5}$	0.02	lb/MMBtu	0.23	1.02
SO_2	5.88E-04	lb/MMBtu	7.04E-03	3.08E-02
CO_2e[5]	117.1	lb/MMBtu	1401	6136
CO_2[6]	116.9	lb/MMBtu	1400	6130
CH_4[7]	0.002	lb/MMBtu	0.03	0.12
N_2O[7]	0.0002	lb/MMBtu	2.64E-03	1.16E-02
Ammonia[8]	18	lb/MMscf	0.18	0.79
Total HAPs	2.19E-02	lb/MMBtu	0.17	0.76
1,1,2,2-Tetrachloroethane	2.53E-05	lb/MMBtu	3.03E-04	1.33E-03
1,1,2-Trichloroethane	1.53E-05	lb/MMBtu	1.83E-04	8.02E-04
1,1-Dichloroethane	1.13E-05	lb/MMBtu	1.35E-04	5.92E-04
1,2-Dichloroethane	1.13E-05	lb/MMBtu	1.35E-04	5.92E-04
1,2-Dichloropropane	1.30E-05	lb/MMBtu	1.56E-04	6.81E-04
1,3-Butadiene	6.63E-04	lb/MMBtu	7.93E-03	3.48E-02
1,3-Dichloropropene	1.27E-05	lb/MMBtu	1.52E-04	6.66E-04
Acetaldehyde	2.79E-03	lb/MMBtu	0.03	1.46E-01
Acrolein	2.63E-03	lb/MMBtu	0.03	1.38E-01
Benzene	1.58E-03	lb/MMBtu	0.02	8.28E-02
Butyr/isobutyraldehyde	4.86E-05	lb/MMBtu	5.82E-04	2.55E-03
Carbon Tetrachloride	1.77E-05	lb/MMBtu	2.12E-04	9.28E-04
Chlorobenzene	1.29E-05	lb/MMBtu	1.54E-04	6.76E-04
Chloroform	1.37E-05	lb/MMBtu	1.64E-04	7.18E-04
Ethane	7.04E-02	lb/MMBtu	8.43E-01	3.69E+00

ERM The business of sustainability

Facility Name: Tioga Compressor Station
Subject: Potential to Emit Calculations
Task: Waukesha Generator (L5794GSI)

Reviewed: CAB
Date: 2-Jan-20

Pollutant	Emission Factors[3]		Hourly Emissions[4] (lb/hr)	Unlimited Annual Emissions (TPY)
Ethylbenzene	2.48E-05	lb/MMBtu	2.97E-04	1.30E-03
Ethylene Dibromide	2.13E-05	lb/MMBtu	2.55E-04	1.12E-03
Formaldehyde	**0.01**	**g/bhp-hr**	**0.03**	**0.13**
Methanol	3.06E-03	lb/MMBtu	0.04	0.16
Methylene Chloride	4.12E-05	lb/MMBtu	4.93E-04	2.16E-03
Naphthalene	9.71E-05	lb/MMBtu	1.16E-03	5.09E-03
PAH	1.41E-04	lb/MMBtu	1.69E-03	7.39E-03
Styrene	1.19E-05	lb/MMBtu	1.42E-04	6.24E-04
Toluene	5.58E-04	lb/MMBtu	6.68E-03	2.92E-02
Vinyl Chloride	7.18E-06	lb/MMBtu	8.59E-05	3.76E-04
Xylene	1.95E-04	lb/MMBtu	2.33E-03	1.02E-02

[1] Fuel consumption from Waukesha gas engines L5794GSI performance data for 110% overload (1596 BHP), high heat value (HHV).

[2] Heating value of natural gas taken from WBI Energy gas analysis

[3] Emission factors for NOx, CO, NMHC from NSPS Subpart JJJJ. Emission factors for CO_2 and formaldehyde from Technical Data Sheet for Waukesha VHP-L579GSI. The remaining factors from AP-42 emission factors are based on uncontrolled 4-stroke rich burn engines, AP-42 Chapter 3.2 Natural Gas-fired Reciprocating Engines, Table 3.2-3, July 2000.

[4] Hourly emissions are based on the maximum design heat input.

[5] CO_2e emissions are based on global warming potential of CO_2=1, CH_4=25, and N_2O=298.

[6] CO_2 emission factor from 40 CFR 98 Subpart C Table C-1 (53.06 kg CO_2/MMBtu), November 29, 2013.

[7] CH_4 and N_2O emission factors from 40 CFR 98 Subpart C, Table C-2 (CH_4 = 0.001 kg CH_4/MMBtu and N_2O = 0.0001 kg N_2O/MMBtu), November 29, 2013.

[8] Ammonia emission factor is based on FIRE factor for SCC 20200253.

Pollutants listed in *italics* have listed emission factors in AP-42, but are not HAPs as define Section 112(b) of the Clean Air Act and are not included in the Total HAP emission factor.

Largest single facility-wide HAP shown in bold.

ERM The business of sustainability

Facility Name: Tioga Compressor Station
Subject: Potential to Emit Calculations
Task: Fugitive Emissions from Leaks

Prepared: AMC
Reviewed: CAB
Date: 2-Jan-20

Fugitive Emissions Leaks	
Assumptions:	
Hours of Operation	8,760
Gas Analysis:	
VOC Weight Percent[1], %	5.53%
CH_4 Weight Percent[2], %	53.93%
CO_2 Weight Percent[3].%	2.568%
HAP Weight Percent[4], %	0.001%
Specific Gravity from Gas Analysis	0.719
Gas Weight, lb/scf	0.058
Conversion Factors:	
specific gravity of air	1
weight of scf air, lb/scf	0.0807
lb/ton	2,000
lb/kg	2.204
hours per year	8,760
CO_2 to CO_2e	1
CH_4 to CO_2e	25
N_2O to CO_2e	298

Component	Product	Component Count[5]	20% Buffer to Accommodate any Changes	Emission Factor[6] (scf/comp-hr)	Emission Rate (scf/hr)	Emission Rate (lbs/hr)
Connector	Gas	925	1110	0.02	18.87	1.095
Flanges	Gas	incl. with connectors	incl. with connectors	--	--	--
Valve	Gas	205	246	0.12	29.77	1.728
Other	Gas	280	336	0.02	5.71	0.332
Open Ended Line	Gas	0	0	0.03	0.00	0.000
Pressure Relief Valve	Gas	20	24	0.19	4.63	0.269
Total		1,430	1,716		58.98	3.42

Pollutant	Hourly Emissions (lb/hr)	Annual Emissions (TPY)
NO_X	---	---
CO	---	---
VOC	0.19	0.83
PM	---	---
PM_{10}	---	---
$PM_{2.5}$	---	---
SO_2	---	---
HAP	0.0000	0.0002
CO_2e	46	203
CO_2	0.09	0.38
CH_4	1.85	8.09
N_2O	---	---

[1]Weight percent of VOC taken from WBI gas analysis and excludes methane and ethane hydrocarbons.
[2]Weight percent of methane taken from WBI gas analysis.
[3]Weight percent of carbon dioxide taken from WBI gas analysis.
[4]Weight percent of total HAPS is the weight percent of C6 from the WBI gas analysis. This is a conservative estimate of HAPs.
[5]Component counts provided by WBI.
[6]Emission factors obtained from 40 CFR 98 Subpart W Table W-1A for Western U.S. Service Components

https://www.law.cornell.edu/cfr/text/40/appendix-Table_W-1A_to_subpart_W_of_part_98

ERM The business of sustainability

Facility Name: Tioga Compressor Station
Subject: Potential to Emit Calculations
Task: Emissions from Comfort Heating

Prepared: AMC
Reviewed: CAB
Date: Dec. 20, 2020

Boiler Two Weil-McLain LGB-10 (2.47 MMBtu/hr) and One Unit Heater (0.25)	
Assumptions:	
Natural Gas Fired	
Hours of Operation[1]	8,760
Total Rated Capacity, MMBtu/hr	5.19
Conversion Factors:	
lb/ton	2,000
lb/kg	2.204
CO_2 to CO_2e	1
CH_4 to CO_2e	25
N_2O to CO_2e	298
hours/yr	8,760
Btu/scf[2]	1,020

Pollutant	**AP-42 Emission Factors[3]**				**Hourly Emissions[4] (lb/hr)**	**Annual Emissions (TPY)**
NO_X	100.00	lb/MMscf	0.10	lb/MMBtu	0.51	2.23
CO	84.00	lb/MMscf	0.08	lb/MMBtu	0.43	1.87
VOC (NMHC)	5.50	lb/MMscf	0.01	lb/MMBtu	0.03	0.12
PM	7.60	lb/MMscf	0.01	lb/MMBtu	0.04	0.17
PM_{10}	7.60	lb/MMscf	0.01	lb/MMBtu	0.04	0.17
$PM_{2.5}$	7.60	lb/MMscf	0.01	lb/MMBtu	0.04	0.17
SO_2	0.60	lb/MMscf	5.88E-04	lb/MMBtu	3.05E-03	0.01
Lead	0.0005	lb/MMscf	4.90E-07	lb/MMBtu	2.54E-06	1.11E-05
CO_2e[5]	117.1	lb/MMBtu	---		608	2,661
CO_2[6]	116.9	lb/MMBtu	---		607	2,658
CH_4[7]	0.002	lb/MMBtu	---		0.01	0.05
N_2O[7]	0.0002	lb/MMBtu	---		1.14E-03	5.01E-03
Ammonia[8]	3.20	lb/MMscf	3.14E-03	lb/MMBtu	0.02	0.07
Total HAPs	3.49E+00	lb/MMscf	3.42E-03	lb/MMBtu	1.77E-02	7.77E-02
2-Methylnaphthalene	2.40E-05	lb/MMscf	2.35E-08	lb/MMBtu	1.22E-07	5.35E-07
3-Methylchloranthrene	1.80E-06	lb/MMscf	1.76E-09	lb/MMBtu	9.16E-09	4.01E-08
7,12-Dimethylbenz(a)anthracene	1.60E-05	lb/MMscf	1.57E-08	lb/MMBtu	8.14E-08	3.57E-07
Acenaphthene	1.80E-06	lb/MMscf	1.76E-09	lb/MMBtu	9.16E-09	4.01E-08
Acenaphthylene	1.80E-06	lb/MMscf	1.76E-09	lb/MMBtu	9.16E-09	4.01E-08
Anthracene	2.40E-06	lb/MMscf	2.35E-09	lb/MMBtu	1.22E-08	5.35E-08
Benz(a)anthracene	1.80E-06	lb/MMscf	1.76E-09	lb/MMBtu	9.16E-09	4.01E-08
Benzene	2.10E-03	lb/MMscf	2.06E-06	lb/MMBtu	1.07E-05	4.68E-05
Benzo(a)pyrene	1.20E-06	lb/MMscf	1.18E-09	lb/MMBtu	6.11E-09	2.67E-08
Benzo(b)fluoranthene	1.80E-06	lb/MMscf	1.76E-09	lb/MMBtu	9.16E-09	4.01E-08
Benzo(g,h,i)perylene	1.20E-06	lb/MMscf	1.18E-09	lb/MMBtu	6.11E-09	2.67E-08
Benzo(k)fluoranthene	1.80E-06	lb/MMscf	1.76E-09	lb/MMBtu	9.16E-09	4.01E-08
Butane	*2.10E+00*	*lb/MMscf*	*2.06E-03*	*lb/MMBtu*	*1.07E-02*	*4.68E-02*
Chrysene	1.80E-06	lb/MMscf	1.76E-09	lb/MMBtu	9.16E-09	4.01E-08
Dibenzo(a,h)anthracene	1.20E-06	lb/MMscf	1.18E-09	lb/MMBtu	6.11E-09	2.67E-08
Dichlorobenzene	1.20E-03	lb/MMscf	1.18E-06	lb/MMBtu	6.11E-06	2.67E-05
Ethane	*3.10E+00*	*lb/MMscf*	*3.04E-03*	*lb/MMBtu*	*1.58E-02*	*6.91E-02*
Fluoranthene	3.00E-06	lb/MMscf	2.94E-09	lb/MMBtu	1.53E-08	6.69E-08
Fluorene	2.80E-06	lb/MMscf	2.75E-09	lb/MMBtu	1.42E-08	6.24E-08
Formaldehyde	**7.50E-02**	**lb/MMscf**	**7.35E-05**	**lb/MMBtu**	**3.82E-04**	**1.67E-03**
Hexane	1.80E+00	lb/MMscf	1.76E-03	lb/MMBtu	9.16E-03	4.01E-02

ERM *The business of sustainability*

Facility Name: Tioga Compressor Station
Subject: Potential to Emit Calculations
Task: Emissions from Comfort Heating

Prepared: AMC
Reviewed: CAB
Date: Dec. 20, 2020

Pollutant	AP-42 Emission Factors[2]				Hourly Emissions[3] (lb/hr)	Unlimited Annual Emissions (TPY)
Indeno(1,2,3-cd)pyrene	1.80E-06	lb/MMscf	1.76E-09	lb/MMBtu	9.16E-09	4.01E-08
Naphthalene	6.10E-04	lb/MMscf	5.98E-07	lb/MMBtu	3.10E-06	1.36E-05
Pentane	*2.60E+00*	*lb/MMscf*	*2.55E-03*	*lb/MMBtu*	*1.32E-02*	*5.79E-02*
Phenanathrene	1.70E-05	lb/MMscf	1.67E-08	lb/MMBtu	8.65E-08	3.79E-07
Propane	*1.60E+00*	*lb/MMscf*	*1.57E-03*	*lb/MMBtu*	*8.14E-03*	*3.57E-02*
Pyrene	5.00E-06	lb/MMscf	4.90E-09	lb/MMBtu	2.54E-08	1.11E-07
Toluene	3.40E-03	lb/MMscf	3.33E-06	lb/MMBtu	1.73E-05	7.58E-05
Arsenic	2.00E-04	lb/MMscf	1.96E-07	lb/MMBtu	1.02E-06	4.46E-06
Barium	*4.40E-03*	*lb/MMscf*	*4.31E-06*	*lb/MMBtu*	*2.24E-05*	*9.81E-05*
Beryllium	1.20E-05	lb/MMscf	1.18E-08	lb/MMBtu	6.11E-08	2.67E-07
Cadmium	1.10E-03	lb/MMscf	1.08E-06	lb/MMBtu	5.60E-06	2.45E-05
Chromium	1.40E-03	lb/MMscf	1.37E-06	lb/MMBtu	7.12E-06	3.12E-05
Cobalt	8.40E-05	lb/MMscf	8.24E-08	lb/MMBtu	4.27E-07	1.87E-06
Copper	*8.50E-04*	*lb/MMscf*	*8.33E-07*	*lb/MMBtu*	*4.33E-06*	*1.89E-05*
Manganese	3.80E-04	lb/MMscf	3.73E-07	lb/MMBtu	1.93E-06	8.47E-06
Mercury	2.60E-04	lb/MMscf	2.55E-07	lb/MMBtu	1.32E-06	5.79E-06
Molybdenum	*1.10E-03*	*lb/MMscf*	*1.08E-06*	*lb/MMBtu*	*5.60E-06*	*2.45E-05*
Nickel	2.10E-03	lb/MMscf	2.06E-06	lb/MMBtu	1.07E-05	4.68E-05
Selenium	2.40E-05	lb/MMscf	2.35E-08	lb/MMBtu	1.22E-07	5.35E-07
Vanadium	*2.30E-03*	*lb/MMscf*	*2.25E-06*	*lb/MMBtu*	*1.17E-05*	*5.13E-05*
Zinc	*2.90E-02*	*lb/MMscf*	*2.84E-05*	*lb/MMBtu*	*1.48E-04*	*6.46E-04*

[1] Hours of operation based on the heating year round even though the heating season is likely only half the year
[2] Heating value of natural gas taken from basis of AP-42 emission factors which is listed as 1,020 Btu/scf.
3 AP-42 emission factors are based on uncontrolled small boilers, AP-42 Chapter 1.4 Natural Gas Combustion, Tables 1.4-1 though -4, July 1998.
[4] Hourly emissions are based on the maximum design heat input.
[5] CO_2e emissions are based on global warming potential of CO_2=1, CH_4=25, and N_2O=298.
[6] CO_2 emission factor from 40 CFR 98 Subpart C Table C-1 (53.06 kg CO_2/MMBtu), November 29, 2013.
[7] CH_4 and N_2O emission factors from 40 CFR 98 Subpart C, Table C-2 (CH_4 = 0.001 kg CH_4/MMBtu and N_2O = 0.0001 kg N_2O/MMBtu), November 29, 2013.
[8] Ammonia emission factor is based on FIRE factor for natural gas combustion.
Pollutants listed in *italics* have listed emission factors in AP-42, but are not HAPs as define Section 112(b) of the Clean Air Act and are not included in the Total HAP emission factor.
Largest single facility-wide HAP shown in bold.

ERM The business of sustainability

Facility Name: Tioga Compressor Station
Subject: Potential to Emit Calculations
Task: Tank Emissions

Prepared: KAT
Reviewed: CAB
Date: Dec. 20, 2020

Pollutant	Tank	Volume (gal)	Turnovers	Net Throughput[4] (gal/yr)	Operating Hours	Losses (lb)		Emission Rate[6]	
						Working	Standing[5]	lb/yr	TPY
VOC	Tank 1[1]	3,000	5.33	10,658	8,760	11.61	0.00	11.61	0.0058
	Tank 2[2]	3,000	5.33	10,658	8,760	11.61	0.00	11.61	0.0058
	Tank 3[3]	3,000	3.27	6,532	8,760	0.00	0.00	0.00	0.0000
	Total	**9,000**	**3.09**	**27,848**	**26,280**	**23.22**	**0.00**	**23.22**	**0.0116**
HAP	Tank 1	3,000	5.33	10,658	8,760	11.32	0.00	11.32	0.0057
	Tank 2	3,000	5.33	10,658	8,760	11.32	0.00	11.32	0.0057
	Tank 3	3,000	3.27	6,532	8,760	0.00	0.00	0.00	0.0000
	Total	**9,000**	**3.09**	**27,848**	**26,280**	**22.64**	**0.00**	**22.64**	**0.0113**

[1] Tank 1 is a 3,000 gallon underground slop oil fixed roof storage tank that contains pipeline fluids, which consists of any entrained debris and oil from the pipeline that has been filtered from natural gas before the gas sent downstream.

[2] Tank 2 is a 3,000 gallon underground waste oil fixed roof storage tank, which contains waste oil from the engine oil used by the compressor engines.

[3] Tank 3 is a 3,000 gallon underground floor drain fixed roof tank that collects water and oil drippings from the engines when the floor is cleaned.

[4] Tank throughput is calculated by using a ratio of the net throughput of a pipeline fluids storage tank located at a similar site and the HP of the six compressor engines located at Tioga Compressor Station.

[5] Standing losses for underground tanks are assumed to be zero.

[6] Tank emission calculations were completed using the calculations for a fixed roof tank in AP-42 Chapter 7.1 Organic Liquid Storage Tanks, November 2006. Based on meteorological data from Minot, ND.

ERM The business of sustainability

Facility Name: Tioga Compressor Station
Subject: Potential to Emit Calculations
Task: Fugitive Emissions from Blowdown, Startup and Operation

Prepared: AMC

Date: 2-Jan-20

Blowdown	
Assumptions:	
Hours of Operation	8,760
Gas Analysis:	
VOC Weight Percent[1], %	5.53%
CH_4 Weight Percent[2], %	53.93%
CO_2 Weight Percent[3].%	2.568%
HAP Weight Percent[4], %	0.022%
Specific Gravity from Gas Analysis	0.719
Gas Weight, lb/scf	0.058
Conversion Factors:	
specific gravity of air	1
weight of scf air, lb/scf	0.0807
lb/ton	2,000
lb/kg	2.204
hours per year	8,760
CO_2 to CO_2e	1
CH_4 to CO_2e	25
N_2O to CO_2e	298

				Pollutant (TPY)					
Blowdown Event	**Number of Events**	**SCF/Event**	**Total SCF**	**VOC**	**HAP**	**CO_2e**	**CO_2**	**CH_4**	**N_2O**
Startup and Commissioning									
Full Station	2	125,000	250,000	0.40	0.0016	98.00	0.1863	3.9126	0
Compressor Unit	10	35,000	350,000	0.56	0.0022	137.20	0.2608	5.4776	0
Sub-Total	-	-	600,000	0.96	0.00	235.20	0.45	9.39	0
Annual Operation									
ESD Test Station	1	125,000	125,000	0.20	0.0008	49.00	0.0931	1.9563	0
Compressor Unit	120	35,000	4,200,000	6.74	0.0268	1646.41	3.1294	65.7314	0
Sub-Total	-	-	4,325,000	6.94	0.03	1695.42	3.22	67.69	0
Total			**4,925,000**	**7.90**	**0.03**	**1930.62**	**3.67**	**77.08**	**0.00**

[1]Weight percent of VOC taken from WBI Energy gas analysis and excludes methane and ethane hydrocarbons.
[2]Weight percent of methane taken from WBI Energy gas analysis.
[3]Weight percent of carbon dioxide taken from WBI Energy gas analysis.
[4]Weight percent of total HAPS is the weight percent of C6 from the WBI Energy gas analysis. This is a conservative estimate of HAPs.
[5]Blowdown quantities provided by WBI Energy.

Appendix C

Permit Application Forms

PERMIT APPLICATION FOR AIR CONTAMINANT SOURCES

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8516 (3-2019)

SECTION A - FACILITY INFORMATION

Name of Firm or Organization WBI Energy Transmission, Inc.		
Applicant's Name Marc Dempewolf		
Title Director of Pipeline Operations	Telephone Number (406) 359-7309	E-mail Address Marc.Dempewolf@wbienergy.com
Contact Person for Air Pollution Matters Jill Linn		
Title Environmental Manager	Telephone Number (406) 359-7332	E-mail Address Jill.Linn@wbienergy.com
Mailing Address (Street & No.) 2010 Montana Avenue		
City Glendive	State MT	ZIP Code 59330
Facility Name Tioga Compressor Station		
Facility Address (Street & No.) [no street address available at this time]		
City Tioga	State ND	ZIP Code 58852
County Williams	Latitude (Nearest Second) 48.4026	Longitude (Nearest Second) -102.9072

Legal Description of Facility Site Gas Compression Station				
Quarter SW1/4	Quarter SW1/4	Section 24	Township 157N	Range 95W

Land Area at Facility Site Acres (or) Sq. Ft.	MSL Elevation at Facility 2280 ft

SECTION B – GENERAL NATURE OF BUSINESS

Describe Nature of Business	North American Industry Classification System Number	Standard Industrial Classification Number (SIC)
Natural Gas Transmission - Gas Compression Station	486210	4922

SECTION C – GENERAL PERMIT INFORMATION

Type of Permit? ■ Permit to Construct (PTC) ☐ Permit to Operate (PTO)	
If application is for a Permit to Construct, please provide the following data:	
Planned Start Construction Date April 2021	Planned End Construction Date October 2021

SECTION D – SOURCE IDENTIFICATION AND CATEGORY OF EACH SOURCE INCLUDED ON THIS PERMIT APPLICATION

		Permit to Construct				Minor Source Permit to Operate						
Your Source ID Number	Source or Unit (Equipment, Machines, Devices, Boilers, Processes, Incinerators, Etc.)	New Source	Existing Source Modification	Existing Source Expansion	Existing Source Change of Location	New Source	Existing Source Initial Application	Existing Source After Modification	Existing Source After Expansion	Existing Source After Change of Location	Existing Source After Change of Ownership	Other
EU02	Engine/Compressor #2	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
EU03	Engine/Compressor #3	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
EU04	Engine/Compressor #4	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
EU05	Engine/Compressor #5	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
EU06	Engine/Compressor #6	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
EU07	Engine/Compressor #7	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
EU08	Generator	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Add additional pages if necessary

SECTION D2 – APPLICABLE REGULATIONS

Source ID No.	Applicable Regulations (NSPS/MACT/NESHAP/etc.)
Facility-wide	NSPS 40 CFR 60 Subpart OOOOa
EU02 thru EU08	40 CFR 60 Subpart JJJJ, 40 CFR 63 Subpart ZZZZ

SECTION E – TOTAL POTENTIAL EMISSIONS

Pollutant	Amount (Tons Per Year)
NO_x	232.82
CO	137.15
PM	8.55

Pollutant	Amount (Tons Per Year)
PM_{10} (filterable and condensable)	8.55
$PM_{2.5}$ (filterable and condensable)	8.55
SO_2	0.48
VOC	150.22 (without fugitives)
GHG (as CO_2e)	117,143
Largest Single HAP	8.90
Total HAPS	23.97

*If performance test results are available for the unit, submit a copy of test with this application. If manufacturer guarantee is used provide spec sheet.

SECTION F1 – ADDITIONAL FORMS

Indicate which of the following forms are attached and made part of the application

- ■ Air Pollution Control Equipment (SFN 8532)
- ☐ Construct/Operate Incinerators (SFN 8522)
- ☐ Natural Gas Processing Plants (SFN 11408)
- ☐ Glycol Dehydration Units (SFN 58923)
- ☐ Flares (SFN 59652)
- ☐ Grain, Feed, and Fertilizer Operations (SFN 8524)
- ☐ Fuel Burning Equipment Used for Indirect Heating (SFN 8518)
- ■ Hazardous Air Pollutant (HAP) Sources (SFN 8329)
- ☐ Manufacturing or Processing Equipment (SFN 8520)
- ☐ Volatile Organic Compounds Storage Tank (SFN 8535)
- ■ Internal Combustion Engines and Turbines (SFN 8891)
- ☐ Oil/Gas Production Facility Registration (SFN 14334)

SECTION F2 – OTHER ATTACHMENTS INCLUDED AS PART OF THIS APPLICATION

1.	Site Location Map & Site Plot Plan	4.	Summary of Air Dispersion Modeling Applicability
2.	Project and Process Description	5.	Summary of Applicable Federal Regulations
3.	Estimated Emissions Calculations	6.	Analysis of Air Toxics

I, the undersigned applicant, am fully aware that statements made in this application and the attached exhibits and statements constitute the application for Permit(s) to Construct and/or Operate Air Contaminant sources from the North Dakota Department of Environmental Quality and certify that the information in this application is true, correct and complete to the best of my knowledge and belief. Further, I agree to comply with the provisions of Chapter 23.1-06 of the North Dakota Century Code and all rules and regulations of the Department, or revisions thereof. I also understand the permit is nontransferable and, if granted a permit, I will promptly notify the Department upon sale or legal transfer of this permitted establishment.

Signature	Date
[signature]	2-10-20

INSTRUCTIONS

SITE PLANS TO BE ATTACHED TO APPLICATION:

Prepare and attach a plot plan drawn to scale or properly dimensioned, showing at least the following:

a. The property involved and the outlines and heights of all buildings on the property. Identify property lines plainly. Also, indicate if there is a fence around the property that prevents public access.

b. Location and identification of all existing or proposed equipment, manufacturing processes, etc., and points of emission or discharge of air contaminants to the atmosphere.

c. Location of the facility or property with respect to the surrounding area, including residences, businesses and other permanent structures, streets and roadways. Identify all such structures and roadways. Indicate direction (**NORTH**) on the drawing and the prevailing wind direction.

EQUIPMENT PLANS AND SPECIFICATIONS FOR PERMIT TO CONSTRUCT:

Supply plans and specifications, including as a minimum an assembly drawing, dimensioned and to scale, in plan, elevation and as many sections as are needed to show clearly the design and operation of the equipment and the means by which air contaminants are controlled.

The following must be shown:

a. Size and shape of the equipment. Show exterior and interior dimensions and features.

b. Locations, sizes, and shape details of all features which may affect the production, collection, conveying, or control of air contaminants of any kind, location, size, and shape details concerning all material handling equipment.

c. All data and calculations used in selecting or designing the equipment.

d. Horsepower rating of all internal combustion engines driving the equipment.

NOTE: **STRUCTURAL DESIGN CALCULATIONS AND DETAILS ARE NOT REQUIRED.** WHEN STANDARD COMMERCIAL EQUIPMENT IS TO BE INSTALLED, THE MANUFACTURER'S CATALOG DESCRIBING THE EQUIPMENT MAY BE SUBMITTED IN LIEU OF ITEMS a, b, c, and d OF ABOVE, WHICH THE CATALOG COVERS. ALL INFORMATION REQUIRED ABOVE THAT THE CATALOG DOES NOT CONTAIN MUST BE SUBMITTED BY THE APPLICANT.

ADDITIONAL INFORMATION MAY BE REQUIRED:

If the application is signed by an authorized representative of the owner, a LETTER OF AUTHORIZATION must be attached to the application.

SEND COMPLETED APPLICATION AND ALL ATTACHMENTS TO:

North Dakota Department of Environmental Quality
Division of Air Quality
918 E Divide Avenue, 2nd Floor
Bismarck, ND 58501-1947
(701) 328-5188

EU02

PERMIT APPLICATION FOR INTERNAL COMBUSTION ENGINES AND TURBINES
NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8891 (3-2019)

NOTE: READ INSTRUCTIONS BEFORE COMPLETING THIS FORM.
- Must include SFN 8516 or SFN 52858

SECTION A – GENERAL INFORMATION

Name of Firm or Organization	Facility Name
WBI Energy Transmission, Inc.	Tioga Compressor Station

SECTION B – FACILITY AND UNIT INFORMATION

Source ID Number (From form SFN 8516)
EU02 Caterpillar 3612 natural gas-fired SI RICE (3750 HP)

Type of Unit (check all that apply)		
	☒ Stationary Natural Gas-Fired Engine	☐ Emergency Use Only
	☐ Stationary Diesel and Dual Fuel Engine	☒ Non-Emergency Use
	☐ Stationary Gasoline Engine	☐ Peaking
	☐ Stationary Natural Gas-Fired Turbine	☐ Demand Response
	☐ Other – Specify:	

SECTION C – MANUFACTURER DATA

Make	Model	Date of Manufacture
Caterpillar	G 3612 LE A4	

Reciprocating Internal Combustion Engine

☒ Spark Ignition ☐ Compression Ignition

☐ 4 Stroke ☐ 2 Stroke ☐ Rich Burn ☒ Lean Burn

Maximum Rating (BHP @ rpm)	Operating Capacity (BHP @ rpm)
3,750	3,750

Engine Subject to:
☐ 40 CFR 60, Subpart IIII ☒ 40 CFR 60, Subpart JJJJ ☒ 40 CFR 63, Subpart ZZZZ
☐ 40 CFR 60, Subpart OOOO ☒ 40 CFR 60, Subpart OOOOa

Turbine — Dry Low Emissions? ☐ Yes ☐ No

Heat Input (MMBtu/hr)	Maximum Rating (HP)	75% Rating (HP)	Efficiency
	3,750		

Turbine Subject to: ☐ 40 CFR 60, Subpart GG ☐ 40 CFR 60, Subpart KKKK

SECTION D – FUELS USED

Natural Gas (10^6 cu ft/year)	Percent Sulfur	Percent H_2S
239.3 Million Cubic Feet / year	0.6 %	negl.
Oil (gal/year)	**Percent Sulfur**	**Grade No.**
0 gallons/year	N/A	N/A
LP Gas (gal/year)	**Other – Specify:**	
0 gallons/year	N/A	

SECTION E – NORMAL OPERATING SCHEDULE

Hours Per Day	Days Per Week	Weeks Per Year	Hours Per Year	Peak Production Season (if any)
24	7	52	8760	

SECTION F – STACK PARAMETERS

Emission Point ID Number		Stack Height Above Ground Level (feet)	
EP02		43 feet	
Stack Diameter (feet at top)	**Gas Discharged (SCFM)**	**Exit Temp (°F)**	**Gas Velocity (FPS)**
2 feet	9,096 scfm	823 F	126.8 ft/sec

SECTION G – EMISSION CONTROL EQUIPMENT

Is any emission control equipment installed on this unit?

☐ No ☒ Yes – Complete and attach form SFN 8532

SECTION H – MAXIMUM AIR CONTAMINANTS EMITTED

Pollutant	Maximum Pounds Per Hour	Amount (Tons Per Year)	Basis of Estimate*
NO_x	8.27	36.21	Emission factor based on compliance with 40 CFR 60 Subpart JJJJ
CO	16.53	18.11	Emission factor based on compliance with 40 CFR 60 Subpart JJJJ
PM	0.28	1.23	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
PM_{10} (filterable and condensable)	0.28	1.23	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
$PM_{2.5}$ (filterable and condensable)	0.28	1.23	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
SO_2	0.02	0.07	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
VOC	4.13	18.11	Emission factor based on compliance with 40 CFR 60 Subpart JJJJ
GHG (as CO_2e)	3,872	16,961	CO2 emission factor from 40 CFR 98 Subpart C Table C-1 (53.06 kg CO2/MMBtu), November 29, 2013. CH4 and N2O e
Largest Single HAP	0.33	1.45	largest single HAP is formadehyde
Total HAPS	0.88	3.83	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000, formaldehyde is based on vendor

* If performance test results are available for the unit, submit a copy of test with this application, if manufacture data used, submit manufacturers specification sheets.

IS THIS UNIT IN COMPLIANCE WITH ALL APPLICABLE AIR POLLUTION RULES AND REGULATIONS?

☒ YES ☐ NO

If "NO" a Compliance Schedule (SFN 61008) must be completed and attached.

Attach and label separate sheet(s) if you need more space to explain any system or answers or to provide complete listings of Emissions, Contaminants, or other items.

SEND COMPLETED APPLICATION AND ALL ATTACHMENTS TO:

North Dakota Department of Environmental Quality
Division of Air Quality
918 E Divide Avenue, 2nd Floor
Bismarck, ND 58501-1947
(701) 328-5188

PERMIT APPLICATION FOR AIR POLLUTION CONTROL EQUIPMENT
NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8532 (3-2019)

NOTE: READ INSTRUCTIONS BEFORE COMPLETING THIS FORM.
- Must also include forms SFN 8516 or SFN 52858

SECTION A – GENERAL INFORMATION

Name of Firm or Organization	Facility Name
WBI Energy Transmission, Inc.	Tioga Compressor Station
Source ID No. of Equipment being Controlled: EU02 Caterpillar 3612 natural gas-fired SI RICE (3750 HP)	

SECTION B – EQUIPMENT

Type: ☐ Cyclone ☐ Multiclone ☐ Baghouse ☐ Electrostatic Precipitator
☐ Wet Scrubber ☐ Spray Dryer ☐ Flare/Combustor
☒ Other – Specify: Catalytic Oxidizer

Name of Manufacturer	Model Number	Date to Be Installed
MIRATECH	SP-PT-72-16080005-XH4B0	April 2021

Application:
☐ Boiler ☐ Kiln ☒ Engine ☐ Other – Specify:

Pollutants Removed	CO	NMNEHC	CH2O	
Design Efficiency (%)				
Operating Efficiency (%)	83	19	79	

Describe method used to determine operating efficiency:
Operating Efficiency determined based on difference between inlet emissions and outlet emissions; outlet emissions are based on requested permit limits for mass emissions.

SECTION CD – GAS CONDITIONS

Gas Conditions			Inlet	Outlet
Gas Volume (SCFM; 68°F; 14.7 psia)				9206 SCFM
Gas Temperature (°F)			550F -1250F	1350 F
Gas Pressure (in. H_2O)			not available	not available
Gas Velocity (ft/sec)			not available	not available
Pollutant Concentration (Specify Pollutant and Unit of Concentration)	Pollutant	Unit of Concentration		
	CO	g/bhp-hr	2.98	0.5
	NMNEHC	g/bhp-hr	0.62	0.5
	CH2O	g/bhp-hr	0.19	0.04

Pressure Drop Through Gas Cleaning Device (in. H_2O)
7.5 inches of water

INSTRUCTIONS FOR PERMIT APPLICATION FOR AIR POLLUTION CONTROL EQUIPMENT

1. Complete this form for each piece of equipment or process, which has air pollution control equipment installed, described in the following Permit Applications: Hazardous Air Pollutant (HAP) Sources (SFN 8329), Fuel Burning Equipment for Indirect Heating (SFN 8518); Manufacturing or Processing Equipment (SFN 8520); Incinerators/Crematories (SFN 8522); Internal Combustion Engines and Turbines (SFN 8891); and Glycol Dehydration Units (SFN 58923). Print or type all information. If an item does not apply, place NA in the appropriate space.

2. Type of Equipment - If the type is not one of those listed; provide enough information so the operating principal of the equipment can be determined.

3. List each pollutant which the device is intended to control, the efficiency of removal intended by the designer, and the actual efficiency under operating conditions.

4. Please attach the following:

   - A brief description and sketch of the air pollution control device if it is of unusual design or used in conjunction with other control devices. Show any bypass of the device and specify the conditions under which the bypass is used.

   - A description of what is done with collected air contaminants from the time they are collected until they reach the final disposal point. Include a description of the transportation methods used.

   - If a stack test has been conducted, attach a copy of the results, date of the test, a description of the techniques used, and the name and address of the organization which performed the test.

5. If the control device is a combustor (e.g.: thermal oxidizer, vapor combustion unit, etc.), include an estimate of potential greenhouse gas emissions (CO_2e).

<u>SUBMIT YOUR APPLICATION WITH ALL SUPPORTING DOCUMENTS, ALONG WITH THE FORMS SPECIFIED IN THE FIRST PARAGRAPH ABOVE, TO:</u>

North Dakota Department of Environmental Quality
Division of Air Quality
918 E Divide Avenue, 2nd Floor
Bismarck, ND 58501-1947
(701) 328-5188

PERMIT APPLICATION FOR HAZARDOUS AIR POLLUTANT (HAP) SOURCES

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8329 (3-2019)

SECTION A1 - APPLICANT INFORMATION

Name of Firm or Organization WBI Energy Transmission, Inc.		
Applicant's Name Marc Dempewolf		
Title Director of Pipeline Operations	Telephone Number (409) 359-7309	E-mail Address Marc.Dempewolf@wbienergy.com
Mailing Address (Street & No.) 2010 Montana Avenue		
City Glendive	State MT	ZIP Code 59330

SECTION A2 - FACILITY INFORMATION

Contact Person for Air Pollution Matters Jill Linn		
Title Environmental Manager	Telephone Number (406) 359-7332	E-mail Address Jill.Linn@wbienergy.com
Facility Address (Street & No. or Lat/Long to Nearest Second) 48°24'13"N 102°54'21"W		
City Tioga	State ND	ZIP Code 58852
County Williams	Number of Employees at Location 2	
Land Area at Plant Site 9 Acres (or) 2280 Sq. Ft.	MSL Elevation at Plant	

Describe Nature of Business/Process

Natural Gas Transmission - Gas Compressor Station

SECTION B – STACK DATA

Inside Diameter (ft) 2 feet	Height Above Grade (ft) 43 feet	
Gas Temperature at Exit (°F) 823 F	Gas Velocity at Exit (ft/sec) 126.8 feet / second	Gas Volume (scfm) 9,096 SCFM
Basis of any Estimates (attach separate sheet if necessary)		
Are Emission Control Devices in Place? If YES – Complete SFN 8532	◉ Yes	○ No
Nearest Residences or Building	Distance (ft) 2,063.8	Direction E
Nearest Property Line	Distance (ft)	Direction

SECTION C – EMISSION STREAM DATA

Source ID No. From SFN 8516 EU 02	Mean Particle Diameter (um) N/A
Flow Rate (scfm) 9096 ACFM	Drift Velocity (ft/sec) N/A
Stream Temperature (°F) 823 F	Particulate Concentration (gr/dscf) N/A
Moisture Content (%) 17 %	Halogens or Metals Present? No
Pressure (in. Hg) N/A	Organic Content (ppmv) NMNEHC 126 ppm @ 15% O2
Heat Content (Btu/scfm) 1,193 Btu/scf	O_2 Content (%) 11.6 %

SECTION D – POLLUTANT SPECIFIC DATA
(Complete One Box for Each Pollutant in Emission Stream)

Pollutant Emitted See calculations in Appendix B	Chemical Abstract Services (CAS) Number
Proposed Emission Rate (lb/hr)	Emission Source (describe)
Source Classification (process point, process fugitive, area fugitive)	Pollutant Class and Form (organic/inorganic - particulate/vapor)
Concentration in Emission Stream (ppmv)	Vapor Pressure (in. Hg @ °F)
Solubility	Molecular Weight (lb/lb-mole)
Absorptive Properties	

Pollutant Emitted	Chemical Abstract Services (CAS) Number
Proposed Emission Rate (lb/hr)	Emission Source (describe)
Source Classification (process point, process fugitive, area fugitive)	Pollutant Class and Form (organic/inorganic - particulate/vapor)
Concentration in Emission Stream (ppmv)	Vapor Pressure (in. Hg @ °F)
Solubility	Molecular Weight (lb/lb-mole)
Absorptive Properties	

(Add additional pages if necessary)

Signature of Applicant [signature]	Date 2-10-20

SEND COMPLETED APPLICATION AND ALL ATTACHMENTS TO:

North Dakota Department of Environmental Quality
Division of Air Quality
918 E Divide Avenue, 2nd Floor
Bismarck, ND 58501-1947
(701) 328-5188

EU03

PERMIT APPLICATION FOR INTERNAL COMBUSTION ENGINES AND TURBINES

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8891 (3-2019)

NOTE: READ INSTRUCTIONS BEFORE COMPLETING THIS FORM.
- Must include SFN 8516 or SFN 52858

SECTION A – GENERAL INFORMATION

Name of Firm or Organization	Facility Name
WBI Energy Transmission, Inc.	Tioga Compressor Station

SECTION B – FACILITY AND UNIT INFORMATION

Source ID Number (From form SFN 8516)
EU03 Caterpillar 3612 natural gas-fired SI RICE (3750 HP)

Type of Unit (check all that apply)		
	☒ Stationary Natural Gas-Fired Engine	☐ Emergency Use Only
	☐ Stationary Diesel and Dual Fuel Engine	☒ Non-Emergency Use
	☐ Stationary Gasoline Engine	☐ Peaking
	☐ Stationary Natural Gas-Fired Turbine	☐ Demand Response
	☐ Other – Specify:	

SECTION C – MANUFACTURER DATA

Make	Model	Date of Manufacture
Caterpillar	G 3612 LE A4	

Reciprocating Internal Combustion Engine

☒ Spark Ignition ☐ Compression Ignition

☐ 4 Stroke ☐ 2 Stroke ☐ Rich Burn ☒ Lean Burn

Maximum Rating (BHP @ rpm)	Operating Capacity (BHP @ rpm)
3,750	3,750

Engine Subject to:
☐ 40 CFR 60, Subpart IIII ☒ 40 CFR 60, Subpart JJJJ ☒ 40 CFR 63, Subpart ZZZZ
☐ 40 CFR 60, Subpart OOOO ☒ 40 CFR 60, Subpart OOOOa

Turbine Dry Low Emissions? ☐ Yes ☐ No

Heat Input (MMBtu/hr)	Maximum Rating (HP)	75% Rating (HP)	Efficiency
	3,750		

Turbine Subject to: ☐ 40 CFR 60, Subpart GG ☐ 40 CFR 60, Subpart KKKK

SECTION D – FUELS USED

Natural Gas (10^6 cu ft/year)	Percent Sulfur	Percent H_2S
239.3 Million Cubic Feet / year	0.6 %	negl.
Oil (gal/year)	**Percent Sulfur**	**Grade No.**
0 gallons/year	N/A	N/A
LP Gas (gal/year)	**Other – Specify:**	
0 gallons/year	N/A	

SECTION E – NORMAL OPERATING SCHEDULE

Hours Per Day	Days Per Week	Weeks Per Year	Hours Per Year	Peak Production Season (if any)
24	7	52	8760	

SECTION F – STACK PARAMETERS

Emission Point ID Number		Stack Height Above Ground Level (feet)	
EP02		43 feet	
Stack Diameter (feet at top)	**Gas Discharged (SCFM)**	**Exit Temp (°F)**	**Gas Velocity (FPS)**
2 feet	9,096 scfm	823 F	126.8 ft/sec

SECTION G – EMISSION CONTROL EQUIPMENT

Is any emission control equipment installed on this unit?

☐ No ☒ Yes – Complete and attach form SFN 8532

SECTION H – MAXIMUM AIR CONTAMINANTS EMITTED

Pollutant	Maximum Pounds Per Hour	Amount (Tons Per Year)	Basis of Estimate*
NO_x	8.27	36.21	Emission factor based on compliance with 40 CFR 60 Subpart JJJJ
CO	16.53	18.11	Emission factor based on compliance with 40 CFR 60 Subpart JJJJ
PM	0.28	1.23	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
PM_{10} (filterable and condensable)	0.28	1.23	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
$PM_{2.5}$ (filterable and condensable)	0.28	1.23	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
SO_2	0.02	0.07	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
VOC	4.13	18.11	Emission factor based on compliance with 40 CFR 60 Subpart JJJJ
GHG (as CO_2e)	3,872	16,961	CO2 emission factor from 40 CFR 98 Subpart C Table C-1 (53.06 kg CO2/MMBtu), November 29, 2013. CH4 and N2O e
Largest Single HAP	0.33	1.45	largest single HAP is formadehyde
Total HAPS	0.88	3.83	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000, formaldehyde is based on vendor

* If performance test results are available for the unit, submit a copy of test with this application, if manufacture data used, submit manufacturers specification sheets.

IS THIS UNIT IN COMPLIANCE WITH ALL APPLICABLE AIR POLLUTION RULES AND REGULATIONS?

☒ YES ☐ NO

If "NO" a Compliance Schedule (SFN 61008) must be completed and attached.

Attach and label separate sheet(s) if you need more space to explain any system or answers or to provide complete listings of Emissions, Contaminants, or other items.

SEND COMPLETED APPLICATION AND ALL ATTACHMENTS TO:

North Dakota Department of Environmental Quality
Division of Air Quality
918 E Divide Avenue, 2nd Floor
Bismarck, ND 58501-1947
(701) 328-5188

PERMIT APPLICATION FOR AIR POLLUTION CONTROL EQUIPMENT

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8532 (3-2019)

NOTE: READ INSTRUCTIONS BEFORE COMPLETING THIS FORM.
- Must also include forms SFN 8516 or SFN 52858

SECTION A – GENERAL INFORMATION

Name of Firm or Organization	Facility Name
WBI Energy Transmission, Inc.	Tioga Compressor Station
Source ID No. of Equipment being Controlled: EU03 Caterpillar 3612 natural gas-fired SI RICE (3750 HP)	

SECTION B – EQUIPMENT

Type: ☐ Cyclone ☐ Multiclone ☐ Baghouse ☐ Electrostatic Precipitator
☐ Wet Scrubber ☐ Spray Dryer ☐ Flare/Combustor
☒ Other – Specify: Catalytic Oxidizer

Name of Manufacturer	Model Number	Date to Be Installed
MIRATECH	SP-PT-72-16080005-XH4B0	April 2021

Application: ☐ Boiler ☐ Kiln ☒ Engine ☐ Other – Specify:

Pollutants Removed	CO	NMNEHC	CH2O	
Design Efficiency (%)				
Operating Efficiency (%)	83	19	79	

Describe method used to determine operating efficiency:
Operating Efficiency determined based on difference between inlet emissions and outlet emissions; outlet emissions are based on requested permit limits for mass emissions.

SECTION CD – GAS CONDITIONS

Gas Conditions			Inlet	Outlet
Gas Volume (SCFM; 68°F; 14.7 psia)				9206 SCFM
Gas Temperature (°F)			550F -1250F	1350 F
Gas Pressure (in. H_2O)			not available	not available
Gas Velocity (ft/sec)			not available	not available
Pollutant Concentration (Specify Pollutant and Unit of Concentration)	Pollutant	Unit of Concentration		
	CO	g/bhp-hr	2.98	0.5
	NMNEHC	g/bhp-hr	0.62	0.5
	CH2O	g/bhp-hr	0.19	0.04

Pressure Drop Through Gas Cleaning Device (in. H_2O)
7.5 inches of water

INSTRUCTIONS FOR PERMIT APPLICATION FOR AIR POLLUTION CONTROL EQUIPMENT

1. Complete this form for each piece of equipment or process, which has air pollution control equipment installed, described in the following Permit Applications: Hazardous Air Pollutant (HAP) Sources (SFN 8329), Fuel Burning Equipment for Indirect Heating (SFN 8518); Manufacturing or Processing Equipment (SFN 8520); Incinerators/Crematories (SFN 8522); Internal Combustion Engines and Turbines (SFN 8891); and Glycol Dehydration Units (SFN 58923). Print or type all information. If an item does not apply, place NA in the appropriate space.

2. Type of Equipment - If the type is not one of those listed; provide enough information so the operating principal of the equipment can be determined.

3. List each pollutant which the device is intended to control, the efficiency of removal intended by the designer, and the actual efficiency under operating conditions.

4. Please attach the following:

   - A brief description and sketch of the air pollution control device if it is of unusual design or used in conjunction with other control devices. Show any bypass of the device and specify the conditions under which the bypass is used.

   - A description of what is done with collected air contaminants from the time they are collected until they reach the final disposal point. Include a description of the transportation methods used.

   - If a stack test has been conducted, attach a copy of the results, date of the test, a description of the techniques used, and the name and address of the organization which performed the test.

5. If the control device is a combustor (e.g.: thermal oxidizer, vapor combustion unit, etc.), include an estimate of potential greenhouse gas emissions (CO_2e).

<u>SUBMIT YOUR APPLICATION WITH ALL SUPPORTING DOCUMENTS, ALONG WITH THE FORMS SPECIFIED IN THE FIRST PARAGRAPH ABOVE, TO:</u>

North Dakota Department of Environmental Quality
Division of Air Quality
918 E Divide Avenue, 2nd Floor
Bismarck, ND 58501-1947
(701) 328-5188

PERMIT APPLICATION FOR HAZARDOUS AIR POLLUTANT (HAP) SOURCES

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8329 (3-2019)

SECTION A1 - APPLICANT INFORMATION

Name of Firm or Organization WBI Energy Transmission, Inc.		
Applicant's Name Marc Dempewolf		
Title Director of Pipeline Operations	Telephone Number (409) 359-7309	E-mail Address Marc.Dempewolf@wbienergy.com
Mailing Address (Street & No.) 2010 Montana Avenue		
City Glendive	State MT	ZIP Code 59330

SECTION A2 - FACILITY INFORMATION

Contact Person for Air Pollution Matters Jill Linn		
Title Environmental Manager	Telephone Number (406) 359-7332	E-mail Address Jill.Linn@wbienergy.com
Facility Address (Street & No. or Lat/Long to Nearest Second) 48°24'13"N 102°54'21"W		
City Tioga	State ND	ZIP Code 58852
County Williams	Number of Employees at Location 2	
Land Area at Plant Site 9 Acres (or) 2280 Sq. Ft.	MSL Elevation at Plant	

Describe Nature of Business/Process

Natural Gas Transmission - Gas Compressor Station

SECTION B – STACK DATA

Inside Diameter (ft) 2 feet	Height Above Grade (ft) 43 feet	
Gas Temperature at Exit (°F) 823 F	Gas Velocity at Exit (ft/sec) 126.8 feet / second	Gas Volume (scfm) 9,096 SCFM
Basis of any Estimates (attach separate sheet if necessary)		
Are Emission Control Devices in Place? If YES – Complete SFN 8532	◉ Yes	○ No
Nearest Residences or Building	Distance (ft) 2,063.8	Direction E
Nearest Property Line	Distance (ft)	Direction

SECTION C – EMISSION STREAM DATA

Source ID No. From SFN 8516 EU03	Mean Particle Diameter (um) N/A
Flow Rate (scfm) 9096 ACFM	Drift Velocity (ft/sec) N/A
Stream Temperature (°F) 823 F	Particulate Concentration (gr/dscf) N/A
Moisture Content (%) 17 %	Halogens or Metals Present? No
Pressure (in. Hg) N/A	Organic Content (ppmv) NMNEHC 126 ppm @ 15% O2
Heat Content (Btu/scfm) 1,193 Btu/scf	O_2 Content (%) 11.6 %

SECTION D – POLLUTANT SPECIFIC DATA
(Complete One Box for Each Pollutant in Emission Stream)

Pollutant Emitted See Calculations in Appendix B	Chemical Abstract Services (CAS) Number
Proposed Emission Rate (lb/hr)	Emission Source (describe)
Source Classification (process point, process fugitive, area fugitive)	Pollutant Class and Form (organic/inorganic - particulate/vapor)
Concentration in Emission Stream (ppmv)	Vapor Pressure (in. Hg @ °F)
Solubility	Molecular Weight (lb/lb-mole)
Absorptive Properties	

Pollutant Emitted	Chemical Abstract Services (CAS) Number
Proposed Emission Rate (lb/hr)	Emission Source (describe)
Source Classification (process point, process fugitive, area fugitive)	Pollutant Class and Form (organic/inorganic - particulate/vapor)
Concentration in Emission Stream (ppmv)	Vapor Pressure (in. Hg @ °F)
Solubility	Molecular Weight (lb/lb-mole)
Absorptive Properties	

(Add additional pages if necessary)

Signature of Applicant [signature]	Date 2-10-20

SEND COMPLETED APPLICATION AND ALL ATTACHMENTS TO:

North Dakota Department of Environmental Quality
Division of Air Quality
918 E Divide Avenue, 2nd Floor
Bismarck, ND 58501-1947
(701) 328-5188

EU04

PERMIT APPLICATION FOR INTERNAL COMBUSTION ENGINES AND TURBINES

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8891 (3-2019)

NOTE: READ INSTRUCTIONS BEFORE COMPLETING THIS FORM.
- Must include SFN 8516 or SFN 52858

SECTION A – GENERAL INFORMATION

Name of Firm or Organization	Facility Name
WBI Energy Transmission, Inc.	Tioga Compressor Station

SECTION B – FACILITY AND UNIT INFORMATION

Source ID Number (From form SFN 8516)		
EU04 Caterpillar 3612 natural gas-fired SI RICE (3750 HP)		
Type of Unit (check all that apply)	☒ Stationary Natural Gas-Fired Engine ☐ Stationary Diesel and Dual Fuel Engine ☐ Stationary Gasoline Engine ☐ Stationary Natural Gas-Fired Turbine	☐ Emergency Use Only ☒ Non-Emergency Use ☐ Peaking ☐ Demand Response
	☐ Other – Specify:	

SECTION C – MANUFACTURER DATA

Make	Model	Date of Manufacture
Caterpillar	G 3612 LE A4	

Reciprocating Internal Combustion Engine

☒ Spark Ignition ☐ Compression Ignition

☐ 4 Stroke ☐ 2 Stroke | ☐ Rich Burn ☒ Lean Burn

Maximum Rating (BHP @ rpm)	Operating Capacity (BHP @ rpm)
3,750	3,750

Engine Subject to:
☐ 40 CFR 60, Subpart IIII ☒ 40 CFR 60, Subpart JJJJ ☒ 40 CFR 63, Subpart ZZZZ
☐ 40 CFR 60, Subpart OOOO ☒ 40 CFR 60, Subpart OOOOa

Turbine Dry Low Emissions? ☐ Yes ☐ No

Heat Input (MMBtu/hr)	Maximum Rating (HP)	75% Rating (HP)	Efficiency
	3,750		

Turbine Subject to: ☐ 40 CFR 60, Subpart GG ☐ 40 CFR 60, Subpart KKKK

SECTION D – FUELS USED

Natural Gas (10^6 cu ft/year)	Percent Sulfur	Percent H_2S
239.3 Million Cubic Feet / year	0.6 %	negl.
Oil (gal/year)	**Percent Sulfur**	**Grade No.**
0 gallons/year	N/A	N/A
LP Gas (gal/year)	**Other – Specify:**	
0 gallons/year	N/A	

SECTION E – NORMAL OPERATING SCHEDULE

Hours Per Day	Days Per Week	Weeks Per Year	Hours Per Year	Peak Production Season (if any)
24	7	52	8760	

SECTION F – STACK PARAMETERS

Emission Point ID Number		Stack Height Above Ground Level (feet)	
EP02		43 feet	
Stack Diameter (feet at top)	**Gas Discharged (SCFM)**	**Exit Temp (°F)**	**Gas Velocity (FPS)**
2 feet	9,096 scfm	823 F	126.8 ft/sec

SECTION G – EMISSION CONTROL EQUIPMENT

Is any emission control equipment installed on this unit?

☐ No ☒ Yes – Complete and attach form SFN 8532

SECTION H – MAXIMUM AIR CONTAMINANTS EMITTED

Pollutant	Maximum Pounds Per Hour	Amount (Tons Per Year)	Basis of Estimate*
NO_x	8.27	36.21	Emission factor based on compliance with 40 CFR 60 Subpart JJJJ
CO	16.53	18.11	Emission factor based on compliance with 40 CFR 60 Subpart JJJJ
PM	0.28	1.23	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
PM_{10} (filterable and condensable)	0.28	1.23	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
$PM_{2.5}$ (filterable and condensable)	0.28	1.23	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
SO_2	0.02	0.07	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
VOC	4.13	18.11	Emission factor based on compliance with 40 CFR 60 Subpart JJJJ
GHG (as CO_2e)	3,872	16,961	CO2 emission factor from 40 CFR 98 Subpart C Table C-1 (53.06 kg CO2/MMBtu), November 29, 2013. CH4 and N2O e
Largest Single HAP	0.33	1.45	largest single HAP is formadehyde
Total HAPS	0.88	3.83	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000, formaldehyde is based on vendor

* If performance test results are available for the unit, submit a copy of test with this application, if manufacture data used, submit manufacturers specification sheets.

IS THIS UNIT IN COMPLIANCE WITH ALL APPLICABLE AIR POLLUTION RULES AND REGULATIONS?

☒ YES ☐ NO

If "NO" a Compliance Schedule (SFN 61008) must be completed and attached.

Attach and label separate sheet(s) if you need more space to explain any system or answers or to provide complete listings of Emissions, Contaminants, or other items.

SEND COMPLETED APPLICATION AND ALL ATTACHMENTS TO:

North Dakota Department of Environmental Quality
Division of Air Quality
918 E Divide Avenue, 2nd Floor
Bismarck, ND 58501-1947
(701) 328-5188

PERMIT APPLICATION FOR AIR POLLUTION CONTROL EQUIPMENT

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8532 (3-2019)

NOTE: READ INSTRUCTIONS BEFORE COMPLETING THIS FORM.
- Must also include forms SFN 8516 or SFN 52858

SECTION A – GENERAL INFORMATION

Name of Firm or Organization	Facility Name
WBI Energy Transmission, Inc.	Tioga Compressor Station
Source ID No. of Equipment being Controlled EU04 Caterpillar 3612 natural gas-fired SI RICE (3750 HP)	

SECTION B – EQUIPMENT

Type:
- ☐ Cyclone ☐ Multiclone ☐ Baghouse ☐ Electrostatic Precipitator
- ☐ Wet Scrubber ☐ Spray Dryer ☐ Flare/Combustor
- ☒ Other – Specify: Catalytic Oxidizer

Name of Manufacturer	Model Number	Date to Be Installed
MIRATECH	SP-PT-72-16080005-XH4B0	April 2021

Application: ☐ Boiler ☐ Kiln ☒ Engine ☐ Other – Specify:

Pollutants Removed	CO	NMNEHC	CH2O	
Design Efficiency (%)				
Operating Efficiency (%)	83	19	79	

Describe method used to determine operating efficiency:

Operating Efficiency determined based on difference between inlet emissions and outlet emissions; outlet emissions are based on requested permit limits for mass emissions.

SECTION CD – GAS CONDITIONS

Gas Conditions			Inlet	Outlet
Gas Volume (SCFM; 68°F; 14.7 psia)				9206 SCFM
Gas Temperature (°F)			550F -1250F	1350 F
Gas Pressure (in. H_2O)			not available	not available
Gas Velocity (ft/sec)			not available	not available
Pollutant Concentration (Specify Pollutant and Unit of Concentration)	Pollutant	Unit of Concentration		
	CO	g/bhp-hr	2.98	0.5
	NMNEHC	g/bhp-hr	0.62	0.5
	CH2O	g/bhp-hr	0.19	0.04

Pressure Drop Through Gas Cleaning Device (in. H_2O)
7.5 inches of water

INSTRUCTIONS FOR PERMIT APPLICATION FOR AIR POLLUTION CONTROL EQUIPMENT

1. Complete this form for each piece of equipment or process, which has air pollution control equipment installed, described in the following Permit Applications: Hazardous Air Pollutant (HAP) Sources (SFN 8329), Fuel Burning Equipment for Indirect Heating (SFN 8518); Manufacturing or Processing Equipment (SFN 8520); Incinerators/Crematories (SFN 8522); Internal Combustion Engines and Turbines (SFN 8891); and Glycol Dehydration Units (SFN 58923). Print or type all information. If an item does not apply, place NA in the appropriate space.

2. Type of Equipment - If the type is not one of those listed; provide enough information so the operating principal of the equipment can be determined.

3. List each pollutant which the device is intended to control, the efficiency of removal intended by the designer, and the actual efficiency under operating conditions.

4. Please attach the following:

   - A brief description and sketch of the air pollution control device if it is of unusual design or used in conjunction with other control devices. Show any bypass of the device and specify the conditions under which the bypass is used.

   - A description of what is done with collected air contaminants from the time they are collected until they reach the final disposal point. Include a description of the transportation methods used.

   - If a stack test has been conducted, attach a copy of the results, date of the test, a description of the techniques used, and the name and address of the organization which performed the test.

5. If the control device is a combustor (e.g.: thermal oxidizer, vapor combustion unit, etc.), include an estimate of potential greenhouse gas emissions (CO_2e).

<u>SUBMIT YOUR APPLICATION WITH ALL SUPPORTING DOCUMENTS, ALONG WITH THE FORMS SPECIFIED IN THE FIRST PARAGRAPH ABOVE, TO:</u>

North Dakota Department of Environmental Quality
Division of Air Quality
918 E Divide Avenue, 2nd Floor
Bismarck, ND 58501-1947
(701) 328-5188

PERMIT APPLICATION FOR HAZARDOUS AIR POLLUTANT (HAP) SOURCES

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8329 (3-2019)

SECTION A1 - APPLICANT INFORMATION

Name of Firm or Organization WBI Energy Transmission, Inc.		
Applicant's Name Marc Dempewolf		
Title Director of Pipeline Operations	Telephone Number (409) 359-7309	E-mail Address Marc.Dempewolf@wbienergy.com
Mailing Address (Street & No.) 2010 Montana Avenue		
City Glendive	State MT	ZIP Code 59330

SECTION A2 - FACILITY INFORMATION

Contact Person for Air Pollution Matters Jill Linn		
Title Environmental Manager	Telephone Number (406) 359-7332	E-mail Address Jill.Linn@wbienergy.com
Facility Address (Street & No. or Lat/Long to Nearest Second) 48°24'13"N 102°54'21"W		
City Tioga	State ND	ZIP Code 58852
County Williams	Number of Employees at Location 2	
Land Area at Plant Site 9 Acres (or) 2280 Sq. Ft.	MSL Elevation at Plant	

Describe Nature of Business/Process

Natural Gas Transmission - Gas Compressor Station

SECTION B – STACK DATA

Inside Diameter (ft) 2 feet	Height Above Grade (ft) 43 feet	
Gas Temperature at Exit (°F) 823 F	Gas Velocity at Exit (ft/sec) 126.8 feet / second	Gas Volume (scfm) 9,096 SCFM
Basis of any Estimates (attach separate sheet if necessary)		
Are Emission Control Devices in Place? If YES – Complete SFN 8532	◉ Yes	○ No
Nearest Residences or Building	Distance (ft) 2,063.8	Direction E
Nearest Property Line	Distance (ft)	Direction

SECTION C – EMISSION STREAM DATA

Source ID No. From SFN 8516 EU04	Mean Particle Diameter (um) N/A
Flow Rate (scfm) 9096 ACFM	Drift Velocity (ft/sec) N/A
Stream Temperature (°F) 823 F	Particulate Concentration (gr/dscf) N/A
Moisture Content (%) 17 %	Halogens or Metals Present? No
Pressure (in. Hg) N/A	Organic Content (ppmv) NMNEHC 126 ppm @ 15% O2
Heat Content (Btu/scfm) 1,193 Btu/scf	O_2 Content (%) 11.6 %

SECTION D – POLLUTANT SPECIFIC DATA
(Complete One Box for Each Pollutant in Emission Stream)

Pollutant Emitted See Calculations in Appendix B	Chemical Abstract Services (CAS) Number
Proposed Emission Rate (lb/hr)	Emission Source (describe)
Source Classification (process point, process fugitive, area fugitive)	Pollutant Class and Form (organic/inorganic - particulate/vapor)
Concentration in Emission Stream (ppmv)	Vapor Pressure (in. Hg @ °F)
Solubility	Molecular Weight (lb/lb-mole)
Absorptive Properties	

Pollutant Emitted	Chemical Abstract Services (CAS) Number
Proposed Emission Rate (lb/hr)	Emission Source (describe)
Source Classification (process point, process fugitive, area fugitive)	Pollutant Class and Form (organic/inorganic - particulate/vapor)
Concentration in Emission Stream (ppmv)	Vapor Pressure (in. Hg @ °F)
Solubility	Molecular Weight (lb/lb-mole)
Absorptive Properties	

(Add additional pages if necessary)

Signature of Applicant [signature]	Date 2-10-20

SEND COMPLETED APPLICATION AND ALL ATTACHMENTS TO:

North Dakota Department of Environmental Quality
Division of Air Quality
918 E Divide Avenue, 2nd Floor
Bismarck, ND 58501-1947
(701) 328-5188

EU05

PERMIT APPLICATION FOR INTERNAL COMBUSTION ENGINES AND TURBINES
NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8891 (3-2019)

NOTE: READ INSTRUCTIONS BEFORE COMPLETING THIS FORM.
- Must include SFN 8516 or SFN 52858

SECTION A – GENERAL INFORMATION

Name of Firm or Organization	Facility Name
WBI Energy Transmission, Inc.	Tioga Compressor Station

SECTION B – FACILITY AND UNIT INFORMATION

Source ID Number (From form SFN 8516)
EU05 Caterpillar 3612 natural gas-fired SI RICE (3750 HP)

Type of Unit (check all that apply)		
	☒ Stationary Natural Gas-Fired Engine	☐ Emergency Use Only
	☐ Stationary Diesel and Dual Fuel Engine	☒ Non-Emergency Use
	☐ Stationary Gasoline Engine	☐ Peaking
	☐ Stationary Natural Gas-Fired Turbine	☐ Demand Response
	☐ Other – Specify:	

SECTION C – MANUFACTURER DATA

Make	Model	Date of Manufacture
Caterpillar	G 3612 LE A4	

Reciprocating Internal Combustion Engine

☒ Spark Ignition ☐ Compression Ignition

☐ 4 Stroke ☐ 2 Stroke ☐ Rich Burn ☒ Lean Burn

Maximum Rating (BHP @ rpm)	Operating Capacity (BHP @ rpm)
3,750	3,750

Engine Subject to:
☐ 40 CFR 60, Subpart IIII ☒ 40 CFR 60, Subpart JJJJ ☒ 40 CFR 63, Subpart ZZZZ
☐ 40 CFR 60, Subpart OOOO ☒ 40 CFR 60, Subpart OOOOa

Turbine — Dry Low Emissions? ☐ Yes ☐ No

Heat Input (MMBtu/hr)	Maximum Rating (HP)	75% Rating (HP)	Efficiency
	3,750		

Turbine Subject to: ☐ 40 CFR 60, Subpart GG ☐ 40 CFR 60, Subpart KKKK

SECTION D – FUELS USED

Natural Gas (10^6 cu ft/year)	Percent Sulfur	Percent H_2S
239.3 Million Cubic Feet / year	0.6 %	negl.
Oil (gal/year)	Percent Sulfur	Grade No.
0 gallons/year	N/A	N/A
LP Gas (gal/year)	Other – Specify:	
0 gallons/year	N/A	

SECTION E – NORMAL OPERATING SCHEDULE

Hours Per Day	Days Per Week	Weeks Per Year	Hours Per Year	Peak Production Season (if any)
24	7	52	8760	

SECTION F – STACK PARAMETERS

Emission Point ID Number		Stack Height Above Ground Level (feet)	
EP02		43 feet	
Stack Diameter (feet at top)	Gas Discharged (SCFM)	Exit Temp (°F)	Gas Velocity (FPS)
2 feet	9,096 scfm	823 F	126.8 ft/sec

SECTION G – EMISSION CONTROL EQUIPMENT

Is any emission control equipment installed on this unit?

☐ No ☒ Yes – Complete and attach form SFN 8532

SECTION H – MAXIMUM AIR CONTAMINANTS EMITTED

Pollutant	Maximum Pounds Per Hour	Amount (Tons Per Year)	Basis of Estimate*
NO_x	8.27	36.21	Emission factor based on compliance with 40 CFR 60 Subpart JJJJ
CO	16.53	18.11	Emission factor based on compliance with 40 CFR 60 Subpart JJJJ
PM	0.28	1.23	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
PM_{10} (filterable and condensable)	0.28	1.23	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
$PM_{2.5}$ (filterable and condensable)	0.28	1.23	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
SO_2	0.02	0.07	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
VOC	4.13	18.11	Emission factor based on compliance with 40 CFR 60 Subpart JJJJ
GHG (as CO_2e)	3,872	16,961	CO2 emission factor from 40 CFR 98 Subpart C Table C-1 (53.06 kg CO2/MMBtu), November 29, 2013. CH4 and N2O e
Largest Single HAP	0.33	1.45	largest single HAP is formadehyde
Total HAPS	0.88	3.83	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000, formaldehyde is based on vendor

* If performance test results are available for the unit, submit a copy of test with this application, if manufacture data used, submit manufacturers specification sheets.

IS THIS UNIT IN COMPLIANCE WITH ALL APPLICABLE AIR POLLUTION RULES AND REGULATIONS?

☒ YES ☐ NO

If "NO" a Compliance Schedule (SFN 61008) must be completed and attached.

Attach and label separate sheet(s) if you need more space to explain any system or answers or to provide complete listings of Emissions, Contaminants, or other items.

SEND COMPLETED APPLICATION AND ALL ATTACHMENTS TO:

North Dakota Department of Environmental Quality
Division of Air Quality
918 E Divide Avenue, 2nd Floor
Bismarck, ND 58501-1947
(701) 328-5188

PERMIT APPLICATION FOR AIR POLLUTION CONTROL EQUIPMENT

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8532 (3-2019)

NOTE: READ INSTRUCTIONS BEFORE COMPLETING THIS FORM.
- Must also include forms SFN 8516 or SFN 52858

SECTION A – GENERAL INFORMATION

Name of Firm or Organization	Facility Name
WBI Energy Transmission, Inc.	Tioga Compressor Station
Source ID No. of Equipment being Controlled	
EU05 Caterpillar 3612 natural gas-fired SI RICE (3750 HP)	

SECTION B – EQUIPMENT

Type: ☐ Cyclone ☐ Multiclone ☐ Baghouse ☐ Electrostatic Precipitator
☐ Wet Scrubber ☐ Spray Dryer ☐ Flare/Combustor
☒ Other – Specify: Catalytic Oxidizer

Name of Manufacturer	Model Number	Date to Be Installed
MIRATECH	SP-PT-72-16080005-XH4B0	April 2021

Application:
☐ Boiler ☐ Kiln ☒ Engine ☐ Other – Specify:

Pollutants Removed	CO	NMNEHC	CH2O	
Design Efficiency (%)				
Operating Efficiency (%)	83	19	79	

Describe method used to determine operating efficiency:
Operating Efficiency determined based on difference between inlet emissions and outlet emissions; outlet emissions are based on requested permit limits for mass emissions.

SECTION CD – GAS CONDITIONS

Gas Conditions			Inlet	Outlet
Gas Volume (SCFM; 68°F; 14.7 psia)				9206 SCFM
Gas Temperature (°F)			550F -1250F	1350 F
Gas Pressure (in. H_2O)			not available	not available
Gas Velocity (ft/sec)			not available	not available
Pollutant Concentration (Specify Pollutant and Unit of Concentration)	Pollutant	Unit of Concentration		
	CO	g/bhp-hr	2.98	0.5
	NMNEHC	g/bhp-hr	0.62	0.5
	CH2O	g/bhp-hr	0.19	0.04

Pressure Drop Through Gas Cleaning Device (in. H_2O)
7.5 inches of water

INSTRUCTIONS FOR PERMIT APPLICATION FOR AIR POLLUTION CONTROL EQUIPMENT

1. Complete this form for each piece of equipment or process, which has air pollution control equipment installed, described in the following Permit Applications: Hazardous Air Pollutant (HAP) Sources (SFN 8329), Fuel Burning Equipment for Indirect Heating (SFN 8518); Manufacturing or Processing Equipment (SFN 8520); Incinerators/Crematories (SFN 8522); Internal Combustion Engines and Turbines (SFN 8891); and Glycol Dehydration Units (SFN 58923). Print or type all information. If an item does not apply, place NA in the appropriate space.

2. Type of Equipment - If the type is not one of those listed; provide enough information so the operating principal of the equipment can be determined.

3. List each pollutant which the device is intended to control, the efficiency of removal intended by the designer, and the actual efficiency under operating conditions.

4. Please attach the following:

   - A brief description and sketch of the air pollution control device if it is of unusual design or used in conjunction with other control devices. Show any bypass of the device and specify the conditions under which the bypass is used.

   - A description of what is done with collected air contaminants from the time they are collected until they reach the final disposal point. Include a description of the transportation methods used.

   - If a stack test has been conducted, attach a copy of the results, date of the test, a description of the techniques used, and the name and address of the organization which performed the test.

5. If the control device is a combustor (e.g.: thermal oxidizer, vapor combustion unit, etc.), include an estimate of potential greenhouse gas emissions (CO_2e).

<u>SUBMIT YOUR APPLICATION WITH ALL SUPPORTING DOCUMENTS, ALONG WITH THE FORMS SPECIFIED IN THE FIRST PARAGRAPH ABOVE, TO:</u>

North Dakota Department of Environmental Quality
Division of Air Quality
918 E Divide Avenue, 2nd Floor
Bismarck, ND 58501-1947
(701) 328-5188

PERMIT APPLICATION FOR HAZARDOUS AIR POLLUTANT (HAP) SOURCES

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8329 (3-2019)

SECTION A1 - APPLICANT INFORMATION

Name of Firm or Organization WBI Energy Transmission, Inc.		
Applicant's Name Marc Dempewolf		
Title Director of Pipeline Operations	Telephone Number (409) 359-7309	E-mail Address Marc.Dempewolf@wbienergy.com
Mailing Address (Street & No.) 2010 Montana Avenue		
City Glendive	State MT	ZIP Code 59330

SECTION A2 - FACILITY INFORMATION

Contact Person for Air Pollution Matters Jill Linn		
Title Environmental Manager	Telephone Number (406) 359-7332	E-mail Address Jill.Linn@wbienergy.com
Facility Address (Street & No. or Lat/Long to Nearest Second) 48°24'13"N 102°54'21"W		
City Tioga	State ND	ZIP Code 58852
County Williams	Number of Employees at Location 2	
Land Area at Plant Site 9 Acres (or) 2280 Sq. Ft.	MSL Elevation at Plant	

Describe Nature of Business/Process

Natural Gas Transmission - Gas Compressor Station

SECTION B – STACK DATA

Inside Diameter (ft) 2 feet	Height Above Grade (ft) 43 feet	
Gas Temperature at Exit (°F) 823 F	Gas Velocity at Exit (ft/sec) 126.8 feet / second	Gas Volume (scfm) 9,096 SCFM
Basis of any Estimates (attach separate sheet if necessary)		
Are Emission Control Devices in Place? If YES – Complete SFN 8532	◉ Yes	○ No
Nearest Residences or Building	Distance (ft) 2,063.8	Direction E
Nearest Property Line	Distance (ft)	Direction

SECTION C – EMISSION STREAM DATA

Source ID No. From SFN 8516 EU05	Mean Particle Diameter (um) N/A
~~Flow Rate (scfm)~~ 9096 ACFM	~~Drift Velocity (ft/sec)~~ N/A
Stream Temperature (°F) 823 F	Particulate Concentration (gr/dscf) N/A
Moisture Content (%) 17 %	Halogens or Metals Present? No
Pressure (in. Hg) N/A	Organic Content (ppmv) NMNEHC 126 ppm @ 15% O2
Heat Content (Btu/scfm) 1,193 Btu/scf	O_2 Content (%) 11.6 %

SECTION D – POLLUTANT SPECIFIC DATA
(Complete One Box for Each Pollutant in Emission Stream)

Pollutant Emitted See Calculations in Appendix B	Chemical Abstract Services (CAS) Number
Proposed Emission Rate (lb/hr)	Emission Source (describe)
Source Classification (process point, process fugitive, area fugitive)	Pollutant Class and Form (organic/inorganic - particulate/vapor)
Concentration in Emission Stream (ppmv)	Vapor Pressure (in. Hg @ °F)
Solubility	Molecular Weight (lb/lb-mole)
Absorptive Properties	

Pollutant Emitted	Chemical Abstract Services (CAS) Number
Proposed Emission Rate (lb/hr)	Emission Source (describe)
Source Classification (process point, process fugitive, area fugitive)	Pollutant Class and Form (organic/inorganic - particulate/vapor)
Concentration in Emission Stream (ppmv)	Vapor Pressure (in. Hg @ °F)
Solubility	Molecular Weight (lb/lb-mole)
Absorptive Properties	

(Add additional pages if necessary)

Signature of Applicant Paul Desperado	Date 2-10-20

SEND COMPLETED APPLICATION AND ALL ATTACHMENTS TO:

North Dakota Department of Environmental Quality
Division of Air Quality
918 E Divide Avenue, 2nd Floor
Bismarck, ND 58501-1947
(701) 328-5188

EU06

PERMIT APPLICATION FOR INTERNAL COMBUSTION ENGINES AND TURBINES

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8891 (3-2019)

NOTE: READ INSTRUCTIONS BEFORE COMPLETING THIS FORM.
- Must include SFN 8516 or SFN 52858

SECTION A – GENERAL INFORMATION

Name of Firm or Organization	Facility Name
WBI Energy Transmission, Inc.	Tioga Compressor Station

SECTION B – FACILITY AND UNIT INFORMATION

Source ID Number (From form SFN 8516)
EU06 Caterpillar 3612 natural gas-fired SI RICE (3750 HP)

Type of Unit (check all that apply)		
	☒ Stationary Natural Gas-Fired Engine	☐ Emergency Use Only
	☐ Stationary Diesel and Dual Fuel Engine	☒ Non-Emergency Use
	☐ Stationary Gasoline Engine	☐ Peaking
	☐ Stationary Natural Gas-Fired Turbine	☐ Demand Response
	☐ Other – Specify:	

SECTION C – MANUFACTURER DATA

Make	Model	Date of Manufacture
Caterpillar	G 3612 LE A4	

Reciprocating Internal Combustion Engine

☒ Spark Ignition ☐ Compression Ignition

☐ 4 Stroke ☐ 2 Stroke ☐ Rich Burn ☒ Lean Burn

Maximum Rating (BHP @ rpm)	Operating Capacity (BHP @ rpm)
3,750	3,750

Engine Subject to:
☐ 40 CFR 60, Subpart IIII ☒ 40 CFR 60, Subpart JJJJ ☒ 40 CFR 63, Subpart ZZZZ
☐ 40 CFR 60, Subpart OOOO ☒ 40 CFR 60, Subpart OOOOa

Turbine Dry Low Emissions? ☐ Yes ☐ No

Heat Input (MMBtu/hr)	Maximum Rating (HP)	75% Rating (HP)	Efficiency
	3,750		

Turbine Subject to: ☐ 40 CFR 60, Subpart GG ☐ 40 CFR 60, Subpart KKKK

SECTION D – FUELS USED

Natural Gas (10^6 cu ft/year)	Percent Sulfur	Percent H_2S
239.3 Million Cubic Feet / year	0.6 %	negl.
Oil (gal/year)	Percent Sulfur	Grade No.
0 gallons/year	N/A	N/A
LP Gas (gal/year)	Other – Specify:	
0 gallons/year	N/A	

SECTION E – NORMAL OPERATING SCHEDULE

Hours Per Day	Days Per Week	Weeks Per Year	Hours Per Year	Peak Production Season (if any)
24	7	52	8760	

SECTION F – STACK PARAMETERS

Emission Point ID Number		Stack Height Above Ground Level (feet)	
EP02		43 feet	
Stack Diameter (feet at top)	Gas Discharged (SCFM)	Exit Temp (°F)	Gas Velocity (FPS)
2 feet	9,096 scfm	823 F	126.8 ft/sec

SECTION G – EMISSION CONTROL EQUIPMENT

Is any emission control equipment installed on this unit?

☐ No ☒ Yes – Complete and attach form SFN 8532

SECTION H – MAXIMUM AIR CONTAMINANTS EMITTED

Pollutant	Maximum Pounds Per Hour	Amount (Tons Per Year)	Basis of Estimate*
NO_x	8.27	36.21	Emission factor based on compliance with 40 CFR 60 Subpart JJJJ
CO	16.53	18.11	Emission factor based on compliance with 40 CFR 60 Subpart JJJJ
PM	0.28	1.23	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
PM_{10} (filterable and condensable)	0.28	1.23	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
$PM_{2.5}$ (filterable and condensable)	0.28	1.23	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
SO_2	0.02	0.07	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
VOC	4.13	18.11	Emission factor based on compliance with 40 CFR 60 Subpart JJJJ
GHG (as CO_2e)	3,872	16,961	CO2 emission factor from 40 CFR 98 Subpart C Table C-1 (53.06 kg CO2/MMBtu), November 29, 2013. CH4 and N2O e
Largest Single HAP	0.33	1.45	largest single HAP is formadehyde
Total HAPS	0.88	3.83	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000, formaldehyde is based on vendor

* If performance test results are available for the unit, submit a copy of test with this application, if manufacture data used, submit manufacturers specification sheets.

IS THIS UNIT IN COMPLIANCE WITH ALL APPLICABLE AIR POLLUTION RULES AND REGULATIONS?

☒ YES ☐ NO

If "NO" a Compliance Schedule (SFN 61008) must be completed and attached.

Attach and label separate sheet(s) if you need more space to explain any system or answers or to provide complete listings of Emissions, Contaminants, or other items.

SEND COMPLETED APPLICATION AND ALL ATTACHMENTS TO:

North Dakota Department of Environmental Quality
Division of Air Quality
918 E Divide Avenue, 2nd Floor
Bismarck, ND 58501-1947
(701) 328-5188

PERMIT APPLICATION FOR AIR POLLUTION CONTROL EQUIPMENT

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8532 (3-2019)

NOTE: READ INSTRUCTIONS BEFORE COMPLETING THIS FORM.
- Must also include forms SFN 8516 or SFN 52858

SECTION A – GENERAL INFORMATION

Name of Firm or Organization	Facility Name
WBI Energy Transmission, Inc.	Tioga Compressor Station
Source ID No. of Equipment being Controlled EU06 Caterpillar 3612 natural gas-fired SI RICE (3750 HP)	

SECTION B – EQUIPMENT

Type: ☐ Cyclone ☐ Multiclone ☐ Baghouse ☐ Electrostatic Precipitator
☐ Wet Scrubber ☐ Spray Dryer ☐ Flare/Combustor
☒ Other – Specify: Catalytic Oxidizer

Name of Manufacturer	Model Number	Date to Be Installed
MIRATECH	SP-PT-72-16080005-XH4B0	April 2021

Application: ☐ Boiler ☐ Kiln ☒ Engine ☐ Other – Specify:

Pollutants Removed	CO	NMNEHC	CH2O	
Design Efficiency (%)				
Operating Efficiency (%)	83	19	79	

Describe method used to determine operating efficiency:
Operating Efficiency determined based on difference between inlet emissions and outlet emissions; outlet emissions are based on requested permit limits for mass emissions.

SECTION CD – GAS CONDITIONS

Gas Conditions			Inlet	Outlet
Gas Volume (SCFM; 68°F; 14.7 psia)				9206 SCFM
Gas Temperature (°F)			550F -1250F	1350 F
Gas Pressure (in. H_2O)			not available	not available
Gas Velocity (ft/sec)			not available	not available
Pollutant Concentration (Specify Pollutant and Unit of Concentration)	Pollutant	Unit of Concentration		
	CO	g/bhp-hr	2.98	0.5
	NMNEHC	g/bhp-hr	0.62	0.5
	CH2O	g/bhp-hr	0.19	0.04

Pressure Drop Through Gas Cleaning Device (in. H_2O)
7.5 inches of water

INSTRUCTIONS FOR PERMIT APPLICATION FOR AIR POLLUTION CONTROL EQUIPMENT

1. Complete this form for each piece of equipment or process, which has air pollution control equipment installed, described in the following Permit Applications: Hazardous Air Pollutant (HAP) Sources (SFN 8329), Fuel Burning Equipment for Indirect Heating (SFN 8518); Manufacturing or Processing Equipment (SFN 8520); Incinerators/Crematories (SFN 8522); Internal Combustion Engines and Turbines (SFN 8891); and Glycol Dehydration Units (SFN 58923). Print or type all information. If an item does not apply, place NA in the appropriate space.

2. Type of Equipment - If the type is not one of those listed; provide enough information so the operating principal of the equipment can be determined.

3. List each pollutant which the device is intended to control, the efficiency of removal intended by the designer, and the actual efficiency under operating conditions.

4. Please attach the following:

   - A brief description and sketch of the air pollution control device if it is of unusual design or used in conjunction with other control devices. Show any bypass of the device and specify the conditions under which the bypass is used.

   - A description of what is done with collected air contaminants from the time they are collected until they reach the final disposal point. Include a description of the transportation methods used.

   - If a stack test has been conducted, attach a copy of the results, date of the test, a description of the techniques used, and the name and address of the organization which performed the test.

5. If the control device is a combustor (e.g.: thermal oxidizer, vapor combustion unit, etc.), include an estimate of potential greenhouse gas emissions (CO_2e).

SUBMIT YOUR APPLICATION WITH ALL SUPPORTING DOCUMENTS, ALONG WITH THE FORMS SPECIFIED IN THE FIRST PARAGRAPH ABOVE, TO:

North Dakota Department of Environmental Quality
Division of Air Quality
918 E Divide Avenue, 2nd Floor
Bismarck, ND 58501-1947
(701) 328-5188

PERMIT APPLICATION FOR HAZARDOUS AIR POLLUTANT (HAP) SOURCES

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8329 (3-2019)

SECTION A1 - APPLICANT INFORMATION

Name of Firm or Organization WBI Energy Transmission, Inc.		
Applicant's Name Marc Dempewolf		
Title Director of Pipeline Operations	Telephone Number (409) 359-7309	E-mail Address Marc.Dempewolf@wbienergy.com
Mailing Address (Street & No.) 2010 Montana Avenue		
City Glendive	State MT	ZIP Code 59330

SECTION A2 - FACILITY INFORMATION

Contact Person for Air Pollution Matters Jill Linn		
Title Environmental Manager	Telephone Number (406) 359-7332	E-mail Address Jill.Linn@wbienergy.com
Facility Address (Street & No. or Lat/Long to Nearest Second) 48°24'13"N 102°54'21"W		
City Tioga	State ND	ZIP Code 58852
County Williams	Number of Employees at Location 2	
Land Area at Plant Site 9 Acres (or) 2280 Sq. Ft.	MSL Elevation at Plant	

Describe Nature of Business/Process

Natural Gas Transmission - Gas Compressor Station

SECTION B – STACK DATA

Inside Diameter (ft) 2 feet	Height Above Grade (ft) 43 feet	
Gas Temperature at Exit (°F) 823 F	Gas Velocity at Exit (ft/sec) 126.8 feet / second	Gas Volume (scfm) 9,096 SCFM
Basis of any Estimates (attach separate sheet if necessary)		
Are Emission Control Devices in Place? If YES – Complete SFN 8532	☒ Yes	☐ No
Nearest Residences or Building	Distance (ft) 2,063.8	Direction E
Nearest Property Line	Distance (ft)	Direction

SECTION C – EMISSION STREAM DATA

Source ID No. From SFN 8516 EU06	Mean Particle Diameter (um) N/A
Flow Rate (scfm) 9096 ACFM	Drift Velocity (ft/sec) N/A
Stream Temperature (°F) 823 F	Particulate Concentration (gr/dscf) N/A
Moisture Content (%) 17 %	Halogens or Metals Present? No
Pressure (in. Hg) N/A	Organic Content (ppmv) NMNEHC 126 ppm @ 15% O2
Heat Content (Btu/scfm) 1,193 Btu/scf	O_2 Content (%) 11.6 %

SECTION D – POLLUTANT SPECIFIC DATA
(Complete One Box for Each Pollutant in Emission Stream)

Pollutant Emitted See Calculations in Appendix B	Chemical Abstract Services (CAS) Number
Proposed Emission Rate (lb/hr)	Emission Source (describe)
Source Classification (process point, process fugitive, area fugitive)	Pollutant Class and Form (organic/inorganic - particulate/vapor)
Concentration in Emission Stream (ppmv)	Vapor Pressure (in. Hg @ °F)
Solubility	Molecular Weight (lb/lb-mole)
Absorptive Properties	

Pollutant Emitted	Chemical Abstract Services (CAS) Number
Proposed Emission Rate (lb/hr)	Emission Source (describe)
Source Classification (process point, process fugitive, area fugitive)	Pollutant Class and Form (organic/inorganic - particulate/vapor)
Concentration in Emission Stream (ppmv)	Vapor Pressure (in. Hg @ °F)
Solubility	Molecular Weight (lb/lb-mole)
Absorptive Properties	

(Add additional pages if necessary)

Signature of Applicant Paul Deparade	Date 2-10-20

SEND COMPLETED APPLICATION AND ALL ATTACHMENTS TO:

North Dakota Department of Environmental Quality
Division of Air Quality
918 E Divide Avenue, 2nd Floor
Bismarck, ND 58501-1947
(701) 328-5188

EU07

PERMIT APPLICATION FOR INTERNAL COMBUSTION ENGINES AND TURBINES

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8891 (3-2019)

NOTE: READ INSTRUCTIONS BEFORE COMPLETING THIS FORM.
- Must include SFN 8516 or SFN 52858

SECTION A – GENERAL INFORMATION

Name of Firm or Organization	Facility Name
WBI Energy Transmission, Inc.	Tioga Compressor Station

SECTION B – FACILITY AND UNIT INFORMATION

Source ID Number (From form SFN 8516)		
EU07 Caterpillar 3612 natural gas-fired SI RICE (3750 HP)		
Type of Unit (check all that apply)	☒ Stationary Natural Gas-Fired Engine ☐ Stationary Diesel and Dual Fuel Engine ☐ Stationary Gasoline Engine ☐ Stationary Natural Gas-Fired Turbine	☐ Emergency Use Only ☒ Non-Emergency Use ☐ Peaking ☐ Demand Response
	☐ Other – Specify:	

SECTION C – MANUFACTURER DATA

Make	Model	Date of Manufacture
Caterpillar	G 3612 LE A4	

Reciprocating Internal Combustion Engine	
☒ Spark Ignition	☐ Compression Ignition
☐ 4 Stroke ☐ 2 Stroke	☐ Rich Burn ☒ Lean Burn
Maximum Rating (BHP @ rpm) 3,750	Operating Capacity (BHP @ rpm) 3,750

Engine Subject to:
☐ 40 CFR 60, Subpart IIII ☒ 40 CFR 60, Subpart JJJJ ☒ 40 CFR 63, Subpart ZZZZ
☐ 40 CFR 60, Subpart OOOO ☒ 40 CFR 60, Subpart OOOOa

Turbine — Dry Low Emissions? ☐ Yes ☐ No

Heat Input (MMBtu/hr)	Maximum Rating (HP)	75% Rating (HP)	Efficiency
	3,750		

Turbine Subject to: ☐ 40 CFR 60, Subpart GG ☐ 40 CFR 60, Subpart KKKK

SECTION D – FUELS USED

Natural Gas (10^6 cu ft/year)	Percent Sulfur	Percent H_2S
239.3 Million Cubic Feet / year	0.6 %	negl.
Oil (gal/year)	**Percent Sulfur**	**Grade No.**
0 gallons/year	N/A	N/A
LP Gas (gal/year)	**Other – Specify:**	
0 gallons/year	N/A	

SECTION E – NORMAL OPERATING SCHEDULE

Hours Per Day	Days Per Week	Weeks Per Year	Hours Per Year	Peak Production Season (if any)
24	7	52	8760	

SECTION F – STACK PARAMETERS

Emission Point ID Number		Stack Height Above Ground Level (feet)	
EP02		43 feet	
Stack Diameter (feet at top)	**Gas Discharged (SCFM)**	**Exit Temp (°F)**	**Gas Velocity (FPS)**
2 feet	9,096 scfm	823 F	126.8 ft/sec

SECTION G – EMISSION CONTROL EQUIPMENT

Is any emission control equipment installed on this unit?

☐ No ☒ Yes – Complete and attach form SFN 8532

SECTION H – MAXIMUM AIR CONTAMINANTS EMITTED

Pollutant	Maximum Pounds Per Hour	Amount (Tons Per Year)	Basis of Estimate*
NO_x	8.27	36.21	Emission factor based on compliance with 40 CFR 60 Subpart JJJJ
CO	16.53	18.11	Emission factor based on compliance with 40 CFR 60 Subpart JJJJ
PM	0.28	1.23	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
PM_{10} (filterable and condensable)	0.28	1.23	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
$PM_{2.5}$ (filterable and condensable)	0.28	1.23	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
SO_2	0.02	0.07	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
VOC	4.13	18.11	Emission factor based on compliance with 40 CFR 60 Subpart JJJJ
GHG (as CO_2e)	3,872	16,961	CO2 emission factor from 40 CFR 98 Subpart C Table C-1 (53.06 kg CO2/MMBtu), November 29, 2013. CH4 and N2O e
Largest Single HAP	0.33	1.45	largest single HAP is formadehyde
Total HAPS	0.88	3.83	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000, formaldehyde is based on vendor

* If performance test results are available for the unit, submit a copy of test with this application, if manufacture data used, submit manufacturers specification sheets.

IS THIS UNIT IN COMPLIANCE WITH ALL APPLICABLE AIR POLLUTION RULES AND REGULATIONS?

☒ YES ☐ NO

If "NO" a Compliance Schedule (SFN 61008) must be completed and attached.

Attach and label separate sheet(s) if you need more space to explain any system or answers or to provide complete listings of Emissions, Contaminants, or other items.

SEND COMPLETED APPLICATION AND ALL ATTACHMENTS TO:

North Dakota Department of Environmental Quality
Division of Air Quality
918 E Divide Avenue, 2nd Floor
Bismarck, ND 58501-1947
(701) 328-5188

PERMIT APPLICATION FOR AIR POLLUTION CONTROL EQUIPMENT

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8532 (3-2019)

NOTE: READ INSTRUCTIONS BEFORE COMPLETING THIS FORM.
- Must also include forms SFN 8516 or SFN 52858

SECTION A – GENERAL INFORMATION

Name of Firm or Organization	Facility Name
WBI Energy Transmission, Inc.	Tioga Compressor Station
Source ID No. of Equipment being Controlled EU03 Caterpillar 3612 natural gas-fired SI RICE (3750 HP)	

SECTION B – EQUIPMENT

Type:
- ☐ Cyclone
- ☐ Multiclone
- ☐ Baghouse
- ☐ Electrostatic Precipitator
- ☐ Wet Scrubber
- ☐ Spray Dryer
- ☐ Flare/Combustor
- ☒ Other – Specify: Catalytic Oxidizer

Name of Manufacturer	Model Number	Date to Be Installed
MIRATECH	SP-PT-72-16080005-XH4B0	April 2021

Application: ☐ Boiler ☐ Kiln ☒ Engine ☐ Other – Specify:

Pollutants Removed	CO	NMNEHC	CH2O	
Design Efficiency (%)				
Operating Efficiency (%)	83	19	79	

Describe method used to determine operating efficiency:

Operating Efficiency determined based on difference between inlet emissions and outlet emissions; outlet emissions are based on requested permit limits for mass emissions.

SECTION CD – GAS CONDITIONS

Gas Conditions	Inlet	Outlet
Gas Volume (SCFM; 68°F; 14.7 psia)		9206 SCFM
Gas Temperature (°F)	550F -1250F	1350 F
Gas Pressure (in. H_2O)	not available	not available
Gas Velocity (ft/sec)	not available	not available

Pollutant Concentration (Specify Pollutant and Unit of Concentration)	Pollutant	Unit of Concentration	Inlet	Outlet
	CO	g/bhp-hr	2.98	0.5
	NMNEHC	g/bhp-hr	0.62	0.5
	CH2O	g/bhp-hr	0.19	0.04

Pressure Drop Through Gas Cleaning Device (in. H_2O)
7.5 inches of water

INSTRUCTIONS FOR PERMIT APPLICATION FOR AIR POLLUTION CONTROL EQUIPMENT

1. Complete this form for each piece of equipment or process, which has air pollution control equipment installed, described in the following Permit Applications: Hazardous Air Pollutant (HAP) Sources (SFN 8329), Fuel Burning Equipment for Indirect Heating (SFN 8518); Manufacturing or Processing Equipment (SFN 8520); Incinerators/Crematories (SFN 8522); Internal Combustion Engines and Turbines (SFN 8891); and Glycol Dehydration Units (SFN 58923). Print or type all information. If an item does not apply, place NA in the appropriate space.

2. Type of Equipment - If the type is not one of those listed; provide enough information so the operating principal of the equipment can be determined.

3. List each pollutant which the device is intended to control, the efficiency of removal intended by the designer, and the actual efficiency under operating conditions.

4. Please attach the following:

   - A brief description and sketch of the air pollution control device if it is of unusual design or used in conjunction with other control devices. Show any bypass of the device and specify the conditions under which the bypass is used.

   - A description of what is done with collected air contaminants from the time they are collected until they reach the final disposal point. Include a description of the transportation methods used.

   - If a stack test has been conducted, attach a copy of the results, date of the test, a description of the techniques used, and the name and address of the organization which performed the test.

5. If the control device is a combustor (e.g.: thermal oxidizer, vapor combustion unit, etc.), include an estimate of potential greenhouse gas emissions (CO_2e).

<u>SUBMIT YOUR APPLICATION WITH ALL SUPPORTING DOCUMENTS, ALONG WITH THE FORMS SPECIFIED IN THE FIRST PARAGRAPH ABOVE, TO:</u>

North Dakota Department of Environmental Quality
Division of Air Quality
918 E Divide Avenue, 2nd Floor
Bismarck, ND 58501-1947
(701) 328-5188

PERMIT APPLICATION FOR HAZARDOUS AIR POLLUTANT (HAP) SOURCES

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8329 (3-2019)

SECTION A1 - APPLICANT INFORMATION

Name of Firm or Organization WBI Energy Transmission, Inc.		
Applicant's Name Marc Dempewolf		
Title Director of Pipeline Operations	Telephone Number (409) 359-7309	E-mail Address Marc.Dempewolf@wbienergy.com
Mailing Address (Street & No.) 2010 Montana Avenue		
City Glendive	State MT	ZIP Code 59330

SECTION A2 - FACILITY INFORMATION

Contact Person for Air Pollution Matters Jill Linn		
Title Environmental Manager	Telephone Number (406) 359-7332	E-mail Address Jill.Linn@wbienergy.com
Facility Address (Street & No. or Lat/Long to Nearest Second) 48°24'13"N 102°54'21"W		
City Tioga	State ND	ZIP Code 58852
County Williams	Number of Employees at Location 2	
Land Area at Plant Site 9 Acres (or) 2280 Sq. Ft.	MSL Elevation at Plant	

Describe Nature of Business/Process

Natural Gas Transmission - Gas Compressor Station

SECTION B – STACK DATA

Inside Diameter (ft) 2 feet	Height Above Grade (ft) 43 feet	
Gas Temperature at Exit (°F) 823 F	Gas Velocity at Exit (ft/sec) 126.8 feet / second	Gas Volume (scfm) 9,096 SCFM
Basis of any Estimates (attach separate sheet if necessary)		
Are Emission Control Devices in Place? If YES – Complete SFN 8532	(●) Yes	( ) No
Nearest Residences or Building	Distance (ft) 2,063.8	Direction E
Nearest Property Line	Distance (ft)	Direction

SECTION C – EMISSION STREAM DATA

Source ID No. From SFN 8516 EU07	Mean Particle Diameter (um) N/A
Flow Rate (scfm) 9096 ACFM	Drift Velocity (ft/sec) N/A
Stream Temperature (°F) 823 F	Particulate Concentration (gr/dscf) N/A
Moisture Content (%) 17 %	Halogens or Metals Present? No
Pressure (in. Hg) N/A	Organic Content (ppmv) NMNEHC 126 ppm @ 15% O2
Heat Content (Btu/scfm) 1,193 Btu/scf	O_2 Content (%) 11.6 %

SECTION D – POLLUTANT SPECIFIC DATA
(Complete One Box for Each Pollutant in Emission Stream)

Pollutant Emitted See Calculations in Appendix B	Chemical Abstract Services (CAS) Number
Proposed Emission Rate (lb/hr)	Emission Source (describe)
Source Classification (process point, process fugitive, area fugitive)	Pollutant Class and Form (organic/inorganic - particulate/vapor)
Concentration in Emission Stream (ppmv)	Vapor Pressure (in. Hg @ °F)
Solubility	Molecular Weight (lb/lb-mole)
Absorptive Properties	

Pollutant Emitted	Chemical Abstract Services (CAS) Number
Proposed Emission Rate (lb/hr)	Emission Source (describe)
Source Classification (process point, process fugitive, area fugitive)	Pollutant Class and Form (organic/inorganic - particulate/vapor)
Concentration in Emission Stream (ppmv)	Vapor Pressure (in. Hg @ °F)
Solubility	Molecular Weight (lb/lb-mole)
Absorptive Properties	

(Add additional pages if necessary)

Signature of Applicant [signature]	Date 2-10-20

SEND COMPLETED APPLICATION AND ALL ATTACHMENTS TO:

North Dakota Department of Environmental Quality
Division of Air Quality
918 E Divide Avenue, 2nd Floor
Bismarck, ND 58501-1947
(701) 328-5188

EU08

PERMIT APPLICATION FOR INTERNAL COMBUSTION ENGINES AND TURBINES

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8891 (3-2019)

NOTE: READ INSTRUCTIONS BEFORE COMPLETING THIS FORM.
- Must include SFN 8516 or SFN 52858

SECTION A – GENERAL INFORMATION

Name of Firm or Organization	Facility Name
WBI Energy Transmission, Inc.	Tioga Compressor Station

SECTION B – FACILITY AND UNIT INFORMATION

Source ID Number (From form SFN 8516)
EU08 Waukesha VHP - L594GSI natural gas-fired SI RICE (1380 HP)

Type of Unit (check all that apply)		
	☒ Stationary Natural Gas-Fired Engine	☐ Emergency Use Only
	☐ Stationary Diesel and Dual Fuel Engine	☒ Non-Emergency Use
	☐ Stationary Gasoline Engine	☐ Peaking
	☐ Stationary Natural Gas-Fired Turbine	☐ Demand Response
	☐ Other – Specify:	

SECTION C – MANUFACTURER DATA

Make	Model	Date of Manufacture
Waukesha	VHP - L594GSI	to be determined

Reciprocating Internal Combustion Engine

☒ Spark Ignition ☐ Compression Ignition

☐ 4 Stroke ☐ 2 Stroke ☒ Rich Burn ☐ Lean Burn

Maximum Rating (BHP @ rpm)	Operating Capacity (BHP @ rpm)
1,380	1,380

Engine Subject to:
☐ 40 CFR 60, Subpart IIII ☒ 40 CFR 60, Subpart JJJJ ☒ 40 CFR 63, Subpart ZZZZ
☐ 40 CFR 60, Subpart OOOO ☒ 40 CFR 60, Subpart OOOOa

Turbine Dry Low Emissions? ☐ Yes ☐ No

Heat Input (MMBtu/hr)	Maximum Rating (HP)	75% Rating (HP)	Efficiency

Turbine Subject to: ☐ 40 CFR 60, Subpart GG ☐ 40 CFR 60, Subpart KKKK

SECTION D – FUELS USED

Natural Gas (10^6 cu ft/year)	Percent Sulfur	Percent H_2S
87.9 million cubic feet / year	0 %	negl.
Oil (gal/year)	**Percent Sulfur**	**Grade No.**
0 gal/year	N/A	N/A
LP Gas (gal/year)	**Other – Specify:**	
0 gal/year	N/A	

SECTION E – NORMAL OPERATING SCHEDULE

Hours Per Day	Days Per Week	Weeks Per Year	Hours Per Year	Peak Production Season (if any)
24	7	52	8760	

SECTION F – STACK PARAMETERS

Emission Point ID Number		Stack Height Above Ground Level (feet)	
EP08		22 feet	
Stack Diameter (feet at top)	**Gas Discharged (SCFM)**	**Exit Temp (°F)**	**Gas Velocity (FPS)**
1.33 feet	2,177 ACFM	1202	88.5

SECTION G – EMISSION CONTROL EQUIPMENT

Is any emission control equipment installed on this unit?

☐ No ☒ Yes – Complete and attach form SFN 8532

SECTION H – MAXIMUM AIR CONTAMINANTS EMITTED

Pollutant	Maximum Pounds Per Hour	Amount (Tons Per Year)	Basis of Estimate*
NO_x	3.04	13.33	Emission factor based on compliance with 40 CFR 60 Subpart JJJJ
CO	6.08	26.65	Emission factor based on compliance with 40 CFR 60 Subpart JJJJ
PM	0.23	1.02	Emission Factors based on AP-42, Ch 3.2, Table 3.2-3, July 2000
PM_{10} (filterable and condensable)	0.23	1.02	Emission Factors based on AP-42, Ch 3.2, Table 3.2-3, July 2000
$PM_{2.5}$ (filterable and condensable)	0.23	1.02	Emission Factors based on AP-42, Ch 3.2, Table 3.2-3, July 2000
SO_2	0.007	0.031	Emission Factors based on AP-42, Ch 3.2, Table 3.2-3, July 2000
VOC	2.13	9.33	Emission factor based on compliance with 40 CFR 60 Subpart JJJJ
GHG (as CO_2e)	1,401	6,136	CO2 emission factor from 40 CFR 98 Subpart C Table C-1 (53.06 kg CO2/MMBtu), November 29, 2013. CH4 and N2O e
Largest Single HAP	0.03	0.13	largest single HAP is formaldehyde
Total HAPS	0.17	0.76	Emission Factors based on AP-42, Ch 3.2, Table 3.2-3, July 2000, formaldehyde based on engine vendor

* If performance test results are available for the unit, submit a copy of test with this application, if manufacture data used, submit manufacturers specification sheets.

IS THIS UNIT IN COMPLIANCE WITH ALL APPLICABLE AIR POLLUTION RULES AND REGULATIONS?

☒ YES ☐ NO

If "NO" a Compliance Schedule (SFN 61008) must be completed and attached.

Attach and label separate sheet(s) if you need more space to explain any system or answers or to provide complete listings of Emissions, Contaminants, or other items.

SEND COMPLETED APPLICATION AND ALL ATTACHMENTS TO:

North Dakota Department of Environmental Quality
Division of Air Quality
918 E Divide Avenue, 2nd Floor
Bismarck, ND 58501-1947
(701) 328-5188

PERMIT APPLICATION FOR HAZARDOUS AIR POLLUTANT (HAP) SOURCES

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8329 (3-2019)

SECTION A1 - APPLICANT INFORMATION

Name of Firm or Organization WBI Energy Transmission, Inc.		
Applicant's Name Marc Dempewolf		
Title Director of Pipeline Operations	Telephone Number (409) 359-7309	E-mail Address Marc.Dempewolf@wbienergy.com
Mailing Address (Street & No.) 2010 Montana Avenue		
City Glendive	State MT	ZIP Code 59330

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Title Environmental Manager	Telephone Number (406) 359-7332	E-mail Address Jill.Linn@wbienergy.com
Facility Address (Street & No. or Lat/Long to Nearest Second) 48°24'13"N 102°54'21"W		
City Tioga	State ND	ZIP Code 58852
County Williams	Number of Employees at Location 2	
Land Area at Plant Site 9 Acres (or) 2280 Sq. Ft.	MSL Elevation at Plant	

Describe Nature of Business/Process

Natural Gas Transmission - Gas Compressor Station

SECTION B – STACK DATA

Inside Diameter (ft) 1.33 feet	Height Above Grade (ft) 22 feet	
Gas Temperature at Exit (°F) 1202 F	Gas Velocity at Exit (ft/sec) 88.5 feet / second	Gas Volume (scfm) 2,177 SCFM
Basis of any Estimates (attach separate sheet if necessary)		
Are Emission Control Devices in Place? If YES – Complete SFN 8532	◉ Yes	○ No
Nearest Residences or Building nearest residence	Distance (ft) 2,063.8 feet	Direction E
Nearest Property Line NW property boundary	Distance (ft) 75 feet	Direction NW

SECTION C – EMISSION STREAM DATA

Source ID No. From SFN 8516 EU08	Mean Particle Diameter (um) N/A
Flow Rate (scfm) 2,177 ACFM	Drift Velocity (ft/sec) N/A
Stream Temperature (°F) 1202 F	Particulate Concentration (gr/dscf) N/A
Moisture Content (%) 17 %	Halogens or Metals Present? No
Pressure (in. Hg) N/A	Organic Content (ppmv) NMNEHC 126 ppm @ 15% O2
Heat Content (Btu/scfm) 1,193 Btu/scf	O_2 Content (%) 11.6 %

SECTION D – POLLUTANT SPECIFIC DATA
(Complete One Box for Each Pollutant in Emission Stream)

Pollutant Emitted See Calculations in Appendix B	Chemical Abstract Services (CAS) Number
Proposed Emission Rate (lb/hr)	Emission Source (describe)
Source Classification (process point, process fugitive, area fugitive)	Pollutant Class and Form (organic/inorganic - particulate/vapor)
Concentration in Emission Stream (ppmv)	Vapor Pressure (in. Hg @ °F)
Solubility	Molecular Weight (lb/lb-mole)
Absorptive Properties	

Pollutant Emitted	Chemical Abstract Services (CAS) Number
Proposed Emission Rate (lb/hr)	Emission Source (describe)
Source Classification (process point, process fugitive, area fugitive)	Pollutant Class and Form (organic/inorganic - particulate/vapor)
Concentration in Emission Stream (ppmv)	Vapor Pressure (in. Hg @ °F)
Solubility	Molecular Weight (lb/lb-mole)
Absorptive Properties	

(Add additional pages if necessary)

Signature of Applicant Paul Dempewolf	Date 2-10-20

SEND COMPLETED APPLICATION AND ALL ATTACHMENTS TO:

North Dakota Department of Environmental Quality
Division of Air Quality
918 E Divide Avenue, 2nd Floor
Bismarck, ND 58501-1947
(701) 328-5188

Appendix D

Manufacturer Specifications

G3612

GAS COMPRESSION APPLICATION

GAS ENGINE SITE SPECIFIC TECHNICAL DATA

CATERPILLAR®

ENGINE SPEED (rpm):	1000	RATING STRATEGY:	STANDARD
COMPRESSION RATIO:	7.6	RATING LEVEL:	CONTINUOUS
AFTERCOOLER TYPE:	SCAC	FUEL SYSTEM:	GAV
AFTERCOOLER - STAGE 2 INLET (°F):	130		WITH AIR FUEL RATIO CONTROL
AFTERCOOLER - STAGE 1 INLET (°F):	174	**SITE CONDITIONS:**	
JACKET WATER OUTLET (°F):	190	FUEL:	Gas Analysis
ASPIRATION:	TA	FUEL PRESSURE RANGE(psig): (See note 1)	58.0-70.3
COOLING SYSTEM:	JW+1AC, OC+2AC	FUEL METHANE NUMBER:	61.4
CONTROL SYSTEM:	ADEM4	FUEL LHV (Btu/scf):	1076
EXHAUST MANIFOLD:	DRY	ALTITUDE(ft):	2150
COMBUSTION:	LOW EMISSION	INLET AIR TEMPERATURE(°F):	100
NOx EMISSION LEVEL (g/bhp-hr NOx):	0.3	STANDARD RATED POWER:	3750 bhp@1000rpm
SET POINT TIMING:	17		

			MAXIMUM RATING	SITE RATING AT MAXIMUM INLET AIR TEMPERATURE		
RATING	**NOTES**	**LOAD**	**100%**	**100%**	**75%**	**50%**
ENGINE POWER (WITHOUT FAN)	(2)	bhp	3750	3750	2813	1875
INLET AIR TEMPERATURE		°F	100	100	100	100
ENGINE DATA						
FUEL CONSUMPTION (LHV)	(3)	Btu/bhp-hr	6787	6787	6990	7451
FUEL CONSUMPTION (HHV)	(3)	Btu/bhp-hr	7480	7480	7703	8211
AIR FLOW (@inlet air temp, 14.7 psia) (WET)	(4)(5)	ft3/min	9797	9797	7427	5086
AIR FLOW (WET)	(4)(5)	lb/hr	41655	41655	31578	21623
FUEL FLOW (60ºF, 14.7 psia)		scfm	394	394	305	216
INLET MANIFOLD PRESSURE	(6)	in Hg(abs)	99.2	99.2	75.8	53.1
EXHAUST TEMPERATURE - ENGINE OUTLET	(7)	°F	823	823	875	938
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia) (WET)	(8)(5)	ft3/min	23913	23913	18885	13564
EXHAUST GAS MASS FLOW (WET)	(8)(5)	lb/hr	42989	42989	32608	22355
EMISSIONS DATA - ENGINE OUT						
NOx (as NO2)	(9)(10)	g/bhp-hr	0.30	0.30	0.30	0.30
CO	(9)(10)	g/bhp-hr	2.98	2.98	2.98	2.98
THC (mol. wt. of 15.84)	(9)(10)	g/bhp-hr	4.36	4.36	4.51	4.52
NMHC (mol. wt. of 15.84)	(9)(10)	g/bhp-hr	2.00	2.00	2.07	2.08
NMNEHC (VOCs) (mol. wt. of 15.84)	(9)(10)(11)	g/bhp-hr	0.62	0.62	0.64	0.64
HCHO (Formaldehyde)	(9)(10)	g/bhp-hr	0.19	0.19	0.20	0.22
CO2	(9)(10)	g/bhp-hr	463	463	477	508
EXHAUST OXYGEN	(9)(12)	% DRY	11.6	11.6	11.3	10.9
HEAT REJECTION						
HEAT REJ. TO JACKET WATER (JW)	(13)	Btu/min	41707	41707	33251	28406
HEAT REJ. TO ATMOSPHERE	(13)	Btu/min	16733	16733	16350	13618
HEAT REJ. TO LUBE OIL (OC)	(13)	Btu/min	18740	18740	17106	15196
HEAT REJ. TO A/C - STAGE 1 (1AC)	(13)(14)	Btu/min	40310	40310	19702	4454
HEAT REJ. TO A/C - STAGE 2 (2AC)	(13)(14)	Btu/min	7319	7319	5322	3473

COOLING SYSTEM SIZING CRITERIA			
TOTAL JACKET WATER CIRCUIT (JW+1AC)	(14)(15)	Btu/min	88202
TOTAL STAGE 2 AFTERCOOLER CIRCUIT (OC+2AC)	(14)(15)	Btu/min	30174
A cooling system safety factor of 0% has been added to the cooling system sizing criteria.			

CONDITIONS AND DEFINITIONS

Engine rating obtained and presented in accordance with ISO 3046/1, adjusted for fuel, site altitude and site inlet air temperature. 100% rating at maximum inlet air temperature is the maximum engine capability for the specified fuel at site altitude and maximum site inlet air temperature. Maximum rating is the maximum capability at the specified aftercooler inlet temperature for the specified fuel at site altitude and reduced inlet air temperature. Lowest load point is the lowest continuous duty operating load allowed. No overload permitted at rating shown.

For notes information consult page three.

PREPARED BY:

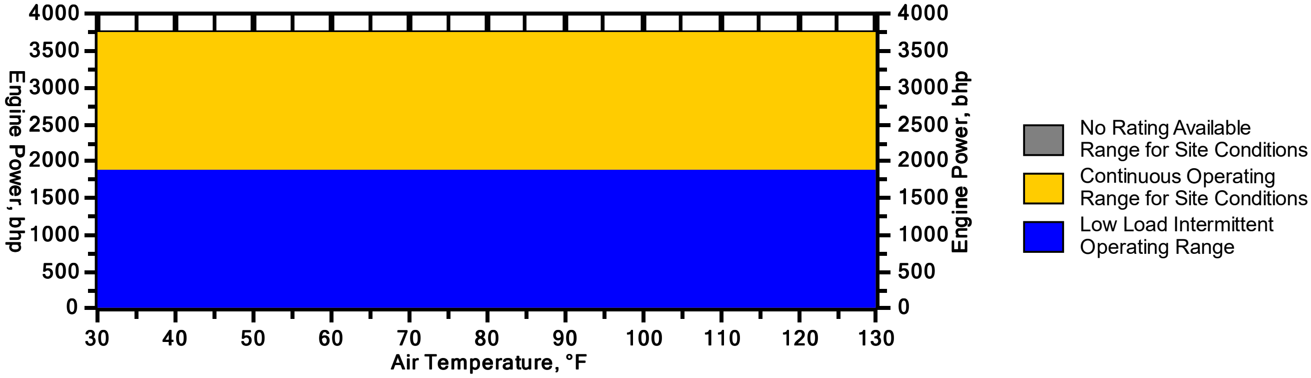
Data generated by Gas Engine Rating Pro Version 6.09.04

Ref. Data Set EM1418-05-001, Printed 28Aug2019

GAS ENGINE SITE SPECIFIC TECHNICAL DATA

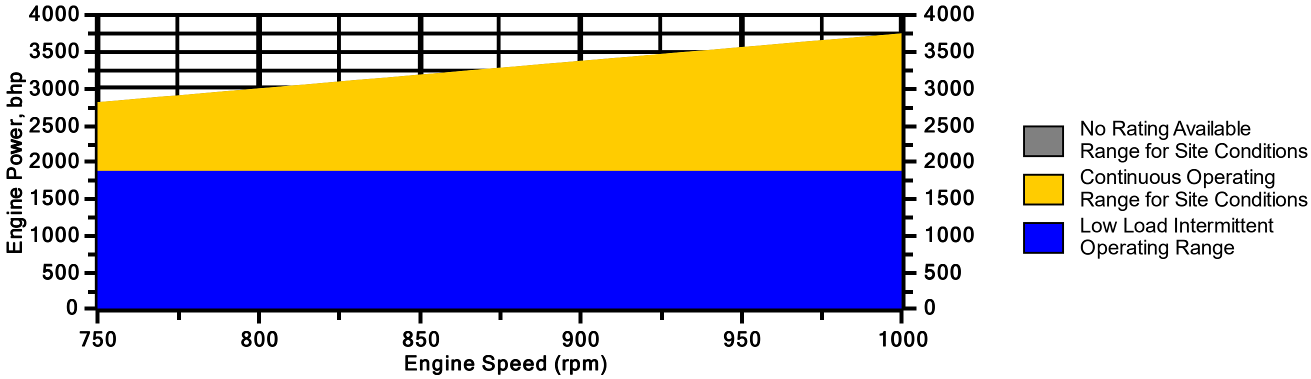
Engine Power vs. Inlet Air Temperature

Data represents temperature sweep at 2150 ft and 1000 rpm



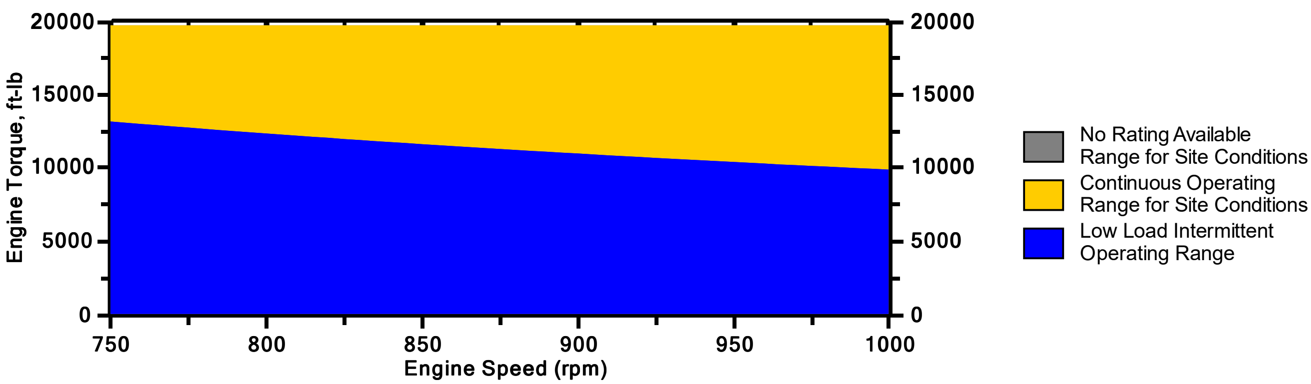
Engine Power vs. Engine Speed

Data represents speed sweep at 2150 ft and 100 ºF



Engine Torque vs. Engine Speed

Data represents speed sweep at 2150 ft and 100 ºF



Note: At site conditions of 2150 ft and 100°F inlet air temp., constant torque can be maintained down to 750 rpm. The minimum speed for loading at these conditions is 750 rpm.

NOTES

1. Fuel pressure range specified is to the engine gas shutoff valve (GSOV). Additional fuel train components should be considered in pressure and flow calculations.

2. Engine rating is with two engine driven water pumps. Tolerance is ± 3% of full load.

3. Fuel consumption tolerance is ± 2.5% of full load data.

4. Air flow value is on a 'wet' basis. Flow is a nominal value with a tolerance of ± 5 %.

5. Inlet and Exhaust Restrictions must not exceed A&I limits based on full load flow rates from the standard technical data sheet.

6. Inlet manifold pressure is a nominal value with a tolerance of ± 5 %.

7. Exhaust temperature is a nominal value with a tolerance of (+)63°F, (-)54°F.

8. Exhaust flow value is on a "wet" basis. Flow is a nominal value with a tolerance of ± 6 %.

9. Emissions data is at engine exhaust flange prior to any after treatment.

10. Values listed are higher than nominal levels to allow for instrumentation, measurement, and engine-to-engine variations. They indicate the maximum values expected under steady state conditions. Fuel methane number cannot vary more than ± 3. THC, NMHC, and NMNEHC do not include aldehydes. An oxidation catalyst may be required to meet Federal, State or local CO or HC requirements.

11. VOCs - Volatile organic compounds as defined in US EPA 40 CFR 60, subpart JJJJ

12. Exhaust Oxygen level is the result of adjusting the engine to operate at the specified NOx level. Tolerance is ± 0.5.

13. Heat rejection values are nominal. Tolerances, based on treated water, are ± 10% for jacket water circuit, ± 50% for radiation, ± 20% for lube oil circuit, and ± 5% for aftercooler circuit.

14. Aftercooler heat rejection includes an aftercooler heat rejection factor for the site elevation and inlet air temperature specified. Aftercooler heat rejection values at part load are for reference only. Do not use part load data for heat exchanger sizing.

15. Cooling system sizing criteria are maximum circuit heat rejection for the site, with applied tolerances.

Constituent	Abbrev	Mole %	Norm
Water Vapor	H2O	0.0000	0.0000
Methane	CH4	67.4816	67.4667
Ethane	C2H6	19.8992	19.8948
Propane	C3H8	5.1633	5.1622
Isobutane	iso-C4H1O	0.1572	0.1572
Norbutane	nor-C4H1O	0.3192	0.3191
Isopentane	iso-C5H12	0.0175	0.0175
Norpentane	nor-C5H12	0.0174	0.0174
Hexane	C6H14	0.0220	0.0220
Heptane	C7H16	0.0000	0.0000
Nitrogen	N2	6.0208	6.0195
Carbon Dioxide	CO2	0.9239	0.9237
Hydrogen Sulfide	H2S	0.0000	0.0000
Carbon Monoxide	CO	0.0000	0.0000
Hydrogen	H2	0.0000	0.0000
Oxygen	O2	0.0000	0.0000
Helium	HE	0.0000	0.0000
Neopentane	neo-C5H12	0.0000	0.0000
Octane	C8H18	0.0000	0.0000
Nonane	C9H20	0.0000	0.0000
Ethylene	C2H4	0.0000	0.0000
Propylene	C3H6	0.0000	0.0000
TOTAL (Volume %)		100.0221	100.0001

Fuel Makeup:	Gas Analysis
Unit of Measure:	English

Calculated Fuel Properties

Caterpillar Methane Number:	61.4
Lower Heating Value (Btu/scf):	1076
Higher Heating Value (Btu/scf):	1185
WOBBE Index (Btu/scf):	1248
THC: Free Inert Ratio:	13.4
Total % Inerts (% N2, CO2, He):	6.94%
RPC (%) (To 905 Btu/scf Fuel):	100%
Compressibility Factor:	0.997
Stoich A/F Ratio (Vol/Vol):	11.15
Stoich A/F Ratio (Mass/Mass):	15.02
Specific Gravity (Relative to Air):	0.742
Fuel Specific Heat Ratio (K):	1.282

CONDITIONS AND DEFINITIONS

Caterpillar Methane Number represents the knock resistance of a gaseous fuel. It should be used with the Caterpillar Fuel Usage Guide for the engine and rating to determine the rating for the fuel specified. A Fuel Usage Guide for each rating is included on page 2 of its standard technical data sheet.

RPC always applies to naturally aspirated (NA) engines, and turbocharged (TA or LE) engines only when they are derated for altitude and ambient site conditions.

Project specific technical data sheets generated by the Caterpillar Gas Engine Rating Pro program take the Caterpillar Methane Number and RPC into account when generating a site rating.

Fuel properties for Btu/scf calculations are at 60F and 14.696 psia.

Caterpillar shall have no liability in law or equity, for damages, consequently or otherwise, arising from use of program and related material or any part thereof.

FUEL LIQUIDS

Field gases, well head gases, and associated gases typically contain liquid water and heavy hydrocarbons entrained in the gas. To prevent detonation and severe damage to the engine, hydrocarbon liquids must not be allowed to enter the engine fuel system. To remove liquids, a liquid separator and coalescing filter are recommended, with an automatic drain and collection tank to prevent contamination of the ground in accordance with local codes and standards.

To avoid water condensation in the engine or fuel lines, limit the relative humidity of water in the fuel to 80% at the minimum fuel operating temperature.

EngCalc 5794GSI-S4 Tioga - N Dakota

VHP - L5794GSI

Waukesha Pearce Industries Bill Balough 412-951-9028 balough@wpi.com

Power Generation

ENGINE SPEED (rpm):	1200	NOx SELECTION (g/bhp-hr):	0.5
DISPLACEMENT (in3):	5788	COOLING SYSTEM:	JW, IC + OC
COMPRESSION RATIO:	8.2:1	INTERCOOLER WATER INLET (°F):	130
IGNITION SYSTEM:	ESM2	JACKET WATER OUTLET (°F):	180
EXHAUST MANIFOLD:	Water Cooled	JACKET WATER CAPACITY (gal):	107
COMBUSTION:	Rich Burn, Turbocharged	AUXILIARY WATER CAPACITY (gal):	11
ENGINE DRY WEIGHT (lbs):	24760	LUBE OIL CAPACITY (gal):	190
AIR/FUEL RATIO SETTING:	0.38% CO	MAX. EXHAUST BACKPRESSURE (in. H2O):	18
ENGINE SOUND LEVEL (dBA)	102	MAX. AIR INLET RESTRICTION (in. H2O):	15
IGNITION TIMING:	ESM2 Controlled	EXHAUST SOUND LEVEL (dBA)	111
FREQUENCY (Hz):	60	PHASE:	3
GENERATOR TYPE:	Synchronous	PHASE ROTATION:	T1-T2-T3
VOLTAGE:	480		

SITE CONDITIONS:

FUEL:	Natural Gas	ALTITUDE (ft):	2305
FUEL PRESSURE RANGE (psig):	30 - 50	MAXIMUM INLET AIR TEMPERATURE (°F):	105
FUEL HHV (BTU/ft3):	1,188.6	FUEL WKI:	64.7
FUEL LHV (BTU/ft3):	1,074.5		

SITE SPECIFIC TECHNICAL DATA

		110% OVERLOAD SITE DATA (See note 18)	MAX RATING AT 100 °F AIR TEMP	SITE RATING AT MAXIMUM INLET AIR TEMPERATURE OF 105 °F		
POWER RATING	**UNITS**			**100%**	**85%**	**75%**
CONTINUOUS ENGINE POWER	BHP	1506	1380	1374	1168	1036
OVERLOAD	% 2/24 hr	Note 18	9	10	-	-
ELECTRICAL EFFICIENCY (LHV)	%	30.8	31.0	31.0	30.8	30.3
GENERATOR OUTPUT	kWe	1072	983	978	832	738
GENERATOR kVA	kVA	1340	1229	1223	1040	923
GENERATOR CURRENT	Amps	1614	1480	1473	1252	1112
based on 95.5% generator efficiency at 0.8 PF, no auxiliary engine driven equipment						
FUEL CONSUMPTION						
FUEL CONSUMPTION (LHV)	BTU/BHP-hr	7886	7840	7847	7904	8027
FUEL CONSUMPTION (HHV)	BTU/BHP-hr	8723	8672	8680	8743	8880
FUEL FLOW *based on fuel analysis LHV*	SCFM	184	168	167	143	129
HEAT REJECTION						
JACKET WATER (JW)	BTU/hr x 1000	3476	3178	3183	2784	2558
LUBE OIL (OC)	BTU/hr x 1000	488	467	469	436	416
INTERCOOLER (IC)	BTU/hr x 1000	222	186	196	160	139
EXHAUST	BTU/hr x 1000	3424	3042	3017	2479	2178
RADIATION	BTU/hr x 1000	665	644	628	578	549
EMISSIONS (CATALYST OUT):						
NOx (NO + NO2)	g/bhp-hr	0.5	0.5	0.5	0.5	0.5
CO	g/bhp-hr	1.0	1.0	1.0	1.0	1.0
THC	g/bhp-hr	1.30	1.30	1.30	1.30	1.30
NMHC	g/bhp-hr	0.57	0.57	0.57	0.57	0.57
NM,NEHC (VOC)	g/bhp-hr	0.17	0.17	0.17	0.17	0.17
CO2	g/bhp-hr	520	517	517	521	529
CO2e	g/bhp-hr	538	535	535	539	548
CH2O	g/bhp-hr	0.001	0.001	0.001	0.001	0.001
CH4	g/bhp-hr	0.73	0.73	0.73	0.73	0.73
AIR INTAKE / EXHAUST GAS						
INDUCTION AIR FLOW	SCFM	2234	2035	2028	1736	1564
EXHAUST GAS MASS FLOW	lb/hr	10034	9140	9107	7798	7024
EXHAUST GAS FLOW *at exhaust temp, 14.5 psia*	ACFM	7412	6625	6602	5493	4861
EXHAUST TEMPERATURE	°F	1202	1171	1171	1125	1097

HEAT EXCHANGER SIZING[12]			
TOTAL JACKET WATER CIRCUIT (JW)	BTU/hr x 1000	3942	3610
TOTAL AUXILIARY WATER CIRCUIT (IC + OC)	BTU/hr x 1000	805	753

COOLING SYSTEM WITH ENGINE MOUNTED WATER PUMPS		
JACKET WATER PUMP MIN. DESIGN FLOW	GPM	450
JACKET WATER PUMP MAX. EXTERNAL RESTRICTION	psig	16
AUX WATER PUMP MIN. DESIGN FLOW	GPM	79
AUX WATER PUMP MAX. EXTERNAL RESTRICTION	psig	44

All data provided per the condtions listed in the notes section on page three.

EngCalc 5794GSI-S4 Tioga - N Dakota

VHP - L5794GSI

Waukesha Pearce Industries   Bill Balough   412-951-9028   balough@wpi.com

Power Generation

FUEL COMPOSITION

HYDROCARBONS:		Mole or Volume %
Methane	CH_4	67.48
Ethane	C_2H_6	19.9
Propane	C_3H_8	5.163
Iso-Butane	I-C_4H_{10}	0.157
Normal Butane	N-C_4H_{10}	0.319
Iso-Pentane	I-C_5H_{12}	0.0175
Normal Pentane	N-C_5H_{12}	0.0174
Hexane	C_6H_{14}	0
Heptane	C_7H_{16}	0
Ethene	C_2H_4	0
Propene	C_3H_6	0
	SUM HYDROCARBONS	93.054
NON-HYDROCARBONS:		
Nitrogen	N_2	6.02
Oxygen	O_2	0
Helium	He	0
Carbon Dioxide	CO_2	0.924
Carbon Monoxide	CO	0
Hydrogen	H_2	0
Water Vapor	H_2O	0
	TOTAL FUEL	99.998

FUEL:	Natural Gas
FUEL PRESSURE RANGE (psig):	30 - 50
FUEL WKI:	64.7
FUEL SLHV (BTU/ft3):	1055.79
FUEL SLHV (MJ/Nm3):	41.52
FUEL LHV (BTU/ft3):	1074.49
FUEL LHV (MJ/Nm3):	42.25
FUEL HHV (BTU/ft3):	1188.60
FUEL HHV (MJ/Nm3):	46.74
FUEL DENSITY (SG):	0.74

Standard Conditions per ASTM D3588-91 [60°F and 14.696psia] and ISO 6976:1996-02-01[25, V(0;101.325)].
Based on the fuel composition, supply pressure and temperature, liquid hydrocarbons may be present in the fuel. No liquid hydrocarbons are allowed in the fuel. The fuel must not contain any liquid water. Waukesha recommends both of the following:
1) Dew point of the fuel gas to be at least 20°F (11°C) below the measured temperature of the gas at the inlet of the engine fuel regulator.
2) A fuel filter separator to be used on all fuels except commercial quality natural gas.
Refer to the 'Fuel and Lubrication' section of 'Technical Data' or contact the Waukesha Application Engineering Department for additional information on fuels, or LHV and WKI* calculations.
* Trademark of INNIO Waukesha Gas Engines Inc.

FUEL CONTAMINANTS

Total Sulfur Compounds	0	% volume
Total Halogen as Cloride	0	% volume
Total Ammonia	0	% volume
Siloxanes		
Tetramethyl silane	0	% volume
Trimethyl silanol	0	% volume
Hexamethyldisiloxane (L2)	0	% volume
Hexamethylcyclotrisiloxane (D3)	0	% volume
Octamethyltrisiloxane (L3)	0	% volume
Octamethylcyclotetrasiloxane (D4)	0	% volume
Decamethyltetrasiloxane (L4)	0	% volume
Decamethylcyclopentasiloxane (D5)	0	% volume
Dodecamethylpentasiloxane (L5)	0	% volume
Dodecamethylcyclohexasiloxane (D6)	0	% volume
Others	0	% volume

Total Sulfur Compounds	0 µg/BTU
Total Halogen as Cloride	0 µg/BTU
Total Ammonia	0 µg/BTU
Total Siloxanes (as Si)	0 µg/BTU

Calculated fuel contaminant analysis will depend on the entered fuel composition and selected engine model.

No water or hydrocarbon condensates are allowed in the engine. Requires liquids removal.

NOTES

1. All data is based on engines with standard configurations unless noted otherwise.

2. Power rating is adjusted for fuel, site altitude, and site air inlet temperature, in accordance with ISO 3046/1 with tolerance of ± 3%.

3. Fuel consumption is presented in accordance with ISO 3046/1 with a tolerance of -0 / +5% at maximum rating. Fuel flow calculation based on fuel LHV and fuel consumption with a tolerance of -0/+5 %. For sizing piping and fuel equipment, it is recommended to include the 5% tolerance.

4. Heat rejection tolerances are ± 30% for radiation, and ± 8% for jacket water, lube oil, intercooler, and exhaust energy.

5. Emission levels for engines with Waukesha supplied 3-way catalyst are given at catalyst outlet flange. For all other engine models, emission levels are given at engine exhaust outlet flange prior to any after treatment. Values are based on a new engine operating at indicated site conditions, and adjusted to the specified timing and air/fuel ratio at rated load. Catalyst out emission levels represent emission levels the catalyst is sized to achieve. Manual adjustment may be necessary to achieve compliance as catalyst/engine age. Catalyst-out emission levels are valid for the duration of the engine warranty. Emissions are at an absolute humidity of 75 grains H_2O/lb (10.71 g H_2O/kg) of dry air. Emission levels may vary subject to instrumentation, measurement, ambient conditions, fuel quality, and engine variation. Engine may require adjustment on-site to meet emission values, which may affect engine performance and heat output. NOx, CO, THC, and NMHC emission levels are listed as a not to exceed limit, all other emission levels are estimated. CO_2 emissions based on EPA Federal Register/Vol. 74, No. 209/Friday, October 30, 2009 Rules and Regulations 56398, 56399 (3) Tier 3 Calculation Methodology, Equation C-5.

6. Air flow is based on undried air with a tolerance of ± 7%.

7. Exhaust temperature given at engine exhaust outlet flange with a tolerance of ± 50°F (28°C).

8. Exhaust gas mass flow value is based on a "wet basis" with a tolerance of ± 7%.

9. Inlet air restrictions based on full rated engine load. Exhaust backpressure based on 158 PSI BMEP and 1200 RPM. Refer to the engine specification section of Waukesha's standard technical data for more information.

10. Cooling circuit capacity, lube oil capacity, and engine dry weight values are typical.

11. Fuel must conform to Waukesha's "Gaseous Fuel Specification" S7884-7 or most current version. Fuel may require treatment to meet current fuel specification.

12. Heat exchanger sizing values given as the maximum heat rejection of the circuit, with applied tolerances and an additional 5% reserve factor.

13. Fuel volume flow calculation in english units is based on 100% relative humidity of the fuel gas at standard conditions of 60°F and 14.696 psia (29.92 inches of mercury; 101.325 kPa).

14. Fuel volume flow calculation in metric units is based on 100% relative humidity of the fuel gas at a combustion temperature of 25°C and metering conditions of 0°C and 101.325 kPa (14.696 psia; 29.92 inches of mercury). This is expressed as [25, V(0;101.325)].

15. Engine sound data taken with the microphone at 1 m (3.3 ft) from the side of the engine at the approximate front-to-back centerline. Microphone height was at intake manifold level. Engine sound pressure data may be different at front, back and opposite side locations. Exhaust sound data taken with microphone 1 meter (3.3 ft) away and 1 meter (3.3 ft) to the side of the exhaust outlet.

16. Due to variation between test conditions and final site conditions, such as exhaust configuration and background sound level, sound pressure levels under site conditions may be different than those tabulated above.

17. Cooling system design flow is based on minimum allowable cooling system flow. Cooling system maximum external restriction is defined as the allowable restriction at the minimum cooling system flow.

18. Continuous Power Rating: The highest load and speed that can be applied 24 hours per day, seven days per week, 365 days per year except for normal maintenance at indicated ambient reference conditions and fuel. It is permissible to operate the engine at the indicated overload power, for two hours in every 24 hour period.

19. emPact emission compliance available for entire range of operable fuels; however, fuel system and/or O2 set point may need to be adjusted in order to maintain compliance.

20. In cold ambient temperatures, heating of the engine jacket water, lube oil and combustion air may be required. See Waukesha Technical Data.

21. Available Turndown Speed Range refers to the constant torque speed range available. Reduced power may be available at speeds outside of this range. Contact application engineering.

SPECIAL REQUIREMENTS

Requires option code 1004 for 0.5g/bhp-hr catalyst.

Appendix E

Air Toxics Review - Acrolein

Acrolien 1-hr Hazard Index

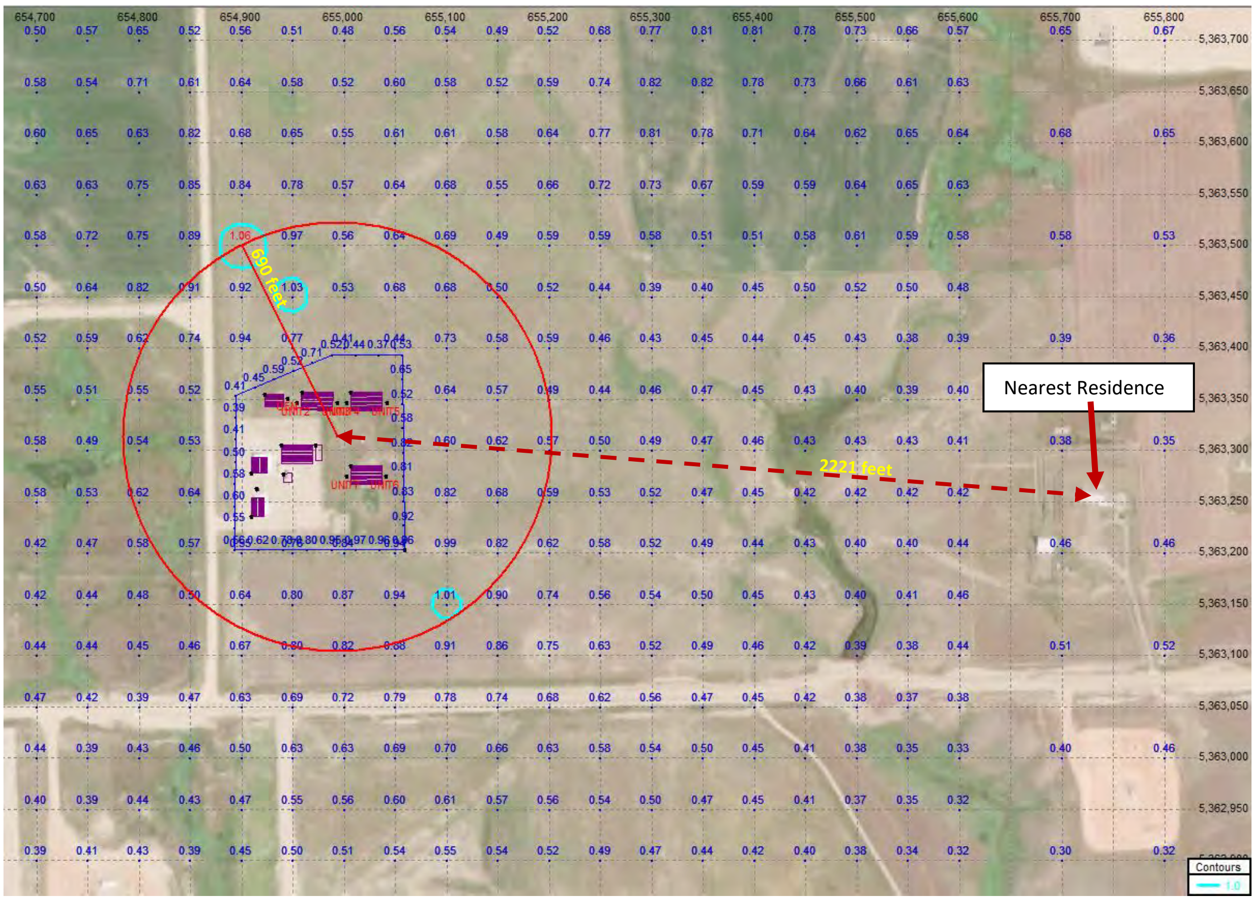
Model simulation year = 2009 (year predicting maximum 1-hour Acrolein impacts)

[all other model simulation years (2010, 2011, 2012, 2013) have less distant impacts]

Locations of predicted Hazard Index above 1.0 are shown in blue contours – very isolated.

Maximum Distance [——] to HI = 1.0 is approximately 210 meters (690 feet), from center of facility.

Distance [------] to nearest residence is 2,221 feet



Grid spacing in figure is 50 meters, coordinates are Universal Transverse Mercator (UTM) Zone 13, NAD83

WBI Energy Transmission

McKenzie County, North Dakota

Application for
Permit to Construct
Elkhorn Creek Compressor Station

Prepared for:

WBI Energy Transmission
2010 Montana Avenue
Glendive, MT 59330

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1000 IDS Center
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February 2020

WBI Energy Transmission
Application for Permit to Construct
Elkhorn Creek Compressor Station

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1.0 INTRODUCTION

WBI Energy Transmission (WBI) is proposing to construct a Elkhorn Creek Compressor Station to support the North Bakken Expansion Project (or Project), which includes the construction of an approximately 62-mile-long, 24-inch-diameter natural gas pipeline from WBI Energy's existing Tioga Compressor Station near Tioga, North Dakota, to a new interconnect with Northern Border Pipeline Company's mainline southeast of Watford City, North Dakota. A new compressor station (Elkhorn Creek Compressor Station) will be constructed near this interconnect. A site location map is located in Appendix A.

The proposed new Elkhorn Creek Compressor Station will involve the installation of the following equipment.

- one Caterpillar 3612 natural gas-fired engine [3,750 horsepower (hp)] coupled to a KBZ-4 compressor unit;
- Comfort Heating: one Weil-McLain LGB-12 Gas Boiler (1.69 MMBtu/hr), one Water Heater (2.08 MMBtu/hr), and one Building Unit Heater (0.25 MMBtu/hr);
- one pig launcher and receiver;
- one underground 2,000 gallon pipeline liquids storage tank;
- one underground 2,000 gallon waste oil storage tank; and
- one underground 2,000 gallon floor drain tank to collect wastewater.

The new Elkhorn Creek Compressor Station will require a permit to construct and subsequently a permit to operate as a minor source from the North Dakota Department of Environmental Quality (NDDEQ). Under North Dakota Administrative Code (NDAQ) 33.1-15-14-02.13, the tanks and the comfort heating unit are exempt from permitting requirements. Other sources of emissions at the compressor station will be blowdown activities and fugitive emissions from leaking components. Pigging activities for pipeline maintenance occur on a 5 to 10 year cycle depending on the pipeline undergoing maintenance. Detailed emission calculations, including emissions from sources exempt from permitting are attached in Appendix B.

1.1 Potential Emissions

Table 1.1-1 summarizes the potential emissions from the emission units to be located at the Elkhorn Creek Compressor Station.

Annual operational emissions from the new Elkhorn Creek Compressor Station are listed in Table 1.1-1. Pigging of the pipeline will only occur every 5 to 10 years depending on the line, but pigging emissions are reported as annual as if all pigging occurs in the same year.

TABLE 1.1-1

North Bakken Expansion Project
Elkhorn Creek Compressor Station Emission Calculation Results

Emission Unit	NO_X (TPY)	CO (TPY)	VOC (TPY)	PM_{10}/$PM_{2.5}$ (TPY)	SO_2 (TPY)	CO_2e (TPY)	Largest Single HAP [a] (TPY)	Total HAPs (TPY)
Caterpillar 3612 [b]	36.21	18.11	18.11	1.23/1.23	0.07	16,961	1.72	4.10
Comfort Heating[c]	1.73	1.45	0.09	0.13/0.13	0.01	2,061	0.06	0.06
Pipeline Liquids Tank	N/A	N/A	0.002	N/A	N/A	N/A	N/A	N/A
Wastewater Tank	N/A	N/A	0.002	N/A	N/A	N/A	N/A	N/A
Waste Oil Tank	N/A	N/A	0.000	N/A	N/A	N/A	N/A	N/A
Equipment Leaks (fugitive)	N/A	N/A	0.30	N/A	N/A	73.2	N/A	N/A
Pig Launching & Receiving	N/A	N/A	60.96	N/A	N/A	14,896	N/A	0.01
Blowdowns [d]	N/A	N/A	3.01	N/A	N/A	735	N/A	N/A
TOTAL PTE [e]	**37.94**	**19.56**	**82.17**	**1.36/1.36**	**0.08**	**34,654**	**1.78**	**4.18**
Title V Threshold	**100**	**100**	**100**	**100**	**100**	**N/A**	**10**	**25**
PSD Major Source Threshold [f]	**250**	**250**	**250**	**250**	**250**	**100,000**	**N/A**	**N/A**

N/A = not applicable; TBD = to be determined

[a] Largest single HAP is formaldehyde.

[b] Caterpillar Engines are equipped with oxidation catalysts for reducing emissions of NMNEHC (VOC), CO, and formaldehyde.

[c] Comfort Heating: one Weil-McLain LGB-12 Gas Boiler (1.69 MMBtu/hr), one Water Heater (2.08 MMBtu/hr), and one Building Unit Heater (0.25 MMBtu/hr)

[d] This includes emissions from commissioning of the station prior to commercial operation. The commission blowdown will not be part of annual ongoing emissions. The standard cubic feet (scf) from commissioning and startup is estimated at 448,000 scf and annual operation will be 1,428,000 scf.

[e] Excludes fugitive emissions (equipment leaks) as compressor stations are not one of the 28 listed source categories. The above table includes these sources but they are not included in the Total PTE because they are not to be compared to permitting thresholds.

[f] PSD for CO_2e would only be triggered if the compressor station was an "anyway source" which means triggering PSD for one of the other regulated PSD pollutants. The compressor station is below the PSD threshold for CO_2e. Even if CO_2e was above the threshold, PSD would not be triggered because none of the other pollutants exceed the PSD threshold.

Note: Short tons (2,000 lbs), not long or metric tons, are used in PSD applicability calculations. Metric tons are used in the GHG reporting rule.

TPY	tons per year
NO_X	nitrogen oxide
CO	carbon monoxide
VOC	volatile organic compound
PM	particulate matter
PM_{10}	particulate matter less than or equal to 10 microns in aerodynamic diameter
$PM_{2.5}$	particulate matter less than or equal to 2.5 microns in aerodynamic diameter
SO_2	sulfur dioxide
Pb	lead
CO_2e	carbon dioxide equivalent
HAP	hazardous air pollutant
PTE	potential to emit

1.2 Permit to Construct Application

The detailed emission calculations are included in Appendix B. The required permit to construct application forms are included in Appendix C. The forms completed for this application include: SFN 8516, SFN8891, SFN 8532, and SFN 8329. No permit forms are included for the small storage tanks or boiler as these are exempt per North Dakota Administrative Code (NDAQ) 33.1-15-14-02.13. No permit form was included for the pig launch/receiving, as it did not seem to fit any obvious form/format. It should be noted that the total facility emissions shown on Form SFN 8516 are inclusive of the compressor engine as well as the tanks, boiler blowdown and pig launch/receiving.

The manufacturer specifications for the natural gas fired engine and its associated catalyst is included in Appendix D. The air toxics review completed for this project in accordance with the Policy for the Control of Hazardous Air Pollutant Emissions in North Dakota (Air Toxics Policy) was performed using the American Meteorological Society/ Environmental Protection Agency Regulatory Model (AERMOD), version 19191. AERMOD is a US Environmental Protection Agency (EPA)-approved, steady state Gaussian plume model approved for industrial sources. The electronic modeling archive, which contains all files associated with the air dispersion modeling analysis completed for the Elkhorn Creek Compressor Station, will be provided to the NDDEQ in electronic format upon request.

2.0 REGULATORY APPLICABILITY

The Project was reviewed for the applicability of Federal and State level requirements for sources of air emissions. The analysis is presented in the sections that follow.

2.1 Federal Requirements

The CAA of 1970, as amended in 1977 and 1990, is the basic federal statute governing air quality. The provisions of the CAA that are potentially applicable to construction and operation of the Project are:

- Prevention of Significant Deterioration (PSD)/Non-Attainment New Source Review (NNSR);
- Federal Class I Area Protection;
- New Source Performance Standards (NSPS);
- National Emission Standards for Hazardous Air Pollutants (NESHAP); and
- State Regulations.

The following is a brief description of these regulations and their requirements.

Prevention of Significant Deterioration/Non-Attainment New Source Review

The CAA requires any new major stationary source of air pollution, or existing source proposing major modification, to obtain an air pollution permit before commencing construction. Air construction permits for major sources or modifications in an attainment areas are issued under the PSD regulations, whereas air construction permits for sources in a nonattainment area are issued under the NNSR program. The entire program, including both PSD and NNSR permitting, is referred to as the New Source Review program.

Title I of the CAA establishes guidelines for the preconstruction/modification review of large air emission sources. Construction of sources in attainment areas must be reviewed in accordance with the PSD regulations. To be classified as a new major PSD source, the potential emissions from the source must either be greater than 100 tons per year (tpy) for any pollutant regulated by the EPA under the CAA for sources that are among the 28 source categories listed in section 169 of the CAA, or greater than 250 tpy for sources that are not among the 28 source categories. Additionally, greenhouse gas (GHG) emissions of 100,000 tpy also trigger PSD review. Best Available Control Technology analyses and detailed dispersion modeling are required if a new source is classified as a major PSD source.

Natural gas compressor stations are not identified in the list of 28 source categories in section 169 of the CAA; therefore, the applicability threshold for PSD review for the proposed compressor stations is 250 tpy. Fugitive emissions, such as component leaks and pipeline venting for maintenance, do not count toward the PSD threshold because the compressor stations are not considered one of the 28 sources categories. Listed sources are required to consider fugitive emissions to evaluate PSD applicability. The primary fugitive emissions at the compressor stations are methane (CH_4) and GHG.

The EPA's May 13, 2010 GHG Tailoring Rule is intended to limit the number of affected sources that account for an estimated 70 percent of GHG emissions from stationary sources while shielding smaller sources such as apartment buildings and schools. As of July 1, 2011, a new industrial facility that is a major source for at least one non-GHG pollutant and will emit or has the potential to emit at least 75,000 tpy of carbon dioxide equivalents (CO_2e) is subject to PSD. Alternatively, a new industrial facility that has the potential to emit 100,000 tpy of CO_2e and will exceed the applicable major source regulation on a mass basis for GHGs will be subject to PSD. In addition, PSD for CO_2e would only be triggered if the compressor stations were "anyway sources" which means triggering PSD for one of the other regulated PSD pollutants. Even if the compressor stations were above the PSD threshold for CO_2e (100,000 tpy), PSD would not be triggered if none of the other pollutants exceed the PSD threshold.

The proposed Elkhorn Compressor Station emissions will not exceed 250 tpy for any criteria air pollutant and as such, PSD permitting requirements will not be triggered.

New Source Performance Standards

The NSPS, codified in 40 CFR 60, establishes pollutant emissions limits and monitoring, reporting, and recordkeeping requirements for various emissions sources based on source type and size. The NSPS apply to new, modified, or reconstructed sources. The potentially applicable NSPS are described below, subparts that do not apply to the Project are not listed below.

NSPS subpart JJJJ applies to all new stationary spark ignition internal combustion engines. The Elkhorn Creek Compressor Station will be installing one (1) 3,750 hp spark ignition internal combustion engine to drive a compressor. The new spark ignition natural gas fired engine will meet emission standards for NO_x, CO, and VOC. The engine to be purchased by WBI Energy will be certified to meet the requirements of this NSPS. Subpart JJJJ requirements will be included in the applicable state air quality permits.

NSPS Subpart OOOO applies to onshore affected facilities including natural gas wells, centrifugal compressors, reciprocating compressors, pneumatic controllers, storage vessels, equipment within process units, and sweetening units. Subpart OOOO only regulates equipment between the wellhead and point of custody transfer to the natural gas transmission and storage segment. Compressors that are associated with natural gas transmission are not subject to Subpart OOOO. This subpart does not apply to the Project.

EPA amended Subpart OOOO to add new regulations affecting CH_4 and VOC emissions. The amended subpart is codified as subpart OOOOa. WBI Energy will meet the requirements of Subpart OOOOa for the Project. Affected sources operated by WBI Energy are fugitive emissions from the compressor station and the reciprocating compressor.

National Emission Standards for Hazardous Air Pollutants

The NESHAPs, codified in 40 CFR Parts 61 and 63, regulate hazardous air pollutants (HAP) emissions. Part 61, which was promulgated prior to the 1990 CAA Amendments (CAAA), regulates only eight types of hazardous substances: asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic, mercury, radionuclides, and vinyl chloride. The 1990 CAAA established a list of 189 HAPs, resulting in the promulgation of Part 63. This part, also known as the Maximum Achievable Control Technology standards, regulates HAP emissions from major sources of HAP emissions and specific source categories of non-major (area) sources that emit

HAPs. Part 63 defines a major source of HAPs as any source that has the potential to emit 10 tpy of any single HAP or 25 tpy of HAPs in aggregate.

The compressor station will be classified as an area source (minor) of HAPs since the potential emissions of HAPs will not exceed the major source thresholds. The NESHAP subpart ZZZZ for reciprocating internal combustion engines will apply to the engine at the compressor station, however, a new source demonstrates compliance by complying with NSPS subpart JJJJ. The engine to be installed as part of this Project will comply with subpart JJJJ, and as such subpart ZZZZ as well.

The compressor station will have one small natural gas fired boiler that will be used for comfort heating and a small natural gas fired water heater. NESHAP subpart JJJJJJ, Area Source Boiler National Emission Standards for Hazardous Air Pollutants sets HAP emission standards for boilers at area sources, however, natural gas fired boilers are exempt.

2.2 State Regulations

North Dakota air emissions are regulated by the NDDEQ Division of Air Quality, also referred to as the Department, under North Dakota Administrative Code (NDAC) 33-15. Listed below are the applicable air quality regulations from the NDAC that apply to the Project as well as required air impact reviews (dispersion modeling).

Applicable North Dakota Air Quality Regulations

NDAC 33.1-15-01 sets the general provisions pertaining to all state level regulations including definitions of terms used by the regulations.

NDAC 33-15-02 establishes ambient air quality standards (AAQS) which are identical to the National Ambient Air Quality Standards promulgated by the EPA, with the exception of an additional state standard for hydrogen sulfide (H_2S). Emissions of H_2S for the Elkhorn Creek Compressor Station are negligible.

NDAC 33.1-15-03 restricts emission of visible air contaminants. This regulation applies to both point sources and fugitive sources of visible emissions. WBI will maintain equipment to not exceed opacity standards and perform construction to minimize dust.

NDAC 33.1-15-04 establishes restrictions on open burning. No open burning is planned; however if the need arises, WBI will follow all requirements stipulated in 33.1-15-04 for permissible open burning.

NDAC 33.1-15-05 addresses emission requirements of PM from industrial processes. Emissions of PM during operations of the Project would not exceed any of the emission limitations set forth in NDAC 33.1-15-05 table 3.

NDAC 33.1-15-07-01 & 02 addresses emission requirements for VOC. Per 33.1-15-07-01, all pumps and compressors that handle VOC material will be equipped and operated with properly maintain seals designed for their specific service and operating conditions. Per 33.1-15.07-02 no person is allowed to emit organic compound gases and vapors, except from an emergency vapor blowdown system or emergency relief system, unless these gases and vapors are burned by flares, or an equally effective control device as approved by the Department. Minor sources, as determined by the department and not subject to NSPS, may be granted exemptions to this subsection. If required, each flare is required to be equipped and operated with an automatic igniter or a continuous burning pilot.

NDAC 33.1-15-08 addresses operation and control of internal combustion engines. WBI Energy will comply with the requirements of NDAC 33-15-08-1 and 33-15-08-02 by operating internal combustion engines and exhaust emission control devices in a reasonable and appropriate manner according to manufacturer specifications.

NDAC 33.1-15-17 restricts fugitive emissions from any source, including emissions of particulate (dust) and various gaseous emissions including those subject to an AAQS or PSD increment, an odorous substance, or those subject to the restrictions of a visible air contaminant. WBI Energy will comply with the applicable requirements of this regulation during construction and operation of the Project.

NDAC 33.1-15-22 address emission standards for HAPs. Emission standards for this chapter are the federal NESHAPs incorporated by reference. WBI Energy will comply with NDAC 33.1-15-22 by complying with the federal NESHAPs which were previously addressed in this document.

2.3 North Dakota Dispersion Modeling

In North Dakota, air dispersion modeling is required to obtain a permit to construct for compressor engines pursuant to a Department January 23, 2015 memorandum unless all of the following certain conditions are met.

- Emissions from all compressor engines are controlled with a catalytic emission control system (or an equivalent control technology which is designed to reduce non-methane hydrocarbons emissions by at least 50 percent.
- Emissions from all compressor engines at the facility are vented from a stack height which is greater than or equal to 1.5 times the nearest building height.
- If the facility is located less than 1/4 mile from a residence: combined air toxics emissions from the entire facility are less than 10 tpy, benzene emissions are less than 2 tpy, and formaldehyde emissions are less than 2 tpy. If the facility is located at least 1/4 mile from a residence: combined air toxics emissions from the entire facility are less than 10 tons per year, benzene emissions are less than 3 tpy, and formaldehyde emissions are less than 3 tpy.

The compressor engine at the Elkhorn Creek Compressor Station is equipped with an oxidation catalyst that reduces non-methane hydrocarbon emission by at least 50 percent. The nearest building peak roof height is 32.5 feet and the compressor stack is at a height of 43 feet from ground level (less than 1.5 times the nearest building height). However, the emissions for criteria pollutants do not exceed the thresholds for sources that contain stacks with heights less than 1.5 times the nearest building height. The nearest residence is approximately 0.70 miles west-southwest of the facility, which is further than a quarter mile away. The HAP emissions at the facility do not exceed the modeling thresholds. Therefore, no air dispersion modeling is required for criteria pollutants per the NDDEQ publication *Criteria Pollutant Modeling Requirements for a Permit to Construct* published on October 6, 2014.

2.4 North Dakota Air Toxics Review

North Dakota also requires an air toxics review to be evaluated for applicability for any source that is required to submit a permit to construct that has the potential to emit HAPs. Since the compressor stack is less than 1.5 times higher than the nearest building height, the air toxics analysis is required. The air toxics review is a stepped approach of comparing HAP concentrations to acceptable values by reviewing the maximum individual carcinogenic risk. The analysis allows the Department to determine if the emission sources require additional review.

2.4.1 Tiered Analysis

Tier 1 Analysis

For Tier 1 of the air toxics review, the HAP emissions from all facility sources were compared to the look-up tables in Appendix A and Appendix B provided in Policy for the Control of Hazardous Air Pollutant Emissions in North Dakota (Air Toxics Policy). Using steps 1 through 11 of the Air Toxics Policy, each HAP was evaluated for its health effects. All HAPs were compared to the applicable 1-hour and 8-hour concentrations for each pollutant as found in Appendix A. In addition, HAPs classified as carcinogenic were compared to the Unit Risk Factors in Appendix B of the Air Toxics Policy. If the emission rate was below the guideline concentration as found in Table 1 of the Air Toxics Policy, the pollutant was screened out from further analysis.

The result of the Tier 1 review for non-carcinogenic pollutants indicated that acrolein and formaldehyde were above their respective 1-hour guideline concentrations. These two pollutants have to be then be reviewed per the Tier 2 or Tier 3 analysis. All other pollutants were below their respective guideline concentrations and did not require additional analysis.

For carcinogenic pollutants, the total calculated maximum individual carcinogenic risk (MICR) was summed and compared to the MICR threshold of 1×10^{-5} mg/m^3 (0.00001). The total MICR for the facility was calculated as 3.88×10^{-5} which is above the MICR threshold of 1×10^{-5} mg/m^3. Specific carcinogenic HAPs were individually above the MICR threshold of 1×10^{-5} and these compounds were individually evaluated further in a Tier 3 analysis. This Tier 3 analysis is presented later in this section.

Table 2.4-1 summarizes the Tier 1 air toxics analysis. Note that values shown in red/italics indicate that the air toxics analysis for that pollutant was advanced to the Tier 3 assessment.

TABLE 2.4-1

Tier 1 Air Toxics Analysis

Pollutant	Averaging Time	Emissions (g/s)	1-hr Concentration (mg/m^3)	1-hr Guideline Conc. [1] (mg/m^3)	1-hr HI [3]	8-hr Concentration (mg/m^3)	8-hr Guideline Conc. [1] (mg/m^3)	8-hr HI [3]	Annual Concentration ($\mu g/m^3$)	URF [2] ($m^3/\mu g$)	MICR [4]
Ammonia	1-hr, 8-hr	5.33E-02	2.67E-01	0.488	0.547	1.87E-01	3.48E-01	5.37E-01	N/A	N/A	N/A
1,1,2,2-Tetrachloroethane	8-hr	1.41E-04	7.07E-04	N/A	N/A	4.95E-04	2.83E-02	1.75E-02	N/A	N/A	N/A
1,1,2-Trichloroethane	8-hr	1.12E-04	5.62E-04	N/A	N/A	3.93E-04	1.09E+00	3.61E-04	N/A	N/A	N/A
1,1-Dichloroethane	8-hr	8.34E-05	4.17E-04	N/A	N/A	2.92E-04	8.10E+00	3.61E-05	N/A	N/A	N/A
1,3,5-Trimethylbenzene	8-hr	1.19E-04	5.97E-04	N/A	N/A	4.18E-04	2.46E+00	1.70E-04	N/A	N/A	N/A
1,3-Butadiene	annual	9.44E-04	4.72E-03	N/A	N/A	3.30E-03	N/A	N/A	3.77E-01	3.00E-05	***1.13E-05*** [6]
1,3-Dichloropropene	annual	9.33E-05	4.67E-04	N/A	N/A	3.27E-04	N/A	N/A	3.73E-02	4.00E-06	1.49E-07
2-Methylnaphthalene	8-hr	1.17E-04	5.87E-04	N/A	N/A	4.11E-04	5.20E-02	7.90E-03	N/A	N/A	N/A
Acetaldehyde	1-hr, annual	2.95E-02	1.48E-01	0.901	0.164	1.03E-01	N/A	N/A	1.18E+01	2.20E-06	***2.60E-05*** [6]
Acrolein	1-hr	1.82E-02	9.08E-02	0.00459	***19.789*** [6]	6.36E-02	N/A	N/A	N/A	N/A	N/A
Benzene	1-hr, 8-hr, annual	1.56E-03	7.78E-03	0.16	0.049	5.44E-03	3.19E-02	1.71E-01	6.22E-01	7.80E-06	4.85E-06
Benzo(b)fluoranthene	annual	5.87E-07	2.93E-06	N/A	N/A	2.05E-06	N/A	N/A	2.35E-04	1.10E-04	2.58E-08
Carbon Tetrachloride	1-hr, 8-hr, annual	1.30E-04	6.49E-04	1.258	0.001	4.54E-04	6.29E-01	7.22E-04	5.19E-02	6.00E-06	3.11E-07
Chlorobenzene	8-hr	1.07E-04	5.37E-04	N/A	N/A	3.76E-04	9.21E-01	4.08E-04	N/A	N/A	N/A
Chloroform	8-hr, annual	1.01E-04	5.04E-04	N/A	N/A	3.53E-04	9.77E-01	3.61E-04	4.03E-02	2.30E-05	9.27E-07
Chrysene	annual	2.45E-06	1.22E-05	N/A	N/A	8.57E-06	N/A	N/A	9.80E-04	1.10E-05	1.08E-08
Cyclopentane	8-hr	8.02E-04	4.01E-03	N/A	N/A	2.81E-03	3.44E+01	N/A	N/A	N/A	N/A
Ethylbenzene	1-hr, 8-hr, annual	1.40E-04	7.02E-04	10.855	0.000	4.91E-04	8.68E+00	5.66E-05	5.61E-02	2.50E-06	1.40E-07
Ethylene Dibromide	annual	1.57E-04	7.83E-04	N/A	N/A	5.48E-04	N/A	N/A	6.26E-02	6.00E-04	***3.76E-05*** [6]
Formaldehyde	1-hr, annual	4.95E-02	2.47E-01	0.00737	***33.568*** [6]	1.73E-01	N/A	N/A	1.98E+01	1.30E-05	***2.57E-04*** [6]
Methanol	1-hr, 8-hr	8.84E-03	4.42E-02	6.552	0.007	3.09E-02	5.24E+00	5.90E-03	N/A	N/A	N/A
Methylcyclohexane	8-hr	4.35E-03	2.17E-02	N/A	N/A	1.52E-02	3.21E+01	4.74E-04	N/A	N/A	N/A
Methylene Chloride	8-hr, annual	7.07E-05	3.53E-04	N/A	N/A	2.47E-04	3.47E+00	7.12E-05	2.83E-02	4.70E-07	1.33E-08
Hexane	8-hr	3.92E-03	1.96E-02	N/A	N/A	1.37E-02	3.53E+00	3.90E-03	N/A	N/A	N/A
Nonane	8-hr	3.89E-04	1.94E-03	N/A	N/A	1.36E-03	2.10E+01	N/A	N/A	N/A	N/A
Octane	8-hr	1.24E-03	6.20E-03	N/A	N/A	4.34E-03	2.80E+01	N/A	N/A	N/A	N/A
Pentane	8-hr	9.19E-03	4.59E-02	N/A	N/A	3.22E-02	3.54E+01	N/A	N/A	N/A	N/A
Naphthalene	1-hr, 8-hr, annual	2.63E-04	1.31E-03	1.573	0.001	9.20E-04	1.05E+00	8.78E-04	1.05E-01	3.40E-05	3.58E-06
PAH [5]	annual	9.51E-05	4.75E-04	N/A	N/A	3.33E-04	N/A	N/A	3.80E-02	1.20E-03	***4.56E-05*** [6]

TABLE 2.4-1

Tier 1 Air Toxics Analysis

Pollutant	Averaging Time	Emissions (g/s)	1-hr Concentration (mg/m^3)	1-hr Guideline Conc. [1] (mg/m^3)	1-hr HI [3]	8-hr Concentration (mg/m^3)	8-hr Guideline Conc. [1] (mg/m^3)	8-hr HI [3]	Annual Concentration ($\mu g/m^3$)	URF [2] ($m^3/\mu g$)	MICR [4]
Phenol	8-hr	8.48E-05	4.24E-04	N/A	N/A	2.97E-04	3.85E-01	7.71E-04	N/A	N/A	N/A
Styrene	1-hr, 8-hr	8.34E-05	4.17E-04	3.408	0.000	2.92E-04	1.70E+00	1.71E-04	N/A	N/A	N/A
Toluene	8-hr	1.44E-03	7.21E-03	N/A	N/A	5.05E-03	1.51E+00	3.35E-03	N/A	N/A	N/A
Vinyl Chloride	8-hr, annual	5.27E-05	2.63E-04	N/A	N/A	1.84E-04	5.11E-02	3.61E-03	2.11E-02	8.80E-06	1.85E-07
Xylene	1-hr, 8-hr	6.50E-04	3.25E-03	13.026	0.000	2.28E-03	8.68E+00	2.62E-04	N/A	N/A	N/A
										Total Facility MICR	**3.88E-04**

Notes:

1 From Appendix A of the Policy for the Control of Hazardous Air Pollutant Emissions in North Dakota.

2 From Appendix B of the Policy for the Control of Hazardous Air Pollutant Emissions in North Dakota. URF = Unit Risk Factor

3 Hazard Index (HI) = Facility Concentration (mg/m^3) ÷ Guideline Concentration (mg/m^3). If HI<1, pollutant is screened out. If HI≥1, pollutant requires further analysis.

4 MICR = Maximum Individual Cancer Risk = annual concentration ($\mu g/m^3$) x URF ($m^3/\mu g$).

5 PAH analysis was completed by using the URF for dibenz(a,h)anthracene, which is one of the pollutants that make up PAH.

6 Pollutants listed in red did not pass the Tier 1 analysis and required further analysis (Tier 3 assessment).

PAH = Polycyclic Aromatic Hydrocarbons
N/A = Not Applicable
g/s = grams per second
mg/m^3 = milligrams per cubic meter

Tier 2 Analysis

According to the Air Toxics Policy, the Tier 2 analysis involves the use of the EPA SCREEN3 computer screening model. The screening model predicts the highest 1-hour concentration of a pollutant from a matrix of predictions for all plausible meteorological conditions. Instead of running a screen model, a refined air dispersion model as specified in the Tier 3 approach was used.

Tier 3 Analysis

The Tier 3 analysis predicts the health effect of each HAP with a refined EPA computer model by using hour-by-hour meteorological data to determine a maximum concentration. This concentration is then compared to a state level toxics standard to evaluate the potential risk to human health and the environment. Through guidance with NDDEQ air quality division, the Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values from the California Air Resources Board, last updated in September 2019 (Table 1 in Appendix L), was used to determine compliance with the Air Toxics Policy.

Description of the Air Quality Dispersion Model

The modeling was performed using AERMOD, version 19191. AERMOD is a US EPA-approved, steady state Gaussian plume model approved for industrial sources and capable of modeling multiple sources in simple and complex terrain. Regulatory default options were used in the analysis.

Receptor Grid

To ensure that the area of maximum effects was accurately sampled, a multi-tier receptor grid extending out to 15 kilometers (km) was used in the model. The configuration of receptor points was as follows:

- • 25-meter (m) spacing along the facility fence/property line;
- • 50-m spacing from the fence/property line to 500 m;
- • 100-m spacing from 500 m to 2 km;
- • 250-m spacing from 2 km to 5 km; and
- • 500-m spacing from 5 km to 15km.

Public access at the facility will be impeded by fencing and gates.

Terrain

Terrain heights were generated using publicly available ground elevation data from the United States Geological Survey (USGS) National Elevation Data set (USGS 2017). The USGS terrain data selected has 1/3 arcsecond (10-meter) grid spacing to provide sufficient spatial resolution of terrain features. These data were processed for use in AERMOD using the AERMAP (version 18081) processor program. To process the data, a selection of rural or urban land use is required. Urban land use, in the context of the AERMAP analysis, is applicable to city centers and industrial areas that are characterized by multi-story buildings and large areas of land covered with impermeable surfaces such as concrete or asphalt. Rural land use is appropriate for areas ranging from suburban areas predominantly characterized by single family homes, moderately populated rural residential areas, and other areas with land use areas with a mix of vegetative cover and moderate development. Rural land use was selected due to Elkhorn Creek Compressor Station's location in an area that fits the rural land use definition; the station will not be located in an urban population center.

Meteorology

EPA air quality modeling guidance recommends the use of one year of onsite meteorological data or five years of representative off-site data. Since onsite data were not available for the Station, meteorological data from the National Weather Service was used in this analysis.

The AERMOD-ready meteorological data sets were developed by using the surface hourly observations from Williston Airport, ND (KISN, WBAN: 94014), along with concurrent twice-daily radiosonde observations from Glasgow Airport, Montana (MT) (GGW, WBAN 94008) for the years 2009-2013. NDDEQ provides the pre-processed data for these years on their website.

Surface Data

Williston Airport is located at latitude 48.195º N, longitude 103.642º W, and elevation 580.6 meters above mean sea level. The station was commissioned as an Automated Surface Observing System (ASOS) station on April 1, 1996. The anemometer height is 10 meters above ground level. The 2009-2013 surface data KISN were provided by NDDEQ. The data is archived in Central Standard Time (GMT-6).

Data for the entire modeling period (43,484 hours) was processed with AERMET stage 1 to assess the data coverage for the following meteorological variable:

Cloud cover	99.95%
Temperature	99.69%
Winds	99.30% (without sub-hourly winds)
Calm	16.81% (without sub-hourly winds)

To improve the wind observation coverage and better resolve the light wind conditions, 1- and 5-minute wind observations were included into the data processing stream in AERMET – stage 2. The 1-minute observations for use with AERMINUTE are provided by NCEI[1] and represent the 2-minute averages of 6-second observations assigned to the ending minute. Five-minute wind observations were added to complete the sub-hourly data set, specifically needed in for the months June to December 2013. KISN was equipped with a sonic anemometer on April 1, 2007, therefore the sub-hourly wind observations were fully incorporated in the entire modeling period.

After incorporating the sub-hourly wind observations the wind data coverage increased to 99.93 percent and the fraction of calm hours decreased to 1.75 percent.

[1] ftp://ftp.ncdc.noaa.gov/pub/data/asos-onemin/, ftp://ftp.ncdc.noaa.gov/pub/data/asos-fivemin/

Upper Air Data

Twice-daily upper air observations from Glasgow, MT airport were provided by NDDEQ in FSL format. The GGW station is located at 48.214º N, 106.621º W and identified with WBAN 94008.

The data was processed with a time shift of 6 hours to match the time zone of the surface station (GMT-6). AERMET Data coverage by atmospheric level is listed in Table 2.4-2.

TABLE 2.4-2

AERMET Data Coverage

Atmospheric Level (km)	Temperature Coverage (%)	Wind Coverage (%)
SURFACE	99.51%	95.16%
0.0 – 0.5 km	99.93%	22.98%
0.5 – 1.0 km	100.00%	40.28%
1.0 – 1.5 km	100.00%	0.00%
1.5 – 2.0 km	100.00%	0.00%
2.0 – 2.5 km	100.00%	38.70%
2.5 – 3.0 km	99.98%	0.61%
3.0 – 3.5 km	99.91%	0.00%
3.5 – 4.0 km	99.70%	0.00%
> 4.0 km	95.74%	21.81%

Notes:

km = kilometer
% = percentage

A total of 3 missing afternoon soundings were found within the modeling period – January 7, 2010, May 16, 2010, and August 25, 2013. The gaps were not filled.

Surface Parameters

Surface parameters - albedo, Bowen Ratio, and surface roughness length - are needed input for dispersion calculations. These parameters are based on the land use features and moisture conditions, and experience seasonal variations. They are calculated as part of the hourly meteorological data processing with AERSURFACE and AERMET.

The surface parameters for this application were calculated using AERSURFACE version. The land use map is part of the 1992 Nationals Land Cover Data state-wide archive, provided by the USGS, and has 30-meter resolution. AERSURFACE was processed with options recommended by NDDEQ[2]:

The domain was centered at the location of the airport located in Williston, North Dakota. The resulting surface parameters are summarized in Table 2.4-3

[2] Recommended AERSURFACE Inputs, North Dakota (March 2017)," https://www.deq.nd.gov/publications/AQ/policy/Modeling/AERSURFACE_InputsND.pdf

TABLE .2.4-3

Seasonal Surface Parameters at Williston Airport, North Dakota

Circular Sector (°)	Winter with snow	Winter with no snow	Spring	Summer	Fall
Albedo (10 x 10 km Domain) [1]					
0 - 360	0.58	0.19	0.17	0.18	0.18
Bowen Ratio (10 x 10 km Domain) - Average Moisture [2]					
0 - 360	0.49	0.83	0.38	0.63	0.83
Surface Roughness Length (m) (1km-radius domain) [3]					
0 - 30	0.007	0.014	0.038	0.095	0.095
30 - 60	0.010	0.021	0.051	0.110	0.110
60 - 90	0.007	0.014	0.039	0.094	0.094
90 - 120	0.007	0.013	0.040	0.096	0.096
120 - 150	0.006	0.013	0.039	0.096	0.096
150 - 180	0.007	0.014	0.034	0.086	0.086
180 - 210	0.007	0.013	0.039	0.099	0.099
210 - 240	0.008	0.016	0.042	0.097	0.097
240 - 270	0.008	0.015	0.055	0.116	0.116
270 - 300	0.019	0.032	0.083	0.146	0.146
300 - 330	0.008	0.016	0.038	0.093	0.093
330 - 360	0.008	0.016	0.032	0.099	0.099

Notes:

[1] Albedo is a non-dimensional measure of the solar reflectivity of a surface.

[2] Bowen Ratio is a non-dimensional measure of the heat transfer for a surface under moisture conditions. Surfaces with higher moisture conditions will result in a lower Bowen Ratio. Typical values range from 0.10 for thick deciduous forest to 0.90 for fresh snow.

[3] Surface Roughness Length is the height (in meters) at which the mean horizontal wind speed is zero.

° = degrees
km = kilometer
m = meter

Model Versions and Modeling Options

The latest versions of all the meteorological processors included in the AERMOD system were used. The default modeling options were selected in all cases.

AERMET v.19191 was used. There are three stages to processing the data in AERMET. In the first stage, meteorological data was extracted from archive data files and the surface hourly and upper air twice-daily data were processed for the entire modeling period 2009 to 2013. In the second stage, the sub-hourly ASOS wind data extracted and processed in AERMINUTE v.15272 was added and all meteorological data were merged together in a single file. In the third stage, the merged data were processed and the appropriate surface parameters were incorporated for use by AERMOD, as calculated with AERSURFACE v.13016. A threshold of 0.5 meters per second (m/s) was set for the ASOS wind speed as recommended by EPA Guidelines. The wind speed was considered a scalar quantity and the appropriate adjustment of the friction velocity (ADJ_U*) was applied.

As show in Table 2.4-4, the resulting 5-year data set provides more than 99 percent coverage of the meteorological conditions.

TABLE 2.4-4

5-Year Meteorological Data Set Coverage

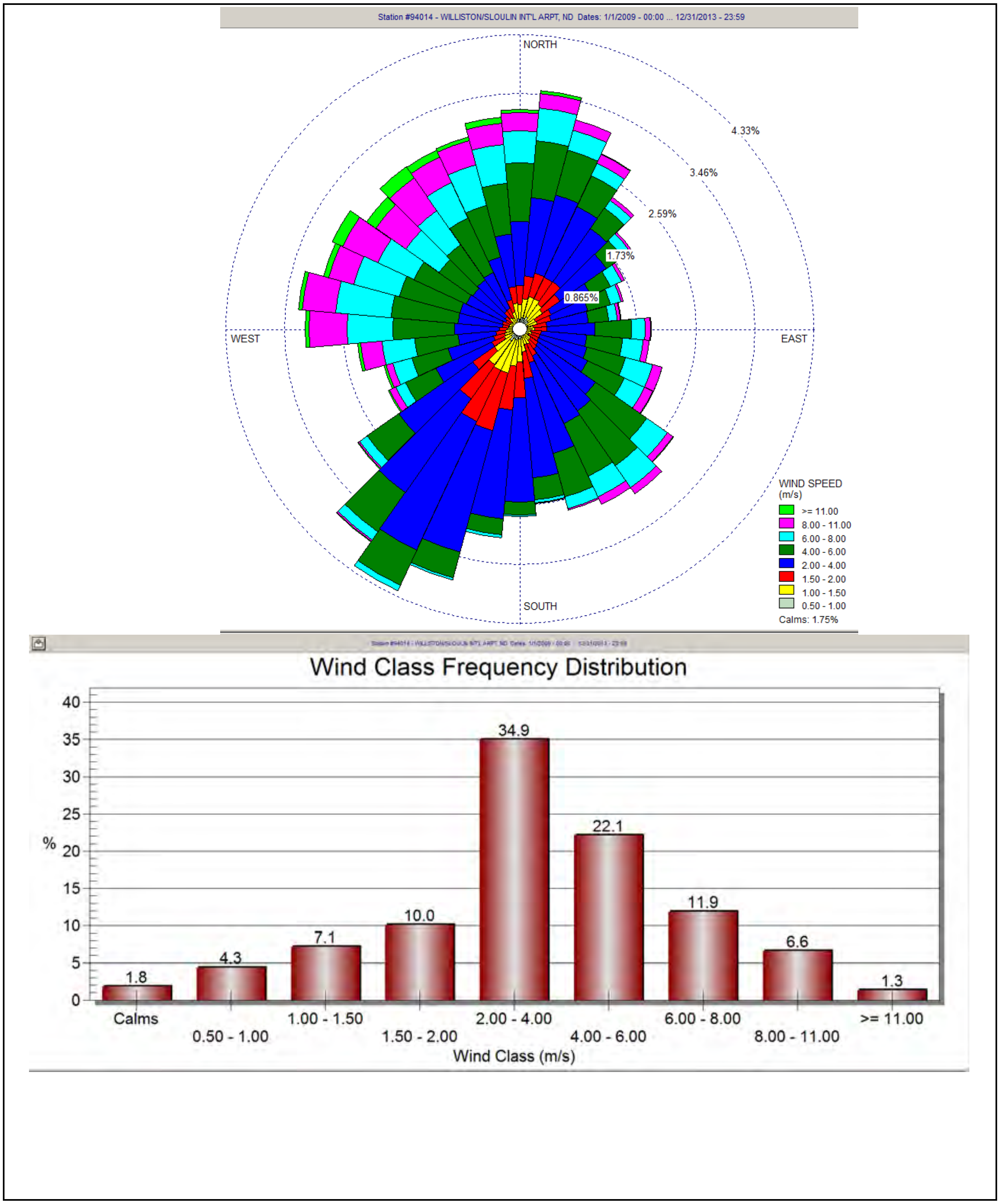
Year	Missing Hours	Total Coverage [1] (%)
2009	0	100.0
2010	18	99.79
2011	14	99.84
2012 [2]	4	99.95
2013	42	99.52

Notes:
[1] Percent coverage is calculated by removing the missing hours from the total hours in a year (8,760)
[2] Total hours in 2012 was 8,784.

% = percentage

Figure 2.4-1 shows the wind rose and wind class and frequency distribution for the 5-year meteorological data set.

Figure 2.3-1 2009-2013 Wind Rose and Distribution from KISN



Building Downwash

The US EPA's Building Profile Input Program (BPIP), version 04274, was used to calculate downwash effects for all emission sources. Building and structure configurations and locations relative to the modeled sources were obtained from WBI. All point source release points at the facility are expected to be below the greater of the GEP formula height calculated by BPIP or 65 m (213 feet). The detailed structure element coordinates and dimensions for all onsite buildings are included in Table 2.4-5. Terrain elevations for all buildings were assigned using survey data.

TABLE 2.4-5

Elkhorn Creek Compressor Station Building Locations

Building ID	Building Description	Location (Southwest Corner)[1,2] X (m E)	Y (m N)	X-Length (ft)	Y-Length (ft)	Eave Height (ft)	Peak Height (ft)
COMPBLDG	Compressor Building	633568.03	5281744.18	60	60	30	32.5
AUX_BLDG	Auxiliary Building	633524.71	5281764.50	40	100	12	13.66
TRNSBLDG	Transfer Building	633558.21	5281779.59	80	60	24	26.5

Notes:
[1] Based on site plot plans.
[2] Estimated using Google Earth.

m E = meters Easting
m N = meters Northing
ft = feet

Modeling Results

Modeling was conducted to further assess non-carcinogenic impacts for 1-hour acrolein and 1-hour formaldehyde, using a Tier 3 approach per NDDEQ guidelines. The predicted maximum non-carcinogenic impacts for acrolein and formaldehyde are below their respective OEHHA/ARB approved risk assessment health values.

The detailed results summary is presented in Table 2.4-6.

TABLE 2.4-6

AERMOD Results and Tier 3 Air Toxics Compliance Summary - Non-carcinogenic impacts

Pollutant	Averaging Period	Project Impact ($\mu g/m^3$)	OEHHA/ARB Risk Assessment Health Value[1] ($\mu g/m^3$)	Hazard Index (HI)
Acrolein	1-hour	0.96	2.5	0.36
Formaldehyde	1-hour	2.61	55	0.05

Notes:
[1] From the California Air Resources Board – Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values, updated September 19, 2019, Table 1 in Appendix L

$\mu g/m^3$ = micrograms per cubic meter
HI = Hazard Index

Modeling was conducted to further assess carcinogenic impacts for acetaldehyde, 1,3-butadiene, benzene, ethylene dibromide, formaldehyde, and PAH. The predicted MICR for each compound are below the MICR threshold of 1 x10^{-5}.

The detailed results summary is presented in Table 2.4-7.

TABLE 2.4-7

AERMOD Results and Tier 3 Air Toxics Compliance Summary - Carcinogenic impacts

Pollutant	Averaging Period	Project Impact ($\mu g/m^3$)	OEHHA/ARB Inhalation Unit Risk Value[1] ($(\mu g/m^3)^{-1}$)	RISK
Acetaldehyde	Annual	0.0254	2.7E-6	4.80E-07
1,3-Butadiene	Annual	0.00081	1.7E-04	9.64E-07
Benzene	Annual	0.00134	2.9E-05	2.72E-07
Ethylene Dibromide	Annual	0.00013	7.1E-05	6.46E-08
Formaldehyde	Annual	0.04233	6.0E-6	4.80E-07
PAH	Annual	0.00043	1.1E-03	3.31E-6

Notes:
[1] From the California Air Resources Board – Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values, updated September 19, 2019, Table 1 in Appendix L

$\mu g/m^3$ = micrograms per cubic meter

Based on this analysis, the emissions of HAPs from the Elkhorn Creek Compressor Station do not cause potentially hazardous impacts to existing surrounding residential areas. As such, the Elkhorn Creek Compressor Station demonstrates compliance with the North Dakota Air Toxics Policy.

The electronic modeling archive, which contains all files associated with the air dispersion modeling analysis completed for the Elkhorn Creek Compressor Station, will be provided to the NDDEQ in electronic format upon request.

Appendix A

Site Location Map and Site Plot Plan

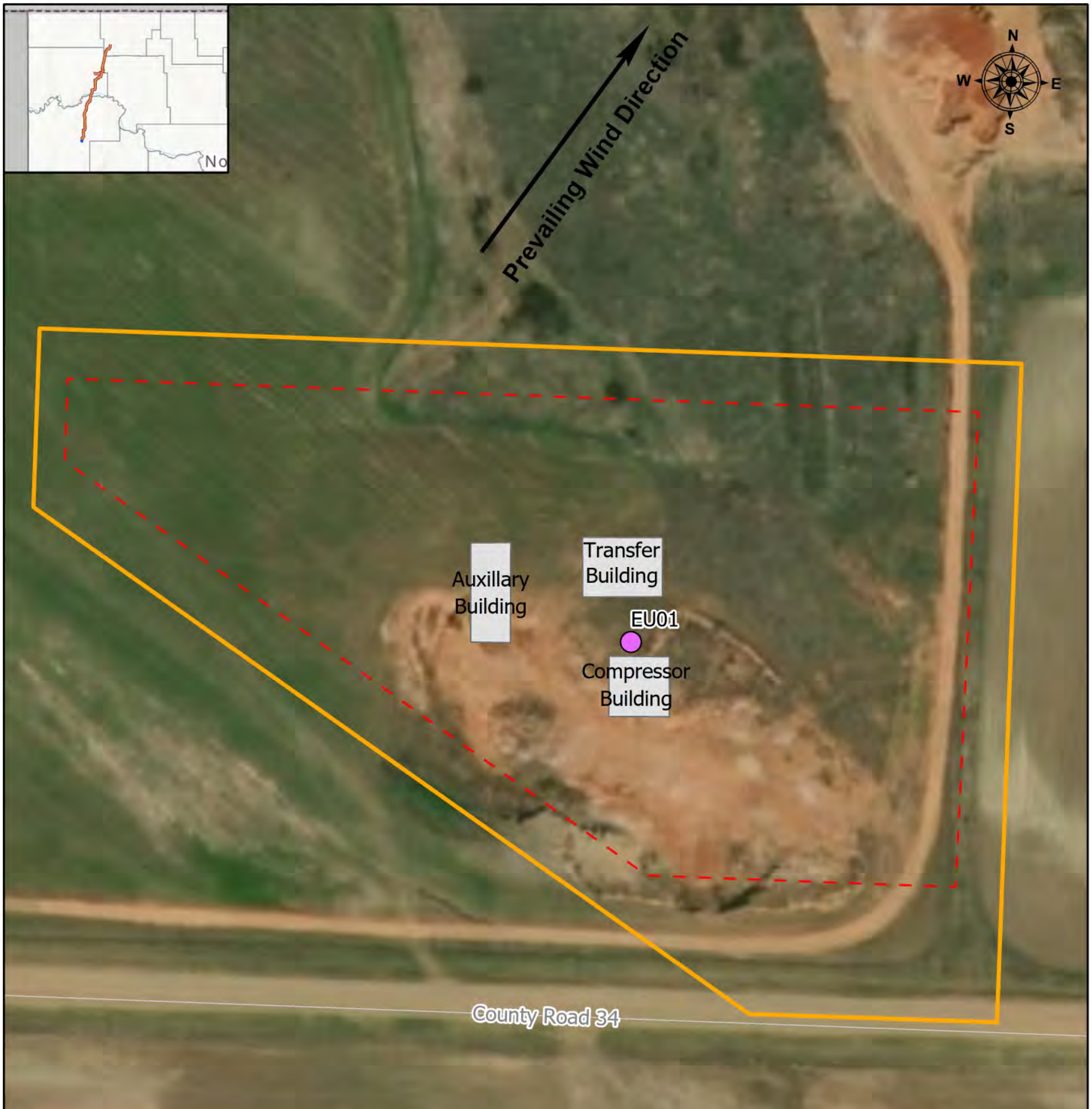
WBI Energy Transmission
Application for Permit to Construct
Elkhorn Creek Compressor Station
Site Location Map

1:12,000

WBI ENERGY TRANSMISSION

File: M:\Clients\V-X\WBI\North_Bakken_Expansion_ArcGIS\2020\01\Air_PermitMaps\AirPermit_CompressorStations\AirPermit_CompressorStations_v2.aprx | Revised: 1/27/2020

Drawn By: 0239



Elkhorn Creek Station	Height (Feet)	
	Eave	Peak
Auxillary Building	12.2	13.6
Compressor Building	30.3	32.5
Transfer Building	23.4	26.5

Compressor Engine Stack
Fence Line
Property Line
Building

0 75 150 300 Feet

WBI Energy Transmission
Application for Permit to Construct
Elkhorn Creek Compressor Station
Site Plan

1:1,800

WBI ENERGY TRANSMISSION

File: M:\Clients\V-X\WBI\North_Bakken_Expansion_ArcGIS\2020\01\Air_PermitMaps\AirPermit_CompressorStations\AirPermit_CompressorStations_v2.aprx | Revised: 1/28/2020 Drawn By: 0239

Appendix B

Potential to Emit Calculations

ERM *The business of sustainability*

Facility Name: Elkhorn Creek Compressor Station
Subject: Potential to Emit Calculations
Task: Potential to Emit Summary

Prepared: AMC
Date: Jan. 2, 2020

Emission Unit	Pollutant (TPY[1])										
	NO_X	CO	VOC	PM	PM_{10}	$PM_{2.5}$	SO_2	Lead	Total HAPs	Largest Single HAP (Formaldehyde)	CO_2e
Engine/Compressor	36.21	18.11	18.11	1.23	1.23	1.23	0.07	---	4.10	1.72	16,961
Pig Launching and Receiving	---	---	60.96	---	---	---	---	---	0.01	NA	14,896
Station Blowdowns	---	---	3.01	---	---	---	---	---	0.001	NA	735
Three (3) Tanks	---	---	0.0046	---	---	---	---	---	0.0045	NA	NA
Boiler (comfort heating)	1.73	1.45	0.09	0.13	0.13	0.13	1.0E-02	8.63E-06	0.06	0.06	2,061
Fugitive Emissions Equipment Leaks	---	---	0.30	---	---	---	---	---	0.0001	---	73.2
Total Facility Unlimited Emissions:	**37.94**	**19.56**	**82.47**	**1.36**	**1.36**	**1.36**	**0.08**	**8.63E-06**	**4.18**	**1.78**	**34,727**
Total Emissions without Fugitives:	**37.94**	**19.56**	**82.17**	**1.36**	**1.36**	**1.36**	**0.08**	**8.63E-06**	**4.18**	**1.78**	**34,654**

[1] TPY - Tons Per Year

ERM *The business of sustainability*

Facility Name: Elkhorn Creek Compressor Station
Subject: Potential to Emit Calculations
Task: Caterpillar 3612 w/Arial Compressor

Prepared: AMC
Reviewed: CAB
Date: Jan. 2, 2020

Engine/Compressor #1	
Assumptions:	
Natural Gas Fired	
Max. Rated Capacity, bhp	3,750
Fuel Consumption[1], Btu/bhp-hr	7,480
Max. Rated Capacity, MMBtu/hr	28.05
Fuel Consumption Rate, cf/hr	23,521
Conversion Factors:	
lb/ton	2,000
lb/kg	2.204
grams to pounds	453.6
Btu/MMBtu	1,000,000
CO_2 to CO_2e	1
CH_4 to CO_2e	25
N_2O to CO_2e	298
hours/yr	8,760
Btu/scf (based on gas analysis)[2]	1,193
Catalyst Safety Factor	2

Pollutant	**Emission Factors[3]**		**Uncontrolled Hourly Emissions[4] (lb/hr)**	**Uncontrolled Annual Emissions (TPY)**	**Catalyst Factors[5]**		**Post Oxidation Catalyst Hourly Emissions (lb/hr)**	**Post Oxidation Catalyst Annual Emissions (TPY)**
NO_X	1.00	grams/bhp-hr	8.27	36.21	NA	NA	NA	NA
CO	2.00	grams/bhp-hr	16.53	72.42	0.50	grams/bhp-hr	4.13	18.11
VOC	0.70	grams/bhp-hr	5.79	25.35	0.50	grams/bhp-hr	4.13	18.11
PM	0.010	lb/MMBtu	0.28	1.23	NA	NA	NA	NA
PM_{10}	0.010	lb/MMBtu	0.28	1.23	NA	NA	NA	NA
$PM_{2.5}$	0.010	lb/MMBtu	0.28	1.23	NA	NA	NA	NA
SO_2	0.00	lb/MMBtu	0.02	0.07	NA	NA	NA	NA
CO_2e[6]	468.1	lb/MMBtu	3,872	16,961	NA	NA	NA	NA
CO_2[7]	468.0	grams/bhp-hr	3,869	16,946	NA	NA	NA	NA
CH_4[8]	0.002	lb/MMBtu	0.06	0.27	NA	NA	NA	NA
N_2O[8]	0.0002	lb/MMBtu	0.01	0.03	NA	NA	NA	NA
Ammonia[9]	18	lb/MMscf	0.42	1.85	NA	NA	NA	NA
Total HAPs	7.54E-02	lb/MMBtu	2.12	9.26	NA	NA	0.94	4.10
1,1,2,2-Tetrachloroethane	4.00E-05	lb/MMBtu	1.12E-03	4.91E-03	NA	NA	NA	NA
1,1,2-Trichloroethane	3.18E-05	lb/MMBtu	8.92E-04	3.91E-03	NA	NA	NA	NA
1,1-Dichloroethane	2.36E-05	lb/MMBtu	6.62E-04	2.90E-03	NA	NA	NA	NA
1,2-Dichloropropane	*2.69E-05*	*lb/MMBtu*	*7.55E-04*	*3.30E-03*	NA	NA	NA	NA
1,3,5-Trimethylbenzene	*3.38E-05*	*lb/MMBtu*	*9.48E-04*	*4.15E-03*	NA	NA	NA	NA
1,3-Butadiene	2.67E-04	lb/MMBtu	7.49E-03	3.28E-02	NA	NA	NA	NA
1,3-Dichloropropene	2.64E-05	lb/MMBtu	7.41E-04	3.24E-03	NA	NA	NA	NA
2-Methylnaphthalene	3.32E-05	lb/MMBtu	9.31E-04	4.08E-03	NA	NA	NA	NA
2,2,4-Trimethylpentane	2.50E-04	lb/MMBtu	7.01E-03	3.07E-02	NA	NA	NA	NA
Acenaphthene	1.25E-06	lb/MMBtu	3.51E-05	1.54E-04	NA	NA	NA	NA
Acenaphthylene	5.53E-06	lb/MMBtu	1.55E-04	6.79E-04	NA	NA	NA	NA
Acetaldehyde	8.36E-03	lb/MMBtu	2.34E-01	1.03E+00	NA	NA	NA	NA
Acrolein	5.14E-03	lb/MMBtu	1.44E-01	6.31E-01	NA	NA	NA	NA
Benzene	4.40E-04	lb/MMBtu	1.23E-02	5.41E-02	NA	NA	NA	NA
Benzo(b)fluoranthene	*1.66E-07*	*lb/MMBtu*	*4.66E-06*	*2.04E-05*	NA	NA	NA	NA
Biphenyl	2.12E-04	lb/MMBtu	5.95E-03	2.60E-02	NA	NA	NA	NA
Carbon Tetrachloride	3.67E-05	lb/MMBtu	1.03E-03	4.51E-03	NA	NA	NA	NA
Chlorobenzene	3.04E-05	lb/MMBtu	8.53E-04	3.73E-03	NA	NA	NA	NA
Chloroethane	1.87E-06	lb/MMBtu	5.25E-05	2.30E-04	NA	NA	NA	NA
Chloroform	2.85E-05	lb/MMBtu	7.99E-04	3.50E-03	NA	NA	NA	NA
Chrysene	*6.93E-07*	*lb/MMBtu*	*1.94E-05*	*8.51E-05*	NA	NA	NA	NA
Cyclopentane	*2.27E-04*	*lb/MMBtu*	*6.37E-03*	*2.79E-02*	NA	NA	NA	NA
Ethylbenzene	3.97E-05	lb/MMBtu	1.11E-03	4.88E-03	NA	NA	NA	NA
Ethylene Dibromide	4.43E-05	lb/MMBtu	1.24E-03	5.44E-03	NA	NA	NA	NA

ERM *The business of sustainability*

Facility Name: Elkhorn Creek Compressor Station
Subject: Potential to Emit Calculations
Task: Caterpillar 3612 w/Arial Compressor

Prepared: AMC
Reviewed: CAB
Date: Jan. 2, 2020

Pollutant	Emission Factors[3]		Uncontrolled Hourly Emissions[4] (lb/hr)	Uncontrolled Annual Emissions (TPY)	Catalyst Factors[5]		Post Oxidation Catalyst Hourly Emissions (lb/hr)	Post Oxidation Catalyst Annual Emissions (TPY)
Formaldehyde (CH_2O)	**1.90E-01**	**grams/bhp-hr**	**1.57**	**6.88**	**0.05**	**grams/bhp-hr**	**0.39**	**1.72**
Methanol	2.50E-03	lb/MMBtu	7.01E-02	3.07E-01	NA	NA	NA	NA
Methylcyclohexane	*1.23E-03*	*lb/MMBtu*	*3.45E-02*	*1.51E-01*	NA	NA	NA	NA
Methylene Chloride	2.00E-05	lb/MMBtu	5.61E-04	2.46E-03	NA	NA	NA	NA
Hexane	1.11E-03	lb/MMBtu	3.11E-02	1.36E-01	NA	NA	NA	NA
Nonane	*1.10E-04*	*lb/MMBtu*	*3.09E-03*	*1.35E-02*	NA	NA	NA	NA
Octane	*3.51E-04*	*lb/MMBtu*	*9.85E-03*	*4.31E-02*	NA	NA	NA	NA
Pentane	*2.60E-03*	*lb/MMBtu*	*7.29E-02*	*3.19E-01*	NA	NA	NA	NA
Naphthalene	7.44E-05	lb/MMBtu	2.09E-03	9.14E-03	NA	NA	NA	NA
PAH	2.69E-05	lb/MMBtu	7.55E-04	3.30E-03	NA	NA	NA	NA
Phenanthrene	1.04E-05	lb/MMBtu	2.92E-04	1.28E-03	NA	NA	NA	NA
Phenol	2.40E-05	lb/MMBtu	6.73E-04	2.95E-03	NA	NA	NA	NA
Styrene	2.36E-05	lb/MMBtu	6.62E-04	2.90E-03	NA	NA	NA	NA
Toluene	4.08E-04	lb/MMBtu	1.14E-02	5.01E-02	NA	NA	NA	NA
Vinyl Chloride	1.49E-05	lb/MMBtu	4.18E-04	1.83E-03	NA	NA	NA	NA
Xylene	1.84E-04	lb/MMBtu	5.16E-03	2.26E-02	NA	NA	NA	NA

1 Fuel consumption from Caterpillar G3612 Gas Engine Site Specific Technical Data sheet, maximum rating at 100% load.

2 Heating value of natural gas taken from WBI Energy gas analysis

3 Emission factors for NOx, CO and VOC based on compliance with 40 CFR Part 60 Subpart JJJJ. All other factors based on AP-42 emission factors for an uncontrolled 4-stroke lean burn engines, AP-42 Chapter 3.2 Natural Gas-

4 Hourly emissions are based on the maximum design heat input.

5 Catalyst emission factors taken from Miratech specification sheet for oxidation system specifications to be used with Caterpillar G3612 LE A4 Engine. The catalyst emission rates for CO and VOC include a safety factor.

6 CO_2e emissions are based on global warming potential of CO_2=1, CH_4=25, and N_2O=298.

7 CO_2 emission factor from 40 CFR 98 Subpart C Table C-1 (53.06 kg CO_2/MMBtu), November 29, 2013.

8 CH_4 and N_2O emission factors from 40 CFR 98 Subpart C, Table C-2 (CH_4 = 0.001 kg CH_4/MMBtu and N_2O = 0.0001 kg N_2O/MMBtu), November 29, 2013.

9 Ammonia emission factor is based on FIRE factor for SCC 20200253.

Pollutants listed in *italics* have listed emission factors in AP-42, but are not HAPs as define Section 112(b) of the Clean Air Act and are not included in the Total HAP emission factor.

Largest single facility-wide HAP shown in bold.

ERM *The business of sustainability*

Facility Name: Elkhorn Compressor Station
Subject: Potential to Emit Calculations
Task: Fugitive Emissions Equipment Leaks

Prepared: PCB
Reviewed: CAB
Date: Jan. 2, 2020

Fugitive Emissions Leaks	
Assumptions:	
Hours of Operation	8,760
Gas Analysis:	
VOC Weight Percent[1], %	5.53%
CH_4 Weight Percent[2], %	53.93%
CO_2 Weight Percent[3].%	2.568%
HAP Weight Percent[4], %	0.001%
Specific Gravity from Gas Analysis	0.719
Gas Weight, lb/scf	0.058
Conversion Factors:	
specific gravity of air	1
weight of scf air, lb/scf	0.0807
lb/ton	2,000
lb/kg	2.204
hours per year	8,760
CO_2 to CO_2e	1
CH_4 to CO_2e	25
N_2O to CO_2e	298

Component	Product	Component Count[5]	20% Buffer to Accommodate any Changes	Emission Factor[6] (scf/comp-hr)	Emission Rate (scf/hr)	Emission Rate (lbs/hr)
Connector	Gas	370	444	0.02	7.55	0.438
Flanges	Gas	incl. with connectors	incl. with connectors	--	--	--
Valve	Gas	82	98	0.12	11.91	0.691
Other	Gas	0	0	0.02	0.00	0.000
Open Ended Line	Gas	0	0	0.03	0.00	0.000
Pressure Relief Valve	Gas	8	10	0.19	1.85	0.108
Total		460			21.31	1.24

Pollutant	Hourly Emissions (lb/hr)	Annual Emissions (TPY)
NO_X	---	---
CO	---	---
VOC	0.07	0.30
PM	---	---
PM_{10}	---	---
$PM_{2.5}$	---	---
SO_2	---	---
HAP	0.0000	0.0001
CO_2e	17	73
CO_2	0.03	0.14
CH_4	0.67	2.92
N_2O	---	---

[1] Weight percent of VOC taken from WBI gas analysis and excludes methane and ethane hydrocarbons.
[2] Weight percent of methane taken from WBI gas analysis.
[3] Weight percent of carbon dioxide taken from WBI gas analysis.
[4] Weight percent of total HAPS is the weight percent of C6 from the WBI gas analysis. This is a conservative estimate of HAPs.
[5] Component counts provided by WBI.
[6] Emission factors obtained from 40 CFR 98 Subpart W Table W-aA for Western U.S. Service Components:
https://www.law.cornell.edu/cfr/text/40/appendix-Table_W-1A_to_subpart_W_of_part_98

ERM *The business of sustainability*

Facility Name: Elkhorn Compressor Station
Subject: Potential to Emit Calculations
Task: Emissions from Comfort Heating

Prepared: PCB
Reviewed: CAB
Date: Dec. 20, 2019

Weil-McLain LGB-12 Gas Boiler (1.69 MMBtu/hr) , Water Heater (2.08 MMBtu/hr), and Building Unit Heater (0.25 MMBtu/hr).	
Assumptions:	
Natural Gas Fired	
Limited Hours of Operation[1]	8,760
Total Rated Capacity, MMBtu/hr	4.02
Conversion Factors:	
lb/ton	2,000
lb/kg	2.204
CO_2 to CO_2e	1
CH_4 to CO_2e	25
N_2O to CO_2e	298
hours/yr	8,760
Btu/scf[2]	1,020

Pollutant	**AP-42 Emission Factors[3]**				**Hourly Emissions[4] (lb/hr)**	**Annual Emissions (TPY)**
NO_X	100.00	lb/MMscf	0.10	lb/MMBtu	0.39	1.73
CO	84.00	lb/MMscf	0.08	lb/MMBtu	0.33	1.45
VOC (NMHC)	5.50	lb/MMscf	5.39E-03	lb/MMBtu	0.02	0.09
PM	7.60	lb/MMscf	0.01	lb/MMBtu	0.03	0.13
PM_{10}	7.60	lb/MMscf	0.01	lb/MMBtu	0.03	0.13
$PM_{2.5}$	7.60	lb/MMscf	0.01	lb/MMBtu	0.03	0.13
SO_2	0.60	lb/MMscf	5.88E-04	lb/MMBtu	0.00	0.01
Lead	0.0005	lb/MMscf	4.90E-07	lb/MMBtu	0.00	0.00
CO_2e[5]	117.1	lb/MMBtu	---		471	2,061
CO_2[6]	116.9	lb/MMBtu	---		470	2,059
CH_4[7]	0.002	lb/MMBtu	---		8.86E-03	0.04
N_2O[7]	0.0002	lb/MMBtu	---		8.86E-04	3.88E-03
Ammonia[8]	3.20	lb/MMscf	3.14E-03	lb/MMBtu	1.26E-02	0.06
Total HAPs	3.49	lb/MMscf	3.42E-03	lb/MMBtu	1.37E-02	0.06
2-Methylnaphthalene	2.40E-05	lb/MMscf	2.35E-08	lb/MMBtu	9.46E-08	4.14E-07
3-Methylchloranthrene	1.80E-06	lb/MMscf	1.76E-09	lb/MMBtu	7.09E-09	3.11E-08
7,12-Dimethylbenz(a)anthracene	1.60E-05	lb/MMscf	1.57E-08	lb/MMBtu	6.31E-08	2.76E-07
Acenaphthene	1.80E-06	lb/MMscf	1.76E-09	lb/MMBtu	7.09E-09	3.11E-08
Acenaphthylene	1.80E-06	lb/MMscf	1.76E-09	lb/MMBtu	7.09E-09	3.11E-08
Anthracene	2.40E-06	lb/MMscf	2.35E-09	lb/MMBtu	9.46E-09	4.14E-08
Benz(a)anthracene	1.80E-06	lb/MMscf	1.76E-09	lb/MMBtu	7.09E-09	3.11E-08
Benzene	2.10E-03	lb/MMscf	2.06E-06	lb/MMBtu	8.28E-06	3.63E-05
Benzo(a)pyrene	1.20E-06	lb/MMscf	1.18E-09	lb/MMBtu	4.73E-09	2.07E-08
Benzo(b)fluoranthene	1.80E-06	lb/MMscf	1.76E-09	lb/MMBtu	7.09E-09	3.11E-08
Benzo(g,h,i)perylene	1.20E-06	lb/MMscf	1.18E-09	lb/MMBtu	4.73E-09	2.07E-08
Benzo(k)fluoranthene	1.80E-06	lb/MMscf	1.76E-09	lb/MMBtu	7.09E-09	3.11E-08
Butane	*2.10*	*lb/MMscf*	*2.06E-03*	*lb/MMBtu*	*8.28E-03*	*0.04*
Chrysene	1.80E-06	lb/MMscf	1.76E-09	lb/MMBtu	7.09E-09	3.11E-08

Pollutant	**AP-42 Emission Factors[3]**				**Hourly Emissions[4] (lb/hr)**	**Unlimited Annual Emissions (TPY)**
Dibenzo(a,h)anthracene	1.20E-06	lb/MMscf	1.18E-09	lb/MMBtu	4.73E-09	2.07E-08
Dichlorobenzene	1.20E-03	lb/MMscf	1.18E-06	lb/MMBtu	4.73E-06	2.07E-05
Ethane	*3.10*	*lb/MMscf*	*3.04E-03*	*lb/MMBtu*	*1.22E-02*	*0.05*
Fluoranthene	3.00E-06	lb/MMscf	2.94E-09	lb/MMBtu	1.18E-08	5.18E-08

Fluorene	2.80E-06	lb/MMscf	2.75E-09	lb/MMBtu	1.10E-08	4.83E-08
Formaldehyde	**7.50E-02**	**lb/MMscf**	**7.35E-05**	**lb/MMBtu**	**2.96E-04**	**1.29E-03**
Hexane	1.80	lb/MMscf	1.76E-03	lb/MMBtu	7.09E-03	0.03
Indeno(1,2,3-cd)pyrene	1.80E-06	lb/MMscf	1.76E-09	lb/MMBtu	7.09E-09	3.11E-08
Naphthalene	6.10E-04	lb/MMscf	5.98E-07	lb/MMBtu	2.40E-06	1.05E-05
Pentane	*2.60E+00*	*lb/MMscf*	*2.55E-03*	*lb/MMBtu*	*1.02E-02*	*0.04*
Phenanathrene	1.70E-05	lb/MMscf	1.67E-08	lb/MMBtu	6.70E-08	2.93E-07
Propane	*1.60*	*lb/MMscf*	*1.57E-03*	*lb/MMBtu*	*6.31E-03*	*0.03*
Pyrene	5.00E-06	lb/MMscf	4.90E-09	lb/MMBtu	1.97E-08	8.63E-08
Toluene	3.40E-03	lb/MMscf	3.33E-06	lb/MMBtu	1.34E-05	5.87E-05
Arsenic	2.00E-04	lb/MMscf	1.96E-07	lb/MMBtu	7.88E-07	3.45E-06
Barium	*4.40E-03*	*lb/MMscf*	*4.31E-06*	*lb/MMBtu*	*1.73E-05*	*7.60E-05*
Beryllium	1.20E-05	lb/MMscf	1.18E-08	lb/MMBtu	4.73E-08	2.07E-07
Cadmium	1.10E-03	lb/MMscf	1.08E-06	lb/MMBtu	4.34E-06	1.90E-05
Chromium	1.40E-03	lb/MMscf	1.37E-06	lb/MMBtu	5.52E-06	2.42E-05
Cobalt	8.40E-05	lb/MMscf	8.24E-08	lb/MMBtu	3.31E-07	1.45E-06
Copper	*8.50E-04*	*lb/MMscf*	*8.33E-07*	*lb/MMBtu*	*3.35E-06*	*1.47E-05*
Manganese	3.80E-04	lb/MMscf	3.73E-07	lb/MMBtu	1.50E-06	6.56E-06
Mercury	2.60E-04	lb/MMscf	2.55E-07	lb/MMBtu	1.02E-06	4.49E-06
Molybdenum	*1.10E-03*	*lb/MMscf*	*1.08E-06*	*lb/MMBtu*	*4.34E-06*	*1.90E-05*
Nickel	2.10E-03	lb/MMscf	2.06E-06	lb/MMBtu	8.28E-06	3.63E-05
Selenium	2.40E-05	lb/MMscf	2.35E-08	lb/MMBtu	9.46E-08	4.14E-07
Vanadium	*2.30E-03*	*lb/MMscf*	*2.25E-06*	*lb/MMBtu*	*9.06E-06*	*3.97E-05*
Zinc	*2.90E-02*	*lb/MMscf*	*2.84E-05*	*lb/MMBtu*	*1.14E-04*	*5.01E-04*

[1] Hours of operation based on the heating year round even though the heating season is likely only half the year

[2] Heating value of natural gas taken from basis of AP-42 emission factors which is listed as 1,020 Btu/scf.

3 AP-42 emission factors are based on uncontrolled small boilers, AP-42 Chapter 1.4 Natural Gas Combustion, Tables 1.4-1 though -4, July 1998.

[4] Hourly emissions are based on the maximum design heat input.

[5] CO_2e emissions are based on global warming potential of CO_2=1, CH_4=25, and N_2O=298.

[6] CO_2 emission factor from 40 CFR 98 Subpart C Table C-1 (53.06 kg CO_2/MMBtu), November 29, 2013.

[7] CH_4 and N_2O emission factors from 40 CFR 98 Subpart C, Table C-2 (CH_4 = 0.001 kg CH_4/MMBtu and N_2O = 0.0001 kg N_2O/MMBtu), November 29, 2013.

[8] Ammonia emission factor is based on FIRE factor for natural gas combustion.

Pollutants listed in *italics* have listed emission factors in AP-42, but are not HAPs as define Section 112(b) of the Clean Air Act and are not included in the Total HAP emission factor.

Largest single facility-wide HAP shown in bold.

ERM *The business of sustainability*

Facility Name: Elkhorn Creek Compressor Station
Subject: Potential to Emit Calculations
Task: Tank Emissions

Prepared: KAT
Reviewed: CAB
Date: Dec. 20, 2019

Pollutant	Tank	Volume (gal)	Turnovers	Net Throughput[4] (gal/yr)	Operating Hours	Losses (lb)		Emission Rate[6]	
						Working	Standing[5]	lb/yr	TPY
VOC	Tank 1[1]	2,000	2.13	4,263	8760	4.64	0.00	4.64	0.0023
	Tank 2[2]	2,000	2.13	4,263	8760	4.64	0.00	4.64	0.0023
	Tank 3[3]	2,000	0.65	1,306	8760	0.00	0.00	0.00	0.0000
	Total	**6,000**	**1.64**	**9,833**	**26,280**	**9.29**	**0.00**	**9.29**	**0.0046**
HAP	Tank 1	2,000	2.13	4,263	8760	4.53	0.00	4.53	0.0023
	Tank 2	2,000	2.13	4,263	8760	4.53	0.00	4.53	0.0023
	Tank 3	2,000	0.65	1,306	8760	0.00	0.00	0.00	0.0000
	Total	**6,000**	**1.64**	**9,833**	**26,280**	**9.06**	**0.00**	**9.06**	**0.0045**

[1] Tank 1 is a 2,000 gallon underground slop oil fixed roof storage tank that contains pipeline fluids, which consists of any

[2] Tank 2 is a 2,000 gallon underground waste oil fixed roof storage tank, which contains waste oil from the engine oil used by

[3] Tank 3 is a 2,000 gallon underground floor drain fixed roof tank that collects water and oil drippings from the engines when

[4] Tank throughput is calculated by using a ratio of the net throughput of a pipeline fluids storage tank located at a similar site

[5] Standing losses for underground tanks are assumed to be zero.

[6] Tank emission calculations were completed using the calculations for a fixed roof tank in AP-42 Chapter 7.1 Organic Liquid

ERM *The business of sustainability*

Facility Name: Elkhorn Compressor Station
Subject: Potential to Emit Calculations
Task: Station Blowdowns

Prepared: PCB
Reviewed: CAB
Date: Jan. 2, 2020

Blowdown	
Assumptions:	
Hours of Operation	8,760
Gas Analysis:	
VOC Weight Percent[1], %	5.53%
CH_4 Weight Percent[2], %	53.93%
CO_2 Weight Percent[3].%	2.568%
HAP Weight Percent[4], %	0.001%
Specific Gravity from Gas Analysis	0.719
Gas Weight, lb/scf	0.058
Conversion Factors:	
specific gravity of air	1
weight of scf air, lb/scf	0.0807
lb/ton	2,000
lb/kg	2.204
hours per year	8,760
CO_2 to CO_2e	1
CH_4 to CO_2e	25
N_2O to CO_2e	298

				Pollutant (TPY)					
Blowdown Event	**Number of Events**	**SCF/Event**	**Total SCF**	**VOC**	**HAP**	**CO_2e**	**CO_2**	**CH_4**	**N_2O**
Startup and Commissioning									
Full Station	2	84,000	168,000	0.27	0.0001	65.86	0.1252	2.6293	0
Compressor Unit	10	28,000	280,000	0.45	0.0001	109.76	0.2086	4.3821	0
Sub-Total	-	-	448,000	0.72	0.00	175.62	0.33	7.01	0
Annual Operation									
ESD Test Station	1	84,000	84,000	0.13	0.0000	32.93	0.0626	1.3146	0
Compressor Unit	48	28,000	1,344,000	2.16	0.0005	526.85	1.0014	21.0341	0
Sub-Total	-	-	1,428,000	2.29	0.00	559.78	1.06	22.35	0
Total			**1,876,000**	**3.01**	**0.001**	**735.40**	**1.40**	**29.36**	**0.00**

[1]Weight percent of VOC taken from WBI Energy gas analysis and excludes methane and ethane hydrocarbons.
[2]Weight percent of methane taken from WBI Energy gas analysis.
[3]Weight percent of carbon dioxide taken from WBI Energy gas analysis.
[4]Weight percent of total HAPS is the weight percent of C6 from the WBI Energy gas analysis. This is a conservative estimate of HAPs.
[5]Blowdown quantities provided by WBI Energy.

ERM The business of sustainability

Facility Name: Tioga Compressor Station
Subject: Potential to Emit Calculations
Task: Fugitive Emissions from Pigging

Prepared: AMC
Date: Jan. 2, 2020

Pigging	
Gas Analysis:	
VOC Weight Percent[1], %	5.53%
CH_4 Weight Percent[2], %	53.93%
CO_2 Weight Percent[3].%	2.568%
HAP Weight Percent[4], %	0.001%
Specific Gravity from Gas Analysis	0.719
Gas Weight, lb/scf	0.058
Conversion Factors:	
specific gravity of air	1
weight of scf air, lb/scf	0.0807
lb/ton	2,000
lb/kg	2.204
hours per year	8,760
CO_2 to CO_2e	1
CH_4 to CO_2e	25
N_2O to CO_2e	298

			Pollutant (Tons per Event)					
Pigging Identification	**Frequency (years)**	**MMSCF/ Event**	**VOC**	**HAP**	**CO_2e**	**CO_2**	**CH_4**	**N_2O**
Tioga-Elkhorn Creek 24"	10	38.0	60.96	0.01	14,896	28.31	595	0.00
Total			**60.96**	**0.01**	**14,896**	**28.31**	**595**	**0.00**

Worst-case emissions occur when pigging happens in a particular year.

[1]Weight percent of VOC taken from WBI Energy gas analysis and excludes methane and ethane hydrocarbons.
[2]Weight percent of methane taken from WBI Energy gas analysis.
[3]Weight percent of carbon dioxide taken from WBI Energy gas analysis.
[4]Weight percent of total HAPS is the weight percent of C6 from the WBI Energy gas analysis. This is a conservative estimate of HAPs.
[5]Blowdown quantities provided by WBI Energy.

Appendix C

Permit Application Forms

PERMIT APPLICATION FOR AIR CONTAMINANT SOURCES

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8516 (3-2019)

SECTION A - FACILITY INFORMATION

Name of Firm or Organization WBI Energy Transmission, Inc.				
Applicant's Name Marc Dempewolf				
Title Director of Pipeline Operations		Telephone Number (406) 359-7309	E-mail Address Marc.Dempewolf@wbienergy.com	
Contact Person for Air Pollution Matters Jill Linn				
Title Environmental Manager		Telephone Number (406) 359-7332	E-mail Address Jill.Linn@wbienergy.com	
Mailing Address (Street & No.) 2010 Montana Avenue				
City Glendive		State MT	ZIP Code 59330	
Facility Name Elkhorn Creek Compressor Station				
Facility Address (Street & No.) [no street address available at this time]				
City Watford City		State ND	ZIP Code 58854	
County McKenzie	Latitude (Nearest Second) 47 40' 56"		Longitude (Nearest Second) -103 13' 20"	
Legal Description of Facility Site Gas Compression Station				
Quarter SE1/4	Quarter SE1/4	Section Sec. 33	Township T149N	Range R98W
Land Area at Facility Site 20.0 Acres (or) Sq. Ft.		MSL Elevation at Facility 723 m		

SECTION B – GENERAL NATURE OF BUSINESS

Describe Nature of Business	North American Industry Classification System Number	Standard Industrial Classification Number (SIC)
Natural Gas Transmission - Gas Compression Station	486210	4922

SECTION C – GENERAL PERMIT INFORMATION

Type of Permit? ☒ Permit to Construct (PTC) ☐ Permit to Operate (PTO)

If application is for a Permit to Construct, please provide the following data:

Planned Start Construction Date	Planned End Construction Date
April 2021	October 2021

SECTION D – SOURCE IDENTIFICATION AND CATEGORY OF EACH SOURCE INCLUDED ON THIS PERMIT APPLICATION

		Permit to Construct				Minor Source Permit to Operate						
Your Source ID Number	Source or Unit (Equipment, Machines, Devices, Boilers, Processes, Incinerators, Etc.)	New Source	Existing Source Modification	Existing Source Expansion	Existing Source Change of Location	New Source	Existing Source Initial Application	Existing Source After Modification	Existing Source After Expansion	Existing Source After Change of Location	Existing Source After Change of Ownership	Other
EU01	Internal Combustion Engine	✓										

Add additional pages if necessary

SECTION D2 – APPLICABLE REGULATIONS

Source ID No.	Applicable Regulations (NSPS/MACT/NESHAP/etc.)
Facility-wide	40 CFR 60 Subpart OOOOa
EU01	40 CFR 60 Subpart JJJJ, 40 CFR 63 Subpart ZZZZ

SECTION E – TOTAL POTENTIAL EMISSIONS

Pollutant	Amount (Tons Per Year)
NO_x	37.94
CO	19.56
PM	1.36

Pollutant	Amount (Tons Per Year)
PM_{10} (filterable and condensable)	1.36
$PM_{2.5}$ (filterable and condensable)	1.36
SO_2	0.08
VOC	82.17 (without fugitives)
GHG (as CO_2e)	34,654
Largest Single HAP	1.72
Total HAPS	4.18

*If performance test results are available for the unit, submit a copy of test with this application. If manufacturer guarantee is used provide spec sheet.

SECTION F1 – ADDITIONAL FORMS

Indicate which of the following forms are attached and made part of the application	
☒ Air Pollution Control Equipment (SFN 8532)	☐ Fuel Burning Equipment Used for Indirect Heating (SFN 8518)
☐ Construct/Operate Incinerators (SFN 8522)	☒ Hazardous Air Pollutant (HAP) Sources (SFN 8329)
☐ Natural Gas Processing Plants (SFN 11408)	☐ Manufacturing or Processing Equipment (SFN 8520)
☐ Glycol Dehydration Units (SFN 58923)	☐ Volatile Organic Compounds Storage Tank (SFN 8535)
☐ Flares (SFN 59652)	☒ Internal Combustion Engines and Turbines (SFN 8891)
☐ Grain, Feed, and Fertilizer Operations (SFN 8524)	☐ Oil/Gas Production Facility Registration (SFN 14334)

SECTION F2 – OTHER ATTACHMENTS INCLUDED AS PART OF THIS APPLICATION

1.	Site Location Map & Site Plot Plan	4.	Summary of Air Dispersion Modeling Applicability
2.	Project and Process Description	5.	Summary of Applicable Federal Regulations
3.	Estimated Emissions Calculations	6.	Analysis of Air Toxics

I, the undersigned applicant, am fully aware that statements made in this application and the attached exhibits and statements constitute the application for Permit(s) to Construct and/or Operate Air Contaminant sources from the North Dakota Department of Environmental Quality and certify that the information in this application is true, correct and complete to the best of my knowledge and belief. Further, I agree to comply with the provisions of Chapter 23.1-06 of the North Dakota Century Code and all rules and regulations of the Department, or revisions thereof. I also understand the permit is nontransferable and, if granted a permit, I will promptly notify the Department upon sale or legal transfer of this permitted establishment.

Signature	Date
[signature]	2-10-20

INSTRUCTIONS

SITE PLANS TO BE ATTACHED TO APPLICATION:

Prepare and attach a plot plan drawn to scale or properly dimensioned, showing at least the following:

a. The property involved and the outlines and heights of all buildings on the property. Identify property lines plainly. Also, indicate if there is a fence around the property that prevents public access.

b. Location and identification of all existing or proposed equipment, manufacturing processes, etc., and points of emission or discharge of air contaminants to the atmosphere.

c. Location of the facility or property with respect to the surrounding area, including residences, businesses and other permanent structures, streets and roadways. Identify all such structures and roadways. Indicate direction (**NORTH**) on the drawing and the prevailing wind direction.

EQUIPMENT PLANS AND SPECIFICATIONS FOR PERMIT TO CONSTRUCT:

Supply plans and specifications, including as a minimum an assembly drawing, dimensioned and to scale, in plan, elevation and as many sections as are needed to show clearly the design and operation of the equipment and the means by which air contaminants are controlled.

The following must be shown:

a. Size and shape of the equipment. Show exterior and interior dimensions and features.

b. Locations, sizes, and shape details of all features which may affect the production, collection, conveying, or control of air contaminants of any kind, location, size, and shape details concerning all material handling equipment.

c. All data and calculations used in selecting or designing the equipment.

d. Horsepower rating of all internal combustion engines driving the equipment.

NOTE: **STRUCTURAL DESIGN CALCULATIONS AND DETAILS ARE NOT REQUIRED.** WHEN STANDARD COMMERCIAL EQUIPMENT IS TO BE INSTALLED, THE MANUFACTURER'S CATALOG DESCRIBING THE EQUIPMENT MAY BE SUBMITTED IN LIEU OF ITEMS a, b, c, and d OF ABOVE, WHICH THE CATALOG COVERS. ALL INFORMATION REQUIRED ABOVE THAT THE CATALOG DOES NOT CONTAIN MUST BE SUBMITTED BY THE APPLICANT.

ADDITIONAL INFORMATION MAY BE REQUIRED:

If the application is signed by an authorized representative of the owner, a LETTER OF AUTHORIZATION must be attached to the application.

SEND COMPLETED APPLICATION AND ALL ATTACHMENTS TO:

North Dakota Department of Environmental Quality
Division of Air Quality
918 E Divide Avenue, 2nd Floor
Bismarck, ND 58501-1947
(701) 328-5188

PERMIT APPLICATION FOR INTERNAL COMBUSTION ENGINES AND TURBINES

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8891 (3-2019)

NOTE: READ INSTRUCTIONS BEFORE COMPLETING THIS FORM.
- Must include SFN 8516 or SFN 52858

SECTION A – GENERAL INFORMATION

Name of Firm or Organization	Facility Name
WBI Energy Transmission, Inc.	Elkhorn Creek Compressor Station

SECTION B – FACILITY AND UNIT INFORMATION

Source ID Number (From form SFN 8516)		
EU01 - Caterpillar 3612 natural gas-fired SI RICE (3,750 HP)		
Type of Unit (check all that apply)	☒ Stationary Natural Gas-Fired Engine ☐ Stationary Diesel and Dual Fuel Engine ☐ Stationary Gasoline Engine ☐ Stationary Natural Gas-Fired Turbine	☐ Emergency Use Only ☒ Non-Emergency Use ☐ Peaking ☐ Demand Response
	☐ Other – Specify:	

SECTION C – MANUFACTURER DATA

Make	Model	Date of Manufacture
Caterpillar	G 3612 LE A4	to be determined

Reciprocating Internal Combustion Engine

☒ Spark Ignition ☐ Compression Ignition

☒ 4 Stroke ☐ 2 Stroke | ☐ Rich Burn ☒ Lean Burn

Maximum Rating (BHP @ rpm)	Operating Capacity (BHP @ rpm)
3,750	3,750

Engine Subject to:
☐ 40 CFR 60, Subpart IIII ☒ 40 CFR 60, Subpart JJJJ ☒ 40 CFR 63, Subpart ZZZZ
☐ 40 CFR 60, Subpart OOOO ☒ 40 CFR 60, Subpart OOOOa

Turbine Dry Low Emissions? ☐ Yes ☐ No

Heat Input (MMBtu/hr)	Maximum Rating (HP)	75% Rating (HP)	Efficiency

Turbine Subject to: ☐ 40 CFR 60, Subpart GG ☐ 40 CFR 60, Subpart KKKK

SECTION D – FUELS USED

Natural Gas (10^6 cu ft/year)	Percent Sulfur	Percent H_2S
206.04 million cubic feet / year	0.6 % sulfur	negl.
Oil (gal/year)	**Percent Sulfur**	**Grade No.**
ZERO gallons/year	N/A	N/A
LP Gas (gal/year)	**Other – Specify:**	
ZERO gallons/year	N/A	

SECTION E – NORMAL OPERATING SCHEDULE

Hours Per Day	Days Per Week	Weeks Per Year	Hours Per Year	Peak Production Season (if any)
24	7	52	8760	

SECTION F – STACK PARAMETERS

Emission Point ID Number		Stack Height Above Ground Level (feet)	
EP01		43 feet	
Stack Diameter (feet at top)	**Gas Discharged (SCFM)**	**Exit Temp (°F)**	**Gas Velocity (FPS)**
2 feet	9,062 scfm	823 F	126.8 feet/second

SECTION G – EMISSION CONTROL EQUIPMENT

Is any emission control equipment installed on this unit?

☐ No ☒ Yes – Complete and attach form SFN 8532

SECTION H – MAXIMUM AIR CONTAMINANTS EMITTED

Pollutant	Maximum Pounds Per Hour	Amount (Tons Per Year)	Basis of Estimate*
NO_x	8.27	36.21	Emission factor based on compliance with 40 CFR 60 Subpart JJJJ
CO	4.13	18.11	Emission factor based on compliance with 40 CFR 60 Subpart JJJJ
PM	0.28	1.23	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
PM_{10} (filterable and condensable)	0.28	1.23	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
$PM_{2.5}$ (filterable and condensable)	0.28	1.23	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
SO_2	0.02	0.07	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
VOC	4.13	18.11	Emission factor based on compliance with 40 CFR 60 Subpart JJJJ
GHG (as CO_2e)	3,872	16,961	CO2 emission factor from 40 CFR 98 Subpart C Table C-1 (53.06 kg CO2/MMBtu), November 29, 2013. CH4 and N2O e
Largest Single HAP	0.39	1.72	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
Total HAPS	0.94	4.10	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000

* If performance test results are available for the unit, submit a copy of test with this application, if manufacture data used, submit manufacturers specification sheets.

IS THIS UNIT IN COMPLIANCE WITH ALL APPLICABLE AIR POLLUTION RULES AND REGULATIONS?

☒ YES ☐ NO

If "NO" a Compliance Schedule (SFN 61008) must be completed and attached.

Attach and label separate sheet(s) if you need more space to explain any system or answers or to provide complete listings of Emissions, Contaminants, or other items.

SEND COMPLETED APPLICATION AND ALL ATTACHMENTS TO:

North Dakota Department of Environmental Quality
Division of Air Quality
918 E Divide Avenue, 2nd Floor
Bismarck, ND 58501-1947
(701) 328-5188

PERMIT APPLICATION FOR AIR POLLUTION CONTROL EQUIPMENT
NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8532 (3-2019)

NOTE: READ INSTRUCTIONS BEFORE COMPLETING THIS FORM.
- Must also include forms SFN 8516 or SFN 52858

SECTION A – GENERAL INFORMATION

Name of Firm or Organization	Facility Name
WBI Energy Transmission, Inc.	Elkhorn Creek Compressor Station
Source ID No. of Equipment being Controlled EU01 - Caterpillar 3612 natural gas-fired SI RICE (3,750 HP)	

SECTION B – EQUIPMENT

Type: ☐ Cyclone ☐ Multiclone ☐ Baghouse ☐ Electrostatic Precipitator
☐ Wet Scrubber ☐ Spray Dryer ☐ Flare/Combustor
☒ Other – Specify: Catalytic Oxidizer

Name of Manufacturer	Model Number	Date to Be Installed
MIRATECH	SP-PT-72-16080005-XH4B0	April 2021

Application: ☐ Boiler ☐ Kiln ☒ Engine ☐ Other – Specify:

Pollutants Removed	CO	NMNEHC	CH2O	
Design Efficiency (%)				
Operating Efficiency (%)	83	19	74	

Describe method used to determine operating efficiency:
Operating Efficiency determined based on difference between inlet emissions and outlet emissions; outlet emissions are based on requested permit limits for mass emissions.

SECTION CD – GAS CONDITIONS

Gas Conditions			Inlet	Outlet
Gas Volume (SCFM; 68°F; 14.7 psia)				9,175 scfm
Gas Temperature (°F)			550-1250	1350
Gas Pressure (in. H_2O)			not available	not available
Gas Velocity (ft/sec)			not available	not available
Pollutant Concentration (Specify Pollutant and Unit of Concentration)	Pollutant	Unit of Concentration		
	CO	g/bhp-hr	2.98	0.5
	NMNEHC	g/bhp-hr	0.62	0.5
	CH2O	g/bhp-hr	0.19	0.05

Pressure Drop Through Gas Cleaning Device (in. H_2O)
7.5 inches of water

INSTRUCTIONS FOR PERMIT APPLICATION FOR AIR POLLUTION CONTROL EQUIPMENT

1. Complete this form for each piece of equipment or process, which has air pollution control equipment installed, described in the following Permit Applications: Hazardous Air Pollutant (HAP) Sources (SFN 8329), Fuel Burning Equipment for Indirect Heating (SFN 8518); Manufacturing or Processing Equipment (SFN 8520); Incinerators/Crematories (SFN 8522); Internal Combustion Engines and Turbines (SFN 8891); and Glycol Dehydration Units (SFN 58923). Print or type all information. If an item does not apply, place NA in the appropriate space.

2. Type of Equipment - If the type is not one of those listed; provide enough information so the operating principal of the equipment can be determined.

3. List each pollutant which the device is intended to control, the efficiency of removal intended by the designer, and the actual efficiency under operating conditions.

4. Please attach the following:

   - A brief description and sketch of the air pollution control device if it is of unusual design or used in conjunction with other control devices. Show any bypass of the device and specify the conditions under which the bypass is used.

   - A description of what is done with collected air contaminants from the time they are collected until they reach the final disposal point. Include a description of the transportation methods used.

   - If a stack test has been conducted, attach a copy of the results, date of the test, a description of the techniques used, and the name and address of the organization which performed the test.

5. If the control device is a combustor (e.g.: thermal oxidizer, vapor combustion unit, etc.), include an estimate of potential greenhouse gas emissions (CO_2e).

<u>SUBMIT YOUR APPLICATION WITH ALL SUPPORTING DOCUMENTS, ALONG WITH THE FORMS SPECIFIED IN THE FIRST PARAGRAPH ABOVE, TO:</u>

North Dakota Department of Environmental Quality
Division of Air Quality
918 E Divide Avenue, 2nd Floor
Bismarck, ND 58501-1947
(701) 328-5188

PERMIT APPLICATION FOR HAZARDOUS AIR POLLUTANT (HAP) SOURCES

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8329 (3-2019)

SECTION A1 - APPLICANT INFORMATION

Name of Firm or Organization WBI Energy Transmission, Inc.		
Applicant's Name Marc Dempewolf		
Title Director of Pipeline Operations	Telephone Number (406) 359-7309	E-mail Address Marc.Dempewolf@wbienergy.com
Mailing Address (Street & No.) 2010 Montana Avenue		
City Glendive	State MT	ZIP Code 59330

SECTION A2 - FACILITY INFORMATION

Contact Person for Air Pollution Matters Jill Linn		
Title Environmental Manager	Telephone Number (406) 359-7332	E-mail Address Jill.Linn@wbienergy.com
Facility Address (Street & No. or Lat/Long to Nearest Second) 47 40' 56" N -103 13' 20" W		
City Watford City	State ND	ZIP Code 58854
County McKenzie	Number of Employees at Location 2	
Land Area at Plant Site 20.0 Acres (or) ____ Sq. Ft.	MSL Elevation at Plant 692 m	

Describe Nature of Business/Process

Natural Gas Transmission - Gas Compressor Station

SECTION B – STACK DATA

Inside Diameter (ft) 2 feet	Height Above Grade (ft) 43 feet	
Gas Temperature at Exit (°F) 823 F	Gas Velocity at Exit (ft/sec) 126.86 feet/second	Gas Volume (scfm) 9,062 scfm
Basis of any Estimates (attach separate sheet if necessary) Information either supplied by vendor or determined by engineering estimate.		
Are Emission Control Devices in Place? If YES – Complete SFN 8532	◉ Yes	○ No
Nearest Residences or Building	Distance (ft) 14	Direction S
Nearest Property Line	Distance (ft) 259	Direction SW

SECTION C – EMISSION STREAM DATA

Source ID No. From SFN 8516 EU01	Mean Particle Diameter (um) not applicable
Flow Rate (scfm) 9,602 acfm [exit from stack]	Drift Velocity (ft/sec) not applicable
Stream Temperature (°F) 823 F	Particulate Concentration (gr/dscf) not applicable
Moisture Content (%) 17 %	Halogens or Metals Present? No
Pressure (in. Hg) not available	Organic Content (ppmv) NMNEHC 126 ppm @ 15% O2
Heat Content (Btu/scfm) 1,193 Btu/scf	O_2 Content (%) 11.6 %

SECTION D – POLLUTANT SPECIFIC DATA
(Complete One Box for Each Pollutant in Emission Stream)

Pollutant Emitted See calculations in Appendix B	Chemical Abstract Services (CAS) Number
Proposed Emission Rate (lb/hr)	Emission Source (describe)
Source Classification (process point, process fugitive, area fugitive)	Pollutant Class and Form (organic/inorganic - particulate/vapor)
Concentration in Emission Stream (ppmv)	Vapor Pressure (in. Hg @ °F)
Solubility	Molecular Weight (lb/lb-mole)
Absorptive Properties	

Pollutant Emitted	Chemical Abstract Services (CAS) Number
Proposed Emission Rate (lb/hr)	Emission Source (describe)
Source Classification (process point, process fugitive, area fugitive)	Pollutant Class and Form (organic/inorganic - particulate/vapor)
Concentration in Emission Stream (ppmv)	Vapor Pressure (in. Hg @ °F)
Solubility	Molecular Weight (lb/lb-mole)
Absorptive Properties	

(Add additional pages if necessary)

Signature of Applicant [signature]	Date 2-10-20

SEND COMPLETED APPLICATION AND ALL ATTACHMENTS TO:

North Dakota Department of Environmental Quality
Division of Air Quality
918 E Divide Avenue, 2nd Floor
Bismarck, ND 58501-1947
(701) 328-5188

Appendix D

Manufacturer Specifications

G3612

GAS COMPRESSION APPLICATION

GAS ENGINE SITE SPECIFIC TECHNICAL DATA

CATERPILLAR®

ENGINE SPEED (rpm):	1000	RATING STRATEGY:	STANDARD
COMPRESSION RATIO:	7.6	RATING LEVEL:	CONTINUOUS
AFTERCOOLER TYPE:	SCAC	FUEL SYSTEM:	GAV
AFTERCOOLER - STAGE 2 INLET (°F):	130		WITH AIR FUEL RATIO CONTROL
AFTERCOOLER - STAGE 1 INLET (°F):	174	**SITE CONDITIONS:**	
JACKET WATER OUTLET (°F):	190	FUEL:	Gas Analysis
ASPIRATION:	TA	FUEL PRESSURE RANGE(psig): (See note 1)	58.0-70.3
COOLING SYSTEM:	JW+1AC, OC+2AC	FUEL METHANE NUMBER:	61.4
CONTROL SYSTEM:	ADEM4	FUEL LHV (Btu/scf):	1076
EXHAUST MANIFOLD:	DRY	ALTITUDE(ft):	2150
COMBUSTION:	LOW EMISSION	INLET AIR TEMPERATURE(°F):	100
NOx EMISSION LEVEL (g/bhp-hr NOx):	0.3	STANDARD RATED POWER:	3750 bhp@1000rpm
SET POINT TIMING:	17		

			MAXIMUM RATING	SITE RATING AT MAXIMUM INLET AIR TEMPERATURE		
RATING	**NOTES**	**LOAD**	**100%**	**100%**	**75%**	**50%**
ENGINE POWER (WITHOUT FAN)	(2)	bhp	3750	3750	2813	1875
INLET AIR TEMPERATURE		°F	100	100	100	100
ENGINE DATA						
FUEL CONSUMPTION (LHV)	(3)	Btu/bhp-hr	6787	6787	6990	7451
FUEL CONSUMPTION (HHV)	(3)	Btu/bhp-hr	7480	7480	7703	8211
AIR FLOW (@inlet air temp, 14.7 psia) (WET)	(4)(5)	ft3/min	9797	9797	7427	5086
AIR FLOW (WET)	(4)(5)	lb/hr	41655	41655	31578	21623
FUEL FLOW (60ºF, 14.7 psia)		scfm	394	394	305	216
INLET MANIFOLD PRESSURE	(6)	in Hg(abs)	99.2	99.2	75.8	53.1
EXHAUST TEMPERATURE - ENGINE OUTLET	(7)	°F	823	823	875	938
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia) (WET)	(8)(5)	ft3/min	23913	23913	18885	13564
EXHAUST GAS MASS FLOW (WET)	(8)(5)	lb/hr	42989	42989	32608	22355
EMISSIONS DATA - ENGINE OUT						
NOx (as NO2)	(9)(10)	g/bhp-hr	0.30	0.30	0.30	0.30
CO	(9)(10)	g/bhp-hr	2.98	2.98	2.98	2.98
THC (mol. wt. of 15.84)	(9)(10)	g/bhp-hr	4.36	4.36	4.51	4.52
NMHC (mol. wt. of 15.84)	(9)(10)	g/bhp-hr	2.00	2.00	2.07	2.08
NMNEHC (VOCs) (mol. wt. of 15.84)	(9)(10)(11)	g/bhp-hr	0.62	0.62	0.64	0.64
HCHO (Formaldehyde)	(9)(10)	g/bhp-hr	0.19	0.19	0.20	0.22
CO2	(9)(10)	g/bhp-hr	463	463	477	508
EXHAUST OXYGEN	(9)(12)	% DRY	11.6	11.6	11.3	10.9
HEAT REJECTION						
HEAT REJ. TO JACKET WATER (JW)	(13)	Btu/min	41707	41707	33251	28406
HEAT REJ. TO ATMOSPHERE	(13)	Btu/min	16733	16733	16350	13618
HEAT REJ. TO LUBE OIL (OC)	(13)	Btu/min	18740	18740	17106	15196
HEAT REJ. TO A/C - STAGE 1 (1AC)	(13)(14)	Btu/min	40310	40310	19702	4454
HEAT REJ. TO A/C - STAGE 2 (2AC)	(13)(14)	Btu/min	7319	7319	5322	3473

COOLING SYSTEM SIZING CRITERIA			
TOTAL JACKET WATER CIRCUIT (JW+1AC)	(14)(15)	Btu/min	88202
TOTAL STAGE 2 AFTERCOOLER CIRCUIT (OC+2AC)	(14)(15)	Btu/min	30174
A cooling system safety factor of 0% has been added to the cooling system sizing criteria.			

CONDITIONS AND DEFINITIONS

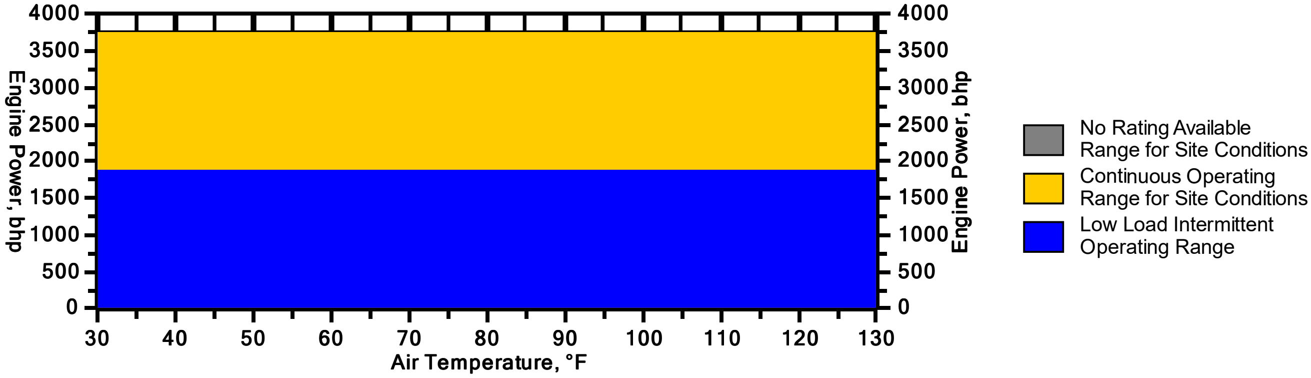
Engine rating obtained and presented in accordance with ISO 3046/1, adjusted for fuel, site altitude and site inlet air temperature. 100% rating at maximum inlet air temperature is the maximum engine capability for the specified fuel at site altitude and maximum site inlet air temperature. Maximum rating is the maximum capability at the specified aftercooler inlet temperature for the specified fuel at site altitude and reduced inlet air temperature. Lowest load point is the lowest continuous duty operating load allowed. No overload permitted at rating shown.

For notes information consult page three.

PREPARED BY:
Data generated by Gas Engine Rating Pro Version 6.09.04
Ref. Data Set EM1418-05-001, Printed 28Aug2019

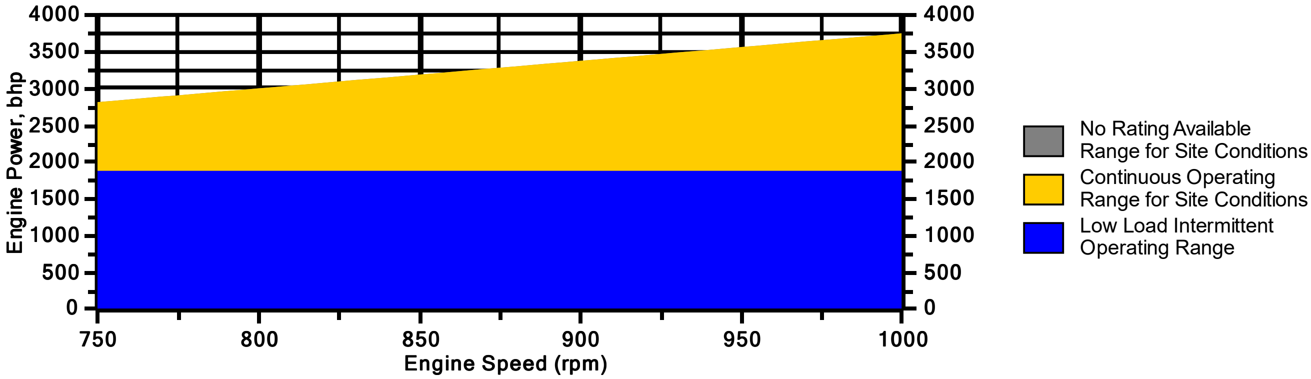
Engine Power vs. Inlet Air Temperature

Data represents temperature sweep at 2150 ft and 1000 rpm



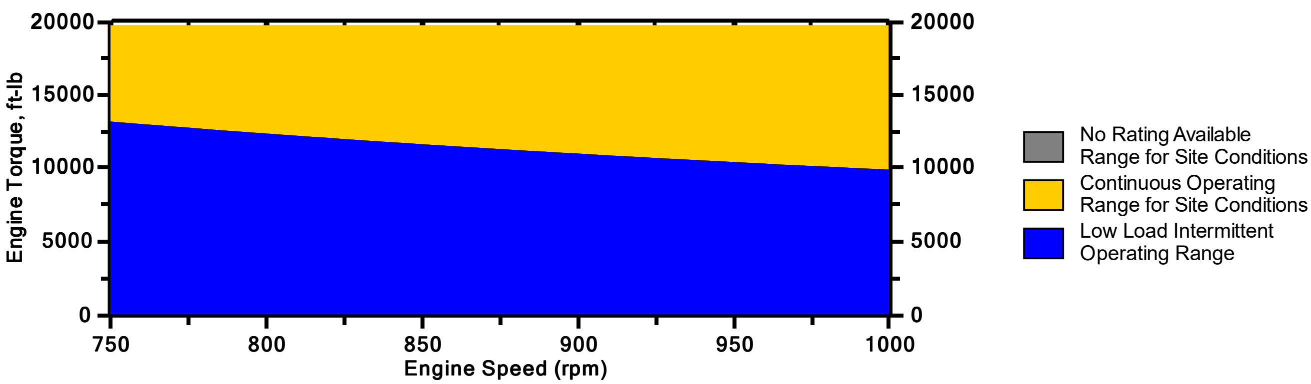
Engine Power vs. Engine Speed

Data represents speed sweep at 2150 ft and 100 ºF



Engine Torque vs. Engine Speed

Data represents speed sweep at 2150 ft and 100 ºF



Note: At site conditions of 2150 ft and 100°F inlet air temp., constant torque can be maintained down to 750 rpm. The minimum speed for loading at these conditions is 750 rpm.

NOTES

1. Fuel pressure range specified is to the engine gas shutoff valve (GSOV). Additional fuel train components should be considered in pressure and flow calculations.

2. Engine rating is with two engine driven water pumps. Tolerance is ± 3% of full load.

3. Fuel consumption tolerance is ± 2.5% of full load data.

4. Air flow value is on a 'wet' basis. Flow is a nominal value with a tolerance of ± 5 %.

5. Inlet and Exhaust Restrictions must not exceed A&I limits based on full load flow rates from the standard technical data sheet.

6. Inlet manifold pressure is a nominal value with a tolerance of ± 5 %.

7. Exhaust temperature is a nominal value with a tolerance of (+)63°F, (-)54°F.

8. Exhaust flow value is on a "wet" basis. Flow is a nominal value with a tolerance of ± 6 %.

9. Emissions data is at engine exhaust flange prior to any after treatment.

10. Values listed are higher than nominal levels to allow for instrumentation, measurement, and engine-to-engine variations. They indicate the maximum values expected under steady state conditions. Fuel methane number cannot vary more than ± 3. THC, NMHC, and NMNEHC do not include aldehydes. An oxidation catalyst may be required to meet Federal, State or local CO or HC requirements.

11. VOCs - Volatile organic compounds as defined in US EPA 40 CFR 60, subpart JJJJ

12. Exhaust Oxygen level is the result of adjusting the engine to operate at the specified NOx level. Tolerance is ± 0.5.

13. Heat rejection values are nominal. Tolerances, based on treated water, are ± 10% for jacket water circuit, ± 50% for radiation, ± 20% for lube oil circuit, and ± 5% for aftercooler circuit.

14. Aftercooler heat rejection includes an aftercooler heat rejection factor for the site elevation and inlet air temperature specified. Aftercooler heat rejection values at part load are for reference only. Do not use part load data for heat exchanger sizing.

15. Cooling system sizing criteria are maximum circuit heat rejection for the site, with applied tolerances.

Constituent	Abbrev	Mole %	Norm
Water Vapor	H2O	0.0000	0.0000
Methane	CH4	67.4816	67.4667
Ethane	C2H6	19.8992	19.8948
Propane	C3H8	5.1633	5.1622
Isobutane	iso-C4H1O	0.1572	0.1572
Norbutane	nor-C4H1O	0.3192	0.3191
Isopentane	iso-C5H12	0.0175	0.0175
Norpentane	nor-C5H12	0.0174	0.0174
Hexane	C6H14	0.0220	0.0220
Heptane	C7H16	0.0000	0.0000
Nitrogen	N2	6.0208	6.0195
Carbon Dioxide	CO2	0.9239	0.9237
Hydrogen Sulfide	H2S	0.0000	0.0000
Carbon Monoxide	CO	0.0000	0.0000
Hydrogen	H2	0.0000	0.0000
Oxygen	O2	0.0000	0.0000
Helium	HE	0.0000	0.0000
Neopentane	neo-C5H12	0.0000	0.0000
Octane	C8H18	0.0000	0.0000
Nonane	C9H20	0.0000	0.0000
Ethylene	C2H4	0.0000	0.0000
Propylene	C3H6	0.0000	0.0000
TOTAL (Volume %)		100.0221	100.0001

Fuel Makeup:	Gas Analysis
Unit of Measure:	English

Calculated Fuel Properties

Caterpillar Methane Number:	61.4
Lower Heating Value (Btu/scf):	1076
Higher Heating Value (Btu/scf):	1185
WOBBE Index (Btu/scf):	1248
THC: Free Inert Ratio:	13.4
Total % Inerts (% N2, CO2, He):	6.94%
RPC (%) (To 905 Btu/scf Fuel):	100%
Compressibility Factor:	0.997
Stoich A/F Ratio (Vol/Vol):	11.15
Stoich A/F Ratio (Mass/Mass):	15.02
Specific Gravity (Relative to Air):	0.742
Fuel Specific Heat Ratio (K):	1.282

CONDITIONS AND DEFINITIONS

Caterpillar Methane Number represents the knock resistance of a gaseous fuel. It should be used with the Caterpillar Fuel Usage Guide for the engine and rating to determine the rating for the fuel specified. A Fuel Usage Guide for each rating is included on page 2 of its standard technical data sheet.

RPC always applies to naturally aspirated (NA) engines, and turbocharged (TA or LE) engines only when they are derated for altitude and ambient site conditions.

Project specific technical data sheets generated by the Caterpillar Gas Engine Rating Pro program take the Caterpillar Methane Number and RPC into account when generating a site rating.

Fuel properties for Btu/scf calculations are at 60F and 14.696 psia.

FUEL LIQUIDS

Field gases, well head gases, and associated gases typically contain liquid water and heavy hydrocarbons entrained in the gas. To prevent detonation and severe damage to the engine, hydrocarbon liquids must not be allowed to enter the engine fuel system. To remove liquids, a liquid separator and coalescing filter are recommended, with an automatic drain and collection tank to prevent contamination of the ground in accordance with local codes and standards.

To avoid water condensation in the engine or fuel lines, limit the relative humidity of water in the fuel to 80% at the minimum fuel operating temperature.

PREPARED BY:
Data generated by Gas Engine Rating Pro Version 6.09.04
Ref. Data Set EM1418-05-001, Printed 28Aug2019

NORTH BAKKEN EXPANSION PROJECT

Resource Report 9

APPENDIX 9C
CONSTRUCTION EMISSION CALCULATIONS

ERM

Project: North Bakken Expansion Project
Subject: Construction Emissions
Task: Construction Emission Totals for Entire Project - Appendix 9C

Prepared by: PCB
Reviewed by: AMC
Date: 16-Oct-19

Total Emissions	Pollutant (Tons)							
	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC	HAP	CO_2e
Elkhorn Creek Compressor Station								
Diesel Non-Road Equipment	1.01	1.17	0.09	0.08	0.00	0.17	0.05	5.00
Diesel and Gas On-Road Equipment	0.55	0.05	0.00	0.00	0.00	0.04	0.00	50.45
Construction Activity Fugitive Dust	---	---	1.29	0.19	---	---	---	---
Unpaved Roadway Fugitive Dust	---	---	0.00	0.00	---	---	---	---
Emissions Total:	**1.57**	**1.22**	**1.38**	**0.28**	**0.00**	**0.21**	**0.05**	**55.45**
Tioga Compressor Station								
Diesel Non-Road Equipment	1.14	1.34	0.10	0.09	0.00	0.20	0.05	5.74
Diesel and Gas On-Road Equipment	0.40	0.04	0.00	0.00	0.00	0.03	0.00	35.62
Construction Activity Fugitive Dust	---	---	1.04	0.16	---	---	---	---
Unpaved Roadway Fugitive Dust	---	---	0.00	0.00	---	---	---	---
Emissions Total:	**1.54**	**1.37**	**1.14**	**0.25**	**0.00**	**0.23**	**0.05**	**41.36**
Tioga-Elkhorn Creek Pipeline Segment								
Diesel Non-Road Equipment	12.76	17.94	1.22	1.18	0.06	1.82	1.01	335.79
Diesel and Gas On-Road Equipment	1.47	0.24	0.01	0.01	0.00	0.11	0.01	155.07
Construction Activity Fugitive Dust	---	---	122.70	17.04	---	---	---	---
Unpaved Roadway Fugitive Dust	---	---	19.45	1.95	---	---	---	---
Emissions Total:	**14.23**	**18.18**	**143.38**	**20.18**	**0.06**	**1.94**	**1.01**	**490.86**
Line Section 25 Loop Pipeline Segment								
Diesel Non-Road Equipment	2.89	4.88	0.31	0.25	0.02	0.42	0.16	66.24
Diesel and Gas On-Road Equipment	1.11	0.18	0.01	0.01	0.00	0.09	0.01	115.52
Construction Activity Fugitive Dust	---	---	33.32	4.61	---	---	---	---
Unpaved Roadway Fugitive Dust	---	---	3.46	0.35	---	---	---	---
Emissions Total:	**4.00**	**5.06**	**37.10**	**5.21**	**0.02**	**0.51**	**0.17**	**181.76**

Line Section 30 Loop Pipeline Segment								
Diesel Non-Road Equipment	2.12	3.45	0.21	0.21	0.01	0.29	0.17	38.33
Diesel and Gas On-Road Equipment	0.15	0.04	0.00	0.00	0.00	0.01	0.00	17.71
Construction Activity Fugitive Dust	---	---	15.32	2.11	---	---	---	---
Unpaved Roadway Fugitive Dust	---	---	0.27	0.03	---	---	---	---
Emissions Total:	**2.27**	**3.48**	**15.80**	**2.35**	**0.01**	**0.30**	**0.17**	**56.04**
Tioga Compressor Lateral Pipeline Segment								
Diesel Non-Road Equipment	1.05	1.07	0.07	0.07	0.00	0.14	0.06	7.84
Diesel and Gas On-Road Equipment	0.07	0.02	0.00	0.00	0.00	0.01	0.00	8.86
Construction Activity Fugitive Dust	---	---	0.78	0.11	---	---	---	---
Unpaved Roadway Fugitive Dust	---	---	0.01	0.00	---	---	---	---
Emissions Total:	**1.12**	**1.09**	**0.86**	**0.18**	**0.00**	**0.14**	**0.06**	**16.70**
Uprate Line Section 25 Pipeline Segment								
Diesel Non-Road Equipment	1.04	0.98	0.07	0.07	0.00	0.13	0.04	7.42
Diesel and Gas On-Road Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.45
Construction Activity Fugitive Dust	---	---	1.89	0.28	---	---	---	---
Unpaved Roadway Fugitive Dust	---	---	0.11	0.01	---	---	---	---
Emissions Total:	**1.04**	**0.98**	**2.07**	**0.36**	**0.00**	**0.13**	**0.04**	**7.87**
McKenzie and Williams Information - Lake Sakakawea HDD								
Diesel Non-Road Equipment	0.93	3.46	0.15	0.14	0.01	0.15	0.15	13.91
Diesel and Gas On-Road Equipment	0.01	0.02	0.00	0.00	0.00	0.00	0.00	5.67
Construction Activity Fugitive Dust	---	---	0.93	0.14	---	---	---	---
Unpaved Roadway Fugitive Dust	---	---	0.00	0.00	---	---	---	---
Emissions Total:	**0.93**	**3.49**	**1.08**	**0.28**	**0.01**	**0.16**	**0.15**	**19.58**
Project Emission Totals:	**26.70**	**34.88**	**202.82**	**29.09**	**0.11**	**3.62**	**1.71**	**869.62**

1 CO_2e is the sum of CO_2, CH_4, and N_2O multiplied by the applicable global warming potential expressed in tons.

Project: North Bakken Expansion Project
Subject: Construction Emissions
Task: Off-Road Construction Equipment Information - Appendix 9C

Prepared by: PCB
Reviewed by: AMC
Date: 16-Oct-19

Equipment Type	SCC	Fuel Type[1]	Hours/week[1]	Load Factor[1]	Engine Rating[1] (hp)	Quantity[1]	Total Weeks[1]	Total Hours for Project[1]	hp-hrs	Estimated Fuel Consumption (gallons/hr)	Estimated Fuel Consumption (MMBtu/hr)	NONROAD Emission Factors: CO[2] lb/hp-hr	NO_x[2] lb/hp-hr	PM_{10}[2] lb/hp-hr	$PM_{2.5}$[2] lb/hp-hr	SO_2[2] lb/hp-hr	VOC[2] lb/hp-hr	HAP lb/hp-hr	CO_2[2] lb/hp-hr	CH_4[3] kg/MMBtu	N_2O[3] kg/MMBtu
McKenzie County Information - Elkhorn Creek Compressor Station (new)																					
Scraper		Diesel	40	0.59	350	1	2	80	16,520	4	0.52	0.00111	0.00253	0.00019	0.00018	0.00001	0.00015	0.00008	1.18	0.003	0.0006
Dozers		Diesel	40	0.59	200	1	2	80	9,440	2	0.30	0.00039	0.00111	0.00008	0.00008	0.00001	0.00007	0.00004	1.18	0.003	0.0006
Grader		Gasoline	50	0.59	200	1	4	200	23,600	2	0.30	0.00037	0.00107	0.00008	0.00007	0.00001	0.00007	0.00004	1.18	0.003	0.0006
Trackhoes		Diesel	40	0.59	200	2	5	400	47,200	4	0.59	0.00030	0.00085	0.00006	0.00006	0.00001	0.00006	0.00003	1.18	0.003	0.0006
Generators		Diesel	60	0.50	100	2	18	2,160	108,000	2	0.25	0.00304	0.00634	0.00050	0.00049	0.00001	0.00149	0.00019	1.30	0.003	0.0006
Air Compressors		Diesel	40	0.50	100	1	18	720	36,000	1	0.13	0.02894	0.00747	0.00052	0.00050	0.00002	0.00171	0.00019	2.85	0.003	0.0006
Concrete Mixer Truck		Diesel	10	0.59	250	1	12	120	17,700	3	0.37	0.00098	0.00401	0.00017	0.00016	0.00001	0.00028	0.00014	1.17	0.003	0.0006
Skid Steer Loader		Diesel	20	0.59	50	2	12	480	14,160	1	0.15	0.00278	0.00750	0.00041	0.00040	0.00001	0.00075	0.00041	1.53	0.003	0.0006
Large Crane		Diesel	40	0.59	350	2	1	80	16,520	8	1.04	0.00090	0.00295	0.00014	0.00013	0.00001	0.00018	0.00010	1.17	0.003	0.0006
Truck mounted Crane		Diesel	30	0.59	250	2	18	1,080	159,300	5	0.74	0.00047	0.00182	0.00009	0.00008	0.00001	0.00011	0.00006	1.17	0.003	0.0006
Rubber tire Backhoe		Diesel	20	0.59	100	2	14	560	33,040	2	0.30	0.00667	0.00594	0.00095	0.00093	0.00001	0.00071	0.00036	1.53	0.003	0.0006
Fork Lift		Diesel	10	0.59	120	1	18	180	12,744	1	0.18	0.00287	0.00519	0.00064	0.00062	0.00001	0.00068	0.00034	1.38	0.003	0.0006
Front End Loader		Diesel	40	0.59	200	1	3	120	14,160	2	0.30	0.00215	0.00397	0.00041	0.00040	0.00001	0.00054	0.00004	1.38	0.003	0.0006
Welding Rigs		Diesel	40	0.59	25	5	18	3,600	53,100	1	0.19	0.00334	0.00831	0.00038	0.00037	0.00001	0.00079	0.00044	1.31	0.003	0.0006
Williams County Information - Tioga Compressor Station (existing)																					
Scraper		Diesel	40	0.59	350	1	2	80	16,520	4	0.52	0.00111	0.00253	0.00019	0.00018	0.00001	0.00015	0.00008	1.18	0.003	0.0006
Dozers		Diesel	40	0.59	200	1	2	80	9,440	2	0.30	0.00039	0.00111	0.00008	0.00008	0.00001	0.00007	0.00004	1.18	0.003	0.0006
Grader		Gasoline	50	0.59	200	1	4	200	23,600	2	0.30	0.00037	0.00107	0.00008	0.00007	0.00001	0.00007	0.00004	1.18	0.003	0.0006
Trackhoes		Diesel	50	0.59	200	2	5	500	59,000	4	0.59	0.00030	0.00085	0.00006	0.00006	0.00001	0.00006	0.00003	1.18	0.003	0.0006
Generators		Diesel	60	0.50	100	2	20	2,400	120,000	2	0.25	0.00304	0.00634	0.00050	0.00049	0.00001	0.00149	0.00019	1.30	0.003	0.0006
Air Compressors		Diesel	40	0.50	100	1	20	800	40,000	1	0.13	0.02894	0.00747	0.00052	0.00050	0.00002	0.00171	0.00019	2.85	0.003	0.0006
Concrete Mixer Truck		Diesel	10	0.59	250	1	14	140	20,650	3	0.37	0.00098	0.00401	0.00017	0.00016	0.00001	0.00028	0.00014	1.17	0.003	0.0006
Skid Steer Loader		Diesel	20	0.59	50	2	14	560	16,520	1	0.15	0.00278	0.00750	0.00041	0.00040	0.00001	0.00075	0.00041	1.53	0.003	0.0006
Large Crane		Diesel	40	0.59	350	2	2	160	33,040	8	1.04	0.00090	0.00295	0.00014	0.00013	0.00001	0.00018	0.00010	1.17	0.003	0.0006
Truck mounted Crane		Diesel	30	0.59	250	2	20	1,200	177,000	5	0.74	0.00047	0.00182	0.00009	0.00008	0.00001	0.00011	0.00006	1.17	0.003	0.0006
Rubber tire Backhoe		Diesel	20	0.59	100	2	16	640	37,760	2	0.30	0.00667	0.00594	0.00095	0.00093	0.00001	0.00071	0.00036	1.53	0.003	0.0006
Fork Lift		Diesel	10	0.59	120	1	20	200	14,160	1	0.18	0.00287	0.00519	0.00064	0.00062	0.00001	0.00068	0.00034	1.38	0.003	0.0006
Front End Loader		Diesel	40	0.59	200	1	4	160	18,880	2	0.30	0.00215	0.00397	0.00041	0.00040	0.00001	0.00054	0.00004	1.38	0.003	0.0006
Welding Rigs		Diesel	40	0.59	25	5	20	4,000	59,000	1	0.19	0.00334	0.00831	0.00038	0.00037	0.00001	0.00079	0.00044	1.31	0.003	0.0006
McKenzie County Information - Tioga-Elkhorn Creek Pipeline Segment																					
Air Compressor		Diesel	40	0.80	80	2	8	640	40,960	2	0.32	0.02894	0.00747	0.00052	0.00050	0.00002	0.00171	0.00019	2.85	0.003	0.0006
ATV		Gasoline	30	0.50	40	4	25	3,000	60,000	1	0.20	0.08158	0.00092	0.00019	0.00017	0.00000	0.00902	0.00044	0.52	0.003	0.0006
Tractors/loaders/backhoe		Diesel	60	0.80	75	1	4	240	14,400	1	0.15	0.00358	0.00721	0.00049	0.00047	0.00001	0.00067	0.00062	1.53	0.003	0.0006
Concrete Mixer Truck		Diesel	30	1.00	325	1	6	180	58,500	6	0.82	0.00111	0.00395	0.00014	0.00014	0.00001	0.00024	0.00022	1.17	0.003	0.0006
Crane, wheeled		Diesel	25	0.80	350	1	4	100	28,000	5	0.70	0.00090	0.00295	0.00014	0.00013	0.00001	0.00018	0.00018	1.17	0.003	0.0006
Dozers		Diesel	60	1.00	410	3	12	2,160	885,600	23	3.09	0.00107	0.00245	0.00018	0.00018	0.00001	0.00015	0.00015	1.18	0.003	0.0006
Dozers		Diesel	20	1.00	150	1	25	500	75,000	3	0.38	0.00049	0.00162	0.00012	0.00012	0.00001	0.00007	0.00007	1.18	0.003	0.0006
Dump Truck		Diesel	40	0.80	325	2	8	640	166,400	10	1.31	0.00271	0.00518	0.00060	0.00058	0.00001	0.00065	0.00061	1.38	0.003	0.0006
Generators		Diesel	60	1.00	250	2	25	3,000	750,000	9	1.26	0.00107	0.00434	0.00019	0.00019	0.00001	0.00012	0.00012	1.17	0.003	0.0006
Grader		Diesel	60	1.00	255	2	14	1,680	428,400	9	1.28	0.00037	0.00107	0.00008	0.00007	0.00001	0.00007	0.00006	1.18	0.003	0.0006
Guided Bore Machine		Diesel	60	0.60	150	1	12	720	64,800	2	0.23	0.00112	0.00447	0.00026	0.00026	0.00001	0.00028	0.00026	1.17	0.003	0.0006
Pickup Truck		Gasoline	30	0.25	300	20	25	15,000	1,125,000	27	3.77	0.00101	0.00261	0.00020	0.00019	0.00001	0.00018	0.00018	1.18	0.003	0.0006
Sideboom		Diesel	60	0.50	240	3	20	3,600	432,000	7	0.90	0.00047	0.00182	0.00009	0.00008	0.00001	0.00011	0.00005	1.17	0.003	0.0006
Skid Steer Loader		Diesel	20	0.80	50	1	25	500	20,000	1	0.10	0.00278	0.00750	0.00041	0.00040	0.00001	0.00075	0.00075	1.53	0.003	0.0006
Trackhoe		Diesel	60	1.00	320	4	25	6,000	1,920,000	23	3.21	0.00072	0.00180	0.00012	0.00012	0.00001	0.00010	0.00010	1.18	0.003	0.0006
Welding Machine		Diesel	60	0.80	35	12	20	14,400	403,200	6	0.84	0.00396	0.00821	0.00061	0.00059	0.00001	0.00103	0.00045	1.53	0.003	0.0006
Williams County Information - Tioga-Elkhorn Creek Pipeline Segment																					
Air Compressor		Diesel	40	0.80	80	2	8	640	40,960	2	0.32	0.02894	0.00747	0.00052	0.00050	0.00002	0.00171	0.00019	2.85	0.003	0.0006
ATV		Gasoline	30	0.50	40	4	25	3,000	60,000	1	0.20	0.08158	0.00092	0.00019	0.00017	0.00000	0.00902	0.00044	0.52	0.003	0.0006
Tractors/loaders/backhoe		Diesel	60	0.80	75	1	6	360	21,600	1	0.15	0.00358	0.00721	0.00049	0.00047	0.00001	0.00067	0.00062	1.53	0.003	0.0006
Concrete Mixer Truck		Diesel	30	1.00	325	1	6	180	58,500	6	0.82	0.00111	0.00395	0.00014	0.00014	0.00001	0.00024	0.00022	1.17	0.003	0.0006
Crane, wheeled		Diesel	25	0.80	350	1	4	100	28,000	5	0.70	0.00090	0.00295	0.00014	0.00013	0.00001	0.00018	0.00018	1.17	0.003	0.0006
Dozers		Diesel	60	1.00	410	3	12	2,160	885,600	23	3.09	0.00107	0.00245	0.00018	0.00018	0.00001	0.00015	0.00015	1.18	0.003	0.0006
Dozers		Diesel	20	1.00	150	1	25	500	75,000	3	0.38	0.00049	0.00162	0.00012	0.00012	0.00001	0.00007	0.00007	1.18	0.003	0.0006
Dump Truck		Diesel	40	0.80	325	2	8	640	166,400	10	1.31	0.00271	0.00518	0.00060	0.00058	0.00001	0.00065	0.00061	1.38	0.003	0.0006
Generators		Diesel	60	1.00	250	2	25	3,000	750,000	9	1.26	0.00107	0.00434	0.00019	0.00019	0.00001	0.00012	0.00012	1.17	0.003	0.0006
Grader		Diesel	60	1.00	255	2	14	1,680	428,400	9	1.28	0.00037	0.00107	0.00008	0.00007	0.00001	0.00007	0.00006	1.18	0.003	0.0006
Guided Bore Machine		Diesel	60	0.60	150	1	12	720	64,800	2	0.23	0.00112	0.00447	0.00026	0.00026	0.00001	0.00028	0.00026	1.17	0.003	0.0006
Pickup Truck		Gasoline	30	0.25	300	20	25	15,000	1,125,000	27	3.77	0.00101	0.00261	0.00020	0.00019	0.00001	0.00018	0.00018	1.18	0.003	0.0006
Sideboom		Diesel	60	0.50	240	3	20	3,600	432,000	7	0.90	0.00047	0.00182	0.00009	0.00008	0.00001	0.00011	0.00005	1.17	0.003	0.0006
Skid Steer Loader		Diesel	20	0.80	50	1	25	500	20,000	1	0.10	0.00278	0.00750	0.00041	0.00040	0.00001	0.00075	0.00075	1.53	0.003	0.0006
Trackhoe		Diesel	60	1.00	320	4	25	6,000	1,920,000	23	3.21	0.00072	0.00180	0.00012	0.00012	0.00001	0.00010	0.00010	1.18	0.003	0.0006
Welding Machine		Diesel	60	0.80	35	12	12	8,640	241,920	6	0.84	0.00396	0.00821	0.00061	0.00059	0.00001	0.00103	0.00045	1.53	0.003	0.0006

Equipment Type	SCC	Fuel Type[1]	Hours/week[1]	Load Factor[1]	Engine Rating[1] (hp)	Quantity[1]	Total Weeks[1]	Total Hours for Project[1]	hp-hrs	Estimated Fuel Consumption (gallons/hr)	Estimated Fuel Consumption (MMBtu/hr)	NONROAD Emission Factors CO[2]	NOx[2]	PM_{10}[2]	$PM_{2.5}$[2]	SO_2[2]	VOC[2]	HAP	CO_2[2]	CH_4[3]	N_2O[3]
												lb/hp-hr	lb/hp-hr	lb/hp-hr	lb/hp-hr	lb/hp-hr	lb/hp-hr	lb/hp-hr	lb/hp-hr	kg/MMBtu	kg/MMBtu
Burke, Montrail, and Williams County Information - Line Section 25 Loop Pipeline Segment																					
Air Compressor		Diesel	40	0.80	80	1	6	240	15,360	1	0.16	0.02894	0.00747	0.00052	0.00050	0.00002	0.00171	0.00019	2.85	0.003	0.0006
ATV		Gasoline	35	0.50	40	2	17	1,190	23,800	1	0.10	0.08158	0.00092	0.00019	0.00017	0.00000	0.00902	0.00044	0.52	0.003	0.0006
Tractors/loaders/backhoe		Diesel	60	0.80	75	1	8	480	28,800	1	0.15	0.00358	0.00721	0.00049	0.00047	0.00001	0.00067	0.00015	1.53	0.003	0.0006
Concrete Mixer Truck		Diesel	20	0.80	150	1	2	40	4,800	2	0.30	0.00114	0.00462	0.00025	0.00024	0.00001	0.00029	0.00012	1.17	0.003	0.0006
Crane, wheeled		Diesel	20	1.00	350	1	2	40	14,000	6	0.88	0.00090	0.00295	0.00014	0.00013	0.00001	0.00018	0.00008	1.17	0.003	0.0006
Dozers		Diesel	60	1.00	410	2	6	720	295,200	15	2.06	0.00107	0.00245	0.00018	0.00018	0.00001	0.00015	0.00007	1.18	0.003	0.0006
Dump Truck		Diesel	20	0.80	325	1	4	80	20,800	5	0.65	0.00271	0.00518	0.00060	0.00058	0.00001	0.00065	0.00028	1.38	0.003	0.0006
Generators		Diesel	60	0.50	250	3	17	3,060	382,500	7	0.94	0.00107	0.00434	0.00019	0.00019	0.00001	0.00012	0.00012	1.17	0.003	0.0006
Grader		Diesel	60	1.00	140	2	12	1,440	201,600	5	0.70	0.00047	0.00157	0.00012	0.00012	0.00001	0.00007	0.00003	1.18	0.003	0.0006
Guided Bore Machine		Diesel	60	0.80	150	2	14	1,680	201,600	4	0.60	0.00112	0.00447	0.00026	0.00026	0.00001	0.00028	0.00012	1.17	0.003	0.0006
Pickup Truck		Gasoline	30	0.25	150	12	17	6,120	229,500	8	1.13	0.00101	0.00261	0.00020	0.00019	0.00001	0.00018	0.00018	1.18	0.003	0.0006
Sideboom		Diesel	60	1.00	240	3	14	2,520	604,800	13	1.81	0.00047	0.00182	0.00009	0.00008	0.00001	0.00011	0.00005	1.17	0.003	0.0006
Skid Steer Loader		Diesel	30	1.00	50	1	17	510	25,500	1	0.13	0.00278	0.00750	0.00013	0.00040	0.00001	0.00075	0.00034	1.31	0.003	0.0006
Trackhoe		Diesel	60	1.00	320	5	17	5,100	1,632,000	29	4.02	0.00072	0.00180	0.00012	0.00006	0.00001	0.00010	0.00004	1.18	0.003	0.0006
Welding Machine		Diesel	60	0.80	35	10	6	3,600	100,800	5	0.70	0.00396	0.00821	0.00061	0.00059	0.00001	0.00103	0.00045	1.53	0.003	0.0006
Williams County Information - Line Section 30 Loop Pipeline Segment																					
Air Compressor		Diesel	40	0.80	80	1	3	120	7,680	1	0.16	0.02894	0.00747	0.00052	0.00050	0.00002	0.00171	0.00019	2.85	0.003	0.0006
ATV		Gasoline	30	0.50	40	2	17	1,020	20,400	1	0.10	0.08158	0.00092	0.00019	0.00017	0.00000	0.00902	0.00044	0.52	0.003	0.0006
Tractors/loaders/backhoe		Diesel	60	0.80	75	1	4	240	14,400	1	0.15	0.00358	0.00721	0.00049	0.00047	0.00001	0.00067	0.00062	1.53	0.003	0.0006
Concrete Mixer Truck		Diesel	20	0.80	150	1	2	40	4,800	2	0.30	0.00114	0.00462	0.00025	0.00024	0.00001	0.00029	0.00027	1.17	0.003	0.0006
Crane, wheeled		Diesel	20	0.80	350	1	2	40	11,200	5	0.70	0.00090	0.00295	0.00014	0.00013	0.00001	0.00018	0.00018	1.17	0.003	0.0006
Dozers		Diesel	60	1.00	410	2	4	480	196,800	15	2.06	0.00107	0.00245	0.00018	0.00018	0.00001	0.00015	0.00015	1.18	0.003	0.0006
Dump Truck		Diesel	20	0.80	325	1	2	40	10,400	5	0.65	0.00271	0.00518	0.00060	0.00058	0.00001	0.00065	0.00061	1.38	0.003	0.0006
Generators		Diesel	60	1.00	250	2	17	2,040	510,000	9	1.26	0.00107	0.00434	0.00019	0.00019	0.00001	0.00012	0.00012	1.17	0.003	0.0006
Grader		Diesel	60	1.00	255	2	10	1,200	306,000	9	1.28	0.00037	0.00107	0.00008	0.00007	0.00001	0.00007	0.00006	1.18	0.003	0.0006
Guided Bore Machine		Diesel	60	0.60	150	1	3	180	16,200	2	0.23	0.00112	0.00447	0.00026	0.00026	0.00001	0.00028	0.00026	1.17	0.003	0.0006
Pickup Truck		Gasoline	30	0.25	300	10	17	5,100	382,500	14	1.88	0.00101	0.00261	0.00020	0.00019	0.00001	0.00018	0.00018	1.18	0.003	0.0006
Sideboom		Diesel	60	0.50	240	2	12	1,440	172,800	4	0.60	0.00047	0.00182	0.00009	0.00008	0.00001	0.00011	0.00005	1.17	0.003	0.0006
Skid Steer Loader		Diesel	20	0.80	50	1	17	340	13,600	1	0.10	0.00278	0.00750	0.00041	0.00040	0.00001	0.00075	0.00075	1.53	0.003	0.0006
Trackhoe		Diesel	60	1.00	320	3	17	3,060	979,200	18	2.41	0.00072	0.00180	0.00012	0.00012	0.00001	0.00010	0.00010	1.18	0.003	0.0006
Welding Machine		Diesel	60	0.80	35	8	3	1,440	40,320	4	0.56	0.00396	0.00821	0.00061	0.00059	0.00001	0.00103	0.00045	1.53	0.003	0.0006
Williams County Information - Tioga Compressor Lateral Pipeline Segment																					
Air Compressor		Diesel	40	0.80	80	1	2	80	5,120	1	0.16	0.02894	0.00747	0.00052	0.00050	0.00002	0.00171	0.00019	2.85	0.003	0.0006
ATV		Gasoline	30	0.50	40	2	12	720	14,400	1	0.10	0.08158	0.00092	0.00019	0.00017	0.00000	0.00902	0.00044	0.52	0.003	0.0006
Tractors/loaders/backhoe		Diesel	60	0.80	75	1	2	120	7,200	1	0.15	0.00358	0.00721	0.00049	0.00047	0.00001	0.00067	0.00062	1.53	0.003	0.0006
Concrete Mixer Truck		Diesel	40	0.80	150	1	1	40	4,800	2	0.30	0.00114	0.00462	0.00025	0.00024	0.00001	0.00029	0.00027	1.17	0.003	0.0006
Crane, wheeled		Diesel	40	0.80	350	1	1	40	11,200	5	0.70	0.00090	0.00295	0.00014	0.00013	0.00001	0.00018	0.00018	1.17	0.003	0.0006
Dozers		Diesel	60	1.00	410	1	2	120	49,200	8	1.03	0.00107	0.00245	0.00018	0.00018	0.00001	0.00015	0.00015	1.18	0.003	0.0006
Generators		Diesel	60	1.00	250	1	4	240	60,000	5	0.63	0.00107	0.00434	0.00019	0.00019	0.00001	0.00012	0.00012	1.17	0.003	0.0006
Grader		Diesel	30	1.00	255	1	2	60	15,300	5	0.64	0.00037	0.00107	0.00008	0.00007	0.00001	0.00007	0.00006	1.18	0.003	0.0006
Guided Bore Machine		Diesel	20	0.60	150	1	1	20	1,800	2	0.23	0.00112	0.00447	0.00026	0.00026	0.00001	0.00028	0.00026	1.17	0.003	0.0006
Pickup Truck		Gasoline	30	0.25	300	5	12	1,800	135,000	7	0.94	0.00101	0.00261	0.00020	0.00019	0.00001	0.00018	0.00018	1.18	0.003	0.0006
Sideboom		Diesel	60	0.50	240	1	12	720	86,400	2	0.30	0.00047	0.00182	0.00009	0.00008	0.00001	0.00011	0.00005	1.17	0.003	0.0006
Skid Steer Loader		Diesel	20	0.80	50	1	12	240	9,600	1	0.10	0.00278	0.00750	0.00041	0.00040	0.00001	0.00075	0.00075	1.53	0.003	0.0006
Trackhoe		Diesel	60	1.00	320	2	12	1,440	460,800	12	1.61	0.00072	0.00180	0.00012	0.00012	0.00001	0.00010	0.00010	1.18	0.003	0.0006
Welding Machine		Diesel	60	0.80	35	4	3	720	20,160	2	0.28	0.00396	0.00821	0.00061	0.00059	0.00001	0.00103	0.00045	1.53	0.003	0.0006
Burke County Information - Uprate Line Section 25 Pipeline Segment																					
Air Compressor		Diesel	40	0.80	80	1	2	80	5,120	1	0.16	0.02894	0.00747	0.00052	0.00050	0.00002	0.00171	0.00019	2.85	0.003	0.0006
ATV		Gasoline	30	0.50	40	2	12	720	14,400	1	0.10	0.08158	0.00092	0.00019	0.00017	0.00000	0.00902	0.00044	0.52	0.003	0.0006
Tractors/loaders/backhoe		Diesel	60	0.80	75	1	2	120	7,200	1	0.15	0.00358	0.00721	0.00049	0.00047	0.00001	0.00067	0.00028	1.53	0.003	0.0006
Dozers		Diesel	60	1.00	410	1	2	120	49,200	8	1.03	0.00107	0.00245	0.00018	0.00018	0.00001	0.00015	0.00007	1.18	0.003	0.0006
Dump Truck		Diesel	20	0.80	325	1	2	40	10,400	5	0.65	0.00271	0.00518	0.00060	0.00058	0.00001	0.00065	0.00028	1.38	0.003	0.0006
Generators		Diesel	60	1.00	250	1	4	240	60,000	5	0.63	0.00107	0.00434	0.00019	0.00019	0.00001	0.00012	0.00012	1.17	0.003	0.0006
Guided Bore Machine		Diesel	20	0.60	150	1	1	20	1,800	2	0.23	0.00112	0.00447	0.00026	0.00026	0.00001	0.00028	0.00012	1.17	0.003	0.0006
Pickup Truck		Gasoline	30	0.25	300	5	12	1,800	135,000	7	0.94	0.00101	0.00261	0.00020	0.00019	0.00001	0.00018	0.00018	1.18	0.003	0.0006
Skid Steer Loader		Diesel	20	0.80	50	1	12	240	9,600	1	0.10	0.00278	0.00750	0.00041	0.00040	0.00001	0.00075	0.00034	1.53	0.003	0.0006
Trackhoe		Diesel	60	1.00	320	2	12	1,440	460,800	12	1.61	0.00072	0.00180	0.00012	0.00012	0.00001	0.00010	0.00004	1.18	0.003	0.0006
Welding Machine		Diesel	60	0.80	35	4	3	720	20,160	2	0.28	0.00396	0.00821	0.00061	0.00059	0.00001	0.00103	0.00045	1.53	0.003	0.0006
McKenzie and Williams Information - Lake Sakakawea HDD																					
Drill Rig		Diesel	60	0.80	450	2	20	2,400	864,000	13	1.81	0.00113	0.00396	0.00016	0.00015	0.00001	0.00024	0.00023	1.17	0.003	0.0006
Mudd Unit		Diesel	60	0.80	200	2	20	2,400	384,000	6	0.80	0.00107	0.00434	0.00019	0.00019	0.00001	0.00012	0.00012	1.17	0.003	0.0006
Cleaner		Diesel	60	0.80	200	2	20	2,400	384,000	6	0.80	0.00107	0.00434	0.00019	0.00019	0.00001	0.00012	0.00012	1.17	0.003	0.0006
Trackhoe		Diesel	30	0.80	138	2	20	1,200	132,480	4	0.55	0.00040	0.00129	0.00010	0.00010	0.00001	0.00006	0.00006	1.18	0.003	0.0006

Conversion Factors	
hp to gallon of diesel	55
scf/gallon	7.4805
Btu/gallon diesel[4]	137,000
Btu/MMBtu	1,000,000
lb/kg	2.20
lb/ton	2,000
Global Warming Potential	
CO_2	1
CH_4	25
N_2O	298

[1] Type, quantity, load factor, and duration of use of construction equipment provided by WBI Energy.

[2] Emission Factors come from MOVES2014a Emission Runs for Burke, McKenzie, Montrail, and Williams Counties, ND.

[3] Emission Factor Comes from 40 CFR Part 98 Table C-2.

[4] Btu/gallon from USEPA AP-42 Appendix A Typical Parameters of Various Fuels.

ERM

Project: North Bakken Expansion Project
Subject: Construction Emissions
Task: Off-Road Construction Equipment Emissions - Appendix C

Prepared by: PCB
Reviewed by: AMC
Date: 16-Oct-19

Equipment Type	Pollutant (Tons)										
	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC	HAP	CO_2	CH_4	N_2O	CO_2e
McKenzie County Information - Elkhorn Creek Compressor Station (new)											
Scraper	9.18E-03	2.09E-02	1.56E-03	1.52E-03	7.24E-05	1.26E-03	6.76E-04	0.05	1.37E-04	2.74E-05	0.07
Dozers	1.83E-03	5.25E-03	3.69E-04	3.58E-04	3.84E-05	3.45E-04	1.75E-04	0.03	7.84E-05	1.57E-05	0.04
Grader	4.37E-03	1.26E-02	8.89E-04	8.62E-04	9.58E-05	8.33E-04	4.20E-04	0.08	1.96E-04	3.92E-05	0.09
Trackhoes	7.00E-03	1.99E-02	1.49E-03	1.44E-03	1.90E-04	1.42E-03	7.00E-04	0.31	7.84E-04	1.57E-04	0.38
Concrete Mixer Truck	8.71E-03	3.55E-02	1.47E-03	1.43E-03	8.07E-05	2.48E-03	1.25E-03	0.06	1.47E-04	2.94E-05	0.07
Skid Steer Loader	1.97E-02	5.31E-02	2.91E-03	2.83E-03	8.63E-05	5.33E-03	2.87E-03	0.12	2.35E-04	4.70E-05	0.14
Large Crane	7.41E-03	2.44E-02	1.15E-03	1.11E-03	7.33E-05	1.52E-03	8.13E-04	0.11	2.74E-04	5.49E-05	0.13
Truck mounted Crane	3.73E-02	1.45E-01	6.82E-03	6.61E-03	6.63E-04	9.02E-03	4.73E-03	1.03	2.64E-03	5.29E-04	1.26
Rubber tire Backhoe	1.10E-01	9.81E-02	1.58E-02	1.53E-02	1.96E-04	1.17E-02	5.98E-03	0.28	5.49E-04	1.10E-04	0.33
Fork Lift	1.83E-02	3.31E-02	4.08E-03	3.96E-03	6.86E-05	4.35E-03	2.20E-03	0.05	1.06E-04	2.12E-05	0.06
Front End Loader	1.52E-02	2.81E-02	2.94E-03	2.85E-03	7.51E-05	3.85E-03	2.62E-04	0.05	1.18E-04	2.35E-05	0.06
Welding Rigs	8.87E-02	2.21E-01	1.01E-02	9.80E-03	3.20E-04	2.10E-02	1.16E-02	0.96	2.20E-03	4.41E-04	1.15
Elkhorn Creek Compressor Station Total	**1.01E+00**	**1.17E+00**	**8.60E-02**	**8.33E-02**	**2.85E-03**	**1.74E-01**	**4.53E-02**	**4.19**	**9.56E-03**	**1.91E-03**	**5.00**
Williams County Information - Tioga Compressor Station (existing)											
Scraper	9.18E-03	2.09E-02	1.56E-03	1.52E-03	7.24E-05	1.26E-03	6.76E-04	0.05	1.37E-04	2.74E-05	0.07
Dozers	1.83E-03	5.25E-03	3.69E-04	3.58E-04	3.84E-05	3.45E-04	1.75E-04	0.03	7.84E-05	1.57E-05	0.04
Grader	4.37E-03	1.26E-02	8.89E-04	8.62E-04	9.58E-05	8.33E-04	4.20E-04	0.08	1.96E-04	3.92E-05	0.09
Trackhoes	8.75E-03	2.49E-02	1.86E-03	1.80E-03	2.37E-04	1.65E-03	8.75E-04	0.39	9.79E-04	1.96E-04	0.47
Concrete Mixer Truck	1.02E-02	4.14E-02	1.72E-03	1.67E-03	9.42E-05	2.89E-03	1.46E-03	0.07	1.71E-04	3.43E-05	0.08
Skid Steer Loader	2.30E-02	6.20E-02	3.40E-03	3.30E-03	1.01E-04	6.22E-03	3.35E-03	0.14	2.74E-04	5.49E-05	0.16
Large Crane	1.48E-02	4.88E-02	2.30E-03	2.23E-03	1.47E-04	3.04E-03	1.63E-03	0.21	5.49E-04	1.10E-04	0.26
Truck mounted Crane	4.15E-02	1.61E-01	7.58E-03	7.35E-03	7.37E-04	1.00E-02	5.26E-03	1.15	2.94E-03	5.88E-04	1.40
Rubber tire Backhoe	1.26E-01	1.12E-01	1.80E-02	1.75E-02	2.24E-04	1.34E-02	6.84E-03	0.32	6.27E-04	1.25E-04	0.37
Fork Lift	2.03E-02	3.67E-02	4.53E-03	4.40E-03	7.63E-05	4.83E-03	2.44E-03	0.05	1.18E-04	2.35E-05	0.06
Front End Loader	2.03E-02	3.75E-02	3.92E-03	3.80E-03	1.00E-04	5.13E-03	3.49E-04	0.07	1.57E-04	3.13E-05	0.09
Welding Rigs	9.85E-02	2.45E-01	1.12E-02	1.09E-02	3.56E-04	2.33E-02	1.29E-02	1.07	2.45E-03	4.90E-04	1.28
Tioga Compressor Station Total	**1.14E+00**	**1.34E+00**	**9.79E-02**	**9.48E-02**	**3.27E-03**	**1.97E-01**	**5.15E-02**	**4.81**	**1.10E-02**	**2.20E-03**	**5.74**
McKenzie County Information - Tioga-Elkhorn Creek Pipeline Segment											
Air Compressor	5.93E-01	1.53E-01	1.06E-02	1.02E-02	3.90E-04	3.49E-02	3.93E-03	0.64	6.80E-04	1.36E-04	0.70
ATV	2.45E+00	2.76E-02	5.66E-03	5.20E-03	9.40E-05	2.71E-01	1.32E-02	0.34	1.99E-03	3.98E-04	0.51
Tractors/loaders/backhoe	2.58E-02	5.19E-02	3.52E-03	3.42E-03	8.96E-05	4.79E-03	4.46E-03	0.06	1.20E-04	2.39E-05	0.07
Concrete Mixer Truck	3.24E-02	1.16E-01	4.15E-03	4.03E-03	2.67E-04	6.93E-03	6.57E-03	0.19	4.86E-04	9.71E-05	0.23
Crane, wheeled	1.26E-02	4.13E-02	1.95E-03	1.89E-03	1.24E-04	2.57E-03	2.54E-03	0.09	2.32E-04	4.65E-05	0.11
Dozers	4.75E-01	1.09E+00	8.11E-02	7.86E-02	3.86E-03	6.53E-02	6.44E-02	8.70	2.21E-02	4.41E-03	10.56
Dozers	1.83E-02	6.08E-02	4.68E-03	4.54E-03	3.05E-04	2.74E-03	2.70E-03	0.25	6.23E-04	1.25E-04	0.30
Dump Truck	2.25E-01	4.31E-01	4.98E-02	4.83E-02	8.96E-04	5.45E-02	5.10E-02	1.27	2.76E-03	5.52E-04	1.50
Generators	4.01E-01	1.63E+00	7.15E-02	6.94E-02	3.40E-03	4.61E-02	4.67E-02	4.86	1.25E-02	2.49E-03	5.91
Grader	7.93E-02	2.28E-01	1.61E-02	1.56E-02	1.74E-03	1.51E-02	1.39E-02	2.81	7.11E-03	1.42E-03	3.41
Guided Bore Machine	3.63E-02	1.45E-01	8.53E-03	8.27E-03	2.95E-04	9.13E-03	8.58E-03	0.21	5.38E-04	1.08E-04	0.26
Pickup Truck	5.69E-01	1.47E+00	1.12E-01	1.09E-01	4.95E-03	1.01E-01	9.94E-02	73.65	1.87E-01	3.74E-02	89.45
Sideboom	1.01E-01	3.92E-01	1.85E-02	1.79E-02	1.80E-03	2.44E-02	1.07E-02	4.20	1.08E-02	2.15E-03	5.11
Skid Steer Loader	2.78E-02	7.50E-02	4.12E-03	3.99E-03	1.22E-04	7.53E-03	7.49E-03	0.08	1.66E-04	3.32E-05	0.10
Trackhoe	6.91E-01	1.73E+00	1.18E-01	1.15E-01	8.05E-03	9.77E-02	9.42E-02	25.14	6.37E-02	1.27E-02	30.54
Welding Machine	7.97E-01	1.65E+00	1.23E-01	1.20E-01	2.55E-03	2.09E-01	9.00E-02	20.50	4.02E-02	8.03E-03	23.90
McKenzie Tioga-Elkhorn Creek Total	**6.53E+00**	**9.29E+00**	**6.34E-01**	**6.15E-01**	**2.89E-02**	**9.52E-01**	**5.20E-01**	**142.99**	**3.51E-01**	**7.01E-02**	**172.65**

ERM

Project: North Bakken Expansion Project
Subject: Construction Emissions
Task: Off-Road Construction Equipment Emissions - Appendix C

Prepared by: PCB
Reviewed by: AMC
Date: 16-Oct-19

Williams County Information - Tioga-Elkhorn Creek Pipeline Segment											
Air Compressor	5.93E-01	1.53E-01	1.06E-02	1.02E-02	3.90E-04	3.49E-02	3.93E-03	0.64	6.80E-04	1.36E-04	0.70
ATV	2.45E+00	2.76E-02	5.66E-03	5.20E-03	9.40E-05	2.71E-01	1.32E-02	0.34	1.99E-03	3.98E-04	0.51
Tractors/loaders/backhoe	3.86E-02	7.78E-02	5.29E-03	5.13E-03	1.34E-04	7.19E-03	6.69E-03	0.09	1.79E-04	3.59E-05	0.11
Concrete Mixer Truck	3.24E-02	1.16E-01	4.15E-03	4.03E-03	2.67E-04	6.93E-03	6.57E-03	0.19	4.86E-04	9.71E-05	0.23
Crane, wheeled	1.26E-02	4.13E-02	1.95E-03	1.89E-03	1.24E-04	2.57E-03	2.54E-03	0.09	2.32E-04	4.65E-05	0.11
Dozers	4.75E-01	1.09E+00	8.11E-02	7.86E-02	3.86E-03	6.53E-02	6.44E-02	8.70	2.21E-02	4.41E-03	10.56
Dozers	1.83E-02	6.08E-02	4.68E-03	4.54E-03	3.05E-04	2.74E-03	2.70E-03	0.25	6.23E-04	1.25E-04	0.30
Dump Truck	2.25E-01	4.31E-01	4.98E-02	4.83E-02	8.96E-04	5.45E-02	5.10E-02	1.27	2.76E-03	5.52E-04	1.50
Generators	4.01E-01	1.63E+00	7.15E-02	6.94E-02	3.40E-03	4.61E-02	4.67E-02	4.86	1.25E-02	2.49E-03	5.91
Grader	7.93E-02	2.28E-01	1.61E-02	1.56E-02	1.74E-03	1.51E-02	1.39E-02	2.81	7.11E-03	1.42E-03	3.41
Guided Bore Machine	3.63E-02	1.45E-01	8.53E-03	8.27E-03	2.95E-04	9.13E-03	8.58E-03	0.21	5.38E-04	1.08E-04	0.26
Pickup Truck	5.69E-01	1.47E+00	1.12E-01	1.09E-01	4.95E-03	1.01E-01	9.94E-02	73.66	1.87E-01	3.74E-02	89.46
Sideboom	1.01E-01	3.92E-01	1.85E-02	1.79E-02	1.80E-03	2.44E-02	1.07E-02	4.20	1.08E-02	2.15E-03	5.11
Skid Steer Loader	2.78E-02	7.50E-02	4.12E-03	3.99E-03	1.22E-04	7.53E-03	7.49E-03	0.08	1.66E-04	3.32E-05	0.10
Trackhoe	6.91E-01	1.73E+00	1.18E-01	1.15E-01	8.05E-03	9.77E-02	9.42E-02	25.14	6.37E-02	1.27E-02	30.54
Welding Machine	4.78E-01	9.93E-01	7.41E-02	7.19E-02	1.53E-03	1.25E-01	5.40E-02	12.30	2.41E-02	4.82E-03	14.34
Williams Tioga-Elkhorn Creek Total	**6.23E+00**	**8.65E+00**	**5.86E-01**	**5.68E-01**	**2.80E-02**	**8.71E-01**	**4.86E-01**	**134.83**	**3.35E-01**	**6.69E-02**	**163.14**
Burke, Montrail, and Williams County Information - Line Section 25 Loop Pipeline Segment											
Air Compressor	2.22E-01	5.74E-02	3.98E-03	3.81E-03	1.46E-04	1.31E-02	1.47E-03	0.12	1.27E-04	2.55E-05	0.13
ATV	9.71E-01	1.10E-02	2.24E-03	2.06E-03	3.73E-05	1.07E-01	5.25E-03	0.07	3.95E-04	7.90E-05	0.10
Tractors/loaders/backhoe	5.15E-02	1.04E-01	7.05E-03	6.84E-03	1.79E-04	9.59E-03	2.20E-03	0.12	2.39E-04	4.78E-05	0.14
Concrete Mixer Truck	2.73E-03	1.11E-02	5.90E-04	5.72E-04	2.19E-05	7.03E-04	2.98E-04	0.02	3.98E-05	7.97E-06	0.02
Crane, wheeled	6.28E-03	2.07E-02	9.73E-04	9.43E-04	6.21E-05	1.29E-03	5.80E-04	0.05	1.16E-04	2.32E-05	0.06
Dozers	1.58E-01	3.62E-01	2.70E-02	2.62E-02	1.29E-03	2.18E-02	9.81E-03	1.93	4.90E-03	9.80E-04	2.35
Dump Truck	2.82E-02	5.38E-02	6.22E-03	6.03E-03	1.12E-04	6.81E-03	2.90E-03	0.08	1.73E-04	3.45E-05	0.09
Generators	2.04E-01	8.30E-01	3.65E-02	3.54E-02	1.73E-03	2.35E-02	2.38E-02	3.71	9.53E-03	1.91E-03	4.52
Grader	4.74E-02	1.58E-01	1.21E-02	1.18E-02	8.19E-04	7.10E-03	3.19E-03	1.32	3.35E-03	6.69E-04	1.60
Guided Bore Machine	1.13E-01	4.51E-01	2.65E-02	2.57E-02	9.18E-04	2.84E-02	1.22E-02	1.31	3.35E-03	6.69E-04	1.59
Pickup Truck	1.16E-01	3.00E-01	2.28E-02	2.22E-02	1.01E-03	2.06E-02	2.03E-02	9.02	2.29E-02	4.57E-03	10.95
Sideboom	1.42E-01	5.49E-01	2.59E-02	2.51E-02	2.52E-03	3.42E-02	1.50E-02	5.88	1.51E-02	3.01E-03	7.15
Skid Steer Loader	3.55E-02	9.56E-02	1.66E-03	5.09E-03	1.55E-04	9.60E-03	4.38E-03	0.09	2.12E-04	4.23E-05	0.11
Trackhoe	5.88E-01	1.47E+00	1.01E-01	4.99E-02	6.85E-03	8.30E-02	3.65E-02	26.71	6.77E-02	1.35E-02	32.44
Welding Machine	1.99E-01	4.14E-01	3.09E-02	2.99E-02	6.38E-04	5.21E-02	2.25E-02	4.27	8.37E-03	1.67E-03	4.98
Line Section 25 Loop Total	**2.89E+00**	**4.88E+00**	**3.05E-01**	**2.51E-01**	**1.65E-02**	**4.19E-01**	**1.60E-01**	**54.69**	**1.36E-01**	**2.73E-02**	**66.24**
Williams County Information - Line Section 30 Loop Pipeline Segment											
Air Compressor	1.11E-01	2.87E-02	1.99E-03	1.90E-03	7.32E-05	6.55E-03	7.37E-04	0.06	6.37E-05	1.27E-05	0.07
ATV	8.32E-01	9.39E-03	1.92E-03	1.77E-03	3.19E-05	9.20E-02	4.50E-03	0.06	3.39E-04	6.77E-05	0.09
Tractors/loaders/backhoe	2.58E-02	5.19E-02	3.52E-03	3.42E-03	8.96E-05	4.79E-03	4.46E-03	0.06	1.20E-04	2.39E-05	0.07
Concrete Mixer Truck	2.73E-03	1.11E-02	5.90E-04	5.72E-04	2.19E-05	7.03E-04	6.55E-04	0.02	3.98E-05	7.97E-06	0.02
Crane, wheeled	5.02E-03	1.65E-02	7.78E-04	7.55E-04	4.97E-05	1.03E-03	1.01E-03	0.04	9.30E-05	1.86E-05	0.04
Dozers	1.05E-01	2.41E-01	1.80E-02	1.75E-02	8.59E-04	1.45E-02	1.43E-02	1.29	3.27E-03	6.53E-04	1.56
Dump Truck	1.41E-02	2.69E-02	3.11E-03	3.02E-03	5.60E-05	3.40E-03	3.19E-03	0.04	8.63E-05	1.73E-05	0.05
Generators	2.73E-01	1.11E+00	4.86E-02	4.72E-02	2.31E-03	3.13E-02	3.18E-02	3.30	8.47E-03	1.69E-03	4.02
Grader	5.67E-02	1.63E-01	1.15E-02	1.12E-02	1.24E-03	1.08E-02	9.92E-03	2.00	5.08E-03	1.02E-03	2.43
Guided Bore Machine	9.08E-03	3.62E-02	2.13E-03	2.07E-03	7.37E-05	2.28E-03	2.15E-03	0.05	1.34E-04	2.69E-05	0.06
Pickup Truck	1.93E-01	5.00E-01	3.81E-02	3.69E-02	1.68E-03	3.44E-02	3.38E-02	12.52	3.18E-02	6.35E-03	15.21
Sideboom	4.05E-02	1.57E-01	7.40E-03	7.17E-03	7.19E-04	9.78E-03	4.29E-03	1.12	2.87E-03	5.74E-04	1.36
Skid Steer Loader	1.89E-02	5.10E-02	2.80E-03	2.72E-03	8.29E-05	5.12E-03	5.09E-03	0.06	1.13E-04	2.26E-05	0.07
Trackhoe	3.53E-01	8.80E-01	6.04E-02	5.86E-02	4.11E-03	4.98E-02	4.81E-02	9.62	2.44E-02	4.88E-03	11.68
Welding Machine	7.97E-02	1.65E-01	1.23E-02	1.20E-02	2.55E-04	2.09E-02	9.00E-03	1.37	2.68E-03	5.35E-04	1.59
Line Section 30 Loop Total	**2.12E+00**	**3.45E+00**	**2.13E-01**	**2.07E-01**	**1.17E-02**	**2.87E-01**	**1.73E-01**	**31.60**	**7.95E-02**	**1.59E-02**	**38.33**

ERM

Project: North Bakken Expansion Project
Subject: Construction Emissions
Task: Off-Road Construction Equipment Emissions - Appendix C

Prepared by: PCB
Reviewed by: AMC
Date: 16-Oct-19

Williams County Information - Tioga Compressor Lateral Pipeline Segment											
Air Compressor	7.41E-02	1.91E-02	1.33E-03	1.27E-03	4.88E-05	4.36E-03	4.91E-04	0.04	4.25E-05	8.50E-06	0.04
ATV	5.87E-01	6.63E-03	1.36E-03	1.25E-03	2.25E-05	6.50E-02	3.17E-03	0.04	2.39E-04	4.78E-05	0.06
Tractors/loaders/backhoe	1.29E-02	2.59E-02	1.76E-03	1.71E-03	4.48E-05	2.40E-03	2.23E-03	0.03	5.98E-05	1.20E-05	0.04
Concrete Mixer Truck	2.73E-03	1.11E-02	5.90E-04	5.72E-04	2.19E-05	7.03E-04	6.55E-04	0.02	3.98E-05	7.97E-06	0.02
Crane, wheeled	5.02E-03	1.65E-02	7.78E-04	7.55E-04	4.97E-05	1.03E-03	1.01E-03	0.04	9.30E-05	1.86E-05	0.04
Dozers	2.64E-02	6.03E-02	4.50E-03	4.37E-03	2.15E-04	3.63E-03	3.58E-03	0.16	4.08E-04	8.17E-05	0.20
Generators	3.21E-02	1.30E-01	5.72E-03	5.55E-03	2.72E-04	3.69E-03	3.74E-03	0.19	4.98E-04	9.96E-05	0.24
Grader	2.83E-03	8.16E-03	5.76E-04	5.59E-04	6.21E-05	5.40E-04	4.96E-04	0.05	1.27E-04	2.54E-05	0.06
Guided Bore Machine	1.01E-03	4.03E-03	2.37E-04	2.30E-04	8.19E-06	2.54E-04	2.38E-04	0.01	1.49E-05	2.99E-06	0.01
Pickup Truck	6.83E-02	1.76E-01	1.34E-02	1.30E-02	5.94E-04	1.21E-02	1.19E-02	2.21	5.60E-03	1.12E-03	2.68
Sideboom	2.02E-02	7.85E-02	3.70E-03	3.59E-03	3.60E-04	4.89E-03	2.14E-03	0.28	7.17E-04	1.43E-04	0.34
Skid Steer Loader	1.34E-02	3.60E-02	1.98E-03	1.92E-03	5.85E-05	3.62E-03	3.60E-03	0.04	7.97E-05	1.59E-05	0.05
Trackhoe	1.66E-01	4.14E-01	2.84E-02	2.76E-02	1.93E-03	2.34E-02	2.26E-02	3.02	7.65E-03	1.53E-03	3.66
Welding Machine	3.99E-02	8.27E-02	6.17E-03	5.99E-03	1.28E-04	1.04E-02	4.50E-03	0.34	6.69E-04	1.34E-04	0.40
Tioga Compressor Lateral Total	**1.05E+00**	**1.07E+00**	**7.06E-02**	**6.84E-02**	**3.82E-03**	**1.36E-01**	**6.04E-02**	**6.46**	**1.62E-02**	**3.25E-03**	**7.84**
Burke County Information - Uprate Line Section 25 Pipeline Segment											
Air Compressor	7.41E-02	1.91E-02	1.33E-03	1.27E-03	4.88E-05	4.36E-03	4.91E-04	0.04	2.39E-04	8.50E-06	0.05
ATV	5.87E-01	6.63E-03	1.36E-03	1.25E-03	2.25E-05	6.50E-02	3.17E-03	0.04	5.98E-05	4.78E-05	0.06
Tractors/loaders/backhoe	1.29E-02	2.59E-02	1.76E-03	1.71E-03	4.48E-05	2.40E-03	1.01E-03	0.03	4.08E-04	1.20E-05	0.04
Dozers	2.64E-02	6.03E-02	4.50E-03	4.37E-03	2.15E-04	3.63E-03	1.63E-03	0.16	8.63E-05	8.17E-05	0.19
Dump Truck	1.41E-02	2.69E-02	3.11E-03	3.02E-03	5.60E-05	3.40E-03	1.45E-03	0.04	4.98E-04	1.73E-05	0.06
Generators	3.21E-02	1.30E-01	5.72E-03	5.55E-03	2.72E-04	3.69E-03	3.74E-03	0.19	1.49E-05	9.96E-05	0.22
Guided Bore Machine	1.01E-03	4.03E-03	2.37E-04	2.30E-04	8.22E-06	2.54E-04	1.09E-04	0.01	5.60E-03	2.99E-06	0.15
Pickup Truck	6.83E-02	1.76E-01	1.34E-02	1.30E-02	5.94E-04	1.21E-02	1.19E-02	2.21	7.97E-05	1.12E-03	2.55
Skid Steer Loader	1.34E-02	3.60E-02	1.98E-03	1.92E-03	5.85E-05	3.62E-03	1.65E-03	0.04	7.65E-03	1.59E-05	0.24
Trackhoe	1.66E-01	4.14E-01	2.84E-02	2.76E-02	1.93E-03	2.34E-02	1.03E-02	3.02	6.69E-04	1.53E-03	3.49
Welding Machine	3.99E-02	8.27E-02	6.17E-03	5.99E-03	1.28E-04	1.04E-02	4.50E-03	0.34	0.00E+00	1.34E-04	0.38
Uprate Line Section 25 Total	**1.04E+00**	**9.83E-01**	**6.80E-02**	**6.59E-02**	**3.38E-03**	**1.32E-01**	**4.00E-02**	**6.12**	**1.53E-02**	**3.07E-03**	**7.42**
McKenzie and Williams Information - Lake Sakakawea HDD											
Drill Rig	4.90E-01	1.71E+00	6.79E-02	6.59E-02	3.94E-03	1.03E-01	9.76E-02	5.59	1.43E-02	2.87E-03	6.81
Mudd Unit	2.05E-01	8.33E-01	3.66E-02	3.55E-02	1.74E-03	2.36E-02	2.39E-02	2.49	6.37E-03	1.27E-03	3.03
Cleaner	2.05E-01	8.33E-01	3.66E-02	3.55E-02	1.74E-03	2.36E-02	2.39E-02	2.49	6.37E-03	1.27E-03	3.03
Trackhoe	2.66E-02	8.53E-02	6.82E-03	6.61E-03	5.34E-04	3.98E-03	3.89E-03	0.87	2.20E-03	4.40E-04	1.05
Lake Sakakawea HDD Total	**9.27E-01**	**3.46E+00**	**1.48E-01**	**1.44E-01**	**7.95E-03**	**1.54E-01**	**1.49E-01**	**11.43**	**0.03**	**0.01**	**13.91**

Conversion Factors	
lb/ton	2,000
Global Warming Potential	
CO_2	1
CH_4	25
N_2O	298

Project: North Bakken Expansion Project
Subject: Construction Emissions
Task: On-Road Vehicle Information - Appendix 9C

Prepared by: PCB
Reviewed by: AMC
Date: 16-Oct-19

Equipment Type	Fuel	Quantity[1]	Total Days	Miles per Day[2]	Total Miles per Project	Fuel Usage	MOVES Emission Factors[3]									
							CO	NO_X	PM10	$PM_{2.5}$	SO_2	VOC	HAP	CO_2[4]	CH_4[5]	N_2O[5]
						MMBtu	(g/VMT)	(g/VMT)	(g/VMT)	(g/VMT)	(g/VMT)	(g/VMT)	(g/VMT)	(lb/MMBtu)	(kg/MMBtu)	(kg/MMBtu)
McKenzie County Information - Elkhorn Creek Compressor Station (new)																
Construction & Delivery/Removal Vehicles	Diesel	2	60	30	3,600	33	1.02	2.88	0.12	0.11	0.01	0.24	0.04	164.	3.00E-03	6.00E-04
Workers Commuter Vehicles	Gasoline	16	198	30	95,040	618	5.25	0.37	0.02	0.01	0.00	0.38	0.02	154.	3.00E-03	6.00E-04
Williams County Information - Tioga Compressor Station (existing)																
Construction & Delivery/Removal Vehicles	Diesel	2	60	20	2,400	22	1.04	2.89	0.12	0.11	0.01	0.24	0.04	164.	3.00E-03	6.00E-04
Workers Commuter Vehicles	Gasoline	17	198	20	67,320	438	5.37	0.38	0.02	0.02	0.00	0.40	0.03	154.	3.00E-03	6.00E-04
McKenzie County Information - Tioga-Elkhorn Creek Pipeline Segment South																
Construction & Delivery/Removal Vehicles	Diesel	2	156	36	11,232	103	1.04	2.89	0.12	0.11	0.01	0.24	0.04	164.	3.00E-03	6.00E-04
Piping Truck	Diesel	3	156	36	16,848	154	0.74	2.93	0.10	0.09	0.01	0.18	0.02	164.	3.00E-03	6.00E-04
Water Truck	Diesel	3	156	36	16,848	154	0.74	2.93	0.10	0.09	0.01	0.18	0.02	164.	3.00E-03	6.00E-04
Workers Commuter Vehicles	Gasoline	43	156	36	241,488	1,570	5.37	0.38	0.02	0.02	0.00	0.40	0.03	154.	3.00E-03	6.00E-04
Williams County Information - Tioga-Elkhorn Creek Pipeline Segment North Pipeline																
Construction & Delivery/Removal Vehicles	Diesel	2	156	25	7,800	71	1.04	2.89	0.12	0.11	0.01	0.24	0.04	164.	3.00E-03	6.00E-04
Piping Truck	Diesel	3	156	25	11,700	107	0.74	2.93	0.10	0.09	0.01	0.18	0.02	164.	3.00E-03	6.00E-04
Water Truck	Diesel	3	156	25	11,700	107	0.74	2.93	0.10	0.09	0.01	0.18	0.02	164.	3.00E-03	6.00E-04
Workers Commuter Vehicles	Gasoline	47	156	25	183,300	1,191	5.37	0.38	0.02	0.02	0.00	0.40	0.03	154.	3.00E-03	6.00E-04
Burke, Montrail, and Williams County Information - Line Section 25 Loop Pipeline Segment																
Construction & Delivery/Removal Vehicles	Diesel	2	99	10	1,989	18	1.04	2.89	0.12	0.11	0.01	0.24	0.04	164.	3.00E-03	6.00E-04
Piping Truck	Diesel	3	99	10	2,983	27	0.74	2.93	0.10	0.09	0.01	0.18	0.02	164.	3.00E-03	6.00E-04
Water Truck	Diesel	3	99	10	2,983	27	0.74	2.93	0.10	0.09	0.01	0.18	0.02	164.	3.00E-03	6.00E-04
Workers Commuter Vehicles	Gasoline	24	99	10	23,366	152	5.37	0.38	0.02	0.02	0.00	0.40	0.03	154.	3.00E-03	6.00E-04
Williams County Information - Line Section 30 Loop Pipeline Segment																
Construction & Delivery/Removal Vehicles	Diesel	2	99	5	994	9	1.04	2.89	0.12	0.11	0.01	0.24	0.04	164.	3.00E-03	6.00E-04
Piping Truck	Diesel	3	99	5	1,491	14	0.74	2.93	0.10	0.09	0.01	0.18	0.02	164.	3.00E-03	6.00E-04
Water Truck	Diesel	3	99	5	1,491	14	0.74	2.93	0.10	0.09	0.01	0.18	0.02	164.	3.00E-03	6.00E-04
Workers Commuter Vehicles	Gasoline	24	99	5	11,683	76	5.37	0.38	0.02	0.02	0.00	0.40	0.03	154.	3.00E-03	6.00E-04
Williams County Information - Tioga Compressor Lateral Pipeline Segment																
Construction & Delivery/Removal Vehicles	Diesel	2	75	1	75	1	1.04	2.89	0.12	0.11	0.01	0.24	0.04	164.	3.00E-03	6.00E-04
Piping Truck	Diesel	3	75	1	113	1	0.74	2.93	0.10	0.09	0.01	0.18	0.02	164.	3.00E-03	6.00E-04
Water Truck	Diesel	3	75	1	113	1	0.74	2.93	0.10	0.09	0.01	0.18	0.02	164.	3.00E-03	6.00E-04
Workers Commuter Vehicles	Gasoline	12	75	1	453	3	5.37	0.38	0.02	0.02	0.00	0.40	0.03	154.	3.00E-03	6.00E-04

Equipment Type	Fuel	Quantity[1]	Total Days	Miles per Day[2]	Total Miles per Project	Fuel Usage	MOVES Emission Factors[3]									
							CO	NO_X	PM10	$PM_{2.5}$	SO_2	VOC	HAP	CO_2[4]	CH_4[5]	N_2O[5]
						MMBtu	(g/VMT)	(g/VMT)	(g/VMT)	(g/VMT)	(g/VMT)	(g/VMT)	(g/VMT)	(lb/MMBtu)	(kg/MMBtu)	(kg/MMBtu)
Burke County Information - Uprate Line Section 25 Pipeline Segment																
Construction & Delivery/Removal Vehicles	Diesel	2	75	20	3,017	28	1.04	2.89	0.12	0.11	0.01	0.24	0.04	164.	3.00E-03	6.00E-04
Piping Truck	Diesel	3	75	20	4,526	41	0.74	2.93	0.10	0.09	0.01	0.18	0.02	164.	3.00E-03	6.00E-04
Water Truck	Diesel	3	75	20	4,526	41	0.74	2.93	0.10	0.09	0.01	0.18	0.02	164.	3.00E-03	6.00E-04
Workers Commuter Vehicles	Gasoline	12	75	20	18,103	118	5.37	0.38	0.02	0.02	0.00	0.40	0.03	154.	3.00E-03	6.00E-04
McKenzie and Williams County Information - Lake Sakawea HDD																
Construction & Delivery/Removal Vehicles	Diesel	2	129	30	7,766	71	1.02	2.88	0.12	0.11	0.01	0.24	0.04	164.	3.00E-03	6.00E-04
Workers Commuter Vehicles	Gasoline	15	129	30	56,301	366	5.25	0.37	0.02	0.01	0.00	0.38	0.02	154.	3.00E-03	6.00E-04

Conversion Factors	
construction & delivery vehicle, hp	400
piping truck hp	250
water truck hp	200
hp to gallon of diesel	55
Btu/gallon diesel[6]	137,000
construction & delivery vehicle, miles/gal	15
worker commuter vehicle, hp	150
hp to gallon of gasoline	49
commuter vehicles, miles/gal	20
Btu/gallon gasoline[6]	130,000
lb/kg	2.20
g/lb	453.59
lb/ton	2,000
Btu/hp-hour[7]	7,000
Btu/MMBtu	1,000,000

Notes

1 Commuter vehicle quantities estimated from workforce schedule, based on the average workforce throughout the project and assuming 2 workers per commuter vehicle.
2 Miles per day based on the average distance between the pipeline section and Watford City or Tioga, whichever was closer.
3 Emission factors based on EPA MOVES2014 Model for McKenzie County, ND.
.4 Emission Factor Comes from USEPA AP-42 Table 3.3-1
5 Emission Factor Comes from 40 CFR Part 98 Table C-.2, CH_4 3.0 10-2 kg/MMBtu, N_2O 6.0 x 10-4 kg/MMBtu.
6 Btu/gallon from USEPA AP-42 Appendix A Typical Parameters of Various Fuels.
7 Conversion from USEPA AP-42 Table 3.3-1 footnotes.

Project: North Bakken Expansion Project
Subject: Construction Emissions
Task: On-Road Vehicle Emissions - Appendix 9C

Prepared by: PCB
Reviewed by: AMC
Date: 16-Oct-19

Equipment Type	Emissions (Tons)										
	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC	HAP	CO_2	CH_4	N_2O	CO_2e
McKenzie County Information - Elkhorn Creek Compressor Station (new)											
Construction & Delivery/Removal Vehicles	4.06E-03	1.14E-02	4.82E-04	4.44E-04	4.64E-05	9.46E-04	1.54E-04	2.70	1.09E-04	2.17E-05	2.71
Workers Commuter Vehicles	5.50E-01	3.89E-02	1.69E-03	1.49E-03	2.92E-04	3.94E-02	2.53E-03	47.57	2.04E-03	4.09E-04	47.74
Elkhorn Creek Compressor Station Total	**5.54E-01**	**5.04E-02**	**2.17E-03**	**1.93E-03**	**3.38E-04**	**4.04E-02**	**2.69E-03**	**50.26**	**2.15E-03**	**4.30E-04**	**50.45**
Williams County Information - Tioga Compressor Station (existing)											
Construction & Delivery/Removal Vehicles	2.74E-03	7.66E-03	3.21E-04	2.96E-04	3.09E-05	6.39E-04	1.05E-04	1.80	7.25E-05	1.45E-05	1.80
Workers Commuter Vehicles	3.98E-01	2.79E-02	1.29E-03	1.14E-03	2.07E-04	2.94E-02	1.91E-03	33.69	1.45E-03	2.89E-04	33.82
Tioga Compressor Station Total	**4.01E-01**	**3.55E-02**	**1.61E-03**	**1.44E-03**	**2.38E-04**	**3.00E-02**	**2.01E-03**	**35.49**	**1.52E-03**	**3.04E-04**	**35.62**
Williams and McKenzie County Information - Tioga-Elkhorn Creek Pipeline Segment											
Construction & Delivery/Removal Vehicles	1.28E-02	3.58E-02	1.50E-03	1.38E-03	1.44E-04	2.99E-03	4.90E-04	8.41	3.39E-04	6.78E-05	8.44
Piping Truck	1.38E-02	5.44E-02	1.90E-03	1.75E-03	2.56E-04	3.26E-03	4.32E-04	12.62	5.09E-04	1.02E-04	12.66
Water Truck	1.38E-02	5.44E-02	1.90E-03	1.75E-03	2.56E-04	3.26E-03	4.32E-04	12.62	5.09E-04	1.02E-04	12.66
Workers Commuter Vehicles	1.43E+00	1.00E-01	4.63E-03	4.10E-03	7.42E-04	1.05E-01	6.84E-03	120.86	5.19E-03	1.04E-03	121.30
Tioga - Elkhorn Creek Total	**1.47E+00**	**2.45E-01**	**9.93E-03**	**8.97E-03**	**1.40E-03**	**1.15E-01**	**8.19E-03**	**154.51**	**6.55E-03**	**1.31E-03**	**155.07**
Burke, Montrail, and Williams County Information - Line Section 25 Loop Pipeline Segment											
Construction & Delivery/Removal Vehicles	8.91E-03	2.49E-02	1.04E-03	9.61E-04	1.00E-04	2.08E-03	3.40E-04	5.84	2.36E-04	4.71E-05	5.86
Piping Truck	9.58E-03	3.78E-02	1.32E-03	1.21E-03	1.78E-04	2.27E-03	3.00E-04	8.76	3.53E-04	7.07E-05	8.79
Water Truck	9.58E-03	3.78E-02	1.32E-03	1.21E-03	1.78E-04	2.27E-03	3.00E-04	8.76	3.53E-04	7.07E-05	8.79
Workers Commuter Vehicles	1.08E+00	7.59E-02	3.52E-03	3.11E-03	5.64E-04	8.00E-02	5.19E-03	91.74	3.94E-03	7.88E-04	92.07
Line Section 25 Loop Total	**1.11E+00**	**1.76E-01**	**7.19E-03**	**6.49E-03**	**1.02E-03**	**8.66E-02**	**6.13E-03**	**115.11**	**4.88E-03**	**9.76E-04**	**115.52**
Williams County Information - Line Section 30 Loop Pipeline Segment											
Construction & Delivery/Removal Vehicles	2.27E-03	6.34E-03	2.66E-04	2.45E-04	2.56E-05	5.30E-04	8.68E-05	1.49	6.01E-05	1.20E-05	1.49
Piping Truck	2.44E-03	9.63E-03	3.36E-04	3.09E-04	4.54E-05	5.78E-04	7.65E-05	2.23	9.01E-05	1.80E-05	2.24
Water Truck	2.44E-03	9.63E-03	3.36E-04	3.09E-04	4.54E-05	5.78E-04	7.65E-05	2.23	9.01E-05	1.80E-05	2.24
Workers Commuter Vehicles	1.38E-01	9.68E-03	4.48E-04	3.96E-04	7.18E-05	1.02E-02	6.62E-04	11.69	5.02E-04	1.00E-04	11.74
Line Section 30 Loop Total	**1.45E-01**	**3.53E-02**	**1.39E-03**	**1.26E-03**	**1.88E-04**	**1.19E-02**	**9.02E-04**	**17.65**	**7.42E-04**	**1.48E-04**	**17.71**
Williams County Information - Tioga Compressor Lateral Pipeline Segment											
Construction & Delivery/Removal Vehicles	1.14E-03	3.17E-03	1.33E-04	1.23E-04	1.28E-05	2.65E-04	4.34E-05	0.74	3.00E-05	6.01E-06	0.75
Piping Truck	1.22E-03	4.81E-03	1.68E-04	1.54E-04	2.27E-05	2.89E-04	3.83E-05	1.12	4.50E-05	9.01E-06	1.12
Water Truck	1.22E-03	4.81E-03	1.68E-04	1.54E-04	2.27E-05	2.89E-04	3.83E-05	1.12	4.50E-05	9.01E-06	1.12
Workers Commuter Vehicles	6.91E-02	4.84E-03	2.24E-04	1.98E-04	3.59E-05	5.10E-03	3.31E-04	5.85	2.51E-04	5.02E-05	5.87
Tioga Compressor Lateral Total	**7.27E-02**	**1.76E-02**	**6.93E-04**	**6.30E-04**	**9.41E-05**	**5.94E-03**	**4.51E-04**	**8.83**	**3.71E-04**	**7.42E-05**	**8.86**
Burke County Information - Uprate Line Section 25 Pipeline Segment											
Construction & Delivery/Removal Vehicles	8.62E-05	2.41E-04	1.01E-05	9.30E-06	9.70E-07	2.01E-05	3.29E-06	0.06	2.28E-06	4.56E-07	0.06
Piping Truck	9.27E-05	3.65E-04	1.27E-05	1.17E-05	1.72E-06	2.19E-05	2.90E-06	0.08	3.42E-06	6.83E-07	0.09
Water Truck	9.27E-05	3.65E-04	1.27E-05	1.17E-05	1.72E-06	2.19E-05	2.90E-06	0.08	3.42E-06	6.83E-07	0.09
Workers Commuter Vehicles	2.68E-03	1.87E-04	8.68E-06	7.68E-06	1.39E-06	1.97E-04	1.28E-05	0.23	9.73E-06	1.95E-06	0.23
Uprate Line Section 25	**2.95E-03**	**1.16E-03**	**4.43E-05**	**4.04E-05**	**5.81E-06**	**2.61E-04**	**2.19E-05**	**0.45**	**1.88E-05**	**3.77E-06**	**0.45**
McKenzie and Williams Information - Lake Sakakawea HDD											
Construction & Delivery/Removal Vehicles	3.45E-03	9.63E-03	4.04E-04	3.72E-04	3.88E-05	8.04E-04	1.32E-04	2.26	9.11E-05	1.82E-05	2.27
Workers Commuter Vehicles	3.71E-03	1.46E-02	5.10E-04	4.69E-04	6.89E-05	8.76E-04	1.16E-04	3.39	1.37E-04	2.73E-05	3.40
Lake Sakakawea HDD Total	**7.15E-03**	**2.42E-02**	**9.14E-04**	**8.41E-04**	**1.08E-04**	**1.68E-03**	**2.48E-04**	**5.65**	**2.28E-04**	**4.56E-05**	**5.67**

Conversion Factors	
g/lb	453.59
lb/kg	2.20
lb/ton	2,000
Global Warming Potential	
CO_2	1
CH_4	25
N_2O	298

ERM

Project: North Bakken Expansion Project
Subject: Construction Emissions
Task: Construction Activity Fugitive Dust Emissions - Appendix 9C

Prepared by: PCB
Reviewed by: AMC
Date: 16-Oct-19

	Elkhorn Creek Compressor Station	Tioga Compressor Station	Tioga-Elkhorn Creek Pipeline Segment	Line Section 25 Loop Pipeline Segment	Line Section 30 Loop Pipline Segment	Tioga Compressor Lateral Pipeline Segment	Uprate Line Section 25 Pipeline Segment	Lake Sakakawea HDD
Construction Activities	**McKenzie County**	**Williams County**	**McKenzie and Williams Counties**	**Burke, Montrail, and Williams Counties**	**Williams County**	**Williams County**	**Burke County**	**McKenzie and Williams Counties**
Assumptions:								
Approximate Pipeline Installation Length[1], ft	0	0	326,832	106,656	50,160	2,640	1,056	0
Approximate Pipeline Diameter, in	N/A	N/A	20	12	12	20	12	NA
Total Project Area, acres	10.80	8.70	797.50	212.70	97.10	4.70	15.10	7.81
Construction Start Date	Mar-21	Apr-21	May-21	May-21	May-21	May-21	May-21	May-21
Construction End Date	Oct-21	Oct-21	Nov-21	Aug-21	Aug-21	Jul-21	Jul-21	Oct-21
Construction Duration, days	198	198	156	99	99	75	75	129
$PM_{2.5}/PM_{10}$ Ratio[2] (construction and demolition)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
$PM_{2.5}/PM_{10}$ Ratio[2] (industrial wind erosion)	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Average Excavation Width at Surface, ft	NA	NA	23.00	22.33	22.33	23.00	22.33	NA
Average Excavation Width at Bottom of Trench, ft	NA	NA	3.00	2.33	2.33	3.00	2.33	NA
Average Excavation Depth, ft	NA	NA	6.00	5.25	5.25	6.00	5.25	NA
Soil Density, lb/cf	100	100	100	100	100	100	100	100
Excavation, tons	0	0	784,397	225,311	105,963	6,336	2,231	0
Backfilling, tons	0	0	748,745	221,122	103,993	6,048	2,189	0

Conversion Factors	
lb/ton	2000
in/ft	12
days/yr	365

Construction Emissions	Excavation		Backfilling		Windblown Dust			Total Emissions
	Emission Factor[3]	Emissions	Emission Factor[3]	Emissions	Emission Factor[3]	Control Efficiency[4]	Emissions	
	(lb/ton)	(Tons)	(lb/ton)	(Tons)	(ton/acre)	(%)	(Tons)	(Tons)
McKenzie County - Elkhorn Creek Compressor Station								
Construction Activity PM_{10} Emissions	0.058	0.00	0.012	0.00	0.38	69%	1.29	1.29
Construction Activity $PM_{2.5}$ Emissions	0.0058	0.00	0.0012	0.00	0.057	69%	0.19	0.19
Williams County - Tioga Compressor Station								
Construction Activity PM_{10} Emissions	0.058	0.00	0.012	0.00	0.38	69%	1.04	1.04
Construction Activity $PM_{2.5}$ Emissions	0.0058	0.00	0.0012	0.00	0.057	69%	0.16	0.16
McKenzie and Williams Counties - Tioga-Elkhorn Creek Pipeline Segment								
Construction Activity PM_{10} Emissions	0.058	22.75	0.012	4.49	0.38	69%	95.46	122.70
Construction Activity $PM_{2.5}$ Emissions	0.0058	2.27	0.0012	0.45	0.057	69%	14.32	17.04
Burke, Montrail, and Williams Counties - Line Section 25 Loop Pipeline Segment								
Construction Activity PM_{10} Emissions	0.058	6.53	0.012	1.33	0.38	69%	25.46	33.32
Construction Activity $PM_{2.5}$ Emissions	0.0058	0.65	0.0012	0.13	0.057	69%	3.82	4.61
Williams County - Line Section 30 Loop Pipline Segment								
Construction Activity PM_{10} Emissions	0.058	3.07	0.012	0.62	0.38	69%	11.62	15.32
Construction Activity $PM_{2.5}$ Emissions	0.0058	0.31	0.0012	0.06	0.057	69%	1.74	2.11
Williams County - Tioga Compressor Lateral Pipeline Segment								
Construction Activity PM_{10} Emissions	0.058	0.18	0.012	0.04	0.38	69%	0.56	0.78
Construction Activity $PM_{2.5}$ Emissions	0.0058	0.02	0.0012	0.00	0.057	69%	0.08	0.11
Burke County - Uprate Line Section 25 Pipeline Segment								
Construction Activity PM_{10} Emissions	0.058	0.06	0.012	0.01	0.38	69%	1.81	1.89
Construction Activity $PM_{2.5}$ Emissions	0.0058	0.01	0.0012	0.00	0.057	69%	0.27	0.28
McKenzie and Williams Counties - Lake Sakakawea HDD								
Construction Activity PM_{10} Emissions	0.058	0.00	0.012	0.00	0.38	69%	0.93	0.93
Construction Activity $PM_{2.5}$ Emissions	0.0058	0.00	0.0012	0.00	0.057	69%	0.14	0.14

1 The pipeline length as measured.
2 $PM_{2.5}/PM_{10}$ ratios based on USEPA AP-42 Chapter 13.2.2 Background Document for Revisions to Fine Fraction Ratios Used for USEPA AP-42 Fugitive Dust Emission Factors, Table 1, November 2006.
3 Emission factors are based on topsoil removal, overburden replacement and wind erosion assuming $TSP=PM_{10}$, USEPA AP-42 Chapter 11.9 Western Surface Coal Mining, Table 11.9-4, October 1998.
4 Control efficiency based on project measures to minimize dust utilizing water truck to dampen the material handling and storage locations under dry-dusty conditions, "Control of Open Fugitive Dust Sources", USEPA EPA-450/3-38-008, Section 5.3.2.1, September 1988.

Project: North Bakken Expansion Project
Subject: Construction Emissions
Task: Unpaved Roadway Fugitive Dust Emissions - Appendix 9C

Prepared by: PCB
Reviewed by: AMC
Date: 16-Oct-19

Equipment Type	Average Vehicle Weight (tons)	Quantity[1]	Total Days[2]	Unpaved Access Road Round Trip (Miles)[3]	Total Miles per Project	PM_{10} Emission Factor (lb/VMT)	$PM_{2.5}$ Emission Factor (lb/VMT)	PM_{10} Uncontrolled Emissions (Tons)	PM_{10} Controlled Emissions[4] (Tons)	$PM_{2.5}$ Uncontrolled Emissions (Tons)	$PM_{2.5}$ Controlled Emissions[4] (Tons)
McKenzie County Information - Elkhorn Creek Compressor Station (new) (no travel on unpaved roads)											
2 Ton Flat Beds	2.0	1	44	0	0	0.69	0.07	0.00	0.00	0.00	0.00
Crane Trucks	20.0	1	21	0	0	1.95	0.19	0.00	0.00	0.00	0.00
Pickup Trucks	0.5	16	198	0	0	0.37	0.04	0.00	0.00	0.00	0.00
Dump Trucks	25.0	2	41	0	0	2.15	0.22	0.00	0.00	0.00	0.00
TDW[5] Trucks	1.0	2	39	0	0	0.51	0.05	0.00	0.00	0.00	0.00
Tractor Trailers	25.0	4	115	0	0	2.15	0.22	0.00	0.00	0.00	0.00
							Elkhorn Creek Compressor Station Total	**0.00**	**0.00**	**0.00**	**0.00**
Williams County Information - Tioga Compressor Station (existing) (no travel on unpaved roads)											
2 Ton Flat Beds	2.0	1	44	0	0	0.69	0.07	0.00	0.00	0.00	0.00
Crane Trucks	20.0	1	21	0	0	1.95	0.19	0.00	0.00	0.00	0.00
Pickup Trucks	0.5	17	198	0	0	0.37	0.04	0.00	0.00	0.00	0.00
Dump Trucks	25.0	2	41	0	0	2.15	0.22	0.00	0.00	0.00	0.00
TDW[5] Trucks	1.0	2	39	0	0	0.51	0.05	0.00	0.00	0.00	0.00
Tractor Trailers	25.0	4	115	0	0	2.15	0.22	0.00	0.00	0.00	0.00
							Tioga Compressor Station Total	**0.00**	**0.00**	**0.00**	**0.00**
Williams and McKenzie County Information - Tioga-Elkhorn Creek Pipeline Segment											
2 Ton Flat Beds	2.0	1	35	19.9	698	0.69	0.07	0.24	0.08	0.02	0.01
Crane Trucks	20.0	1	17	19.9	339	1.95	0.19	0.33	0.10	0.03	0.01
Pickup Trucks	0.5	90	156	19.9	279,939	0.37	0.04	51.79	16.31	5.18	1.63
Dump Trucks	25.0	2	32	19.9	1,276	2.15	0.22	1.37	0.43	0.14	0.04
TDW[5] Trucks	1.0	2	30	19.9	1,196	0.51	0.05	0.30	0.10	0.03	0.01
Tractor Trailers	25.0	4	90	19.9	7,178	2.15	0.22	7.72	2.43	0.77	0.24
							Tioga - Elkhorn Creek Total	**61.75**	**19.45**	**6.18**	**1.95**
Burke, Montrail, and Williams County Information - Line Section 25 Loop Pipeline Segment											
2 Ton Flat Beds	2.0	1	22	14.7	323	0.69	0.07	0.11	0.04	0.01	0.00
Crane Trucks	20.0	1	11	14.7	162	1.95	0.19	0.16	0.05	0.02	0.00
Pickup Trucks	0.5	24	99	14.7	34,176	0.37	0.04	6.32	1.99	0.63	0.20
Dump Trucks	25.0	2	21	14.7	617	2.15	0.22	0.66	0.21	0.07	0.02
TDW[5] Trucks	1.0	2	19	14.7	558	0.51	0.05	0.14	0.04	0.01	0.00
Tractor Trailers	25.0	4	57	14.7	3,349	2.15	0.22	3.60	1.13	0.36	0.11
							Line Section 25 Loop Total	**11.00**	**3.46**	**1.10**	**0.35**
Williams County Information - Line Section 30 Loop Pipeline Segment											
2 Ton Flat Beds	2.0	1	22	1.1	25	0.69	0.07	0.01	0.00	0.00	0.00
Crane Trucks	20.0	1	11	1.1	12	1.95	0.19	0.01	0.00	0.00	0.00
Pickup Trucks	0.5	24	99	1.1	2,631	0.37	0.04	0.49	0.15	0.05	0.02
Dump Trucks	25.0	2	21	1.1	47	2.15	0.22	0.05	0.02	0.01	0.00
TDW[5] Trucks	1.0	2	19	1.1	43	0.51	0.05	0.01	0.00	0.00	0.00
Tractor Trailers	25.0	4	57	1.1	258	2.15	0.22	0.28	0.09	0.03	0.01
							Line Section 30 Loop Total	**0.85**	**0.27**	**0.08**	**0.03**

Equipment Type	Average Vehicle Weight (tons)	Quantity[1]	Total Days[2]	Unpaved Access Road Round Trip (Miles)[3]	Total Miles per Project	PM_{10} Emission Factor (lb/VMT)	$PM_{2.5}$ Emission Factor (lb/VMT)	PM_{10} Uncontrolled Emissions (Tons)	PM_{10} Controlled Emissions[4] (Tons)	$PM_{2.5}$ Uncontrolled Emissions (Tons)	$PM_{2.5}$ Controlled Emissions[4] (Tons)
Williams County Information - Tioga Compressor Lateral Pipeline Segment											
2 Ton Flat Beds	2.0	1	17	0.1	1	0.69	0.07	0.00	0.00	0.00	0.00
Crane Trucks	20.0	1	8	0.1	1	1.95	0.19	0.00	0.00	0.00	0.00
Pickup Trucks	0.5	12	75	0.1	72	0.37	0.04	0.01	0.00	0.00	0.00
Dump Trucks	25.0	2	16	0.1	3	2.15	0.22	0.00	0.00	0.00	0.00
TDW[5] Trucks	1.0	2	15	0.1	2	0.51	0.05	0.00	0.00	0.00	0.00
Tractor Trailers	25.0	4	43	0.1	14	2.15	0.22	0.01	0.00	0.00	0.00
							Tioga Compressor Lateral Total	**0.03**	**0.01**	**0.00**	**0.00**
Burke County Information - Uprate Line Section 25 Pipeline Segment											
2 Ton Flat Beds	2.0	1	17	0.9	15	0.69	0.07	0.01	0.00	0.00	0.00
Crane Trucks	20.0	1	8	0.9	7	1.95	0.19	0.01	0.00	0.00	0.00
Pickup Trucks	0.5	12	75	0.9	800	0.37	0.04	0.15	0.05	0.01	0.00
Dump Trucks	25.0	2	16	0.9	28	2.15	0.22	0.03	0.01	0.00	0.00
TDW[5] Trucks	1.0	2	15	0.9	27	0.51	0.05	0.01	0.00	0.00	0.00
Tractor Trailers	25.0	4	43	0.9	153	2.15	0.22	0.16	0.05	0.02	0.01
							Uprate Line Section 25	**0.36**	**0.11**	**0.04**	**0.01**
McKenzie and Williams Counties Information - Lake Sakakawea HDD (no travel on unpaved roads)											
2 Ton Flat Beds	2.0	1	28	0	0	0.69	0.07	0.00	0.00	0.00	0.00
Crane Trucks	20.0	1	14	0	0	1.95	0.19	0.00	0.00	0.00	0.00
Pickup Trucks	0.5	15	126	0	0	0.37	0.04	0.00	0.00	0.00	0.00
Dump Trucks	25.0	2	26	0	0	2.15	0.22	0.00	0.00	0.00	0.00
TDW[5] Trucks	1.0	2	25	0	0	0.51	0.05	0.00	0.00	0.00	0.00
Tractor Trailers	25.0	4	73	0	0	2.15	0.22	0.00	0.00	0.00	0.00
							Lake Sakakawea HDD Total	**0.00**	**0.00**	**0.00**	**0.00**

Emission Factor Equation[6]	
E = k * (s/12)^a * (W/3)^b * [(365-P)/365]	
Constant, k (PM_{10})[7], lb/VMT	1.5
Constant, k ($PM_{2.5}$)[7], lb/VMT	0.15
Silt Content of Road Surface[8], s, %	8.5
Empirical Constant[7], a	0.9
Mean Vehicle Weight, W, tons	---
Empirical Constant[4], b	0.45
Number of Wet Days (≥0.01" precip)[9], P	90

Conversion Factors	
lb/ton	2,000

1 Vehicle quantities estimated from a similar pipeline project. Pickup truck quantities estimated from workforce schedule, based on the average workforce throughout the project and assuming 2 workers per vehicle.

2 Total days estimated from a similar pipeline project, adjusted for the total expected working days for each project segment.

3 TWD - Two wheel drive.

4 Unpaved access road length for Tioga-Elkhorn Creek is 10.0 miles, Line Section 25 is 7.3 miles, Line Section 30 is 0.6 miles, Tioga Plant Lateral is 0.04 miles, and Norse Loop uprate is 0.4 miles. Elkhorn Creek Compressor Station, Tioga Compressor Station, and Lake Sakakawea HDD have no unpaved access roads.

5 Control efficiency based on project measures to minimize dust utilizing water truck to dampen the ROW under dry-dusty conditions, "Control of Open Fugitive Dust Sources", EPA-450/3-38-008, Section 5.3.1.1, September 1988.

6 Emission factor equation based on industrial sites from AP-42 Chapter 13.2.2 Unpaved Roads, Equations 1a and 2, November 2006.

Equipment Type	Average Vehicle Weight (tons)	Quantity[1]	Total Days[2]	Unpaved Access Road Round Trip (Miles)[3]	Total Miles per Project	PM_{10} Emission Factor (lb/VMT)	$PM_{2.5}$ Emission Factor (lb/VMT)	PM_{10} Uncontrolled Emissions (Tons)	PM_{10} Controlled Emissions[4] (Tons)	$PM_{2.5}$ Uncontrolled Emissions (Tons)	$PM_{2.5}$ Controlled Emissions[4] (Tons)

7 Constant based on industrial roads from AP-42 Chapter 13.2.2 Unpaved Roads, Table 13.2.2-2, November 2006.

8 Silt content based on construction sites from AP-42 Chapter 13.2.2 Unpaved Roads, Table 13.2.2-1, November 2006.

9 Number of wet days based on site location from AP-42 Chapter 13.2.2 Unpaved Roads, Figure 13.2.2-1, November 2006.

NORTH BAKKEN EXPANSION PROJECT

Resource Report 9

APPENDIX 9D
Pipeline Operational Emission Calculations

ERM The business of sustainability

Facility Name: WBI Pipeline
Subject: Pipeline Operating Emission Calculations
Task: Pipeline Operating Emissions Summary - Appendix 9D

Prepared: AMC
Reviewed: LK
Date: 17-Jan-20

Emission Unit	Pollutant (TPY[1])									
	NO_X	CO	VOC	PM	PM_{10}	$PM_{2.5}$	SO_2	Lead	Total HAPs	CO_2e
Pigging[2]	NA	NA	75.87	NA	NA	NA	NA	---	1.78E-02	18,542
Pipeline Length (fugitive leaks)	---	---	NA	---	---	---	---	---	NA	106
Above Ground Facilities (not including compressor stations) (fugitive leaks)	---	---	8.83	---	---	---	---	---	2.08E-03	2,159
Total Pipeline Operating Emissions:	**NA**	**NA**	**84.71**	**NA**	**NA**	**NA**	**NA**	**NA**	**1.99E-02**	**20,807**

[1] TPY - Tons Per Year

[2]These are the pigging emissions that occur not at compressor station. The pigging emissions that occur at the compressor stations are permitted with the compressor stations. Pigging occurs every 5 to 10 years depending on the pipline segment. Worst-case is that all pigging occurs in the same year and that is what is shown in the summary table. Actual pipeline maintenance would not have all the pigging occurring in the same year.

NA -Not Applicable

ERM The business of sustainability

Facility Name: WBI
Subject: Pipeline Operating Emission Calculations
Task: Pipeline Pigging Emissions - Appendix D

All other pipeline pigging emissions occur at the compressor stations.

Prepared: AMC
Reviewed: LK
Date: 17-Jan-20

Pigging	
Gas Analysis:	
VOC Weight Percent[1], %	5.53%
CH_4 Weight Percent[2], %	53.93%
CO_2 Weight Percent[3].%	2.568%
HAP Weight Percent[4], %	0.001%
Specific Gravity from Gas Analysis	0.719
Gas Weight, lb/scf	0.058
Conversion Factors:	
specific gravity of air	1
weight of scf air, lb/scf	0.0807
lb/ton	2,000
lb/kg	2.204
hours per year	8,760
CO_2 to CO_2e	1
CH_4 to CO_2e	25
N_2O to CO_2e	298

			Pollutant (Tons per Event)					
Pigging Identification	**Frequency (years)**	**MMSCF/ Event**	**VOC**	**HAP**	**CO_2e**	**CO_2**	**CH_4**	**N_2O**
Tioga-Elkhorn Creek, 104th Avenue NW, (MP 6.1)	10	38.0	60.96	0.014	14,896	28.31	595	0.00
Line Section 25 Loop, Norse Transfer Station, (MP 20.4)	10	3.25	5.21	0.001	1,274	2.42	51	0.00
Line Section 30 Loop, Nesson Valve Setting, (MP 0.0)	10	2.20	3.53	0.001	862	1.64	34	0.00
Tioga Compressor Lateral, Tioga Plant Receipt Station, (MP 0.0)	5	0.15	0.24	0.000	59	0.11	2	0.00
Uprate Line Section 25, Norse Transfer Station	10	1.4	2.25	0.001	549	1.04	22	0.00
Uprate Line Section 25, Lignite Border Station	10	1.4	2.25	0.001	549	1.04	22	0.00
Uprate Line Section 25, Norse Transfer Station	10	0.9	1.44	0.000	353	0.67	14	0.00
Total			**75.87**	**0.02**	**18,542**	**35.24**	**740.26**	**0.00**

Worst-case emissions occur when pigging happens in a particular year.

[1]Weight percent of VOC taken from WBI Energy gas analysis and excludes methane and ethane hydrocarbons.
[2]Weight percent of methane taken from WBI Energy gas analysis.
[3]Weight percent of carbon dioxide taken from WBI Energy gas analysis.
[4]Weight percent of total HAPS is the weight percent of C6 from the WBI Energy gas analysis. This is a conservative estimate of HAPs.
[5]Blowdown quantities provided by WBI Energy.

ERM *The business of sustainability*

Facility Name: WBI
Subject: Pipeline Operating Emission Calculations
Task: Pipeline Fugitive Emissions Based on Length - Appendix D

Prepared: AMC
Reviewed: LK
Date: 17-Jan-20

Pipeline	
Assumptions:	
Pipeline Length, miles	92.20
Protected Steel Factor, scf/methane-hr-mile	0.35
Pounds of CH_4 per scf	0.03
Conversion Factors:	
lb/ton	2,000
hours per year	8,760
CH_4 to CO_2e	25

CH_4 (tons/year)	**CO_2e (tons/year)**
4.24	106.01

Pipelines have some losses due to leaks across the length of line. To calculate the losses, the methodology contained in 40 CFR Part 98 Subpart W was used. The emission calculations, which depend on the pipeline material and the length of pipe, use the factors contained in table W-7 to Subpart W of Part 98 – Default Methane Emission Factors for Natural Gas Distribution Mains.

ERM The business of sustainability

Facility Name: WBI Pipeline
Subject: Pipeline Operating Emission Calculations
Task: Fugitive Emissions Equipment Leaks at above Ground Facilities (Meter Stations, Interconnects, Transfer Stations, and Receipt Stations) - Appendix D

Prepared: AMC
Reviewed: PCB
Date: 17-Jan-20

Fugitive Emissions Leaks	
Assumptions:	
Hours of Operation	8,760
Gas Analysis:	
VOC Weight Percent[1], %	5.53%
CH_4 Weight Percent[2], %	53.93%
CO_2 Weight Percent[3].%	2.568%
HAP Weight Percent[4], %	0.001%
Specific Gravity from Gas Analysis	0.719
Gas Weight, lb/scf	0.058
Conversion Factors:	
specific gravity of air	1
weight of scf air, lb/scf	0.0807
lb/ton	2,000
lb/kg	2.204
hours per year	8,760
CO_2 to CO_2e	1
CH_4 to CO_2e	25
N_2O to CO_2e	298

Component	Product	Component Count[5]	20% Buffer to Accommodate any Changes	Emission Factor[6] (scf/comp-hr)	Emission Rate (scf/hr)	Emission Rate (lbs/hr)
Lignite Plant Receipt Station						
Connector	Gas	1,250	1,500	0.02	25.50	1.480
Flanges	Gas	incl. with connectors	incl. with connectors	--	--	--
Valve	Gas	350	420	0.12	50.82	2.950
Other	Gas	2	2	0.02	0.04	0.002
Open Ended Line	Gas	175	210	0.03	6.51	0.378
Pressure Relief Valve	Gas	30	36	0.19	6.95	0.403
				Lignite Plant Receipt Station Total	89.82	5.21
Norse Plant Receipt Station						
Connector	Gas	1,250	1,500	0.02	25.50	1.480
Flanges	Gas	incl. with connectors	incl. with connectors	--	--	--
Valve	Gas	350	420	0.12	50.82	2.950
Other	Gas	2	2	0.02	0.04	0.002
Open Ended Line	Gas	175	210	0.03	6.51	0.378
Pressure Relief Valve	Gas	30	36	0.19	6.95	0.403
				Norse Plant Receipt Station Total	89.82	5.21
Norse Transfer Station						
Connector	Gas	1,250	1,500	0.02	25.50	1.480
Flanges	Gas	incl. with connectors	incl. with connectors	--	--	--
Valve	Gas	350	420	0.12	50.82	2.950
Other	Gas	2	2	0.02	0.04	0.002
Open Ended Line	Gas	175	210	0.03	6.51	0.378
Pressure Relief Valve	Gas	30	36	0.19	6.95	0.403
				Norse Transfer Station Total	89.82	5.21
Northern Border Interconnect						
Connector	Gas	1,250	1,500	0.02	25.50	1.480
Flanges	Gas	incl. with connectors	incl. with connectors	--	--	--
Valve	Gas	350	420	0.12	50.82	2.950
Other	Gas	2	2	0.02	0.04	0.002
Open Ended Line	Gas	175	210	0.03	6.51	0.378
Pressure Relief Valve	Gas	30	36	0.19	6.95	0.403
				Northern Border Interconnect Total	89.82	5.21

ERM The business of sustainability

Facility Name: WBI Pipeline
Subject: Pipeline Operating Emission Calculations
Task: Fugitive Emissions Equipment Leaks at above Ground Facilities (Meter Stations, Interconnects, Transfer Stations, and Receipt Stations) - Appendix D

Prepared: AMC
Reviewed: PCB
Date: 17-Jan-20

Pollutant	Hourly Emissions (lb/hr)	Annual Emissions (TPY)
NO_X	---	---
CO	---	---
VOC	2.02	8.83
PM	---	---
PM_{10}	---	---
$PM_{2.5}$	---	---
SO_2	---	---
HAP	0.0005	0.0021
CO_2e	493	2,159
CO_2	0.94	4.10
CH_4	19.68	86.20
N_2O	---	---

Robinson Lake Plant Receipt Station						
Connector	Gas	1,250	1,500	0.02	25.50	1.480
Flanges	Gas	incl. with connectors	incl. with connectors	--	--	--
Valve	Gas	350	420	0.12	50.82	2.950
Other	Gas	2	2	0.02	0.04	0.002
Open Ended Line	Gas	175	210	0.03	6.51	0.378
Pressure Relief Valve	Gas	30	36	0.19	6.95	0.403
Robinson Lake Plant Receipt Station Total					89.82	5.21
Springbrook Plant Receipt Station						
Connector	Gas	1,250	1,500	0.02	25.50	1.480
Flanges	Gas	incl. with connectors	incl. with connectors	--	--	--
Valve	Gas	350	420	0.12	50.82	2.950
Other	Gas	2	2	0.02	0.04	0.002
Open Ended Line	Gas	175	210	0.03	6.51	0.378
Pressure Relief Valve	Gas	30	36	0.19	6.95	0.403
Springbrook Plant Receipt Station Total					89.82	5.21
Tioga Plant Receipt Station						
Connector	Gas	1,250	1,500	0.02	25.50	1.480
Flanges	Gas	incl. with connectors	incl. with connectors	--	--	--
Valve	Gas	350	420	0.12	50.82	2.950
Other	Gas	2	2	0.02	0.04	0.002
Open Ended Line	Gas	175	210	0.03	6.51	0.378
Pressure Relief Valve	Gas	30	36	0.19	6.95	0.403
Tioga Plant Receipt Station Total					89.82	5.21
Total					**628.73**	**36.49**

[1] Weight percent of VOC taken from WBI gas analysis and excludes methane and ethane hydrocarbons.

[2] Weight percent of methane taken from WBI gas analysis.

[3] Weight percent of carbon dioxide taken from WBI gas analysis.

[4] Weight percent of total HAPS is the weight percent of C6 from the WBI gas analysis. This is a conservative estimate of HAPs.

[5] Component estimated from a similar facility and buffer was applied for conservatism in the estimate.

[6] Emission factors obtained from 40 CFR 98 Subpart W Table W-1A for Western U.S. Service Components:

https://www.ecfr.gov/cgi-bin/text-idx?SID=145a39a5af564132eeb6a8489d675324&mc=true&node=ap40.23.98_1238.1&rgn=div9

NORTH BAKKEN EXPANSION PROJECT

Resource Report 9

APPENDIX 9E
AIR DISPERSION MODELING REPORTS

Air Dispersion Modeling Report

Tioga Compressor Station

AIR QUALITY IMPACTS

WBI Energy Transmission, Inc. (WBI) currently owns and operates a compressor station in Tioga, North Dakota (ND). The existing Tioga Compressor Station (the Station) as-built consists of one (1) electric compressor engine. WBI is proposing to construct six (6) new compressor engines and one (1) natural gas-fired generator at the Station. Air dispersion modeling analyses were conducted pursuant to guidance contained in the Federal Energy Regulatory Commission (FERC) Guidance Manual for Environmental Report Preparation for Applications filed under the Natural Gas Act, Volume I, February 2017 (FERC, 2017). These analyses were performed to predict 1-hour and 8-hour carbon monoxide (CO), 1-hour and Annual nitrogen dioxide (NO_2), 1-hour sulfur dioxide (SO_2), 24-hour particulate matter less than or equal to 10 microns in aerodynamic diameter (PM_{10}), and 24-hour and Annual particulate matter less than or equal to 2.5 microns in aerodynamic diameter ($PM_{2.5}$) impacts from the applicable facility sources to compare to the National Ambient Air Quality Standard (NAAQS) thresholds.

Detailed facility emission calculations are included with the air permit application for the Tioga Compressor Station in Appendix 9B.

DESCRIPTION OF THE AIR QUALITY DISPERSION MODEL

The modeling was performed using the American Meteorological Society/ Environmental Protection Agency Regulatory Model (AERMOD), version 19191. AERMOD is a US EPA-approved, steady state Gaussian plume model approved for industrial sources and capable of modeling multiple sources in simple and complex terrain. Regulatory default options were used in the analysis.

RECEPTOR GRID

To ensure that the area of maximum effects was accurately sampled, a multi-tier receptor grid extending out to 15 kilometers (km) was used in the model. The configuration of receptor points was as follows:

- 25-meter (m) spacing along the facility fence/property line;
- 50-m spacing from the fence/property line to 500 m;
- 100-m spacing from 500 m to 2 km;
- 250-m spacing from 2 km to 5 km; and

- 500-m spacing from 5 km to 15 km.

Public access at the facility will be impeded by fencing and gates.

TERRAIN

Terrain heights were generated using publicly available ground elevation data from the United States Geological Survey (USGS) National Elevation Data (NED) data set (USGS 2017). The USGS terrain data selected has 1/3 arcsecond (10-meter) grid spacing to provide sufficient spatial resolution of terrain features. These data were processed for use in AERMOD using the AERMAP (version 18081) processor program. To process the data, a selection of rural or urban land use is required. Urban land use, in the context of the AERMAP analysis, is applicable to city centers and industrial areas that are characterized by multi-story buildings and large areas of land covered with impermeable surfaces such as concrete or asphalt. Rural land use is appropriate for areas ranging from suburban areas predominantly characterized by single family homes, moderately populated rural residential areas, and other areas with land use areas with a mix of vegetative cover and moderate development. Rural land use was selected due to Tioga Compressor Station's location in an area that fits the rural land use definition; the station will not be located in an urban population center.

METEOROLOGY

EPA air quality modeling guidance recommends the use of one year of onsite meteorological data or five years of representative off-site data. Since onsite data were not available for the Station, meteorological data from the National Weather Service (NWS) was used in this analysis.

Using the recommended 5 consecutive years (2009-2013) of surface hourly observations from Williston Airport, ND (KISN, WBAN: 94014), along with concurrent twice-daily radiosonde observations from Glasgow Airport, Montana(MT) (GGW, WBAN 94008), the AERMOD-ready meteorological data sets were developed.

Surface Data

Williston Airport is located at latitude 48.195° N, longitude 103.642° W, and elevation 580.6 meters above mean sea level. The station was commissioned as an Automated Surface Observing System (ASOS) station on April 1, 1996. The anemometer height is 10 meters above ground level. The 2009-2013 surface data KISN were provided by the North Dakota Department of Environmental Quality (NDDEQ) in CD144 format. The data is archived in Central Standard Time (GMT-6).

Data for the entire modeling period (43484 hours) was processed with AERMET stage 1 to assess the data coverage for the following meteorological variables:

Cloud cover	99.95%
Temperature	99.69%
Winds	99.30% (without sub-hourly winds)
Calm	16.81% (without sub-hourly winds)

To improve the wind observation coverage and better resolve the light wind conditions, 1- and 5-minute wind observations were included into the data processing stream in AERMET – stage 2. The 1-minute observations for use with AERMINUTE are provided by NCEI[1] and represent the 2-minute averages of 6-second observations assigned to the ending minute. Five-minute wind observations were added to complete the sub-hourly data set, specifically needed in for the months June to December 2013. KISN was equipped with a sonic anemometer on 04/01/2007, therefore the sub-hourly wind observations were fully incorporated in the entire modeling period.
After incorporating the sub-hourly wind observations the wind data coverage increased to 99.93% and the fraction of calm hours decreased 1.75%.

Upper Air Data

Twice-daily upper air observations from Glasgow, MT airport were provided by NDDEQ in FSL format. The GGW station is located at 48.214° N, 106.621° W and identified with WBAN 94008.

[1] ftp://ftp.ncdc.noaa.gov/pub/data/asos-onemin/, ftp://ftp.ncdc.noaa.gov/pub/data/asos-fivemin/

The data was processed with time shift of 6 hours to match the time zone of the surface station (GMT-6). Data coverage by level was reported by AERMET as follows:

LEVEL	Temperature	Wind
SURFACE	99.51%	95.16%
0.0 – 0.5 km	99.93%	22.98%
0.5 – 1.0 km	100.00%	40.28%
1.0 – 1.5 km	100.00%	0.00%
1.5 – 2.0 km	100.00%	0.00%
2.0 – 2.5 km	100.00%	38.70%
2.5 – 3.0 km	99.98%	0.61%
3.0 – 3.5 km	99.91%	0.00%
3.5 – 4.0 km	99.70%	0.00%
> 4.0 km	95.74%	21.81%

A total of 3 missing afternoon soundings were found within the modeling period – 07.Jan.2010, 16.May.2010 and 25.Aug.2013. The gaps were not filled.

Surface Parameters

Surface parameters - albedo, Bowen ratio, and surface roughness length - are needed input for dispersion calculations. These parameters are based on the land-use features and moisture conditions, and experience seasonal variations. They are calculated as part of the hourly meteorological data processing with AERSURFACE and AERMET – Stage 3.

The surface parameters for this application were calculated using AERSURFACE version. The land-use map is part of the 1992 Nationals Land Cover Data (NLCD) state-wide archive, provided by United States Geological Survey (USGS), and has 30-meter resolution. AERSURFACE was processed with options recommended by NDDEQ[2]:

Radius of study area used for surface roughness: 1.0 km
Define the surface roughness length for multiple sectors? Yes
Number of sectors: 12
Temporal resolution of surface characteristics: Monthly
Continuous snow cover for at least one month? Yes
Reassign the months to different seasons? Yes
Specify months for each season: Northwest ND
- *Late autumn after frost and harvest, or winter with no snow: Oct, Nov, Dec, Mar*
- *Winter with continuous snow on the ground: Jan, Feb*
- *Transitional spring (partial green coverage, short annuals): Apr, May*

[2] Recommended AERSURFACE Inputs, North Dakota (March 2017)

Midsummer with lush vegetation: Jun, Jul, Aug
Autumn with unharvested cropland: Sep
Is this site at an airport? Yes.
Is the site in an arid region? No
Surface moisture condition at the site: Average

The domain was centered at the location of the airport at Williston, ND. The resulting surface parameters are summarized in Table 1.

Table 1. Seasonal Surface Parameters at Willison Airport, ND

Sector	Winter with snow	Winter with no snow	Spring	Summer	Fall
Albedo (10 x 10 km Domain)					
0 - 360	0.58	0.19	0.17	0.18	0.18
Bowen Ratio (10 x 10 km Domain) - Average Moisture					
0 - 360	0.49	0.83	0.38	0.63	0.83
Surface Roughness Length (m) (1km-radius domain)					
0 - 30	0.007	0.014	0.038	0.095	0.095
30 - 60	0.010	0.021	0.051	0.110	0.110
60 - 90	0.007	0.014	0.039	0.094	0.094
90 - 120	0.007	0.013	0.040	0.096	0.096
120 - 150	0.006	0.013	0.039	0.096	0.096
150 - 180	0.007	0.014	0.034	0.086	0.086
180 - 210	0.007	0.013	0.039	0.099	0.099
210 - 240	0.008	0.016	0.042	0.097	0.097
240 - 270	0.008	0.015	0.055	0.116	0.116
270 - 300	0.019	0.032	0.083	0.146	0.146
300 - 330	0.008	0.016	0.038	0.093	0.093
330 - 360	0.008	0.016	0.032	0.099	0.099

Model Versions and Modeling Options

The latest versions of all the meteorological processors included in the AERMOD system were used. The default modeling options were selected in all cases.

AERMET v.19191 was used. In stage 1 the surface hourly and upper air twice-daily data were processed for the entire modeling period 2009 to 2013. In stage 2 the sub-hourly ASOS wind data extracted and processed in AERMINUTE v.15272 was added and all meteorological data were merged together. In AERMET stage 3 the merged data were processed and the appropriate surface parameters were incorporated, as calculated with AERSURFACE v.13016. A threshold of 0.5 m/s was set for the ASOS wind speed as recommended by EPA Guidelines. The wind speed was considered a scalar quantity and the appropriate adjustment of the friction velocity (ADJ_U*) was applied.

AERMET-stage3 model options:

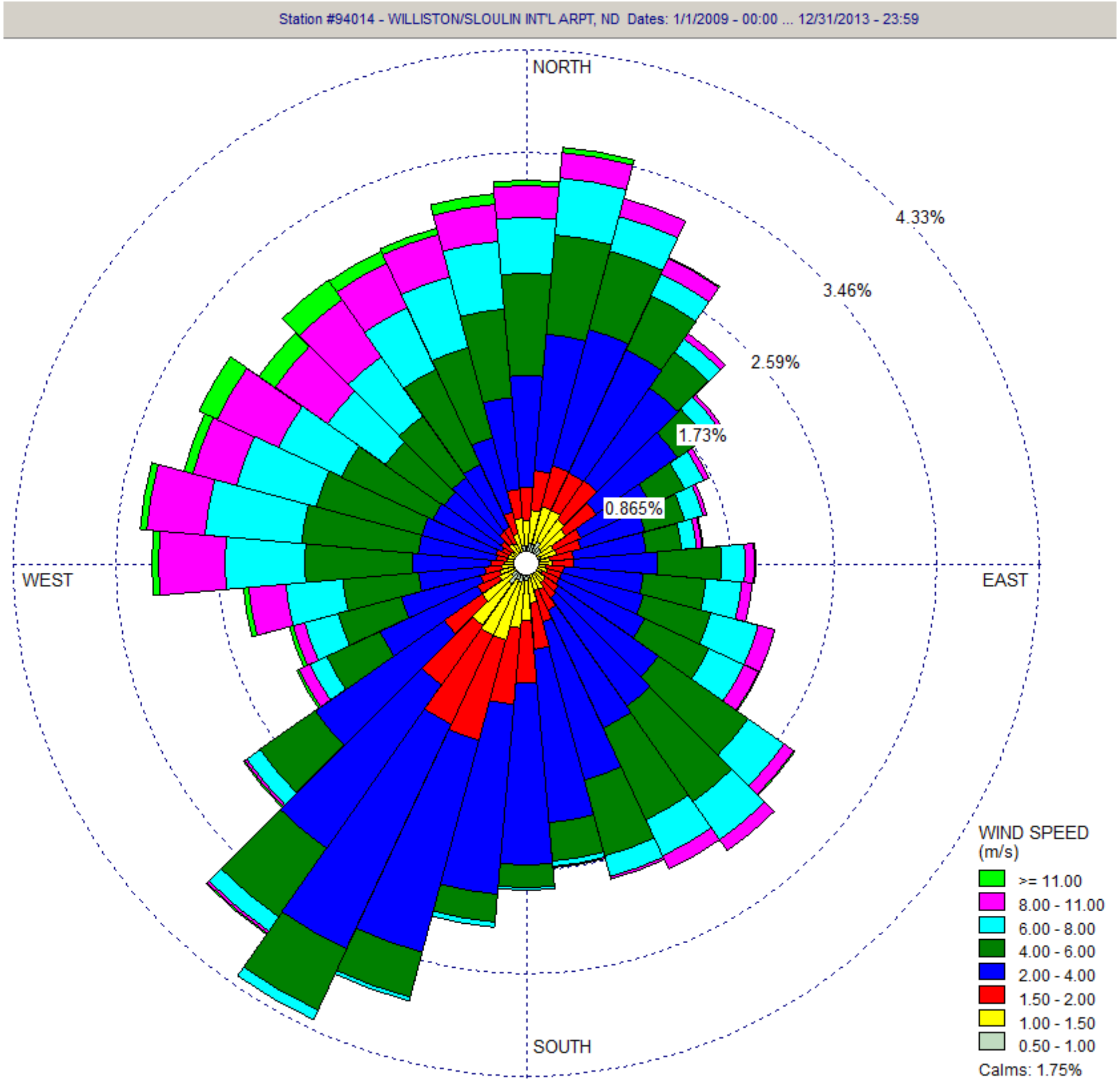
METHOD REFLEVEL SUBNWS
METHOD WIND_DIR RANDOM
METHOD CCVR SUB_CC
METHOD TEMP SUB_TT
*METHOD STABLEBL ADJ_U**

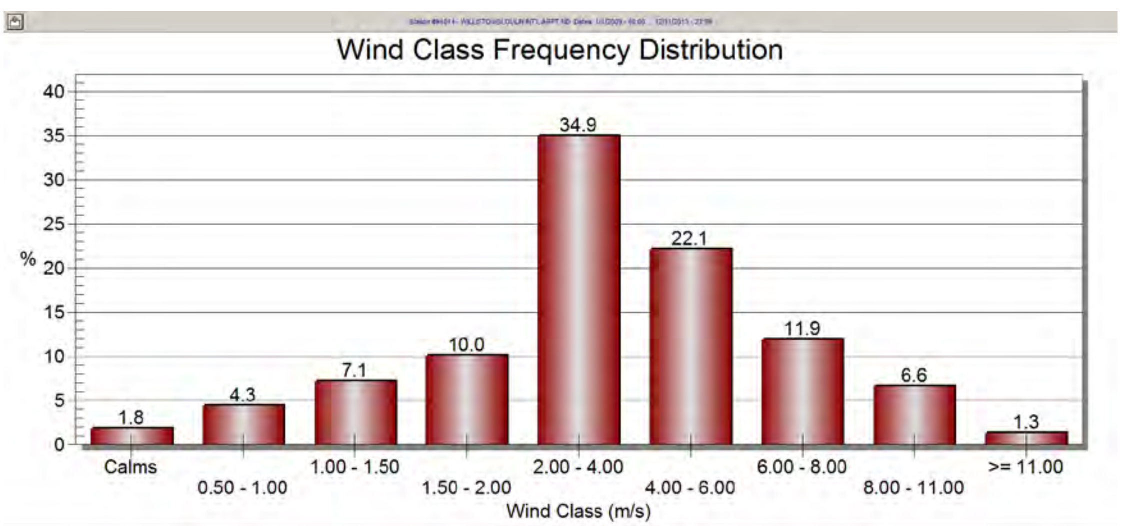
The resulting 5-year data set provides more than 99% coverage of the meteorological conditions with the following yearly percentages:

- 2009 – 100.0 %, no missing hours
- 2010 – 99.79%, 18 missing hours
- 2011 – 99.84%, 14 missing hours
- 2012 – 99.95%, 4 missing hours
- 2013 - 99.52%, 42 missing hours

Figure 1 depicts the wind rose and wind class frequency distribution for all five years included in the modeling analysis (2009-2013).

Figure 1. 2009-2013 Wind Rose and Distribution from KISN





AIR EMISSION SOURCES AND FACILITY CONFIGURATION

WBI is proposing to construct six (6) new compressor engines and one (1) natural gas-fired generator at the Tioga Compressor Station. A listing of the source parameters and emission rates are presented in Tables 2, 3, and 4. Depiction of the facility, sources, structures, and receptors are shown in Figures 2 through 6.

BUILDING DOWNWASH

The USEPA's Building Profile Input Program (BPIP), Version 04274, was used to calculate downwash effects for all emission sources. Building and structure configurations and locations relative to the modeled sources were obtained from WBI. All point source release points at the facility are expected to be below the greater of the GEP formula height calculated by BPIP or 65 m (213 feet). The detailed structure element coordinates and dimensions for all onsite buildings are included in Table 5. Terrain elevations for all buildings were assigned using survey data.

AMBIENT BACKGROUND CONCENTRATIONS

Representative background concentrations are added to the maximum predicted concentrations so that nearby sources that are not explicitly modeled are included in the NAAQS assessment. The Air Quality Dispersion Modeling Analysis Guide, issued by the NDDEQ, Division of Air Quality, on June 21, 2013, provides fixed background concentrations for CO, NO_2, SO_2, PM_{10}, and $PM_{2.5}$ that reflect default values which are representative for the entire State of North Dakota. Due to the conservative nature of these default values and the isolated location of the proposed Project, the fixed values were determined to provide a conservative estimate of the ambient background concentrations of each pollutant included in the modeling analysis.

The ambient background concentrations for each pollutant and averaging time are presented in Table 6.

SUMMARY OF MODELING RESULTS

Modeling was conducted for CO, NO_2, SO_2, PM_{10}, and $PM_{2.5}$. Modeled results are combined with representative background air quality data. The predicted maximum impacts from the applicable facility sources are lower than the applicable NAAQS thresholds for each pollutant. Therefore, the facility sources are not expected to cause, contribute, or exacerbate any violation of the NAAQS for CO, NO_2, SO_2, PM_{10}, and $PM_{2.5}$. Consequently, WBI asserts that operation of equipment at the Tioga Compressor Station will not cause any significant hazard to public health, safety, or welfare or to the environment.

The detailed results summary is presented in Table 6.

Table 2. Stack Locations

Unit ID	Description	Location[1]		Base Elevation[2] (m)
		X (m E)	Y (m N)	
Unit 2	Compressor Unit #2	654953.9	5363347	692
Unit 3	Compressor Unit #3	654993	5363346	692
Unit 4	Compressor Unit #4	655002.2	5363346	692
Unit 5	Compressor Unit #5	655041.4	5363346	692
Unit 6	Compressor Unit #6	655041.1	5363275	692
Unit 7	Compressor Unit #7	655002	5363275	692
GEN	Natural gas-fired generator	654945	5363351	692

Notes:
[1] Based on site plot plans and estimated using Google Earth.
[2] Based on graded site elevation.

Table 3. Source Parameters

Model ID	Source Description	Stack Release Type[1]	Stack Height[1]	Temperature[2]	Exit Velocity	Flow Rate[2]	Stack Diameter[1]
			ft	°F	ft/s	acfm	ft
Unit 2	Compressor Unit #2	Default	43	823	126.86	23,913	2
Unit 3	Compressor Unit #3	Default	43	823	126.86	23,913	2
Unit 4	Compressor Unit #4	Default	43	823	126.86	23,913	2
Unit 5	Compressor Unit #5	Default	43	823	126.86	23,913	2
Unit 6	Compressor Unit #6	Default	43	823	126.86	23,913	2
Unit 7	Compressor Unit #7	Default	43	823	126.86	23,913	2
GEN	Natural gas-fired generator	Default	22	1,202	88.48	7,412	1.33

Notes:
[1] Based on information provided by WBI.

[2] Based on manufacturer specifications.

Table 4. Emission Rates

Model ID	CO Emissions		NO_2 Emissions		PM_{10} Emissions		$PM_{2.5}$ Emissions		SO_2 Emissions	
	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
Unit 2	4.13	18.11	8.27	36.21	0.28	1.23	0.28	1.23	0.016	0.072
Unit 3	4.13	18.11	8.27	36.21	0.28	1.23	0.28	1.23	0.016	0.072
Unit 4	4.13	18.11	8.27	36.21	0.28	1.23	0.28	1.23	0.016	0.072
Unit 5	4.13	18.11	8.27	36.21	0.28	1.23	0.28	1.23	0.016	0.072
Unit 6	4.13	18.11	8.27	36.21	0.28	1.23	0.28	1.23	0.016	0.072
Unit 7	4.13	18.11	8.27	36.21	0.28	1.23	0.28	1.23	0.016	0.072
GEN	6.08	26.65	3.04	13.33	0.23	1.02	0.23	1.02	7.04E-03	3.08E-02

Table 5. Building Locations

Building ID	Building Description	Location (NW Corner)[1,2]		X-Length[1] (ft)	Y-Length[1] (ft)	Eave Height[1] (ft)	Peak Height[1] (ft)
		X (m E)	Y (m N)				
TRNBLDG1	Transfer Building #1	654909.64	5363293.39	50	50	12	13
TRNBLDG2	Transfer Building #2	654938.54	5363305.65	60	100	12	13
U1COMP	Unit #1 Compressor Building	654941.00	5363277.21	28	26	11	11
METER	Meter Building	654914.37	5363262.46	7.5	7.5	10	10
OFCSHOP	Office/Shop	654909.64	5363253.33	60	40	15	17.3
COMPBLDG1	Compressor Building #1	654958.41	5363357.14	60	100	30	32.5
COMPBLDG2	Compressor Building #2	655006.84	5363356.97	60	100	30	32.5
COMPBLDG3	Compressor Building #3	655006.54	5363285.09	60	100	30	32.5
AUX	Auxiliary Building	654922.36	5363354.92	40	60	12	13.66
SCRUB	Scrubber Building	654971.94	5363305.55	20	50	12	12

Notes:
[1] Based on site plot plans.
[2] Estimated using Google Earth.

Table 6. AERMOD Results and NAAQS Compliance Summary

Pollutant	Averaging Period	Project Impact (µg/m^3)	Ambient Background (µg/m^3)	Total Impact (µg/m^3)	NAAQS (µg/m^3)	Percent of NAAQS
NO_2	1-hour	115.14	35	150.14	188	79.9%
	Annual	8.31	5	13.31	100	13.3%
CO	1-hour	183.68	1,149	1,332.68	40,000	3.3%
	8-hour	115.09	1,149	1,264.09	10,000	12.6%
PM_{10}	24-hour	3.68	30	33.68	150	22.5%
$PM_{2.5}$	24-hour	2.19	13.7	15.89	35	45.4%
	Annual	0.32	4.75	4.75	12	39.6%
SO_2	1-hour	0.27	13	13.27	196	6.8%

Figure 2. Depiction of Tioga Compressor Station – showing full receptor grid

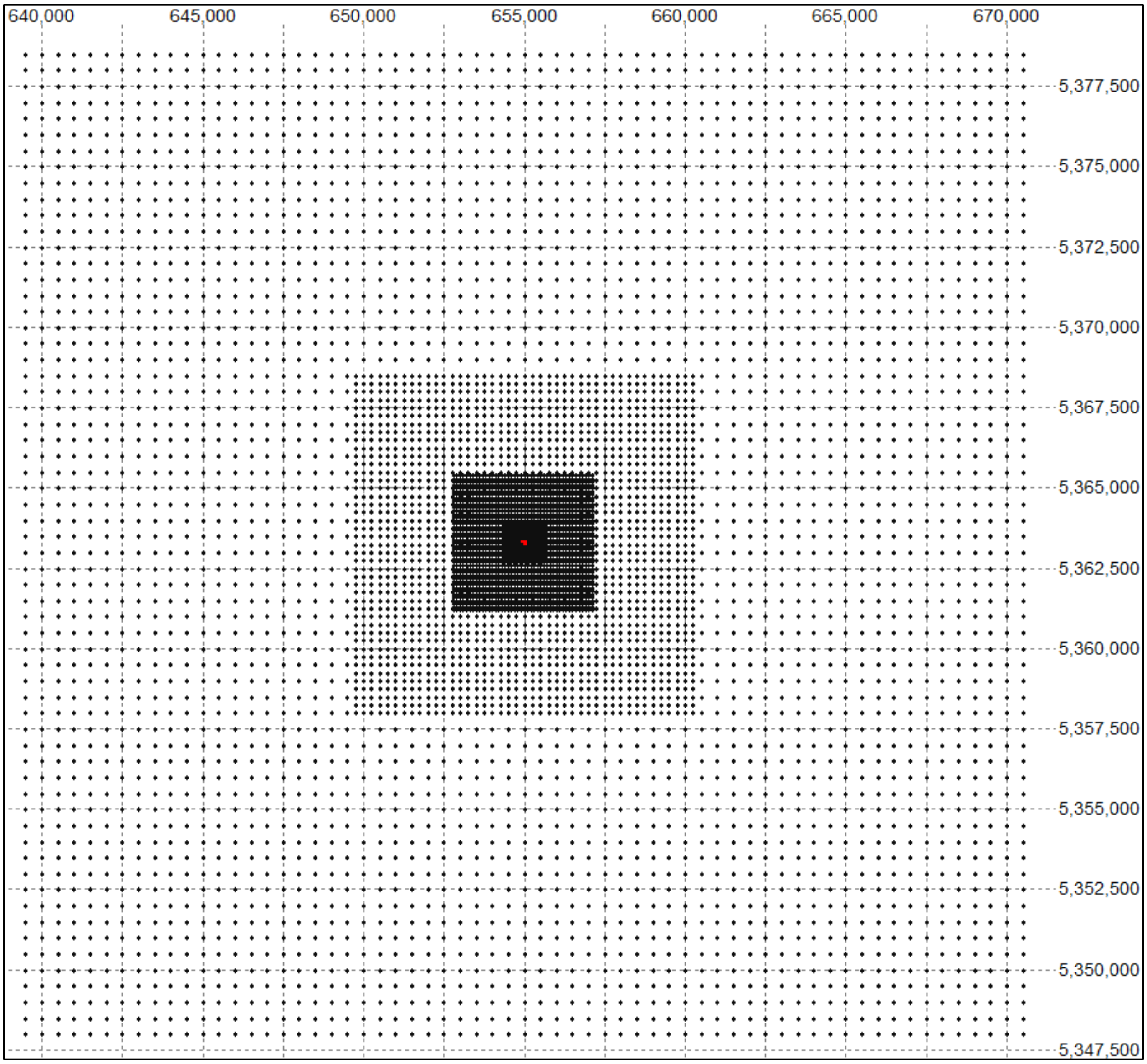


Figure 3. Depiction of Tioga Compressor Station – showing facility and close receptors

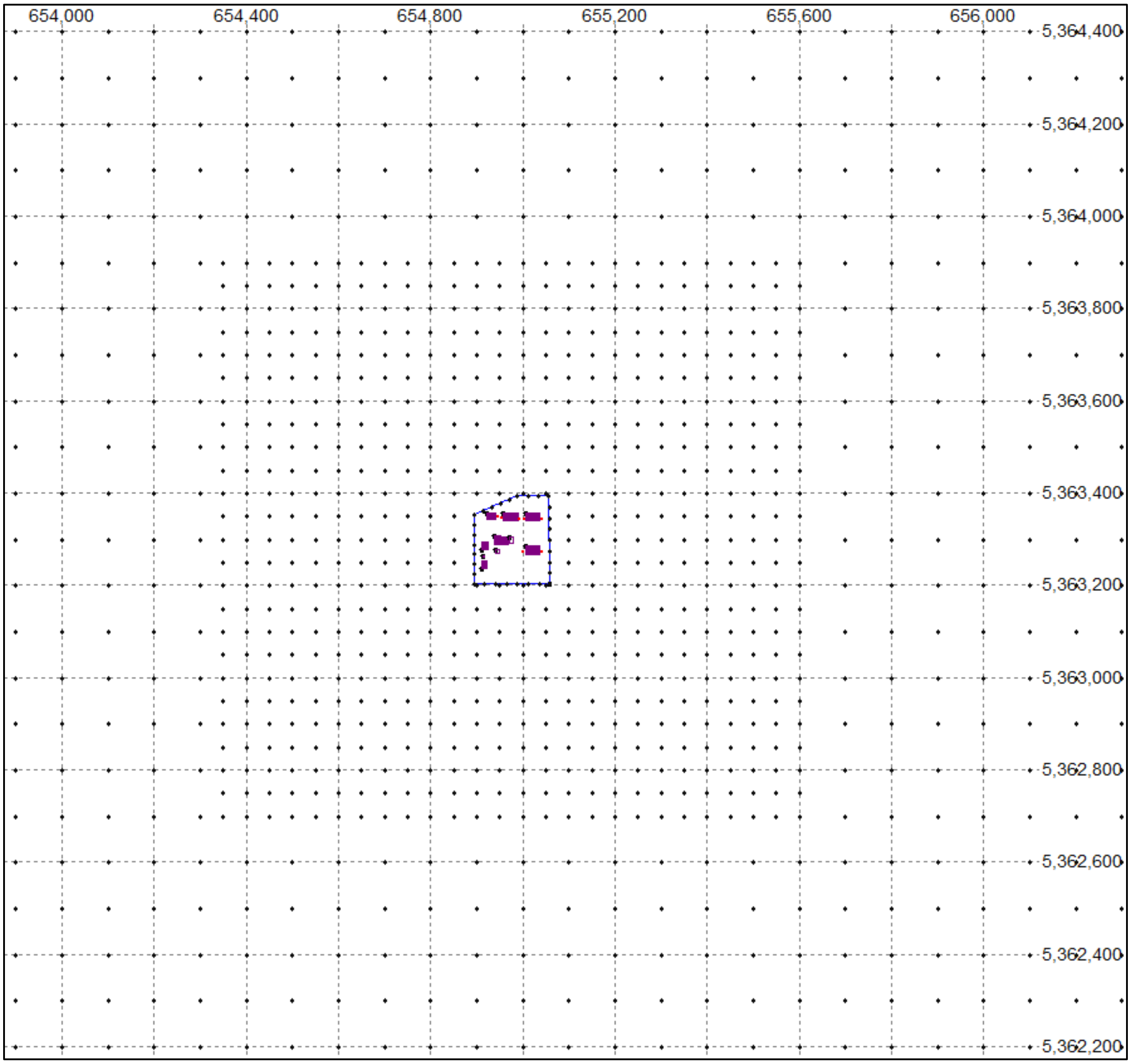


Figure 4. Depiction of Tioga Compressor Station – Close-up 1, with aerial photo

Figure 5. Depiction of Tioga Compressor Station – Close-up 2, showing additional source detail

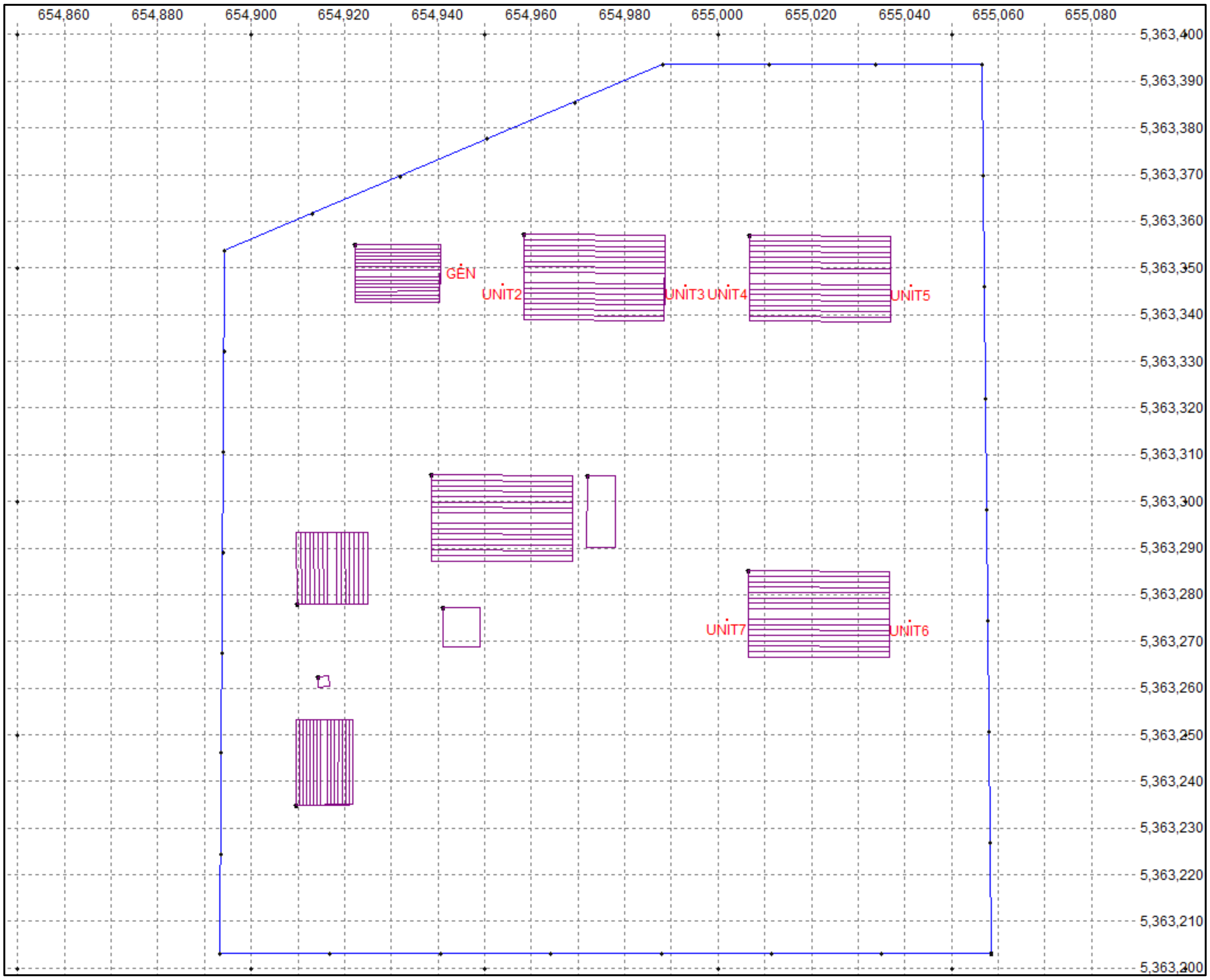
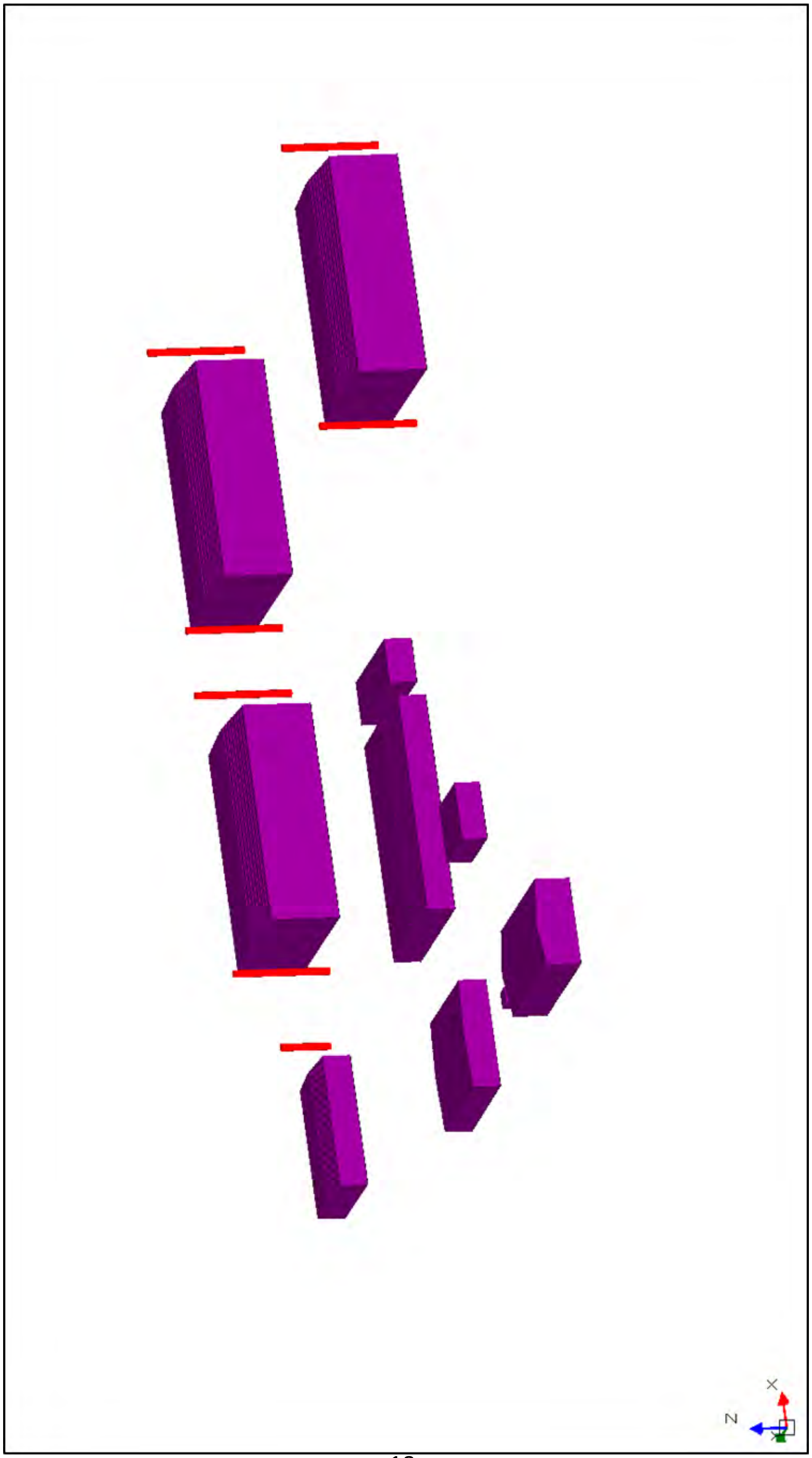


Figure 6. Depiction of Tioga Compressor Station – 3D depiction of structures and sources



Air Dispersion Modeling Report

Elkhorn Creek Compressor Station

AIR QUALITY IMPACTS

WBI Energy Transmission, Inc. (WBI) is proposing to construct and operate a new compressor station south of Watford City, North Dakota (ND). Air quality modeling analyses were performed to assess the ambient air quality impact of the Elkhorn Creek Compressor Station (the Station) for Resource Report 9. The Station will consist of one (1) compressor engine. Air dispersion modeling analyses were conducted pursuant to guidance contained in the Federal Energy Regulatory Commission (FERC) Guidance Manual for Environmental Report Preparation for Applications filed under the Natural Gas Act, Volume I, February 2017 (FERC, 2017). These were performed to predict 1-hour and 8-hour carbon monoxide (CO), 1-hour and Annual nitrogen dioxide (NO_2), 1-hour sulfur dioxide (SO_2), 24-hour particulate matter less than or equal to 10 microns in aerodynamic diameter (PM_{10}), and 24-hour and Annual particulate matter less than or equal to 2.5 microns in aerodynamic diameter ($PM_{2.5}$) impacts from the applicable facility sources to compare to the National Ambient Air Quality Standard (NAAQS) thresholds.

Detailed facility emission calculations are included with the air permit application for the Elkhorn Creek Compressor Station in Appendix 9B.

DESCRIPTION OF THE AIR QUALITY DISPERSION MODEL

The modeling was performed using the American Meteorological Society/ Environmental Protection Agency Regulatory Model (AERMOD), version 19191. AERMOD is a US EPA-approved, steady state Gaussian plume model approved for industrial sources and capable of modeling multiple sources in simple and complex terrain. Regulatory default options were used in the analysis.

RECEPTOR GRID

To ensure that the area of maximum effects was accurately sampled, a multi-tier receptor grid extending out to 15 kilometers (km) was used in the model. The configuration of receptor points was as follows:

- 25-meter (m) spacing along the facility fence/property line;
- 50-m spacing from the fence/property line to 500 m;
- 100-m spacing from 500 m to 2 km;
- 250-m spacing from 2 km to 5 km; and

- 500-m spacing from 5 km to 15 km.

Public access at the facility will be impeded by fencing and gates.

TERRAIN

Terrain heights were generated using publicly available ground elevation data from the United States Geological Survey (USGS) National Elevation Data (NED) data set (USGS 2017). The USGS terrain data selected has 1/3 arcsecond (10-meter) grid spacing to provide sufficient spatial resolution of terrain features. These data were processed for use in AERMOD using the AERMAP (version 18081) processor program. To process the data, a selection of rural or urban land use is required. Urban land use, in the context of the AERMAP analysis, is applicable to city centers and industrial areas that are characterized by multi-story buildings and large areas of land covered with impermeable surfaces such as concrete or asphalt. Rural land use is appropriate for areas ranging from suburban areas predominantly characterized by single family homes, moderately populated rural residential areas, and other areas with land use areas with a mix of vegetative cover and moderate development. Rural land use was selected due to Elkhorn Creek Compressor Station's location in an area that fits the rural land use definition; the station will not be located in an urban population center.

METEOROLOGY

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2.0 – 2.5 km	100.00%	38.70%
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Define the surface roughness length for multiple sectors? Yes
Number of sectors: 12
Temporal resolution of surface characteristics: Monthly
Continuous snow cover for at least one month? Yes
Reassign the months to different seasons? Yes
Specify months for each season: Northwest ND
- *Late autumn after frost and harvest, or winter with no snow: Oct, Nov, Dec, Mar*
- *Winter with continuous snow on the ground: Jan, Feb*
- *Transitional spring (partial green coverage, short annuals): Apr, May*
- *Midsummer with lush vegetation: Jun, Jul, Aug*
- *Autumn with unharvested cropland: Sep*

Is this site at an airport? Yes.
Is the site in an arid region? No

[2] Recommended AERSURFACE Inputs, North Dakota (March 2017)

Surface moisture condition at the site: Average

The domain was centered at the location of the airport at Williston, ND. The resulting surface parameters are summarized in Table 1.

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90 - 120	0.007	0.013	0.040	0.096	0.096
120 - 150	0.006	0.013	0.039	0.096	0.096
150 - 180	0.007	0.014	0.034	0.086	0.086
180 - 210	0.007	0.013	0.039	0.099	0.099
210 - 240	0.008	0.016	0.042	0.097	0.097
240 - 270	0.008	0.015	0.055	0.116	0.116
270 - 300	0.019	0.032	0.083	0.146	0.146
300 - 330	0.008	0.016	0.038	0.093	0.093
330 - 360	0.008	0.016	0.032	0.099	0.099

Model Versions and Modeling Options

The latest versions of all the meteorological processors included in the AERMOD system were used. The default modeling options were selected in all cases.

AERMET v.19191 was used. In stage 1 the surface hourly and upper air twice-daily data were processed for the entire modeling period 2009 to 2013. In stage 2 the sub-hourly ASOS wind data extracted and processed in AERMINUTE v.15272 was added and all meteorological data were merged together. In AERMET stage 3 the merged data were processed and the appropriate surface parameters were incorporated, as calculated with AERSURFACE v.13016. A threshold of 0.5 m/s was set for the ASOS wind speed as recommended by EPA Guidelines. The wind speed was considered a scalar quantity and the appropriate adjustment of the friction velocity (ADJ_U*) was applied. AERMET-stage3 model options:

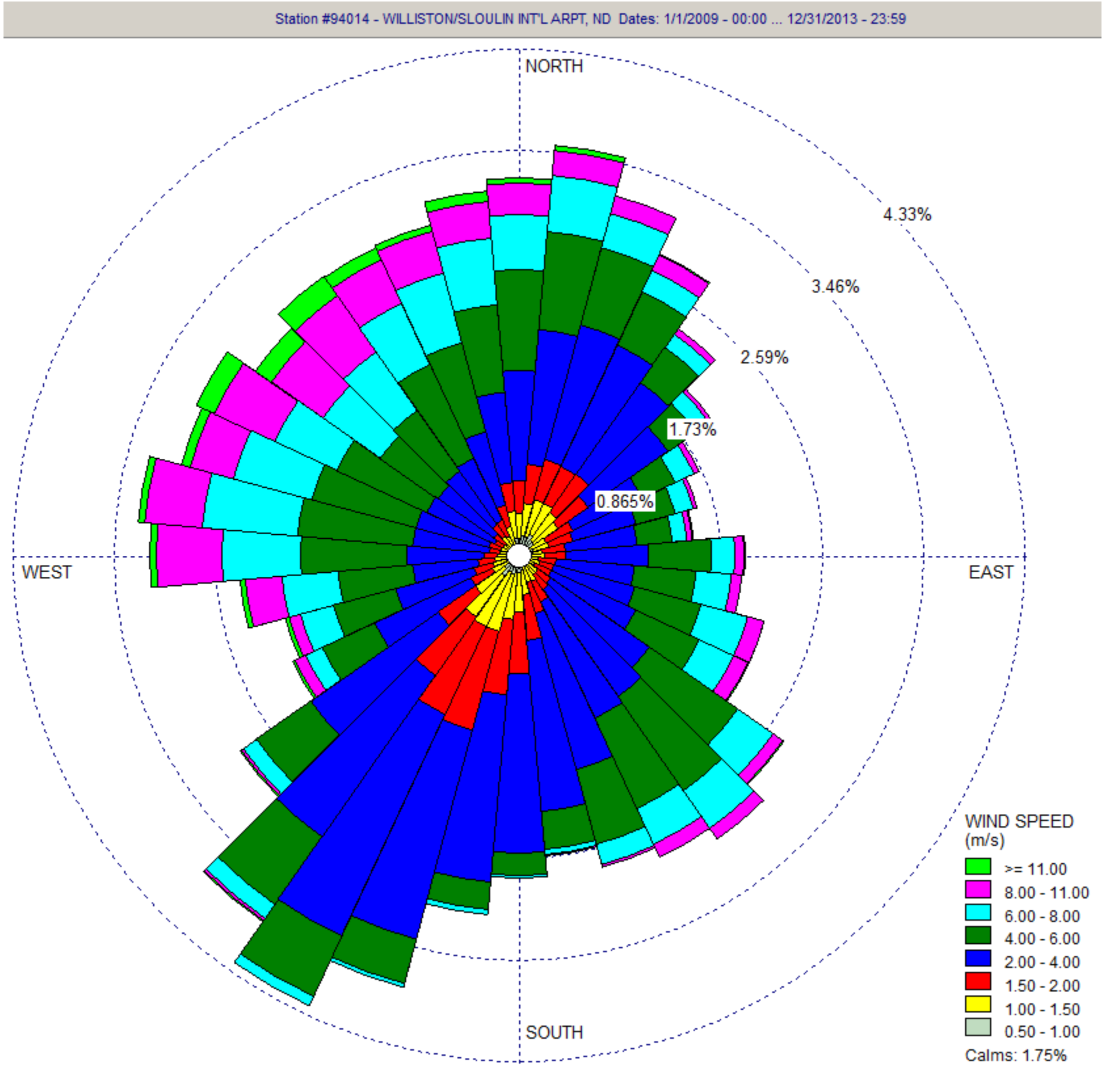
METHOD REFLEVEL SUBNWS
METHOD WIND_DIR RANDOM
METHOD CCVR SUB_CC
METHOD TEMP SUB_TT
*METHOD STABLEBL ADJ_U**

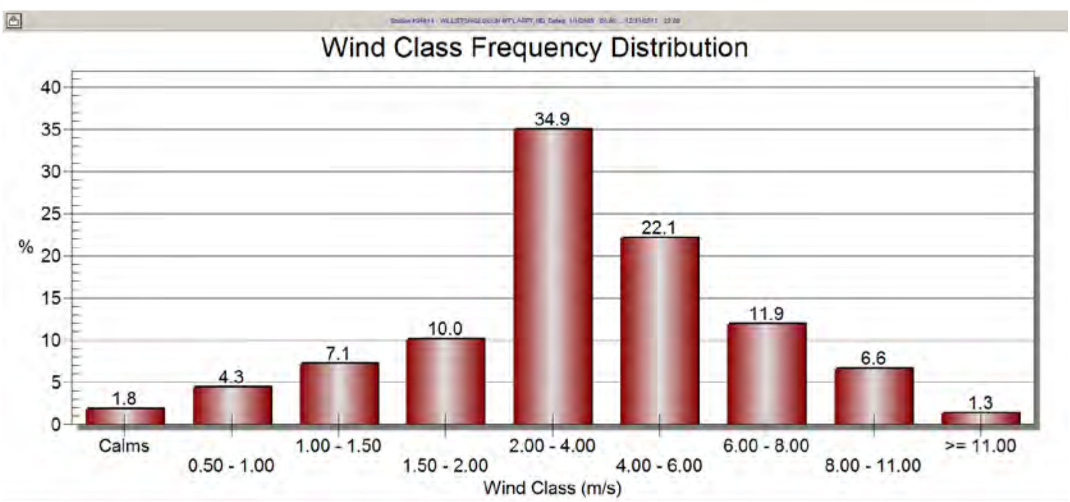
The resulting 5-year data set provides more than 99% coverage of the meteorological conditions with the following yearly percentages:

- 2009 – 100.0 %, no missing hours
- 2010 – 99.79%, 18 missing hours
- 2011 – 99.84%, 14 missing hours
- 2012 – 99.95%, 4 missing hours
- 2013 - 99.52%, 42 missing hours

Figure 1 depicts the wind rose and wind class frequency distribution for all five years included in the modeling analysis (2009-2013).

Figure 1. 2009-2013 Wind Rose and Distribution from KISN





AIR EMISSION SOURCES AND FACILITY CONFIGURATION

WBI is proposing to construct one (1) new compressor engine at the Elkhorn Creek Compressor Station. A listing of the source parameters and emission rates are presented in Tables 2, 3, and 4. Depiction of the facility, sources, structures, and receptors are shows in Figures 2 through 6.

Table 2. Stack Locations

Unit ID	Description	Location[1]		Base Elevation[2] (m)
		X (m E)	Y (m N)	
EU01	Compressor Unit #1	633573.59	5281766.95	723.47

Notes:
[1] Based on site plot plans and estimated using Google Earth.
[2] Based on AERMAP run results.

Table 3. Source Parameters

Model ID	Source Description	Stack Release Type[1]	Stack Height[1]	Temperature[2]	Exit Velocity	Flow Rate[2]	Stack Diameter[1]
			ft	°F	ft/s	acfm	ft
EU01	Compressor Unit #1	Default	43	823	126.86	23,913	2

Notes:
[1] Based on information provided by WBI.
[2] Based on manufacturer specifications.

Table 4. Emission Rates

Model ID	CO Emissions		NO_2 Emissions		PM_{10} Emissions		$PM_{2.5}$ Emissions		SO_2 Emissions	
	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
EU01	4.13	18.11	8.27	36.21	0.28	1.23	0.28	1.23	0.016	0.072

Figure 2. Depiction of Elkhorn Creek Compressor Station – showing full receptor grid

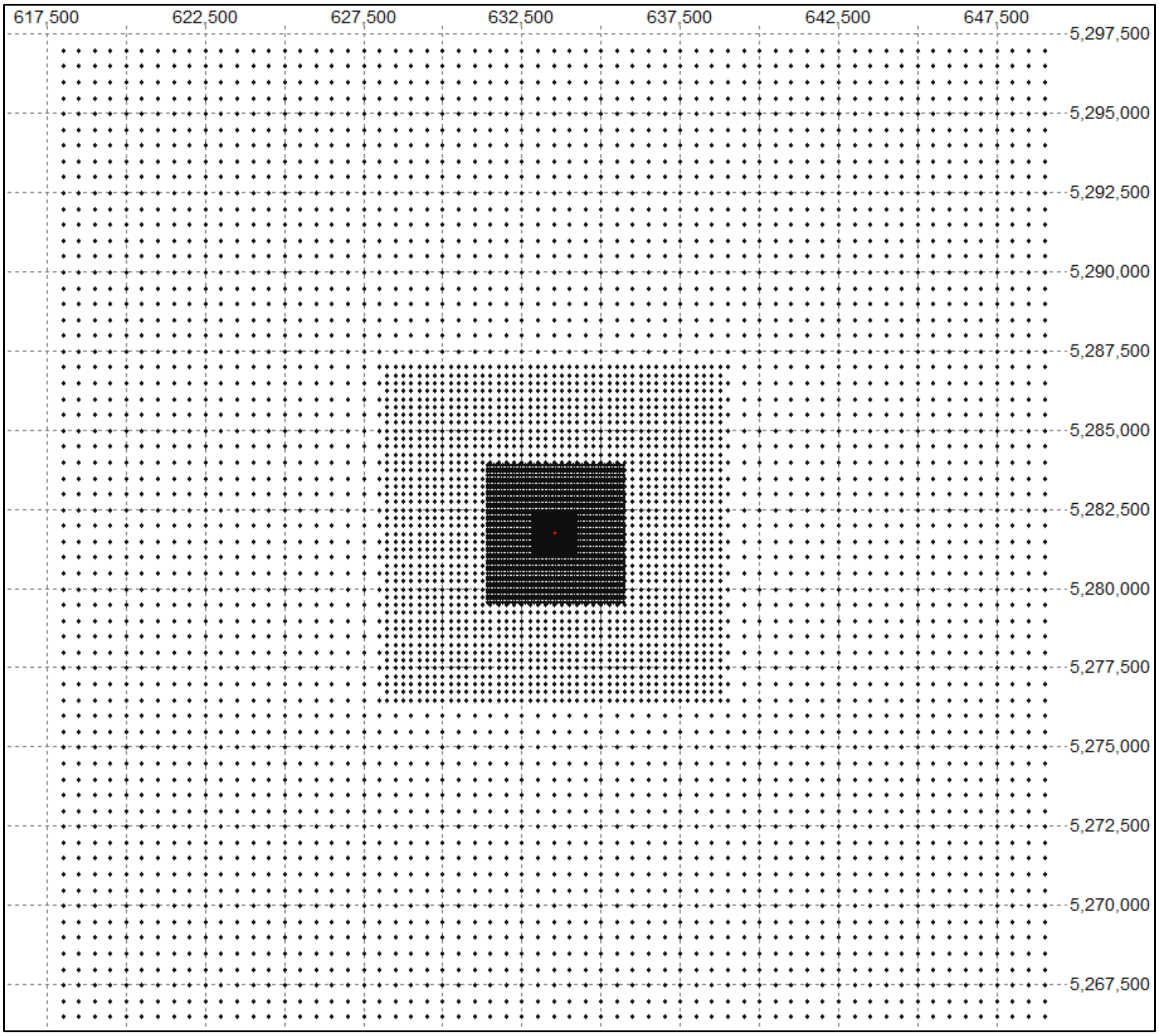


Figure 3. Depiction of Elkhorn Creek Compressor Station – showing facility and close receptors

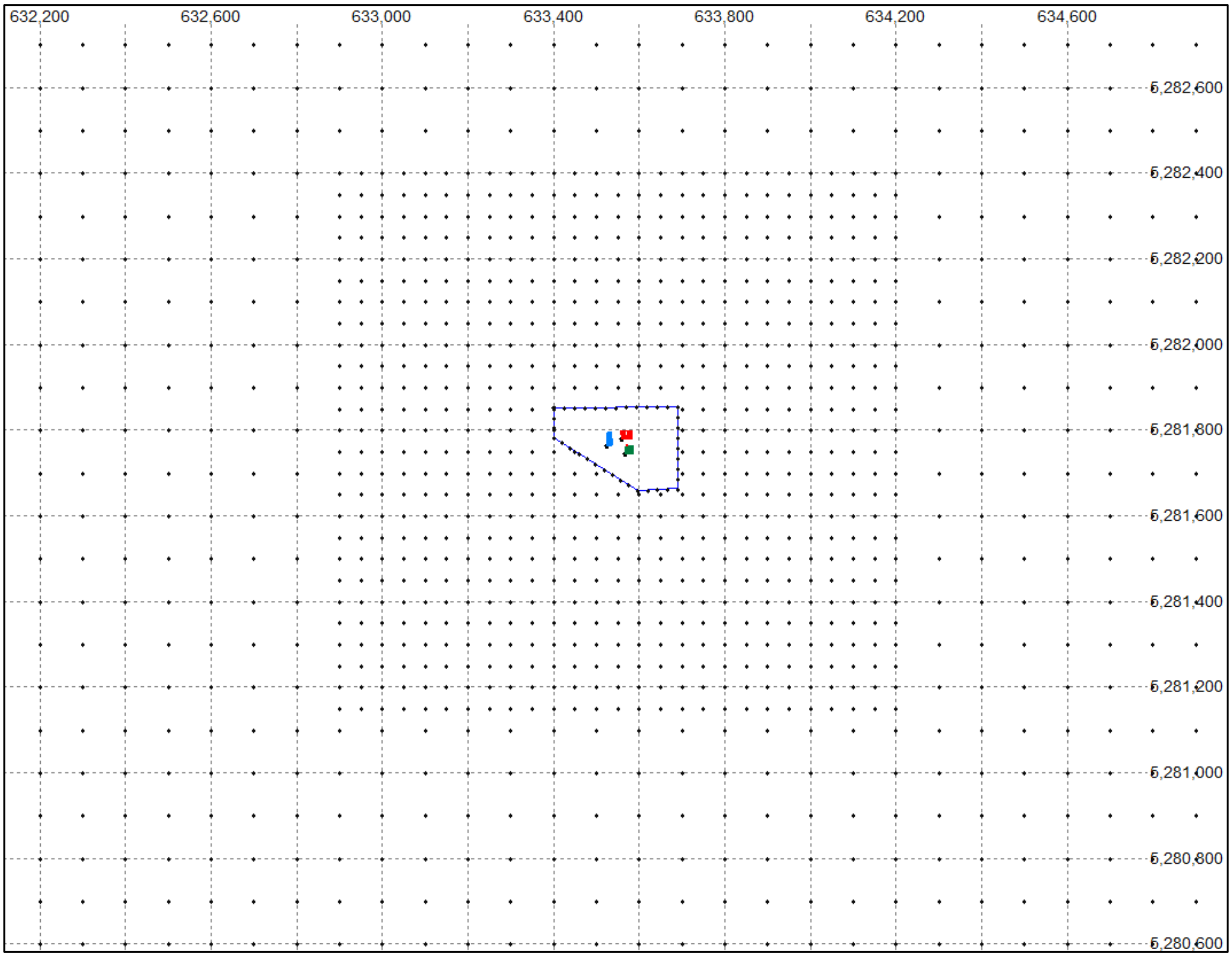
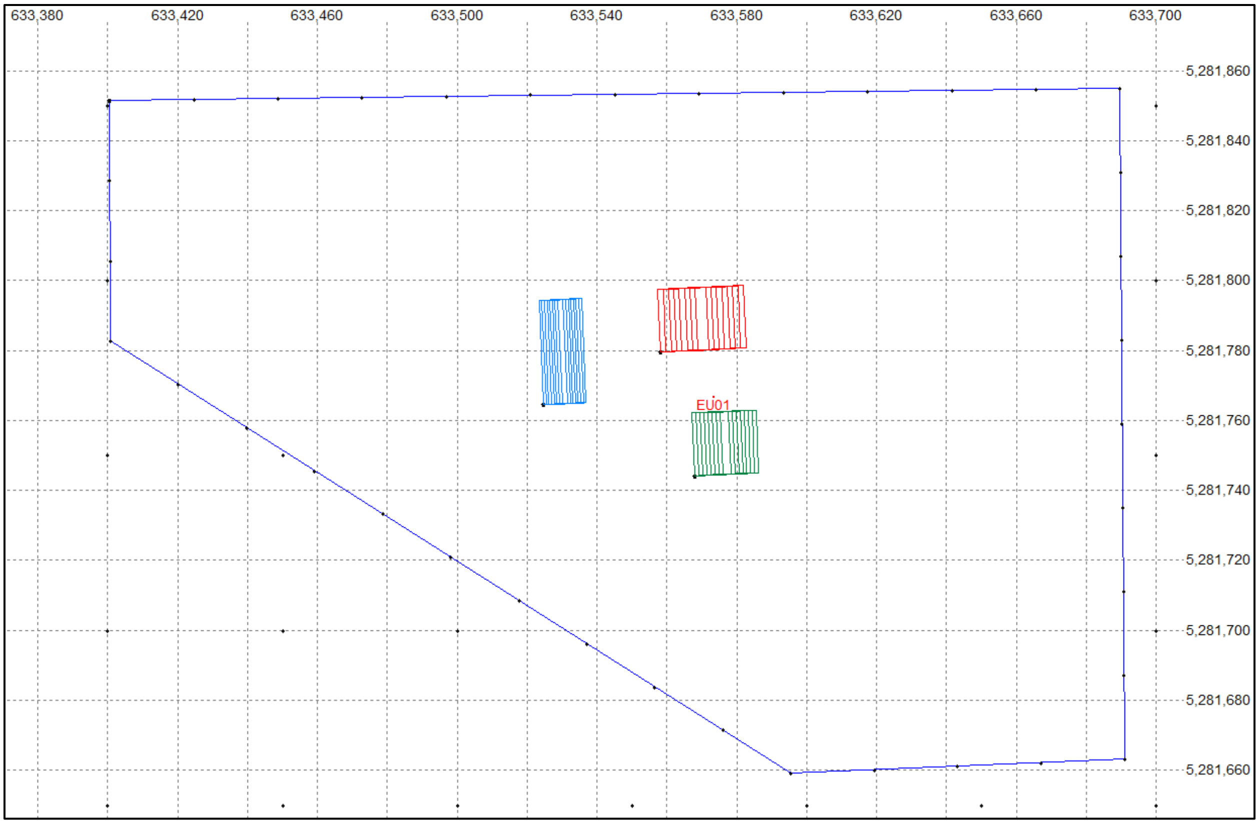


Figure 4. Depiction of Elkhorn Creek Compressor Station – Close-up 1, with aerial photo

Figure 5. Depiction of Elkhorn Creek Compressor Station – Close-up 2, showing additional source detail



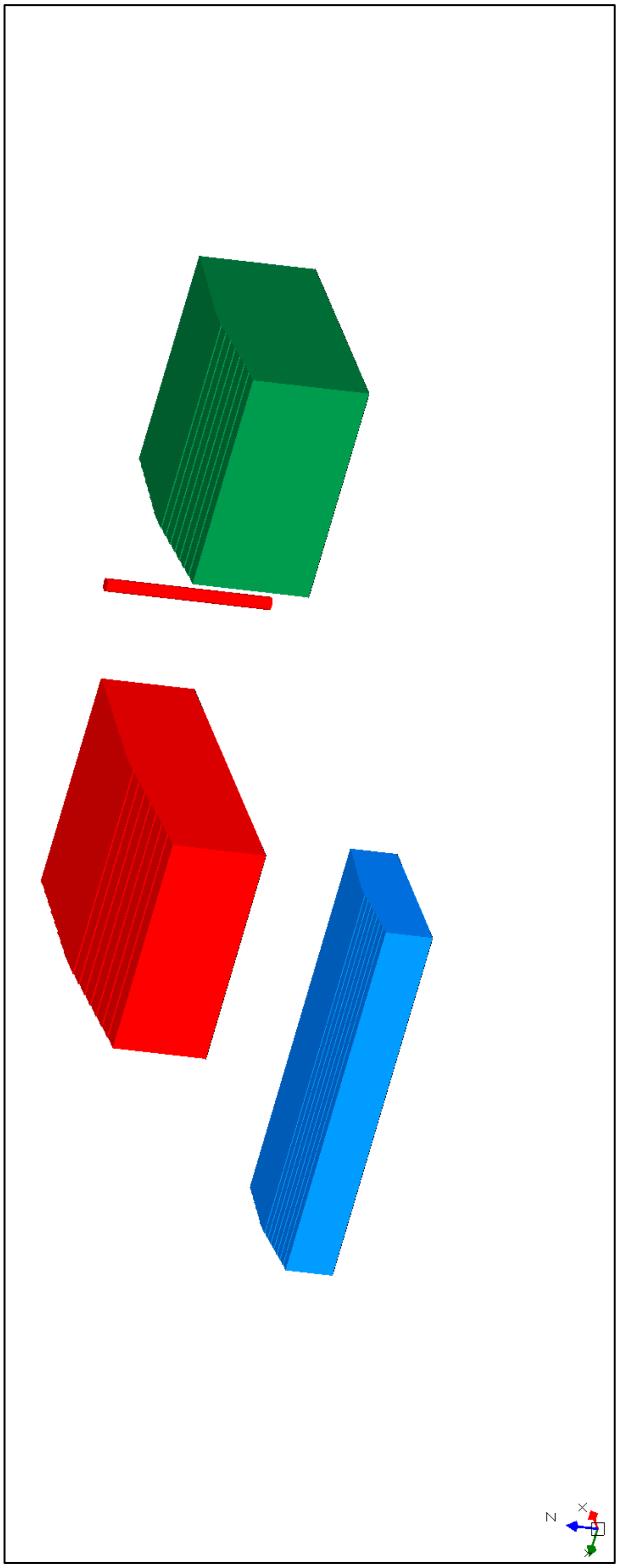


Figure 6. Depiction of Elkhorn Creek Compressor Station – 3D depiction of structures and sources

BUILDING DOWNWASH

The USEPA's Building Profile Input Program (BPIP), Version 04274, was used to calculate downwash effects for all emission sources. Building and structure configurations and locations relative to the modeled sources were obtained from WBI. All point source release points at the facility are expected to be below the greater of the GEP formula height calculated by BPIP or 65 m (213 feet). The detailed structure element coordinates and dimensions for all onsite buildings are included in Table 5. Terrain elevations for all buildings were assigned using survey data.

Table 5. Building Locations

Building ID	Building Description	Location (SW Corner)[1,2]		X-Length[1] (ft)	Y-Length[1] (ft)	Eave Height[1] (ft)	Peak Height[1] (ft)
		X (m E)	Y (m N)				
COMPBLDG	Compressor Building	633568.03	5281744.18	60	60	30	32.5
AUX_BLDG	Auxiliary Building	633524.71	5281764.5	40	100	12	13.66
TRNSBLDG	Transfer Building	633558.21	5281779.59	80	60	24	26.5

Notes:
[1] Based on site plot plans.
[2] Estimated using Google Earth.

AMBIENT BACKGROUND CONCENTRATIONS

Representative background concentrations are added to the maximum predicted concentrations so that nearby sources that are not explicitly modeled are included in the NAAQS assessment. The Air Quality Dispersion Modeling Analysis Guide, issued by the NDDEQ, Division of Air Quality, on June 21, 2013, provides fixed background concentrations for CO, NO_2, SO_2, PM_{10}, and $PM_{2.5}$ that reflect default values which are representative for the entire State of North Dakota. Due to the conservative nature of these default values and the isolated location of the proposed Project, the fixed values were determined to provide a conservative estimate of the ambient background concentrations of each pollutant included in the modeling analysis.

The ambient background concentrations for each pollutant and averaging time are presented in Table 6.

SUMMARY OF MODELING RESULTS

Modeling was conducted for CO, NO_2, SO_2, PM_{10}, and $PM_{2.5}$. Modeled results are combined with representative background air quality data. The predicted maximum impacts from the applicable facility sources are lower than the applicable NAAQS thresholds for each pollutant. Therefore, the facility sources are not expected to cause, contribute, or exacerbate any violation of the NAAQS for CO, NO_2, SO_2, PM_{10}, and $PM_{2.5}$. Consequently, WBI asserts that operation of equipment at the Elkhorn Creek Compressor Station will not cause any significant hazard to public health, safety, or welfare or to the environment.

The detailed results summary is presented in Table 6.

Table 6. AERMOD Results and NAAQS Compliance Summary

Pollutant	Averaging Period	Project Impact (µg/m^3)	Ambient Background (µg/m^3)	Total Impact (µg/m^3)	NAAQS (µg/m^3)	Percent of NAAQS
NO2	1-hour	52.35	35	87.35	188	46.5%
	Annual	0.9	5	5.9	100	5.9%
CO	1-hour	27.03	1,149	1,176.03	40,000	2.9%
	8-hour	20.21	1,149	1,169.21	10,000	11.7%
PM10	24-hour	0.60	30	30.6	150	20.4%
PM2.5	24-hour	0.26	13.7	13.96	35	39.9%
	Annual	0.026	4.75	4.776	12	39.8%
SO2	1-hour	0.086	13	13.086	196	6.7%

NORTH BAKKEN EXPANSION PROJECT

Resource Report 9

APPENDIX 9F
PRE-CONSTRUCTION NOISE SURVEY AND ACOUSTICAL ANALYSIS REPORT

WBI ENERGY TRANSMISSION, INC.

North Bakken Expansion Project

Pre-Construction Noise Survey and Acoustical Analysis

Docket No.
PF19-7-000

December 2019

December 2019

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WBI Energy Transmission, Inc.
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1.0 INTRODUCTION

Between July 22, and 25, 2019, Environmental Resources Management, Inc. (ERM) conducted pre-construction noise surveys at select sites located near Noise Sensitive Areas (NSAs) adjacent to the proposed WBI Energy Transmission, Inc. (WBI Energy) North Bakken Expansion Project (Project) located in northwest North Dakota (see figure 1 in Appendix A). This report presents the results of the pre-construction noise surveys and ERM's acoustical analysis of the noise impact to nearby NSAs.

The proposed Project would involve the construction and operation of approximately 60 miles of a 20-inch-diameter steel natural gas pipeline from WBI Energy's existing Tioga Compressor Station near Tioga, North Dakota, to a new interconnect with Northern Border Pipeline Company's mainline pipeline south of Watford City, North Dakota. The proposed pipeline route crosses portions of McKenzie and Williams Counties. In addition to the pipeline, the Project will include construction and operation of a new 3,750 horsepower compressor station (Elkhorn Creek Compressor Station) at the new interconnect in McKenzie County; as well as the addition of 18,750 horsepower to the existing compressor station (Tioga Compressor Station) in Williams County.

The purpose of the noise survey was to measure ambient noise levels at existing NSAs near the proposed compressor station and existing Tioga compressor station and at locations where construction is planned to be conducted using the horizontal directional drilling (HDD) methodology. An acoustical analysis was also completed to evaluate whether the contribution of Project-related noise would comply with a day/night (L_{dn}) sound pressure level of 55 A-weighted decibels (dBA) noise guidance set forth by the Federal Energy Regulatory Commission (FERC).

2.0 NOISE SURVEY METHODS AND LOCATIONS

2.1 Noise Measurement Equipment and Methodology

Sound pressure levels were measured using two Bruel & Kjaer Type 2250-S hand-held analyzers (Serial Numbers 3011887 and 3011939) equipped with a Bruel & Kjaer preamplifier (Serial Numbers 27164 and 27012), and a Bruel & Kjaer Type 4189 1/2 inch free field microphone (Serial Numbers 3130964 and 3130955) with a windscreen. Field calibration was performed before and after monitoring using a Bruel & Kjaer Type 4231 calibrator. All equipment has current certificate of calibration from the manufacturer. Sound measurements were recorded at 1-second intervals for a period of one hour during daytime (7:00 am to 10:00 pm) measurements and 15 minutes during nighttime (10:00 pm to 7:00 am) measurements. For quality control purposes, instantaneous sound pressure levels were also recorded manually every 15 minutes. Unweighted octave band center and an A-weighted time-equivalent sound pressure levels (L_{eq}) were measured on both slow and fast response with the sound level meter set at a height of approximately 4 feet above ground level.

2.2 Location Descriptions

2.2.1 Compressor Stations

The Elkhorn Creek Compressor Station is proposed to be located at the south end of the proposed pipeline route (approximate milepost (MP) 61.9) in McKenzie County, North Dakota approximately 9 miles southeast of Watford City. The nearest NSAs to the approximate center of the compressor station site are:

NSA #1: Residence located on County Road 34, approximately 4,253 feet to the southwest;

NSA #2: Residence located on 125th Avenue Northwest, approximately 3,465 feet to the east;

NSA #3: Residence located on 125th Avenue Northwest, approximately 3,895 feet to the northeast.

There are additional buildings located within a 1-mile radius of the proposed compressor. These buildings were confirmed to be industrial facilities during the field survey and, as such, are not considered NSAs. The locations of the NSAs associated with the Elkhorn Creek Compressor Station are provided on Figure 1.

The Tioga Compressor station is located at the north end of the proposed pipeline route (approximate MP 0.0) in Williams County, North Dakota, approximately one mile east of Tioga and one mile north of the Tioga Municipal Airport. The nearest NSAs to the approximate center of the existing Tioga compressor station site are:

NSA #1: Residence located on 69th Street Northwest, approximately 3,974 feet to the north;

NSA #2: Residence located on 102nd Avenue Northwest, approximately 4,076 feet to the northeast;

NSA #3: Residence located on 102nd Avenue Northwest, approximately 4,920 feet to the east;

NSA #4: Residence located on County Highway 10, approximately 2,221 feet to the east;

NSA #5: Residence located on County Highway 10, approximately 4,940 feet to the southeast;

NSA #6: Residence located on State Highway 40, approximately 5,229 feet to the west;

NSA #7: Residence located on State Highway 40, approximately 4,862 feet to the northwest; and

There are additional buildings within a one-mile radius of the compressor. These buildings were confirmed to be office buildings and industrial facilities during the field survey and, as such, are not considered NSAs. The locations of the NSAs associated with the Tioga Compressor Station are provided on Figure 2.

2.2.2 HDD Sites

The following are descriptions of the nearest NSAs to the proposed HDD locations.

The proposed Lake Sakakawea HDD crossing (MP 23 to 26) will be approximately at the border of McKenzie and Williams Counties. The HDD crossing is proposed to use the “Intersect” method in which drilling (entry) occurs from both ends of the crossing and intersects near the middle of Lake Sakakawea. An “exit” noise evaluation is not applicable when using the Intersect method. The nearest NSAs to the approximate centers of the proposed north and south HDD entry sites are:

North HDD Entry

> NSA #1: Approximately 13 residences located on 51st Street Northwest, with the closest residence approximately 492 feet southeast of the north entry of the HDD crossing;
>
> NSA #2: Residence located on the 111th Avenue Northwest, approximately 2,597 feet northwest of the north entry of the HDD crossing.

South HDD Entry

> NSA #1: Residence located on County Road 2, approximately 2,240 feet southwest of the south entry of the HDD crossing.

There are additional buildings within a 0.5-mile radius of the HDD entry sites. These buildings were confirmed to be industrial facilities during the field survey and, as such, are not considered NSAs. The locations of the NSAs associated with the north and south HDD entry sites are provided on Figures 3 and 4, respectively.

2.3 Weather Conditions During the Noise Survey

The weather conditions for the survey period are summarized in table 1 and included on the Field Monitoring Forms attached as Appendix B.

TABLE 1

Summary of Weather Conditions during Field Survey

Condition	Minimum	Maximum	Average
Temperature ^{0}F	59	88	74
Relative Humidity %	27	85	65
Wind Direction	--	--	S
Wind Speed (miles per hour)	1	10	4
Barometric Pressure inches. Hg	29.9	30.3	30.0

3.0 NOISE REGULATIONS

In 1974, the U.S. Environmental Protection Agency (EPA) published its document entitled "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin on Safety." This publication evaluated the effects of environmental noise with respect to health and safety. As set forth in that publication, the EPA has determined that noise levels should not exceed an L_{dn} of 55 dBA, which is the level that protects the public from outdoor activity interference. This noise level has been useful for state and federal agencies to establish noise limitations for various noise sources. A 55 dBA L_{dn} noise level equates to a L_{eq} of 48.6 dBA (i.e., a facility that does not exceed a continuous noise impact of 48.6 dBA will not exceed 55 dBA L_{dn}).

WBI's proposed compressor stations must comply with the FERC's noise regulations for interstate pipelines. These regulations state:

1) The noise attributable to any new compressor station, compression added to an existing station, or any modification, upgrade or update of an existing station, must not exceed an L_{dn} of 55 dBA at any pre-existing NSAs such as schools, hospitals, or residences.

2) New compressor stations or modifications of existing stations shall not result in a perceptible increase in vibration at any NSA (18 CFR § 380.12(k)(4)(v)).

HDD activities must also comply with FERC's noise guidance for construction activity performed during nighttime hours. This guidance states:

1) Construction activity that would or may occur during nighttime hours should be performed with the goal that the activity contribute noise levels below 55 dBA L_{dn} and 48.6 L_{eq}, or no more than 10 dBA over background if ambient noise levels are above 55 dBA L_{dn} (FERC, 2017).

North Dakota does not have noise regulations regarding the proposed compressor station or HDD activities. The state regulates noise using public nuisance laws, but does not impose NSA property-line decibel noise limits for new facilities.

McKenzie County does not have any pertinent noise regulations regarding the proposed compressor station or HDD activities.

Williams County maintains the following general noise regulations:

1) Maximum Noise Standards by District

Zone of Property Receiving Noise	Maximum Noise Level dB
Residential Districts: Urban Residential (UR), Rural Residential (UR)	60
Commercial Districts: Urban Commercial (UC), Rural Residential (RC)	65
Industrial Districts: Light Industrial (LI), Heavy Industrial (HI)	70
Planned Development:	PUD In accordance with base district

2) Duration and Timing
The noise standards above shall be modified as follows to account for the effects of time and duration on the impact of noise levels:

a. In the UR and RR districts, the noise standards shall be 5 dB lower between 10:00 p.m. and 7:00 a.m.
b. Noise that is produced for no more than a cumulative period of five minutes in any hour may exceed the standards above by 10 dB (Williams County, 2015).

Zoning designations are not shown at NSAs in Williams County's zoning maps. However, as identified NSAs are houses, it is assumed that the "Residential Districts" regulation of a 60 dB maximum noise level applies. Williams County's noise regulations are less strict than FERC regulations; therefore meeting FERC's regulations will be sufficient to meet Williams County regulations.

4.0 NOISE SURVEY RESULTS AND ACOUSTICAL ANALYSIS

Compressor Stations

Proposed Elkhorn Creek Compression Station

The significant noise-producing equipment associated with the proposed compressor station will include:

- One Ariel KBZ-4 compressor and 3,750 horsepower Caterpillar 3612 reciprocating natural gas driven engine,
- after gas and auxiliary coolers, and
- piping.

To mitigate noise impacts at the nearby NSAs, the following noise control measures will be implemented:

- The compressor engine will be fitted with a catalyst silencer.
- The compressor and engine will be housed inside a building with 26-gauge steel walls and a 24-gauge steel roof, both with 6-inches of fiberglass insulation and a vapor barrier.

The results of the baseline sound level analysis for the Elkhorn Creek Compressor Station are summarized in Table 2

TABLE 2

Baseline Sound Level Analysis for the Elkhorn Creek Compressor Station

Station and Closest NSA(s)	Distance and Direction of NSA	Surveyed Ambient L_{dn} (dBA)	Estimated L_{dn} of Station (dBA) at NSA	Station L_{dn} Plus Ambient L_{dn} (dBA)	Potential Increase Above Ambient (dB)
NSA 1 (House)	4,253 feet SW	55.6	41.1	55.7	0.1
NSA 2 (House)	3,465 feet E	41.0	42.9	45.1	4.1
NSA 3 (House)	3,895 feet NE	41.0	41.9	44.5	3.5

Existing Tioga Compressor Station Upgrade

The significant noise-producing equipment associated with the compressor station upgrade will include the addition of:

- Six Ariel KBZ-4 compressors and 3,750 horsepower Caterpillar 3612 reciprocating natural gas driven engines,
- after gas and auxiliary coolers
- piping.

To mitigate noise impacts at the nearby NSAs, the following noise control measures will be implemented:

- The six compressor engines will be fitted with catalyst silencers.
- The compressors and engines will be housed inside a building with 26-gauge steel walls and a 24-gauge steel roof, both with 6-inches of fiberglass insulation and a vapor barrier.

The results of the baseline sound level analysis are summarized in Table 3. The surveyed ambient sound level represents the existing station at approximately 81% load.

TABLE 3

Baseline Sound Level Analysis for the Tioga Compressor Station

Station and Closest NSA(s)	Distance and Direction of NSA	Surveyed Ambient L_{dn} (dBA)	Estimated L_{dn} of Station (dBA) at NSA[1]	Station L_{dn} Plus Ambient L_{dn} (dBA)	Potential Increase Above Ambient (dB)
NSA 1 (House)	3,974 feet N	57.2	49.5	58.0	0.8
NSA 2 (House)	4,076 feet NE	58.2	49.3	58.8	0.6
NSA 3 (House)	4,920 feet E	54.0	47.7	55.0	1.0
NSA 4 (House)	2,221 feet E	55.6	54.6	58.2	2.8
NSA 5 (House)	4,940 feet SE	54.0	47.6	55.0	1.0
NSA 6 (House)	5,229 feet W	61.3	47.2	61.4	0.1
NSA 7 (House)	4,862 feet NW	61.3	47.8	61.4	0.1

[1]Estimated L_{dn} of the existing equipment and additional equipment at 100% load

Horizontal Directional Drilling

Noise contributions due to HDD activity were estimated based on a noise survey evaluating noise barrier performance for a similar project, provided by Michels Corporation. The HDD drilling methodology will utilize the “intersect” method. The intersect method utilizes the same “entry”

HDD drilling equipment on both sides of the drill. Entry site drilling equipment typically is louder than exit equipment, as the drilling rig and associated power unit are the predominant noise sources at the entry site. The significant noise producing equipment associated with the HDD entry site will include:

- Drilling Rig
- Mud Rig
- Shaker
- Crane
- Power Unit

The noise contributed by this equipment equates to an estimated sound power level of 125.2 dBA. The estimated noise impact to the nearest NSAs resulting from each HDD is summarized in Table 4. Estimated noise levels that exceed regulations are shown in bold and italics in the table.

TABLE 4

Noise Quality Analysis for HDD Operations

Station and Closest NSA(s)	Distance and Direction of NSA	Surveyed Ambient L_{dn} (dBA)	Estimated L_{dn} of HDD Operations (dBA)	Estimated L_{dn} of HDD Operations plus Ambient L_{dn} (dBA)	Potential Increase Above Ambient (dBA)
HDD North Entry					
NSA 1 (13 Houses)	492 feet SE	44.7	***84.8***	***84.8***	***40.1***
NSA 2 (House)	2,597 feet NW	48.7	***69.1***	***69.2***	***20.5***
HDD South Entry					
NSA 3 (House)	2,240 feet SW	54.7	***70.4***	***70.5***	***15.8***

The estimated noise impact to the nearest NSAs resulting from each HDD with temporary acoustical noise barriers in place is summarized in Table 5. Estimated noise levels that exceed regulations are shown in bold and italics in the table. In order to achieve maximum noise reduction, noise barriers should be positioned as close as reasonably possible to the predominant noise-producing equipment and have at a minimum, a Sound Transmission Class (STC)-32 rating.

TABLE 5

Noise Barrier Analysis for HDD Operations

Station and Closest NSA(s)	Distance and Direction of NSA	Surveyed Ambient L_{dn} (dBA)	Estimated L_{dn} of HDD Operations (dBA)	Estimated L_{dn} of HDD Operations plus Ambient L_{dn} (dBA)	Potential Increase Above Ambient (dBA)
HDD North Entry					
NSA 1 (13 Houses)	492 feet SE	44.7	***78.3***	***78.3***	***33.6***
NSA 2 (House)	2,597 feet NW	48.7	***62.7***	***62.8***	***14.1***
HDD South Entry					
NSA 3 (House)	2,240 feet SW	54.7	***63.9***	***64.4***	9.7

Note: Estimated mitigated noise levels assume equipment is positioned optimally to shield noise, and that noise barriers are placed within line-of-sight between noise-producing equipment and NSAs.

Based on this evaluation, HDD operations will contribute to noise levels exceeding Williams County and FERC noise guidance at all of the thirteen (13) residences associated with NSA 1 as well as at NSAs 2 and 3. Although nighttime construction is only proposed during pullback operations, which will occur for less than one week, WBI would like the flexibility to operate 24 hours per day, seven days per week. During drilling operations, which are expected to last approximately 6 months, construction will be limited to daytime hours unless site conditions necessitate 24-hour work.

Due to the proximity of the drilling operations to NSAs, on-Site acoustical monitoring should be completed during startup to evaluate the actual noise impact to the nearby NSA and help evaluate if additional noise mitigation will be required to meet FERC's guidance of 55 dBA $L_{dn.}$ at the NSAs. If nighttime drilling will only be completed during pullback which is estimated to last less than one week, temporary relocation of residents may be an option. If needed, additional noise mitigation measures may include; use of additional or higher temporary acoustical noise barriers, residential grade silencers or mufflers on engines, and use of gear box and other mechanical noise dampening blankets.

<u>Blowdown Events</u>

Compressor unit blowdowns (venting of gas) can happen during startup and shutdown of the compressor, maintenance activities, or for emergency purposes. During startup and commissioning, there will be 2 full station blowdowns for each compressor station and 5 compressor unit blowdowns for each compressor unit. During annual operation, there will be one emergency shutdown full station blowdown test for each compressor station and 24 compressor unit blowdowns for each compressor unit.

Blowdown noise analysis was based on a sound power level of 120.2 dB from a project of similar size, with sound pressure levels at NSAs calculated using hemispherical attenuation (Hoover & Keith, 2007). The results of this analysis are summarized in Tables 6 and 7.

TABLE 6

Noise Quality Analysis for Blowdown Events at the Elkhorn Creek Compressor Station

Station and Closest NSA(s)	Distance and Direction of NSA	Surveyed Ambient L_{dn} (via measured L_{eq}) (dBA)	Estimated L_{dn} of Station Blowdown(dBA)	Station Blowdown L_{dn} Plus Ambient L_{dn} (dBA)	Potential Increase Above Ambient (dB)
NSA 1 (House)	4,253 feet SW	55.6	53.2	57.6	2.0
NSA 2 (House)	3,465 feet E	41.0	55.0	55.1	14.1
NSA 3 (House)	3,895 feet NE	41.0	53.9	54.1	13.1

TABLE 7

Noise Quality Analysis for Blowdown Events at the Tioga Compressor Station

Station and Closest NSA(s)	Distance and Direction of NSA	Surveyed Ambient L_{dn} (via measured L_{eq}) (dBA)	Estimated L_{dn} of Station Blowdown(dBA)	Station Blowdown L_{dn} Plus Ambient L_{dn} (dBA)	Potential Increase Above Ambient (dB)
NSA 1 (House)	3,974 feet N	57.2	54.0	58.9	1.7
NSA 2 (House)	4,076 feet NE	58.2	53.7	59.5	1.3
NSA 3 (House)	4,920 feet E	54.0	52.1	56.2	2.2

NSA 4 (House)	2,221 feet E	55.6	59.0	60.6	5.0
NSA 5 (House)	4,940 feet SE	54.0	52.1	56.2	2.2
NSA 6 (House)	5,229 feet W	61.3	51.6	61.7	0.4
NSA 7 (House)	4,862 feet NW	61.3	52.2	61.8	0.5

5.0 ACOUSTICAL ANALYSIS METHODOLOGY

Compressor Stations

Predicted noise contributions due to compressor station operations were estimated based on the measured ambient noise data and provided equipment information. To complete this evaluation, the octave band sound power levels for each piece of equipment were calculated using the following equation:

$$L_w = L_p + 20 * Log(d) + 0.7$$

where L_w is the sound power level and L_p the sound pressure level at a distance (*d)* from the equipment. Total power levels of the indoor equipment for each octave band were then calculated by performing a logarithmic sum of the individual equipment sound power levels. The transmission loss at each octave band contributed by the roof and insulated metal walls of the buildings were subtracted from these totals. The mitigated octave band sound power levels were then A-weighted to determine an overall sound power level for the buildings.

Next, the mitigated overall building sound power level was logarithmically added to the sound power levels of each piece of outdoor equipment to determine the facility total sound power level, which was then attenuated for distance according to a hemispherical sound propagation model using the following equation:

$$L_{eq\ NSA} = L_{w\ Facility} - 20 * \text{Log}\ (D_{NSA}) - 0.7$$

Where $L_{eq,\ NSA}$ is the sound pressure level associated with all equipment at the NSA distance (D_{NSA}) from the compressor station.

The L_{dn} was then calculated for ambient noise measurements and predicted noise contribution of the compressor stations using the following formula:

$$L_{dn} = 10 * Log\left({}^{15}\!/_{24} * 10^{L_{eq,day}/10} + {}^{9}\!/_{24} * 10^{(L_{eq,night}+10)/10}\right)$$

The two L_{dn} values were logarithmically added to obtain the predicted day-night noise level at each NSA while the compressor station is in operation.

Note that attenuation from foliage, obstructions, and atmospheric absorption are not included in the predicted noise levels, but would likely provide additional attenuation of noise in higher frequency ranges.

HDD Operations

Predicted noise contributions due to HDD activity at NSAs were also estimated according to a hemispherical sound propagation model as described above. Sound power levels were calculated based on sound pressure levels measured by Michels Corporation at a similar project. The provided measurements and calculated sound power levels are provided in Table 4 above.

Note that attenuation from foliage, obstructions, and atmospheric absorption are not included in the predicted noise levels, but would likely provide additional attenuation of noise in higher frequency ranges.

6.0 CONCLUSION

Based on the measured data and proposed equipment specifications, The new Elkhorn Creek compressor station and expanded Tioga compressor station operation would not contribute to an exceedance the FERC 55 dBA L_{dn} noise limit. During blowdown events at the compressor stations the noise would exceed the FERC 55 dBA L_{dn} noise limit for short periods of time for maintenance activities and emergencies. During planned blowdown events, the blowdown rate will be controlled to not exceed the FERC 55 dBA L_{dn} noise impact at nearby NSAs.

Based on the measured data and HDD entry equipment noise levels, unmitigated noise from HDD operations would exceed both the Williams County and FERC noise limits at the nearest NSAs to the HDD sites. Placement of a temporary acoustical barrier is recommended to help reduce noise impacts at NSAs, but when used alone will not provide adequate attenuation to be in compliance with the FERC 55 dBA L_{dn} noise guidance.

To ensure compliance with FERC limits, on-Site acoustical monitoring should be completed during startup to evaluate the actual noise impact to the nearby NSA and help evaluate if additional noise mitigation will be required to meet FERC's guidance of 55 dBA $L_{dn.}$ at the NSAs. If nighttime drilling will only be completed during pullback which is estimated to last less than one week, temporary relocation of residents may be an option. If needed, additional noise mitigation measures may include; use of additional or higher temporary acoustical noise barriers, residential grade silencers or mufflers on engines, and use of gear box and other mechanical noise dampening blankets.

References:

Federal Energy Regulatory Commission. “Guidance Manual for Environmental Report Preparation”. February 2017.

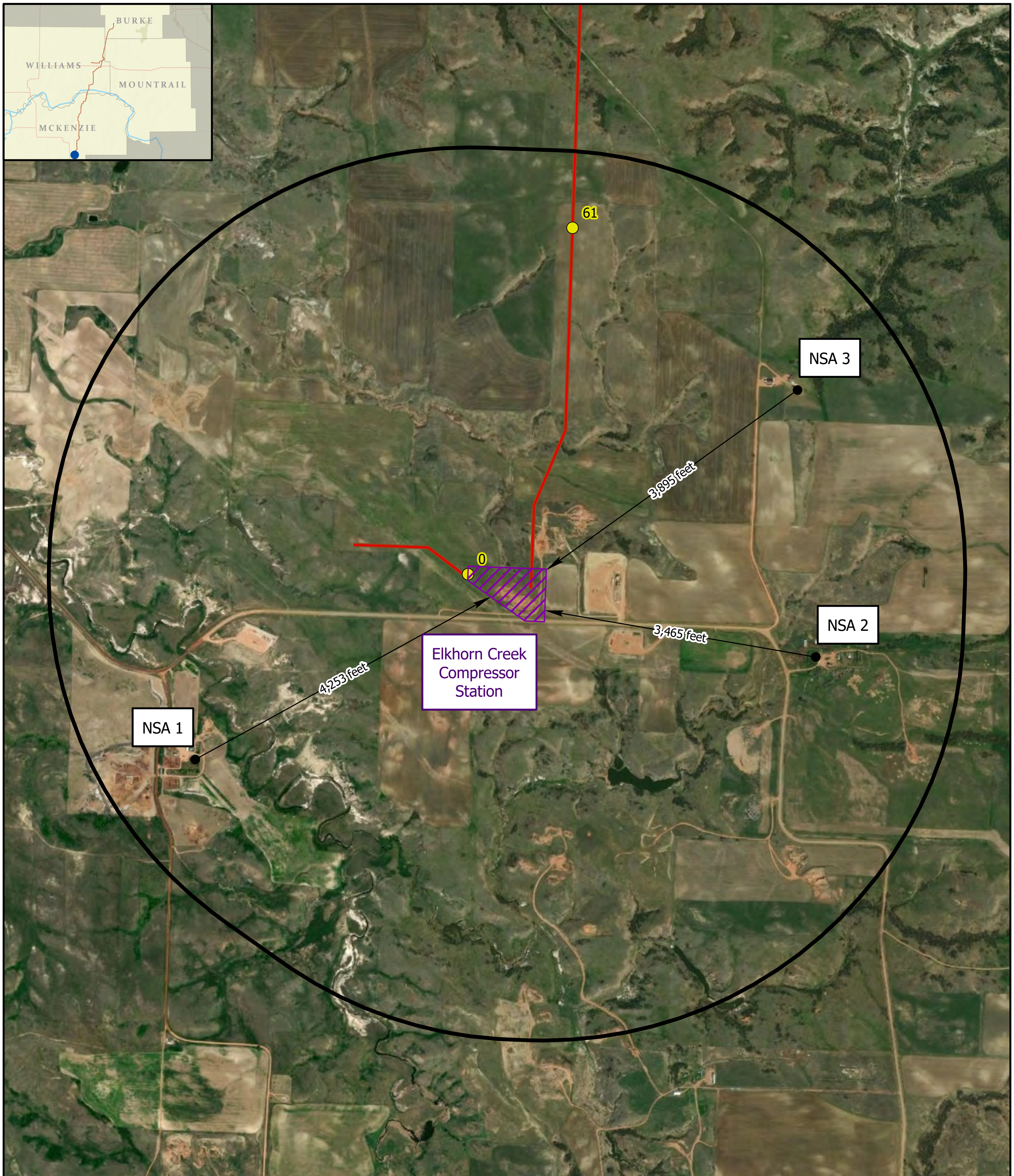
Hoover & Keith, Inc. “Results of an Ambient Site Sound Survey and Acoustical Analyses for an New Natural Gas Compressor Station Associated with the Proposed Gulf Crossing Project.” June 14, 2007.

Williams County. “Zoning Ordinance and Subdivision Regulations. September 15, 2015.
https://www.williamsnd.com/usrfiles/dept/122/forms/Zoning%20Ordinance%20and%20Subdivision%20Regulations%20Final.pdf

NORTH BAKKEN EXPANSION PROJECT

Pre-Construction Noise Survey and Acoustical Analysis
McKenzie and Williams Counties, North Dakota

APPENDIX A
Figures



Milepost
NSA Point
NSA Radius
Preliminary Route
Aboveground Facility

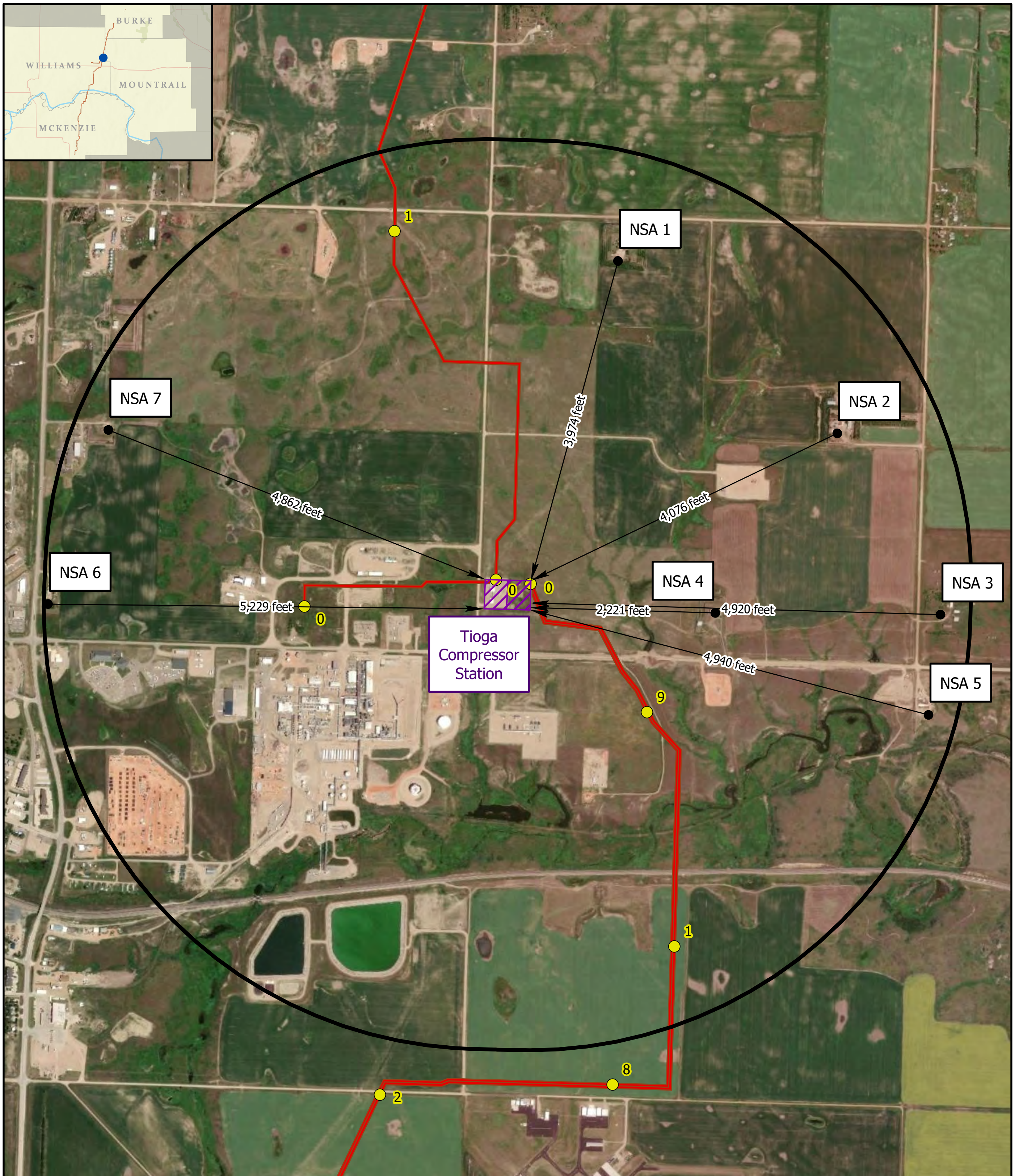
N

0.15 0.07 0 0.15
Miles

Figure 1
NSAs within 1.0 mile of Elkhorn Creek Compressor Station
North Bakken Expansion Project
McKenzie County, North Dakota

WBI ENERGY TRANSMISSION

File: M:\Clients\V-X\WBI\North_Bakken_Expansion_ArcGIS\FERC_ResourceReportMaps_FERC_RR_FERC_RR.aprx | Revised: 12/19/2019 | Scale 1:21,000 Drawn By: RJC



Milepost
NSA Point
NSA Radius
Preliminary Route
Aboveground Facility

0.15 0.07 0 0.15
Miles

Figure 2
NSAs within 1.0 mile of Tioga Compressor Station
North Bakken Expansion Project
Williams County, North Dakota

WBI ENERGY TRANSMISSION

File: M:\Clients\V-X\WBI\North_Bakken_Expansion_ArcGIS\FERC_ResourceReportMaps_FERC_RR_FERC_RR.aprx | Revised: 12/19/2019 | Scale 1:20,000 Drawn By: RJC

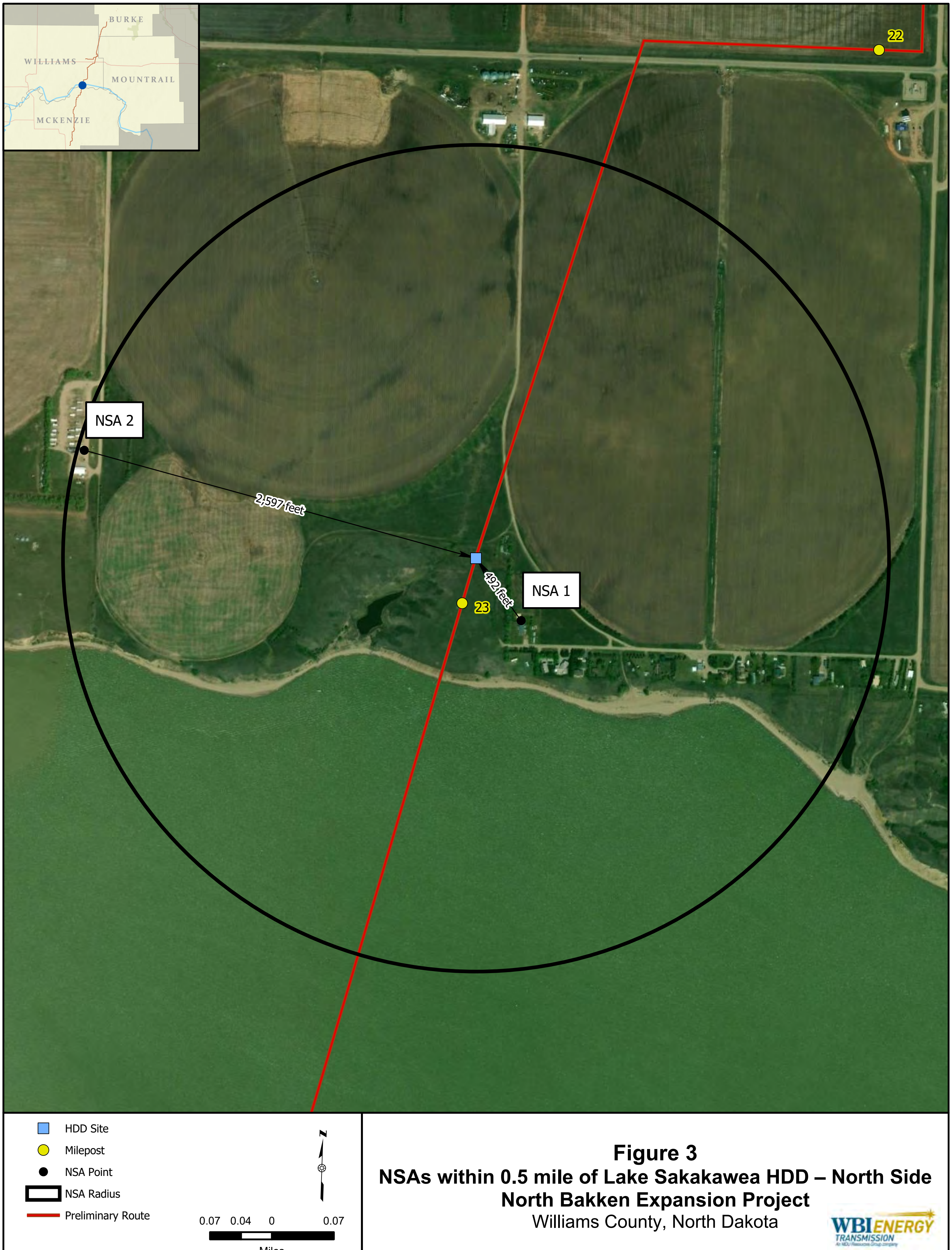


Figure 3
NSAs within 0.5 mile of Lake Sakakawea HDD – North Side
North Bakken Expansion Project
Williams County, North Dakota

WBI ENERGY TRANSMISSION

File: M:\Clients\V-X\WBI\North_Bakken_Expansion_ArcGIS\FERC_ResourceReportMaps_FERC_RR_FERC_RR.aprx | Revised: 12/19/2019 | Scale 1:10,000

Drawn By: RJC

Figure 4

NSAs within 0.5 mile of Lake Sakakawea HDD – South Side

North Bakken Expansion Project

McKenzie County, North Dakota

WBI ENERGY TRANSMISSION

File: M:\Clients\V-X\WBI\North_Bakken_Expansion_ArcGIS\FERC_ResourceReportMaps_FERC_RR_FERC_RR.aprx | Revised: 12/19/2019 | Scale 1:10,000

Drawn By: RJC

NORTH BAKKEN EXPANSION PROJECT

Pre-Construction Noise Survey and Acoustical Analysis
McKenzie and Williams Counties, North Dakota

APPENDIX B
Field Monitoring Forms

Noise Survey Data Sheet

Location: Elkhorn Creek Compressor Station NSA 1 (47.670899,-103.237866)

Investigator Name: Patrick Buffington, Nic Kuzola

Date: 07/22/2019

Meter Manufacturer and Model Number: Bruel & Kjaer 2250

Serial Number: 3011939

Calibrator Manufacturer, Model, and dB: Bruel & Kjaer 421, 94 dB

Calibrator Serial Number: 27012

Initial Calibration: 93.3 dB deviation from last -0.06 dB

Final Calibration:

Meteorological Conditions

Wind Speed: 2-4 mph

Direction: South

Temperature: 72°F

RH %: 64%

Barometric Pressure in mmHg:

Predominant noise source(s): Construction south of project, trucks on Hwy 34

Other noise source(s): Birds

Time start: 0924

Time end: 1024

Comments: Instantaneous Leq was 40-45 dBA w/o construction

Time	Unweighted Sound Pressure Level (dB) at each Octave Band Center Frequency (Hz)											Leq (dBA)
	16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
0939	46.5	40.3	47.2	45.7	42.4	43.4	43.4	37.5	35.4	29.8	23.0	51.0
0954	56.6	47.7	50.9	36.6	30.6	31.8	32.2	28.9	25.5	18.1	15.2	53.2
1009	44.9	50.5	49.6	49.2	44.4	49.9	46.6	41.2	33.9	26.3	20.6	40.4
1024	46.1	45.9	53.4	52.0	53.9	49.2	47.8	42.6	36.9	34.1	18.2	58.4

ERM

Noise Survey Data Sheet

Location: Elkhorn Creek Compressor Station NSA 1 (47.670899,-103.237866)

Investigator Name: Patrick Buffington, Nic Kuzola

Date: 07/22/2019

Meter Manufacturer and Model Number: Bruel & Kjaer 2250

Serial Number: 3011939

Calibrator Manufacturer, Model, and dB: Bruel & Kjaer 421, 94 dB

Calibrator Serial Number: 27012

Initial Calibration: 93.4 dB, deviation from last 0.00 dB

Final Calibration: 93.9 dB, deviation from last 0.09 dB

Meteorological Conditions

Wind Speed: 2 mph

Direction: South

Temperature: 59°F

RH %: 82%

Barometric Pressure in mmHg:

Predominant noise source(s): Insects

Other noise source(s): Minor traffic, ~ 4 cars

Time start: 2230

Time end: 2247

Comments:

Time	Unweighted Sound Pressure Level (dB) at each Octave Band Center Frequency (Hz)											LAeq (dBA)
	16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
2247	47.7	43.8	32.8	26.3	27.2	20.4	19.0	13.5	16.1	18.4	16.5	32.2

ERM

Noise Survey Data Sheet

Location: Elkhorn Creek Compressor Station NSA 2 (47.674509,-103.207512)

Investigator Name: Patrick Buffington, Nic Kuzola

Date: 07/22/2019

Meter Manufacturer and Model Number: Bruel & Kjaer 2250

Serial Number: 3011939

Calibrator Manufacturer, Model, and dB: Bruel & Kjaer 421, 94 dB

Calibrator Serial Number: 27012

Initial Calibration: 93.4 dB, deviation from last 0.01dB

Final Calibration: 93.4 dB, deviation from last -0.02 dB

Meteorological Conditions

Wind Speed: 2-2.5 mph

Direction: South

Temperature: 88°F

RH %: 30%

Barometric Pressure in mmHg:

Predominant noise source(s): Birds, insects, traffic

Other noise source(s):

Time start: 1110

Time end: 1210

Comments:

Time	Unweighted Sound Pressure Level (dB) at each Octave Band Center Frequency (Hz)											LAeq (dBA)
	16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
1128	55.8	44.6	36.0	28.9	22.0	18.7	18.9	19.0	28.3	25.4	27.9	29.4
1140	65.3	54.8	39.1	27.9	22.6	20.7	20.1	16.8	21.6	25.9	23.3	27.7
1155	45.1	50.7	41.	32.0	19.2	26.4	20.4	20.8	22.1	19.4	22.4	30.9
1210	54.3	49.5	44.0	31.5	34.6	23.5	25.4	28.1	15.3	23.0	21.6	25.8

ERM

Noise Survey Data Sheet

Location: Elkhorn Creek Compressor Station NSA 2 (47.674509,-103.207512)________

Investigator Name: Patrick Buffington, Nic Kuzola_____________

Date: 07/22/2019____________________________

Meter Manufacturer and Model Number: Bruel & Kjaer 2250______ ________

Serial Number: 3011939_____________________________

Calibrator Manufacturer, Model, and dB: Bruel & Kjaer 421, 94 dB________________

Calibrator Serial Number: 27012_______________________________

Initial Calibration: 93.4 dB, deviation from last 0.01dB_______

Final Calibration: 93.9 dB, deviation from last 0.00 dB_______

Meteorological Conditions

Wind Speed: 2.5-3.8 mph___________________________

Direction: South_______________________________

Temperature: 59°F_______________________________

RH %: 73%_________________________________

Barometric Pressure in mmHg: ________________________________

Predominant noise source(s): Wind, insects, ___________________________

Other noise source(s): Very quiet traffic, far off over hill___________

Time start: 2332_______________________________

Time end: 2347_______________________________

Comments: ________________________________

Time	Unweighted Sound Pressure Level (dB) at each Octave Band Center Frequency (Hz)											LAeq (dBA)
	16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
2332	45.6	43.0	35.5	29.8	23.8	23.8	31.6	18.6	17.3	18.7	20.4	26.8

ERM

Noise Survey Data Sheet

Location: HDD NSA 1 (48.154528,-103.076141)

Investigator Name: Patrick Buffington, Nic Kuzola

Date: 07/23/2019

Meter Manufacturer and Model Number: Bruel & Kjaer 2250

Serial Number: 3011939

Calibrator Manufacturer, Model, and dB: Bruel & Kjaer 421, 94 dB

Calibrator Serial Number: 27012

Initial Calibration: 94.9 dB, deviation from last -0.05 dB

Final Calibration: 93.9, dB, deviation from last 0.05 dB

Meteorological Conditions

Wind Speed: 0-2 mph

Direction: South

Temperature: 88°F

RH %: 44%

Barometric Pressure in mmHg:

Predominant noise source(s): Rustling trees, insects

Other noise source(s):

Time start: 1506

Time end: 1606

Comments:

	Unweighted Sound Pressure Level (dB) at each Octave Band Center Frequency (Hz)											LAeq
Time	16	31.5	63	125	250	500	1000	2000	4000	8000	16000	(dBA)
1521	48.0	45.1	41.9	39.2	32.8	35.5	34.7	39.4	33.7	29.0	27.6	42.2
1537	51.8	49.4	48.1	42.1	42.7	41.6	40.4	37.0	38.1	34.1	26.2	44.2
1551	49.1	45.0	41.9	49.1	33.8	33.5	34.3	32.9	30.6	27.6	30.0	40.3
1606	49.8	46.0	43.9	42.	45.2	50.9	35.2	33.0	26.1	29.1	27.0	42.8

ERM

Noise Survey Data Sheet

Location: HDD NSA 1 (48.154528,-103.076141)

Investigator Name: Patrick Buffington, Nic Kuzola

Date: 07/24/2019

Meter Manufacturer and Model Number: Bruel & Kjaer 2250

Serial Number: 3011887

Calibrator Manufacturer, Model, and dB: Bruel & Kjaer 421, 94 dB

Calibrator Serial Number: 27012

Initial Calibration: 94.4 dB, deviation from last -0.06 dB

Final Calibration: 93.8 dB, deviation from last 0.02 dB

Meteorological Conditions

Wind Speed: 1-2 mph

Direction: Southeast

Temperature: 70°F

RH %: 81%

Barometric Pressure in mmHg:

Predominant noise source(s): Rustling trees

Other noise source(s):

Time start: 0121

Time end: 0136

Comments:

	Unweighted Sound Pressure Level (dB) at each Octave Band Center Frequency (Hz)											LAeq
Time	16	31.5	63	125	250	500	1000	2000	4000	8000	16000	(dBA)
0136	53.9	51.9	50.7	43.4	32.1	30.7	23.0	22.2	27.5	29.4	34.9	34.0

ERM

Noise Survey Data Sheet

Location: HDD NSA 2 (48.155231,-103.087188)____

Investigator Name: Patrick Buffington, Nic Kuzola_

Date: 07/23/2019__

Meter Manufacturer and Model Number: Bruel & Kjaer 2250

Serial Number: 3011939

Calibrator Manufacturer, Model, and dB: Bruel & Kjaer 421, 94 dB

Calibrator Serial Number: 27012

Initial Calibration: 93.4 dB, deviation from last 0.07 dB

Final Calibration: 93.8, dB, deviation from last 0.08 dB

Meteorological Conditions

Wind Speed: 8-12 mph

Direction: Southeast

Temperature: 81°F

RH %: 52%

Barometric Pressure in mmHg: ____

Predominant noise source(s): Insects, wind

Other noise source(s): ____

Time start: 1351

Time end: 1451

Comments: ____

Time	Unweighted Sound Pressure Level (dB) at each Octave Band Center Frequency (Hz)											LAeq (dBA)
	16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
1406	78.3	71.9	70.2	47.1	41.2	34.9	33.6	30.2	27.7	37.2	39.8	44.6
1421	69.0	62.7	48.1	44.6	32.6	30.1	29.5	27.8	22.3	37.7	40.7	40.8
1436	78.2	67.5	52.1	45.7	28.8	31.0	29.2	28.4	24.8	37.4	40.4	42.1
1451	70.6	66.8	50.5	41.8	30.9	30.2	29.8	29.7	24.0	37.1	36.8	40.6

Noise Survey Data Sheet

Location: HDD NSA 2 (48.155231,-103.087188)

Investigator Name: Patrick Buffington, Nic Kuzola

Date: 07/24/2019

Meter Manufacturer and Model Number: Bruel & Kjaer 2250

Serial Number: 3011887

Calibrator Manufacturer, Model, and dB: Bruel & Kjaer 421, 94 dB

Calibrator Serial Number: 27012

Initial Calibration: 93.7 dB, deviation from last -0.07 dB

Final Calibration: 94.0 dB, deviation from last 0.10 dB

Meteorological Conditions

Wind Speed: 1.8-2.7 mph

Direction: Southeast

Temperature: 70°F

RH %: 85%

Barometric Pressure in mmHg:

Predominant noise source(s): Insects

Other noise source(s):

Time start: 0052

Time end: 0107

Comments:

	Unweighted Sound Pressure Level (dB) at each Octave Band Center Frequency (Hz)											LAeq
Time	16	31.5	63	125	250	500	1000	2000	4000	8000	16000	(dBA)
0107	61.6	52.4	50.6	40.5	28.7	28.3	23.1	17.9	15.7	41.1	46.6	44.4

Noise Survey Data Sheet

Location: HDD NSA 3 (48.110783,-103.099304)____

Investigator Name: Patrick Buffington, Nic Kuzola_

Date: 07/23/2019__

Meter Manufacturer and Model Number: Bruel & Kjaer 2250

Serial Number: 3011939

Calibrator Manufacturer, Model, and dB: Bruel & Kjaer 421, 94 dB

Calibrator Serial Number: 27012

Initial Calibration: 94.0 dB, deviation from last 0.01dB

Final Calibration: 93.4 dB, deviation from last 0.00 dB

Meteorological Conditions

Wind Speed: 9 mph, gust up to 11 mph

Direction: South

Temperature: 72°F

RH %: 64%

Barometric Pressure in mmHg:

Predominant noise source(s): Wind, insects

Other noise source(s): Traffic

Time start: 1049

Time end: 1149

Comments: Idling truck ~200' away for first 5-10 minutes, associated with oil drills near NSA

Time	Unweighted Sound Pressure Level (dB) at each Octave Band Center Frequency (Hz)											LAeq (dBA)
	16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
1104	76.7	66.0	51.9	50.3	40.1	34.2	30.9	33.3	33.5	40.8	27.1	40.5
1119	77.2	64.8	59.0	50.7	41.9	38.0	37.0	34.1	34.3	34.7	29.8	45.3
1134	83.7	75.1	64.4	52.1	40.2	38.1	35.0	35.2	36.6	33.2	31.6	43.8
1149	78.3	68.2	59.7	61.1	38.9	30.9	42.5	31.8	32.9	32.2	25.7	49.2

ERM

Noise Survey Data Sheet

Location: HDD NSA 3 (48.110783,-103.099304)

Investigator Name: Patrick Buffington, Nic Kuzola

Date: 07/23/2019

Meter Manufacturer and Model Number: Bruel & Kjaer 2250

Serial Number: 3011887

Calibrator Manufacturer, Model, and dB: Bruel & Kjaer 421, 94 dB

Calibrator Serial Number: 27012

Initial Calibration: 94.0 dB, deviation from last -0.06 dB

Final Calibration: 94.0 dB, deviation from last 0.08 dB

Meteorological Conditions

Wind Speed: 5.5-6.5 mph

Direction: Southeast

Temperature: 73°F

RH %: 69%

Barometric Pressure in mmHg:

Predominant noise source(s): Insects, wind, tank battery ~ 600' east w/ 4 tanks

Other noise source(s): Minor traffic,

Time start: 2246

Time end: 2301

Comments:

Time	Unweighted Sound Pressure Level (dB) at each Octave Band Center Frequency (Hz)											LAeq (dBA)
	16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
2301	74.3	59.1	49.6	44.5	39.1	31.4	31.4	29.0	25.8	37.9	21.8	41.2

Noise Survey Data Sheet

Location: Tioga NSAs 1 & 8 (48.416102,-102.907314)

Investigator Name: Patrick Buffington, Nic Kuzola

Date: 07/24/2019

Meter Manufacturer and Model Number: Bruel & Kjaer 2250

Serial Number: 3011887

Calibrator Manufacturer, Model, and dB: Bruel & Kjaer 421, 94 dB

Calibrator Serial Number: 27012

Initial Calibration: 93.4 dB, deviation from last 0.02 dB

Final Calibration: 93.3 dB, deviation from last -0.11 dB

Meteorological Conditions

Wind Speed: 2-5 mph, gusts up to 7 mph

Direction: South

Temperature: 72°F

RH %: 72%

Barometric Pressure in mmHg:

Predominant noise source(s): Rustling grass

Other noise source(s): Minor traffic (2 cars)

Time start: 1310

Time end: 1502

Comments: Measurement taken about 1000’ from NSAs 1 & 8. 8 is to north, 1 is to east, both in sight from location. Paused run from 1330-1422 for rain.

Time	Unweighted Sound Pressure Level (dB) at each Octave Band Center Frequency (Hz)											LAeq (dBA)
	16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
1325	60.5	58.1	53.6	47.7	45.1	36.6	31.8	30.7	25.2	19.7	17.2	41.4
1432	57.5	57.2	51.4	48.8	43.2	37.3	32.1	26.9	21.2	35.5	37.8	41.7
1448	62.4	57.4	54.7	57.6	50.3	43.7	37.6	29.5	21.5	38.6	41.0	45.9
1502	61.3	60.1	53.6	51.9	50.6	38.5	38.9	28.1	22.8	39.9	43.0	44.4

Noise Survey Data Sheet

Location: Tioga NSAs 1 & 8 (48.416102,-102.907314)

Investigator Name: Patrick Buffington, Nic Kuzola

Date: 07/24/2019

Meter Manufacturer and Model Number: Bruel & Kjaer 2250

Serial Number: 3011939

Calibrator Manufacturer, Model, and dB: Bruel & Kjaer 421, 94 dB

Calibrator Serial Number: 27012

Initial Calibration: 93.9 dB, deviation from last 0.03 dB

Final Calibration: 93.9 dB, deviation from last -0.01 dB

Meteorological Conditions

Wind Speed: 2-3 mph

Direction: South

Temperature: 72°F

RH %: 83%

Barometric Pressure in mmHg:

Predominant noise source(s): Insects, compressor station

Other noise source(s):

Time start: 2323

Time end: 2339

Comments:

Time	Unweighted Sound Pressure Level (dB) at each Octave Band Center Frequency (Hz)											LAeq (dBA)
	16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
2339	58.0	62.9	55.8	51.4	44.5	41.5	35.8	29.6	19.8	41.4	45.4	47.3

ERM

Noise Survey Data Sheet

Location: Tioga NSA 2 (48.408438,-102.885868)

Investigator Name: Patrick Buffington, Nic Kuzola

Date: 07/25/2019

Meter Manufacturer and Model Number: Bruel & Kjaer 2250

Serial Number: 3011939

Calibrator Manufacturer, Model, and dB: Bruel & Kjaer 421, 94 dB

Calibrator Serial Number: 27012

Initial Calibration: 93.8 dB, deviation from last 0.02 dB

Final Calibration: 93.9 dB, deviation from last 0.01 dB

Meteorological Conditions

Wind Speed: 7-9 mph

Direction: North

Temperature: 68°F

RH %: 58%

Barometric Pressure in mmHg:

Predominant noise source(s): Insects, wind

Other noise source(s): Minor traffic

Time start: 0959

Time end: 1059

Comments:

Time	Unweighted Sound Pressure Level (dB) at each Octave Band Center Frequency (Hz)											LAeq (dBA)
	16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
1014	65.9	52.0	47.6	39.2	24.7	22.4	28.4	27.0	25.3	41.4	46.3	43.9
1029	59.9	51.1	43.9	35.3	28.2	20.8	18.8	16.4	22.6	41.1	45.9	49.9
1044	59.7	55.3	42.7	37.7	26.8	21.5	26.0	19.9	30.	41.5	44.9	43.1
1059	73.4	60.1	46.0	34.9	27.5	22.1	22.6	22.5	20.5	39.8	45.0	45.1

ERM

Noise Survey Data Sheet

Location: Tioga NSA 2 (48.408438,-102.885868)

Investigator Name: Patrick Buffington, Nic Kuzola

Date: 07/24/2019

Meter Manufacturer and Model Number: Bruel & Kjaer 2250

Serial Number: 3011939

Calibrator Manufacturer, Model, and dB: Bruel & Kjaer 421, 94 dB

Calibrator Serial Number: 27012

Initial Calibration: 93.8 dB, deviation from last 0.02 dB

Final Calibration: 93.9 dB, deviation from last -0.03 dB

Meteorological Conditions

Wind Speed: 5.0-7.5 mph

Direction: South

Temperature: 73°F

RH %: 70%

Barometric Pressure in mmHg:

Predominant noise source(s): Insects

Other noise source(s):

Time start: 2255

Time end: 2310

Comments:

Time	Unweighted Sound Pressure Level (dB) at each Octave Band Center Frequency (Hz)											LAeq (dBA)
	16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
2310	58.8	54.1	49.4	45.5	36.7	32.5	26.3	19.8	21.8	49.9	56.0	51.0

ERM

Noise Survey Data Sheet

Location: Tioga NSAs 3 & 5 (48.402277,-102.885672)

Investigator Name: Patrick Buffington, Nic Kuzola

Date: 07/24/2019

Meter Manufacturer and Model Number: Bruel & Kjaer 2250

Serial Number: 3011939

Calibrator Manufacturer, Model and dB: Bruel & Kjaer 421, 94 dB

Calibrator Serial Number: 27012

Initial Calibration: 93.4 dB, deviation from last -0.02 dB

Final Calibration: 93.9 dB, deviation from last 0.06 dB

Meteorological Conditions

Wind Speed: 3-4 mph, increased during measurement

Direction: South

Temperature: 73°F

RH %: 72%

Barometric Pressure in mmHg:

Predominant noise source(s): Traffic, wind, insects

Other noise source(s): Plane, compressor station

Time start: 1535

Time end: 1635

Comments: Measurement taken about 500' from NSAs 3 & 5. 3 is to north, 5 is to south, both in sight from monitoring location.

Time	Unweighted Sound Pressure Level (dB) at each Octave Band Center Frequency (Hz)											LAeq (dBA)
	16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
1550	67.0	53.8	50.3	44.4	37.1	31.6	24.1	18.5	19.4	40.9	50.1	45.7
1605	70.9	63.8	47.4	44.5	34.6	28.4	24.4	23.9	22.5	44.6	49.6	48.7
1620	83.6	72.2	63.9	56.6	41.1	33.6	34.2	31.2	32.3	47.3	51.1	56.8
1635	75.5	65.0	52.1	41.8	40.0	30.3	25.0	24.1	35.0	46.1	50.0	46.8

Noise Survey Data Sheet

Location: Tioga NSAs 3 & 5 (48.402277,-102.885672)

Investigator Name: Patrick Buffington, Nic Kuzola

Date: 07/24/2019

Meter Manufacturer and Model Number: Bruel & Kjaer 2250

Serial Number: 3011939

Calibrator Manufacturer, Model, and dB: Bruel & Kjaer 421, 94 dB

Calibrator Serial Number: 27012

Initial Calibration: 93.9 dB, deviation from last 0.00 dB

Final Calibration: 93.9 dB, deviation from last 0.01 dB

Meteorological Conditions

Wind Speed: 1-2 mph

Direction: South

Temperature: 77°F

RH %: 72%

Barometric Pressure in mmHg:

Predominant noise source(s): Insects, wind,

Other noise source(s): Cows, 1 car, compressor

Time start: 2230

Time end: 2246

Comments:

	Unweighted Sound Pressure Level (dB) at each Octave Band Center Frequency (Hz)											LAeq
Time	16	31.5	63	125	250	500	1000	2000	4000	8000	16000	(dBA)
2246	57.2	55.1	48.7	44.5	38.9	30.1	28.2	22.3	29.5	45.1	48.6	49.4

ERM

Noise Survey Data Sheet

Location: Tioga NSA 4 (48.401697,-102.893168)

Investigator Name: Patrick Buffington, Nic Kuzola

Date: 07/24/2019

Meter Manufacturer and Model Number: Bruel & Kjaer 2250

Serial Number: 3011939

Calibrator Manufacturer, Model, and dB: Bruel & Kjaer 421, 94 dB

Calibrator Serial Number: 27012

Initial Calibration: 93.9 dB, deviation from last -0.02 dB

Final Calibration: 93.9 dB, deviation from last 0.05 dB

Meteorological Conditions

Wind Speed: 8-11 mph

Direction: South

Temperature: 79°F

RH %: 66%

Barometric Pressure in mmHg:

Predominant noise source(s): Traffic, train, oil well, compressor station

Other noise source(s): Horses

Time start: 1654

Time end: 1754

Comments:

	Unweighted Sound Pressure Level (dB) at each Octave Band Center Frequency (Hz)											LAeq
Time	16	31.5	63	125	250	500	1000	2000	4000	8000	16000	(dBA)
1709	81.2	63.7	52.5	49.4	40.8	50.4	48.2	38.7	28.7	40.4	45.9	69.2
1724	71.9	62.9	56.3	45.9	41.0	34.7	30.0	28.0	30.3	34.6	44.3	49.3
1739	77.3	55.1	52.2	44.4	35.9	34.8	33.2	29.8	36.9	43.2	39.8	46.2
1754	77.7	70.7	58.6	53.6	33.4	32.0	64.3	51.4	30.5	42.2	41.1	45.0

Noise Survey Data Sheet

Location: Tioga NSA 4 (48.401697,-102.893168)

Investigator Name: Patrick Buffington, Nic Kuzola

Date: 07/24/2019

Meter Manufacturer and Model Number: Bruel & Kjaer 2250

Serial Number: 3011939

Calibrator Manufacturer, Model, and dB: Bruel & Kjaer 421, 94 dB

Calibrator Serial Number: 27012

Initial Calibration: 93.8 dB, deviation from last -0.05 dB

Final Calibration: 93.9 dB, deviation from last -0.03 dB

Meteorological Conditions

Wind Speed: 2 mph

Direction: South

Temperature: 79°F

RH %: 67%

Barometric Pressure in mmHg:

Predominant noise source(s): Traffic, oil well, compressor station

Other noise source(s): Horses

Time start: 2207

Time end: 2222

Comments:

Time	Unweighted Sound Pressure Level (dB) at each Octave Band Center Frequency (Hz)											LAeq (dBA)
	16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
2222	59.6	58.3	54.0	51.0	37.7	35.9	33.7	31.2	33.3	26.3	19.4	40.1

ERM

Noise Survey Data Sheet

Location: Tioga NSA 6 & 7(48.408634,-102.928193)

Investigator Name: Patrick Buffington, Nic Kuzola

Date: 07/24/2019

Meter Manufacturer and Model Number: Bruel & Kjaer 2250

Serial Number: 3011887

Calibrator Manufacturer, Model, and dB: Bruel & Kjaer 421, 94 dB

Calibrator Serial Number: 27012

Initial Calibration: 94.0 dB, deviation from last 0.05 dB

Final Calibration: 93.4 dB, deviation from last 0.05 dB

Meteorological Conditions

Wind Speed: 5.5-7.5 mph

Direction: South

Temperature: 81°F

RH %: 57%

Barometric Pressure in mmHg:

Predominant noise source(s): Traffic

Other noise source(s):

Time start: 1154

Time end: 1254

Comments: Measurement taken about 500'from NSAs 6 and 7, 2000' from NSA 6. No safe parking closer to 6.

Time	Unweighted Sound Pressure Level (dB) at each Octave Band Center Frequency (Hz)											LAeq (dBA)
	16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
1209	67.0	63.4	59.1	50.0	45.3	44.2	44.6	41.2	35.5	40.8	38.3	54.7
1224	65.0	57.2	57.0	61.3	47.3	42.0	37.9	43.4	31.1	32.1	36.4	44.2
1239	66.9	59.3	56.2	47.8	42.1	55.4	66.7	45.9	31.4	33.1	39.7	55.1
1254	67.7	57.1	54.1	60.1	47.2	42.8	42.2	34.9	27.7	37.4	37.1	56.9

ERM

Noise Survey Data Sheet

Location: Tioga NSAs 6 & 7 (48.408634,-102.928193)

Investigator Name: Patrick Buffington, Nic Kuzola

Date: 07/24/2019

Meter Manufacturer and Model Number: Bruel & Kjaer 2250

Serial Number: 3011939

Calibrator Manufacturer, Model, and dB: Bruel & Kjaer 421, 94 dB

Calibrator Serial Number: 27012

Initial Calibration: 93.8 dB, deviation from last 0.05 dB

Final Calibration: 94.0 dB, deviation from last -0.01dB

Meteorological Conditions

Wind Speed: 4-6 mph

Direction: South

Temperature: 72°F

RH %: 77%

Barometric Pressure in mmHg: ________

Predominant noise source(s): Traffic, insects

Other noise source(s): Compressor station

Time start: 2354

Time end: 07/25/2019 0010

Comments: ________

Time	Unweighted Sound Pressure Level (dB) at each Octave Band Center Frequency (Hz)											LAeq (dBA)
	16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
0010	68.9	61.0	64.8	53.1	48.8	42.0	33.2	26.9	22.3	42.4	48.2	62.1

NORTH BAKKEN EXPANSION PROJECT

Pre-Construction Noise Survey and Acoustical Analysis
McKenzie and Williams Counties, North Dakota

APPENDIX C
Sound Level Meter Data

Project Name	Start Time	Elapsed Time	Persistent Overload	LAFTeq	LAFmax	LASmax	LAImax	LCFmax	LCSmax	LCImax	LAFmin
Project 004	7/22/2019 9:24	01:02:22	0	62.55	78.32	76.77	79.07	82.56	81.19	83.34	27.04
Project 002 (1)	7/22/2019 9:23	01:01:44	0	62.09	78.39	77.16	79.02	82.34	80.98	83.37	26.86
Project 003	7/22/2019 11:09	01:00:00	0	46.02	65.46	57.27	70.01	76.06	71.9	78.52	21.93
Project 004	7/22/2019 12:40	01:00:00	0	68.26	91.89	90.51	92.88	102.16	99.62	103.3	21.45
Project 005	7/22/2019 22:28	00:17:07	0	44.37	64.33	62.39	65.59	72.82	70.94	74.82	23.46
Project 006	7/22/2019 23:02	00:15:01	0	53.72	72.82	70.41	74.95	78.11	76.86	78.7	18.6
Project 007	7/22/2019 23:31	00:15:02	0	37.8	48.73	47.56	53.96	59.65	57.66	61.55	21.97
Project 008	7/23/2019 10:49	01:00:00	0	60.85	83.34	81.17	84.68	92.43	87.31	95.11	35.68
Project 009	7/23/2019 13:50	01:00:00	0	47.36	61.97	55.75	65.31	88.77	82.56	92.39	35.08
Project 010	7/23/2019 15:05	01:00:00	0	48.29	63.76	57.08	68.67	76.28	68.43	79.77	34.26
Project 011	7/23/2019 16:19	00:32:03	0	49.77	64.55	58.32	69.04	83.68	78.18	86.8	35.22
Project 012	7/23/2019 17:00	00:30:04	0	57.61	78.98	74.31	81.44	87.67	80.47	91.66	34.01
Project 013	7/23/2019 22:45	00:15:00	0	50.52	70.56	67.19	75.17	82.92	77.39	85.6	34.79
Project 014	7/24/2019 0:52	00:15:00	0	44.8	55.26	48.02	60.25	74.26	71.2	76.69	35.5
Project 015	7/24/2019 1:21	00:15:00	0	40.43	56.19	47.63	61.29	60.84	57.42	62.78	31.34
Project 016	7/24/2019 1:48	00:15:00	0	41.08	50.75	46.07	53.65	63.6	60.66	65.68	34.48
Project 017	7/24/2019 11:54	01:00:00	0	65.31	83.24	79.95	87.71	89.96	86.73	91.8	39.41
Project 018	7/24/2019 13:10	01:00:00	0	65.91	92.44	89.58	93.36	102.83	99.36	103.58	37.56
Project 005	7/24/2019 15:34	01:02:21	0	54.92	77.6	75.52	78.46	90.45	86.82	93	40.19
Project 006	7/24/2019 16:53	01:01:18	0	60.1	78.47	76.49	79.12	94.19	88.77	98.14	34.81
Project 007	7/24/2019 22:07	00:15:17	0	52.49	69.33	65.22	73.78	70.64	67.94	74.57	38.61
Project 008	7/24/2019 22:29	00:17:00	0	49.39	59.32	56.46	63.57	81.62	74.34	84.75	41.6
Project 009	7/24/2019 22:54	00:15:18	0	53.33	57.37	54.35	61.03	74.17	69.94	77.47	49.66
Project 010	7/24/2019 23:22	00:17:00	0	47.8	52.64	50.07	55.16	68.92	65.26	72.58	43.45
Project 011	7/24/2019 23:53	00:16:17	0	55.33	68.26	66.96	69.01	86.93	82.93	89.52	44.76
Project 012	7/25/2019 9:58	01:01:00	0	50.89	73.67	70.58	74.74	81.76	76.39	86.03	37.7

Project Name	LASmin	LAImin	LCFmin	LCSmin	LCImin	LApeak	LAIeq	LCIeq	LAeq	Lep,d	Lep,d,v	LCeq	LAE	LCE	LAIeq-LAeq
Project 004	27.97	27.52	42.64	44.98	45.98	90.6	60.2	64.34	57.39	57.11	57.11	62.18	93.12	97.9	2.81
Project 002 (1)	29.12	29	41.47	44.7	45.89	92.09	59.76	64.19	57.15	56.87	56.87	62.19	92.83	97.87	2.61
Project 003	22.9	22.43	36.35	39.5	40.78	86.44	44.96	56.19	36.56	36.28	36.28	52.59	72.12	88.15	8.4
Project 004	22.25	21.49	33.38	35.31	35.41	108.42	65.99	77.14	63.23	62.95	62.95	74.26	98.79	109.82	2.76
Project 005	23.99	23.65	38.54	41.73	42.78	87.1	42.53	55.32	39.95	39.67	39.67	52.92	70.06	83.04	2.58
Project 006	18.97	18.56	33.21	35.25	36.27	89.92	52.28	60.57	48.58	48.3	48.3	58.91	78.13	88.46	3.7
Project 007	22.7	22.12	37.14	39.63	40.67	75.03	36.89	47.86	34.21	33.93	33.93	45.76	63.76	75.31	2.68
Project 008	36.67	35.81	50.57	54.33	56.46	95.92	58.64	80.1	54.86	54.58	54.58	74.48	90.42	110.04	3.78
Project 009	38.14	37.66	47.57	51.13	52.74	85.4	46.39	76.16	43.02	42.74	42.74	70.89	78.57	106.45	3.37
Project 010	34.63	34.46	44.32	46.31	46.73	88.17	47.27	56.1	43.91	43.63	43.63	51.44	79.47	87	3.36
Project 011	36.69	36.12	53.47	55.23	55.92	87.57	48.43	73.18	43.07	42.79	42.79	68.2	75.91	101.04	5.36
Project 012	36.54	35.67	51.99	55.15	55.46	92.28	55.23	73.27	49.1	48.82	48.82	67.82	81.66	100.38	6.13
Project 013	35.56	35.35	50.87	54.19	54.93	92.07	49.34	69.9	44.32	44.04	44.04	64.37	73.86	93.91	5.02
Project 014	37.29	36.63	49.75	52.13	53.29	77.29	43.91	59.47	42.14	41.86	41.86	56.22	71.67	85.76	1.77
Project 015	31.93	31.51	47.73	49.74	50.41	82.07	39.58	55.81	35.7	35.42	35.42	53.21	65.24	82.75	3.88
Project 016	35.19	34.84	52.75	54.64	55.14	67.94	40.29	59.42	39.52	39.24	39.24	56.8	69.06	86.34	0.77
Project 017	40.23	39.89	55.47	58.68	59.91	104.89	62.98	71.73	60.51	60.23	60.23	69.29	96.07	104.85	2.47
Project 018	37.93	37.73	51.7	54.31	55.54	104	60.99	71.59	57.59	57.31	57.31	67.92	93.15	103.48	3.4
Project 005	41.63	40.5	49.99	51.97	52.86	94.02	52.5	74.37	50.56	50.28	50.28	68.84	86.29	104.57	1.94
Project 006	40.36	40.17	52.04	57.51	58.99	96.9	57.37	81.88	55.29	55.01	55.01	76.37	90.95	112.02	2.08
Project 007	39.77	39.41	54.94	57.35	58.45	88.89	50.48	62.38	46	45.72	45.72	59.75	75.62	89.37	4.48
Project 008	42.25	41.65	52.22	54.61	55.31	78.62	48.32	61.64	46.85	46.57	46.57	57.49	76.93	87.57	1.47
Project 009	50.4	50.05	53.69	55.26	55.84	79.63	52.74	61.27	52.31	52.03	52.03	58.35	81.93	87.98	0.43
Project 010	43.87	43.74	55.88	57.98	58.43	74.67	47.15	63.65	46.46	46.18	46.18	61.3	76.54	91.38	0.69
Project 011	45.28	44.94	56.13	58.33	59.73	82.2	53.41	70.25	52.26	51.98	51.98	66.7	82.16	96.6	1.15
Project 012	39.82	38.95	47.16	50.5	51.48	91.29	49.09	68	45.97	45.69	45.69	61.88	81.6	97.51	3.12

Project Name	LCeq-LAeq	LAFTeq-LAeq	Overload	LAF1.0	LAF5.0	LAF10.0	LAF50.0	LAF90.0	LAF95.0	LAF99.0	StdDev	LavS5	TWA	TWAv
Project 004	4.79	5.16	0	69.92	63.71	59.98	45.81	36.45	34.3	30.57	8.78	53.76	23.58	23.58
Project 002 (1)	5.04	4.94	0	69.81	63.44	59.28	45.71	36.54	34.39	30.53	8.62	53.43	22.98	22.98
Project 003	16.03	9.46	0	47.41	41.63	38.75	30.12	25.77	24.71	23.41	5.26	34.51		
Project 004	11.03	5.03	0	74.31	64.05	52.71	31.63	25.33	24.32	23.08	11.76	53.88	35.84	35.84
Project 005	12.97	4.42	0	51.4	43.2	38.48	27.58	24.82	24.45	24	6.14	34.83		
Project 006	10.33	5.14	0	60.97	50.07	44.81	24.93	20.51	20.02	19.24	9.89	40.87	-7.36	-7.36
Project 007	11.55	3.59	0	46.55	42.05	36.77	26.54	24.57	24.11	23.21	5.26	31.52		
Project 008	19.62	5.99	0	65.39	52.59	49.59	43.3	39.88	39.17	37.9	4.94	48.69	23.16	23.16
Project 009	27.87	4.34	0	49.27	46.38	45.13	42.05	39.9	39.25	38.03	2.2	42.78		
Project 010	7.53	4.38	0	52.3	49.47	47.7	40.86	37.02	36.2	35.24	4.02	43		
Project 011	25.13	6.7	0	49.69	46.67	45.4	41.39	38.53	37.92	36.86	2.8	42.63		
Project 012	18.72	8.51	0	59.76	54.56	46.96	41.61	38.74	38.06	36.9	4.55	45.59	2.51	2.51
Project 013	20.05	6.2	0	51.21	44.32	42.26	39.1	37.05	36.59	35.71	3.05	41.24		
Project 014	14.08	2.66	0	44.76	44.05	43.69	42.06	39.05	38.35	37.09	1.78	42.05		
Project 015	17.51	4.73	0	40.52	38.96	38.09	34.25	32.78	32.53	32.07	2.19	35.39		
Project 016	17.28	1.56	0	44.1	42.28	41.52	38.94	36.78	36.37	35.72	1.84	39.34		
Project 017	8.78	4.8	0	71.08	66.55	63.73	52.07	42.72	41.82	40.8	8.05	57.61	27.78	27.78
Project 018	10.33	8.32	0	59.59	50.16	47.71	42.92	40.54	39.97	39.05	3.87	47.61	24.04	24.04
Project 005	18.28	4.36	0	57.7	54.51	51.41	48.02	45.48	44.68	43.43	2.84	49.26	7.63	7.63
Project 006	21.08	4.81	0	68.45	58.03	53.96	46.98	42.93	41.88	39.81	5.27	51.53	21.81	21.81
Project 007	13.75	6.49	0	55.69	47.56	46.91	42.28	40.69	40.3	39.65	2.99	44.38		
Project 008	10.64	2.54	0	50.97	48.97	48.61	46.43	43.66	43.26	42.53	2.02	46.67		
Project 009	6.04	1.02	0	53.54	53.24	53.08	52.38	51.24	51	50.53	0.7	52.28		
Project 010	14.84	1.34	0	49.01	47.99	47.61	46.29	45.16	44.81	44.12	0.99	46.4		
Project 011	14.44	3.07	0	64.66	57.95	53.25	47.26	46.2	45.91	45.43	3.85	50.34		
Project 012	15.91	4.92	0	48.82	46.66	46.09	44.38	42.46	41.77	40.41	1.89	44.92	-5.08	-5.08

Project Name	E	Dose	DoseS5	ProjDose	ProjDoseS5	#APeaks(>140dB)	#APeaks(>137dB)	#APeaks(>135dB)
Project 004	0.000228259	0	0.02	0.05	0.15	0	0	0
Project 002 (1)	0.000213778	0	0.01	0.05	0.14	0	0	0
Project 003	1.8131E-06					0	0	0
Project 004	0.000842752	0.07	0.1	0.61	0.87	0	0	0
Project 005	1.12907E-06					0	0	0
Project 006	7.22722E-06	0	0	0	0	0	0	0
Project 007	2.64424E-07					0	0	0
Project 008	0.00012263	0	0.01	0.07	0.15	0	0	0
Project 009	8.0256E-06					0	0	0
Project 010	9.8508E-06					0	0	0
Project 011	4.33658E-06					0	0	0
Project 012	1.63106E-05	0	0	0	0.01	0	0	0
Project 013	2.7066E-06					0	0	0
Project 014	1.6384E-06					0	0	0
Project 015	3.71813E-07					0	0	0
Project 016	8.9615E-07					0	0	0
Project 017	0.000450458	0.01	0.03	0.12	0.28	0	0	0
Project 018	0.000229952	0.02	0.02	0.16	0.17	0	0	0
Project 005	4.73394E-05	0	0	0	0.01	0	0	0
Project 006	0.000138325	0	0.01	0.04	0.12	0	0	0
Project 007	4.06048E-06					0	0	0
Project 008	5.49304E-06					0	0	0
Project 009	1.73824E-05					0	0	0
Project 010	5.02112E-06					0	0	0
Project 011	1.82877E-05					0	0	0
Project 012	1.60951E-05	0	0	0	0	0	0	0

Project Name	LAeq,15,mov,max	LAeq,60,mov,max	LCeq,15,mov,max	LCeq,60,mov,max	ΔLeq,15,mov,max	ΔLeq,60,mov,max
Project 004	61.19	57.55	64.29	62.24	3.1	4.69
Project 002 (1)	60.57	57.27	64.25	62.22	3.68	4.95
Project 003	38.46	36.56	54.37	52.59	15.91	16.03
Project 004	67.55	63.23	77.15	74.26	9.6	11.03
Project 005	40.32		53.4		13.08	
Project 006	48.59		58.92		10.33	
Project 007	34.22		45.76		11.54	
Project 008	57.64	54.86	76.13	74.48	18.49	19.62
Project 009	44.62	43.02	73.66	70.89	29.04	27.87
Project 010	45.6	43.91	53.86	51.44	8.26	7.53
Project 011	43.61		69.23		25.62	
Project 012	51.54		68.77		17.23	
Project 013	44.32		64.37		20.05	
Project 014	42.14		56.22		14.08	
Project 015	35.7		53.21		17.51	
Project 016	39.52		56.8		17.28	
Project 017	63.94	60.51	71.69	69.29	7.75	8.78
Project 018	63.37	57.59	73.39	67.92	10.02	10.33
Project 005	52.34	50.67	72.87	68.99	20.53	18.32
Project 006	58.94	55.33	78.66	76.43	19.72	21.1
Project 007	46.05		59.76		13.71	
Project 008	47.08		57.57		10.49	
Project 009	52.33		58.36		6.03	
Project 010	46.51		61.37		14.86	
Project 011	52.42		66.9		14.48	
Project 012	48.54	46.01	62.6	61.91	14.06	15.9

Project Name	Wind Dir. avg	Wind Dir. min	Wind Dir. max	Wind Speed avg	Wind Speed min	Wind Speed max	Amb. Temperature
Project 004							
Project 002 (1)							
Project 003							
Project 004							
Project 005							
Project 006							
Project 007							
Project 008							
Project 009							
Project 010							
Project 011							
Project 012							
Project 013							
Project 014							
Project 015							
Project 016							
Project 017							
Project 018							
Project 005							
Project 006							
Project 007							
Project 008							
Project 009							
Project 010							
Project 011							
Project 012							

Project Name	Amb. Humidity	Amb. Pressure	Amb. Rain Gauge	Full Scale Level	Max. Input Level	Avg. RPM	CIC 1 Result	CIC 1 Ratio
Project 004				142.6300049	141.3300018		Undefined	
Project 002 (1)				142.6999969	141.3999939		Undefined	
Project 003				142.6900024	141.3899994		Undefined	
Project 004				142.6999969	141.3999939		Undefined	
Project 005				142.7100067	141.4100037		Undefined	
Project 006				142.6999969	141.3999939		Undefined	
Project 007				142.6999969	141.3999939		Undefined	
Project 008				142.6999969	141.3999939		Undefined	
Project 009				142.7599945	141.4600067		Undefined	
Project 010				142.7299957	141.4299927		Undefined	
Project 011				142.7200012	141.4199982		Undefined	
Project 012				142.6699982	141.3699951		Undefined	
Project 013				142.6699982	141.3699951		Undefined	
Project 014				142.5899963	141.2899933		Undefined	
Project 015				142.5599976	141.2599945		Undefined	
Project 016				142.5899963	141.2899933		Undefined	
Project 017				142.6300049	141.3300018		Undefined	
Project 018				142.5899963	141.2899933		Undefined	
Project 005				142.7400055	141.4400024		Undefined	
Project 006				142.6900024	141.3899994		Undefined	
Project 007				142.6900024	141.3899994		Undefined	
Project 008				142.7200012	141.4199982		Undefined	
Project 009				142.6900024	141.3899994		Undefined	
Project 010				142.6999969	141.3999939		Undefined	
Project 011				142.6600037	141.3600006		Undefined	
Project 012				142.6499939	141.3500061		Undefined	

Project Name	CIC 1 Background Level Before	CIC 1 Measurement Level	CIC 1 Generator Level	CIC 1 Background Level After
Project 004				
Project 002 (1)				
Project 003				
Project 004				
Project 005				
Project 006				
Project 007				
Project 008				
Project 009				
Project 010				
Project 011				
Project 012				
Project 013				
Project 014				
Project 015				
Project 016				
Project 017				
Project 018				
Project 005				
Project 006				
Project 007				
Project 008				
Project 009				
Project 010				
Project 011				
Project 012				

Project Name	CIC 1 Dev. from Reference	CIC 2 Result	CIC 2 Ratio	CIC 2 Background Level Before	CIC 2 Measurement Level
Project 004		Undefined			
Project 002 (1)		Undefined			
Project 003		Undefined			
Project 004		Undefined			
Project 005		Undefined			
Project 006		Undefined			
Project 007		Undefined			
Project 008		Undefined			
Project 009		Undefined			
Project 010		Undefined			
Project 011		Undefined			
Project 012		Undefined			
Project 013		Undefined			
Project 014		Undefined			
Project 015		Undefined			
Project 016		Undefined			
Project 017		Undefined			
Project 018		Undefined			
Project 005		Undefined			
Project 006		Undefined			
Project 007		Undefined			
Project 008		Undefined			
Project 009		Undefined			
Project 010		Undefined			
Project 011		Undefined			
Project 012		Undefined			

Project Name	CIC 2 Generator Level	CIC 2 Background Level After	CIC 2 Dev. from Reference	SIL	PSIL	SIL3	LZeq (16 Hz-250 Hz)
Project 004				50.18	52.15	49.56	62.22
Project 002 (1)				50.21	52.05	49.34	62.32
Project 003				29.78	30.48	29.12	57.13
Project 004				53.49	56.73	50.37	75.1
Project 005				32.45	34.33	30.95	54.34
Project 006				40.79	43.43	39.28	60.45
Project 007				26.36	28.66	25.14	48.29
Project 008				47.85	49.43	46.64	80.67
Project 009				32.32	32.92	31.52	77.05
Project 010				37.32	37.04	37.18	54.84
Project 011				35.43	36.41	34.98	74.33
Project 012				42.08	43.83	40.53	73.77
Project 013				37.32	38.71	36.23	70.54
Project 014				23.44	25.28	21.69	61.71
Project 015				26.45	26.42	26.09	57.94
Project 016				32.46	33.5	31.45	61.01
Project 017				53.07	55.29	51.65	71.64
Project 018				47.81	49.79	45.25	68.99
Project 005				39.73	42.21	37.66	74.83
Project 006				46.92	49.37	45.7	82.53
Project 007				37.95	39.2	37.67	63.35
Project 008				30.39	32.9	28.78	61.5
Project 009				26.87	28.36	24.48	63.29
Project 010				31.22	34.39	28.2	64.5
Project 011				43.12	45.85	41.65	72.11
Project 012				34.03	35.69	32.51	68.23

Project Name	NC	NCDecisiveBand	NR	NRDecisiveBand	NCB	NCBCriteria	RC	RCCriteria	Loudness	Loudness_Level
Project 004	53	2000	55	2000	50	(H)		(HF) Objectionable		
Project 002 (1)	52	1000	54	2000	50	(H)		(HF) Objectionable		
Project 003	30		33	4000	30	(H)	30	(HF) Objectionable		
Project 004	60	500	60	500	53	(R) (RV)		(MF) Marginal		
Project 005	35	1000	36	1000	32	(H)	34	(HF) Marginal		
Project 006	45	1000	46	1000	41	(H)	43	(HF) Objectionable		
Project 007	29	1000	31	1000	26	(H)	29	(HF) Marginal		
Project 008	50	1000	51	1000	48	(H) (RV)	49	(HF) Marginal		
Project 009	42	8000	46	8000	32	(R) (H) (RV)	33	(LFVA) Objectionable		
Project 010	41	4000	44	4000	37	(H)	37	(HF) Objectionable		
Project 011	37	1000	39	2000	35	(H) (RV)	36	(LFVB) Objectionable		
Project 012	43	500	44	500	42	(H) (RV)	44	(HF) Marginal		
Project 013	39	1000	40	1000	37	(H) (RV)	39	(HF) Marginal		
Project 014	44	8000	47	8000	23	(H)	25	(LF) Marginal		
Project 015	33	8000	37	8000	26	(H)	26	(HF) Marginal		
Project 016	33	1000	35	1000	32	(H)	34	(HF) Marginal		
Project 017	57	1000	58	1000	53	(H) (RV)		(HF) Objectionable		
Project 018	55	250	54	250	48	(R)	50	(MF) Objectionable		
Project 005	49	8000	52	8000	40	(H) (RV)	42	(LFVB) Marginal		
Project 006	51	1000	52	1000	47	(H) (RV)	49	(LFVA) Marginal		
Project 007	41	8000	45	8000	38	(H)	39	(HF) Marginal		
Project 008	47	8000	51	8000	30	(H)	33	(N) Acceptable		
Project 009	54	8000	57	8000	27	(H)	28	(N) Acceptable		
Project 010	46	8000	49	8000	31	(R) (H)	34	(N) Acceptable		
Project 011	47	1000	51	8000	43	(H) (RV)	46	(N) Marginal		
Project 012	46	8000	50	8000	34	(H) (RV)	36	(LFVB) Marginal		

Project Name	LZFmax_O 16Hz	LZFmax_O 31.5Hz	LZFmax_O 63Hz	LZFmax_O 125Hz	LZFmax_O 250Hz	LZFmax_O 500Hz	LZFmax_O 1kHz
Project 004	74.5	68.48	82.7	77.55	76.84	77.93	73.43
Project 002 (1)	74.25	69.2	81.65	77.47	78.11	78.74	72.19
Project 003	79.32	72.79	72.81	55.92	55.15	57.45	57.97
Project 004	92.22	101.03	97.47	94.54	95.09	92.09	84.95
Project 005	68.88	68.01	73.39	66.33	64.38	62.85	60.32
Project 006	63.96	80.5	72.92	72.42	71.44	69.81	70.07
Project 007	53.12	56.14	56.91	49.26	48.57	45.8	47.26
Project 008	94.52	89.61	85.41	82.21	84.84	80.96	78.58
Project 009	89.33	84.68	78.41	65.92	57.78	50.1	55.23
Project 010	72.22	73.43	73.91	64.89	66.98	57.19	56.45
Project 011	86.12	79.31	74.48	65.7	56.05	52.28	56.94
Project 012	87.19	84.59	79.79	69.87	71.38	77.98	76.58
Project 013	85.3	78.3	72.2	64.17	62.84	69.38	67.29
Project 014	76.23	74	67.06	53.17	48.46	48.58	53.07
Project 015	64.49	55.91	57.56	51.33	42.71	47.7	49.67
Project 016	65.58	61.05	57.08	49.24	40.95	46.71	46.42
Project 017	82.85	78.54	84.2	83.13	88.34	82.55	78.55
Project 018	77.32	82.89	93.87	100.89	96.49	89.34	84.36
Project 005	88.89	87.76	88.14	82.76	76.51	75.7	73.89
Project 006	95.89	90.16	90.45	90.37	79.72	77.16	76.46
Project 007	65.14	63.48	66.19	61.28	61.97	59.93	65.72
Project 008	79.58	78.91	74.9	65.21	62.53	57.89	55.41
Project 009	77.69	70.39	66.86	61.05	52.95	50.2	50.96
Project 010	72.38	63.94	64.1	63.61	59.18	49.01	49.76
Project 011	90.64	83.38	75.52	78.39	72.32	69.21	64.58
Project 012	85.43	79.48	74.65	73.42	70.63	72.14	71.23

Project Name	LZFmax_O 2kHz	LZFmax_O 4kHz	LZFmax_O 8kHz	LZFmax_O 16kHz	LZSmax_O 16Hz	LZSmax_O 31.5Hz	LZSmax_O 63Hz
Project 004	74.56	69.09	55.95	47.1	72.79	66.6	81.27
Project 002 (1)	73.75	69.71	55.47	44.61	72.66	66.79	80.43
Project 003	61.22	59.43	50.37	39.15	77.68	70.06	71.36
Project 004	75.05	69.04	70.64	59.25	91.76	98.57	96.03
Project 005	55.45	54.43	51.55	40.35	66.45	64.09	71.4
Project 006	64.16	58.97	58.15	49.89	62.49	79.42	71.56
Project 007	43.71	45.04	38.49	35.48	52.46	54.87	55.42
Project 008	76.14	73.24	68.34	61.9	92.57	85.53	78.5
Project 009	57.76	58.5	47.5	49.03	87.42	81.92	73.84
Project 010	54.88	60.34	56.05	44.02	70.96	68.26	66.04
Project 011	60.63	60.78	53.72	43.75	84.14	76.67	70.44
Project 012	70.89	63.53	57.68	45.34	85.86	80.46	72.39
Project 013	63.21	59.02	50.91	41.12	83.04	75.47	68.94
Project 014	49.47	40.99	43.92	47.92	75.37	72.16	61.75
Project 015	52.91	49.84	44.79	37.55	62.72	54.77	55.67
Project 016	40.9	49.66	38.78	39.04	64.11	58.99	55.19
Project 017	77.65	73.72	68.08	52.32	80.86	74.92	83.46
Project 018	81.4	78.52	72.21	65.1	75.95	80.31	90.39
Project 005	67.66	62.73	56.49	55.28	87.16	83.38	83.72
Project 006	70.76	65.42	59.09	53.28	94.13	85.88	87.16
Project 007	64.62	58.12	55.56	51.28	64.02	61.8	63.72
Project 008	50.57	45.87	47.48	53.46	77.04	74.19	67.03
Project 009	50.21	45.19	51.96	57.18	76.49	66.39	60.19
Project 010	45.6	41.05	45.77	48.79	70.59	62.09	61.76
Project 011	60.27	52.21	50.25	50.99	89.09	80.73	73.63
Project 012	63.96	61.88	54.59	51.22	83.17	74.25	71.01

Project Name	LZSmax_O 125Hz	LZSmax_O 250Hz	LZSmax_O 500Hz	LZSmax_O 1kHz	LZSmax_O 2kHz	LZSmax_O 4kHz	LZSmax_O 8kHz
Project 004	74.86	75.2	76.55	71.47	70.81	66.5	54.66
Project 002 (1)	74.87	76.64	76.98	71.16	69.99	66.9	53.99
Project 003	53.98	52.55	51.31	49.83	53.05	51.14	42.54
Project 004	91.85	94.12	90.65	82.72	72.58	63.95	62.16
Project 005	63.77	61.48	60.49	58.14	53.24	48.38	43.81
Project 006	70.43	68	66.91	67.23	61.74	56.08	52
Project 007	46.8	46.92	44.55	45.97	38.95	36.27	30.7
Project 008	79.62	81.45	78.64	76.25	72.88	69.42	63.84
Project 009	61.8	49.9	43.81	48.78	51.15	51.03	43.36
Project 010	62.22	58.5	49.33	48.71	46.76	55.08	49.33
Project 011	62.21	51.9	45.21	49.91	53.44	53.81	45.85
Project 012	67.04	66.89	74.05	69.78	65.86	56.01	50.22
Project 013	62.64	60.63	64.44	62.91	60.02	54.87	47.34
Project 014	50.25	40.83	41.12	44.57	40.89	35.51	43.01
Project 015	49.7	39.92	41.02	43.17	44.15	41.05	36.62
Project 016	47.09	38.77	41	40.72	39.45	44.53	33.81
Project 017	80.88	84.32	79.35	76.5	74.46	70.97	65.8
Project 018	96.88	93.61	86.93	81.29	77.81	74.8	68.11
Project 005	79.98	74.52	73.04	71.93	65.79	58.63	51.6
Project 006	87.91	76.64	73.53	73.09	67.87	62.38	55.02
Project 007	58.21	55.38	57.03	60.48	60.88	54.41	51.71
Project 008	58	54.41	54.12	53.45	44.36	39.38	46.83
Project 009	53.95	45.71	42.5	43.22	42.83	38.01	51.42
Project 010	61.84	55.98	46.68	44.34	40.86	34.11	44.65
Project 011	77.42	70.86	67.01	62.97	57.91	50.75	46.1
Project 012	70.83	67.39	69.14	67.57	58.74	53.95	48.16

Project Name	LZSmax_O 16kHz	LZFmin_O 16Hz	LZFmin_O 31.5Hz	LZFmin_O 63Hz	LZFmin_O 125Hz	LZFmin_O 250Hz	LZFmin_O 500Hz
Project 004	44.93	40.47	36.61	35.72	29.93	22.34	20.3
Project 002 (1)	43.05	40	38.26	34.95	29.01	22.85	20.79
Project 003	31.95	39.47	33.72	28.17	20.59	16.67	15.14
Project 004	50.84	30.95	29.08	26.61	21.09	16.23	15.13
Project 005	34.72	39.8	38.8	29.74	23.34	18.4	16.66
Project 006	43.97	33.02	32.55	25.95	18.32	17.89	11.66
Project 007	29.01	38.63	35.72	30.19	22.14	12.43	13.2
Project 008	56.82	55.7	47.59	41.48	36.79	30.63	28.32
Project 009	44.44	53.29	44.8	39.24	30.36	21.95	25.49
Project 010	36.68	40.86	40.33	37.72	34.93	27.78	28.34
Project 011	39.01	50.62	45.5	52.2	42.26	26.51	26.72
Project 012	40.26	50.58	46.66	50.47	40.45	26.79	26.03
Project 013	39.53	52.76	48.64	45.09	39.68	31.36	29.23
Project 014	46.94	51.84	48.17	43.49	35.13	26.34	23.76
Project 015	35.55	47.77	44.38	43.36	37.2	27.24	21.59
Project 016	34.19	52.23	50.08	48.47	40.64	29.88	29.96
Project 017	49.8	57.65	53.53	45.94	42.37	36.53	34.2
Project 018	59.93	53.64	50.75	43.25	42.85	37.8	29.35
Project 005	53.28	49.03	46.94	41.09	36.33	30.62	24.85
Project 006	51.22	55.61	50.55	45.51	40.78	30.22	26.6
Project 007	50.39	53.82	53.09	49.59	43.96	33.64	32.21
Project 008	52.47	51.82	50.7	44.53	40.44	33.35	27.82
Project 009	56.62	52.09	49.42	44.06	38.18	32.31	28.88
Project 010	47.93	54.88	52.26	50.37	46.36	40.29	35.04
Project 011	49.8	58.77	53.55	46.46	43.71	38.28	35.68
Project 012	49.91	49.69	45.05	37.84	29.28	21.02	17.82

Project Name	LZFmin_O 1kHz	LZFmin_O 2kHz	LZFmin_O 4kHz	LZFmin_O 8kHz	LZFmin_O 16kHz	LZSmin_O 16Hz	LZSmin_O 31.5Hz
Project 004	17.89	14.44	13.65	15.14	13.91	41.26	38.93
Project 002 (1)	17.97	15.38	13.63	14.74	13.81	41.77	39.58
Project 003	13.38	10.92	11.57	14.29	13.83	40.53	36.5
Project 004	12.74	10.47	11.48	12.88	13.18	32.69	32.23
Project 005	15.17	11.56	11.54	16.42	15.03	41.49	41.45
Project 006	7.46	7.43	9.93	11.87	12.6	34.79	34.22
Project 007	12.96	11.26	11.63	13.81	13.7	39.85	38.01
Project 008	27.18	27.06	27.61	25.43	19.49	58.05	50.81
Project 009	24.79	19.96	17.4	30.24	31.74	54.81	46.96
Project 010	28.6	25.51	21.13	20.21	18.29	42.84	42.66
Project 011	25.9	22.44	21.74	18.85	16.74	52.27	48.49
Project 012	26.35	22.52	21.25	18.47	17.14	52.35	48.15
Project 013	26.76	23.5	22.51	20.47	17.19	54.44	51.07
Project 014	19.14	14.02	13.22	32.99	36.14	52.8	50.05
Project 015	18.16	14.65	12.77	26.59	29.16	49.1	46.74
Project 016	25.94	21.41	18.54	15.51	13.92	53.23	52.03
Project 017	29.86	24.91	19.15	29.24	29.53	59.95	55.15
Project 018	24.75	17.46	15.27	17.16	15.53	54.77	52.91
Project 005	19.39	15.04	16.05	34.22	36.48	50.55	48.87
Project 006	24.05	22.88	22.01	25.61	25.73	60.55	54.81
Project 007	29.96	26.8	21.13	17.15	13.43	54.88	56.27
Project 008	25.11	19.08	15.61	37.05	41.44	53.25	52.63
Project 009	23.68	16.71	19.58	46.73	52.09	54.76	51.3
Project 010	29.58	22.18	17.02	39.09	41.77	55.51	54.39
Project 011	29.97	25.19	19.87	40.08	44.35	60.1	54.94
Project 012	14.92	12.71	16.34	35.63	38.8	51.46	47.96

Project Name	LZSmin_O 63Hz	LZSmin_O 125Hz	LZSmin_O 250Hz	LZSmin_O 500Hz	LZSmin_O 1kHz	LZSmin_O 2kHz	LZSmin_O 4kHz
Project 004	38.17	32.54	24.99	21.76	18.06	15.05	17.13
Project 002 (1)	37.83	32.28	24.26	22.46	20.01	17.58	17.47
Project 003	31.13	22.78	18.15	16.17	14.41	11.96	12.48
Project 004	29.42	23.24	17.53	16.47	13.94	10.94	12.46
Project 005	32.67	25.9	19.23	18.07	16.05	12.48	13.78
Project 006	28.66	20.43	19.66	13.03	8.53	8.15	10.39
Project 007	34.09	23.98	14.27	14.2	14.29	12.13	12.16
Project 008	44.45	39.23	32.53	29.32	28.53	27.87	28.42
Project 009	42.47	33.46	23.76	26.48	25.69	21.49	20
Project 010	40.86	37.12	30.29	29.31	29.44	26.13	21.79
Project 011	52.92	43.25	29.31	29.07	27.48	23.87	23.12
Project 012	52.34	42.7	28.79	29.34	29	25.92	23.34
Project 013	48.06	42.21	33.54	30.56	27.98	24.9	23.1
Project 014	46.45	37.76	27.61	24.72	19.92	14.87	13.88
Project 015	45.45	40.51	28.76	22.73	18.92	15.35	13.24
Project 016	51.27	42.6	31.35	30.99	26.9	22.11	19.37
Project 017	48.38	44.03	38.2	35.41	30.77	25.73	19.87
Project 018	45.61	45.08	39.66	30.73	25.84	18.38	16.06
Project 005	44.3	38.59	31.98	25.89	20.26	15.93	17.86
Project 006	48.76	43.3	32.22	27.95	25.58	24.62	24.24
Project 007	52.17	46.48	34.97	33.54	30.65	28.27	23.35
Project 008	47.16	42.03	34.92	28.87	25.99	20.07	16.42
Project 009	46.04	40.19	34.13	30.47	24.56	17.34	20.02
Project 010	52.33	48.57	42.59	36.34	30.64	22.96	17.4
Project 011	49.57	45.32	39.54	36.69	30.41	26.16	20.3
Project 012	40.39	31.09	22.82	18.72	15.88	13.7	17.24

Project Name	LZSmin_O 8kHz	LZSmin_O 16kHz	LZeq_O 16Hz	LZeq_O 31.5Hz	LZeq_O 63Hz	LZeq_O 125Hz	LZeq_O 250Hz	LZeq_O 500Hz
Project 004	15.86	14.43	56.51	51.43	58.35	53.5	52.4	52.05
Project 002 (1)	15.56	14.23	56.97	51.6	58.15	53.03	53.24	52.83
Project 003	15.24	14.65	55.41	49.22	48.88	37.5	32.37	31.75
Project 004	14.69	13.66	66.22	68.81	70.84	67.25	65	62.84
Project 005	16.84	15.44	46.36	46.5	51.99	42.62	38.57	36.96
Project 006	12.18	12.83	46.6	58.38	53.9	49.53	45.95	45.31
Project 007	14.43	14.72	43.81	42.16	43.63	33.93	31.42	30.03
Project 008	25.95	20.39	79.82	72.46	63.73	56.69	53.13	51.47
Project 009	34	35.81	75.98	69.95	60.24	49.2	38.88	34.71
Project 010	21.93	19.96	52.72	47.86	45.43	42.44	36.56	37.72
Project 011	21.41	19.45	73.55	65.56	58.85	49.88	39.39	36.78
Project 012	21.74	21.17	72.86	65.22	59.76	52.71	44.29	46.7
Project 013	21.03	18.16	69.78	61.81	54.01	46.93	40.47	40.61
Project 014	35.12	38.57	60.27	54.87	49.94	41.11	30.18	28.67
Project 015	27.51	30.41	56.06	50.63	48.92	43.67	31.86	27.54
Project 016	17.46	17.06	58.44	55.26	52.93	44.42	34.54	35.48
Project 017	30.62	31.15	68.3	63.13	65.97	60.49	58.5	57.32
Project 018	18.58	16.79	63.1	58.56	59.36	64.48	61.73	55.47
Project 005	35.6	37.4	73.88	67	58.9	52.23	48.22	45.94
Project 006	30.93	30.31	81.74	73.67	66.7	62.46	52.58	50.59
Project 007	20.19	13.77	59.76	59.01	54.86	50.28	39.25	38.78
Project 008	38.07	42.16	58.75	56.63	51.47	47.44	39	35.23
Project 009	48.22	53.13	62.21	54.92	51.05	44.28	37.59	34.04
Project 010	39.6	42.35	61.11	58.56	56.97	54.14	47.21	40.28
Project 011	41.63	45.98	70.84	64.4	58.13	57.72	50.82	47.54
Project 012	38.06	41.7	67.62	58.8	49.39	44.12	38.89	38.58

Project Name	LZeq_O 1kHz	LZeq_O 2kHz	LZeq_O 4kHz	LZeq_O 8kHz	LZeq_O 16kHz	Application	[System] Serial Number
Project 004	52.88	51.53	44.26	33.19	22.4	BZ7224 Version 4.7.5	3011887
Project 002 (1)	52.38	50.93	44.7	32.63	21.17	BZ7224 Version 4.7.5	3011939
Project 003	30.99	28.71	27.66	25.87	23.1	BZ7224 Version 4.7.5	3011939
Project 004	56.79	50.55	43.76	36.23	26.72	BZ7224 Version 4.7.5	3011939
Project 005	35.74	30.29	26.82	21.27	18.17	BZ7224 Version 4.7.5	3011939
Project 006	45.21	39.77	32.85	26.81	19.19	BZ7224 Version 4.7.5	3011939
Project 007	30.98	24.98	19.46	21.28	21.79	BZ7224 Version 4.7.5	3011939
Project 008	50.3	46.52	43.09	37.98	31.34	BZ7224 Version 4.7.5	3011939
Project 009	33.33	30.72	30.51	38.55	40.96	BZ7224 Version 4.7.5	3011939
Project 010	37.81	35.59	38.14	33.03	28.21	BZ7224 Version 4.7.5	3011939
Project 011	37.32	35.12	32.51	28.39	30.62	BZ7224 Version 4.7.5	3011939
Project 012	43.83	40.97	36.8	31.72	32.96	BZ7224 Version 4.7.5	3011887
Project 013	39.43	36.1	33.15	32.4	31.86	BZ7224 Version 4.7.5	3011887
Project 014	25.26	21.91	17.91	40.28	44.23	BZ7224 Version 4.7.5	3011887
Project 015	26.09	25.63	26.54	29.81	32.68	BZ7224 Version 4.7.5	3011887
Project 016	34.18	30.85	29.32	26.33	29.47	BZ7224 Version 4.7.5	3011887
Project 017	57.03	51.53	46.4	40.67	38.16	BZ7224 Version 4.7.5	3011887
Project 018	49.04	44.85	41.86	38.78	39.53	BZ7224 Version 4.7.5	3011887
Project 005	43.35	37.35	32.29	45.52	49.88	BZ7224 Version 4.7.5	3011939
Project 006	51.12	46.39	39.58	41.78	45.7	BZ7224 Version 4.7.5	3011939
Project 007	39.94	38.89	34.17	37.47	42.67	BZ7224 Version 4.7.5	3011939
Project 008	35	28.46	22.87	43.99	49.32	BZ7224 Version 4.7.5	3011939
Project 009	28.57	22.46	22.42	50.24	55.42	BZ7224 Version 4.7.5	3011939
Project 010	34.74	28.15	21.7	42.44	45.68	BZ7224 Version 4.7.5	3011939
Project 011	47.47	42.54	34.93	43.58	47.9	BZ7224 Version 4.7.5	3011939
Project 012	37.21	31.28	29.03	42.83	46.63	BZ7224 Version 4.7.5	3011939

Project Name	[System] User	[System] Instrument Type	[Transducer] Micr Used	[Transducer] Transducer Serial No
Project 004	2250	Type2250	4189(3130964)	3130964
Project 002 (1)	2250	Type2250	4189(3130955)	3130955
Project 003	2250	Type2250	4189(3130955)	3130955
Project 004	2250	Type2250	4189(3130955)	3130955
Project 005	2250	Type2250	4189(3130955)	3130955
Project 006	2250	Type2250	4189(3130955)	3130955
Project 007	2250	Type2250	4189(3130955)	3130955
Project 008	2250	Type2250	4189(3130955)	3130955
Project 009	2250	Type2250	4189(3130955)	3130955
Project 010	2250	Type2250	4189(3130955)	3130955
Project 011	2250	Type2250	4189(3130955)	3130955
Project 012	2250	Type2250	4189(3130964)	3130964
Project 013	2250	Type2250	4189(3130964)	3130964
Project 014	2250	Type2250	4189(3130964)	3130964
Project 015	2250	Type2250	4189(3130964)	3130964
Project 016	2250	Type2250	4189(3130964)	3130964
Project 017	2250	Type2250	4189(3130964)	3130964
Project 018	2250	Type2250	4189(3130964)	3130964
Project 005	2250	Type2250	4189(3130955)	3130955
Project 006	2250	Type2250	4189(3130955)	3130955
Project 007	2250	Type2250	4189(3130955)	3130955
Project 008	2250	Type2250	4189(3130955)	3130955
Project 009	2250	Type2250	4189(3130955)	3130955
Project 010	2250	Type2250	4189(3130955)	3130955
Project 011	2250	Type2250	4189(3130955)	3130955
Project 012	2250	Type2250	4189(3130955)	3130955

Project Name	[Transducer] Transducer Name	[Transducer] Transducer Family	[Transducer] Microphone Type
Project 004	4189	Microphone	4189
Project 002 (1)	4189	Microphone	4189
Project 003	4189	Microphone	4189
Project 004	4189	Microphone	4189
Project 005	4189	Microphone	4189
Project 006	4189	Microphone	4189
Project 007	4189	Microphone	4189
Project 008	4189	Microphone	4189
Project 009	4189	Microphone	4189
Project 010	4189	Microphone	4189
Project 011	4189	Microphone	4189
Project 012	4189	Microphone	4189
Project 013	4189	Microphone	4189
Project 014	4189	Microphone	4189
Project 015	4189	Microphone	4189
Project 016	4189	Microphone	4189
Project 017	4189	Microphone	4189
Project 018	4189	Microphone	4189
Project 005	4189	Microphone	4189
Project 006	4189	Microphone	4189
Project 007	4189	Microphone	4189
Project 008	4189	Microphone	4189
Project 009	4189	Microphone	4189
Project 010	4189	Microphone	4189
Project 011	4189	Microphone	4189
Project 012	4189	Microphone	4189

Project Name	[Transducer] Accelerometer Type	[Transducer] Nominal Sensitivity	[Transducer] Unit	[Transducer] Micr Capacitance
Project 004	Unknown	50	mV/Pa	13.5
Project 002 (1)	Unknown	50	mV/Pa	13.5
Project 003	Unknown	50	mV/Pa	13.5
Project 004	Unknown	50	mV/Pa	13.5
Project 005	Unknown	50	mV/Pa	13.5
Project 006	Unknown	50	mV/Pa	13.5
Project 007	Unknown	50	mV/Pa	13.5
Project 008	Unknown	50	mV/Pa	13.5
Project 009	Unknown	50	mV/Pa	13.5
Project 010	Unknown	50	mV/Pa	13.5
Project 011	Unknown	50	mV/Pa	13.5
Project 012	Unknown	50	mV/Pa	13.5
Project 013	Unknown	50	mV/Pa	13.5
Project 014	Unknown	50	mV/Pa	13.5
Project 015	Unknown	50	mV/Pa	13.5
Project 016	Unknown	50	mV/Pa	13.5
Project 017	Unknown	50	mV/Pa	13.5
Project 018	Unknown	50	mV/Pa	13.5
Project 005	Unknown	50	mV/Pa	13.5
Project 006	Unknown	50	mV/Pa	13.5
Project 007	Unknown	50	mV/Pa	13.5
Project 008	Unknown	50	mV/Pa	13.5
Project 009	Unknown	50	mV/Pa	13.5
Project 010	Unknown	50	mV/Pa	13.5
Project 011	Unknown	50	mV/Pa	13.5
Project 012	Unknown	50	mV/Pa	13.5

Project Name	[Transducer] Accelerometer Weight	[Transducer] Polarization Voltage	[Transducer] Free-field	[Transducer] CCLD
Project 004	0	0	1	0
Project 002 (1)	0	0	1	0
Project 003	0	0	1	0
Project 004	0	0	1	0
Project 005	0	0	1	0
Project 006	0	0	1	0
Project 007	0	0	1	0
Project 008	0	0	1	0
Project 009	0	0	1	0
Project 010	0	0	1	0
Project 011	0	0	1	0
Project 012	0	0	1	0
Project 013	0	0	1	0
Project 014	0	0	1	0
Project 015	0	0	1	0
Project 016	0	0	1	0
Project 017	0	0	1	0
Project 018	0	0	1	0
Project 005	0	0	1	0
Project 006	0	0	1	0
Project 007	0	0	1	0
Project 008	0	0	1	0
Project 009	0	0	1	0
Project 010	0	0	1	0
Project 011	0	0	1	0
Project 012	0	0	1	0

Project Name	[Transducer] Preamplifier ID No	[Transducer] Transd Descr	[Calibration] CalibrationTimeUTC Date Time
Project 004	27164	Free-field 1/2"	7/22/2019 14:16
Project 002 (1)	27012	Free-field 1/2"	7/22/2019 14:17
Project 003	27012	Free-field 1/2"	7/22/2019 16:07
Project 004	27012	Free-field 1/2"	7/22/2019 17:35
Project 005	27012	Free-field 1/2"	7/23/2019 3:24
Project 006	27012	Free-field 1/2"	7/23/2019 3:59
Project 007	27012	Free-field 1/2"	7/23/2019 4:28
Project 008	27012	Free-field 1/2"	7/23/2019 15:41
Project 009	27012	Free-field 1/2"	7/23/2019 18:49
Project 010	27012	Free-field 1/2"	7/23/2019 20:02
Project 011	27012	Free-field 1/2"	7/23/2019 21:19
Project 012	27164	Free-field 1/2"	7/23/2019 21:59
Project 013	27164	Free-field 1/2"	7/24/2019 3:43
Project 014	27164	Free-field 1/2"	7/24/2019 5:51
Project 015	27164	Free-field 1/2"	7/24/2019 6:20
Project 016	27164	Free-field 1/2"	7/24/2019 6:46
Project 017	27164	Free-field 1/2"	7/24/2019 16:52
Project 018	27164	Free-field 1/2"	7/24/2019 18:08
Project 005	27012	Free-field 1/2"	7/24/2019 20:29
Project 006	27012	Free-field 1/2"	7/24/2019 21:51
Project 007	27012	Free-field 1/2"	7/25/2019 3:04
Project 008	27012	Free-field 1/2"	7/25/2019 3:27
Project 009	27012	Free-field 1/2"	7/25/2019 3:51
Project 010	27012	Free-field 1/2"	7/25/2019 4:19
Project 011	27012	Free-field 1/2"	43671.20169
Project 012	27012	Free-field 1/2"	7/25/2019 14:57

Project Name	[Calibration] CalibrationTimeUTC Time Zone	[Calibration] CalibrationTimeUTC Daylight Saving
Project 004	Central Standard Time	TRUE
Project 002 (1)	Central Standard Time	TRUE
Project 003	Central Standard Time	TRUE
Project 004	Central Standard Time	TRUE
Project 005	Central Standard Time	TRUE
Project 006	Central Standard Time	TRUE
Project 007	Central Standard Time	TRUE
Project 008	Central Standard Time	TRUE
Project 009	Central Standard Time	TRUE
Project 010	Central Standard Time	TRUE
Project 011	Central Standard Time	TRUE
Project 012	Central Standard Time	TRUE
Project 013	Central Standard Time	TRUE
Project 014	Central Standard Time	TRUE
Project 015	Central Standard Time	TRUE
Project 016	Central Standard Time	TRUE
Project 017	Central Standard Time	TRUE
Project 018	Central Standard Time	TRUE
Project 005	Central Standard Time	TRUE
Project 006	Central Standard Time	TRUE
Project 007	Central Standard Time	TRUE
Project 008	Central Standard Time	TRUE
Project 009	Central Standard Time	TRUE
Project 010	Central Standard Time	TRUE
Project 011	Central Standard Time	TRUE
Project 012	Central Standard Time	TRUE

Project Name	[Calibration] CalibrationTime	[Calibration] Calibration Sensitivity	[Calibration] Unit
Project 004	7/22/2019 9:16	45.90447247	mV/Pa
Project 002 (1)	7/22/2019 9:17	47.51546681	mV/Pa
Project 003	7/22/2019 11:07	47.5849919	mV/Pa
Project 004	7/22/2019 12:35	47.51765728	mV/Pa
Project 005	7/22/2019 22:24	47.4684462	mV/Pa
Project 006	7/22/2019 22:59	47.48046771	mV/Pa
Project 007	7/22/2019 23:28	47.48702794	mV/Pa
Project 008	7/23/2019 10:41	47.51984403	mV/Pa
Project 009	7/23/2019 13:49	47.18457162	mV/Pa
Project 010	7/23/2019 15:02	47.35000059	mV/Pa
Project 011	7/23/2019 16:19	47.39472643	mV/Pa
Project 012	7/23/2019 16:59	45.91504484	mV/Pa
Project 013	7/23/2019 22:43	45.44750229	mV/Pa
Project 014	7/24/2019 0:51	45.49932852	mV/Pa
Project 015	7/24/2019 1:20	45.724608	mV/Pa
Project 016	7/24/2019 1:46	45.70198059	mV/Pa
Project 017	7/24/2019 11:52	46.08982056	mV/Pa
Project 018	7/24/2019 13:08	46.6680862	mV/Pa
Project 005	7/24/2019 15:29	47.28027433	mV/Pa
Project 006	7/24/2019 16:51	47.53407091	mV/Pa
Project 007	7/24/2019 22:04	47.56198823	mV/Pa
Project 008	7/24/2019 22:27	47.39854485	mV/Pa
Project 009	7/24/2019 22:51	47.5477539	mV/Pa
Project 010	7/24/2019 23:19	47.52367362	mV/Pa
Project 011	43670.99336	47.72270098	mV/Pa
Project 012	7/25/2019 9:57	47.75512591	mV/Pa

Project Name	[Calibration] Calibration Preamp ID No	[Calibration] Calibration User	[Calibration] Calibration Input
Project 004	27164	2250	TopSocket
Project 002 (1)	27012	2250	TopSocket
Project 003	27012	2250	TopSocket
Project 004	27012	2250	TopSocket
Project 005	27012	2250	TopSocket
Project 006	27012	2250	TopSocket
Project 007	27012	2250	TopSocket
Project 008	27012	2250	TopSocket
Project 009	27012	2250	TopSocket
Project 010	27012	2250	TopSocket
Project 011	27012	2250	TopSocket
Project 012	27164	2250	TopSocket
Project 013	27164	2250	TopSocket
Project 014	27164	2250	TopSocket
Project 015	27164	2250	TopSocket
Project 016	27164	2250	TopSocket
Project 017	27164	2250	TopSocket
Project 018	27164	2250	TopSocket
Project 005	27012	2250	TopSocket
Project 006	27012	2250	TopSocket
Project 007	27012	2250	TopSocket
Project 008	27012	2250	TopSocket
Project 009	27012	2250	TopSocket
Project 010	27012	2250	TopSocket
Project 011	27012	2250	TopSocket
Project 012	27012	2250	TopSocket

Project Name	[Calibration] Calibration Type	[Calibration] Calibration Comment	[Calibration] Deviation from initial
Project 004	External reference		-0.451400189
Project 002 (1)	External reference		0.119500182
Project 003	External reference		0.132200171
Project 004	External reference		0.119900594
Project 005	External reference		0.110900496
Project 006	External reference		0.113099943
Project 007	External reference		0.114299964
Project 008	External reference		0.120300306
Project 009	External reference		0.058800507
Project 010	External reference		0.089199951
Project 011	External reference		0.097400591
Project 012	External reference		-0.449399951
Project 013	External reference		-0.538299804
Project 014	External reference		-0.528400459
Project 015	External reference		-0.485500388
Project 016	External reference		-0.489799776
Project 017	External reference		-0.41639986
Project 018	External reference		-0.308100379
Project 005	External reference		0.076399931
Project 006	External reference		0.12290037
Project 007	External reference		0.128000199
Project 008	External reference		0.098100354
Project 009	External reference		0.1254003
Project 010	External reference		0.121000269
Project 011	External reference		0.157300489
Project 012	External reference		0.163200065

Project Name	[Calibration] Deviation from last	[Calibration] CIC Reference Ratio	[Calibration] CIC Ref. DateUTC Date Time
Project 004	-0.06470036	-36.81	1/30/2018 7:14
Project 002 (1)	0.184999661	-37.19	1/30/2018 7:14
Project 003	0.012699989	-37.19	1/30/2018 7:14
Project 004	0.011100554	-37.19	1/30/2018 7:14
Project 005	-0.003199816	-37.19	1/30/2018 7:14
Project 006	-0.089100118	-37.19	1/30/2018 7:14
Project 007	0.006599781	-37.19	1/30/2018 7:14
Project 008	0.008300358	-37.19	1/30/2018 7:14
Project 009	-0.065999549	-37.19	1/30/2018 7:14
Project 010	-0.049300109	-37.19	1/30/2018 7:14
Project 011	-0.046599639	-37.19	1/30/2018 7:14
Project 012	0.002000239	-36.81	1/30/2018 7:14
Project 013	-0.062599925	-36.81	1/30/2018 7:14
Project 014	-0.068900163	-36.81	1/30/2018 7:14
Project 015	-0.057200317	-36.81	1/30/2018 7:14
Project 016	-0.022599989	-36.81	1/30/2018 7:14
Project 017	0.048900537	-36.81	1/30/2018 7:14
Project 018	0.023399569	-36.81	1/30/2018 7:14
Project 005	-0.02100066	-37.19	1/30/2018 7:14
Project 006	-0.016799605	-37.19	1/30/2018 7:14
Project 007	-0.048200162	-37.19	1/30/2018 7:14
Project 008	-0.001800008	-37.19	1/30/2018 7:14
Project 009	0.016200037	-37.19	1/30/2018 7:14
Project 010	0.025299824	-37.19	1/30/2018 7:14
Project 011	0.051200223	-37.19	43130.30184
Project 012	0.017799706	-37.19	1/30/2018 7:14

Project Name	[Calibration] CIC Ref. DateUTC Time Zone	[Calibration] CIC Ref. DateUTC Daylight Saving	[Calibration] CIC Ref. Date
Project 004	Romance Standard Time	FALSE	1/30/2018 8:14
Project 002 (1)	Romance Standard Time	FALSE	1/30/2018 8:14
Project 003	Romance Standard Time	FALSE	1/30/2018 8:14
Project 004	Romance Standard Time	FALSE	1/30/2018 8:14
Project 005	Romance Standard Time	FALSE	1/30/2018 8:14
Project 006	Romance Standard Time	FALSE	1/30/2018 8:14
Project 007	Romance Standard Time	FALSE	1/30/2018 8:14
Project 008	Romance Standard Time	FALSE	1/30/2018 8:14
Project 009	Romance Standard Time	FALSE	1/30/2018 8:14
Project 010	Romance Standard Time	FALSE	1/30/2018 8:14
Project 011	Romance Standard Time	FALSE	1/30/2018 8:14
Project 012	Romance Standard Time	FALSE	1/30/2018 8:14
Project 013	Romance Standard Time	FALSE	1/30/2018 8:14
Project 014	Romance Standard Time	FALSE	1/30/2018 8:14
Project 015	Romance Standard Time	FALSE	1/30/2018 8:14
Project 016	Romance Standard Time	FALSE	1/30/2018 8:14
Project 017	Romance Standard Time	FALSE	1/30/2018 8:14
Project 018	Romance Standard Time	FALSE	1/30/2018 8:14
Project 005	Romance Standard Time	FALSE	1/30/2018 8:14
Project 006	Romance Standard Time	FALSE	1/30/2018 8:14
Project 007	Romance Standard Time	FALSE	1/30/2018 8:14
Project 008	Romance Standard Time	FALSE	1/30/2018 8:14
Project 009	Romance Standard Time	FALSE	1/30/2018 8:14
Project 010	Romance Standard Time	FALSE	1/30/2018 8:14
Project 011	Romance Standard Time	FALSE	43130.34351
Project 012	Romance Standard Time	FALSE	1/30/2018 8:14

Project Name	[Input] Input	[Input] Sound Field Correction	[Input] Loudness	[Input] Windscreen Auto Detect
Project 004	Top Socket	Free-field	Auto	Off
Project 002 (1)	Top Socket	Free-field	Auto	Off
Project 003	Top Socket	Free-field	Auto	Off
Project 004	Top Socket	Free-field	Auto	Off
Project 005	Top Socket	Free-field	Auto	Off
Project 006	Top Socket	Free-field	Auto	Off
Project 007	Top Socket	Free-field	Auto	Off
Project 008	Top Socket	Free-field	Auto	Off
Project 009	Top Socket	Free-field	Auto	Off
Project 010	Top Socket	Free-field	Auto	Off
Project 011	Top Socket	Free-field	Auto	Off
Project 012	Top Socket	Free-field	Auto	Off
Project 013	Top Socket	Free-field	Auto	Off
Project 014	Top Socket	Free-field	Auto	Off
Project 015	Top Socket	Free-field	Auto	Off
Project 016	Top Socket	Free-field	Auto	Off
Project 017	Top Socket	Free-field	Auto	Off
Project 018	Top Socket	Free-field	Auto	Off
Project 005	Top Socket	Free-field	Auto	Off
Project 006	Top Socket	Free-field	Auto	Off
Project 007	Top Socket	Free-field	Auto	Off
Project 008	Top Socket	Free-field	Auto	Off
Project 009	Top Socket	Free-field	Auto	Off
Project 010	Top Socket	Free-field	Auto	Off
Project 011	Top Socket	Free-field	Auto	Off
Project 012	Top Socket	Free-field	Auto	Off

Project Name	[Input] Windscreen Correction	[Input] Trigger Input	[Frequency Weightings] Broadband (excl. Peak)
Project 004	UA-1650	MATRON Handswitch	AC
Project 002 (1)	UA-1650	None/Tacho	AC
Project 003	UA-1650	None/Tacho	AC
Project 004	UA-1650	None/Tacho	AC
Project 005	UA-1650	None/Tacho	AC
Project 006	UA-1650	None/Tacho	AC
Project 007	UA-1650	None/Tacho	AC
Project 008	UA-1650	None/Tacho	AC
Project 009	UA-1650	None/Tacho	AC
Project 010	UA-1650	None/Tacho	AC
Project 011	UA-1650	None/Tacho	AC
Project 012	UA-1650	None/Tacho	AC
Project 013	UA-1650	None/Tacho	AC
Project 014	UA-1650	None/Tacho	AC
Project 015	UA-1650	None/Tacho	AC
Project 016	UA-1650	None/Tacho	AC
Project 017	UA-1650	None/Tacho	AC
Project 018	UA-1650	None/Tacho	AC
Project 005	UA-1650	None/Tacho	AC
Project 006	UA-1650	None/Tacho	AC
Project 007	UA-1650	None/Tacho	AC
Project 008	UA-1650	None/Tacho	AC
Project 009	UA-1650	None/Tacho	AC
Project 010	UA-1650	None/Tacho	AC
Project 011	UA-1650	None/Tacho	AC
Project 012	UA-1650	None/Tacho	AC

Project Name	[Frequency Weightings] Broadband Peak	[Frequency Weightings] Spectrum	[Frequency Weightings] Bandwidth
Project 004	A	Z	1/1-octave
Project 002 (1)	A	Z	1/1-octave
Project 003	A	Z	1/1-octave
Project 004	A	Z	1/1-octave
Project 005	A	Z	1/1-octave
Project 006	A	Z	1/1-octave
Project 007	A	Z	1/1-octave
Project 008	A	Z	1/1-octave
Project 009	A	Z	1/1-octave
Project 010	A	Z	1/1-octave
Project 011	A	Z	1/1-octave
Project 012	A	Z	1/1-octave
Project 013	A	Z	1/1-octave
Project 014	A	Z	1/1-octave
Project 015	A	Z	1/1-octave
Project 016	A	Z	1/1-octave
Project 017	A	Z	1/1-octave
Project 018	A	Z	1/1-octave
Project 005	A	Z	1/1-octave
Project 006	A	Z	1/1-octave
Project 007	A	Z	1/1-octave
Project 008	A	Z	1/1-octave
Project 009	A	Z	1/1-octave
Project 010	A	Z	1/1-octave
Project 011	A	Z	1/1-octave
Project 012	A	Z	1/1-octave

Project Name	[Frequency Weightings] Low Frequency	[Frequency Weightings] Bottom F. for Special Leq
Project 004	Normal	16 Hz
Project 002 (1)	Normal	16 Hz
Project 003	Normal	16 Hz
Project 004	Normal	16 Hz
Project 005	Normal	16 Hz
Project 006	Normal	16 Hz
Project 007	Normal	16 Hz
Project 008	Normal	16 Hz
Project 009	Normal	16 Hz
Project 010	Normal	16 Hz
Project 011	Normal	16 Hz
Project 012	Normal	16 Hz
Project 013	Normal	16 Hz
Project 014	Normal	16 Hz
Project 015	Normal	16 Hz
Project 016	Normal	16 Hz
Project 017	Normal	16 Hz
Project 018	Normal	16 Hz
Project 005	Normal	16 Hz
Project 006	Normal	16 Hz
Project 007	Normal	16 Hz
Project 008	Normal	16 Hz
Project 009	Normal	16 Hz
Project 010	Normal	16 Hz
Project 011	Normal	16 Hz
Project 012	Normal	16 Hz

Project Name	[Frequency Weightings] Top Freq. for Special Leq	[Statistics] Broadband Statistics based on
Project 004	250 Hz	LAF
Project 002 (1)	250 Hz	LAF
Project 003	250 Hz	LAF
Project 004	250 Hz	LAF
Project 005	250 Hz	LAF
Project 006	250 Hz	LAF
Project 007	250 Hz	LAF
Project 008	250 Hz	LAF
Project 009	250 Hz	LAF
Project 010	250 Hz	LAF
Project 011	250 Hz	LAF
Project 012	250 Hz	LAF
Project 013	250 Hz	LAF
Project 014	250 Hz	LAF
Project 015	250 Hz	LAF
Project 016	250 Hz	LAF
Project 017	250 Hz	LAF
Project 018	250 Hz	LAF
Project 005	250 Hz	LAF
Project 006	250 Hz	LAF
Project 007	250 Hz	LAF
Project 008	250 Hz	LAF
Project 009	250 Hz	LAF
Project 010	250 Hz	LAF
Project 011	250 Hz	LAF
Project 012	250 Hz	LAF

Project Name	[Statistics] Spectral Statistics based on	[Statistics] Percentile 1	[Statistics] Percentile 2	[Statistics] Percentile 3
Project 004	LXF	1	5	10
Project 002 (1)	LXF	1	5	10
Project 003	LXF	1	5	10
Project 004	LXF	1	5	10
Project 005	LXF	1	5	10
Project 006	LXF	1	5	10
Project 007	LXF	1	5	10
Project 008	LXF	1	5	10
Project 009	LXF	1	5	10
Project 010	LXF	1	5	10
Project 011	LXF	1	5	10
Project 012	LXF	1	5	10
Project 013	LXF	1	5	10
Project 014	LXF	1	5	10
Project 015	LXF	1	5	10
Project 016	LXF	1	5	10
Project 017	LXF	1	5	10
Project 018	LXF	1	5	10
Project 005	LXF	1	5	10
Project 006	LXF	1	5	10
Project 007	LXF	1	5	10
Project 008	LXF	1	5	10
Project 009	LXF	1	5	10
Project 010	LXF	1	5	10
Project 011	LXF	1	5	10
Project 012	LXF	1	5	10

Project Name	[Statistics] Percentile 4	[Statistics] Percentile 5	[Statistics] Percentile 6	[Statistics] Percentile 7
Project 004	50	90	95	99
Project 002 (1)	50	90	95	99
Project 003	50	90	95	99
Project 004	50	90	95	99
Project 005	50	90	95	99
Project 006	50	90	95	99
Project 007	50	90	95	99
Project 008	50	90	95	99
Project 009	50	90	95	99
Project 010	50	90	95	99
Project 011	50	90	95	99
Project 012	50	90	95	99
Project 013	50	90	95	99
Project 014	50	90	95	99
Project 015	50	90	95	99
Project 016	50	90	95	99
Project 017	50	90	95	99
Project 018	50	90	95	99
Project 005	50	90	95	99
Project 006	50	90	95	99
Project 007	50	90	95	99
Project 008	50	90	95	99
Project 009	50	90	95	99
Project 010	50	90	95	99
Project 011	50	90	95	99
Project 012	50	90	95	99

Project Name	[Measurement Control] Preset Logging Time	[Measurement Control] LoggingPeriodTimespan
Project 004	1.01:00:00	0:00:01
Project 002 (1)	1.01:00:00	0:00:01
Project 003	1:00:00	0:00:01
Project 004	1:00:00	0:00:01
Project 005	1:00:00	0:00:01
Project 006	1:00:00	0:00:01
Project 007	1:00:00	0:00:01
Project 008	1:00:00	0:00:01
Project 009	1:00:00	0:00:01
Project 010	1:00:00	0:00:01
Project 011	1:00:00	0:00:01
Project 012	1:00:00	0:00:01
Project 013	0:15:00	0:00:01
Project 014	0:15:00	0:00:01
Project 015	0:15:00	0:00:01
Project 016	0:15:00	0:00:01
Project 017	1:00:00	0:00:01
Project 018	1:00:00	0:00:01
Project 005	1.01:00:00	0:00:01
Project 006	1.01:00:00	0:00:01
Project 007	1.01:00:00	0:00:01
Project 008	1.01:00:00	0:00:01
Project 009	1.01:00:00	0:00:01
Project 010	1.01:00:00	0:00:01
Project 011	1.01:00:00	1.15741E-05
Project 012	1.01:00:00	0:00:01

Project Name	[Measurement Control] Synchronize with Clock	[Measurement Control] T for LAeq,T,mov
Project 004	1	1:00:00
Project 002 (1)	1	1:00:00
Project 003	1	1:00:00
Project 004	1	1:00:00
Project 005	1	1:00:00
Project 006	1	1:00:00
Project 007	1	1:00:00
Project 008	1	1:00:00
Project 009	1	1:00:00
Project 010	1	1:00:00
Project 011	1	1:00:00
Project 012	1	1:00:00
Project 013	1	1:00:00
Project 014	1	1:00:00
Project 015	1	1:00:00
Project 016	1	1:00:00
Project 017	1	1:00:00
Project 018	1	1:00:00
Project 005	1	1:00:00
Project 006	1	1:00:00
Project 007	1	1:00:00
Project 008	1	1:00:00
Project 009	1	1:00:00
Project 010	1	1:00:00
Project 011	1	0.041666667
Project 012	1	1:00:00

Project Name	[Measurement Control] Charge Injection Calibration	[Logged Broadband] FullStatisticsLogged
Project 004	Off	1
Project 002 (1)	Off	0
Project 003	Off	0
Project 004	Off	0
Project 005	Off	0
Project 006	Off	0
Project 007	Off	0
Project 008	Off	0
Project 009	Off	0
Project 010	Off	0
Project 011	Off	0
Project 012	Off	0
Project 013	Off	0
Project 014	Off	0
Project 015	Off	0
Project 016	Off	0
Project 017	Off	0
Project 018	Off	0
Project 005	Off	0
Project 006	Off	0
Project 007	Off	0
Project 008	Off	0
Project 009	Off	0
Project 010	Off	0
Project 011	Off	0
Project 012	Off	0

Project Name	[Logged Broadband] Broadband Parameters	[Logged Broadband] Parameter 1	[Logged Broadband] Parameter 2
Project 004	Selected	LAeq	LCeq
Project 002 (1)	Selected	LAeq	LCeq
Project 003	Selected	LAeq	LCeq
Project 004	Selected	LAeq	LCeq
Project 005	Selected	LAeq	LCeq
Project 006	Selected	LAeq	LCeq
Project 007	Selected	LAeq	LCeq
Project 008	Selected	LAeq	LCeq
Project 009	Selected	LAeq	LCeq
Project 010	Selected	LAeq	LCeq
Project 011	Selected	LAeq	LCeq
Project 012	Selected	LAeq	LCeq
Project 013	Selected	LAeq	LCeq
Project 014	Selected	LAeq	LCeq
Project 015	Selected	LAeq	LCeq
Project 016	Selected	LAeq	LCeq
Project 017	Selected	LAeq	LCeq
Project 018	Selected	LAeq	LCeq
Project 005	Selected	LAeq	LCeq
Project 006	Selected	LAeq	LCeq
Project 007	Selected	LAeq	LCeq
Project 008	Selected	LAeq	LCeq
Project 009	Selected	LAeq	LCeq
Project 010	Selected	LAeq	LCeq
Project 011	Selected	LAeq	LCeq
Project 012	Selected	LAeq	LCeq

Project Name	[Logged Broadband] Parameter 3	[Logged Broadband] Parameter 4	[Logged Broadband] Parameter 5
Project 004	LAIeq-LAeq	LCFmax	LCFmin
Project 002 (1)	LAFmax	LAFmin	LCeq
Project 003	LAFmax	LAFmin	LCeq
Project 004	LAFmax	LAFmin	LCeq
Project 005	LAFmax	LAFmin	LCeq
Project 006	LAFmax	LAFmin	LCeq
Project 007	LAFmax	LAFmin	LCeq
Project 008	LAFmax	LAFmin	LCeq
Project 009	LAFmax	LAFmin	LCeq
Project 010	LAFmax	LAFmin	LCeq
Project 011	LAFmax	LAFmin	LCeq
Project 012	LAFmax	LAFmin	LCeq
Project 013	LAFmax	LAFmin	LCeq
Project 014	LAFmax	LAFmin	LCeq
Project 015	LAFmax	LAFmin	LCeq
Project 016	LAFmax	LAFmin	LCeq
Project 017	LAFmax	LAFmin	LCeq
Project 018	LAFmax	LAFmin	LCeq
Project 005	LAFmax	LAFmin	LCeq
Project 006	LAFmax	LAFmin	LCeq
Project 007	LAFmax	LAFmin	LCeq
Project 008	LAFmax	LAFmin	LCeq
Project 009	LAFmax	LAFmin	LCeq
Project 010	LAFmax	LAFmin	LCeq
Project 011	LAFmax	LAFmin	LCeq
Project 012	LAFmax	LAFmin	LCeq

Project Name	[Logged Broadband] Parameter 6	[Logged Broadband] Parameter 7	[Logged Broadband] Parameter 8
Project 004	Overload	None	None
Project 002 (1)	LAIeq	None	None
Project 003	LAIeq	None	None
Project 004	LAIeq	None	None
Project 005	LAIeq	None	None
Project 006	LAIeq	None	None
Project 007	LAIeq	None	None
Project 008	LAIeq	None	None
Project 009	LAIeq	None	None
Project 010	LAIeq	None	None
Project 011	LAIeq	None	None
Project 012	LAIeq	None	None
Project 013	LAIeq	None	None
Project 014	LAIeq	None	None
Project 015	LAIeq	None	None
Project 016	LAIeq	None	None
Project 017	LAIeq	None	None
Project 018	LAIeq	None	None
Project 005	LAIeq	None	None
Project 006	LAIeq	None	None
Project 007	LAIeq	None	None
Project 008	LAIeq	None	None
Project 009	LAIeq	None	None
Project 010	LAIeq	None	None
Project 011	LAIeq	None	None
Project 012	LAIeq	None	None

Project Name	[Logged Broadband] Parameter 9	[Logged Broadband] Parameter 10	[Logged Spectrum] Full Statistics
Project 004	None	None	0
Project 002 (1)	None	None	0
Project 003	None	None	0
Project 004	None	None	0
Project 005	None	None	0
Project 006	None	None	0
Project 007	None	None	0
Project 008	None	None	0
Project 009	None	None	0
Project 010	None	None	0
Project 011	None	None	0
Project 012	None	None	0
Project 013	None	None	0
Project 014	None	None	0
Project 015	None	None	0
Project 016	None	None	0
Project 017	None	None	0
Project 018	None	None	0
Project 005	None	None	0
Project 006	None	None	0
Project 007	None	None	0
Project 008	None	None	0
Project 009	None	None	0
Project 010	None	None	0
Project 011	None	None	0
Project 012	None	None	0

Project Name	[Logged Spectrum] Spectrum Parameters	[Logged Spectrum] Spectrum 1	[Logged Spectrum] Spectrum 2
Project 004	All	LZeq	None
Project 002 (1)	All	LZeq	None
Project 003	All	LZeq	None
Project 004	All	LZeq	None
Project 005	All	LZeq	None
Project 006	All	LZeq	None
Project 007	All	LZeq	None
Project 008	All	LZeq	None
Project 009	All	LZeq	None
Project 010	All	LZeq	None
Project 011	All	LZeq	None
Project 012	All	LZeq	None
Project 013	All	LZeq	None
Project 014	All	LZeq	None
Project 015	All	LZeq	None
Project 016	All	LZeq	None
Project 017	All	LZeq	None
Project 018	All	LZeq	None
Project 005	All	LZeq	None
Project 006	All	LZeq	None
Project 007	All	LZeq	None
Project 008	All	LZeq	None
Project 009	All	LZeq	None
Project 010	All	LZeq	None
Project 011	All	LZeq	None
Project 012	All	LZeq	None

Project Name	[Logged Spectrum] Spectrum 3	[Logged Broadband (100 ms)] Parameter 1	[Logged Broadband (100 ms)] Parameter 2
Project 004	None	None	None
Project 002 (1)	None	None	None
Project 003	None	None	None
Project 004	None	None	None
Project 005	None	None	None
Project 006	None	None	None
Project 007	None	None	None
Project 008	None	None	None
Project 009	None	None	None
Project 010	None	None	None
Project 011	None	None	None
Project 012	None	None	None
Project 013	None	None	None
Project 014	None	None	None
Project 015	None	None	None
Project 016	None	None	None
Project 017	None	None	None
Project 018	None	None	None
Project 005	None	None	None
Project 006	None	None	None
Project 007	None	None	None
Project 008	None	None	None
Project 009	None	None	None
Project 010	None	None	None
Project 011	None	None	None
Project 012	None	None	None

Project Name	[Logged Broadband (100 ms)] Parameter 3	[Logged Broadband (100 ms)] Spectrum Par. 1	[Markers] Marker 1
Project 004	None	None	Exclude
Project 002 (1)	None	None	Exclude
Project 003	None	None	Exclude
Project 004	None	None	Exclude
Project 005	None	None	Exclude
Project 006	None	None	Exclude
Project 007	None	None	Exclude
Project 008	None	None	Exclude
Project 009	None	None	Exclude
Project 010	None	None	Exclude
Project 011	None	None	Exclude
Project 012	None	None	Exclude
Project 013	None	None	Exclude
Project 014	None	None	Exclude
Project 015	None	None	Exclude
Project 016	None	None	Exclude
Project 017	None	None	Exclude
Project 018	None	None	Exclude
Project 005	None	None	Exclude
Project 006	None	None	Exclude
Project 007	None	None	Exclude
Project 008	None	None	Exclude
Project 009	None	None	Exclude
Project 010	None	None	Exclude
Project 011	None	None	Exclude
Project 012	None	None	Exclude

Project Name	[Markers] Marker 2	[Markers] Marker 3	[Markers] Marker 4	[Markers] Marker 5	[Markers] Marker 6
Project 004	Manual	Level	Marker4	Marker5	Sound
Project 002 (1)	Manual	Level	Marker4	Marker5	Sound
Project 003	Manual	Level	Marker4	Marker5	Sound
Project 004	Manual	Level	Marker4	Marker5	Sound
Project 005	Manual	Level	Marker4	Marker5	Sound
Project 006	Manual	Level	Marker4	Marker5	Sound
Project 007	Manual	Level	Marker4	Marker5	Sound
Project 008	Manual	Level	Marker4	Marker5	Sound
Project 009	Manual	Level	Marker4	Marker5	Sound
Project 010	Manual	Level	Marker4	Marker5	Sound
Project 011	Manual	Level	Marker4	Marker5	Sound
Project 012	Manual	Level	Marker4	Marker5	Sound
Project 013	Manual	Level	Marker4	Marker5	Sound
Project 014	Manual	Level	Marker4	Marker5	Sound
Project 015	Manual	Level	Marker4	Marker5	Sound
Project 016	Manual	Level	Marker4	Marker5	Sound
Project 017	Manual	Level	Marker4	Marker5	Sound
Project 018	Manual	Level	Marker4	Marker5	Sound
Project 005	Manual	Level	Marker4	Marker5	Sound
Project 006	Manual	Level	Marker4	Marker5	Sound
Project 007	Manual	Level	Marker4	Marker5	Sound
Project 008	Manual	Level	Marker4	Marker5	Sound
Project 009	Manual	Level	Marker4	Marker5	Sound
Project 010	Manual	Level	Marker4	Marker5	Sound
Project 011	Manual	Level	Marker4	Marker5	Sound
Project 012	Manual	Level	Marker4	Marker5	Sound

Project Name	[Markers] Pre-marker Time	[Level Trigger] Trigger	[Level Trigger] Start Slope	[Level Trigger] Start Level
Project 004	3	Off	Rising	80
Project 002 (1)	3	Off	Rising	80
Project 003	3	Off	Rising	80
Project 004	3	Off	Rising	80
Project 005	3	Off	Rising	80
Project 006	3	Off	Rising	80
Project 007	3	Off	Rising	80
Project 008	3	Off	Rising	80
Project 009	3	Off	Rising	80
Project 010	3	Off	Rising	80
Project 011	3	Off	Rising	80
Project 012	3	Off	Rising	80
Project 013	3	Off	Rising	80
Project 014	3	Off	Rising	80
Project 015	3	Off	Rising	80
Project 016	3	Off	Rising	80
Project 017	3	Off	Rising	80
Project 018	3	Off	Rising	80
Project 005	3	Off	Rising	80
Project 006	3	Off	Rising	80
Project 007	3	Off	Rising	80
Project 008	3	Off	Rising	80
Project 009	3	Off	Rising	80
Project 010	3	Off	Rising	80
Project 011	3	Off	Rising	80
Project 012	3	Off	Rising	80

Project Name	[Level Trigger] Start Duration	[Level Trigger] Stop Level	[Level Trigger] Stop Duration	[Level Trigger] Parameter
Project 004	2	70	2	None
Project 002 (1)	2	70	2	None
Project 003	2	70	2	None
Project 004	2	70	2	None
Project 005	2	70	2	None
Project 006	2	70	2	None
Project 007	2	70	2	None
Project 008	2	70	2	None
Project 009	2	70	2	None
Project 010	2	70	2	None
Project 011	2	70	2	None
Project 012	2	70	2	None
Project 013	2	70	2	None
Project 014	2	70	2	None
Project 015	2	70	2	None
Project 016	2	70	2	None
Project 017	2	70	2	None
Project 018	2	70	2	None
Project 005	2	70	2	None
Project 006	2	70	2	None
Project 007	2	70	2	None
Project 008	2	70	2	None
Project 009	2	70	2	None
Project 010	2	70	2	None
Project 011	2	70	2	None
Project 012	2	70	2	None

Project Name	[Sound Recording] Recording Control	[Sound Recording] Recording Quality	[Sound Recording] Recorded Signal
Project 004	Automatic	Fair	Input Z-weighted
Project 002 (1)	Automatic	High	Input Z-weighted
Project 003	Automatic	High	Input Z-weighted
Project 004	Automatic	High	Input Z-weighted
Project 005	Automatic	High	Input Z-weighted
Project 006	Automatic	High	Input Z-weighted
Project 007	Automatic	High	Input Z-weighted
Project 008	Automatic	High	Input Z-weighted
Project 009	Automatic	High	Input Z-weighted
Project 010	Automatic	High	Input Z-weighted
Project 011	Automatic	High	Input Z-weighted
Project 012	Automatic	High	Input Z-weighted
Project 013	Automatic	High	Input Z-weighted
Project 014	Automatic	High	Input Z-weighted
Project 015	Automatic	High	Input Z-weighted
Project 016	Automatic	High	Input Z-weighted
Project 017	Automatic	High	Input Z-weighted
Project 018	Automatic	High	Input Z-weighted
Project 005	Automatic	High	Input Z-weighted
Project 006	Automatic	High	Input Z-weighted
Project 007	Automatic	High	Input Z-weighted
Project 008	Automatic	High	Input Z-weighted
Project 009	Automatic	High	Input Z-weighted
Project 010	Automatic	High	Input Z-weighted
Project 011	Automatic	High	Input Z-weighted
Project 012	Automatic	High	Input Z-weighted

Project Name	[Sound Recording] Automatic Gain Control	[Sound Recording] Resolution	[Sound Recording] Peak Rec. Level
Project 004	On	16 bit	145.6400018
Project 002 (1)	On	16 bit	145.7099939
Project 003	On	16 bit	145.6999994
Project 004	On	16 bit	145.7099939
Project 005	On	16 bit	145.7200037
Project 006	On	16 bit	145.7099939
Project 007	On	16 bit	145.7099939
Project 008	On	16 bit	145.7099939
Project 009	On	16 bit	145.7700067
Project 010	On	16 bit	145.7399927
Project 011	On	16 bit	145.7299982
Project 012	On	16 bit	145.6799951
Project 013	On	16 bit	145.6799951
Project 014	On	16 bit	145.5999933
Project 015	On	16 bit	145.5699945
Project 016	On	16 bit	145.5999933
Project 017	On	16 bit	145.6400018
Project 018	On	16 bit	145.5999933
Project 005	On	16 bit	145.7500024
Project 006	On	16 bit	145.6999994
Project 007	On	16 bit	145.6999994
Project 008	On	16 bit	145.7299982
Project 009	On	16 bit	145.6999994
Project 010	On	16 bit	145.7099939
Project 011	On	16 bit	145.6700006
Project 012	On	16 bit	145.6600061

Project Name	[Sound Recording] Pre-recording Time	[Sound Recording] Post-recording Time	[Sound Recording] Duration Limit
Project 004	0:00:10	0:00:02	Off
Project 002 (1)	0:00:10	0:00:02	Off
Project 003	0:00:10	0:00:02	Off
Project 004	0:00:10	0:00:02	Off
Project 005	0:00:10	0:00:02	Off
Project 006	0:00:10	0:00:02	Off
Project 007	0:00:10	0:00:02	Off
Project 008	0:00:10	0:00:02	Off
Project 009	0:00:10	0:00:02	Off
Project 010	0:00:10	0:00:02	Off
Project 011	0:00:10	0:00:02	Off
Project 012	0:00:10	0:00:02	Off
Project 013	0:00:10	0:00:02	Off
Project 014	0:00:10	0:00:02	Off
Project 015	0:00:10	0:00:02	Off
Project 016	0:00:10	0:00:02	Off
Project 017	0:00:10	0:00:02	Off
Project 018	0:00:10	0:00:02	Off
Project 005	0:00:10	0:00:02	Off
Project 006	0:00:10	0:00:02	Off
Project 007	0:00:10	0:00:02	Off
Project 008	0:00:10	0:00:02	Off
Project 009	0:00:10	0:00:02	Off
Project 010	0:00:10	0:00:02	Off
Project 011	0.000115741	2.31481E-05	Off
Project 012	0:00:10	0:00:02	Off

Project Name	[Sound Recording] Minimum Duration	[Sound Recording] Maximum Duration	[Output Socket Signal] Source
Project 004	0:00:30	0:00:31	Off
Project 002 (1)	0:00:05	0:02:00	Off
Project 003	0:00:05	0:02:00	Off
Project 004	0:00:05	0:02:00	Off
Project 005	0:00:05	0:02:00	Off
Project 006	0:00:05	0:02:00	Off
Project 007	0:00:05	0:02:00	Off
Project 008	0:00:05	0:02:00	Off
Project 009	0:00:05	0:02:00	Off
Project 010	0:00:05	0:02:00	Off
Project 011	0:00:05	0:02:00	Off
Project 012	0:00:05	0:02:00	Off
Project 013	0:00:05	0:02:00	Off
Project 014	0:00:05	0:02:00	Off
Project 015	0:00:05	0:02:00	Off
Project 016	0:00:05	0:02:00	Off
Project 017	0:00:05	0:02:00	Off
Project 018	0:00:05	0:02:00	Off
Project 005	0:00:05	0:02:00	Off
Project 006	0:00:05	0:02:00	Off
Project 007	0:00:05	0:02:00	Off
Project 008	0:00:05	0:02:00	Off
Project 009	0:00:05	0:02:00	Off
Project 010	0:00:05	0:02:00	Off
Project 011	5.78704E-05	0.001388889	Off
Project 012	0:00:05	0:02:00	Off

Project Name	[Output Socket Signal] Gain	[Output Socket Signal] DC Output (20mV/dB)	[Occupational Health] Exposure Time
Project 004	0	0	7:30:00
Project 002 (1)	0	0	7:30:00
Project 003	0	0	7:30:00
Project 004	0	0	7:30:00
Project 005	0	0	7:30:00
Project 006	0	0	7:30:00
Project 007	0	0	7:30:00
Project 008	0	0	7:30:00
Project 009	0	0	7:30:00
Project 010	0	0	7:30:00
Project 011	0	0	7:30:00
Project 012	0	0	7:30:00
Project 013	0	0	7:30:00
Project 014	0	0	7:30:00
Project 015	0	0	7:30:00
Project 016	0	0	7:30:00
Project 017	0	0	7:30:00
Project 018	0	0	7:30:00
Project 005	0	0	7:30:00
Project 006	0	0	7:30:00
Project 007	0	0	7:30:00
Project 008	0	0	7:30:00
Project 009	0	0	7:30:00
Project 010	0	0	7:30:00
Project 011	0	0	0.3125
Project 012	0	0	7:30:00

Project Name	[Occupational Health] Reference Time	[Occupational Health] Threshold Level	[Occupational Health] Criterion Level
Project 004	8:00:00	70	85
Project 002 (1)	8:00:00	70	85
Project 003	8:00:00	70	85
Project 004	8:00:00	70	85
Project 005	8:00:00	70	85
Project 006	8:00:00	70	85
Project 007	8:00:00	70	85
Project 008	8:00:00	70	85
Project 009	8:00:00	70	85
Project 010	8:00:00	70	85
Project 011	8:00:00	70	85
Project 012	8:00:00	70	85
Project 013	8:00:00	70	85
Project 014	8:00:00	70	85
Project 015	8:00:00	70	85
Project 016	8:00:00	70	85
Project 017	8:00:00	70	85
Project 018	8:00:00	70	85
Project 005	8:00:00	70	85
Project 006	8:00:00	70	85
Project 007	8:00:00	70	85
Project 008	8:00:00	70	85
Project 009	8:00:00	70	85
Project 010	8:00:00	70	85
Project 011	0.333333333	70	85
Project 012	8:00:00	70	85

Project Name	[Occupational Health] PeaksOver Level	[Occupational Health] Exchange Rate for Lav
Project 004	140	5 dB
Project 002 (1)	140	5 dB
Project 003	140	5 dB
Project 004	140	5 dB
Project 005	140	5 dB
Project 006	140	5 dB
Project 007	140	5 dB
Project 008	140	5 dB
Project 009	140	5 dB
Project 010	140	5 dB
Project 011	140	5 dB
Project 012	140	5 dB
Project 013	140	5 dB
Project 014	140	5 dB
Project 015	140	5 dB
Project 016	140	5 dB
Project 017	140	5 dB
Project 018	140	5 dB
Project 005	140	5 dB
Project 006	140	5 dB
Project 007	140	5 dB
Project 008	140	5 dB
Project 009	140	5 dB
Project 010	140	5 dB
Project 011	140	5 dB
Project 012	140	5 dB

Project Name	[Occupational Health] Time Weighting for Lav	[Tone Assessment] Tone Assessment	[Tone Assessment] Tone Standard
Project 004	S	Off	ISO 1996-2:2007
Project 002 (1)	S	Off	ISO 1996-2:2007
Project 003	S	Off	ISO 1996-2:2007
Project 004	S	Off	ISO 1996-2:2007
Project 005	S	Off	ISO 1996-2:2007
Project 006	S	Off	ISO 1996-2:2007
Project 007	S	Off	ISO 1996-2:2007
Project 008	S	Off	ISO 1996-2:2007
Project 009	S	Off	ISO 1996-2:2007
Project 010	S	Off	ISO 1996-2:2007
Project 011	S	Off	ISO 1996-2:2007
Project 012	S	Off	ISO 1996-2:2007
Project 013	S	Off	ISO 1996-2:2007
Project 014	S	Off	ISO 1996-2:2007
Project 015	S	Off	ISO 1996-2:2007
Project 016	S	Off	ISO 1996-2:2007
Project 017	S	Off	ISO 1996-2:2007
Project 018	S	Off	ISO 1996-2:2007
Project 005	S	Off	ISO 1996-2:2007
Project 006	S	Off	ISO 1996-2:2007
Project 007	S	Off	ISO 1996-2:2007
Project 008	S	Off	ISO 1996-2:2007
Project 009	S	Off	ISO 1996-2:2007
Project 010	S	Off	ISO 1996-2:2007
Project 011	S	Off	ISO 1996-2:2007
Project 012	S	Off	ISO 1996-2:2007

Project Name	[Tone Assessment] Adjustment	[Tone Assessment] Low Freq. Last Band	[Tone Assessment] Middle Freq. Last Band
Project 004	5	Hz125	Hz400
Project 002 (1)	5	Hz125	Hz400
Project 003	5	Hz125	Hz400
Project 004	5	Hz125	Hz400
Project 005	5	Hz125	Hz400
Project 006	5	Hz125	Hz400
Project 007	5	Hz125	Hz400
Project 008	5	Hz125	Hz400
Project 009	5	Hz125	Hz400
Project 010	5	Hz125	Hz400
Project 011	5	Hz125	Hz400
Project 012	5	Hz125	Hz400
Project 013	5	Hz125	Hz400
Project 014	5	Hz125	Hz400
Project 015	5	Hz125	Hz400
Project 016	5	Hz125	Hz400
Project 017	5	Hz125	Hz400
Project 018	5	Hz125	Hz400
Project 005	5	Hz125	Hz400
Project 006	5	Hz125	Hz400
Project 007	5	Hz125	Hz400
Project 008	5	Hz125	Hz400
Project 009	5	Hz125	Hz400
Project 010	5	Hz125	Hz400
Project 011	5	Hz125	Hz400
Project 012	5	Hz125	Hz400

Project Name	[Tone Assessment] Level Difference Low	[Tone Assessment] Level Difference Middle
Project 004	15	8
Project 002 (1)	15	8
Project 003	15	8
Project 004	15	8
Project 005	15	8
Project 006	15	8
Project 007	15	8
Project 008	15	8
Project 009	15	8
Project 010	15	8
Project 011	15	8
Project 012	15	8
Project 013	15	8
Project 014	15	8
Project 015	15	8
Project 016	15	8
Project 017	15	8
Project 018	15	8
Project 005	15	8
Project 006	15	8
Project 007	15	8
Project 008	15	8
Project 009	15	8
Project 010	15	8
Project 011	15	8
Project 012	15	8

Project Name	[Tone Assessment] Level Difference High	[Tone Assessment] ISO 226	[Tacho] Tacho	[Tacho] RPM Gear Ratio
Project 004	5	1987 Free-field	Off	1
Project 002 (1)	5	1987 Free-field	Off	1
Project 003	5	1987 Free-field	Off	1
Project 004	5	1987 Free-field	Off	1
Project 005	5	1987 Free-field	Off	1
Project 006	5	1987 Free-field	Off	1
Project 007	5	1987 Free-field	Off	1
Project 008	5	1987 Free-field	Off	1
Project 009	5	1987 Free-field	Off	1
Project 010	5	1987 Free-field	Off	1
Project 011	5	1987 Free-field	Off	1
Project 012	5	1987 Free-field	Off	1
Project 013	5	1987 Free-field	Off	1
Project 014	5	1987 Free-field	Off	1
Project 015	5	1987 Free-field	Off	1
Project 016	5	1987 Free-field	Off	1
Project 017	5	1987 Free-field	Off	1
Project 018	5	1987 Free-field	Off	1
Project 005	5	1987 Free-field	Off	1
Project 006	5	1987 Free-field	Off	1
Project 007	5	1987 Free-field	Off	1
Project 008	5	1987 Free-field	Off	1
Project 009	5	1987 Free-field	Off	1
Project 010	5	1987 Free-field	Off	1
Project 011	5	1987 Free-field	Off	1
Project 012	5	1987 Free-field	Off	1

Project Name	[Tacho] External Level	[Tacho] Hysteresis	[Tacho] Slope	[Tacho] CCLD	Start TimeUTC Date Time
Project 004	18.1	0.1	Falling	On	7/22/2019 14:24
Project 002 (1)	18.1	0.1	Falling	On	7/22/2019 14:23
Project 003	18.1	0.1	Falling	On	7/22/2019 16:09
Project 004	18.1	0.1	Falling	On	7/22/2019 17:40
Project 005	18.1	0.1	Falling	On	7/23/2019 3:28
Project 006	18.1	0.1	Falling	On	7/23/2019 4:02
Project 007	18.1	0.1	Falling	On	7/23/2019 4:31
Project 008	18.1	0.1	Falling	On	7/23/2019 15:49
Project 009	18.1	0.1	Falling	On	7/23/2019 18:50
Project 010	18.1	0.1	Falling	On	7/23/2019 20:05
Project 011	18.1	0.1	Falling	On	7/23/2019 21:19
Project 012	18.1	0.1	Falling	On	7/23/2019 22:00
Project 013	18.1	0.1	Falling	On	7/24/2019 3:45
Project 014	18.1	0.1	Falling	On	7/24/2019 5:52
Project 015	18.1	0.1	Falling	On	7/24/2019 6:21
Project 016	18.1	0.1	Falling	On	7/24/2019 6:48
Project 017	18.1	0.1	Falling	On	7/24/2019 16:54
Project 018	18.1	0.1	Falling	On	7/24/2019 18:10
Project 005	18.1	0.1	Falling	On	7/24/2019 20:34
Project 006	18.1	0.1	Falling	On	7/24/2019 21:53
Project 007	18.1	0.1	Falling	On	7/25/2019 3:07
Project 008	18.1	0.1	Falling	On	7/25/2019 3:29
Project 009	18.1	0.1	Falling	On	7/25/2019 3:54
Project 010	18.1	0.1	Falling	On	7/25/2019 4:22
Project 011	18.1	0.1	Falling	On	7/25/2019 4:53
Project 012	18.1	0.1	Falling	On	7/25/2019 14:58

Project Name	Start TimeUTC Time Zone	Start TimeUTC Daylight Saving	Start Time	Stop TimeUTC Date Time
Project 004	Central Standard Time	TRUE	7/22/2019 9:24	7/22/2019 15:27
Project 002 (1)	Central Standard Time	TRUE	7/22/2019 9:23	7/22/2019 15:25
Project 003	Central Standard Time	TRUE	7/22/2019 11:09	7/22/2019 17:09
Project 004	Central Standard Time	TRUE	7/22/2019 12:40	7/22/2019 18:40
Project 005	Central Standard Time	TRUE	7/22/2019 22:28	7/23/2019 3:45
Project 006	Central Standard Time	TRUE	7/22/2019 23:02	7/23/2019 4:17
Project 007	Central Standard Time	TRUE	7/22/2019 23:31	7/23/2019 4:46
Project 008	Central Standard Time	TRUE	7/23/2019 10:49	7/23/2019 16:49
Project 009	Central Standard Time	TRUE	7/23/2019 13:50	7/23/2019 19:50
Project 010	Central Standard Time	TRUE	7/23/2019 15:05	7/23/2019 21:05
Project 011	Central Standard Time	TRUE	7/23/2019 16:19	7/23/2019 21:51
Project 012	Central Standard Time	TRUE	7/23/2019 17:00	7/23/2019 22:30
Project 013	Central Standard Time	TRUE	7/23/2019 22:45	7/24/2019 4:00
Project 014	Central Standard Time	TRUE	7/24/2019 0:52	7/24/2019 6:07
Project 015	Central Standard Time	TRUE	7/24/2019 1:21	7/24/2019 6:36
Project 016	Central Standard Time	TRUE	7/24/2019 1:48	7/24/2019 7:03
Project 017	Central Standard Time	TRUE	7/24/2019 11:54	7/24/2019 17:54
Project 018	Central Standard Time	TRUE	7/24/2019 13:10	7/24/2019 20:01
Project 005	Central Standard Time	TRUE	7/24/2019 15:34	7/24/2019 21:36
Project 006	Central Standard Time	TRUE	7/24/2019 16:53	7/24/2019 22:55
Project 007	Central Standard Time	TRUE	7/24/2019 22:07	7/25/2019 3:22
Project 008	Central Standard Time	TRUE	7/24/2019 22:29	7/25/2019 3:46
Project 009	Central Standard Time	TRUE	7/24/2019 22:54	7/25/2019 4:09
Project 010	Central Standard Time	TRUE	7/24/2019 23:22	7/25/2019 4:39
Project 011	Central Standard Time	TRUE	7/24/2019 23:53	7/25/2019 5:10
Project 012	Central Standard Time	TRUE	7/25/2019 9:58	7/25/2019 15:59

Project Name	Stop TimeUTC Time Zone	Stop TimeUTC Daylight Saving	Stop Time	TApeakUTC Date Time	TApeakUTC Time Zone
Project 004	Central Standard Time	TRUE	7/22/2019 10:27	7/22/2019 15:23	Central Standard Time
Project 002 (1)	Central Standard Time	TRUE	7/22/2019 10:25	7/22/2019 14:55	Central Standard Time
Project 003	Central Standard Time	TRUE	7/22/2019 12:09	7/22/2019 16:27	Central Standard Time
Project 004	Central Standard Time	TRUE	7/22/2019 13:40	7/22/2019 18:13	Central Standard Time
Project 005	Central Standard Time	TRUE	7/22/2019 22:45	7/23/2019 3:44	Central Standard Time
Project 006	Central Standard Time	TRUE	7/22/2019 23:17	7/23/2019 4:16	Central Standard Time
Project 007	Central Standard Time	TRUE	7/22/2019 23:46	7/23/2019 4:32	Central Standard Time
Project 008	Central Standard Time	TRUE	7/23/2019 11:49	7/23/2019 16:38	Central Standard Time
Project 009	Central Standard Time	TRUE	7/23/2019 14:50	7/23/2019 19:06	Central Standard Time
Project 010	Central Standard Time	TRUE	7/23/2019 16:05	7/23/2019 20:23	Central Standard Time
Project 011	Central Standard Time	TRUE	7/23/2019 16:51	7/23/2019 21:34	Central Standard Time
Project 012	Central Standard Time	TRUE	7/23/2019 17:30	7/23/2019 22:14	Central Standard Time
Project 013	Central Standard Time	TRUE	7/23/2019 23:00	7/24/2019 3:52	Central Standard Time
Project 014	Central Standard Time	TRUE	7/24/2019 1:07	7/24/2019 5:52	Central Standard Time
Project 015	Central Standard Time	TRUE	7/24/2019 1:36	7/24/2019 6:22	Central Standard Time
Project 016	Central Standard Time	TRUE	7/24/2019 2:03	7/24/2019 7:00	Central Standard Time
Project 017	Central Standard Time	TRUE	7/24/2019 12:54	7/24/2019 17:12	Central Standard Time
Project 018	Central Standard Time	TRUE	7/24/2019 15:01	7/24/2019 19:40	Central Standard Time
Project 005	Central Standard Time	TRUE	7/24/2019 16:36	7/24/2019 21:18	Central Standard Time
Project 006	Central Standard Time	TRUE	7/24/2019 17:55	7/24/2019 22:38	Central Standard Time
Project 007	Central Standard Time	TRUE	7/24/2019 22:22	7/25/2019 3:18	Central Standard Time
Project 008	Central Standard Time	TRUE	7/24/2019 22:46	7/25/2019 3:45	Central Standard Time
Project 009	Central Standard Time	TRUE	7/24/2019 23:09	7/25/2019 3:56	Central Standard Time
Project 010	Central Standard Time	TRUE	7/24/2019 23:39	7/25/2019 4:22	Central Standard Time
Project 011	Central Standard Time	TRUE	7/25/2019 0:10	7/25/2019 5:10	Central Standard Time
Project 012	Central Standard Time	TRUE	7/25/2019 10:59	7/25/2019 15:58	Central Standard Time

Project Name	TApeakUTC Daylight Saving	TApeak	CIC 1 Ratio DateUTC Date Time	CIC 1 Ratio DateUTC Time Zone
Project 004	TRUE	7/22/2019 10:23	12:00:00 AM	Central Standard Time
Project 002 (1)	TRUE	7/22/2019 9:55	12:00:00 AM	Central Standard Time
Project 003	TRUE	7/22/2019 11:27	12:00:00 AM	Central Standard Time
Project 004	TRUE	7/22/2019 13:13	12:00:00 AM	Central Standard Time
Project 005	TRUE	7/22/2019 22:44	12:00:00 AM	Central Standard Time
Project 006	TRUE	7/22/2019 23:16	12:00:00 AM	Central Standard Time
Project 007	TRUE	7/22/2019 23:32	12:00:00 AM	Central Standard Time
Project 008	TRUE	7/23/2019 11:38	12:00:00 AM	Central Standard Time
Project 009	TRUE	7/23/2019 14:06	12:00:00 AM	Central Standard Time
Project 010	TRUE	7/23/2019 15:23	12:00:00 AM	Central Standard Time
Project 011	TRUE	7/23/2019 16:34	12:00:00 AM	Central Standard Time
Project 012	TRUE	7/23/2019 17:14	12:00:00 AM	Central Standard Time
Project 013	TRUE	7/23/2019 22:52	12:00:00 AM	Central Standard Time
Project 014	TRUE	7/24/2019 0:52	12:00:00 AM	Central Standard Time
Project 015	TRUE	7/24/2019 1:22	12:00:00 AM	Central Standard Time
Project 016	TRUE	7/24/2019 2:00	12:00:00 AM	Central Standard Time
Project 017	TRUE	7/24/2019 12:12	12:00:00 AM	Central Standard Time
Project 018	TRUE	7/24/2019 14:40	12:00:00 AM	Central Standard Time
Project 005	TRUE	7/24/2019 16:18	12:00:00 AM	Central Standard Time
Project 006	TRUE	7/24/2019 17:38	12:00:00 AM	Central Standard Time
Project 007	TRUE	7/24/2019 22:18	12:00:00 AM	Central Standard Time
Project 008	TRUE	7/24/2019 22:45	12:00:00 AM	Central Standard Time
Project 009	TRUE	7/24/2019 22:56	12:00:00 AM	Central Standard Time
Project 010	TRUE	7/24/2019 23:22	12:00:00 AM	Central Standard Time
Project 011	TRUE	7/25/2019 0:10	12:00:00 AM	Central Standard Time
Project 012	TRUE	7/25/2019 10:58	12:00:00 AM	Central Standard Time

Project Name	CIC 1 Ratio DateUTC Daylight Saving	CIC 1 Ratio Date	CIC 2 Ratio DateUTC Date Time	CIC 2 Ratio DateUTC Time Zone
Project 004	TRUE	12:00:00 AM	12:00:00 AM	Central Standard Time
Project 002 (1)	TRUE	12:00:00 AM	12:00:00 AM	Central Standard Time
Project 003	TRUE	12:00:00 AM	12:00:00 AM	Central Standard Time
Project 004	TRUE	12:00:00 AM	12:00:00 AM	Central Standard Time
Project 005	TRUE	12:00:00 AM	12:00:00 AM	Central Standard Time
Project 006	TRUE	12:00:00 AM	12:00:00 AM	Central Standard Time
Project 007	TRUE	12:00:00 AM	12:00:00 AM	Central Standard Time
Project 008	TRUE	12:00:00 AM	12:00:00 AM	Central Standard Time
Project 009	TRUE	12:00:00 AM	12:00:00 AM	Central Standard Time
Project 010	TRUE	12:00:00 AM	12:00:00 AM	Central Standard Time
Project 011	TRUE	12:00:00 AM	12:00:00 AM	Central Standard Time
Project 012	TRUE	12:00:00 AM	12:00:00 AM	Central Standard Time
Project 013	TRUE	12:00:00 AM	12:00:00 AM	Central Standard Time
Project 014	TRUE	12:00:00 AM	12:00:00 AM	Central Standard Time
Project 015	TRUE	12:00:00 AM	12:00:00 AM	Central Standard Time
Project 016	TRUE	12:00:00 AM	12:00:00 AM	Central Standard Time
Project 017	TRUE	12:00:00 AM	12:00:00 AM	Central Standard Time
Project 018	TRUE	12:00:00 AM	12:00:00 AM	Central Standard Time
Project 005	TRUE	12:00:00 AM	12:00:00 AM	Central Standard Time
Project 006	TRUE	12:00:00 AM	12:00:00 AM	Central Standard Time
Project 007	TRUE	12:00:00 AM	12:00:00 AM	Central Standard Time
Project 008	TRUE	12:00:00 AM	12:00:00 AM	Central Standard Time
Project 009	TRUE	12:00:00 AM	12:00:00 AM	Central Standard Time
Project 010	TRUE	12:00:00 AM	12:00:00 AM	Central Standard Time
Project 011	TRUE	12:00:00 AM	12:00:00 AM	Central Standard Time
Project 012	TRUE	12:00:00 AM	12:00:00 AM	Central Standard Time

Project Name	CIC 2 Ratio DateUTC Daylight Saving	CIC 2 Ratio Date	[Spectrum] Base	[Spectrum] Bandwidth	[Spectrum] First Index
Project 004	TRUE	12:00:00 AM	10	1/1	4
Project 002 (1)	TRUE	12:00:00 AM	10	1/1	4
Project 003	TRUE	12:00:00 AM	10	1/1	4
Project 004	TRUE	12:00:00 AM	10	1/1	4
Project 005	TRUE	12:00:00 AM	10	1/1	4
Project 006	TRUE	12:00:00 AM	10	1/1	4
Project 007	TRUE	12:00:00 AM	10	1/1	4
Project 008	TRUE	12:00:00 AM	10	1/1	4
Project 009	TRUE	12:00:00 AM	10	1/1	4
Project 010	TRUE	12:00:00 AM	10	1/1	4
Project 011	TRUE	12:00:00 AM	10	1/1	4
Project 012	TRUE	12:00:00 AM	10	1/1	4
Project 013	TRUE	12:00:00 AM	10	1/1	4
Project 014	TRUE	12:00:00 AM	10	1/1	4
Project 015	TRUE	12:00:00 AM	10	1/1	4
Project 016	TRUE	12:00:00 AM	10	1/1	4
Project 017	TRUE	12:00:00 AM	10	1/1	4
Project 018	TRUE	12:00:00 AM	10	1/1	4
Project 005	TRUE	12:00:00 AM	10	1/1	4
Project 006	TRUE	12:00:00 AM	10	1/1	4
Project 007	TRUE	12:00:00 AM	10	1/1	4
Project 008	TRUE	12:00:00 AM	10	1/1	4
Project 009	TRUE	12:00:00 AM	10	1/1	4
Project 010	TRUE	12:00:00 AM	10	1/1	4
Project 011	TRUE	12:00:00 AM	10	1/1	4
Project 012	TRUE	12:00:00 AM	10	1/1	4

Project Name	[Spectrum] Number Of Data
Project 004	11
Project 002 (1)	11
Project 003	11
Project 004	11
Project 005	11
Project 006	11
Project 007	11
Project 008	11
Project 009	11
Project 010	11
Project 011	11
Project 012	11
Project 013	11
Project 014	11
Project 015	11
Project 016	11
Project 017	11
Project 018	11
Project 005	11
Project 006	11
Project 007	11
Project 008	11
Project 009	11
Project 010	11
Project 011	11
Project 012	11

NORTH BAKKEN EXPANSION PROJECT

Pre-Construction Noise Survey and Acoustical Analysis
McKenzie and Williams Counties, North Dakota

APPENDIX D
Noise Calculations for Compressor Station Sound Power Levels

Elkhorn Creek											
Indoor Equipment	**Quantity**	**32**	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**Total L_W**
Compressor Engine Mechanical (CAT G3612 A4)	1	108	121.3	125.7	119.6	119.6	118.9	119.7	118.8	110.9	125.7
Engine Exhaust	1	107.9	122.9	121	120.5	122.5	127.5	132.8	139	140.3	143.3
Catalyst Insertion Loss	1	30	30	30	30	30	30	30	30	30	---
Mitigated Exhaust Noise	1	77.9	92.9	91	90.5	92.5	97.5	102.8	109	110.3	113.3
Compressor (Ariel KBU-4)	1	0.0	99.0	99.0	109.0	99.0	95.0	91.0	89.0	85.0	103.2
Total	**---**	**108.0**	**121.3**	**125.7**	**120.0**	**119.6**	**118.9**	**119.8**	**119.2**	**113.6**	**126.0**
Wall and Roof Transmission Loss	---	0.0	0.0	12.0	16.0	26.0	33.0	36.0	47.0	0.0	---
Total Outside Compressor Building	**---**	**108.0**	**121.3**	**113.7**	**104.0**	**93.6**	**85.9**	**83.8**	**72.2**	**113.6**	**112.9**
Outdoor Equipment	**Quantity**	**Single L_P (dBA)**	**d (m)**	**Single L_W (dBA)**	**Total L_W (dBA)**						**Overall Station L_W**
Gas Cooler	1	71.9	15	106.4	106.4						**114.4**
Aux Cooler	1	71.1	15	105.6	105.6						

Tioga											
Indoor Equipment	**Quantity**	**32**	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**Total L_W**
Compressor Engine Mechanical (CAT G3612 A4)	6	108	121.3	125.7	119.6	119.6	118.9	119.7	118.8	110.9	125.7
Engine Exhaust	6	107.9	122.9	121	120.5	122.5	127.5	132.8	139	140.3	143.3
Catalyst Insertion Loss	6	30	30	30	30	30	30	30	30	30	---
Mitigated Exhaust Noise	6	77.9	92.9	91	90.5	92.5	97.5	102.8	109	110.3	113.3
Compressor (Ariel KBU-4)	6	0.0	99.0	99.0	109.0	99.0	95.0	91.0	89.0	85.0	103.2
Generator Mechanical (L5794GSI)	1	94.7	112.7	113.7	110.7	109.7	107.7	106.7	106.7	104.7	114.3
Generator Exhaust	1	112.7	130.7	132.7	122.7	119.7	114.7	111.7	104.7	91.7	122.3
Silencer Insertion Loss	1	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	---
Mitigated Exhaust Noise	1	80.7	98.7	100.7	90.7	87.7	82.7	79.7	72.7	59.7	90.3
Total	**---**	**115.8**	**129.2**	**133.5**	**127.8**	**127.5**	**126.8**	**127.6**	**127.1**	**121.5**	**133.8**
Wall and Roof Transmission Loss	---	0.0	0.0	12.0	16.0	26.0	33.0	36.0	47.0	0.0	---
Total Outside Compressor Building	**---**	**115.8**	**129.2**	**121.5**	**111.8**	**101.5**	**93.8**	**91.6**	**80.1**	**121.5**	**120.7**
Outdoor Equipment	**Quantity**	**Single L_P (dBA)**	**d (m)**	**Single L_W (dBA)**	**Total L_W (dBA)**						**Overall Station L_W**
Gas Cooler	6	71.9	15	106.4	114.2						**122.2**
Aux Cooler	6	71.1	15	105.6	113.4						