1250 West Century Avenue
Mailing Address:
P.O. Box 5601
Bismarck, ND 58506-5601
(701) 530-1600

July 28, 2020

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E., Room 1A
Washington, D.C. 20426

Re: WBI Energy Transmission, Inc.
Amended Application for a Certificate of Public Convenience and Necessity
Docket No. CP20-52-000
North Bakken Expansion Project

Dear Ms. Bose:

WBI Energy Transmission, Inc. (WBI Energy), pursuant to Section 7(c) of the Natural Gas Act, as amended, and Part 157 of the regulations of the Federal Energy Regulatory Commission (Commission), respectively, submits for filing an Amendment to the Abbreviated Application for a Certificate of Public Convenience and Necessity in the above-referenced docket authorizing WBI Energy to construct, modify, operate and maintain natural gas transmission facilities in Burke, McKenzie, Mountrail and Williams Counties, collectively known as the North Bakken Expansion Project (Project). The Amendment proposes a reduction in the incremental firm transportation capacity of the Project, updated Project costs and revisions to certain appurtenant Project facilities.

The filing includes the following volumes:

Volume I - Consists of the Amended Application, Form of Notice and updated Exhibits K, N, O, P and Z to reflect the proposed revisions to the Application, as amended. The information contained in Volume I is public.

Volume II – Consists of updated sections of Resource Report 9 of Exhibit F-I, Environmental Report, with updated associated appendices to Resource Report 9. The information contained in Volume II is public.

Volume III -Consists of updated Exhibits G and G-I, Flow Diagrams, to the Application, as amended, and updated Appendix 1E to Resource Report 1, Plot Plans for Aboveground Facility Sites. The information contained in Volume III is considered Critical Energy Infrastructure Information (CEII) and could be useful to any persons planning an attack on the infrastructures pursuant to 18 CFR §388.113. WBI Energy requests privileged and confidential treatment of this information, which is labeled: "CUI//CEII – DO NOT RELEASE," and that such information retains the CEII designation for a period of five years, subject to re-designation at that time.

Pursuant to the Commission's guidelines for eFiling,[1] WBI Energy is hereby eFiling this Amended Application and will provide two complete copies of the Amended Application to the Office of Energy Projects (OEP) Room 62-46 and one complete copy to the Office of General Council – Energy Projects (OGC-EP) Room 101-56.

Should you have any questions or comments regarding this filing, please call the undersigned at (701) 530-1563.

Sincerely,

/s/ Lori Myerchin

Lori Myerchin
Director, Regulatory Affairs and
Transportation Services

Attachments

cc: OEP Room 62-46 (2 copies)
OGC-EP Room 101-56 (1 copy)
Dawn Ramsey, FERC Environmental Project Manager (via email)
Shannon Crosley, FERC Environmental Deputy Project Manager (via email)
Official Service List (via email)

[1] Federal Energy Regulatory Commission Filing Guide/Qualified Documents List (February 14, 2017).

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

WBI Energy Transmission, Inc.	)	Docket No. CP20-52-___

AMENDMENT TO ABBREVIATED APPLICATION OF
WBI ENERGY TRANSMISSION, INC.
FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY

WBI Energy Transmission, Inc. (WBI Energy), pursuant to Section 7(c) of the Natural Gas Act (NGA), as amended,[1] and Part 157 of the Federal Energy Regulatory Commission's (Commission or FERC) regulations,[2] hereby amends its Abbreviated Application for a Certificate of Public Convenience and Necessity (Application) filed February 14, 2020 in the above-captioned docket to construct, modify, operate and maintain the North Bakken Expansion Project (Project).

By this Amendment, WBI Energy, in addition to the authorizations requested in the Application, is hereby proposing (i) to reduce the Project's incremental firm transportation design capacity from 350,000 mcf per day to 250,000 mcf per day by reducing the number of additional compressor units at its existing Tioga Compressor Station from six units to three units; (ii) to update Project costs to reflect the reduction in additional compressor units at the Tioga Compressor Station, as well as a reduction in estimated Project costs related to the purchase of pipeline, construction of the proposed Elkhorn Creek Compressor Station, and construction of the WBI Energy interconnect facilities with Northern Border Pipeline Company (Northern Border), and (iii) to update certain appurtenant Project facilities.

The reduction in additional compression at the Tioga Compressor Station will not change the construction workspace and boundary extension of the station proposed in the Application.

[1] 15 U.S.C. §717(f) (2019).
[2] 18 C.F.R. §157.5 (2019).

However, there will be a reduction in the environmental impact associated with air and noise emissions at the Tioga Compressor Station. This is reflected in the applicable sections of Resource Report 9 which have been updated and are included with this Amendment. WBI Energy is also providing a cross-reference update to the applicable sections of the Applicant Prepared Draft Environmental Assessment submitted for the Project. There are no additional directly affected landowners as a result of the changes proposed in this Amendment.

WBI Energy is submitting a revised Exhibit K to reflect the reduction in compression-related costs at the Tioga Compressor Station as well as the reduction in the other estimated Project costs noted above. The revised total estimated capital cost of the Project is approximately $260.5 million. WBI Energy has also updated the previously filed Exhibits N and O to incorporate the revised Project costs. WBI Energy proposes a revised incremental recourse reservation rate to recover the revised Project costs as shown in an updated Exhibit P.

The Project, as amended, continues to be in the public interest and required by the public convenience and necessity. WBI Energy respectfully requests that the Commission issue the requisite authorization for the Project, as amended, no later than January 2021. This will enable WBI Energy to meet the November 1, 2021 in-service date requested by its Project shippers. In support of this Amendment, WBI Energy respectively states the following:

I.
BACKGROUND AND BASIS

In its Application, WBI Energy proposes to construct, modify, operate and maintain facilities for the Project under Section 7(c) of the NGA. The Project, as initially proposed, would allow WBI Energy to provide an additional 350,000 mcf per day of incremental firm transportation capacity from the Williston Basin in northwest North Dakota to a new interconnect with Northern

Border's existing mainline. WBI Energy explained that new pipeline infrastructure in the Williston Basin of northwest North Dakota is of critical importance to support the transportation of increasing levels of associated natural gas production and to aid in the reduction of natural gas flaring.

WBI Energy filed six binding Precedent Agreements with Project shippers for a total of 243,000 equivalent dekatherms (dkt) per day of incremental firm natural gas transportation service in support of the Project. The estimated capital cost of the Project was $300 million with a target in-service date of November 1, 2021.

As explained herein, WBI Energy now proposes to reduce the design capacity of the Project from 350,000 Mcf per day to 250,000 Mcf per day due to oil and natural gas production challenges associated with a global oversupply of oil, in combination with the effects of the sudden and unforeseeable COVID-19 pandemic, which have led to a substantial decline in the price of oil. The reduction in design capacity will be accomplished by reducing the proposed compression at WBI Energy's Tioga Compressor Station. WBI Energy is also updating certain Project costs as well as updating appurtenant facilities associated with the Project.

II.
DESCRIPTION OF FACILITY MODIFICATIONS

To facilitate the design capacity reduction, WBI Energy will reduce from 22,500 horsepower (hp) to 11,250 hp the compression proposed at its existing Tioga Compressor Station in Williams County, North Dakota. The proposed modification will increase total station capacity to 12,000 hp.

Specifically, WBI Energy will install three instead of six new compressor units (Units 2-4), each consisting of a skid mounted 3,750 hp natural gas-fired Caterpillar G3612 engine coupled to a KBZ-4 compressor unit. Two new compressor buildings will be added, one housing two units and the other housing one unit, instead of three new buildings each housing two units as originally proposed. A combination gas and engine auxiliary cooler will be installed for each new compressor unit instead of individual coolers for each unit. WBI Energy is also modifying certain appurtenant facilities. A 592-kilowatt (kw) backup power generator driven by a natural gas-fired 840 hp Waukesha F3524GSI engine will be installed instead of a 980-kw backup generator driven by a 1,380 hp natural gas fired L5794GSI engine. WBI Energy will not install a new scrubber building. The proposed modifications are summarized in Table 1 below.

Table 1 – Tioga Compressor Station Modifications

Compressor Equipment	***Application***	***Amendment***
Compressor Units (skid mounted 3,750 hp natural gas-fired Caterpillar G3612 engine coupled to a KBZ-4 compressor unit)	6 units – 22,500 hp	3 units – 11,250 hp
Cooling Equipment	Gas cooler and auxiliary cooler for each new compressor unit (6 total)	A combination gas and engine auxiliary cooler for each new compressor unit (3 total)
Compressor Buildings	3 buildings – two units each	2 buildings – one housing two units; one housing one unit
Appurtenant Facilities		
Backup Power Generator	980-kw backup power generator driven by a natural gas-fired 1,380 hp Waukesha L5794GSI engine	592-kw backup power generator driven by a natural gas-fired 840 hp Waukesha F3524GSI engine
Buildings	New transfer building, auxiliary building, scrubber building	New transfer building and auxiliary building

WBI Energy has also updated certain appurtenant facilities to be installed at the proposed Elkhorn Creek Compressor Station in McKenzie County, North Dakota, as noted below in Table 2. Specifically, a combination gas and engine auxiliary cooler will be installed for the new compressor unit instead of individual coolers. WBI Energy will install a 0.12 million British thermal units per hour (MMBtu/hr) fuel gas preheater. WBI Energy has corrected the heating value of the water heater from 2.08 MMBtu/hr to 0.2 MMBtu/hr.

Table 2 – Elkhorn Creek Compressor Station Modifications

Appurtenant Facilities	***Application***	***Amendment***
Cooling Equipment	One gas cooler and one auxiliary cooler	A combination gas and engine auxiliary cooler
Water Heater	2.08 MMBTU/hr	0.2 MMBTU/hr
Fuel Gas Preheater	None	0.12 MMBTU/hr

The plot plans for the Tioga Compressor Station and the proposed Elkhorn Creek Compressor Station originally submitted with the Application in Appendix 1E to Resource Report 1 have been updated to reflect these changes. The updated plot plans are included with this Amendment as an update to Appendix 1E and are included in Volume III.

The facilities WBI Energy will construct, own and operate at the interconnect with Northern Border, as modified based on continued discussions with Northern Border, include a new building with that will house RTU and telemetering equipment. WBI Energy will not be installing gas quality instruments or a second building with high pressure metering, an odorant system, and station piping with over pressure protection equipment as indicated in the Application. A plot plan for the WBI Energy interconnect facilities will be provided in a future supplemental filing.

Previously filed Exhibits G and G-1 have been updated to reflect the operational capabilities and conditions of the Project as amended and are included in Volume III to this Amendment. As demonstrated in these updated exhibits, the Project facilities are now designed to create approximately 250,000 mcf per day of incremental natural gas transportation capacity.

In addition, the estimated incremental fuel use reimbursement percentage continues to be below the current fuel use reimbursement percentage for transportation services in WBI Energy's FERC Gas Tariff, Third Revised Volume No. 1 (Tariff), and supports the use of the current fuel use reimbursement percentage as shown in revised Exhibit Z to this Amendment.

III.
PUBLIC CONVENIENCE AND NECESSITY AND CERTIFICATE POLICY STATEMENT

The Project, as amended, continues to serve the present and future public convenience and necessity as demonstrated in the Application. Furthermore, this Amendment does not change the Application's demonstration of compliance with the Commission's Certificate Policy Statement (Policy Statement).[3]

WBI Energy proposes to provide up to 250,000 mcf per day of incremental firm transportation capacity to meet the transportation needs of Project shippers from natural gas processing plants located on WBI Energy's Line Sections 7, 25 and 30 to a proposed interconnect with Northern Border. Construction of the Project facilities, as amended, represents a $260.5 million capital investment in much-needed pipeline infrastructure that continues to: (i) respond to the market demand for additional firm take-away capacity for increasing levels of associated natural gas production from the Bakken and Three Forks Formations in the Williston Basin, as evidenced by the firm contractual commitments of the Project shippers, which continue to total 243,000 equivalent dekatherms (dkt) per day; (ii) connect associated natural gas production from the Bakken and Three Forks Formations to Midwest markets via a new interconnect with Northern Border; (iii) assist in the reduction of flaring of natural gas in the region to meet established state mandated natural gas capture targets; and (iv) create an additional outlet for the increasing volume of natural gas production in northwest North Dakota which has resulted in increased transportation constraints on WBI Energy's Line Sections 7, 25, and 30 over the past few years.

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[3] *Certification of New Interstate Nat. Gas Pipeline Facilities,* 88 FERC ¶ 61,227 at pp. 61,745-46 (1999).

The COVID-19 pandemic, which has significantly reduced the global demand for oil,[4] in combination with an over supplied global oil market, has led to a substantial decline in the price of oil in recent months.[5] Lower oil prices in turn have had a negative impact on oil and gas producers in North America, including those drilling in the Bakken and Three Forks Formations in the Williston Basin. For example, a substantial number of oil wells in the Williston Basin have been shut in. As of June 26, 2020, there were 5,000 oil wells shut-in with 405,000 barrels per day of shut-in oil production.[6] Additionally, the number of active drilling rigs targeting the Williston Basin has declined precipitously from fifty-five (55) rigs in November 2019[7] to ten rigs as of July 17, 2020.[8]

Natural gas production from the Bakken and Three Forks Formations has been impacted as well. In November 2019, natural gas production from the Williston Basin was at an all-time high of 3.145 billion cubic feet (Bcf) per day and fell to approximately 1.928 Bcf per day in May 2020.[9] In November 2019, approximately 2.591 Bcf per day[10] was captured and processed versus approximately 1.711 Bcf per day captured and processed in May 2020.[11]

In its Application, WBI Energy indicated that it would continue to actively market the Project including discussions and negotiations with additional prospective shippers for the

[4] *Oil Market Report - July 2020*, IEA, https://www.iea.org/reports/oil-market-report-july-2020 (last visited July 16, 2020).
[5] *Short-Term Energy Outlook*, EIA (July 7, 2020) https://www.eia.gov/outlooks/steo/marketreview/crude.php.
[6] Bakken Restart Task Force, ND DEPT. OF MINERAL RES., PRESENTATION (June 26, 2020), https://www.dmr.nd.gov/oilgas/FinalBakken_Restart_Task_Force_Action_Report.pdf.
[7] Lynn Helms, *Director's Cut*, NDIC DEPT. OF MINERAL RES. (Jan. 17, 2020), p. 3, https://www.dmr.nd.gov/oilgas/directorscut/directorscut-2020-01-17.pdf.
[8] Lynn Helms, *Director's Cut*, NDIC DEPT. OF MINERAL RES. (July 17, 2020), p. 1, https://www.dmr.nd.gov/oilgas/directorscut/directorscut-2020-07-17.pdf.
[9] *Id*.
[10] *Supra* note 7.
[11] *Supra* note 8.

remaining unsubscribed capacity. In accordance with the open season, the remaining unsubscribed capacity will be sold on a first-come first-served basis, until the Project is placed into service. As a result of current oil market conditions and the impact of such conditions on natural gas production in the Willison Basin, WBI Energy proposes to reduce the design capacity of the Project from 350,000 Mcf per day to 250,000 Mcf per day. This proposed reduction aligns with current market conditions.

The Project, as amended, continues to comply with the Commission's Policy Statement as set forth below.

1. No Subsidies from Existing Customers

The Project continues to be supported by binding long-term firm transportation commitments by six Project shippers for a total of 243,000 equivalent dkt per day. WBI Energy proposes a revised incremental recourse reservation rate designed to recover the incremental cost of service attributable to the Project based on an updated capital investment of approximately $260.5 million. The commodity rate WBI Energy proposes remains unchanged and is equal to the maximum Rate Schedule FT-1 commodity rate as set forth in WBI Energy's Tariff. Therefore, the Project satisfies the Commission's threshold requirement under the Policy Statement that there is no subsidy from existing customers. Exhibit P of this Amendment details the estimated cost of service for the Project and the calculation of the revised incremental recourse reservation rate.

Also, the reduction in compression associated with this Amendment is not anticipated to have an impact on WBI Energy's fuel use reimbursement percentage for transportation services. WBI Energy has evaluated the potential effect of the additional compression at the Tioga Compression Station (Units 2-4, as amended) and the proposed compression at the Elkhorn Creek Compressor Station on the overall system fuel consumption and has determined that existing shippers will not be subsidizing fuel use attributable to the Project. Based on the analysis in revised Exhibit G provided herein, the estimated incremental fuel use reimbursement percentage is below the current Tariff fuel use reimbursement percentage and supports the use of the current fuel use reimbursement percentage. Exhibit Z, as amended, provides fuel use information. There is no subsidization from WBI Energy's existing shippers; therefore, the Project continues to satisfy the Commission's threshold requirement under the Policy Statement.

2. No Adverse Impacts on Existing Customers and Pipelines

The Project, as amended, will not result in any detriment or degradation of service to WBI Energy's existing customers or any other existing pipeline and its customers. The Project will continue to provide additional take-away capacity for the increasing volume of natural gas production from the Bakken and Three Forks Formations. The Project will not adversely affect WBI Energy's existing customers because it has been designed to provide firm transportation service while maintaining WBI Energy's current obligations. Revised Exhibits G and G-I demonstrate that there will be no adverse operational impact on service provided to WBI Energy's existing customers as a result of the Project. In addition, the Project is not designed to bypass an existing pipeline or to provide service that is already provided by an existing pipeline. Therefore, the Commission need only consider the residual effects on landowners and affected communities.

3. Effects on Affected Landowners and Communities

The Project is designed to minimize impacts on landowners, communities and the environment, and to ensure safety. Although there will be temporary impacts during the construction of the Project and permanent impacts once the Project facilities are placed into service, the environmental mitigation measures set forth in the Environmental Report in Exhibit F-I filed with the Application will minimize those impacts. In addition, the reduction in compression at the Tioga Compressor Station proposed by this Amendment will reduce air and noise emissions resulting in less of an environmental impact as shown in the revised sections of Resource Report 9 and associated appendices filed herein as Exhibit F-1. WBI Energy intends to use the construction workspace and extend the boundary of the station as proposed in the Application. Therefore, no additional landowners will be directly impacted.

Based on these analyses, WBI Energy continues to optimize constructability, minimize environmental impacts, minimize impacts to landowners and communities, and minimize cost of construction. Accordingly, WBI Energy submits that, as amended, the Project's public benefits continue to outweigh any adverse impacts that may result. As such, the Project proposal is consistent with the Commission's Policy Statement.

IV.
COST AND RATE EFFECTS OF THE AMENDMENT

In addition to reflecting the reduction in compression-related costs associated with the reduction in additional compressor units proposed at the Tioga Compressor Station, WBI Energy has refined its estimated cost to purchase pipeline as well as its estimated cost to construct the Elkhorn Creek Compressor Station and WBI Energy interconnect facilities with Northern Border. Pipeline costs are being reduced as a result of a competitive third-party contract bid and softened steel prices. The reduction in costs to construct the Elkhorn Creek Compressor Station include the current cost to acquire station property and actual quotes on auxiliary facilities. Finally, through continued discussions with Northern Border as indicated above, WBI Energy has refined the scope of the facilities it will be constructing to interconnect with Northern Border, resulting in a further reduction in costs. As a result, total Project costs have been reduced to approximately $260.5 million, a reduction of $39 million from the filed level of approximately $300 million. WBI

Energy's updated estimated capital costs reflecting these changes are provided in a revised Exhibit K.

In addition, the reduction in Project costs has resulted in a change to the proposed incremental recourse reservation rate under WBI Energy's existing Rate Schedule FT-1 for firm transportation service. The revised incremental reservation rate is based on an updated estimated first-year cost of service for the Project of approximately $40.5 million and a design capacity of 250,000 equivalent dkt per day. WBI Energy calculated the revised cost of service using the capital structure and rate of return approved in WBI Energy's Docket No. RP00-107-000 rate case proceeding and the depreciation rates approved in WBI Energy's recent rate case settlement in Docket No. RP19-165-000. WBI Energy's revised incremental reservation rate continues to be above its otherwise applicable integrated system rate for comparable service. The derivation of the revised incremental reservation rate is set forth in Exhibit P to this Amendment.

In this Amendment, WBI Energy has re-calculated a Project commodity rate based on updated estimated variable operation and maintenance expense of $608,793 and Project billing determinants of 91,250,000 equivalent dkt (250,000 equivalent dkt per day x 365 days). The resulting Project commodity rate continues to be less than WBI Energy's applicable integrated system commodity rate. Therefore, in accordance with Commission policy, WBI Energy is proposing to charge its applicable integrated system commodity rate under Rate Schedule FT-1 for transportation service on the Project facilities. Updated pro-forma tariff sheets are included in Exhibit P to this Amendment.

V.
STAKEHOLDER AND LANDOWNER OUTREACH

WBI Energy will comply with the landowner notification requirements under Section 157.6(d) of the Commission's regulations by making a good faith effort to notify all affected landowners within one-half mile of the Tioga Compressor Station and the proposed Elkhorn Creek Compressor Station. WBI Energy will also post a notice of the Project changes in the local newspapers near each compressor station. As indicated above, no additional landowners will be directly affected by the changes proposed in this Amendment.

VI.
EXHIBITS

WBI Energy is filing this Amendment pursuant to Section 157.7(a) of the Commission's regulations and, as such, contains only the data and information required to fully disclose the nature and extent of the proposal herein.

Except as noted below, the exhibits filed with the Application are hereby incorporated by reference.

EXHIBIT A — ARTICLES OF INCORPORATION AND BYLAWS
Incorporated herein by reference to Exhibit A, Docket No. CP20-52-000.

EXHIBIT B — STATE AUTHORIZATION
Incorporated herein by reference to Exhibit B, Docket No. CP20-52-000.

EXHIBIT C — COMPANY OFFICIALS
Incorporated herein by reference to Exhibit C, Docket No. CP20-52-000.

EXHIBIT D — SUBSIDIARIES AND AFFILIATION
Incorporated herein by reference to Exhibit D, Docket No. CP20-52-000.

EXHIBIT E — OTHER PENDING APPLICATIONS AND FILINGS
Omitted. None.

EXHIBIT F	LOCATION OF FACILITIES Incorporated herein by reference to Exhibit F, Docket No. CP20-52-000.
EXHIBIT F-I	ENVIRONMENTAL REPORT Submitted herewith. Sections of Resource Report 9 have been updated, along with associated appendices, and included in Volume II.
EXHIBIT G	FLOW DIAGRAMS SHOWING DAILY DESIGN CAPACITY AND REFLECTING OPERATION WITH AND WITHOUT PROPOSED FACILITIES ADDED Submitted herewith. Exhibit G is being submitted as Critical Energy Infrastructure Information (CEII) and included in Volume III. This information is labeled: "CUI//CEII - DO NOT RELEASE."
EXHIBIT G-I	FLOW DIAGRAMS REFLECTING MAXIMUM CAPABILITIES Submitted herewith. Exhibit G-I is being submitted as CEII and included in Volume III. This information is labeled: "CUI//CEII - DO NOT RELEASE."
EXHIBIT G-II	FLOW DIAGRAM DATA Incorporated herein by reference to Exhibit G-II, Docket No. CP20-52-000. WBI Energy does not propose any changes to its previously filed Exhibit G-II.
EXHIBIT H	TOTAL GAS SUPPLY DATA Incorporated herein by reference to Exhibit H, Docket No. CP20-52-000.
EXHIBIT I	MARKET DATA Incorporated herein by reference to Exhibit I, Docket No. CP20-52-000.
EXHIBIT J	FEDERAL AUTHORIZATIONS Incorporated herein by reference to Exhibit J, Docket No. CP20-52-000.
EXHIBIT K	COST OF FACILITIES Submitted herewith.
EXHIBIT L	FINANCING Omitted. WBI Energy plans to finance the Project both during construction and permanently utilizing internally generated funds and/or a combination of debt and equity.
EXHIBIT M	CONSTRUCTION, OPERATION AND MANAGEMENT Incorporated herein by reference to Exhibit M, Docket No. CP20-52-000.
EXHIBIT N	REVENUES-EXPENSES-INCOME

Submitted herewith.

EXHIBIT O — DEPRECIATION AND DEPLETION
Submitted herewith.

EXHIBIT P — TARIFF
Submitted herewith.

EXHIBIT Z — FUEL STUDY
Submitted herewith

FORM OF NOTICE — Submitted herewith.

XIII. REQUESTED AUTHORIZATION AND CONCLUSION

WBI Energy believes the information and data set forth in this Amendment demonstrates that the proposal herein is required by the present and future public convenience and necessity. WBI Energy is willing and able to perform properly the acts described herein and to conform to the provisions of the NGA and the requirements, rules and regulations of the Commission thereunder.

WBI Energy respectfully requests that the Commission:

(a) Grant to WBI Energy, no later than January 2021, a Certificate of Public Convenience and Necessity, pursuant to Section 7(c) of the NGA authorizing the proposed construction, installation, operation and maintenance of the North Bakken Expansion Project, as requested in the Application and this Amendment; and

(b) Grant such other relief or authority as may be deemed necessary and appropriate.

Dated this 28th day of July 2020

Respectfully submitted,
WBI ENERGY TRANSMISSION, INC.

By __/s/ Lori Myerchin__________
Lori Myerchin
Director, Regulatory Affairs and
Transportation Services

STATE OF NORTH DAKOTA)
COUNTY OF BURLEIGH)

I, Lori Myerchin, being first duly sworn, do hereby depose and say that I am the Director, Regulatory Affairs and Transportation Services for WBI Energy Transmission, Inc.; that I have read the foregoing document; that I know the contents thereof; that I am authorized to execute such document; and that all such statements and matters set forth therein are true and correct to the best of my knowledge, information and belief.

Dated this 28th day of July 2020.

By Lori Myerchin
Lori Myerchin
Director, Regulatory Affairs and
Transportation Services

Subscribed and sworn to before me this 28th day of July 2020.

Carmen Fish
Carmen Fish, Notary Public
Burleigh County, North Dakota
My Commission Expires: 1/03/2024

CARMEN FISH
Notary Public
State of North Dakota
My Commission Expires January 3, 2024

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

WBI Energy Transmission, Inc.) Docket No. CP20-52-___

NOTICE OF AMENDMENT TO
ABBREVIATED APPLICATION FOR CERTIFICATE
OF PUBLIC CONVENIENCE AND NECESSITY

(July __, 2020)

Take notice that on July__, 2020, WBI Energy Transmission, Inc. (WBI Energy) filed with the Federal Energy Regulatory Commission (FERC or Commission) an Amendment to its Abbreviated Application for a Certificate of Public Convenience and Necessity filed February 14, 2020 in the above-captioned docket to construct, modify, operate and maintain the North Bakken Expansion Project (Project) pursuant to Section 7(c) of the Natural Gas Act. By this Amendment, WBI Energy, in addition to the authorizations requested in the Application, proposes (i) to reduce the Project's incremental firm transportation design capacity from 350,000 mcf per day to 250,000 mcf per day by reducing the number of additional compressor units at its existing Tioga Compressor Station from six units to three units; (ii) to update Project costs to reflect the reduction in additional compressor units at the Tioga Compressor Station, as well as a reduction in estimated Project costs related to the purchase of pipeline, construction of the proposed Elkhorn Creek Compressor Station, and construction of the WBI Energy interconnect facilities with Northern Border Pipeline Company (Northern Border), and (iii) to update certain appurtenant Project facilities.

Any questions regarding the application should be directed to Lori Myerchin, Director, Regulatory Affairs and Transportation Services, WBI Energy Transmission, Inc., 1250 West Century Avenue, Bismarck, North Dakota 58503; by phone at (701) 530-1563; or by email to lori.myerchin@wbienergy.com.

Any person desiring to intervene or to protest this filing must file in accordance with Rules 211 and 214 of the Commission's Rules of Practice and Procedure (18 CFR 385.211 and 385.214). Protests will be considered by the Commission in determining the appropriate action to be taken but will not serve to make protestants parties to the proceeding. Any person wishing to become a party must file a notice of intervention or motion to intervene, as appropriate. Such notices, motions, or protests must be filed on or before the comment date. Anyone filing a motion to intervene, or protest must serve a copy of that document on the Applicant. On or before the comment date, it is not necessary to serve motions to intervene or protests on persons other than the Applicant.

The Commission encourages electronic submission of comments, protests and interventions in lieu of paper using the "eFiling" link at http://www.ferc.gov. Persons unable to file electronically should submit an original and 5 copies of the protest or intervention to the Federal Energy Regulatory Commission, 888 First Street, N.E., Washington, D.C. 20426.

This filing is accessible on-line at http://www.ferc.gov, using the "eLibrary" link. Enter the docket number excluding the last three digits in the docket number field to access the document. There is an "eSubscription" link on the web site that enables subscribers to receive email notification when a document is added to a subscribed docket(s). For assistance with any FERC Online service, please email FERCOnlineSupport@ferc.gov, or call toll-free, (866) 208-3676 or TTY, call (202) 502-8659. The filing is also available for review in the Commission's Public Reference Room in Washington, D.C.

Comment Date: 5:00 pm Eastern Time on (insert date).

Kimberly D. Bose
Secretary

FERC Docket No. CP20-52-___

EXHIBIT F-1

ENVIRONMENTAL REPORT

Sections of Resource Report 9 have been updated, along with associated appendices, and are included in Volume II. Updated Plot Plans for the Tioga Compressor Station and proposed Elkhorn Creek Compressor Station (Appendix 1E to Resource Report 1) are being submitted as “CUI//CEII – DO NOT RELEASE” under separate cover in Volume III.

WBI ENERGY TRANSMISSION, INC.

FERC Docket No. CP20-52-___

EXHIBIT G

FLOW DIAGRAMS SHOWING DAILY DESIGN CAPACITY
AND REFLECTING OPERATION WITH AND WITHOUT
PROPOSED FACILITIES ADDED

Flow diagram information is being submitted as “CUI//CEII – DO NOT RELEASE”
under separate cover in Volume III.

WBI ENERGY TRANSMISSION, INC.

FERC Docket No. CP20-52-___

EXHIBIT G-I

FLOW DIAGRAMS REFLECTING
MAXIMUM CAPABILITIES

Flow diagram information is being submitted as “CUI//CEII – DO NOT RELEASE”
under separate cover in Volume III.

WBI ENERGY TRANSMISSION, INC.

FERC Docket No. CP20-52-___

EXHIBIT K

COST OF FACILITIES

WBI ENERGY TRANSMISSION, INC.

WBI Energy Transmission, Inc. North Bakken Expansion Project
Exhibit K
Estimated Cost of Facilities

Note: All cost estimates are based on requests for information from various suppliers, actual cost estimates received for the project, and historical experience.

Line No.	Description	Pipeline	Compressor Station	Measurement	Northern Border Interconnect	Total Costs
	(A)	(B)	(C)	(D)	(E)	(F)
		($)	($)	($)	($)	($)
1	Right-of-Way	10,423,299	255,000	224,681	13,810	10,916,790
2	Damages	1,171,150	-	-	-	1,171,150
3	Surveys	2,269,430	16,174	17,140	13,705	2,316,449
4	Materials	42,517,152	25,088,080	3,737,884	61,416	71,404,532
5	Direct Labor	1,896,448	955,890	488,620	58,031	3,398,989
6	Contract Charges	111,396,190	11,426,104	415,022	195,100	123,432,416
7	Engineering & Inspection	4,682,266	893,526	169,971	-	5,745,763
8	Legal & Other Fees	500,000	-	-	-	500,000
9	Administrative Overhead (AO)	544,889	195,180	32,829	76,617	849,515
10	AFUDC	4,243,816	1,816,956	298,884	726,970	7,086,625
11	Contingencies	16,692,110	4,200,000	522,003	983,100	22,397,213
12	Other Direct Costs 1/	828,476	443,561	171,378	9,805,408	11,248,823
13	Total Estimated Cost of Facilities	197,165,226	45,290,471	6,078,412	11,934,156	260,468,265

Footnotes

14 1/ Other Direct Costs related to Northern Border Interconnect includes payment for measurement facilities estimated to be $9,748,000.

WBI Energy Transmission, Inc. North Bakken Expansion Project
Exhibit K
Allowance for Funds Used During Construction (AFUDC) Calculation 1/

Line No.		Yearly	Monthly
1	**AFUDC Debt 2/**	**1.84%**	**0.1533%**
2	**AFUDC Equity 2/**	**3.84%**	**0.3200%**
3	**Debt %**	**38.80%**	**Source: 2019 Year-end Percentage**
4	**Equity %**	**61.20%**	**Source: 2019 Year-end Percentage**
5	**Debt Interest Rate**	**4.45%**	**Source: 2019 Year-end Percentage**
6	**Cost of Equity 2/**	**9.28%**	**Source: 2017-2019 average**

7 **1/ Actuals per Books for July 2019-June 2020.**
8 **2/ AFUDC Debt and Equity % and Cost of Equity include short term paper borrowings in accordance with WBI Energy's Cash Management Agreement with WBI Holdings, Inc.**

Pipeline

	Current Month CapEx (excluding AFUDC)	Current Month Retainage	Total Cum CapEx (excluding AFUDC & Retainage)	Total Cum CapEx & Retainage (excluding AFUDC)	Debt AFUDC	Equity AFUDC	Debt + Equity AFUDC
Jul-19	2,431,097.06	-	2,431,097.06	2,431,097.06	-	-	-
Aug-19	448,247.72	-	2,879,344.78	2,879,344.78	6,177.74	-	6,177.74
Sep-19	306,972.12	-	3,186,316.90	3,186,316.90	7,249.77	-	7,249.77
Oct-19	152,926.48	-	3,339,243.38	3,339,243.38	7,983.93	-	7,983.93
Nov-19	419,989.97	-	3,759,233.35	3,759,233.35	8,350.76	-	8,350.76
Dec-19	692,132.25	-	4,451,365.60	4,451,365.60	3,872.84	16,624.42	20,497.26
Jan-20	292,136.71	-	4,743,502.31	4,743,502.31	6,352.22	13,259.71	19,611.93
Feb-20	411,745.84	-	5,155,248.15	5,155,248.15	6,803.20	14,201.09	21,004.29
Mar-20	460,334.53	-	5,615,582.68	5,615,582.68	7,242.18	15,117.42	22,359.60
Apr-20	975,195.34	-	6,590,778.02	6,590,778.02	8,011.80	21,485.86	29,497.66
May-20	1,205,495.53	-	7,796,273.55	7,796,273.55	8,744.86	19,740.46	28,485.32
Jun-20	669,149.89	-	8,465,423.44	8,465,423.44	10,636.16	24,009.86	34,646.02
Jul-20	3,339,350.00	-	11,804,773.44	11,804,773.44	12,980.32	27,089.36	40,069.67
Aug-20	3,407,250.00	-	15,212,023.44	15,212,023.44	18,100.65	37,775.28	55,875.93
Sep-20	3,151,214.00	-	18,363,237.44	18,363,237.44	23,325.10	48,678.48	72,003.58
Oct-20	4,251,500.00	-	22,614,737.44	22,614,737.44	28,156.96	58,762.36	86,919.32
Nov-20	4,334,961.40	-	26,949,698.84	26,949,698.84	34,675.93	72,367.16	107,043.09
Dec-20	3,706,792.10	-	30,656,490.94	30,656,490.94	41,322.87	86,239.04	127,561.91
Jan-21	1,851,500.00	-	32,507,990.94	32,507,990.94	47,006.62	98,100.77	145,107.39
Feb-21	11,883,300.00	-	44,391,290.94	44,391,290.94	49,845.59	104,025.57	153,871.16
Mar-21	7,997,077.00	-	52,388,367.94	52,388,367.94	68,066.65	142,052.13	210,118.78
Apr-21	6,765,000.00	1,000,000.00	58,153,367.94	59,153,367.94	80,328.83	167,642.78	247,971.61
May-21	11,027,500.00	2,500,000.00	66,680,867.94	69,180,867.94	89,168.50	186,090.78	275,259.27
Jun-21	21,257,500.00	3,300,000.00	84,638,367.94	87,938,367.94	102,244.00	213,378.78	315,622.77
Jul-21	26,862,000.00	5,000,000.00	106,500,367.94	111,500,367.94	129,778.83	270,842.78	400,621.61
Aug-21	25,520,069.30	4,750,000.00	127,270,437.24	132,020,437.24	163,300.56	340,801.18	504,101.74
Sep-21	23,620,445.20	4,400,000.00	146,490,882.44	150,890,882.44	195,148.00	407,265.40	602,413.40
Oct-21	12,309,000.00	2,250,000.00	156,549,882.44	158,799,882.44	224,619.35	468,770.82	693,390.18
Nov-21	10,472,000.00	1,800,000.00	165,221,882.44	167,021,882.44	-	-	-
Dec-21	2,154,638.20	(25,000,000.00)	192,376,520.64	167,376,520.64	-	-	-
Totals	**$ 192,376,520.64**	**$ -**			**$ 1,389,494.23**	**$ 2,854,321.46**	**$ 4,243,815.69**

Construction Start Date *5/1/2021*
Planned In Service *11/1/2021*

Pipeline Costs		Project Cost before AO & AFUDC	Allocated AO	Total Cost w/ AO	Allocated Debt AFUDC	Allocated Equity AFUDC	Total Costs
			$544,889		*1,389,494*	*2,854,321*	
365.2	Right of Way	$10,423,299	$29,523	$10,452,822	$75,285	$154,652	$10,682,759
367	Mains	$181,953,222	$515,366	$182,468,588	$1,314,209	$2,699,669	$186,482,466
		$192,376,521	$544,889	$192,921,410	$1,389,494	$2,854,321	$197,165,226

Compressor Station

	Current Month CapEx (excluding AFUDC)	Current Month Retainage	Total Cum CapEx (excluding AFUDC & Retainage)	Total Cum CapEx & Retainage (excluding AFUDC)	Debt AFUDC	Equity AFUDC	Debt + Equity AFUDC
Jul-19	121,521.52	-	121,521.52	121,521.52	-	-	-
Aug-19	39,483.91	-	161,005.43	161,005.43	290.41	-	290.41
Sep-19	27,486.66	-	188,492.09	188,492.09	384.84	-	384.84
Oct-19	9,247.69	-	197,739.78	197,739.78	450.58	-	450.58
Nov-19	33,001.94	-	230,741.72	230,741.72	472.77	-	472.77
Dec-19	69,657.87	-	300,399.59	300,399.59	250.42	912.72	1,163.14
Jan-20	22,095.36	-	322,494.95	322,494.95	436.74	996.15	1,432.89
Feb-20	53,535.25	-	376,030.20	376,030.20	483.21	1,054.99	1,538.20
Mar-20	25,852.08	-	401,882.28	401,882.28	528.29	1,265.07	1,793.36
Apr-20	25,066.60	-	426,948.88	426,948.88	723.16	1,676.17	2,399.33
May-20	31,680.94	-	458,629.82	458,629.82	678.44	1,504.74	2,183.18
Jun-20	5,285,847.46	-	5,744,477.28	5,744,477.28	769.68	1,575.40	2,345.08
Jul-20	5,204,998.90	-	10,949,476.18	10,949,476.18	8,808.20	18,382.33	27,190.53
Aug-20	943,001.40	-	11,892,477.58	11,892,477.58	16,789.20	35,038.32	51,827.52
Sep-20	1,080,501.40	-	12,972,978.98	12,972,978.98	18,235.13	38,055.93	56,291.06
Oct-20	4,128,556.30	-	17,101,535.28	17,101,535.28	19,891.90	41,513.53	61,405.43
Nov-20	1,601,901.40	-	18,703,436.68	18,703,436.68	26,222.35	54,724.91	80,947.27
Dec-20	2,972,471.70	-	21,675,908.38	21,675,908.38	28,678.60	59,851.00	88,529.60
Jan-21	1,298,000.00	-	22,973,908.38	22,973,908.38	33,236.39	69,362.91	102,599.30
Feb-21	1,383,800.00	-	24,357,708.38	24,357,708.38	35,226.66	73,516.51	108,743.17
Mar-21	2,358,988.50	-	26,716,696.88	26,716,696.88	37,348.49	77,944.67	115,293.15
Apr-21	1,988,558.00	-	28,705,254.88	28,705,254.88	40,965.60	85,493.43	126,459.03
May-21	2,480,117.20	-	31,185,372.08	31,185,372.08	44,014.72	91,856.82	135,871.54
Jun-21	2,397,617.20	-	33,582,989.28	33,582,989.28	47,817.57	99,793.19	147,610.76
Jul-21	2,355,544.40	-	35,938,533.68	35,938,533.68	51,493.92	107,465.57	158,959.48
Aug-21	2,134,999.90	-	38,073,533.58	38,073,533.58	55,105.75	115,003.31	170,109.06
Sep-21	2,162,499.90	-	40,236,033.48	40,236,033.48	58,379.42	121,835.31	180,214.73
Oct-21	2,180,038.30	-	42,416,071.78	42,416,071.78	61,695.25	128,755.31	190,450.56
Nov-21	794,833.60	-	43,210,905.38	43,210,905.38	-	-	-
Dec-21	67,430.00	-	43,278,335.38	43,278,335.38	-	-	-
Totals	**$ 43,278,335.38**	**$0.00**			**$589,377.70**	**$1,227,578.27**	**$ 1,816,955.97**

Construction Start Date *3/1/2021*
Planned In Service *11/1/2021*

Compressor Station Costs		Project Cost before AO & AFUDC	Allocated AO	Total Cost w/ AO	Allocated Debt AFUDC	Allocated Equity AFUDC	Total Costs
			$195,180		*589,378*	*1,227,578*	
365.2	Right of Way	$255,000	$1,150	$256,150	$3,473	$7,233	$266,856
368.1	Comp Station Equip	$43,023,335	$194,030	$43,217,365	$585,905	$1,220,345	$45,023,615
		$43,278,335	$195,180	$43,473,515	$589,378	$1,227,578	$45,290,471

Measurement

	Current Month CapEx (excluding AFUDC)	Current Month Retainage	Total Cum CapEx (excluding AFUDC & Retainage)	Total Cum CapEx & Retainage (excluding AFUDC)	Debt AFUDC	Equity AFUDC	Debt + Equity AFUDC
Jul-19	(65.83)	-	(65.83)	(65.83)	-	-	-
Aug-19	1,000.50	-	934.67	934.67	7.19	-	7.19
Sep-19	2,261.92	-	3,196.59	3,196.59	9.58	-	9.58
Oct-19	916.75	-	4,113.34	4,113.34	14.99	-	14.99
Nov-19	(78.80)	-	4,034.54	4,034.54	17.19	-	17.19
Dec-19	619.81	-	4,654.35	4,654.35	7.71	28.00	35.71
Jan-20	1,142.13	-	5,796.48	5,796.48	11.93	24.91	36.84
Feb-20	1,767.50	-	7,563.98	7,563.98	13.69	28.59	42.28
Mar-20	(462.02)	-	7,101.96	7,101.96	16.42	34.29	50.71
Apr-20	4,408.10	-	11,510.06	11,510.06	16.65	44.70	61.35
May-20	4,771.04	-	16,281.10	16,281.10	22.88	51.65	74.53
Jun-20	5,377.36	-	21,658.46	21,658.46	32.43	66.50	98.93
Jul-20	420,803.50	-	442,461.96	442,461.96	33.21	69.31	102.52
Aug-20	1,020,862.50	-	1,463,324.46	1,463,324.46	678.44	1,415.88	2,094.32
Sep-20	1,202,162.50	-	2,665,486.96	2,665,486.96	2,243.76	4,682.64	6,926.40
Oct-20	1,148,262.50	-	3,813,749.46	3,813,749.46	4,087.08	8,529.56	12,616.64
Nov-20	263,049.60	-	4,076,799.06	4,076,799.06	5,847.75	12,204.00	18,051.75
Dec-20	167,585.00	-	4,244,384.06	4,244,384.06	6,251.09	13,045.76	19,296.85
Jan-21	86,185.00	-	4,330,569.06	4,330,569.06	6,508.06	13,582.03	20,090.08
Feb-21	50,435.00	-	4,381,004.06	4,381,004.06	6,640.21	13,857.82	20,498.03
Mar-21	147,400.00	-	4,528,404.06	4,528,404.06	6,717.54	14,019.21	20,736.75
Apr-21	336,787.00	-	4,865,191.06	4,865,191.06	6,943.55	14,490.89	21,434.45
May-21	506,000.00	-	5,371,191.06	5,371,191.06	7,459.96	15,568.61	23,028.57
Jun-21	297,537.90	-	5,668,728.96	5,668,728.96	8,235.83	17,187.81	25,423.64
Jul-21	34,454.20	-	5,703,183.16	5,703,183.16	8,692.05	18,139.93	26,831.98
Aug-21	23,531.20	-	5,726,714.36	5,726,714.36	8,744.88	18,250.19	26,995.07
Sep-21	19,984.80	-	5,746,699.16	5,746,699.16	8,780.96	18,325.49	27,106.45
Oct-21	-	-	5,746,699.16	5,746,699.16	8,811.61	18,389.44	27,201.04
Nov-21	-	-	5,746,699.16	5,746,699.16	-	-	-
Dec-21	-	-	5,746,699.16	5,746,699.16	-	-	-
Totals	**$ 5,746,699.16**	**$0.00**			**$96,846.64**	**$202,037.20**	**$ 298,883.83**

Construction Start Date *3/1/2021*
Planned In Service *11/1/2021*

		Project Cost before AO & AFUDC	Allocated AO	Total Cost w/ AO	Allocated Debt AFUDC	Allocated Equity AFUDC	Total Costs
			$32,829		*96,847*	*202,037*	
365.2	Right of Way	$224,681	$1,284	$225,965	$3,786	$7,899	$237,650
369	Measuring Equip	$5,522,018	$31,545	$5,553,563	$93,060	$194,138	$5,840,762
		$5,746,699	$32,829	$5,779,528	$96,847	$202,037	$6,078,412

	Measurement and Interconnect at Northern Border						
	Current Month CapEx (excluding AFUDC)	Current Month Retainage	Total Cum CapEx (excluding AFUDC & Retainage)	Total Cum CapEx & Retainage (excluding AFUDC)	Debt AFUDC	Equity AFUDC	Debt + Equity AFUDC
Jul-19	-	-	-	-	-	-	-
Aug-19	-	-	-	-	-	-	-
Sep-19	-	-	-	-	-	-	-
Oct-19	-	-	-	-	-	-	-
Nov-19	576.52	-	576.52	576.52	-	-	-
Dec-19	132.04	-	708.56	708.56	1.19	0.59	1.78
Jan-20	1,142.19	-	1,850.75	1,850.75	1.10	2.29	3.39
Feb-20	1,266.64	-	3,117.39	3,117.39	2.86	5.97	8.83
Mar-20	2,568.77	-	5,686.16	5,686.16	4.82	10.05	14.87
Apr-20	2,543.76	-	8,229.92	8,229.92	9.05	21.97	31.02
May-20	5,429.66	-	13,659.58	13,659.58	12.92	29.15	42.07
Jun-20	18,092.46	-	31,752.04	31,752.04	21.43	48.38	69.81
Jul-20	346,557.00	-	378,309.04	378,309.04	48.69	101.61	150.29
Aug-20	10,474,200.00	-	10,852,509.04	10,852,509.04	580.07	1,210.59	1,790.66
Sep-20	5,863.00	-	10,858,372.04	10,858,372.04	16,640.51	34,728.03	51,368.54
Oct-20	6,049.00	-	10,864,421.04	10,864,421.04	16,649.50	34,746.79	51,396.29
Nov-20	3,143.00	-	10,867,564.04	10,867,564.04	16,658.78	34,766.15	51,424.93
Dec-20	3,143.00	-	10,870,707.04	10,870,707.04	16,663.60	34,776.20	51,439.80
Jan-21	3,300.00	-	10,874,007.04	10,874,007.04	16,668.42	34,786.26	51,454.68
Feb-21	3,300.00	-	10,877,307.04	10,877,307.04	16,673.48	34,796.82	51,470.30
Mar-21	3,300.00	-	10,880,607.04	10,880,607.04	16,678.54	34,807.38	51,485.92
Apr-21	4,364.00	-	10,884,971.04	10,884,971.04	16,683.60	34,817.94	51,501.54
May-21	51,700.00	-	10,936,671.04	10,936,671.04	16,690.29	34,831.91	51,522.20
Jun-21	125,400.00	-	11,062,071.04	11,062,071.04	16,769.56	34,997.35	51,766.91
Jul-21	30,360.00	-	11,092,431.04	11,092,431.04	16,961.84	35,398.63	52,360.47
Aug-21	6,239.00	-	11,098,670.04	11,098,670.04	17,008.39	35,495.78	52,504.17
Sep-21	19,800.00	-	11,118,470.04	11,118,470.04	17,017.96	35,515.74	52,533.70
Oct-21	12,100.00	-	11,130,570.04	11,130,570.04	17,048.32	35,579.10	52,627.42
Nov-21	-	-	11,130,570.04	11,130,570.04	-	-	-
Dec-21	-	-	11,130,570.04	11,130,570.04	-	-	-
Totals	**$11,130,570.04**	**$0.00**			**$235,494.92**	**$491,474.69**	**$726,969.61**

Construction Start Date *4/1/2021*
Planned In Service *11/1/2021*

		Project Cost before AO & AFUDC	Allocated AO	Total Cost w/ AO	Allocated Debt AFUDC	Allocated Equity AFUDC	Total Costs
			$76,617		*235,495*	*491,475*	
365.2	Right of Way	$13,810	$95	$13,905	$292	$610	$14,807
369	Measuring Equip	$1,368,760	$9,422	$1,378,181	$28,960	$60,438	$1,467,579
303	Northern Border Interconnect	$9,748,000	$67,100	$9,815,100	$206,243	$430,427	$10,451,770
		$11,130,570	$76,617	$11,207,187	$235,495	$491,475	$11,934,156

Summary - All Categories for North Bakken Expansion Project

SUMMARY		Project Cost before AO & AFUDC	Allocated AO	Total Cost w/ AO	Allocated Debt AFUDC	Allocated Equity AFUDC	Total Costs
365.2	Right of Way	$10,916,790	$32,052	$10,948,842	$82,837	$170,394	$11,202,072
368.1	Comp Station Equip	$43,023,335	$194,030	$43,217,365	$585,905	$1,220,345	$45,023,615
367	Mains	$181,953,222	$515,366	$182,468,588	$1,314,209	$2,699,669	$186,482,466
369	Measuring Equip	$6,890,778	$40,967	$6,931,745	$122,020	$254,576	$7,308,341
303	Northern Border Interconnect	$9,748,000	$67,100	$9,815,100	$206,243	$430,427	$10,451,770
		$252,532,125	$849,515	$253,381,640	$2,311,213	$4,775,412	$260,468,265

FERC Docket No. CP20-52-000___

EXHIBIT N

REVENUES-EXPENSES-INCOME

WBI ENERGY TRANSMISSION, INC.

WBI Energy Transmission, Inc. North Bakken Expansion Project
Exhibit N
Schedule 1 - Pro-Forma Income Statement
First Three Years of Operation

Line No.	Description	Year of Facility In-Service Year 1	 Year 2	 Year 3
	(A)	(B) ($)	(C) ($)	(D) ($)
1	Operating Revenue 1/	28,996,253	28,996,253	28,996,253
2	Operating Expense			
3	Operation & Maintenance Expense 2/	1,032,446	1,063,419	1,095,322
4	Depreciation 3/	6,247,389	6,247,389	6,247,389
5	Taxes Other Than Income	672,008	672,008	672,008
6	Total Operating Expense	7,951,843	7,982,816	8,014,719
7	Operating Income	21,044,410	21,013,437	20,981,534
8	Interest Expense	4,497,245	4,497,245	4,497,245
9	Income before Income Taxes	16,547,165	16,516,192	16,484,289
10	Less Income Taxes	4,219,527	4,211,629	4,203,494
11	Net Income	12,327,638	12,304,563	12,280,795

Footnotes

12 1/ See Exhibit N, Schedule 2.

13 2/ Total Operation and Maintenance Expense as reflected in Exhibit P, Schedule 1, escalated at 3.0% per year.

14 3/ See Exhibit O.

WBI Energy Transmission, Inc. North Bakken Expansion Project
Exhibit N
Schedule 2 - Derivation of Revenues
First Three Years of Operation

Line No.	Description	Year of Facility In-Service Year 1	Year 2	Year 3
	(A)	(B) ($)	(C) ($)	(D) ($)
1	Rate Schedule FT-1 Revenue			
2	Reservation (250,000 x $13.48985 x 12) 1/	40,469,550	40,469,550	40,469,550
3	Reservation (243,000 x various x 12) 2/	28,996,253	28,996,253	28,996,253

Footnotes
4 1/ Design volume at the North Bakken Expansion Project incremental recourse rate.
5 2/ Contractual volume at rates in accordance with the Precedent Agreements.

FERC Docket No. CP20-52-___

EXHIBIT O

DEPRECIATION AND DEPLETION

WBI ENERGY TRANSMISSION, INC.

WBI Energy Transmission, Inc. North Bakken Expansion Project
Exhibit O
Depreciation

Line No.	Description	Depreciation Rates 1/	Plant Balances 2/	Annual Depreciation Expense
	(A)	(B)	(C)	(D)
			($)	($)
1	Plant In Service			
2	Miscellaneous Intangible Plant (proposed Amortization)	3.32%	10,451,770	346,999
3	Transmission Plant			
4	Right of Way	2.15%	11,202,072	240,845
5	Mains	2.15%	186,482,466	4,009,373
6	Compressor Station Equipment	2.15%	45,023,615	968,008
7	Measuring & Regulation Station Equipment	2.15%	7,308,341	157,129
8	Net Salvage (Line C9 less Line C2 x Line B8)	0.21%		525,035
9	Total Transmission Plant		260,468,265	6,247,389

Footnotes

10 1/ Depreciation rates approved in WBI Energy Transmission, Inc.'s rate case settlement in Docket No. RP19-165-000.

11 2/ See Exhibit K.

FERC Docket No. CP20-52-___

EXHIBIT P

TARIFF

WBI ENERGY TRANSMISSION, INC.

WBI Energy Transmission, Inc. North Bakken Expansion Project
Exhibit P
Schedule 1 - Estimated Rate Base and Cost of Service

Line No.	Description (A)	Year 1 Costs (B) ($)	Year 2 Costs (C) ($)	Year 3 Costs (D) ($)
1	Rate Base			
2	Gas Plant in Service 1/	260,468,265	260,468,265	260,468,265
3	Less: Reserve for Depreciation	6,247,389	12,494,778	18,742,167
4	Net Plant	254,220,876	247,973,487	241,726,098
5	Deferred Income Taxes 2/	(1,560,438)	(6,089,194)	(10,022,811)
6	Rate Base	252,660,438	241,884,293	231,703,287
7	Cost of Service			
8	Return on Rate Base at 10.52% 3/	26,579,878	25,446,228	24,375,186
9	Income Taxes 2/	6,546,618	6,267,401	6,003,603
10	Operation and Maintenance Expense 4/	423,653	436,363	449,453
11	Depreciation Expense 5/	6,247,389	6,247,389	6,247,389
12	Ad Valorem Taxes 2/	672,008	672,008	672,008
13	Total Cost of Service	40,469,546	39,069,389	37,747,640

14 Operation and Maintenance Expense by FERC Account and Labor and Non-Labor Costs (Year 1):

Line No.	Acct	Description	Labor	Material & Other	Total
16	856	Mains Expenses	49,837	46,004	95,841
17	853	Compressor Station Labor & Expenses	169,619	315,006 *	484,625
18	864	Maint. of Compressor Station Equipment	158,193	293,787 *	451,980
19		Total Operation and Maintenance Expense	377,649	654,797	1,032,446

*Amounts classified as variable expense = $608,793

Footnotes

20 1/ See Exhibit K.
21 2/ See Exhibit P, Schedule 3.
22 3/ See Exhibit P, Schedule 4 for Rate of Return calculation.
23 4/ Reflects fixed Operation and Maintenance Expense escalated at 3.0% per year.
24 5/ See Exhibit O.

WBI Energy Transmission, Inc. North Bakken Expansion Project
Exhibit P
Schedule 2 - Rates

Line No.	Description (A)	Year 1 Costs (B) ($)
1	Total Cost of Service 1/	40,469,546
2	Rate Schedule FT-1 Volume (equivalent dkt/day)	250,000
3	Rate Schedule FT-1 Reservation Charge (Maximum) ((Line 1 divided by Line 2) divided by 12 months))	13.48985
4	Rate Schedule FT-1 Commodity Charge 2/	0.02477
5	Rate Schedule FT-1 Scheduled Overrun Charge (Maximum) 2/	0.34367
6	Rate Schedule FT-1 Volumetric Capacity Release Charge (Maximum) ((Line 3 multiplied by 12 months divided by 365 days))	0.44350

Footnotes

7 1/ See Exhibit P, Schedule 1.

8 2/ WBI Energy Transmission Inc.'s currently effective integrated system charge.

WBI Energy Transmission, Inc. North Bakken Expansion Project
Exhibit P
Schedule 3 - Effective Income Tax Rate, Deferred Income Taxes and Ad Valorem Taxes

Line No.	Description		Year 1 Costs	Year 2 Costs	Year 3 Costs
	(A)	(B)	(C)	(D)	(E)
			($)	($)	($)
1	Effective Income Tax Rate				
2	Federal Income Tax Rate	21.00%			
3	Effective State Income Tax Rate	4.50%			
4	Total Effective Income Tax Rate	25.50%			
5	Weighted Long Term Debt Cost 1/	2.95%			
6	Total Weighted Cost of Capital 1/	10.52%			
7	Net Rate Base 2/		252,660,438	241,884,293	231,703,287
8	Interest Expense (Line 5 x Line 7)		7,453,483	7,135,587	6,835,247
9	Income Tax Expense				
10	Return on Rate Base (Line 6 x Line 7)		26,579,878	25,446,228	24,375,186
11	Less Interest Expense (Line 8)		7,453,483	7,135,587	6,835,247
12	Taxable Return on Rate Base		19,126,395	18,310,641	17,539,939
13	Revenue to Recover Interest and Taxes (Line 12 divided by (1-Line 4))	74.50%	25,673,013	24,578,042	23,543,542
14	Income Tax Expense (Line 4 x Line 13)		6,546,618	6,267,401	6,003,603
15	Tax Depreciation				
16	Transmission Plant Addition (Personal Property Plant) 3/		$245,671,510	245,671,510	245,671,510
17	Tax Depreciation Rate (15 year MACRS) 4/		5.00%	9.50%	8.55%
18	Tax Depreciation on Personal Property		12,283,575	23,338,793	21,004,914
19	Intangible Plant Addition (Real Property Plant) 3/		10,021,343	10,021,343	10,021,343
20	Tax Depreciation Rate (15 year Straight Line) 4/		0.83%	6.67%	6.67%
21	Tax Depreciation on Real Property		83,177	668,424	668,424
22	Total Tax Depreciation Personal & Real Property		12,366,752	24,007,217	21,673,338
23	Deferred Income Tax				
24	Total Book Depreciation 3/		6,247,389	6,247,389	6,247,389
25	Excess Book (Tax) Depreciation		(6,119,363)	(17,759,828)	(15,425,949)
26	Deferred Income Tax at Effective Tax Rate (Line 25 x Line 4)		(1,560,438)	(4,528,756)	(3,933,617)
27	Deferred Income Tax		(1,560,438)	(6,089,194)	(10,022,811)
28	Ad Valorem Taxes				
29	North Dakota 5/		672,008	672,008	672,008
30	Total Ad Valorem Taxes		672,008	672,008	672,008

Footnotes
31 1/ See Exhibit P, Schedule 4.
32 2/ See Exhibit P, Schedule 1.
33 3/ See Exhibit O. For purposes of Tax Depreciation, plant additions exclude AFUDC Equity.
34 4/ In accordance with applicable Internal Revenue Service income tax tables.
35 5/ Based on estimated plant additions and latest available assessment ratios and property tax rates for North Dakota.

WBI Energy Transmission, Inc. North Bakken Expansion Project
Exhibit P
Schedule 4 - Capital Structure and Rate of Return 1/

Line No.	Description	Percentage of Capital	Cost	Weighted Cost of Capital
	(A)	(B)	(C)	(D)
1	Long Term Debt	38.70%	7.63%	2.95%
2	Common Equity	58.98%	12.48%	7.36%
3	Preferred	2.32%	8.80%	0.20%
4	Total Capitalization	100.00%		10.52%

Footnotes
1/ Capital structure and rate of return approved in WBI Energy Transmission, Inc.'s Docket No. RP00-107-000 rate case proceeding.

NOTICE OF CURRENTLY EFFECTIVE RATES

(ALL RATES ARE STATED IN CENTS PER DEKATHERM OR EQUIVALENT DEKATHERM AS INDICATED)

RATE SCHEDULE	UNIT	BASE TARIFF RATE	TOP THROUGHPUT SURCHARGE	GAS SUPPLY REALIGNMENT SURCHARGE	BASE TARIFF RATE PLUS SURCHARGES
RATE SCHEDULE FT-1 (NORTH BAKKEN EXPANSION) A/B					
RESERVATION CHARGE					
MAXIMUM DAILY DELIVERY QUANTITY (MDDQ)					
MAXIMUM	RATE PER EQV. DKT PER MO.	1348.985	N.A.	N.A.	1348.985
MINIMUM	RATE PER EQV. DKT PER MO.	0.000	N.A.	N.A.	0.000
COMMODITY CHARGE					
MAXIMUM C/D/E/	RATE PER DKT	2.477	N.A.	N.A.	2.477
MINIMUM C/D/E/	RATE PER DKT	2.477	N.A.	N.A.	2.477
SCHEDULED OVERRUN CHARGE					
MAXIMUM C/D/E/	RATE PER DKT	34.367	N.A.	N.A.	34.367
MINIMUM C/D/E/	RATE PER DKT	2.477	N.A.	N.A.	2.477
VOLUMETRIC CAPACITY RELEASE CHARGE					
MAXIMUM	RATE PER DKT	44.350	N.A.	N.A.	44.350
MINIMUM	RATE PER DKT	0.000	N.A.	N.A.	0.000

A/ APPLICABLE ONLY FOR INCREMENTAL CAPACITY CERTIFICATED IN DOCKET NO. CP20- -000.
B/ REFER TO RATE SCHEDULE FT-1 FIRM TRANSPORTATION SERVICE FOR ALL TERMS AND CONDITIONS OF SERVICE.
C/ SHIPPER MUST REIMBURSE TRANSPORTER IN-KIND FOR TRANSPORTATION FUEL USE AND LOST AND UNACCOUNTED FOR GAS. THE APPLICABLE PERCENTAGES ARE REFLECTED ON SHEET NO. 21A. THESE PERCENTAGES SHALL BE APPLIED TO THE APPLICABLE QUANTITIES OF GAS TENDERED TO TRANSPORTER FOR SHIPPER'S ACCOUNT AT THE RECEIPT POINT(S) INTO TRANSPORTER'S TRANSMISSION FACILITIES.
D/ SHIPPER MUST REIMBURSE TRANSPORTER FOR ELECTRIC POWER USED FOR TRANSPORTATION. THE APPLICABLE RATE IS REFLECTED ON SHEET NO. 21B. THIS RATE SHALL BE APPLIED TO THE APPLICABLE QUANTITIES OF GAS TENDERED TO TRANSPORTER FOR SHIPPER'S ACCOUNT AT THE RECEIPT POINT(S) INTO TRANSPORTER'S TRANSMISSION FACILITIES.
E/ SHIPPER MUST REIMBURSE TRANSPORTER FOR THE ACA SURCHARGE. SUCH SURCHARGE SHALL BE THE ACA UNIT CHARGE SPECIFIED IN THE ANNUAL NOTICE ISSUED BY THE FERC ENTITLED "FY [YEAR] GAS ANNUAL CHARGES CORRECTION FOR ANNUAL CHARGES UNIT CHARGE."

NOTICE OF CURRENTLY EFFECTIVE RATES

(ALL RATES ARE STATED IN CENTS PER DEKATHERM OR EQUIVALENT DEKATHERM AS INDICATED)

RATE SCHEDULE	UNIT	BASE TARIFF RATE	TOP THROUGHPUT SURCHARGE	GAS SUPPLY REALIGNMENT SURCHARGE	BASE TARIFF RATE PLUS SURCHARGES
RATE SCHEDULE FT-1 (NORTH BAKKEN EXPANSION) A/B					
RESERVATION CHARGE					
MAXIMUM DAILY DELIVERY QUANTITY (MDDQ)					
MAXIMUM	RATE PER EQV. DKT PER MO.	1348.985	N.A.	N.A.	1348.985
MINIMUM	RATE PER EQV. DKT PER MO.	0.000	N.A.	N.A.	0.000
COMMODITY CHARGE					
MAXIMUM C/D/E/	RATE PER DKT	2.477	N.A.	N.A.	2.477
MINIMUM C/D/E/	RATE PER DKT	2.477	N.A.	N.A.	2.477
SCHEDULED OVERRUN CHARGE					
MAXIMUM C/D/E/	RATE PER DKT	34.367	N.A.	N.A.	34.367
MINIMUM C/D/E/	RATE PER DKT	2.477	N.A.	N.A.	2.477
VOLUMETRIC CAPACITY RELEASE CHARGE					
MAXIMUM	RATE PER DKT	44.350	N.A.	N.A.	44.350
MINIMUM	RATE PER DKT	0.000	N.A.	N.A.	0.000

A/ APPLICABLE ONLY FOR INCREMENTAL CAPACITY CERTIFICATED IN DOCKET NO. CP20- -000.

B/ REFER TO RATE SCHEDULE FT-1 FIRM TRANSPORTATION SERVICE FOR ALL TERMS AND CONDITIONS OF SERVICE.

C/ SHIPPER MUST REIMBURSE TRANSPORTER IN-KIND FOR TRANSPORTATION FUEL USE AND LOST AND UNACCOUNTED FOR GAS. THE APPLICABLE PERCENTAGES ARE REFLECTED ON SHEET NO. 21A. THESE PERCENTAGES SHALL BE APPLIED TO THE APPLICABLE QUANTITIES OF GAS TENDERED TO TRANSPORTER FOR SHIPPER'S ACCOUNT AT THE RECEIPT POINT(S) INTO TRANSPORTER'S TRANSMISSION FACILITIES.

D/ SHIPPER MUST REIMBURSE TRANSPORTER FOR ELECTRIC POWER USED FOR TRANSPORTATION. THE APPLICABLE RATE IS REFLECTED ON SHEET NO. 21B. THIS RATE SHALL BE APPLIED TO THE APPLICABLE QUANTITIES OF GAS TENDERED TO TRANSPORTER FOR SHIPPER'S ACCOUNT AT THE RECEIPT POINT(S) INTO TRANSPORTER'S TRANSMISSION FACILITIES.

E/ SHIPPER MUST REIMBURSE TRANSPORTER FOR THE ACA SURCHARGE. SUCH SURCHARGE SHALL BE THE ACA UNIT CHARGE SPECIFIED IN THE ANNUAL NOTICE ISSUED BY THE FERC ENTITLED "FY [YEAR] GAS ANNUAL CHARGES CORRECTION FOR ANNUAL CHARGES UNIT CHARGE."

FERC Docket No. CP20-52-___

EXHIBIT Z

FUEL STUDY

WBI ENERGY TRANSMISSION, INC.

WBI Energy Transmission, Inc. North Bakken Expansion Project
Exhibit Z
Projected Fuel Use

Line No.	Description	Elkhorn Creek Compressor Station		Tioga Compressor Station		North Bakken Expansion Project Total	
	(A)	(B)		(C)		(D)	
1	Installed Horsepower 1/	3,750	hp	11,250	hp	15,000	hp
2	North Bakken Expansion Project Capacity					250,000	Mcf/d
3	Assumed Load Factor	90%		90%			
4	Estimated Fuel Use					2,417	Mcf/d
5	North Bakken Expansion Project Fuel Use Percentage 2/					1.074%	
6	Current Fuel Use Percentage 3/					1.381%	

Footnotes

7 1/ See Amendment to Application for proposed horsepower for each station.

8 2/ (Line 4 x 365)/(Line 2 x Line 3 x 365).

9 3/ Company Fuel Use for transportation service is a combined Fuel Use Current Percentage of 1.419% and a Fuel Use Deferral Percentage of (0.038%). See Appendix A, Attachment B, Page 3, Line 10 of WBI Energy Transmission, Inc.'s Annual Fuel & Electric Power Reimbursement Adjustment Filing submitted in Docket No. RP20-602-000.

Volume II

NORTH BAKKEN EXPANSION PROJECT

Docket No. CP20-52-000

Updated Sections to Resource Report 9

& Updated Associated Appendices

Exhibit F-I

July 2020

WBI Energy Transmission, Inc.
North Bakken Expansion Project
Docket No. CP20-52-000

Amendment Filing – Updates to Resource Report 9

The following sections of Resource Report 9 (filed on February 14, 2020) have been updated to reflect the reduction in additional compression to be installed at WBI Energy's existing Tioga Compressor Station and minor auxiliary facility modifications at the Tioga Compressor Station and the proposed Elkhorn Creek Compressor Station. The corresponding sections of the Applicant Prepared Draft Environmental Assessment are also listed. Replacement text for these sections is provided below, along with updated copies of applicable appendices. The updated permit to construct application for the Tioga Compressor station was submitted to the North Dakota Department of Environmental Quality on July 3, 2020. The Elkhorn Creek Compressor Station's permit to construct application did not require revising and is not included as part of this amendment filing. However, a copy of the issued permit from the North Dakota Department of Environmental Quality is provided in appendix 9B.

Resource Report 9 Section	**Applicant Prepared Draft Environmental Assessment Section**
9.1.3.1 – New Source Performance Standards	B.8.1 – New Source Performance Standards
9.1.3.1 – Title V Operating Permits	B.8.1 – Title V Permitting
9.1.3.2 – State Regulations	B.8.1 – State Regulations
9.1.4.2 – Operational Emissions	B.8.1 – General Impacts and Mitigation - Operations
9.2.5.1 – Operational Noise Tioga Compressor Station	B.8.2 –General Impacts and Mitigation – Operation – Tioga Compressor Station
9.2.5.2 – Operational Noise Elkhorn Creek Compressor Station	B.8.2 –General Impacts and Mitigation – Operation – Elkhorn Creek Compressor Station
Appendix 9B – Air Permit to Construct Application for Tioga Compressor Station and Issued Permit to Construct for Elkhorn Creek Compressor Station	N/A
Appendix 9E – Air Dispersion Modeling Report for Tioga Compressor Station	N/A
Appendix 9F – Pre-Construction Noise Survey and Acoustical Analysis Report	Appendix K - Pre-Construction Noise Survey and Acoustical Analysis Report

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 three 3,750 horsepower (hp) spark ignition internal combustion engines to drive compressors and one 840 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.

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 not cause the compressor station to exceed the major source threshold for criteria pollutants; therefore, the modifications will not require 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.

9.1.3.2 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 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.

[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.

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 42 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 42 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

The Tioga Compressor Station expansion and the proposed Elkhorn Creek Compressor Station will both require a permit to construct from the Department. Both compressor stations 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 existing 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 fall below Title V permitting thresholds because of the use of oxidation catalysts to lower potential emissions from the engines, and will be classified as a synthetic minor source by NDDEQ. The Tioga Compressor Station permit to construct application for the expansion is in appendix 9B.

A draft permit to construct (PTC20015) was issued by NDDEQ for the Elkhorn Creek Compressor Station on March 27, 2020. Minor changes in design, since the February submittal of the air permit to construct application for the Elkhorn Creek Compressor Station, were determined by the NDDEQ to not require an update to the issued permit to construct per Subdivision 33.1-15-14-02.13.n of the North Dakota Air Pollution Control Rules. The Department's review of the changes was summarized in a May 29, 2020 email from Mr. Craig Thorstenson, the Manager of the Permitting Program at NDDEQ. Since the design changes were limited to adding a small pre-heater and changing the water heater to one with a lower rated capacity, the facility-wide emissions were shown to decrease. A permit to operate will be required, and that permit will reflect the minor design changes. The Elkhorn Creek Compressor Station fell below Title V permitting thresholds because of the use of oxidation catalysts to lower potential emissions from the compressor engine. The Elkhorn Creek Compressor Station will be classified as a synthetic minor source by NDDEQ.

WBI Energy will apply for the operating permits after construction of the Project is complete. WBI Energy filed the permit to construct applications for both of the compressor stations in February 2020. Changes to the Tioga Compressor Station and a request for a nearby source to be included as part of the air dispersion modeling analysis required a new permit application to be prepared and submitted to the Department for the Tioga Compressor Station. The new permit to construct application for the Tioga Compressor Station is provided in appendix 9B along with a copy of the NDDEQ issued PTC for Elkhorn Creek Compressor Station.

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, formaldehyde (CH_2O), and acrolein. The oxidation catalyst will also reduce other volatile HAPs, but the potential emissions for the Tioga Compressor Station are not based on receiving any reduction credit for any HAPs other than formaldehyde and acrolein. At the Elkhorn Creek Compressor Station, reduction credit was only taken for formaldehyde and not acrolein.

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.
- Potential emissions of NO_X, CO, and VOCs for the engine generator at the Tioga Compressor Station are based on NSPS Subpart JJJJ limitations.
- Potential emissions for the three compressor engines at the Tioga Compressor Station:
    i. The NO_x emission rate is based on engine specification and the application of a factor of safety to raise from 0.30 grams per brake horsepower to 0.5 grams per brake horsepower.
    ii. The controlled emission factor for CO, VOC, CH_2O, and acrolein are based on reduction by the catalyst.
    iii. All emission rates based on AP-42 emission factors for an uncontrolled 4-stroke lean burn engines.
- Potential emissions of NO_X, CO, and VOCs for the compressor engine at Elkhorn Creek Compressor Station are based on NSPS Subpart JJJJ limitations.
- Emissions of CH_2O from the compressor engine at the Elkhorn Creek Compressor Station are based on manufacturer information for the oxidation catalyst. The remaining HAPs are based on AP-42 emission factors. for an uncontrolled 4-stroke lean burn engines.
- 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. Table 9.1.4-6 summarizes the operational emissions from sources outside of the compressor stations. These emissions have not changed from the February 14, 2020 filing. The detailed emission calculations for sources outside of a compressor station and not requiring air permits are not included with this amendment filing.

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 19191 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. A new air dispersion modeling summary report, reflecting the changes since the February 14, 2020 filing, is included in appendix 9E. Results of the modeling analysis which have been updated for the Tioga Compressor Station 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 existing 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:

- three Caterpillar 3612 natural gas-fired engines (3,750 hp each) coupled to a KBZ-4 compressor unit;
- one Waukesha natural gas-fired engine (840 hp) with a 592-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]	18.11	18.11	18.11	1.11/1.11	0.07	13,021	1.45	3.61
Caterpillar 3612	18.11	18.11	18.11	1.11/1.11	0.07	13,021	1.45	3.61
Caterpillar 3612	18.11	18.11	18.11	1.11/1.11	0.07	13,021	1.45	3.61
Waukesha Generator	8.92	17.84	6.25	0.72/0.72	0.022	4,336	0.45	0.89
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	0.0058	N/A	N/A	N/A	N/A	0.006
Wastewater Tank	N/A	N/A	0.0058	N/A	N/A	N/A	N/A	0.000
Waste Oil Tank	N/A	N/A	0.00	N/A	N/A	N/A	N/A	0.006
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	0.10
Blowdowns [d]	N/A	N/A	7.90	N/A	N/A	1,931	N/A	0.03
TOTAL Proposed PTE [e]	**65.48**	**74.04**	**93.66**	**4.22/4.22**	**0.24**	**52,842**	**4.87**	**11.94**
Existing Emissions PTE	**0.35**	**0.28**	**0.16**	**0.01**	**0.002**	**427**	**not listed**	**0.01**
Existing and Proposed PTE	**65.83**	**74.32**	**93.82**	**4.23/4.23**	**0.24**	**53,269**	**4.87**	**11.95**

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.

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)

[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	61.2	35	96.2	188	51.2%
	Annual	2.2	5	7.2	100	7.2%
CO	1-hour	147.7	1,149	1,296.7	40,000	3.2%
	8-hour	83.2	1,149	1,232.1	10,000	12.3%
PM_{10}	24-hour	2.1	30	32.1	150	21.3%
$PM_{2.5}$	24-hour	1.4	13.7	15.1	35	42.6%
	Annual	0.17	4.75	4.9	12	41.0%
SO_2	1-hour	0.29	13	13.3	196	6.8%

µg/m^3 = micrograms per cubic meter
[a] Background data
[b] The modeled NO_2 impact represents the EPA Tier 3 method. Using representative In-Stack Ratio from the US EPA ISR database and local background ozone data from the Lostwood monitoring station

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-14-W gas boiler (1.69 MMBtu/hr), one water heater (0.20 MMBtu/hr), and one building unit heater (0.25 MMBtu/hr);
- one Sivalls IH-3005-T2-150-2X fuel preheater (0.12 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]	0.92	0.77	0.05	0.07/0.07	0.0055	1,097	0.03	0.03
Fuel Gas Preheater[d]	0.05	0.04	0.003	0.004	3.1E-4	62	4.0E-5	0.002
Pipeline Liquids Tank	N/A	N/A	0.002	N/A	N/A	N/A	N/A	0.00225
Wastewater Tank	N/A	N/A	0.002	N/A	N/A	N/A	N/A	0.00225
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	0.0001
Pig Launching & Receiving	N/A	N/A	60.96	N/A	N/A	14,896	N/A	0.01
Blowdowns [e]	N/A	N/A	3.01	N/A	N/A	735	N/A	0.001
TOTAL PTE [f]	**37.18**	**18.92**	**82.44**	**1.30/1.30**	**0.08**	**33,824**	**1.75**	**4.15**

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-14-W gas boiler (1.69 MMBtu/hr), one water heater (0.20 MMBtu/hr), and one building unit heater (0.25 MMBtu/hr)

[d] Fuel Gas Preheater: one Sivalls IH-3005-T2-150-2X fuel preheater (0.12 MMBtu/hr)

[e] 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.

[f] 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.

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 11,250hp will be added to the existing compressor station. The following equipment are expected to be potential noise contributors:

- three reciprocating compressor units;
- three 3,750-hp natural gas-fired engines;
- one 840-hp natural gas-fired generator; and
- three combination gas/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	50.9	58.2	1.0	50.9
NSA 2 (residential)	4,076 feet northeast	50.7	58.9	0.7	50.7
NSA 3 (residential)	4,920 feet east	49.0	55.2	1.2	49.0
NSA 4 (residential)	2,221 feet east	55.9	58.8	3.2	55.9
NSA 5 (residential)	4,940 feet southeast	49.0	55.2	1.2	49.0
NSA 6 (residential)	5,229 feet west	48.5	61.5	0.2	48.5
NSA 7 (residential)	4,862 feet northwest	49.1	61.5	0.3	49.1

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, with the exception of at NSA 4. However, it is possible that noise contributed by the compressor station expansion would not actually exceed 55 dBA L_{dn}, as this analysis does not account for attenuation due to temperature, humidity, or ground hardness, which would further reduce the noise contribution. 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; and
- one combination gas/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	45.5	56.0	0.4
NSA 2 (residential)	3,465 feet east	41.0	47.3	48.2	7.2
NSA 3 (residential)	3,895 feet northeast	41.0	46.3	47.4	6.4

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.

Attachments:

Appendix 9B – Air Permit to Construct Application for the Tioga compressor Station and Issued Permit to Construct for the Elkhorn Creek Compressor Station

Appendix 9E – Air Dispersion Modeling Report for Tioga Compressor Station

Appendix 9F – Pre-Construction Noise Survey and Acoustical Analysis Report

Appendix 9B

Air Permit to Construct Application for the Tioga Compressor Station and

Issued Permit to Construct for the Elkhorn Creek Compressor Station

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
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June 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:

- Three (3) 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 (840 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 permit to operate as a synthetic minor source 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]	18.11	18.11	18.11	1.11/1.11	0.07	13,021	1.45	3.61
Caterpillar 3612 Engine [b]	18.11	18.11	18.11	1.11/1.11	0.07	13,021	1.45	3.61
Caterpillar 3612 Engine [b]	18.11	18.11	18.11	1.11/1.11	0.07	13,021	1.45	3.61
Waukesha Generator	8.92	17.84	6.25	0.72/0.72	0.022	4,336	0.45	0.89
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	0.0058	N/A	N/A	N/A	N/A	0.006
Wastewater Tank	N/A	N/A	0.0058	N/A	N/A	N/A	N/A	0.000
Waste Oil Tank	N/A	N/A	0.00	N/A	N/A	N/A	N/A	0.006
Equipment Leaks (fugitive)	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	0.10
Blowdowns [d]	N/A	N/A	7.90	N/A	N/A	1,931	N/A	0.03
TOTAL PTE [e]	**65.48**	**74.04**	**93.66**	**4.22/4.22**	**0.24**	**52,842**	**4.87**	**11.94**
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 & acrolein.

[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.

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, four (4) individual SFN8891, four (4) individual SFN 8532, and four (4) 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, comfort heating, 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 source 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 station was 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 three 3,750 horsepower (hp) spark ignition internal combustion engines to drive compressors and one 840 hp natural gas-fired generator. The new spark ignition natural gas-fired engines 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 below major source thresholds and will not 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 42 feet from ground level (less than 1.5 times the nearest building height). The emissions for criteria pollutants (NO_2 only) 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.

As part of the modeling for NO_2, an assessment of significant impacts was included for the Lost Wood National Wildlife refuge, a federal Class I area located within 100 km of the project site.

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.

For NO_2 modeling, a refined approach was used, using default model options for the Ozone Limiting Method (OLM). This analysis is referred to as a Tier III analysis, and includes the specification of source specific 'in-stack' ratio (ISR) values for each source as well as ambient background ozone concentrations in order to compute the conversion of NO to NO_2. Additional details regarding OLM option settings, including ISR values and ozone background data is discussed below.

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. There is onsite data from a nearby facility (Hess Gas Plant) which provides the most representative meteorological conditions for this analysis. Section 3 of the report, *Onsite Meteorological Data Processing, Tioga, ND* (Bison Engineering, June 2020), provides the justification for met data selection and provides evidence of QA/QC program for this local monitoring program. A copy of this report is included in Appendix E.

Surface Data

The Hess Tioga Gas Plant (TGP) Station #1 was used as the primary surface data source, located at Latitude 48.409º N, longitude 102.91º W, and elevation 761 meters above mean sea level. The Williston Airport was used as the secondary surface data source, 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, at both surface stations. The 2015 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).

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).

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 2016 National Land Cover Data state-wide archive, provided by the 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
Midsummer with lush vegetation: Jun, Jul, Aug
Autumn with unharvested cropland: Sep
Is this site at an airport?
No (for primary Tioga Gas Plant on-site data);
Yes (for secondary Williston Airport NWS data).
Is the site in an arid region? No
Surface moisture condition at the site: Average

The domain for the primary data site was centered at the location of the Hess Tioga Gas Plant Station #1 in Tioga, North Dakota. The resulting surface parameters for the primary data site are summarized in Table 2.3-2.

The domain for the secondary data site was centered at the location of the airport at Williston, ND. The resulting surface parameters for the secondary site are summarized in Table 2.3-3.

[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 Tioga, 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	0.16	0.19	0.19
Bowen Ratio (10 x 10 km Domain) - Average Moisture [2]					
0 - 360	0.49	0.79	0.35	0.60	0.79
Surface Roughness Length (m) (1km-radius domain) [3]					
0 - 30	0.007	0.014	0.048	0.100	0.098
30 - 60	0.008	0.017	0.043	0.113	0.128
60 - 90	0.007	0.015	0.045	0.120	0.119
90 - 120	0.007	0.015	0.045	0.121	0.120
120 - 150	0.007	0.014	0.046	0.110	0.109
150 - 180	0.009	0.018	0.042	0.127	0.125
180 - 210	0.017	0.033	0.050	0.168	0.163
210 - 240	0.013	0.028	0.044	0.171	0.169
240 - 270	0.010	0.020	0.052	0.141	0.141
270 - 300	0.006	0.011	0.053	0.102	0.102
300 - 330	0.005	0.010	0.050	0.099	0.099
330 - 360	0.006	0.012	0.050	0.102	0.101

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

TABLE 2.3-3 **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	0.52	0.18	0.16	0.17	0.17
Bowen Ratio (10 x 10 km Domain) - Average Moisture [2]					
0 - 360	0.48	0.76	0.41	0.61	0.76
Surface Roughness Length (m) (1km-radius domain) [3]					
0 - 30	0.010	0.017	0.033	0.046	0.040
30 - 60	0.014	0.021	0.031	0.038	0.032
60 - 90	0.013	0.020	0.029	0.036	0.031
90 - 120	0.020	0.028	0.033	0.038	0.033
120 - 150	0.020	0.028	0.037	0.043	0.038
150 - 180	0.012	0.019	0.039	0.055	0.050
180 - 210	0.005	0.011	0.046	0.087	0.086
210 - 240	0.006	0.011	0.043	0.077	0.074
240 - 270	0.008	0.015	0.048	0.081	0.076
270 - 300	0.017	0.025	0.031	0.036	0.031
300 - 330	0.010	0.018	0.024	0.032	0.028
330 - 360	0.010	0.018	0.025	0.035	0.031

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 2015. 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.20060. 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 not applied.

As show in Table 2.3-4, the resulting 2015 data set provides more than 99 percent coverage of the meteorological conditions.

TABLE 2.3-4

2015 Meteorological Data Set Coverage

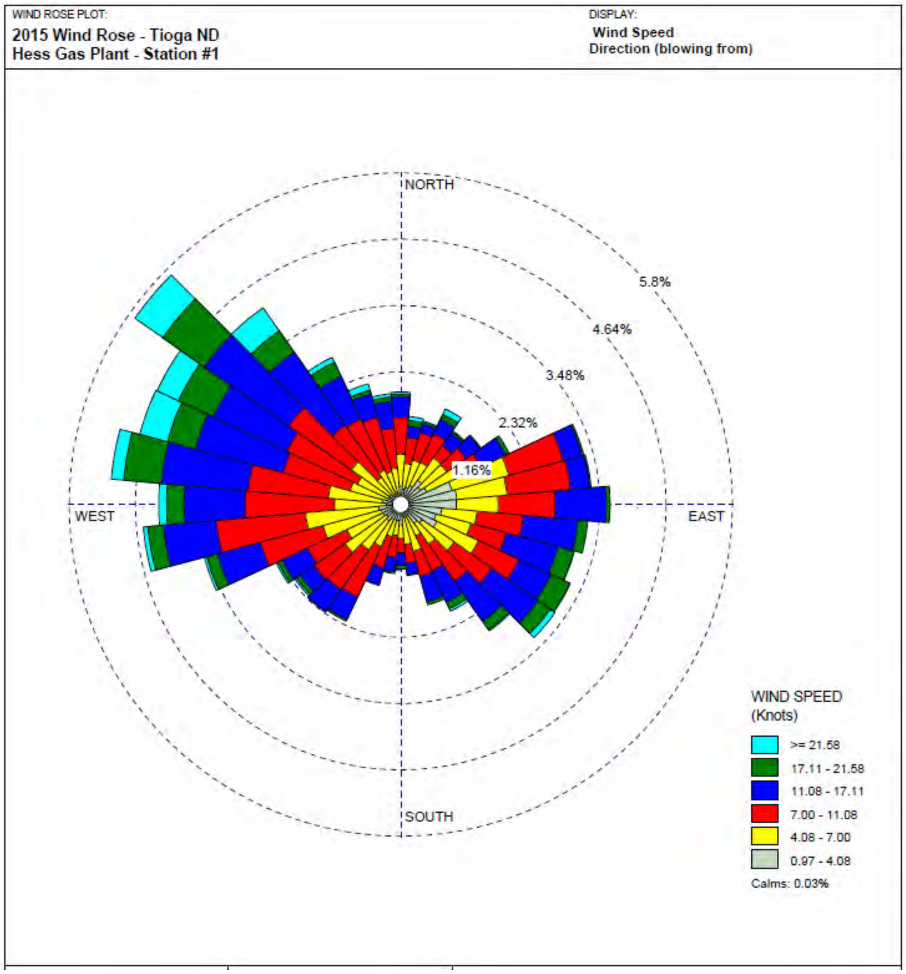
Year	Missing Hours	Total Coverage [1] (%)
2015	8	99.9

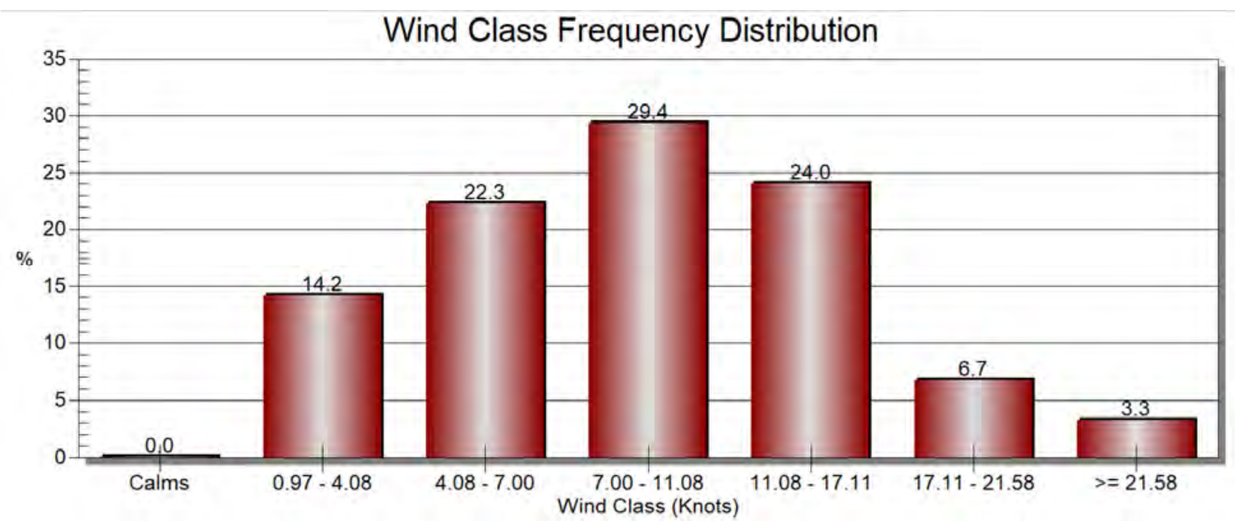
Notes:
[1] Percent coverage is calculated by removing the missing hours from the total hours in a year (8,760)

% = percentage

Figure 2.3-1 shows the wind rose and wind class and frequency distribution for the 2015 meteorological data set.

Figure 2.3 1 2015 Wind Rose and Distribution from Tioga Gas Plant Station #1





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 2.3-5. Terrain elevations for all buildings were assigned using survey data.

TABLE 2.3-5

Tioga Compressor Station Building Locations

Building ID	Building Description	Location (Southwest Corner)[1,2]		X-Length (ft)	Y-Length (ft)	Eave Height (ft)	Peak Height (ft)
		X (m E)	Y (m N)				
TRNBLDG1	Transfer Building #1	654919.13	5363288.36	50	50	12	13
TRNBLDG2	Transfer Building #2	654938.61	5363308.38	60	100	30	32.5
U1COMP	Unit #1 Compressor Building	654950.80	5363272.44	28	26	11	11
METER	Meter Building	654922.15	5363257399	7.5	7.5	10	10
OFCSHOP	Office/Shop	654919.12	5363248.47	60	40	15	17.3
U23BLDG	Unit #2 & #3 Compressor Building	655023.03	5363280.89	60	100	30	32.5
U4BLDG	Unit #4 Compressor Building	655023.03	5363308.35	60	100	30	32.5
AUX	Auxiliary Building	654967.87	5363273.05	40	80	16	18

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

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

NO_X Chemistry

Model simulations for 1-hour NO_2 emissions were performed using the Tier III level assessment, with the Ozone Limited Method (OLM) option. This option uses specific NO2/NOX ratio data, in-stack ratio (ISR) for each source. For the WBI Tioga Compressor station sources, available similar source data was reviewed from the US EPA ISR database; an ISR value was assigned based on the average of similar sources in the EPA ISR database. Background ozone data for 2015 was obtained from EPA monitoring database for the Lostwood Wilderness monitoring station (site ID 038-13-4); missing data blocks of 3 hours or less were filled with simple interpolation from hours before and after, missing data blocks of 4 hours or more were filled with substitution from a nearby ozone monitor site in McKenzie County ND (site ID 038-53-2). If the same hours were also 'missing' in the McKenzie Co data, then the missing data were filled using a default value of 55 ppb, based on NDDEQ guidance. Other default setting for the use of the OLM option were used; the keyword OLMGROUP ALL was utilized according to NDDEQ guidance to properly allow the model program to properly account for competing NO_X plumes in the conversion of NO to NO_2.

Significant Impact Level Results

Model simulations for 1-hour NO_2 emissions were performed with the AERMOD model using the 2015 meteorological database. The maximum value for the applicable time averaging period was compared to the appropriate significant impact level (SIL). For the SIL analysis, the highest, first-high concentration was compared with the SIL value in Table 2.3-6.

For impacts from the project sources exceeding the SIL, 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 2.3-6 summarizes the results of the SIL and SIA analysis.

TABLE 2.3-6

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	89.0	21.1	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 89.0 $\mu g/m^3$. 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 21.1 km from the facility.

Significant Impact Level Results – Class I area (Lostwood Wilderness)

Pursuant to NDDEQ modeling guidance, an assessment was conducted to determine if there would be a significant impact from the project on any Class I area located within 250 km of the project site. The Lostwood Wilderness area is a Class I area which is approximately 40 km from the Tioga Compressor Station.

Specific receptors defining the extents of the Lostwood Wilderness area were obtained from US EPA. These receptors were included in separate AERMOD simulation for the assessment of significant impacts. Based on discussions with NDDEQ, an assessment of significant impacts was conducted for Annual NO_2. Predicted annual NO_2 impacts from the WBI Tioga Compressor Station sources compared to the NDDEQ Class I SIL thresholds are presented in Table 2.3-7

TABLE 2.3-7 **Summary of Project-Only Impacts and CLASS I SIL Analysis**					
Pollutant	Averaging Period	Project Impact ($\mu g/m^3$)	SIL ($\mu g/m^3$)	% of SIL	SIL Exceeded and Additional Modeling Required?
NO_2	Annual	0.00788	0.1	7.88	NO

Notes:

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

NAAQS Results

A NAAQS analysis, using one year of on-site meteorological data from nearby Hess Gas Plant, was performed for 1-hour NO_2. Asd escribed above, the OLM approach for modeling ambient NO_2 impacts was also 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 be included in the analysis. The nearby source to be included is the Hess Gas Plant. As documented in the detailed report *ISR & Volumetric Flow Rate, Data Analysis for Tioga Gas Plant, Tioga, ND* (Bison Engineering, Inc. June 2020), source-specific ISR values were assigned to the Hess Tioga Gas Plant sources based on site-specific measurements and a review of available data from the US EPA ISR Database. A copy of this report is included as Appendix F.

Appendix G provides the source data from the Hess Tioga Gas Plant used in the cumulative modeling for 1-hour NO_2 impacts for comparison to NAAQS.As identified in Table 2.3-7, 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. Based on information from NDDEQ, the Hess Gas Plant was the only additional source to be included with the WBI Tioga Compressor stations sources in the NO_2 cumulative analysis. For the cumulative analysis, the highest, eighth-high concentration was compared, after adding the background concentration, with the NAAQS value in Table 2.3-8.

The initial modeling results show that the 1-hour NO_2 NAAQS is exceeded. Additional refined modeling for source culpability was required to demonstrate that the Tioga Compressor Station would not have significant contribution to the model-predicted exceedance of the 1-hr NO2 NAAQS.

Table 2.3-8 summarizes the results of the initial cumulative NAAQS modeling for 1-hour NO_2 with maximum impacts that exceeded the SILs.

TABLE 2.3-8

Summary of Initial Cumulative NAAQS Analysis

Pollutant	Averaging Period	Facility Impact ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	NAAQS Exceeded?
NO_2	1-hour	354.6	35	389.6	188	YES

Notes:

NAAQS = National Ambient Air Quality Standards
$\mu g/m^3$ = micrograms per cubic meter
km = kilometer

A more refined analysis was conducted to assess the culpability of the Tioga Compressor Station impacts to determine if there was a significant impact from the Tioga Compressor Station at any location and instance of predicted impacts above the ambient standard. This culpability assessment was conducted by re-running AERMOD for only the receptors where there was a predicted impact above the AAQS, using the MAXDCONT keyword to obtain source culpability for each instance at each receptor; there were 1,148 individual receptors where cumulative impacts were predicted above the AAQS.

Results of the MAXDCONT simulation determined that there were 24,207 total instances (at 1,148 unique locations) where predicted impacts from all sources were above the 1-hr NO_2 AAQS. These results were imported into an Excel spreadsheet and sorted based on the total contribution from the Tioga Compressor Station. The maximum contribution from the Tioga Compressor Station for any instance at any location was 2.3 $\mu g/m^3$. This maximum contribution is less than the Significant Impact Level (SIL). Therefore, the Tioga Compressor Station does not cause or contribute in a significant amount to any predicted cumulative impacts which were above the 1-hour NO_2 AAQS.

The detailed electronic modeling files and associated MS EXCEL spreadsheets providing the evaluation of MAXDCONT facility culpability is provided with this application.

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 1.56×10^{-3} 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/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 (µg/m^3)	URF [2] (m^3/µg)	MICR [4]
Ammonia	1-hr, 8-hr	1.61E-01	1.13E+00	0.488	***2.32*** [6]	7.91E-01	3.48E-01	***2.27*** [6]	N/A	N/A	N/A
1,1,2,2-Tetrachloroethane	8-hr	4.11E-04	2.71E-03	N/A	N/A	1.90E-03	2.83E-02	0.07	N/A	N/A	N/A
1,1,2-Trichloroethane	8-hr	3.22E-04	2.06E-03	N/A	N/A	1.44E-03	1.09E+00	1.33E-03	N/A	N/A	N/A
1,1-Dichloroethane	8-hr	2.39E-04	1.53E-03	N/A	N/A	1.07E-03	8.10E+00	1.32E-04	N/A	N/A	N/A
1,3,5-Trimethylbenzene	8-hr	3.23E-04	1.88E-03	N/A	N/A	1.13E-03	2.46E+00	5.34E-04	N/A	N/A	N/A
1,3-Butadiene	annual	3.27E-03	2.76E-02	N/A	N/A	N/A	N/A	N/A	2.21	3.00E-05	***6.62E-05*** [6]
1,3-Dichloropropene	annual	2.67E-04	1.71E-03	N/A	N/A	1.20E-03	N/A	N/A	0.137	4.00E-06	5.48E-07
2-Methylnaphthalene	8-hr	3.19E-04	1.85E-03	N/A	N/A	1.29E-03	5.20E-02	0.02	N/A	N/A	N/A
Acetaldehyde	1-hr, annual	8.32E-02	5.19E-01	0.901	***0.58*** [6]	N/A	N/A	N/A	41.5	2.20E-06	***9.13E-05*** [6]
Acrolein	1-hr	1.51E-02	1.22E-01	0.00459	***26.58*** [6]	N/A	N/A	N/A	N/A	N/A	N/A
Benzene	1-hr, 8-hr, annual	5.91E-03	5.48E-02	0.16	0.34	3.84E-02	3.19E-02	***1.20*** [6]	4.38	7.80E-06	***3.42E-05*** [6]
Benzo(b)fluoranthene	annual	1.59E-06	9.24E-06	N/A	N/A	N/A	N/A	N/A	7.39E-04	1.10E-04	8.13E-08
Carbon Tetrachloride	1-hr, 8-hr, annual	3.71E-04	2.38E-03	1.258	0.0019	1.67E-03	6.29E-01	0.003	0.191	6.00E-06	1.14E-06
Chlorobenzene	8-hr	3.06E-04	1.94E-03	N/A	N/A	1.36E-03	9.21E-01	0.001	N/A	N/A	N/A
Chloroform	8-hr, annual	2.88E-04	1.85E-03	N/A	N/A	1.29E-03	9.77E-01	0.001	1.48E-01	2.30E-05	3.40E-06
Chrysene	annual	6.65E-06	3.86E-05	N/A	N/A	N/A	N/A	N/A	3.09E-03	1.10E-05	3.40E-08
Cyclopentane	8-hr	2.18E-03	1.26E-02	N/A	N/A	8.85E-03	3.44E+01	2.57E-04	N/A	N/A	N/A
Ethylbenzene	1-hr, 8-hr, annual	4.08E-04	2.69E-03	10.855	2.47E-04	1.88E-03	8.68E+00	2.17E-04	2.15E-01	2.50E-06	5.37E-07
Ethylene Dibromide	annual	4.48E-04	2.87E-03	N/A	N/A	N/A	N/A	N/A	2.03E-01	6.00E-04	***1.38E-04*** [6]
Formaldehyde	1-hr, annual	1.07E-01	7.75E-01	0.00737	***105.12*** [6]	N/A	N/A	N/A	6.20E+-1	1.30E-05	***8.06E-04*** [6]
Methanol	1-hr, 8-hr	2.73E-02	1.98E-01	6.552	0.030	1.39E-01	5.24E+00	0.026	N/A	N/A	N/A
Methylcyclohexane	8-hr	1.18E-02	6.85E-02	N/A	N/A	4.79E-02	3.21E+01	0.001	N/A	N/A	N/A
Methylene Chloride	8-hr, annual	2.36E-04	1.90E-03	N/A	N/A	1.33E-03	3.47E+00	3.84E-04	1.52E-01	4.70E-07	7.16E-08
Hexane	8-hr	1.07E-02	6.18E-02	N/A	N/A	4.33E-02	3.53E+00	0.01	N/A	N/A	N/A
Nonane	8-hr	1.06E-03	6.12E-03	N/A	N/A	4.29E-03	2.10E+01	2.04E-04	N/A	N/A	N/A
Octane	8-hr	3.37E-03	1.95E-02	N/A	N/A	1.37E-02	2.80E+01	4.89E-04	N/A	N/A	N/A
Pentane	8-hr	2.50E-02	1.45E-01	N/A	N/A	1.01E-01	3.54E+01	0.003	N/A	N/A	N/A
Naphthalene	1-hr, 8-hr, annual	8.18E-04	6.00E-03	1.573	0.0038	4.20E-03	1.05E+00	0.004	4.80E-01	3.40E-05	***1.63E-05*** [6]
PAH [5]	annual	4.08E-04	4.20E-03	N/A	N/A	N/A	N/A	N/A	3.36E-01	1.20E-03	***4.03E-04*** [6]
Phenol	8-hr	2.03E-04	1.34E-03	N/A	N/A	9.35E-04	3.85E-01	0.002	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	2.39E-04	1.54E-03	3.408	4.53E-04	1.08E-03	1.70E+00	0.001	N/A	N/A	N/A
Toluene	8-hr	4.51E-03	3.34E-02	N/A	N/A	2.34E-02	1.51E+00	0.015	N/A	N/A	N/A
Vinyl Chloride	8-hr, annual	1.51E-04	9.67E-04	N/A	N/A	6.77E-04	5.11E-02	0.013	7.74E-02	8.80E-06	6.81E-07
Xylene	1-hr, 8-hr	1.97E-03	1.40E-02	13.026	0.0011	9.79E-03	8.68E+00	0.001	N/A	N/A	N/A
										Total Facility MICR	**1.56E-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 (µg/m³)	OEHHA/ARB Risk Assessment Health Value[1] (µg/m³)	Hazard Index (HI) [3]
Acetaldehyde	1-hour	4.13	470	0.009
Acrolein	1-hour	0.97	2.5	0.39
Ammonia	1-hour	8.52	3,200	0.003
	8-hour	5.96	3,200 [2]	0.002
Benzene	1-hour	0.45	27	0.017
	8-hour	0.29	3	0.095
Formaldehyde	1-hour	5.93	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/m³) ÷ Guideline Concentration (mg/m³). If HI<1, analysis is complete. If HI≥1, pollutant requires further analysis.

µg/m³ = 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	0.10058	2.70E-06	2.72E-07
1,3-Butadiene	Annual	0.00535	1.70E-04	9.10E-07
Benzene	Annual	0.01157	2.90E-05	3.36E-07
Chloroform	Annual	0.00035	5.30E-06	1.86E-09
Ethylene Dibromide	Annual	0.00055	7.10E-05	3.91E-08
Formaldehyde	Annual	0.13747	6.00E-06	8.25E-07
Naphthalene	Annual	0.00106	3.40E-05	3.60E-08
PAH	Annual	0.00099	1.10E-03	1.09E-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

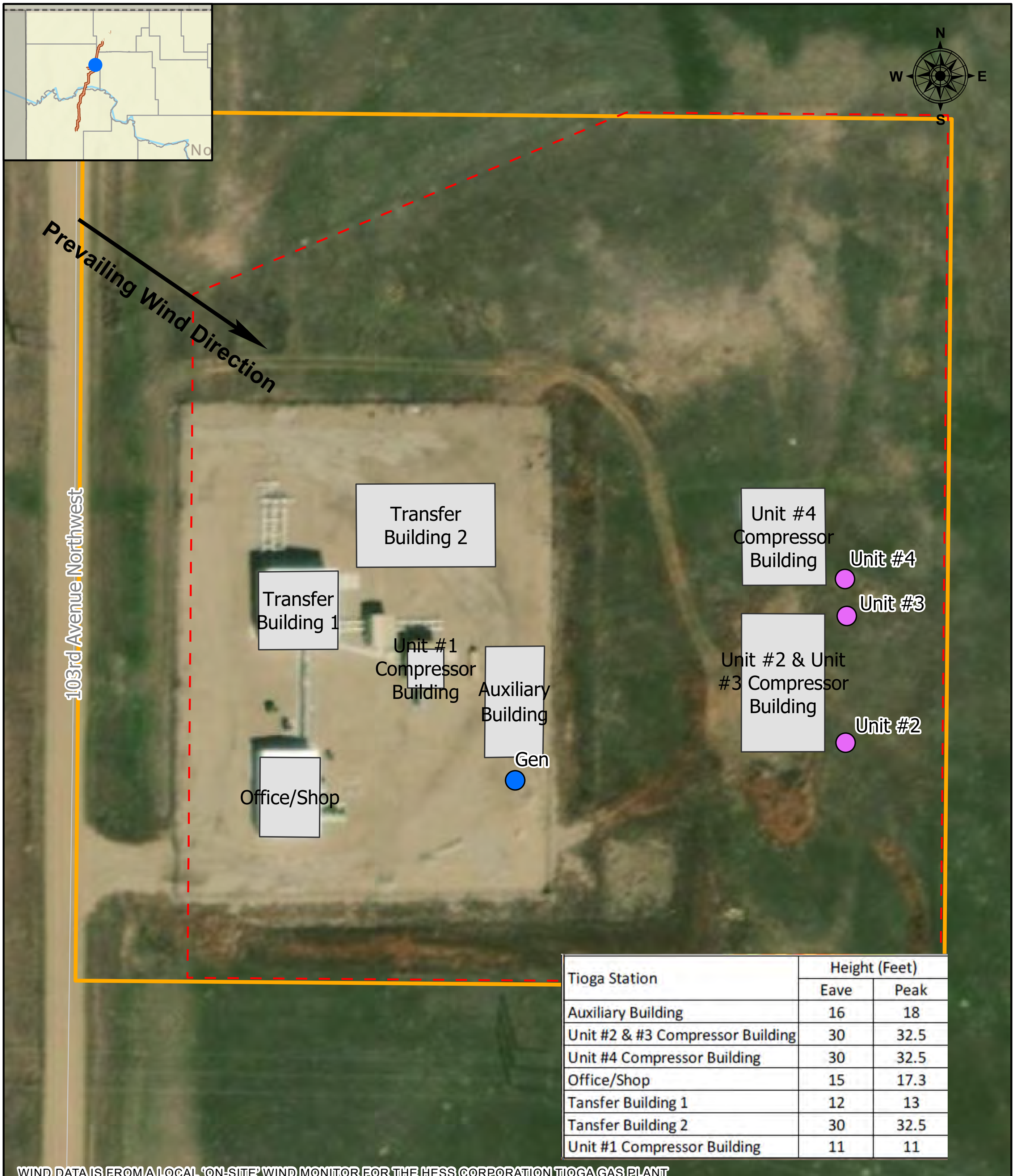
WBI Energy Transmission
Application for Permit to Construct
Tioga Compressor Station
Site Location Map

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	16	18
Unit #2 & #3 Compressor Building	30	32.5
Unit #4 Compressor Building	30	32.5
Office/Shop	15	17.3
Tansfer Building 1	12	13
Tansfer Building 2	30	32.5
Unit #1 Compressor Building	11	11

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

File: M:\Clients\V-X\WBI\North_Bakken_Expansion_ArcGIS\2020\01\Air_PermitMaps\AirPermit_CompressorStations\AirPermit_CompressorStations_v2.aprx | Revised: 6/18/2020

Drawn By: 0239

Appendix B

Potential to Emit Calculations

ERM The business of sustainability

Facility Name: Tioga Compressor Station - Addition of Three Compressor Engines
Subject: Potential to Emit Calculations
Task: Potential to Emit Summary

Prepared: AMC
Reviewed: PCB
Date: 8-Jun-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	18.11	18.11	18.11	1.11	1.11	1.11	0.07	---	3.61	1.45	13,021
Engine/Compressor #3	18.11	18.11	18.11	1.11	1.11	1.11	0.07	---	3.61	1.45	13,021
Engine/Compressor #4	18.11	18.11	18.11	1.11	1.11	1.11	0.07	---	3.61	1.45	13,021
Generator	8.92	17.84	6.25	0.72	0.72	0.72	0.022	---	0.89	0.45	4,336
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:	**65.47**	**74.03**	**93.65**	**4.22**	**4.22**	**4.22**	**0.23**	**1.11E-05**	**11.93**	**4.86**	**52,841**
Total Facility Unlimited Emissions without Fugitives:	65.47	74.03	92.82	4.22	4.22	4.22	0.23	NA	11.93	4.79	52,638

[1] TPY - Tons Per Year

ERM *The business of sustainability*

Facility Name: Tioga Compressor Station - Addition of Three Compressor Engines
Subject: Potential to Emit Calculations
Task: Caterpillar 3612 w/Arial Compressor

Prepared: AMC
Reviewed: PCB
Date: June 8,2020

Engine/Compressor #2	
Assumptions:	
Natural Gas Fired	
Max. Rated Capacity, bhp	3,750
Fuel Consumption[1], Btu/bhp-hr	6,772
Max. Rated Capacity, MMBtu/hr	25.40
Fuel Consumption Rate, cf/hr	21,294
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	0.50	grams/bhp-hr	4.13	18.11	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	0.25	1.11	NA	NA	NA	NA
PM_{10}	0.010	lb/MMBtu	0.25	1.11	NA	NA	NA	NA
$PM_{2.5}$	0.010	lb/MMBtu	0.25	1.11	NA	NA	NA	NA
SO_2	0.00	lb/MMBtu	0.01	0.07	NA	NA	NA	NA
CO_2e[6]	117.1	lb/MMBtu	2,973	13,021	NA	NA	NA	NA
CO_2[7]	116.9	lb/MMBtu	2969.8	13,008	NA	NA	NA	NA
CH_4[8]	0.002	lb/MMBtu	0.06	0.25	NA	NA	NA	NA
N_2O[8]	0.0002	lb/MMBtu	0.01	0.02	NA	NA	NA	NA
Ammonia[9]	18	lb/MMscf	0.38	1.68	NA	NA	NA	NA
Total HAPs	8.13E-02	lb/MMBtu	2.06	9.04	NA	NA	0.82	3.61
1,1,2,2-Tetrachloroethane	4.00E-05	lb/MMBtu	1.02E-03	4.45E-03	NA	NA	NA	NA
1,1,2-Trichloroethane	3.18E-05	lb/MMBtu	8.08E-04	3.54E-03	NA	NA	NA	NA
1,1-Dichloroethane	2.36E-05	lb/MMBtu	5.99E-04	2.63E-03	NA	NA	NA	NA
1,2-Dichloropropane	*2.69E-05*	*lb/MMBtu*	*6.83E-04*	*2.99E-03*	NA	NA	NA	NA
1,3,5-Trimethylbenzene	*3.38E-05*	*lb/MMBtu*	*8.58E-04*	*3.76E-03*	NA	NA	NA	NA
1,3-Butadiene	2.67E-04	lb/MMBtu	6.78E-03	2.97E-02	NA	NA	NA	NA
1,3-Dichloropropene	2.64E-05	lb/MMBtu	6.70E-04	2.94E-03	NA	NA	NA	NA
2-Methylnaphthalene	3.32E-05	lb/MMBtu	8.43E-04	3.69E-03	NA	NA	NA	NA
2,2,4-Trimethylpentane	2.50E-04	lb/MMBtu	6.35E-03	2.78E-02	NA	NA	NA	NA
Acenaphthene	1.25E-06	lb/MMBtu	3.17E-05	1.39E-04	NA	NA	NA	NA
Acenaphthylene	5.53E-06	lb/MMBtu	1.40E-04	6.15E-04	NA	NA	NA	NA
Acetaldehyde	8.36E-03	lb/MMBtu	2.12E-01	9.30E-01	NA	NA	NA	NA
Acrolein	5.14E-03	lb/MMBtu	1.31E-01	5.72E-01	75	%	3.26E-02	1.43E-01
Benzene	4.40E-04	lb/MMBtu	1.12E-02	4.89E-02	NA	NA	NA	NA
Benzo(b)fluoranthene	*1.66E-07*	*lb/MMBtu*	*4.22E-06*	*1.85E-05*	NA	NA	NA	NA
Biphenyl	2.12E-04	lb/MMBtu	5.38E-03	2.36E-02	NA	NA	NA	NA
Carbon Tetrachloride	3.67E-05	lb/MMBtu	9.32E-04	4.08E-03	NA	NA	NA	NA
Chlorobenzene	3.04E-05	lb/MMBtu	7.72E-04	3.38E-03	NA	NA	NA	NA
Chloroethane	1.87E-06	lb/MMBtu	4.75E-05	2.08E-04	NA	NA	NA	NA
Chloroform	2.85E-05	lb/MMBtu	7.24E-04	3.17E-03	NA	NA	NA	NA
Chrysene	*6.93E-07*	*lb/MMBtu*	*1.76E-05*	*7.71E-05*	NA	NA	NA	NA
Cyclopentane	*2.27E-04*	*lb/MMBtu*	*5.76E-03*	*2.52E-02*	NA	NA	NA	NA
Ethylbenzene	3.97E-05	lb/MMBtu	1.01E-03	4.42E-03	NA	NA	NA	NA
Ethylene Dibromide	4.43E-05	lb/MMBtu	1.12E-03	4.93E-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	6.35E-02	2.78E-01	NA	NA	NA	NA
Methylcyclohexane	*1.23E-03*	*lb/MMBtu*	*3.12E-02*	*1.37E-01*	NA	NA	NA	NA
Methylene Chloride	2.00E-05	lb/MMBtu	5.08E-04	2.22E-03	NA	NA	NA	NA
Hexane	1.11E-03	lb/MMBtu	2.82E-02	1.23E-01	NA	NA	NA	NA
Nonane	*1.10E-04*	*lb/MMBtu*	*2.79E-03*	*1.22E-02*	NA	NA	NA	NA
Octane	*3.51E-04*	*lb/MMBtu*	*8.91E-03*	*3.90E-02*	NA	NA	NA	NA
Pentane	*2.60E-03*	*lb/MMBtu*	*6.60E-02*	*2.89E-01*	NA	NA	NA	NA
Naphthalene	7.44E-05	lb/MMBtu	1.89E-03	8.28E-03	NA	NA	NA	NA
PAH	2.69E-05	lb/MMBtu	6.83E-04	2.99E-03	NA	NA	NA	NA
Phenanthrene	1.04E-05	lb/MMBtu	2.64E-04	1.16E-03	NA	NA	NA	NA
Phenol	2.40E-05	lb/MMBtu	6.09E-04	2.67E-03	NA	NA	NA	NA
Styrene	2.36E-05	lb/MMBtu	5.99E-04	2.63E-03	NA	NA	NA	NA
Toluene	4.08E-04	lb/MMBtu	1.04E-02	4.54E-02	NA	NA	NA	NA
Vinyl Chloride	1.49E-05	lb/MMBtu	3.78E-04	1.66E-03	NA	NA	NA	NA
Xylene	1.84E-04	lb/MMBtu	4.67E-03	2.05E-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] Uncontrolled emission factors for CO and VOC based on compliance with 40 CFR Part 60 Subpart JJJJ. Emission factor for NOx and formaldehyde (CH_2O) taken from engine specification sheet. The NOx emission factor from the engine specification uses a factor of safety to raise from 0.30 g/bhp to 0.5 g/bhp. The controlled emission factor for CO, VOC, CH_2O, and acrolein are based on reduction by the catalyst. CO_2, CH_4 and N_2O taken from 40 CFR 98 Subpart C. 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, acrolein, 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 - Addition of Three Compressor Engines
Subject: Potential to Emit Calculations
Task: Caterpillar 3612 w/Arial Compressor

Prepared: AMC
Reviewed: PCB
Date: 8-Jun-20

Engine/Compressor #3	
Assumptions:	
Natural Gas Fired	
Max. Rated Capacity, bhp	3,750
Fuel Consumption[1], Btu/bhp-hr	6,772
Max. Rated Capacity, MMBtu/hr	25.40
Fuel Consumption Rate, cf/hr	21,294
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	0.50	grams/bhp-hr	4.13	18.11	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	0.25	1.11	NA	NA	NA	NA
PM_{10}	0.010	lb/MMBtu	0.25	1.11	NA	NA	NA	NA
$PM_{2.5}$	0.010	lb/MMBtu	0.25	1.11	NA	NA	NA	NA
SO_2	0.00	lb/MMBtu	0.01	0.07	NA	NA	NA	NA
CO_2e[6]	117.1	lb/MMBtu	2,973	13,021	NA	NA	NA	NA
CO_2[7]	116.9	lb/MMBtu	2969.8	13,008	NA	NA	NA	NA
CH_4[8]	0.002	lb/MMBtu	0.06	0.25	NA	NA	NA	NA
N_2O[8]	0.0002	lb/MMBtu	0.01	0.02	NA	NA	NA	NA
Ammonia[9]	18	lb/MMscf	0.38	1.68	NA	NA	NA	NA
Total HAPs	8.13E-02	lb/MMBtu	2.06	9.04	NA	NA	0.82	3.61
1,1,2,2-Tetrachloroethane	4.00E-05	lb/MMBtu	1.02E-03	4.45E-03	NA	NA	NA	NA
1,1,2-Trichloroethane	3.18E-05	lb/MMBtu	8.08E-04	3.54E-03	NA	NA	NA	NA
1,1-Dichloroethane	2.36E-05	lb/MMBtu	5.99E-04	2.63E-03	NA	NA	NA	NA
1,2-Dichloropropane	*2.69E-05*	*lb/MMBtu*	*6.83E-04*	*2.99E-03*	NA	NA	NA	NA
1,3,5-Trimethylbenzene	*3.35E-05*	*lb/MMBtu*	*8.51E-04*	*3.73E-03*	NA	NA	NA	NA
1,3-Butadiene	2.67E-04	lb/MMBtu	6.78E-03	2.97E-02	NA	NA	NA	NA
1,3-Dichloropropene	2.64E-05	lb/MMBtu	6.70E-04	2.94E-03	NA	NA	NA	NA
2-Methylnaphthalene	3.32E-05	lb/MMBtu	8.43E-04	3.69E-03	NA	NA	NA	NA
2,2,4-Trimethylpentane	2.50E-04	lb/MMBtu	6.35E-03	2.78E-02	NA	NA	NA	NA
Acenaphthene	1.25E-06	lb/MMBtu	3.17E-05	1.39E-04	NA	NA	NA	NA
Acenaphthylene	5.53E-06	lb/MMBtu	1.40E-04	6.15E-04	NA	NA	NA	NA
Acetaldehyde	8.36E-03	lb/MMBtu	2.12E-01	9.30E-01	NA	NA	NA	NA
Acrolein	5.14E-03	lb/MMBtu	1.31E-01	5.72E-01	75	%	3.26E-02	1.43E-01
Benzene	4.40E-04	lb/MMBtu	1.12E-02	4.89E-02	NA	NA	NA	NA
Benzo(b)fluoranthene	*1.66E-07*	*lb/MMBtu*	*4.22E-06*	*1.85E-05*	NA	NA	NA	NA
Biphenyl	2.12E-04	lb/MMBtu	5.38E-03	2.36E-02	NA	NA	NA	NA
Carbon Tetrachloride	3.67E-05	lb/MMBtu	9.32E-04	4.08E-03	NA	NA	NA	NA
Chlorobenzene	3.04E-05	lb/MMBtu	7.72E-04	3.38E-03	NA	NA	NA	NA
Chloroethane	1.87E-06	lb/MMBtu	4.75E-05	2.08E-04	NA	NA	NA	NA
Chloroform	2.85E-05	lb/MMBtu	7.24E-04	3.17E-03	NA	NA	NA	NA
Chrysene	*6.93E-07*	*lb/MMBtu*	*1.76E-05*	*7.71E-05*	NA	NA	NA	NA
Cyclopentane	*2.27E-04*	*lb/MMBtu*	*5.76E-03*	*2.52E-02*	NA	NA	NA	NA
Ethylbenzene	3.97E-05	lb/MMBtu	1.01E-03	4.42E-03	NA	NA	NA	NA
Ethylene Dibromide	4.43E-05	lb/MMBtu	1.12E-03	4.93E-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	6.35E-02	2.78E-01	NA	NA	NA	NA
Methylcyclohexane	*1.23E-03*	*lb/MMBtu*	*3.12E-02*	*1.37E-01*	NA	NA	NA	NA
Methylene Chloride	2.00E-05	lb/MMBtu	5.08E-04	2.22E-03	NA	NA	NA	NA
Hexane	1.11E-03	lb/MMBtu	2.82E-02	1.23E-01	NA	NA	NA	NA
Nonane	*1.10E-04*	*lb/MMBtu*	*2.79E-03*	*1.22E-02*	NA	NA	NA	NA
Octane	*3.51E-04*	*lb/MMBtu*	*8.91E-03*	*3.90E-02*	NA	NA	NA	NA
Pentane	*2.60E-03*	*lb/MMBtu*	*6.60E-02*	*2.89E-01*	NA	NA	NA	NA
Naphthalene	7.44E-05	lb/MMBtu	1.89E-03	8.28E-03	NA	NA	NA	NA
PAH	2.69E-05	lb/MMBtu	6.83E-04	2.99E-03	NA	NA	NA	NA
Phenanthrene	1.04E-05	lb/MMBtu	2.64E-04	1.16E-03	NA	NA	NA	NA
Phenol	2.40E-05	lb/MMBtu	6.09E-04	2.67E-03	NA	NA	NA	NA
Styrene	2.36E-05	lb/MMBtu	5.99E-04	2.63E-03	NA	NA	NA	NA
Toluene	4.08E-04	lb/MMBtu	1.04E-02	4.54E-02	NA	NA	NA	NA
Vinyl Chloride	1.49E-05	lb/MMBtu	3.78E-04	1.66E-03	NA	NA	NA	NA
Xylene	1.84E-04	lb/MMBtu	4.67E-03	2.05E-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 Uncontrolled emission factors for CO and VOC based on compliance with 40 CFR Part 60 Subpart JJJJ. Emission factor for NOx and formaldehyde (CH_2O) taken from engine specification sheet. The NOx emission factor from the engine specification uses a factor of safety to raise from 0.30 g/bhp to 0.5 g/bhp. The controlled emission factor for CO, VOC, CH_2O, and acrolein are based on reduction by the catalyst. CO_2, CH_4 and N_2O taken from 40 CFR 98 Subpart C. 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, acrolein, 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 - Addition of Three Compressor Engines
Subject: Potential to Emit Calculations
Task: Caterpillar 3612 w/Arial Compressor

Prepared: AMC
Reviewed: PCB
Date: 8-Jun-20

Engine/Compressor #4	
Assumptions:	
Natural Gas Fired	
Max. Rated Capacity, bhp	3,750
Fuel Consumption[1], Btu/bhp-hr	6,772
Max. Rated Capacity, MMBtu/hr	25.40
Fuel Consumption Rate, cf/hr	21,294
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	0.50	grams/bhp-hr	4.13	18.11	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	0.25	1.11	NA	NA	NA	NA
PM_{10}	0.010	lb/MMBtu	0.25	1.11	NA	NA	NA	NA
$PM_{2.5}$	0.010	lb/MMBtu	0.25	1.11	NA	NA	NA	NA
SO_2	0.00	lb/MMBtu	0.01	0.07	NA	NA	NA	NA
CO_2e[6]	117.1	lb/MMBtu	2,973	13,021	NA	NA	NA	NA
CO_2[7]	116.9	lb/MMBtu	2969.8	13,008	NA	NA	NA	NA
CH_4[8]	0.002	lb/MMBtu	0.06	0.25	NA	NA	NA	NA
N_2O[8]	0.0002	lb/MMBtu	0.01	0.02	NA	NA	NA	NA
Ammonia[9]	18	lb/MMscf	0.38	1.68	NA	NA	NA	NA
Total HAPs	8.13E-02	lb/MMBtu	2.06	9.04	NA	NA	0.82	3.61
1,1,2,2-Tetrachloroethane	4.00E-05	lb/MMBtu	1.02E-03	4.45E-03	NA	NA	NA	NA
1,1,2-Trichloroethane	3.18E-05	lb/MMBtu	8.08E-04	3.54E-03	NA	NA	NA	NA
1,1-Dichloroethane	2.36E-05	lb/MMBtu	5.99E-04	2.63E-03	NA	NA	NA	NA
1,2-Dichloropropane	*2.69E-05*	*lb/MMBtu*	*6.83E-04*	*2.99E-03*	NA	NA	NA	NA
1,3,5-Trimethylbenzene	*3.38E-05*	*lb/MMBtu*	*8.58E-04*	*3.76E-03*	NA	NA	NA	NA
1,3-Butadiene	2.67E-04	lb/MMBtu	6.78E-03	2.97E-02	NA	NA	NA	NA
1,3-Dichloropropene	2.64E-05	lb/MMBtu	6.70E-04	2.94E-03	NA	NA	NA	NA
2-Methylnaphthalene	3.32E-05	lb/MMBtu	8.43E-04	3.69E-03	NA	NA	NA	NA
2,2,4-Trimethylpentane	2.50E-04	lb/MMBtu	6.35E-03	2.78E-02	NA	NA	NA	NA
Acenaphthene	1.25E-06	lb/MMBtu	3.17E-05	1.39E-04	NA	NA	NA	NA
Acenaphthylene	5.53E-06	lb/MMBtu	1.40E-04	6.15E-04	NA	NA	NA	NA
Acetaldehyde	8.36E-03	lb/MMBtu	2.12E-01	9.30E-01	NA	NA	NA	NA
Acrolein	5.14E-03	lb/MMBtu	1.31E-01	5.72E-01	75	%	3.26E-02	1.43E-01
Benzene	4.40E-04	lb/MMBtu	1.12E-02	4.89E-02	NA	NA	NA	NA
Benzo(b)fluoranthene	*1.66E-07*	*lb/MMBtu*	*4.22E-06*	*1.85E-05*	NA	NA	NA	NA
Biphenyl	2.12E-04	lb/MMBtu	5.38E-03	2.36E-02	NA	NA	NA	NA
Carbon Tetrachloride	3.67E-05	lb/MMBtu	9.32E-04	4.08E-03	NA	NA	NA	NA
Chlorobenzene	3.04E-05	lb/MMBtu	7.72E-04	3.38E-03	NA	NA	NA	NA
Chloroethane	1.87E-06	lb/MMBtu	4.75E-05	2.08E-04	NA	NA	NA	NA
Chloroform	2.85E-05	lb/MMBtu	7.24E-04	3.17E-03	NA	NA	NA	NA
Chrysene	*6.93E-07*	*lb/MMBtu*	*1.76E-05*	*7.71E-05*	NA	NA	NA	NA
Cyclopentane	*2.27E-04*	*lb/MMBtu*	*5.76E-03*	*2.52E-02*	NA	NA	NA	NA
Ethylbenzene	3.97E-05	lb/MMBtu	1.01E-03	4.42E-03	NA	NA	NA	NA
Ethylene Dibromide	4.43E-05	lb/MMBtu	1.12E-03	4.93E-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	6.35E-02	2.78E-01	NA	NA	NA	NA
Methylcyclohexane	*1.23E-03*	*lb/MMBtu*	*3.12E-02*	*1.37E-01*	NA	NA	NA	NA
Methylene Chloride	2.00E-05	lb/MMBtu	5.08E-04	2.22E-03	NA	NA	NA	NA
Hexane	1.11E-03	lb/MMBtu	2.82E-02	1.23E-01	NA	NA	NA	NA
Nonane	*1.10E-04*	*lb/MMBtu*	*2.79E-03*	*1.22E-02*	NA	NA	NA	NA
Octane	*3.51E-04*	*lb/MMBtu*	*8.91E-03*	*3.90E-02*	NA	NA	NA	NA
Pentane	*2.60E-03*	*lb/MMBtu*	*6.60E-02*	*2.89E-01*	NA	NA	NA	NA
Naphthalene	7.44E-05	lb/MMBtu	1.89E-03	8.28E-03	NA	NA	NA	NA
PAH	2.69E-05	lb/MMBtu	6.83E-04	2.99E-03	NA	NA	NA	NA
Phenanthrene	1.04E-05	lb/MMBtu	2.64E-04	1.16E-03	NA	NA	NA	NA
Phenol	2.40E-05	lb/MMBtu	6.09E-04	2.67E-03	NA	NA	NA	NA
Styrene	2.36E-05	lb/MMBtu	5.99E-04	2.63E-03	NA	NA	NA	NA
Toluene	4.08E-04	lb/MMBtu	1.04E-02	4.54E-02	NA	NA	NA	NA
Vinyl Chloride	1.49E-05	lb/MMBtu	3.78E-04	1.66E-03	NA	NA	NA	NA
Xylene	1.84E-04	lb/MMBtu	4.67E-03	2.05E-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] Uncontrolled emission factors for CO and VOC based on compliance with 40 CFR Part 60 Subpart JJJJ. Emission factor for NOx and formaldehyde (CH_2O) taken from engine specification sheet. The NOx emission factor from the engine specification uses a factor of safety to raise from 0.30 g/bhp to 0.5 g/bhp. The controlled emission factor for CO, VOC, CH_2O, and acrolein are based on reduction by the catalyst. CO_2, CH_4 and N_2O taken from 40 CFR 98 Subpart C. 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, acrolein, 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 (F3524GSI)

Prepared: AMC
Reviewed: PCB
Date: 8-Jun-20

Generator, Waukesha gas engines 3524GSI	
Assumptions:	
Natural Gas Fired	
Standby Power Rated Capacity, kW	651
Fuel Consumption[1], Btu/bhp-hr	9,151
Max. Rated Capacity, MMBtu/hr	8.46
Fuel Consumption Rate, cf/hr	7,090
Horsepower, hp	924
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	2.04	8.92
CO	2.00	grams/bhp-hr	4.07	17.84
VOC (NMHC)	0.70	grams/bhp-hr	1.43	6.25
PM	0.02	lb/MMBtu	0.16	0.72
PM_{10}	0.02	lb/MMBtu	0.16	0.72
$PM_{2.5}$	0.02	lb/MMBtu	0.16	0.72
SO_2	5.88E-04	lb/MMBtu	4.97E-03	2.18E-02
CO_2e[5]	117.1	lb/MMBtu	990	4336
CO_2[6]	116.9	lb/MMBtu	989	4331
CH_4[7]	0.002	lb/MMBtu	0.02	0.08
N_2O[7]	0.0002	lb/MMBtu	1.86E-03	8.16E-03
Ammonia[8]	18	lb/MMscf	0.13	0.56
Total HAPs	6.19E-02	lb/MMBtu	0.20	0.89
1,1,2,2-Tetrachloroethane	2.53E-05	lb/MMBtu	2.14E-04	9.37E-04
1,1,2-Trichloroethane	1.53E-05	lb/MMBtu	1.29E-04	5.67E-04
1,1-Dichloroethane	1.13E-05	lb/MMBtu	9.55E-05	4.18E-04
1,2-Dichloroethane	1.13E-05	lb/MMBtu	9.55E-05	4.18E-04
1,2-Dichloropropane	1.30E-05	lb/MMBtu	1.10E-04	4.81E-04
1,3-Butadiene	6.63E-04	lb/MMBtu	5.61E-03	2.46E-02
1,3-Dichloropropene	1.27E-05	lb/MMBtu	1.07E-04	4.70E-04
Acetaldehyde	2.79E-03	lb/MMBtu	0.02	1.03E-01
Acrolein	2.63E-03	lb/MMBtu	0.02	9.74E-02
Benzene	1.58E-03	lb/MMBtu	0.01	5.85E-02
Butyr/isobutyraldehyde	4.86E-05	lb/MMBtu	4.11E-04	1.80E-03
Carbon Tetrachloride	1.77E-05	lb/MMBtu	1.50E-04	6.56E-04
Chlorobenzene	1.29E-05	lb/MMBtu	1.09E-04	4.78E-04
Chloroform	1.37E-05	lb/MMBtu	1.16E-04	5.07E-04
Ethane	7.04E-02	lb/MMBtu	5.95E-01	2.61E+00
Ethylbenzene	2.48E-05	lb/MMBtu	2.10E-04	9.18E-04
Ethylene Dibromide	2.13E-05	lb/MMBtu	1.80E-04	7.89E-04
Formaldehyde	**0.05**	**g/bhp-hr**	**0.102**	**0.446**
Methanol	3.06E-03	lb/MMBtu	0.03	0.11
Methylene Chloride	4.12E-05	lb/MMBtu	3.48E-04	1.53E-03
Naphthalene	9.71E-05	lb/MMBtu	8.21E-04	3.60E-03
PAH	1.41E-04	lb/MMBtu	1.19E-03	5.22E-03
Styrene	1.19E-05	lb/MMBtu	1.01E-04	4.41E-04
Toluene	5.58E-04	lb/MMBtu	4.72E-03	2.07E-02
Vinyl Chloride	7.18E-06	lb/MMBtu	6.07E-05	2.66E-04
Xylene	1.95E-04	lb/MMBtu	1.65E-03	7.22E-03

[1] Fuel consumption from Waukesha gas engines 3524GSI (VHP - F3524GSI) performance data for 110% overload (924 BHP), high heat value (HHV).
[2] Heating value of natural gas taken from WBI Energy gas analysis

[3] Emission factors for NO_X, CO, NMHC from NSPS Subpart JJJJ. Emissions for formaldehyde from Technical Data Sheet for Waukesha3524GSI (VHP - F3524GSI) that was adjusted for a factor of safety. Emission factors for CO_2, CH_4, and N_2O from 40 CFR 98 Subpart C. 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 - Addition of Three Compressor Engines
Subject: Potential to Emit Calculations
Task: Fugitive Emissions from Leaks

Prepared: AMC
Reviewed: CAB
Date: 8-Jun-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 - Addition of Three Compressor Engines
Subject: Potential to Emit Calculations
Task: Emissions from Comfort Heating

Prepared: AMC
Reviewed: PCB
Date: 8-Jun-20

Boiler Two Weil-McLain LGB-20 (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 - Addition of Three Compressor Engines
Subject: Potential to Emit Calculations
Task: Emissions from Comfort Heating

Prepared: AMC
Reviewed: PCB
Date: 8-Jun-20

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 - Addition of Three Compressor Engines
Subject: Potential to Emit Calculations
Task: Tank Emissions

Prepared: KAT

Date: 8-Jun-20

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 - Addition of Three Compressor Engines
Subject: Potential to Emit Calculations
Task: Fugitive Emissions from Blowdown, Startup and Operation

Prepared: AMC
Date: 8-Jun-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.

ERM The business of sustainability

Facility Name: Tioga Compressor Station - Addition of Three Compressor Engines
Subject: Potential to Emit Calculations
Task: Fugitive Emissions from Pigging

Prepared: AMC
Date: 8-Jun-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], %	0.022%
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 (Tons per Event)					
Pigging Identification	**Frequency (years)**	**MMSCF/Event**	**VOC**	**HAP**	**CO_2e**	**CO_2**	**CH_4**	**N_2O**
Tioga-Elkhorn Creek 24"	10	9.5	15.24	0.06	3,724	7.08	148.68	0.00
Nesson Loop 12", Nesson Plant Valve (MP 0.0)	10	2.2	3.53	0.01	862	1.64	34.43	0.00
Tioga Plant Lateral 20", Hess Receipt Station (MP 0.0)	5	0.2	0.24	0.00	59	0.11	2.35	0.00
Norse Loop 12", Norse Receipt Station	10	3.3	5.21	0.02	2	2.42	0.00	0.00
Total			**24.22**	**0.10**	**4,648**	**11.25**	**185.46**	**0.00**

Worst-case emissions if all pigging activities would occur in the same 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 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 9 Acres (or) 2,280 Sq. Ft.	MSL Elevation at Facility 2,270 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	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
EU02	Engine/Compressor #2	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
EU03	Engine/Compressor #3	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
EU04	Engine/Compressor #4	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
EU05	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 EU05	40 CFR 60 Subpart JJJJ, 40 CFR 63 Subpart ZZZZ

SECTION E – TOTAL POTENTIAL EMISSIONS

Pollutant	Amount (Tons Per Year)
NO_x	65.47
CO	74.03
PM	4.22

Pollutant	Amount (Tons Per Year)
PM_{10} (filterable and condensable)	4.22
$PM_{2.5}$ (filterable and condensable)	4.22
SO_2	0.23
VOC	92.82 (without fugitives)
GHG (as CO_2e)	52,638
Largest Single HAP	4.86
Total HAPS	11.93

*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

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 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) 392,040 Sq. Ft.	MSL Elevation at Plant 2,270 feet	

Describe Nature of Business/Process

Natural Gas Transmission - Gas Compressor Station

SECTION B – STACK DATA

Inside Diameter (ft) 2 feet	Height Above Grade (ft) 42 feet	
Gas Temperature at Exit (°F) 823 F	Gas Velocity at Exit (ft/sec) 126.9 feet / second	Gas Volume (scfm) 9,844 SCFM
Basis of any Estimates (attach separate sheet if necessary) Manufacturer's specifications.		
Are Emission Control Devices in Place? If YES – Complete SFN 8532	◉ Yes	○ No
Nearest Residences or Building	Distance (ft) 2,317	Direction E
Nearest Property Line	Distance (ft) 40	Direction E

SECTION C – EMISSION STREAM DATA

Source ID No. From SFN 8516 EU 02	Mean Particle Diameter (um) N/A
Flow Rate (scfm) 9,844 SCFM	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 159ppm @ 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	Date

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	MECB-OX-SB2700-2421-2338-291	April 2021

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

Pollutants Removed	CO	NMNEHC	CH2O	
Design Efficiency (%)				
Operating Efficiency (%)	75	29	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)				9,844 SCFM
Gas Temperature (°F)			550F -1250F	823 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) 8 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 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	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 @ 1000 rpm	3,750 @ 1000 rpm

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
186.5 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		42 feet	
Stack Diameter (feet at top)	**Gas Discharged (SCFM)**	**Exit Temp (°F)**	**Gas Velocity (FPS)**
2 feet	9,844 scfm	823 F	126.9 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	4.13	18.11	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	0.25	1.11	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
PM_{10} (filterable and condensable)	0.25	1.11	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
$PM_{2.5}$ (filterable and condensable)	0.25	1.11	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
SO_2	0.01	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)	2,973	13,021	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	0.82	3.61	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

EU03

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) 392,040 Sq. Ft.	MSL Elevation at Plant 2,270 feet	

Describe Nature of Business/Process

Natural Gas Transmission - Gas Compressor Station

SECTION B – STACK DATA

Inside Diameter (ft) 2 feet	Height Above Grade (ft) 42 feet	
Gas Temperature at Exit (°F) 823 F	Gas Velocity at Exit (ft/sec) 126.9 feet / second	Gas Volume (scfm) 9,844 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) 2,320	Direction E
Nearest Property Line	Distance (ft) 39	Direction E

SECTION C – EMISSION STREAM DATA

Source ID No. From SFN 8516 EU 03	Mean Particle Diameter (um) N/A
Flow Rate (scfm) 9,844 SCFM	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 159ppm @ 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	Date

<u>SEND COMPLETED APPLICATION AND ALL ATTACHMENTS 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 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	MECB-OX-SB2700-2421-2338-291	April 2021

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

Pollutants Removed	CO	NMNEHC	CH2O	
Design Efficiency (%)				
Operating Efficiency (%)	75	29	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)				9,844 SCFM
Gas Temperature (°F)			550F -1250F	823 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)
8 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 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)	[x] Stationary Natural Gas-Fired Engine [ ] Stationary Diesel and Dual Fuel Engine [ ] Stationary Gasoline Engine [ ] Stationary Natural Gas-Fired Turbine	[ ] Emergency Use Only [x] Non-Emergency Use [ ] Peaking [ ] Demand Response
	[ ] Other – Specify:	

SECTION C – MANUFACTURER DATA

Make	Model	Date of Manufacture
Caterpillar	G 3612	To Be Determined

Reciprocating Internal Combustion Engine

[x] Spark Ignition [ ] Compression Ignition

[x] 4 Stroke [ ] 2 Stroke | [ ] Rich Burn [x] Lean Burn

Maximum Rating (BHP @ rpm)	Operating Capacity (BHP @ rpm)
3,750 @ 1000 rpm	3,750 @ 1000 rpm

Engine Subject to:
[ ] 40 CFR 60, Subpart IIII [x] 40 CFR 60, Subpart JJJJ [x] 40 CFR 63, Subpart ZZZZ
[ ] 40 CFR 60, Subpart OOOO [x] 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
186.5 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)	
EP03		42 feet	
Stack Diameter (feet at top)	**Gas Discharged (SCFM)**	**Exit Temp (°F)**	**Gas Velocity (FPS)**
2 feet	9,844 scfm	823 F	126.9 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	4.13	18.11	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	0.25	1.11	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
PM_{10} (filterable and condensable)	0.25	1.11	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
$PM_{2.5}$ (filterable and condensable)	0.25	1.11	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
SO_2	0.01	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)	2,973	13,021	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	0.82	3.61	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

EU04

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) 392,040 Sq. Ft.	MSL Elevation at Plant 2,270 feet	

Describe Nature of Business/Process

Natural Gas Transmission - Gas Compressor Station

SECTION B – STACK DATA

Inside Diameter (ft) 2 feet	Height Above Grade (ft) 42 feet	
Gas Temperature at Exit (°F) 823 F	Gas Velocity at Exit (ft/sec) 126.9 feet / second	Gas Volume (scfm) 9,844 SCFM
Basis of any Estimates (attach separate sheet if necessary) Manufacturer's specifications.		
Are Emission Control Devices in Place? If YES – Complete SFN 8532	◉ Yes	◯ No
Nearest Residences or Building	Distance (ft) 2,321	Direction E
Nearest Property Line	Distance (ft) 39	Direction E

SECTION C – EMISSION STREAM DATA

Source ID No. From SFN 8516 EU 04	Mean Particle Diameter (um) N/A
Flow Rate (scfm) 9,844 SCFM	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 159ppm @ 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	Date

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	MECB-OX-SB2700-2421-2338-291	April 2021

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

Pollutants Removed	CO	NMNEHC	CH2O	
Design Efficiency (%)				
Operating Efficiency (%)	75	29	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)				9,844 SCFM
Gas Temperature (°F)			550F -1250F	823 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)
8 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 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	To Be Determined

Reciprocating Internal Combustion Engine	
☒ Spark Ignition	☐ Compression Ignition
☒ 4 Stroke ☐ 2 Stroke	☐ Rich Burn ☒ Lean Burn
Maximum Rating (BHP @ rpm) 3,750 @ 1000 rpm	Operating Capacity (BHP @ rpm) 3,750 @ 1000 rpm

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
186.5 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)	
EP04		42 feet	
Stack Diameter (feet at top)	**Gas Discharged (SCFM)**	**Exit Temp (°F)**	**Gas Velocity (FPS)**
2 feet	9,844 scfm	823 F	126.9 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	4.13	18.11	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	0.25	1.11	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
PM_{10} (filterable and condensable)	0.25	1.11	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
$PM_{2.5}$ (filterable and condensable)	0.25	1.11	Emission Factors based on AP-42, Ch 3.2, Table 3.2-2, July 2000
SO_2	0.01	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)	2,973	13,021	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	0.82	3.61	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

EU05

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) 392,040 Sq. Ft.	MSL Elevation at Plant 2,270 feet	

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) 30 feet	
Gas Temperature at Exit (°F) 1225 F	Gas Velocity at Exit (ft/sec) 53.34 feet / second	Gas Volume (scfm) 1,374 SCFM
Basis of any Estimates (attach separate sheet if necessary) Manufacturer's specifications.		
Are Emission Control Devices in Place? If YES – Complete SFN 8532	○ Yes	◉ No
Nearest Residences or Building	Distance (ft) 2,555	Direction E
Nearest Property Line	Distance (ft) 134	Direction E

SECTION C – EMISSION STREAM DATA

Source ID No. From SFN 8516 EU05	Mean Particle Diameter (um) N/A
Flow Rate (scfm) 1,374 SCFM	Drift Velocity (ft/sec) N/A
Stream Temperature (°F) 1225 F	Particulate Concentration (gr/dscf) N/A
Moisture Content (%) 0 %	Halogens or Metals Present? No
Pressure (in. Hg) N/A	Organic Content (ppmv) NMNEHC 78.9 ppmv
Heat Content (Btu/scfm) 1,193 Btu/scf	O_2 Content (%) 0 %

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	Date

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.	Tioga Compressor Station

SECTION B – FACILITY AND UNIT INFORMATION

Source ID Number (From form SFN 8516)		
EU05 Waukesha VHP - L594GSI natural gas-fired SI RICE (1380 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
Waukesha	VHP - F3524GSI	to be determined

Reciprocating Internal Combustion Engine

☒ Spark Ignition	☐ Compression Ignition
☒ 4 Stroke ☐ 2 Stroke	☒ Rich Burn ☐ Lean Burn
Maximum Rating (BHP @ rpm) 840 @ 1200 rpm	Operating Capacity (BHP @ rpm) 840 @ 1200 rpm

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
62.1 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)	
EP05		30 feet	
Stack Diameter (feet at top)	**Gas Discharged (SCFM)**	**Exit Temp (°F)**	**Gas Velocity (FPS)**
1.33 feet	1,374 SCFM	1225	53.34

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	2.04	8.92	Emission factor based on compliance with 40 CFR 60 Subpart JJJJ
CO	4.07	17.84	Emission factor based on compliance with 40 CFR 60 Subpart JJJJ
PM	0.16	0.72	Emission Factors based on AP-42, Ch 3.2, Table 3.2-3, July 2000
PM_{10} (filterable and condensable)	0.16	0.72	Emission Factors based on AP-42, Ch 3.2, Table 3.2-3, July 2000
$PM_{2.5}$ (filterable and condensable)	0.16	0.72	Emission Factors based on AP-42, Ch 3.2, Table 3.2-3, July 2000
SO_2	0.005	0.022	Emission Factors based on AP-42, Ch 3.2, Table 3.2-3, July 2000
VOC	1.43	6.25	Emission factor based on compliance with 40 CFR 60 Subpart JJJJ
GHG (as CO_2e)	990	4,336	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	0.102	0.446	largest single HAP is formaldehyde
Total HAPS	0.20	0.89	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

Appendix D

Manufacturer Specifications

G3612

GAS ENGINE TECHNICAL DATA

CATERPILLAR®

ENGINE SPEED (rpm):	1000
COMPRESSION RATIO:	7.6
AFTERCOOLER TYPE:	SCAC
AFTERCOOLER - STAGE 2 INLET (°F):	130
AFTERCOOLER - STAGE 1 INLET (°F):	174
JACKET WATER OUTLET (°F):	190
ASPIRATION:	TA
COOLING SYSTEM:	JW+1AC, OC+2AC
CONTROL SYSTEM:	ADEM4
EXHAUST MANIFOLD:	DRY
COMBUSTION:	LOW EMISSION
NOx EMISSION LEVEL (g/bhp-hr NOx):	0.5

RATING STRATEGY:	STANDARD
APPLICATION:	GAS COMPRESSION
RATING LEVEL:	CONTINUOUS
FUEL:	NAT GAS
FUEL SYSTEM:	GAV WITH AIR FUEL RATIO CONTROL
FUEL PRESSURE RANGE(psig): (See note 1)	58.0-70.3
FUEL METHANE NUMBER:	85
FUEL LHV (Btu/scf):	905
ALTITUDE CAPABILITY AT 100°F INLET AIR TEMP. (ft):	8492

RATING		NOTES	LOAD	100%	75%	50%
ENGINE POWER	(WITHOUT FAN)	(2)	bhp	3750	2813	1875
ENGINE EFFICIENCY	(ISO 3046/1)	(3)	%	38.9	37.8	35.4
ENGINE EFFICIENCY	(NOMINAL)	(3)	%	38.0	36.9	34.5

ENGINE DATA						
FUEL CONSUMPTION	(ISO 3046/1)	(4)	Btu/bhp-hr	6540	6737	7192
FUEL CONSUMPTION	(NOMINAL)	(4)	Btu/bhp-hr	6700	6902	7367
AIR FLOW (77°F, 14.7 psia)	(WET)	(5) (6)	ft3/min	9023	6820	4678
AIR FLOW	(WET)	(5) (6)	lb/hr	40009	30242	20744
FUEL FLOW (60ºF, 14.7 psia)			scfm	463	358	254
COMPRESSOR OUT PRESSURE			in Hg(abs)	97.7	74.2	52.6
COMPRESSOR OUT TEMPERATURE			°F	354	281	200
AFTERCOOLER AIR OUT TEMPERATURE			°F	132	133	133
INLET MAN. PRESSURE		(7)	in Hg(abs)	97.1	73.7	52.0
INLET MAN. TEMPERATURE	(MEASURED IN PLENUM)	(8)	°F	132	133	133
TIMING		(9)	°BTDC	18	17	16
EXHAUST TEMPERATURE - ENGINE OUTLET		(10)	°F	850	904	972
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia)	(WET)	(11) (6)	ft3/min	23520	18538	13378
EXHAUST GAS MASS FLOW	(WET)	(11) (6)	lb/hr	41279	31222	21441

EMISSIONS DATA - ENGINE OUT					
NOx (as NO2)	(12)(13)	g/bhp-hr	0.50	0.50	0.50
CO	(12)(14)	g/bhp-hr	2.20	2.20	2.20
THC (mol. wt. of 15.84)	(12)(14)	g/bhp-hr	3.96	4.15	4.14
NMHC (mol. wt. of 15.84)	(12)(14)	g/bhp-hr	0.37	0.38	0.38
NMNEHC (VOCs) (mol. wt. of 15.84)	(12)(14)(15)	g/bhp-hr	0.25	0.26	0.26
HCHO (Formaldehyde)	(12)(14)	g/bhp-hr	0.20	0.21	0.24
CO2	(12)(14)	g/bhp-hr	419	432	461
EXHAUST OXYGEN	(12)(16)	% DRY	11.4	11.1	10.7
LAMBDA	(12)(16)		1.99	1.95	1.88

ENERGY BALANCE DATA					
LHV INPUT	(17)	Btu/min	418752	323515	230236
HEAT REJECTION TO JACKET WATER (JW)	(18)(26)	Btu/min	39508	32125	26890
HEAT REJECTION TO ATMOSPHERE	(19)	Btu/min	17382	16643	13753
HEAT REJECTION TO LUBE OIL (OC)	(20)(27)	Btu/min	18844	17147	15196
HEAT REJECTION TO EXHAUST (LHV TO 77°F)	(21)(22)	Btu/min	145179	117268	86382
HEAT REJECTION TO EXHAUST (LHV TO 350°F)	(21)	Btu/min	91329	76935	59691
HEAT REJECTION TO A/C - STAGE 1 (1AC)	(23)(26)	Btu/min	28779	12900	2098
HEAT REJECTION TO A/C - STAGE 2 (2AC)	(24)(27)	Btu/min	7074	5204	3442
PUMP POWER	(25)	Btu/min	2957	2957	2957

CONDITIONS AND DEFINITIONS

Engine rating obtained and presented in accordance with ISO 3046/1. (Standard reference conditions of 77°F, 29.60 in Hg barometric pressure.) No overload permitted at rating shown. Consult the altitude deration factor chart for applications that exceed the rated altitude or temperature.

Emission levels are at engine exhaust flange prior to any after treatment. Values are based on engine operating at steady state conditions, adjusted to the specified NOx level at 100% load. Tolerances specified are dependent upon fuel quality. Fuel methane number cannot vary more than ± 3.

For notes information consult page three.

FUEL USAGE GUIDE

CAT METHANE NUMBER	<10	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	100
SET POINT TIMING	-	16	16	16	16	16	16	16	16	16	17	17	17	17	18	18	18	18
DERATION FACTOR	0	0.50	0.62	0.75	0.87	1	1	1	1	1	1	1	1	1	1	1	1	1

WOBBE INDEX(MJ/Nm3)	700	850	1550	1870
DERATION FACTOR	0.77	1	1	0.85

ALTITUDE DERATION FACTORS AT RATED SPEED

INLET AIR TEMP °F	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
130	1	1	1	1	1	0.98	0.95	0.91	0.88	0.84	0.81	0.77	0.74
120	1	1	1	1	1	1	1	0.96	0.92	0.87	0.83	0.79	0.74
110	1	1	1	1	1	1	1	1	0.97	0.91	0.86	0.81	0.75
100	1	1	1	1	1	1	1	1	1	0.97	0.90	0.83	0.77
90	1	1	1	1	1	1	1	1	1	0.98	0.91	0.84	0.77
80	1	1	1	1	1	1	1	1	1	1	0.93	0.85	0.78
70	1	1	1	1	1	1	1	1	1	1	0.94	0.86	0.78
60	1	1	1	1	1	1	1	1	1	1	0.96	0.87	0.79
50	1	1	1	1	1	1	1	1	1	1	0.98	0.89	0.79

ALTITUDE (FEET ABOVE SEA LEVEL)

AFTERCOOLER HEAT REJECTION FACTORS (ACHRF)

INLET AIR TEMP °F	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
130	1.33	1.38	1.43	1.48	1.54	1.59	1.64	1.70	1.76	1.81	1.82	1.82	1.82
120	1.27	1.31	1.36	1.41	1.47	1.52	1.57	1.63	1.68	1.74	1.74	1.74	1.74
110	1.20	1.25	1.30	1.34	1.40	1.45	1.50	1.55	1.61	1.66	1.67	1.67	1.67
100	1.13	1.18	1.23	1.28	1.32	1.38	1.43	1.48	1.53	1.59	1.59	1.59	1.59
90	1.06	1.11	1.16	1.21	1.25	1.30	1.35	1.41	1.46	1.51	1.52	1.52	1.52
80	1	1.04	1.09	1.14	1.18	1.23	1.28	1.33	1.39	1.44	1.44	1.44	1.44
70	1	1	1.02	1.07	1.11	1.16	1.21	1.26	1.31	1.36	1.37	1.37	1.37
60	1	1	1	1	1.04	1.09	1.14	1.19	1.24	1.29	1.29	1.29	1.29
50	1	1	1	1	1	1.02	1.07	1.11	1.16	1.21	1.22	1.22	1.22

ALTITUDE (FEET ABOVE SEA LEVEL)

MINIMUM SPEED CAPABILITY AT THE RATED SPEED'S SITE TORQUE (RPM)

INLET AIR TEMP °F	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
130	750	750	750	750	750	750	750	750	750	750	750	750	750
120	750	750	750	750	750	750	750	750	750	750	750	750	750
110	750	750	750	750	750	750	750	750	750	750	750	750	750
100	750	750	750	750	750	750	750	750	750	750	750	750	750
90	750	750	750	750	750	750	750	750	750	750	750	750	750
80	750	750	750	750	750	750	750	750	750	750	750	750	750
70	750	750	750	750	750	750	750	750	750	750	750	750	750
60	750	750	750	750	750	750	750	750	750	750	750	750	750
50	750	750	750	750	750	750	750	750	750	750	750	750	750

ALTITUDE (FEET ABOVE SEA LEVEL)

FUEL USAGE GUIDE:

This table shows the derate factor and full load set point timing required for a given fuel. Note that deration and set point timing adjustment may be required as the methane number decreases. Methane number is a scale to measure detonation characteristics of various fuels. The methane number of a fuel is determined by using the Caterpillar methane number calculation.
The Fuel Lower Heating Value (LHV) table shows the derate factor required for a given fuel. To determine the actual power available, use the lowest factor between the Fuel LHV table and the Caterpillar Methane Number table.

ALTITUDE DERATION FACTORS:

This table shows the deration required for various air inlet temperatures and altitudes. Use this information along with the fuel usage guide chart to help determine actual engine power for your site. The derate factors shown do not account for the external cooling system capacity. The derate factors provided assume the external cooling system can maintain the specified cooling water temperatures at site conditions.

ACTUAL ENGINE RATING:

To determine the actual rating of the engine at site conditions, one must consider separately, limitations due to fuel characteristics and air system limitations. The Fuel Usage Guide deration establishes fuel limitations. The Altitude/Temperature deration factors and RPC (reference the Caterpillar Methane Program) establish air system limitations. RPC comes into play when the Altitude/Temperature deration is less than 1.0 (100%). Under this condition, add the two factors together. When the site conditions do not require an Altitude/Temperature derate (factor is 1.0), it is assumed the turbocharger has sufficient capability to overcome the low fuel relative power, and RPC is ignored. To determine the actual power available, take the lowest rating between 1) and 2).

1) Fuel Usage Guide Deration
2) 1-((1-Altitude/Temperature Deration) + (1-RPC))

AFTERCOOLER HEAT REJECTION FACTORS(ACHRF):

To maintain a constant air inlet manifold temperature, as the inlet air temperature goes up, so must the heat rejection. As altitude increases, the turbocharger must work harder to overcome the lower atmospheric pressure. This increases the amount of heat that must be removed from the inlet air by the aftercooler. Use the aftercooler heat rejection factor (ACHRF) to adjust for inlet air temp and altitude conditions. See notes 26 and 27 for application of this factor in calculating the heat exchanger sizing criteria. Failure to properly account for these factors could result in detonation and cause the engine to shutdown or fail.

MINIMUM SPEED CAPABILITY AT THE RATED SPEED'S SITE TORQUE (RPM):

This table shows the minimum allowable engine turndown speed where the engine will maintain the Rated Speed’s Torque for the given ambient conditions.

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. ISO 3046/1 engine efficiency tolerance is (+)0, (-)5% of full load % efficiency value. Nominal engine efficiency tolerance is ± 2.5% of full load % efficiency value.
4. ISO 3046/1 fuel consumption tolerance is (+)5, (-)0% of full load data. Nominal fuel consumption tolerance is ± 2.5% of full load data.
5. Air flow value is on a 'wet' basis. Flow is a nominal value with a tolerance of ± 5 %.
6. Inlet and Exhaust Restrictions must not exceed A&I limits based on full load flow rates from the standard technical data sheet.
7. Inlet manifold pressure is a nominal value with a tolerance of ± 5 %.
8. Inlet manifold temperature is a nominal value with a tolerance of ± 9°F.
9. Timing indicated is for use with the minimum fuel methane number specified. Consult the appropriate fuel usage guide for timing at other methane numbers.
10. Exhaust temperature is a nominal value with a tolerance of (+)63°F, (-)54°F.
11. Exhaust flow value is on a 'wet' basis. Flow is a nominal value with a tolerance of ± 6 %.
12. Emissions data is at engine exhaust flange prior to any after treatment.
13. NOx values are the maximum values expected under steady state conditions.
14. CO, CO2, THC, NMHC, NMNEHC, and HCHO are the maximum values expected under steady state conditions. THC, NMHC, and NMNEHC do not include aldehydes. An oxidation catalyst may be required to meet Federal, State or local CO or HC requirements.
15. VOCs - Volatile organic compounds as defined in US EPA 40 CFR 60, subpart JJJJ
16. Exhaust Oxygen tolerance is ± 0.5; Lambda tolerance is ± 0.05. Lambda and Exhaust Oxygen level are the result of adjusting the engine to operate at the specified NOx level.
17. LHV rate tolerance is ± 2.5%.
18. Heat rejection to jacket water value displayed includes heat to jacket water alone. Value is based on treated water. Tolerance is ± 10% of full load data.
19. Heat rejection to atmosphere based on treated water. Tolerance is ± 50% of full load data.
20. Lube oil heat rate based on treated water. Tolerance is ± 20% of full load data.
21. Exhaust heat rate based on treated water. Tolerance is ± 10% of full load data.
22. Heat rejection to exhaust (LHV to 77°F) value shown includes unburned fuel and is not intended to be used for sizing or recovery calculations.
23. Heat rejection to A/C - Stage 1 based on treated water. Tolerance is ±5% of full load data.
24. Heat rejection to A/C - Stage 2 based on treated water. Tolerance is ±5% of full load data.
25. Pump power includes engine driven jacket water and aftercooler water pumps. Engine brake power includes effects of pump power.
26. Total Jacket Water Circuit heat rejection is calculated as: (JW x 1.1) + (1AC x 1.05) + [0.99 x (1AC + 2AC) x (ACHRF - 1) x 1.05]. Heat exchanger sizing criterion is maximum circuit heat rejection at site conditions, with applied tolerances. A cooling system safety factor may be multiplied by the total circuit heat rejection to provide additional margin.
27. Total Second Stage Aftercooler Circuit heat rejection is calculated as: (OC x 1.2) + (2AC x 1.05) + [(1AC + 2AC) x 0.01 x (ACHRF - 1) x 1.05]. Heat exchanger sizing criterion is maximum circuit heat rejection at site conditions, with applied tolerances. A cooling system safety factor may be multiplied by the total circuit heat rejection to provide additional margin.

FREE FIELD MECHANICAL & EXHAUST NOISE

MECHANICAL: Sound Power (1/3 Octave Frequencies)

Percent Load	Engine Power	Overall	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz
%	bhp	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
100	3750	124.5	91.5	93.1	94.2	99.4	101.9	107.8	107.6	108.9	110.8	111.5
75	2813	122.9	89.8	92.2	95.9	99.1	101.7	106.9	107.5	109.0	110.7	111.1
50	1875	121.5	87.1	92.6	95.5	98.3	101.6	107.0	108.4	109.7	110.8	110.8

MECHANICAL: Sound Power (1/3 Octave Frequencies)

Percent Load	Engine Power	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz
%	bhp	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
100	3750	111.8	113.3	111.8	112.1	114.6	114.7	111.4	118.4	111.9	107.8	107.1
75	2813	111.0	112.3	111.2	111.4	113.4	113.9	111.7	111.3	110.0	107.8	102.9
50	1875	110.7	111.5	110.3	109.7	111.4	111.0	108.1	107.2	107.0	105.4	101.0

EXHAUST: Sound Power (1/3 Octave Frequencies)

Percent Load	Engine Power	Overall	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz
%	bhp	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
100	3750	146.8	107.3	111.5	115.3	116.7	114.8	116.7	118.6	117.9	119.0	126.4
75	2813	146.6	105.1	109.5	111.1	110.4	109.2	113.3	114.4	113.9	116.6	124.8
50	1875	144.0	103.0	103.2	103.8	103.6	103.2	107.1	109.2	110.2	114.4	122.9

EXHAUST: Sound Power (1/3 Octave Frequencies)

Percent Load	Engine Power	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz
%	bhp	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
100	3750	127.0	130.5	132.3	135.3	137.0	138.8	139.3	138.4	137.7	136.2	134.1
75	2813	127.0	130.1	132.0	135.6	137.4	139.6	139.9	138.1	136.2	134.2	131.4
50	1875	126.1	129.5	130.9	133.4	136.9	138.3	135.3	134.0	132.4	128.8	125.6

SOUND PARAMETER DEFINITION:
Sound Power Level Data - DM8702-03

Sound power is defined as the total sound energy emanating from a source irrespective of direction or distance. Sound power level data is presented under two index headings:
Sound power level -- Mechanical
Sound power level -- Exhaust

Mechanical: Sound power level data is calculated in accordance with ISO 3747. The data is recorded with the exhaust sound source isolated.

Exhaust: Sound power level data is calculated in accordance with ISO 6798 Annex A. Exhaust data is post-catalyst on gas engine ratings labeled as "Integrated Catalyst".

Measurements made in accordance with ISO 3747 and ISO 6798 for mechanical and exhaust sound level only. Frequency bands outside the displayed ranges are not measured, due to physical test, and environmental conditions that affect the accuracy of the measurement. No cooling system noise is included unless specifically indicated. Sound level data is indicative of noise levels recorded on one engine sample in a survey grade 3 environment.

How an engine is packaged, installed and the site acoustical environment will affect the site specific sound levels. For site specific sound level guarantees, sound data collection needs to be done on-site or under similar conditions.

Equipment Specification

Proposal Information

Proposal Number: JB-20-000397 Rev(1)
Date: **2/10/2020**
Project Reference: Enerflex - Q1200012/13 - WBI Station - Cat 3612 A4

Engine Information

Engine Make:	Caterpillar	Speed:	Rated
Engine Model:	G 3612 A4	Power Output:	3,750 bhp
Rated Speed:	1000 RPM	Exhaust Flow Rate:	23,913 acfm (cfm)
Fuel Description:	Natural Gas	Exhaust Temperature:	823 F
Hours Of Operation:	8760 Hours per year	Fuel Consumption:	6,772 btu/bhp-hr
Load:	100%	O_2:	11.6%
		H_2O:	17%

Emission Data (100% Load)

Emission	Raw Engine Emissions						Target Outlet Emissions						Calculated Reduction
	g/bhp-hr	*g/kW-hr*	*tons/yr*	*ppmvd @ 15% O_2*	*ppmvd*	*lb/MW-hr*	*g/bhp-hr*	*g/kW-hr*	*tons/yr*	*ppmvd @ 15% O_2*	*ppmvd*	*lb/MW-hr*	
NO_x*	*0.3*	0.402	10.86	27	42	0.89							
CO	*2.98*	3.996	107.91	439	691	8.81	0.21	0.28	7.55	31	48	0.62	*93%*
THC	6.46	8.663	221.45	1,812	2,488	19.1							
NMNEHC**	*0.62*	0.831	22.45	159	251	1.83	0.31	0.416	11.23	80	126	0.92	50%
CH_2O	*0.19*	0.255	6.88	26	41	0.56	*0.03*	0.04	1.09	4	6	0.09	84.2%

System Specifications

Oxidation (SP-PT-72-16080005-XH4B0, SP-PTH-72-TBD-HSG)

Design Exhaust Flow Rate:	23,914 acfm (cfm)
Design Exhaust Temperature:	823¡F
Housing Model Number:	SP-PT-72-16080005-HSG, SP-PTH-72-TBD-HSG
Element Model Number:	MECB-OX-SB2700-2421-2338-291
Number of Catalyst Elements:	4
Number of Spare Catalyst Tracks:	0
System Pressure Loss:	8.0 inches of WC (Clean) (19.9 mBar)
Sound Attenuation:	30-35 dBA insertion loss
Exhaust Temperature Limits***:	550 Ð 1250¡F (catalyst inlet); 1350¡F (catalyst outlet) Ð ¡C (catalyst inlet); ¡C (catalyst outlet)

* MW referenced as NO_2
** MW referenced as CH_4. Propane in the exhaust shall not exceed 15% by volume of the NMNEHC compounds in the exhaust, excluding aldehydes. The 15% (vol.) shall be established on a wet basis, reported on a methane molecular weight basis. The measurement of exhaust NMNEHC composition shall be based upon EPA method 320 (FTIR), and shall exclude formaldehyde.
*** General catalyst temperature operating range. Performance is based on the Design Exhaust Temperature.

EngCalc 3524GSI Tioga field gas - Tioga ND

VHP - F3524GSI

Waukesha Pearce Industries Bill Balough 412-951-9028 balough@wpi.com

Power Generation

ENGINE SPEED (rpm):	1200	NOx SELECTION (g/bhp-hr):	0.15
DISPLACEMENT (in3):	3520	COOLING SYSTEM:	JW, IC + OC
COMPRESSION RATIO:	8:1	INTERCOOLER WATER INLET (°F):	130
IGNITION SYSTEM:	ESM2	JACKET WATER OUTLET (°F):	180
EXHAUST MANIFOLD:	Water Cooled	JACKET WATER CAPACITY (gal):	49
COMBUSTION:	Rich Burn, Turbocharged	AUXILIARY WATER CAPACITY (gal):	8
ENGINE DRY WEIGHT (lbs):	16000	LUBE OIL CAPACITY (gal):	72
AIR/FUEL RATIO SETTING:	0.38% CO	MAX. EXHAUST BACKPRESSURE (in. H2O):	18
ENGINE SOUND LEVEL (dBA)	101	MAX. AIR INLET RESTRICTION (in. H2O):	15
IGNITION TIMING:	ESM2 Controlled	EXHAUST SOUND LEVEL (dBA)	110
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):	100
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 100 °F		
POWER RATING	**UNITS**			**100%**	**75%**	**55%**
CONTINUOUS ENGINE POWER	BHP	924	840	840	630	464
OVERLOAD	% 2/24 hr	Note 18	10	10	-	-
ELECTRICAL EFFICIENCY (LHV)	%	29.1	28.8	28.8	27.8	26.7
GENERATOR OUTPUT	kWe	651	592	592	444	327
GENERATOR kVA	kVA	814	740	740	555	409
GENERATOR CURRENT	Amps	980	891	891	668	493
based on 94.5% generator efficiency at 0.8 PF, no auxiliary engine driven equipment						
FUEL CONSUMPTION						
FUEL CONSUMPTION (LHV)	BTU/BHP-hr	8272	8366	8367	8671	9030
FUEL CONSUMPTION (HHV)	BTU/BHP-hr	9151	9254	9255	9591	9989
FUEL FLOW *based on fuel analysis LHV*	SCFM	119	109	109	85	65
HEAT REJECTION						
JACKET WATER (JW)	BTU/hr x 1000	2373	2209	2209	1771	1389
LUBE OIL (OC)	BTU/hr x 1000	353	345	345	321	294
INTERCOOLER (IC)	BTU/hr x 1000	162	146	146	98	49
EXHAUST	BTU/hr x 1000	2182	1968	1968	1451	1061
RADIATION	BTU/hr x 1000	370	357	357	324	297
EMISSIONS (CATALYST OUT):						
NOx (NO + NO2)	g/bhp-hr	0.15	0.15	0.15	0.15	0.15
CO	g/bhp-hr	0.3	0.3	0.3	0.3	0.3
THC	g/bhp-hr	1.7	1.7	1.7	1.7	1.7
NMHC	g/bhp-hr	0.75	0.75	0.75	0.75	0.75
NM,NEHC (VOC)	g/bhp-hr	0.23	0.23	0.23	0.23	0.23
CO2	g/bhp-hr	547	553	553	572	596
CO2e	g/bhp-hr	571	577	577	596	619
CH2O	g/bhp-hr	0.00	0.001	0.001	0.001	0.001
CH4	g/bhp-hr	0.95	0.95	0.95	0.95	0.95
AIR INTAKE / EXHAUST GAS						
INDUCTION AIR FLOW	SCFM	1387	1275	1275	991	760
EXHAUST GAS MASS FLOW	lb/hr	6457	5937	5936	4614	3539
EXHAUST GAS FLOW *at exhaust temp, 14.5 psia*	ACFM	4896	4446	4445	3338	2480
EXHAUST TEMPERATURE	°F	1246	1225	1225	1168	1117

HEAT EXCHANGER SIZING[12]			
TOTAL JACKET WATER CIRCUIT (JW)	BTU/hr x 1000	2691	2505
TOTAL AUXILIARY WATER CIRCUIT (IC + OC)	BTU/hr x 1000	585	557

COOLING SYSTEM WITH ENGINE MOUNTED WATER PUMPS		
JACKET WATER PUMP MIN. DESIGN FLOW	GPM	225
JACKET WATER PUMP MAX. EXTERNAL RESTRICTION	psig	15
AUX WATER PUMP MIN. DESIGN FLOW	GPM	48
AUX WATER PUMP MAX. EXTERNAL RESTRICTION	psig	22

All data provided per the condtions listed in the notes section on page three.

Data Generated by EngCalc Program Version 4.0 INNIO Waukesha Gas Engines, Inc.

5/21/2020 7:57 AM

EngCalc 3524GSI Tioga field gas - Tioga ND

VHP - F3524GSI

Waukesha Pearce Industries Bill Balough 412-951-9028 balough@wpi.com

Power Generation

FUEL COMPOSITION

HYDROCARBONS:		Mole or Volume %
Methane	CH4	67.48
Ethane	C2H6	19.9
Propane	C3H8	5.163
Iso-Butane	I-C4H10	0.157
Normal Butane	N-C4H10	0.319
Iso-Pentane	I-C5H12	0.0175
Normal Pentane	N-C5H12	0.0174
Hexane	C6H14	0
Heptane	C7H16	0
Ethene	C2H4	0
Propene	C3H6	0
	SUM HYDROCARBONS	93.054
NON-HYDROCARBONS:		
Nitrogen	N2	6.02
Oxygen	O2	0
Helium	He	0
Carbon Dioxide	CO2	0.924
Carbon Monoxide	CO	0
Hydrogen	H2	0
Water Vapor	H2O	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.

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. NO_x, 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

Site conditions over 100 °F or 1500 ft may require a special generator or radiator. Contact Application Engineering.

Appendix E

Onsite Meteorological Data Processing, Tioga, ND
(Bison Engineering, June 2020)

On-Site Meteorological Data Processing Tioga, ND

Presented to:

North Dakota Department of Environmental Quality

Environmental Health Section

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Bismarck, ND 58501-1947

Prepared for:

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June 16, 2020

1) Introduction

Dispersion modeling has been required as an integral measure for the purpose of obtaining a Permit-To-Construct (PTC) for WBI Energy, Inc. (WBI) from the North Dakota Department of Environmental Quality (NDDEQ). To that end, WBI has submitted an air quality permit application for the construction and operation of a new gas compressor and processing station to be located near the town of Tioga, ND. Among the requirements is a demonstration that the facility of interest (WBI) along with all other significant sources, including background concentrations, does not cause or contribute to an exceedance of the National Ambient Air Quality Standards (NAAQS)[1] or the North Dakota Ambient Air Quality Standards (NDAAQS)[2].

Among the air pollutants to be included in the dispersion modeling simulations include NO_2. EPA and North Dakota guidelines[3] have indicated that in addition to the WBI facility itself, emissions from the Hess Corporation (Hess) Tioga Gas Plant (TGP) also need to be included in the modeling effort.

Bison Engineering, Inc. (Bison) has processed a meteorological dataset to be used for the air dispersion modeling analyses near Tioga, ND. The dataset uses one year of on-site surface meteorological data collected for the Hess TGP as a condition to their air quality permit. The data is processed within the AERMET pre-processor for use in the AERMOD modeling system.

The following sections detail the selection and processing of the data utilized to create the AERMET files, including surface and upper air data selections, surface characterizations, and technical selections within AERMET.

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[1] The NAAQS are found in 40 CFR 50.

[2] https://www.epa.gov/sites/production/files/2018-07/documents/33-15-2-ambient air quality standards final.pdf

[3] NDDEQ Modeling Guideline (June 2013): https://deq.nd.gov/publications/AQ/policy/Modeling/ND_Air_Dispersion_Modeling_Guide.pdf and Appendix W (January 2017): https://www3.epa.gov/ttn/scram/guidance/guide/appw_17.pdf

2) Data Processing

The AERMET pre-processor was used to prepare meteorological data for use in AERMOD. Guidance provided in the most recent AERMET Implementation Guide (EPA, 2019) was utilized. AERMET uses three steps to pre-process and combine the surface and upper-air soundings to output data in a format that is compatible with AERMOD. The first step extracts the data and performs a brief quality assurance check of the data. The second step merges the meteorological data sets. The third step outputs the data in the AERMOD-compatible format while also incorporating surface characteristics surrounding the collection or application site.

The output from the AERMET model consists of two separate files—the surface conditions file (*.SFC) and a vertical profile dataset (*.PFL). AERMOD uses these two files in the dispersion-modeling algorithm to predict pollutant concentrations resulting from a source's emissions.

The AERSURFACE program was used to determine the surface characteristics surrounding the monitoring site. AERSURFACE was developed by the EPA to assist in determining surface characteristics by using U.S. Geological Survey (USGS) land use maps and converting the land use type to values described in the AERMET User's Guide (EPA, 2004). AERSURFACE uses a 1-km radius surrounding the monitoring site to determine surface roughness values for each sector, and a 10x10-km area to determine the mid-day albedo and daytime Bowen Ratio. Average site precipitation data over a 30-year period is also analyzed to determine if individual years rate as dry, average, or wet in the context of AERSURFACE.

The noontime albedo, daytime Bowen ratio, and surface roughness lengths are considered when conducting the Stage 3 AERMET processing. Collectively these are described as surface characteristics. Surface characteristics can vary by season and region (sector) around the data collection site.

The mid-day albedo is the fraction of total incident solar radiation reflected by the surface back to space without absorption. The daytime Bowen ratio is an indicator of surface moisture, which is the ratio of the sensible heat flux to the latent heat flux. The Bowen ratio is used to determine the planetary boundary layer parameters for convective conditions. Surface roughness length is related to the height of obstacles to the wind flow and is the height at which the mean horizontal wind speed is zero. The AERMOD model uses the surface characteristics to define dispersion coefficients in the model.

The latest EPA-recommended versions of the modeling programs were used, including:

Program	Version
AERMET	19191
AERMINUTE	15272
AERSURFACE	20060

3) Data Selection

AERMET utilizes surface and upper air meteorological data files to provide information on wind speed and direction, ambient temperature, and cloud cover. These parameters are used to estimate dispersion parameters within AERMOD.

The following observational meteorological data were used in this analysis:

Surface Data (Primary):	Tioga, ND; Station #1 (Hess)
Surface Data (Secondary):	Williston, ND; Station KISN
Upper Air Data:	Glasgow, MT; Station KGGW

<u>Surface Meteorological Data</u>

Primary Data

One year of data collected on-site at the TGP in 2015 was utilized as the primary surface meteorological dataset in AERMET. The rationale and selection of this data is presented below.

The dispersion modeling guidelines[4] suggest that the meteorological data used should be representative of the project area. The guidelines go on to state:

> *"Site-specific measured data are, therefore, preferred as model input, provided that appropriate instrumentation and quality assurance procedures are followed, and that the data collected are adequately representative (free from inappropriate local or microscale influences) and compatible with the input requirements of the model to be used."* 40 CFR 51, Appendix W. Section 8.4.4.1.

Hess has operated a nearby meteorological station from 1986 to 2016. The monitoring site included the measurement of hourly wind speed, wind direction, wind sigma and temperature. This was known as Station #1. The meteorological station (including an ambient SO_2 monitor) began moving to a new location (now referred to as Station #4) in late 2016. The new site is located roughly 7 km to the northeast of the TGP. Station #1, on the other hand, was less than 1 km from the plant boundary.

The old site (Station #1) was decommissioned as an integral part of implementing the Data Requirements Rule (DDR).[5] The "new" (relocated) station became operational and

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[4] NDDEQ Modeling Guideline (June 2013): https://deq.nd.gov/publications/AQ/policy/Modeling/ND_Air_Dispersion_Modeling_Guide.pdf and Appendix W (January 2017): https://www3.epa.gov/ttn/scram/guidance/guide/appw_17.pdf

[5] DRR refers to the "Data Requirements Rule" which is found at 40 CFR 51.1200 – 1205. The rule generally outlines the ambient monitoring and/or dispersion modeling analyses that need to be conducted in order to determine the appropriate attainment classification for the 2010 national ambient air quality standard for sulfur dioxide.

collecting valid data (SO_2 and meteorology) around January 2017. Bison, on behalf of the Hess TGP, has been submitting quarterly ambient SO_2 and meteorological data from all monitoring sites to the NDDEQ since 1986.

The 2015 dataset was chosen for this modeling analysis. The reasons are two-fold:

1) Proximity to Facilities.

   Among the dataset and years of choice, Station #1 is located the closest to both the TGP and the proposed WBI facility. The station was located less than 1 km from the northern fenceline of TGP and about ½ km from the proposed WBI facility.

   The new location (late 2016) is about 7 kilometers from TGP and about 6 kilometers from the proposed WBI station. Given the terrain characterization of the area, this is sufficiently close to the facility for modeling purposes. However, it would seem imprudent to use this "new" site when there is recent data available from a location that is much closer to the facilities of interest.

   Therefore, Station #1 was chosen as the preferred meteorological site due to its proximity and its availability of recent data.

2) Data Completeness and Quality.

   The meteorological data collected at both Station #1 (through most of 2016) and the "new" Station #4 (beginning 2017) has been provided to NDDEQ in the form of quarterly reports. Insofar as data quality is concerned the data has been acceptable for most years and quarters.

   The meteorological data system (new and old location) is subject to frequent calibration and annual audits per QA guidelines. It is believed that the reported data meets minimum quality assurance requirements. A review of this data, 2015 in particular, shows a high degree of quality. Performance audits were conducted in all four quarters that year (March, June, August and December) and results were all within acceptable values.

   However, a review of the 2017 through 2019 data (when the meteorological station was relocated to Station #4), indicates at least one quarter in each year which had low data recovery (due to instrument freezing issues) for wind speed and direction. Calendar years 2017, 2018 and 2019 had one quarter with less than 54%, 28% and 16% data recovery, respectively. This drove the annual recovery below what might normally be acceptable (usually 90%). The less than typical recovery during each quarter of the three years did not meet desired levels for selection of a representative and complete dispersion modeling year.

Therefore, 2015 is the first available year with excellent data recovery (and QC) at Station #1. The data quality and quantity for this year is outstanding. Each month and quarter of that year had a data recovery of greater than 90%. The yearly data recovery was 97%, 98% and 98%; respectively for wind speed, wind direction (including wind sigma) and temperature.

Calendar year simultaneously yielded excellent quality data. As it regards meteorological data, monitoring guidelines suggest that an audit of the meteorological system should be conducted on a semi-annual basis. For this project, however, quarterly audits were conducted thus exceeding the minimum quality requirement.

As noted previously, audit and calibration data are found in the quarterly reports submitted to NDDEQ in 2015 and early 2016 for this site. Prior to presenting the data, it is worth noting that the results of all four audits indicated good comparison to the audit values. That being the case, it was decided that no calibrations (i.e. measuring and adjusting instrument output) of the equipment were necessary since the audit indicated an excellent comparison between the challenged parameter and instrumentation/system response.

Attachment 1 of this document provides a complete summary of the 2015 meteorological data. It includes the quantity and quality of results for each month, quarter, and year along with the results of all 4 quarterly audits of the site.

Because 2015 is the most recent year with the best combination of data recovery and quality, it was chosen as the year for analysis. That calendar year was further affirmed based on the quantity and quality of collected ozone data from the Lostwood monitoring station during the same time span. That data was also an important parameter in the eventual model runs.

Additionally, the Hess TGP Ambient Monitoring Program produces a Quality Assurance Project Plan (QAPP) and subsequent revisions, as needed, when changes are made to the monitoring network. The objective of the QAPP is to document the quality assurance organization, responsibilities, procedures, documentation, audits, control limits, and other criteria that have been established for the TGP to meet the monitoring objectives. QAPP Revisions have been submitted to NDDEQ on an ongoing basis.

A single year of on-site meteorological data was deemed acceptable for use in the modeling analysis since it represents wind conditions on site (as opposed to a NWS station at Williston 60 kilometers to the southwest). It is consistent with modeling guidelines (Section 8.4.2 of Appendix W) and was discussed with NDDEQ in a meeting on April 6, 2020.

Site-Specific Data Representativeness

As previously stated, the NDDEQ dispersion modeling guideline and Appendix W maintains that "*site-specific measured data are…preferred as model input*" given that appropriate instrumentation and quality assurance procedures are followed, and that the data collected are adequately representative of the local area. It continues to detail a minimum requirement for site-specific measurements to include ambient air temperature, transport wind speed and direction, and the variables necessary to estimate atmospheric dispersion. The Meteorological Monitoring Guidance for Regulatory Modeling Applications (MMGRMA) provides additional technical guidance in determining the representativeness of site-specific measurements.[6] It expands on data requirements and provides guidance for the collection and processing of meteorological data for general use in air quality modeling applications.

The MMGRMA document indicates that one of the most important decisions in preparing for an air quality modeling analysis is the selection of meteorological data. Ultimately, the data and site selection must be evaluated on the representativeness of the area – whether selecting a site for a monitoring station or selecting a station from an existing data base. As general rules, meteorological stations should be located outside of the influence from obstructions. They should also be located in an area representative of the meteorological conditions of the area of interest. Thirdly, stations should be routinely inspected for quality assurance. Station #1 at the TGP largely qualifies for these general rules. It operated in open, simple terrain located away from influence from nearby buildings, trees, and structures. This aided in the quality of data collected and in capturing representative conditions of the area of interest. Appropriately, Station #1 was located about ½ km from the proposed WBI facility which provides a meteorological dataset directly in the area of interest for the WBI model. Furthermore, the station was audited quarterly which provides ample routine quality assurance activities and site inspections to verify the siting and exposure of the sensors and instrumentation. To that point, Station #1 qualifies to the general rules provided in the MMGRMA guidance document.

However, it is important to further expand on the representativeness of the data selection. The MMGRMA guidance document defines representativeness as "the extent to which a set of measurements taken in a space-time domain reflects the actual conditions in the same or different space-time domain taken on a scale appropriate for a specific application". It continues to state that "meteorological data should be representative of conditions affecting the transport and dispersion of pollutants in the 'area of interest' as determined by the locations of the sources and receptors being modeled."

The representativeness of the meteorological data used in an air quality modeling analysis is generally dependent upon the proximity of the meteorological monitoring site to the "area-of-interest". Intuitively, a station closer to the project area should provide data representative of the local conditions and provide the closest approximation to the actual conditions in the same space-time domain. In this case, the next available dataset is the

[6] Meteorological Monitoring Guidance for Regulatory Modeling Applications (Feb 2000): https://www3.epa.gov/ttn/scram/guidance/met/mmgrma.pdf

Williston, ND Airport ASOS station used as the secondary surface dataset in the modeling analysis. It is located approximately 60-km away from the project area which is outside of the recommended technical range (50-km) of AERMOD when evaluating modeled concentration impacts.[7] Station #1 provides representative surface characteristics within the same space-time domain as the project-site and should provide accurate meteorological characteristics in place of the Williston dataset, where possible.

The WBI analysis utilizes a steady-state modeling application assessed in conjunction with steady-state meteorological conditions in the modeling domain. The project area represents open, simple terrain where it is acceptable for the meteorological measurements from a single location to apply at all locations within the modeling domain. Per the MMGRMA guidance, this requires a meteorological station that is located somewhere near the evaluated sources and at a location where meteorological conditions are consistent over the spatial domain of the application. Factors to consider include surface characteristics such as ground cover, surface roughness, and the presence of water bodies.

The surface roughness over an area reflects general surface features, land cover, and man-made/natural obstructions. These elements effect horizontal and vertical wind patterns. Additionally, the surface roughness length within AERMOD influences the surface shear stress and factors into the determination of mechanical turbulence and boundary layer stability. The collection of wind parameters at Station #1 matched with the surface roughness characteristics of the project area provide the most accurate representation of wind speed and direction parameters within the model. This further supports the representativeness and use of the meteorological data parameters collected at Station #1.

The MMGRMA document also points out that it is important to recognize that certain meteorological variables may be considered unrepresentative of another site (such as, wind direction or wind speed) while other variables may be representative (such as temperature, dew point, cloud cover). Exclusion of one variable from a meteorological site does not necessarily exclude all. In this case, the Williston dataset is not a misrepresentation of the project site. Rather, the meteorological data collected at Station #1 provides more representative data for the parameters collected at the site. Fortunately, the Williston dataset provides a robust secondary dataset to be used in support to the Station #1 data. This provides supplemental data for parameters missing from the Station #1 dataset as is described in the following section.

[7] The EPA does not recommend using AERMOD for long-range transport modeling (>50 km) because meteorological conditions can change quite drastically over longer distances or time scales. However, data from meteorological stations located beyond 50-km can still be used to evaluate model results given the station is representative of the project area. The evaluation of modeled concentration impacts is not recommended beyond 50-km.

Secondary Data

A secondary surface meteorological dataset was used to supplement missing data from the on-site dataset. The Williston Basin International Airport in Williston, ND (WBAN 94017) was selected as a secondary surface dataset. The airport meteorological tower is approximately 60 kilometers west-southwest of the project site and data is collected at an Automated Surface Observing System (ASOS) station that records minutely data. The 1-minute ASOS data was also processed using the AERMINUTE preprocessor and is supplemented into the AERMET dataset when required. ASOS is largely the favorable dataset used in modeling analyses in the absence of on-site data. The following information describes the qualifications of an ASOS meteorological station:

> **Automated Surface Observing System (ASOS)** units are operated and controlled cooperatively in the United States by the National Weather Service (NWS), Federal Aviation Administration (FAA), and Department of Defense (DOD). ASOS systems generally report at hourly intervals, but also report special observations if weather conditions change rapidly and cross aviation operation thresholds. Besides serving commercial aviation needs, the ASOS serves as a primary climatological observing network in the United States, designated as the first-order network of climate stations. The program supports forecast activities, aviation operations, and the needs of the meteorological, hydrological, and climatological research communities. The ASOS stations provide a more complete data record and are generally subjected to more rigorous quality assurance.

National Weather Surface (NWS) surface data from the Williston Basin International Airport station were downloaded from the National Climatic Data Center (NCDC) website in standard Integrated Surface Hourly Data (ISHD) format for 2015.[8]

Station metadata is included in Table 1 for both surface meteorological stations.

[8] NCDC data located at ftp://ftp.ncdc.noaa.gov/pub/data/noaa/

Table 1: Surface Meteorological Station Metadata

Location	Station Type	Call Name	WBAN	Lat	Lon	Elev. (m)
Hess TGP Station #1 Tioga, ND	On-Site	NA	NA	48.40875	-102.9088	761
Williston Basin International Airport Williston, ND	ASOS	KISN	94014	48.1737	-103.6373	580

Table 2 is a summary of the percent completeness of wind speed and wind direction data of the AERMET processed *.SCF file that utilizes both the primary and secondary surface datasets. Both parameters have 99.9% data completeness indicating an acceptable dataset for use in AERMOD.

Table 2: Meteorological Data Completeness of Wind Speed and Direction

Parameter	2015 *.SFC
Valid Wind Speed Observations	8752
Possible Observations	8760
% Complete	99.91%
Valid Wind Direction Observations	8751
Possible Observations	8760
% Complete	99.90%

Upper Air Meteorological Data:

Twice-daily upper air soundings required by AERMET were collected at the Glasgow, MT meteorological station, KGGW (WBAN 94008). Data were downloaded from the radiosonde data website in standard Forecast Systems Laboratory (FSL) format.[9] Glendive, MT is the closest upper air station to the project site. It is also the recommended upper-air site to be used with Williston surface data per the NDDEQ AERMET Surface Meteorology Stations (2004-2008) document. The document also recommends using a time zone adjustment factor of +6 for the Glasgow upper-air site when paired with Williston surface data. This time adjustment was used in the corresponding AERMET processing, as directed, since the Williston surface data is used as the secondary dataset and the TGP on-site dataset is in the same approximate area of North Dakota as Williston.

Land Surface Data:

Land Use data collected in the National Land Cover Database (NLCD) format was used in the AERSURFACE analysis. The newest version of AERSURFACE now supports

[9] Radiosonde data located at http://esrl.noaa.gov

newer data than the 1992 format so the 2016 dataset for North Dakota was downloaded from the Multi-Resolution Land Characteristics (MRLC) Consortium and used in the analysis.[10] NLCD data from 2016 is the most current dataset available for use in AERFURFACE. This analysis utilized the land cover, tree canopy, and impervious data files as required by AERSURFACE Version 20060.

Site precipitation data and snow cover data was not collected at the TGP Station #1 monitoring station. Therefore, the recommended AERSURFACE inputs were used in processing the meteorological data as outlined in the NDDEQ document, "Recommended AERSURFACE Inputs North Dakota (March 2017).[11] The document states that "other input values may be used, but require Department approval prior to use." Therefore, the recommended values are presumed to be acceptable selections since no site-specific data is readily available for Station #1. Therefore, the following AERSURFACE selections for the TGP Station #1 and Williston surface meteorological stations as presented in Table 3. Both stations utilize the same parameter unless specified.

Table 3: AERSURFACE Parameters for TGP Station #1 and the Williston Basin International Airport Meteorological Stations

Parameter	Value
Radius of Study Area	1.0 km (Default)
Number of Sectors	12
Temporal Resolution	Monthly
Continuous Snow Cover	Yes
Re-assign Months Different Seasons	Yes
Station Rank	Primary (TGP) Secondary (Williston)
Airport Site	No (TGP) Yes (Williston)
Arid Region	Yes
Surface Moisture Condition	Average

The months were re-assigned to the corresponding seasons of northwest North Dakota as listed in the Recommended AERSURFACE Inputs document. They are listed as follows:

[10] LULAC16 data located access at https://www.mrlc.gov
[11] Recommended AERSURFACE Inputs North Dakota (March 2017) located at https://deq.nd.gov/publications/AQ/policy/Modeling/AERSURFACE_InputsND.pdf

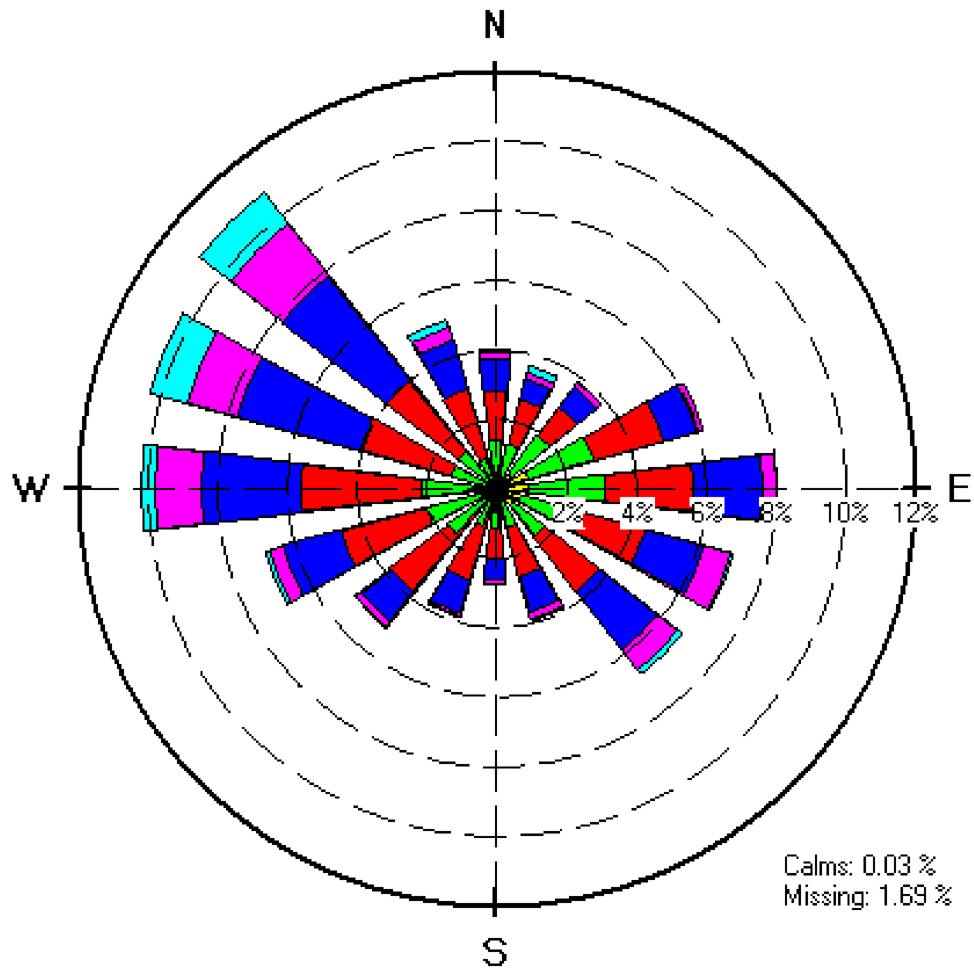
Table 4: Corresponding Months to Seasons for Northwest North Dakota

AERSURFACE Input	Description	Months	AERSURFACE Values
WINTERNS	Late autumn after first and harvest, or winter with no snow	Oct Nov Dec Mar	10 11 12 3
WINTERWS	Winter with continuous snow cover	Jan Feb	1 2
SPRING	Traditional Spring	Apr May	4 5
SUMMER	Midsummer with lush vegetation	Jun Jul Aug	6 7 8
FALL	Autumn with harvested cropland	Sep	9

Technical Selections

As previously stated, AERMET was processed using on-site surface data, NWS ASOS surface data, AERMINUTE data, and NWS upper-air data from 2015. The on-site data underwent a QA/QC process and was formatted for input into AERMET. Minute data was processed in the AERMINUTE pre-processor using a 0.5 m/s threshold wind speed. Data has been processed without the ADJ_U* switch enabled or the Bulk Richardson number Algorithm.[12] Calm hour distribution of the period is approximately 0.03% and missing data accounts for only 1.69% of the data period. For interest, a wind rose of the *.SCF file is included below. All AERMET selections are summarized in Attachment 2.

[12] The preamble to Appendix W suggests ADJ_U* not be used when turbulence data (wind sigma in this case) is used with on-site met data which is the case for this project. *82 FR 5187.*



<1.54 1.54 3.09 5.14 8.23 10.8 >10.8

Wind Speed Classes (mps)

Note: Diagram of the frequency of occurrence of each wind direction.

Met File Type: AERMET SFC
File: OSWG15.SFC

Figure 1
WINDROSE

On-Site Hess TGP Station #1
Secondary:
Station No. 94014
Williston Basin International AP

Attachment 1

On-Site Meteorological Data Summary: Quality and Quantity

Meteorological Audit and Data Recovery Results
Calendar Year 2015
Station #1 – Tioga, ND

This attachment contains a brief summary of the results of meteorological audits conducted at Station #1 near Tioga, ND. The data also includes a summary (month, quarter and year) of the data recovery analysis. The data presented is in reference to data collected during calendar year 2015. This attachment is an integral part of an analysis and justification for using this data as input to an air dispersion modeling effort.

As a side note, it is worth mentioning a full EPA Technical System Audit (TSA) has been scheduled for the site. Had it not been for the Covid-19 virus outbreak, the site portion of the audit would have likely already been completed. Nonetheless, Hess/Bison have previously completed multiple forms and data requested associated with the TSA. That information has been submitted to NNDEQ and is available if a casual review would prove useful.

It is noted that all of the information presented herein is a summary of data previously provided to the North Dakota Department of Environmental Quality (NDDEQ). Quarterly reports are prepared and submitted to NDDEQ on a routine basis. This includes quarterly reports for calendar year 2015. Those reports provide detailed information regarding the results of ambient monitoring and meteorological data. It includes hourly data along with the results of audits, data recovery and other salient data. As a result, this document is only a summary of that information for purposes of the dispersion modeling study.

Data Recovery

The number of hours of collected valid meteorological data for calendar year 2015 is shown below by month, quarter and year. It is expressed as both the number of hours and the % of recovery (# Hours ÷ Total hours).

Quarter #1:

Parameter	Readings Possible	Valid Readings	Percent Recovery
January 2015			
Wind Speed (Station #1)	744	742	99.7
Wind Direction (Station #1)	744	744	100.0
Temperature (Station #1)	744	744	100.0
February 2015			
Wind Speed (Station #1)	672	665	99.0
Wind Direction (Station #1)	672	672	100.0
Temperature (Station #1)	672	672	100.0
March 2015			
Wind Speed (Station #1)	744	738	99.2
Wind Direction (Station #1)	744	741	99.6
Temperature (Station #1)	744	741	99.6
Quarter 1			
Wind Speed (#1)	2,160	2,145	99.3
Wind Direction (#1)	2,160	2,157	99.9
Temperature (#1)	2,160	2,157	99.9

Quarter #2:

Parameter	Readings Possible	Valid Readings	Percent Recovery
April 2015			
Wind Speed (Station #1)	720	720	100.0
Wind Direction (Station #1)	720	720	100.0
Temperature (Station #1)	720	720	100.0
May 2015			
Wind Speed (Station #1)	744	690	92.7
Wind Direction (Station #1)	744	720	100.0
Temperature (Station #1)	744	720	100.0
June 2015			
Wind Speed (Station #1)	720	717	99.6
Wind Direction (Station #1)	720	717	99.6
Temperature (Station #1)	720	717	99.6
Quarter 2			
Wind Speed (#1)	2,184	2,127	97.4
Wind Direction (#1)	2,184	2,181	99.9
Temperature (#1)	2,184	2,181	99.9

Quarter #3:

Parameter	Readings Possible	Valid Readings	Percent Recovery
July 2015			
Wind Speed (Station #1)	744	599	80.5
Wind Direction (Station #1)	744	599	80.5
Temperature (Station #1)	744	599	80.5
August 2015			
Wind Speed (Station #1)	744	684	91.9
Wind Direction (Station #1)	744	684	91.9
Temperature (Station #1)	744	684	91.9
September 2015			
Wind Speed (Station #1)	720	720	100.0
Wind Direction (Station #1)	720	720	100.0
Temperature (Station #1)	720	711	98.8
Quarter 3			
Wind Speed (#1)	2,208	2,003	90.7
Wind Direction (#1)	2,208	2,003	90.7
Temperature (#1)	2,208	1,994	90.3

Quarter #4:

Parameter	Readings Possible	Valid Readings	Percent Recovery
October 2015			
Wind Speed (Station #1)	744	744	100.0
Wind Direction (Station #1)	744	744	100.0
Temperature (Station #1)	744	744	100.0
November 2015			
Wind Speed (Station #1)	720	720	100.0
Wind Direction (Station #1)	720	720	100.0
Temperature (Station #1)	720	720	100.0
December 2015			
Wind Speed (Station #1)	744	739	99.3
Wind Direction (Station #1)	744	739	99.3
Temperature (Station #1)	744	739	99.3
Quarter 4			
Wind Speed (#1)	2,208	2,203	99.8
Wind Direction (#1)	2,208	2,203	99.8
Temperature (#1)	2,208	2,203	99.8

Calendar Year 2015 Summary

Parameter	Readings Possible	Valid Readings	Percent Recovery
2015			
Wind Speed (Station #1)	8760	8478	96.8
Wind Direction (Station #1)	8760	8544	97.5
Temperature (Station #1)	8760	8535	97.4

The data indicates a high degree of recovery. Thus, the data is ideal for input into a dispersion model.

Meteorological Audits/Calibrations

Ambient monitoring guidelines suggest that an audit of the meteorological system should be conducted on a semi-annual basis. For this project, however, quarterly audits were conducted thus exceeding the minimum quality requirement.

As noted previously, audit and calibration data are found in the quarterly reports submitted to NDDEQ in 2015 and early 2016 for this site. Prior to presenting the data, it is worth noting that the results of all four audits indicated good comparison to the audit values. That being the case, it was decided that no calibrations (i.e. measuring and adjusting instrument output) of the equipment were necessary since the audit indicated an excellent comparison between instrument and data output compared to the challenged value. The following is a summary of that information.

Quarter #1 Audit:

March 27, 2015			
	Measured Value	**Sensor Response**	**Difference**
Temperature (degrees F)	14.0	14.8	0.8
RM Young – Model 41342	68.0	67.8	-0.2
	122.0	121.1	-0.9
Wind Direction (degrees)	CW Results		
RM Young – Model 05305	90	88	-2
	180	178	-2
	270	272	2
	360	360	0
	CCW Results		
	90	88	-2
	180	178	-2
	270	272	2
	360	360	0
Wind Speed	0.0	0.0	0.0
(miles per hour)	3.4	3.4	0.0
Synchronous Motor	6.9	6.9	0.0
RM Young – Model 05305	10.9	11.0	0.1

Quarter #2 Audit:

June 10, 2015			
	Measured Value	**Sensor Response**	**Difference**
Temperature (degrees F)	43.1	43.5	0.4
RM Young – Model 41342	61.5	62.0	0.5
	71.4	71.7	0.3
Wind Direction (degrees)	360	356	-4
RM Young – Model 05305	45	45	0
	90	93	3
	135	139	4
	180	182	2
	225	225	0
	270	274	4
	315	318	3
Wind Speed	0.00	0.00	0.00
(miles per hour)	3.44	3.48	0.04
Synchronous Motor	5.73	5.78	0.05
RM Young – Model 05305	6.87	6.94	0.07
	10.88	10.98	0.10

Quarter #3 Audit:

August 27, 2015			
	Measured Value	**Sensor Response**	**Difference**
Temperature (degrees F)	15.3	15.4	0.1
RM Young – Model 41342	68.0	68.2	0.2
	121.5	121.4	-0.1
Wind Direction (degrees)	CW		
RM Young – Model 05305	360	360	0
	90	89	-1
	180	179	-1
	270	271	1
	CCW		
	360	360	0
	90	89	-1
	180	179	-1
	270	271	1
Wind Speed	0.00	0.0	0.0
(miles per hour)	3.44	3.5	0.06
Synchronous Motor	6.87	6.9	0.03
RM Young – Model 05305	10.88	10.9	0.02

Quarter #4 Audit:

December 10, 2015			
	Audit	**Station**	
Temperature (degrees F)	91.9	92.5	0.6
RM Young – Model 41342	62.3	62.6	0.3
	28.6	29.3	0.7
Wind Direction (degrees)	CW0/360	5.5/356	
RM Young – Model 05305	45	46	1
	90	87	-3
	135	135	0
	180	181	1
	225	228	3
	270	270	0
	315	316	1
	CCW 0/360	0.3/356	
	45	46	1
	90	92	2
	135	139	4
	180	181	1
	225	227	2
	270	272	2
	315	316	1
Wind Speed	0.00	0.0	0.0
(miles per hour)	3.44	3.43	-0.01
Synchronous Motor	5.73	5.72	-0.01
RM Young – Model 05305	6.87	6.93	0.06
	10.88	10.95	0.07
Wind Sensor Starting Threshold Torque Measured Value:			0.8 gm-cm

Given the excellent 2015 data recovery and four quarterly audits, the data is suitable for use in dispersion modeling and many other meteorological data analyses.

Attachment 2

AERMET Processing Summary:
Data Inputs and Selections

Datasets			
	Surface	Onsite (Primary)	Hess TGP Station #1
		NWS (Secondary)	Williston, ND
	Upper Air	NWS	Glasgow, MT
	Aerminute	NWS	Williston, ND
	Aersurface	NLCD 2016	North Dakota
		Primary	Hess TGP Station #1
		Secondary	Williston, ND
Date Range			
	Start	1-Jan-15	
	End	31-Dec-15	
Onsite Surface Data			
	Site	Hess TGP Station #1	
	Location	Tioga, ND	
	Network Type	Hess Ambient Monitoring Program	
	File Name	OS15	
	File Type	PRN	
	Time Adjust	0	
	Site ID	555	
	Latitude (N)	48.409	
	Longitude (W)	102.91	
	Elevation (m)	761	
	Threshold Wind Speed (m/s)	0.5	
	Anemometer Height (m)	10	
	Bulk Richardson Number Algorithm	Not Selected	
	Fortran		
	Read Statement	OSYR OSMO OSDY OSHR WD01 WS01 TT01	
	Fortran Statement	(4(I2,1X),F8.0,F8.1,F8.1,)	
NWS Surface Data			
	Site	Williston Basin International Airport	
	Location	Williston, ND	
	Network Type	ASOS	
	File Name	727670-94014-2015	
	File Format	ISHD	
	Time Adjust	6	
	Site ID	94014	
	Latitude (N)	48.183	
	Longitude (W)	103.633	
	Elevation (m)	581	

NWS Upper Air Data		
	Site	Glasgow Valley County Airport
	Location	Glasgow, MT
	Database	NOAA/ESRL Radiosonde
	File Name	UA_GLAS_2015
	File Format	FSL
	Time Adjust	6
	Site ID	94008
	Latitude (N)	48.214
	Longitude (W)	106.621
AERMINUTE DATA		
	Site	Williston Basin International Airport
	Location	Williston, ND
	Network Type	ASOS
	File Names	64050KISN201501 to 64050KISN201512
	File Type	DAT
AERSURFACE OPTIONS		
	See Report Tables 3 and 4	
Output Options		
	Wind Sectors	
	Primary	12
	Secondary	12
	NWS Wind Directions	Randomize
	Adjust ASOS Wind Speeds	Selected
	Adjust Surface Velocity (U*)	Not Selected
	Wind Measurement Height (m)	10
	Surface Characteristics Frequency	
	Primary	Monthly
	Secondary	Monthly

Appendix F

ISR & Volumetric Flow Rate, Data Analysis for Tioga Gas Plant, Tioga, ND (Bison Engineering, Inc. June 2020)

ISR & Volumetric Flow Rate

Data Analysis for
Tioga Gas Plant
Tioga, ND

Presented to:

North Dakota Department of Environmental Quality
Environmental Health Section
918 E. Divide Ave.
Bismarck, ND 58501-1947

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May 28, 2020

1) Introduction

Dispersion modeling has been required as an integral measure for the purpose of obtaining a Permit-To-Construct (PTC) for WBI Energy, Inc. (WBI) from the North Dakota Department of Environmental Quality (NDDEQ). To that end, WBI has submitted an air quality permit application for the construction and operation of a new gas compressor and processing station to be located near the town of Tioga, ND. Among the requirements is a demonstration that the facility of interest (WBI) along with all other significant sources, including background concentrations, does not cause or contribute to an exceedance of the National Ambient Air Quality Standards (NAAQS)[1] or the North Dakota Ambient Air Quality Standards (NDAAQS)[2].

Among the air pollutants to be included in the dispersion modeling simulations include NO_2. EPA and North Dakota guidelines[3] have indicated that in addition to the WBI facility itself, emissions from the Hess Tioga Gas Plant also need to be included in the modeling effort.

One of the important parameters necessary for model execution for NO_2 includes the: In-Stack Ratio (ISR). ISR is the ratio of NO_2:NO in the stack itself just prior to being emitted into the ambient atmosphere. The reason this is an important variable in the modeling calculations is that the ambient standard itself is expressed as NO_2 (nitrogen dioxide) while emissions testing is usually only reported as NOx (total of NO and NO_2). The model is able to consider this differential, among other variables, to predict ambient concentrations of NO_2, not just NOx.

Another parameter necessary for model execution of stack exit volume/velocity. Previously, modeling exercises has relied on data provided to NDDEQ during a 2013 data request by the agency. That information was reviewed and adjusted accordingly for this modeling exercise.

It is the purpose of this document to review recent emissions data and EPA data base numbers in order to determine appropriate ISR values and appropriate stack parameters (primarily exit velocity) to be input into the dispersion model.

Section 2 provides a summary of available recent data and Section 3 provides a summary of those results and conclusions. Section 4 discusses the results of stack testing data as it pertains to stack exit volumetric and velocity flow data.

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[1] The NAAQS are found in 40 CFR 50.

[2] https://www.epa.gov/sites/production/files/2018-07/documents/33-15-2-ambient air quality standards final.pdf

[3] NDDEQ Modeling Guideline (June 2013):
https://deq.nd.gov/publications/AQ/policy/Modeling/ND_Air_Dispersion_Modeling_Guide.pdf
and Appendix W (January 2017): https://www3.epa.gov/ttn/scram/guidance/guide/appw_17.pdf

2) ISR Data Analysis

For purposes of this analysis, there are two potential sources of data to be investigated:

- EPA ISR Database:
- On-Site Stack Testing Data

Before investigating data sources, it is worth summarizing the various sources of emissions of NOx at the Tioga Gas Plant (TGP). There are six categories to be considered:

Category	Description / Name	Comment
Clark Compressor Engines	C-1A, C-1B, C-1C, C-1E, C-1G	1,920 hp @
Retrofit Compressor Engines	C-1D & C-1F	2,350 hp @
Turbine Engines	C-30100, C-30200 & C-30300	1,480 hp @
Boilers	B-1, B-2, B-3, B-4 & B-5	16.8 or 20.1 x 10^6 BTU/hr
Furnaces	F-1, F-2, F-3 & F-5A	25 x 10^6 BTU/hr
SRU Incinerator	S-302	

The most accurate ISR data would, of course, come from on-site emissions testing for the exact emitting units noted above. To that end, recent testing (past few years) documentation was sought to determine if the testing person/team measured both NO and NO_2 during the various testing campaigns. It was discovered that NO and NO_2 were simultaneously measured during testing of the Clark and Retrofit engines during 2017 and 2018. It appears that these two compounds were not measured simultaneously during the 2019 testing. Since there were recent available data, it was decided to review that data and use those testing results for ISR values for the tested sources.

The 2017 and 2018 testing were conducted in accordance with Sections 9, 10 and 11 of Title V permit T5-082002. The testing was conducted by Hess personnel on the Clark engines, Retrofit engines, and the Turbine engines.

Year:	2017
Test Date(s):	October 17 – 18
Engines Tested:	Clark, Retrofit, and Turbines
Report Date:	November 21, 2017
Sample Runs:	3 per engine
Sample Duration:	21 minutes per run

Year:	2018
Test Date(s):	October 16
Engines Tested:	Clark, Retrofit, and Turbines
Report Date:	November 20, 2018
Sample Runs:	3 per engine
Sample Duration:	21 minutes per run

Those reports previously provided to NDDEQ show the detailed results of these tests. Thus, all of the details of the testing are not provided here. The reader is referred to these reports for information.

However, it is important to provide a summary of the raw collected data as it related to a determination of ISR. That information is provided below.

Hess
Tioga Gas Plant — Data Source: 2017 and 2018 Hess Testing
NO : NO_2 Portable Testing Results
In-Stack Ratio (ISR)

Date	Engine	Run	NO	NO_2	ISR	CO	O_2
10/16/2018	C - 1G	1	990	94		293	15.5
		2	972	91		292	15.5
		3	924	96		294	15.4
		Mean =	**962**	**94**	**0.089**	**293**	**15.5**
10/16/2018	C-1D	1	107	63		176	14.8
		2	96	65		172	14.7
		3	103	60		173	14.6
		Mean =	**102**	**63**	**0.381**	**174**	**14.7**
10/16/2018	C-1B	1	1,219	112		184	13.8
		2	1,213	117		188	13.8
		3	1,233	119		191	13.8
		Mean =	**1,222**	**116**	**0.087**	**188**	**13.8**
10/16/2018	C-30300	1	20	9		23	17.5
		2	17	9		22	17.5
		3	15	9		22	17.6
		Mean =	**17**	**9**	**0.342**	**22**	**17.5**
10/16/2018	C-30200	1	18	7		23	17.3
		2	13	8		24	17.4
		3	13	9		24	17.5
		Mean =	**15**	**8**	**0.353**	**24**	**17.4**
10/16/2018	C-30100	1	13	8		18	17.4
		2	17	8		18	17.3
		3	19	9		15	17.1
		Mean =	**16**	**8**	**0.338**	**17**	**17.3**
10/17/2017	C - 1G	1	758	69		180	15.7
		2	724	64		178	15.8
		3	723	65		183	15.8
		Mean =	**735**	**66**	**0.082**	**180**	**15.8**
10/17/2017	C - 1F	1	92	44		191	16.0
		2	98	47		191	16.0
		3	96	46		195	16.0
		Mean =	**95**	**46**	**0.324**	**192**	**16.0**
10/17/2017	C - 1D	1	136	38		246	14.9
		2	129	37		122	15.0
		3	127	37		232	14.9
		Mean =	**131**	**37**	**0.222**	**200**	**14.9**
10/17/2017	C - 1C	1	1,164	87		215	14.6
		2	1,277	99		238	14.1
		3	1,287	101		241	14.0
		Mean =	**1,243**	**96**	**0.071**	**231**	**14.2**
10/17/2017	C - 30200	1	38	6		20	17.6
		2	39	7		21	17.5
		3	40	8		21	17.5
		Mean =	**39**	**7**	**0.152**	**21**	**17.5**
10/17/2017	C - 30300	1	58	13		26	16.1
		2	51	13		28	16.4
		3	57	14		28	16.1
		Mean =	**55**	**13**	**0.194**	**27**	**16.2**
10/17/2017	C - 1B	1	1,192	115		276	14.2
		2	1,168	116		281	14.2
		3	1,126	112		268	14.2
		Mean =	**1,162**	**114**	**0.090**	**275**	**14.2**
10/17/2017	C - 30100	1	38	11		27	17.0
		2	39	12		20	16.7
		3	38	11		28	16.8
		Mean =	**38**	**11**	**0.228**	**25**	**16.8**

The reader will note that not every engine was tested during the two test periods. This was due to several engines not in operation as facility demand dictated at the time of the test. Nonetheless, there appears to be sufficient information and consistency among groups to provide a realistic on-site estimate of ISR for all the engines for dispersion modeling purposes. The information in the table above may now be compiled into a more usable format for each engine type.

Results by Engine

Engine	NO (ppm)	NO_2 (ppm)	ISR
C-1A	No data	No data	No data
C-1B	1,192	115	0.0881
C-1C	1,243	96	0.0715
C-1D	116	50	0.3006
C-1E	No data	No data	No data
C-1F	95	46	0.3239
C-1G	849	80	0.0860
C-30100	27	10	0.2646
C-30200	27	8	0.2184
C-30300	36	11	0.2351

Results by Engine Group

Engine Group	NO (ppm)	NO_2 (ppm)	ISR
Clark (A, B, C, E, G)	1,094	97	0.0819
Retrofit (D and F)	106	48	0.3122
Turbines	30	10	0.2394

The values in the table above were then used as model input for those engines.

For the boilers and furnaces, there was no on-site stack testing data for use with these sources. For these units, the EPA ISR database was reviewed.[4]

The information is provided by EPA in an Excel spreadsheet[5] and contains ISR data that has been submitted via formal collection initiated by OAQPS.[6]

This review was done to determine reasonable ISR values used for the boilers and furnaces; the data was filtered for that source class and approximate size (<100 MMBtu/hr). This was accomplished by filtering various columns of information. After filtering ISR data, to remove internal combustion engines and turbines, the dataset was left with 12 entries. The figure below is a screenshot of the filtered data.

Screenshot: First ISR Database selected for boilers

Site Name	Facility Description	Equipment class	Equipment description	Equipment capaci	Operation mo	Avg N	Ratio
Dutch Harbor Seafood Processing Facility - Captain's Bay Plant	Seafood Processor	Boiler	Cleaver-Brooks Fire Tube Boiler	29.3 MMBtu/hr	Routine	68	0.0074
Dutch Harbor Seafood Processing Facility - Captain's Bay Plant	Seafood Processor	Boiler	Cleaver-Brooks Fire Tube Boiler	29.3 MMBtu/hr	Routine	64	0.0063
Dutch Harbor Seafood Processing Facility - Captain's Bay Plant	Seafood Processor	Boiler	Cleaver-Brooks Fire Tube Boiler	29.3 MMBtu/hr	Routine	79	0.0013
Dutch Harbor Seafood Processing Facility - Captain's Bay Plant	Seafood Processor	Boiler	Cleaver-Brooks Fire Tube Boiler	29.3 MMBtu/hr	Routine	76	0.0053
Dutch Harbor Seafood Processing Facility - Captain's Bay Plant	Seafood Processor	Boiler	Cleaver-Brooks Fire Tube Boiler	29.3 MMBtu/hr	Routine	93	0.0129
Dutch Harbor Seafood Processing Facility - Captain's Bay Plant	Seafood Processor	Boiler	Cleaver-Brooks Fire Tube Boiler	29.3 MMBtu/hr	Routine	124	0.0073
Dutch Harbor Seafood Processing Facility - Captain's Bay Plant	Seafood Processor	Boiler	Cleaver-Brooks Fire Tube Boiler	29.3 MMBtu/hr	Routine	100	0.018
Dutch Harbor Seafood Processing Facility - Captain's Bay Plant	Seafood Processor	Boiler	Cleaver-Brooks Fire Tube Boiler	29.3 MMBtu/hr	Routine	97	0.0082
Dutch Harbor Seafood Processing Facility - Captain's Bay Plant	Seafood Processor	Boiler	Cleaver-Brooks Fire Tube Boiler	29.3 MMBtu/hr	Routine	112	0.0009
Dutch Harbor Seafood Processing Facility - Captain's Bay Plant	Seafood Processor	Boiler	Cleaver-Brooks Fire Tube Boiler	29.3 MMBtu/hr	Routine	113	0.0044
Dutch Harbor Seafood Processing Facility - Captain's Bay Plant	Seafood Processor	Boiler	Cleaver-Brooks Fire Tube Boiler	29.3 MMBtu/hr	Routine	79	0.0076
Dutch Harbor Seafood Processing Facility - Captain's Bay Plant	Seafood Processor	Boiler	Cleaver-Brooks Fire Tube Boiler	29.3 MMBtu/hr	Routine	86	0.0023

Calculating the average yields: ISR = 0.006815.

4 https://www3.epa.gov/scram001/no2_isr_database.htm
5 NO2_ISR_database(2).xls. Available at: https://www3.epa.gov/scram001/no2_isr_database.htm
6 OAQPS = EPA Office of Air Quality Planning and Standards

3) ISR Data Summary

Below is a compiled list of ISR values appropriate for the Hess Tioga gas processing facility. The values were determined from on-site NO and NO_2 emissions testing and the EPA ISR database when no on-site data was available.

Source Category	Emitting Units	ISR
Clark (Old) Engines	C-1A, C-1B, C-1C, C-1E & C-1G	0.0819
Retrofit Engines	C-1D & C-1F	0.3122
Turbine Engines	C-30100, C-30200 & C-30300	0.2394
Other (Boilers, Furnaces …)	B-1, B-2, B-3, B-4, S-302, F-1, F-2, and F-3	0.00681

4) Stack and Building Parameters

The initial modeling efforts by NDDEQ and others used stack parameters that were supplied to the agency in 2013. Although the information was supplied in good faith, it has since been discovered that some of that information may be dated or in some cases the origin is not clear. Thus, a review of important information supplied to the model was undertaken.

To begin, building locations and heights were reviewed. The plant personnel have provided an update to those parameters and they have now been incorporated into the modeling input files (primarily BPIP). No details of those parameters are provided in this document and are instead reflected in the modeling files themselves.

Along with a review of the heights and location of the buildings, verification of the stack location, height, and diameter were also investigated. Those familiar with the facility or plant personnel themselves confirmed that the stack height and stack diameter presented in the 2013 document were, to the best of their knowledge, reasonable estimates. Thus, that data (stack height and diameter) were carried forward to the current modeling effort. Stack locations were adjusted to coincide with the aerial imagery in Google Earth. Locations were then verified and further adjusted by Hess personnel. These adjustments are also not provided in this document but instead reflected in the modeling files.

The final parameter of interest is the velocity and/or volumetric flow estimates from each stack. As a model input parameter, the velocity term is entered and the program, as needed, calculates a flow parameter which is related to the buoyancy flux and to some extent momentum flux.

A discussion of velocity or volumetric flow rate in the model is now appropriate. The model, as part of its many simulations, determines the amount of plume rise above (and distance downwind) the top of the stack for each emitting unit. This value is dependent upon numerous parameters such as wind speed, atmospheric stability, ambient temperature, exit temperature, etc. One of these important parameters is expressed as buoyancy flux or momentum flux. The two are effectively mutually exclusive. The model must decide as to whether buoyancy (volume and heat) flux dominates plume rise or whether momentum (velocity & volume/mass) flux dominates plume rise. The model makes that decision based on what it calls a crossover temperature. Without a detailed review of the mathematics, the model will assume buoyancy flux when the difference in temperature between ambient air and exit temperature is “large” (i.e. greater than the crossover ΔT). For purposes of this discussion, it is fair to state (without proof) the ΔT for these units is sufficiently large such that buoyancy flux will be used in all or nearly all the internal calculations.

The term buoyancy flux as originally developed by Briggs, is as follows:

$$F_b = g v_s \, d_s^2 \left(\frac{\Delta T}{4T_s}\right)$$

v_s = stack exit velocity
d_s = stack diameter
ΔT = stack temperature – ambient temperature
T_s = stack temperature
g = gravitational acceleration coefficient

We draw the reader's attention to the velocity and diameter terms. It should be clear that these terms (velocity * diameter^2) is directly proportional to volumetric air flow by a factor of 4. From that observation it becomes clear that the amount of plume rise is directly dependent upon the volume of air exiting the stack and not necessarily proportional to velocity, except as that term is used to determine volume rate.

This leads to the need to determine the volumetric flow rates that are appropriate for this modeling exercise. Once the volumetric flow rate is determined, then the velocity term is calculated and entered into the model. (Velocity is the variable term in the model used to calculate flow rate based on a given stack diameter).

To determine an appropriate exit velocity (matching an appropriate volumetric flow rate) recent stack testing of the subject stacks was consulted. As a matter of convenience and consistency with ISR, the same stack tests conducted in 2017 and 2018 were used to calculate velocity/volume.

As noted earlier, the data is taken from reports submitted to NDDEQ. Below is a brief summary of the testing dates.

Year:	2017
Test Date(s):	October 17 – 18
Engines Tested:	Clark, Retrofit, and Turbines
Report Date:	November 21, 2017

Year:	2018
Test Date(s):	October 16
Engines Tested:	Clark, Retrofit, and Turbines
Report Date:	November 20, 2018

The testing data relative to flow and velocity calculations is contained in the following table.

Hess
Tioga Gas Plant
NO : NO_2 Portable Testing Results

Data Source: 2017 and 2018 Hess Testing

Stack Flow Analysis

Date	Source	Run	10^6 DSCF/Day	10^6 Wet-SCF/Day	% Full Load	Stk Temp °F	Elevation Factor	acfm	acfm @ 100%	Stk Dia (ft)	ft/sec Stk Velocity @ 100%	Source
10/16/2018	C - 1G	1	13.10	13.89	92.0%							
		2	13.15	13.94	92.0%							
		3	13.05	13.85	93.0%							
		Mean =	**13.10**	**13.89**	**92.3%**	750	1.081	23,924	25,910	1.63	206.94	C - 1G
10/16/2018	C-1D	1	8.85	9.45	73.0%							
		2	8.71	9.31	73.0%							
		3	8.57	9.17	73.0%							
		Mean =	**8.71**	**9.31**	**73.0%**	750	1.081	16,031	21,961	2.44	78.28	C-1D
10/16/2018	C-1B	1	9.86	10.64	91.0%							
		2	9.86	10.64	91.0%							
		3	9.86	10.64	91.0%							
		Mean =	**9.86**	**10.64**	**91.0%**	750	1.081	18,322	20,134	1.63	160.81	C-1B
10/16/2018	C-30300	1	14.06	14.60	82.0%							
		2	14.00	14.54	81.0%							
		3	14.48	15.02	81.0%							
		Mean =	**14.18**	**14.72**	**81.3%**	310	1.081	16,128	19,829	4.33	22.44	C-30300
10/16/2018	C-30200	1	14.39	14.97	88.0%							
		2	14.31	14.87	85.0%							
		3	14.57	15.13	84.0%							
		Mean =	**14.42**	**14.99**	**85.7%**	310	1.081	16,423	19,171	4.33	21.70	C-30200
10/16/2018	C-30100	1	15.00	15.59	90.0%							
		2	13.47	14.01	82.0%							
		3	13.27	13.84	85.0%							
		Mean =	**13.91**	**14.48**	**85.7%**	310	1.081	15,865	18,519	4.33	20.96	C-30100
10/17/2017	C - 1G	1	10.34	10.95	70.0%							
		2	10.58	11.19	71.0%							
		3	10.69	11.30	71.0%							
		Mean =	**10.54**	**11.15**	**70.7%**	750	1.081	19,194	27,161	1.63	216.94	C - 1G
10/17/2017	C - 1F	1	13.53	14.27	89.0%							
		2	13.58	14.32	89.0%							
		3	13.48	14.22	89.0%							
		Mean =	**13.53**	**14.27**	**89.0%**	750	1.081	24,572	27,609	2.44	98.41	C - 1F
10/17/2017	C - 1D	1	8.25	8.81	67.0%							
		2	8.42	8.98	67.0%							
		3	8.26	8.82	67.0%							
		Mean =	**8.31**	**8.87**	**67.0%**	750	1.081	15,274	22,797	2.44	81.25	C - 1D
10/17/2017	C - 1C	1	8.16	8.73	66.0%							
		2	7.49	8.06	66.0%							
		3	7.41	7.99	66.0%							
		Mean =	**7.69**	**8.26**	**66.0%**	750	1.081	14,223	21,551	1.63	172.12	C - 1C
10/17/2017	C - 30200	1	18.29	18.98	103.0%							
		2	17.95	18.63	103.0%							
		3	17.86	18.54	104.0%							
		Mean =	**18.03**	**18.72**	**103.3%**	310	1.081	20,506	19,845	4.33	22.46	C - 30200
10/17/2017	C - 30300	1	13.30	14.02	107.0%							
		2	13.56	14.24	103.0%							
		3	13.69	14.43	111.0%							
		Mean =	**13.52**	**14.23**	**107.0%**	310	1.081	15,591	14,571	4.33	16.49	C - 30300
10/17/2017	C - 1B	1	8.70	9.35	75.0%							
		2	8.68	9.33	75.0%							
		3	8.67	9.32	75.0%							
		Mean =	**8.68**	**9.33**	**75.0%**	750	1.081	16,072	21,429	1.63	171.15	C - 1B
10/17/2017	C - 30100	1	13.89	14.50	93.0%							
		2	12.82	13.42	90.0%							
		3	12.69	13.28	88.0%							
		Mean =	**13.13**	**13.73**	**90.3%**	310	1.081	15,047	16,657	4.33	18.85	C - 30100

Elevation Factor = 29.92 / (29.92 - 2.244)

The data from the test report and calculations above may be summarized as follows.

Results by Engine Stack: Flow

Engine	Diameter (ft)	ACFM	Velocity (ft/sec)
C-1A	1.63	*No data*	*No data*
C-1B	1.63	20,781	166
C-1C	1.63	21,551	172
C-1D	2.44	22,379	80
C-1E	1.63	*No data*	*No data*
C-1F	2.44	27,609	98
C-1G	1.63	26,536	212
C-30100	4.33	17,588	20
C-30200	4.33	19,508	22
C-30300	4.33	17,200	20

Results by Engine/Stack Group: Flow

Engine Group	Diameter (ft)	ACFM	Velocity (ft/sec)
Clark (A, B, C, E, G)	1.63	22,956	183
Retrofit (D and F)	2.44	24,994	89
Turbines	4.33	18,099	21

The values in the table above were then used as model input for those engines.

Appendix G

Detailed Source Information for 1-Hour NO_2 NAAQS Modeling

Hess Tioga Gas Plant Sources

Hess Tioga Gas Plant Sources included in 1-hour NO_2 NAAQS modeling

Source ID	Stack Release Type	Source Description	Easting (X)	Northing (Y)	Base Elevation	Stack Height	Temperature	Exit Velocity	Stack Diameter	NO_2 Emission Rate		ISR Value
			(m)	(m)	(m)	(m)	(K)	(m/s)	(m)	(g/s)		
378B1	DEFAULT	EU B-1 Natural gas-fired boiler rated at 20.1 MMBtu/hr	654212.02	5362800.5	685.76	12.19	478	9.75	0.60	0.231		0.000681
378B2	DEFAULT	EU B-2 Natural gas-fired boiler rated at 16.8 MMBtu/hr	654206.44	5362799.81	685.85	12.19	478	9.75	0.60	0.197		0.000681
378B3	DEFAULT	EU B-3 Natural gas-fired boiler rated at 16.8 MMBtu/hr	654200.47	5362799.66	685.94	13.11	478	9.75	0.60	0.208		0.000681
378B4	DEFAULT	EU B-4 Natural gas-fired boiler rated at 16.8 MMBtu/hr	654189.94	5362800.13	686.13	13.11	478	9.75	0.60	0.219		0.000681
378B5	DEFAULT	EU B-5 Natural gas-fired boiler rated at 20.1 MMBtu/hr	654182.72	5362789.78	687.63	12.192	478	9.7536	0.60	0	**	
378C1A	DEFAULT	EU C-1A Natural gas pipeline compressor engine rated at 1,920 bhp (built 1954)	654268.5	5362828.79	685.72	22.86	672	55.88	0.50	12.411		0.0819
378C1B	DEFAULT	EU C-1B Natural gas pipeline compressor engine rated at 1,920 bhp (built 1954)	654277.78	5362847.14	686.11	22.86	672	55.89	0.50	12.411		0.0819
378C1C	DEFAULT	EU C-1C Natural gas pipeline compressor engine rated at 1,920 bhp (built 1954)	654278.95	5362829.14	685.68	22.86	672	55.89	0.50	12.411		0.0819
378C1D	DEFAULT	EU C-1D Natural gas pipeline compressor engine rated at 2,350 bhp (rebuilt 4/23/04)	654287.85	5362847.64	686.06	22.86	672	27.15	0.74	1.625		0.3122
378C1E	DEFAULT	EU C-1E Natural gas pipeline compressor engine rated at 1,920 bhp (built 1954)	654292.31	5362829.6	685.61	22.86	672	55.89	0.50	12.411		0.0819
378C1F	DEFAULT	EU C-1F Natural gas pipeline compressor engine rated at 2,350 bhp (built 7/5/03)	654302.88	5362847.65	685.94	22.86	672	27.15	0.74	1.625		0.3122
378C1G	DEFAULT	EU C-1G Natural gas pipeline compressor engine rated at 1,920 bhp (built 1954)	654302.9	5362829.84	685.51	22.86	672	55.88	0.50	12.411		0.0819
378C100	DEFAULT	EU C-30100 Natural gas turbine rated at 1,480 bhp with a 5.77 MMBtu/hr natural gas-fired duct burner	654350.59	5362912.07	688.97	7.92	428	6.24	1.32	0.731		0.2394
378C200	DEFAULT	EU C-30200 Natural gas turbine rated at 1,480 bhp with a 5.77 MMBtu/hr natural gas-fired duct burner	654358.74	5362912.27	688.83	7.92	428	6.24	1.32	0.731		0.2394
378C300	DEFAULT	EU C-30300 Natural gas turbine rated at 1,480 bhp	654367.43	5362912.86	688.74	7.92	428	6.24	1.32	0.655		0.2394
378S302	DEFAULT	EU S-302 Amine gas sweetening unit	654196.99	5362702.07	685.02	50.29	600	21.34	0.71	0.265		0.000681
378S101	DEFAULT	EU S-101 Acid/Wet Gas Flare	654588.91	5362838.32	683.67	65.532	1000	40	1.10	0	**	
378F1	DEFAULT	EU F-1 Natural gas-fired heater rated at 26.7 MMBtu/hr (Heater #5210)	654555.23	5362744.89	679.91	35.97	498	1.22	1.25	0.202		0.000681
378F2	DEFAULT	EU F-2 Natural gas-fired heater rated at 93.0 MMBtu/hr (Heater #5704)	654570.59	5362745.95	679.98	41.76	500	4.88	2.08	0.702		0.000681
378F3	DEFAULT	EU F-3 Natural gas-fired heater rated at 93.0 MMBtu/hr (Heater #5714)	654563.33	5362728.28	678.64	41.76	500	4.88	2.08	0.702		0.000681

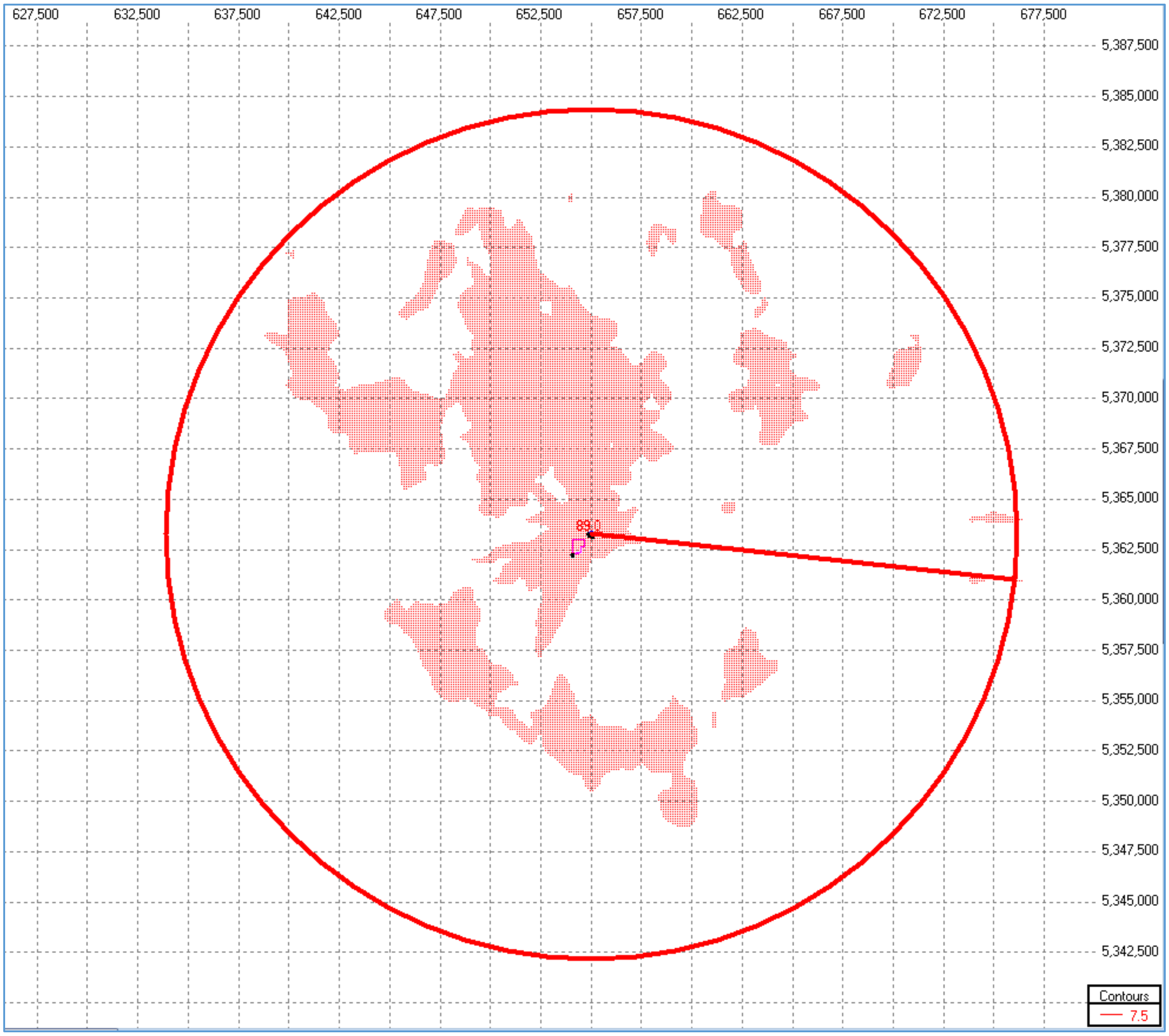
** Source not included in modeling for NAAQS, as this source not operating under normal cnoditions

Appendix H

Modeling Plots – SIL & NAAQS

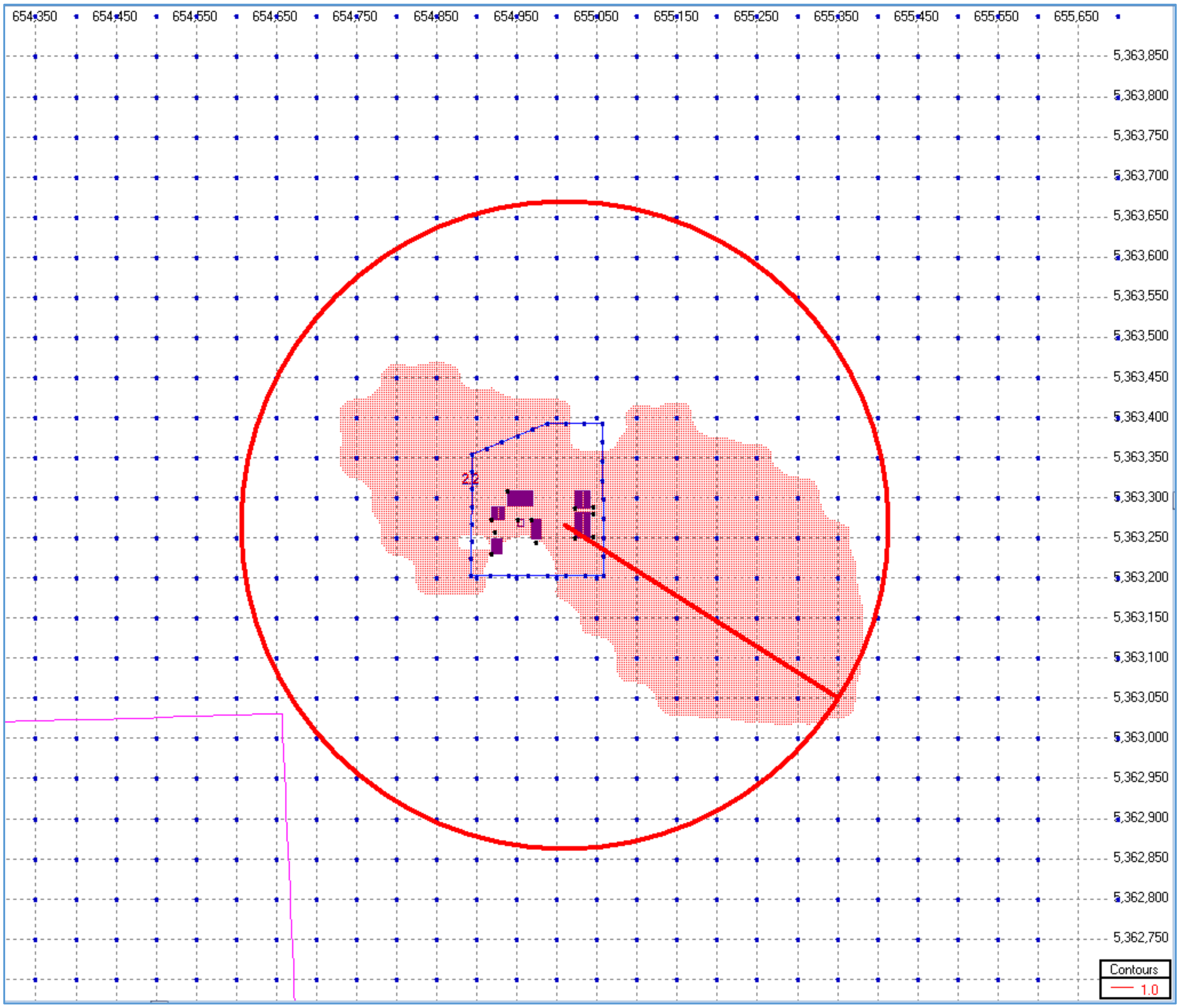
1-hr NO_2 SIL Radius of Impact above 7.5 µg/m^3

Radius = 21.1 km

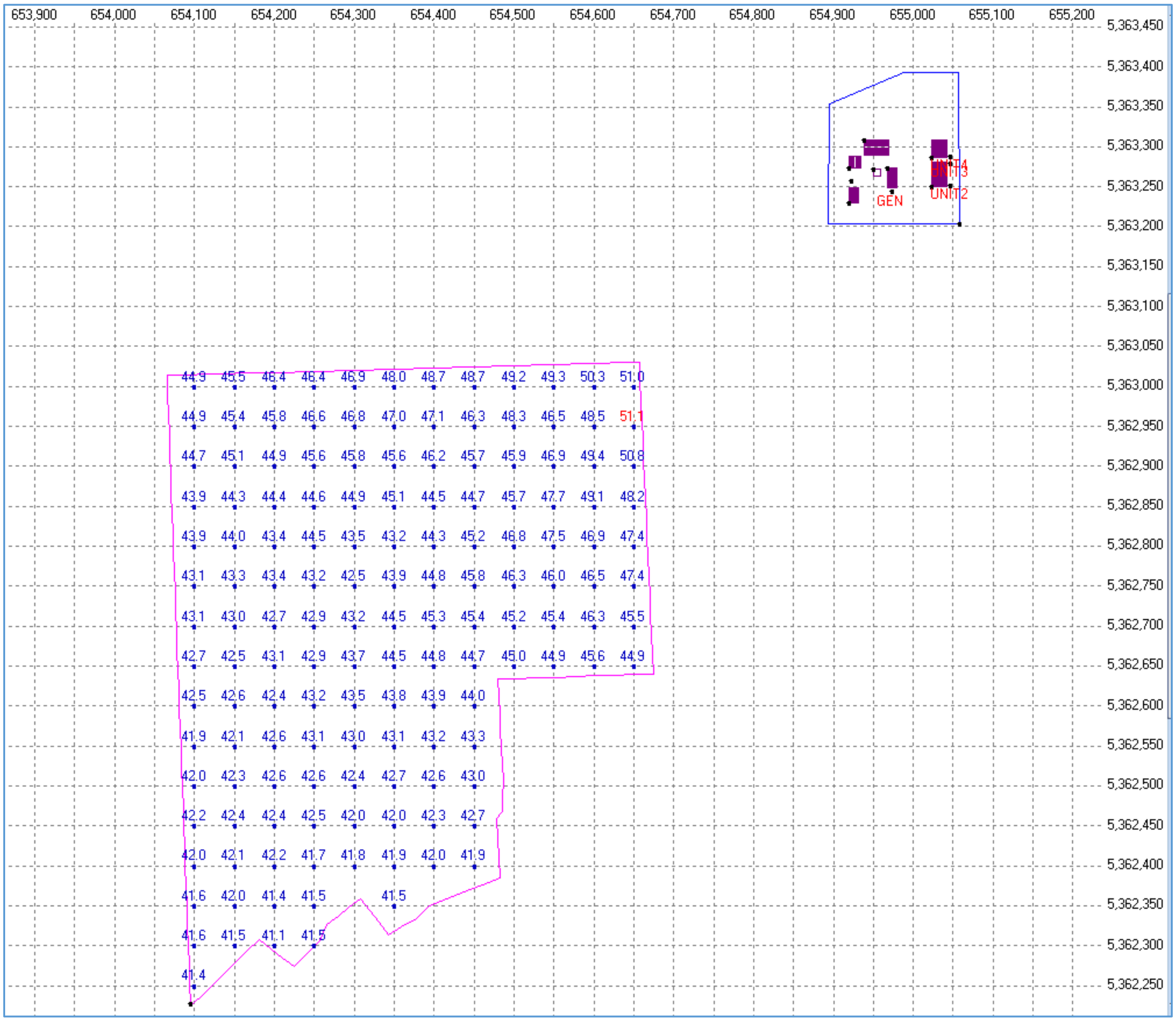


Annual NO_2 SIL Radius of Impact above 1.0 µg/m^3

Radius = 403.2 m

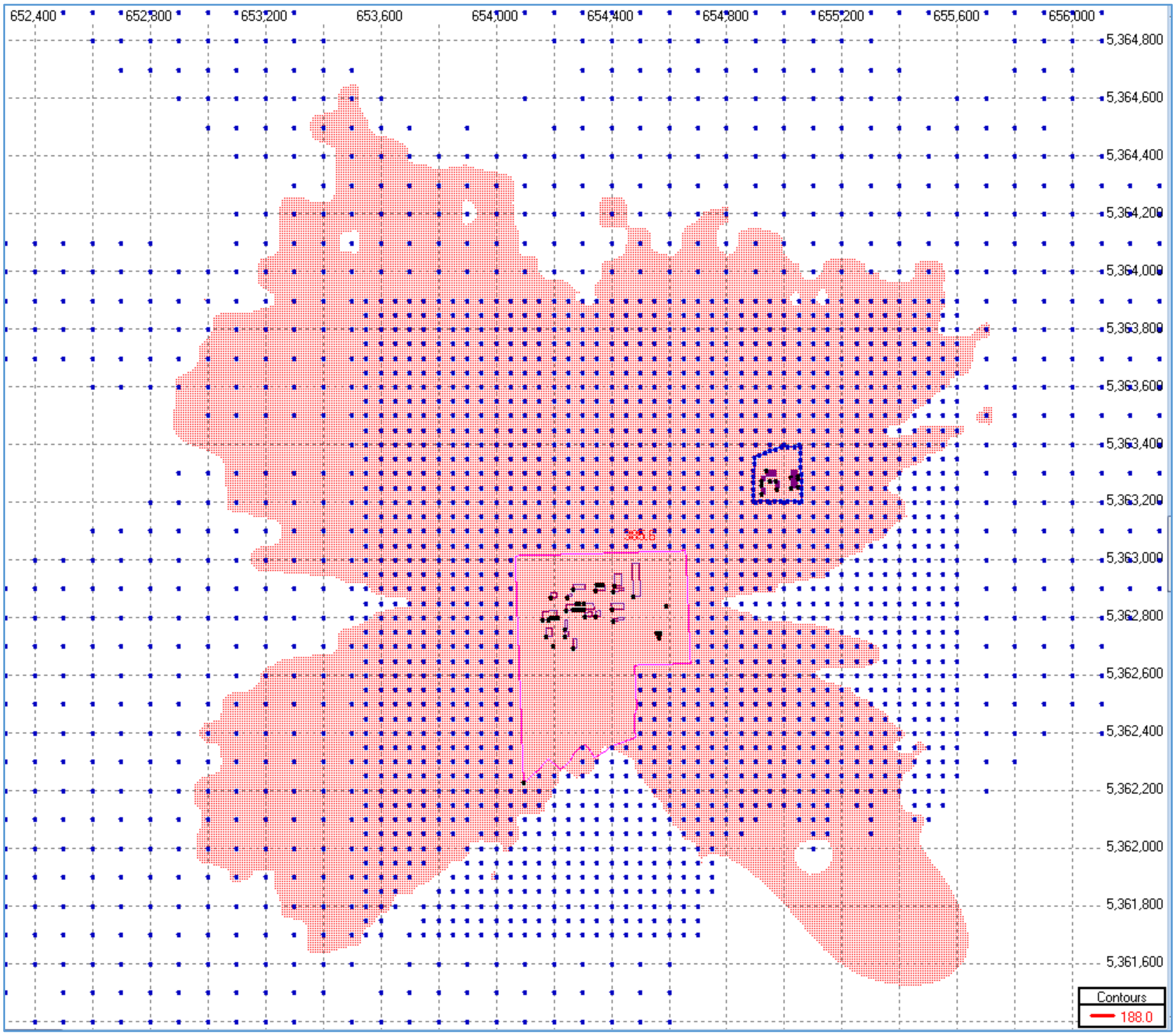


Predicted NAAQS impacts, 1-hr NO_2 (including 35 µg/m^3 background)
Receptors inside Hess Gas Plant Boundary [impacts from WBI Tioga Compressor Station only]

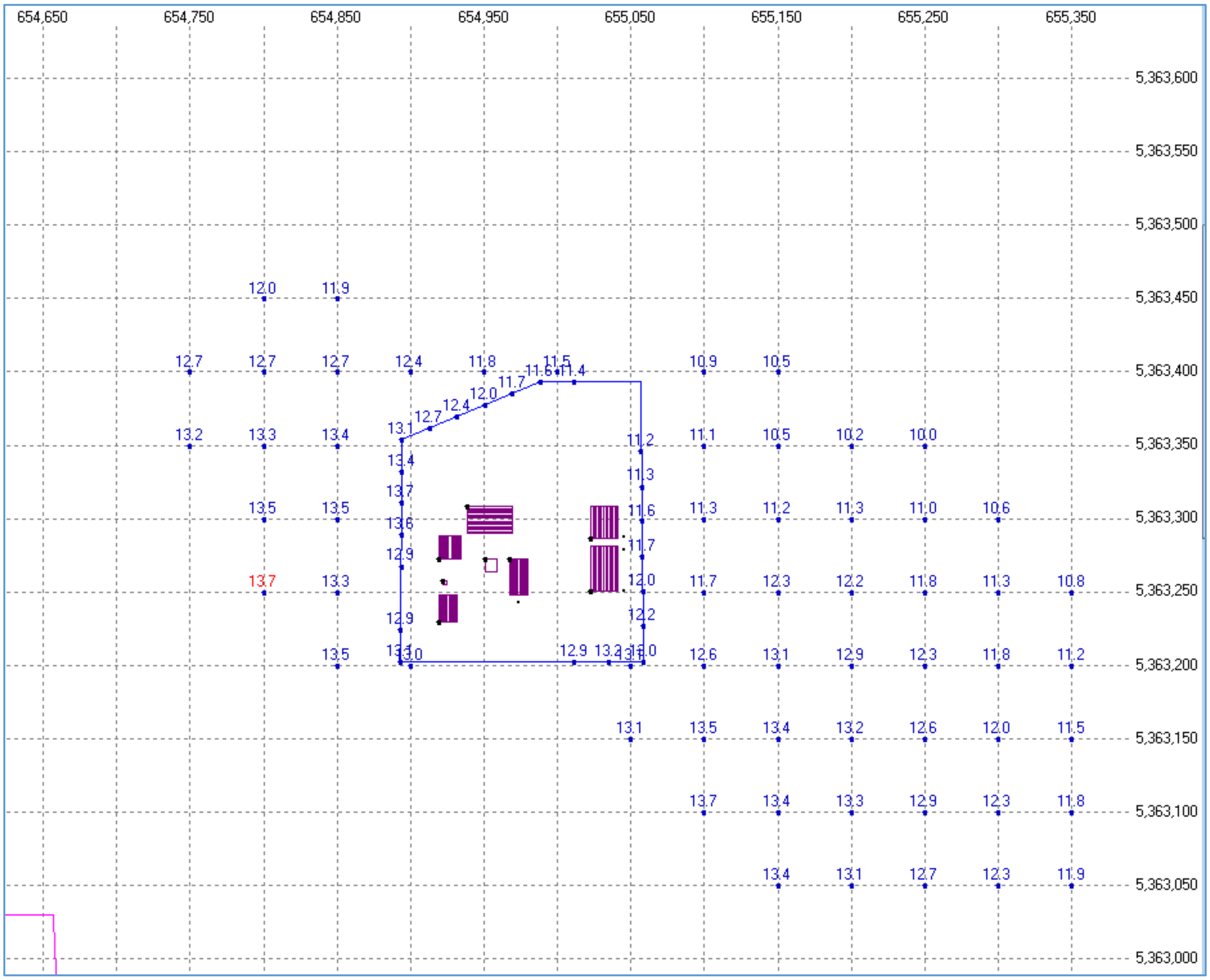


Predicted NAAQS impacts, 1-hr NO_2 (including 35 µg/m^3 background)
Receptors [above SIL] outside Hess Gas Plant Boundary [impacts from WBI & HGP combined]

Shaded contour – impacts above 1-hr NO_2 AAQS (188 µg/m^3)



Predicted NAAQS impacts, Annual NO_2 (including 5 µg/m^3 background)
Receptors [above SIL] outside Hess Gas Plant Boundary [impacts from WBI & HGP combined]



AIR POLLUTION CONTROL
PERMIT TO CONSTRUCT

Pursuant to Chapter 23.1-06 of the North Dakota Century Code, and the Air Pollution Control Rules of the State of North Dakota (Article 33.1-15 of the North Dakota Administrative Code), and in reliance on statements and representations heretofore made by the owner designated below, a Permit to Construct is hereby issued authorizing such owner to construct and initially operate the source unit(s) at the location designated below. This Permit to Construct is subject to all applicable rules and orders now or hereafter in effect of the North Dakota Department of Environmental Quality (Department) and to any conditions specified below:

I. **General Information**:

A. **Permit to Construct Number**: PTC20015

B. **Source**:

1. Name: WBI Energy Transmission, Inc.
2. Location: Elkhorn Creek Compressor Station
   SE ¼, Sec 33, T149N, R98W
   McKenzie County, North Dakota
3. Source Type: Compressor Station
4. Equipment at the Facility:

Emission Unit Description	Emission Unit (EU)	Emission Point (EP)	Air Pollution Control Equipment
Caterpillar G 3612 LE A4 3750 (4SLB) natural gas-fired compressor engine rated at 3750 bhp (2021) (JJJJ)	1	1	Catalytic Oxidizer
Compressor Engine Blowdowns	CB	CB	None
Fugitive Emissions [A]	FUG	FUG	Leak Detection and Repair (LDAR) Program

[A] Insignificant source of emissions.

C. **Owner/Operator (Permit Applicant)**:

1. Name: WBI Energy Transmission, Inc.
2. Address: 2010 Montana Avenue
   Glendive, MT 59330
3. Application Date: February 14, 2020

II. **Conditions**: This Permit to Construct allows the construction and initial operation of the above-mentioned new or modified equipment at the source. The source may be operated under this Permit to Construct until a Permit to Operate is issued unless this permit is suspended or revoked. The source is subject to all applicable rules, regulations, and orders now or hereafter in effect of the North Dakota Department of Environmental Quality and to the conditions specified below.

A. **Emission Limits**: Emission limits from the operation of the source unit(s) identified in Item I.B of this Permit to Construct (hereafter referred to as "permit") are as follows. Source units not listed are subject to the applicable emission limits specified in the North Dakota Air Pollution Control Rules.

Emission Unit Description	EU	EP	Pollutant / Parameter	Emission Limit
Caterpillar G 3612 LE A4 3750 natural gas-fired compressor engine	1	1	NO_x	8.27 lb/hr and 1.0 g/hp-hr or 82 ppmvd [B]
			CO	4.13 lb/hr and 2.0 g/hp-hr or 270 ppmvd [B]
			VOC	4.13 lb/hr and 0.7 g/hp-hr or 60 ppmvd [B]
			Opacity	20% [A]

[A] 40% permissible for not more than one six-minute period per hour.

[B] The emission limit in lb/hr is a State requirement. The emission limits in g/hp-hr and ppmvd (at 15% O_2) are from 40 CFR 60, Subpart JJJJ. Compliance with both State and Subpart JJJJ emission limits is required.

B. **Fuel Restriction**:

The compressor engine (EU 1) is restricted to combusting only natural gas containing no more than 2 grains of sulfur per 100 standard cubic feet.

C. **Emissions Testing**:

1. Initial Testing: Within 180 days after initial startup, the permittee shall conduct emissions tests at the emission units listed below using an independent testing firm, to determine the compliance status of the facility with respect to the emission limits specified in Condition II.A. Emissions testing shall be conducted for the pollutant(s) listed below in accordance with EPA Reference Methods listed in 40 CFR 60, Appendix A. Test methods other than those listed below may be used upon approval by the Department.

Emission Unit Description	EP	Pollutant/ Parameter
Caterpillar G 3612 LE A4 3750 natural gas-fired compressor engine	1	NO_x CO VOC

A signed copy of the test results shall be furnished to the Department within 60 days of the test date. The basis for this condition is NDAC 33.1-15-01-12 which is hereby incorporated into this permit by reference. To facilitate preparing for and conducting such tests, and to facilitate reporting the test results to the Department, the owner/operator shall follow the procedures and formats in the Department's Emission Testing Guideline.

2. Notification: The permittee shall notify the Department using the form in the Emission Testing Guideline, or its equivalent, at least 30 calendar days in advance of any tests of emissions of air contaminants required by the Department. If the permittee is unable to conduct the performance test on the scheduled date, the permittee shall notify the Department at least five days prior to the scheduled test date and coordinate a new test date with the Department.

3. Sampling Ports/Access: Sampling ports shall be provided downstream of all emission control devices and in a flue, conduit, duct, stack or chimney arranged to conduct emissions to the ambient air.

   The ports shall be located to allow for reliable sampling and shall be adequate for test methods applicable to the facility. Safe sampling platforms and safe access to the platforms shall be provided. Plans and specifications showing the size and location of the ports, platform and utilities shall be submitted to the Department for review and approval.

4. Other Testing:

   a) The Department may require the permittee to have tests conducted to determine the emission of air contaminants from any source, whenever the Department has reason to believe that an emission of a contaminant not addressed by the permit applicant is occurring, or the emission of a contaminant in excess of that allowed by this permit is occurring. The Department may specify testing methods to be used in accordance with good professional practice. The Department may observe the testing. All tests shall be conducted by reputable, qualified personnel. A signed copy of the test results shall be furnished to the Department within 60 days of the test date.

      All tests shall be made and the results calculated in accordance with test procedures approved by the Department. All tests shall be made under the direction of persons qualified by training or experience in the field of air pollution control as approved by the Department.

b) The Department may conduct tests of emissions of air contaminants from any source. Upon request of the Department, the permittee shall provide necessary holes in stacks or ducts and such other safe and proper sampling and testing facilities, exclusive of instruments and sensing devices, as may be necessary for proper determination of the emission of air contaminants.

D. **New Source Performance Standards (NSPS)**: The owner/operator shall comply with all applicable requirements of the following NSPS subparts as referenced in Chapter 33.1-15-12 of the North Dakota Air Pollution Control Rules and 40 CFR 60:

1. **40 CFR 60, Subpart JJJJ**: The owner/operator shall comply with all applicable requirements of 40 CFR 60, Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines (EU 1).

2. **40 CFR 60, Subpart OOOOa**: The owner/operator may be subject to the requirements of Subpart OOOOa –Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015. The Department has not adopted this subpart. All required documentation must be submitted to EPA Region 8 at the following address:

   U.S. EPA Region 8
   1595 Wynkoop Street
   Mail Code 8ENF – AT
   Denver, CO 80202-1129

E. **Maximum Achievable Control Technology Standards (MACT)**: The permittee shall comply with all applicable requirements of the following MACT subparts as referenced in Chapter 33.1-15-22 of the North Dakota Air Pollution Control Rules and 40 CFR 63.

1. 40 CFR 63, Subpart ZZZZ - National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (EU 1). The North Dakota Department of Environmental Quality has not adopted the area source provisions of this subpart. Please send all documentation to EPA at the address above.

F. **Like-Kind Engine Replacement**: This permit allows the permittee to replace an existing compressor engine with a like-kind engine. Replacement is subject to the following conditions:

1. The Department must be notified within 10 days after change-out of the engine.

2. The replacement engine shall operate in the same manner, provide no increase in throughput and have equal or less emissions than the engine it is replacing.

3. The date of manufacture of the replacement engine must be included in the notification. The facility must comply with any applicable federal standards (e.g. NSPS, MACT) triggered by the replacement.

The replacement engine is subject to the same state emission limits as the existing engine in addition to any NSPS or MACT emission limit that is applicable. Testing shall be conducted to confirm compliance with the emission limits within 180 days after start-up of the engine.

G. **Construction**: Construction of the above described units shall be in accordance with information provided in the permit application as well as any plans, specifications and supporting data submitted to the Department. The Department shall be notified ten days in advance of any significant deviations from the specifications furnished. The issuance of this Permit to Construct may be suspended or revoked if the Department determines that a significant deviation from the plans and specifications furnished has been or is to be made.

Any violation of a condition issued as part of this permit to construct as well as any construction which proceeds in variance with any information submitted in the application, is regarded as a violation of construction authority and is subject to enforcement action.

H. **Startup Notice**: A notification of the actual date of initial startup shall be submitted to the Department within 15 days after the date of initial startup.

I. **Organic Compounds Emissions**: The permittee shall comply with all applicable requirements of NDAC 33.1-15-07 – Control of Organic Compounds Emissions.

J. **Permit Invalidation**: This permit shall become invalid if construction is not commenced within eighteen months after issuance of such permit, if construction is discontinued for a period of eighteen months or more; or if construction is not completed within a reasonable time.

K. **Fugitive Emissions**: The release of fugitive emissions shall comply with the applicable requirements in NDAC 33.1-15-17.

L. **Annual Emission Inventory/Annual Production Reports**: The owner/operator shall submit an annual emission inventory report and/or an annual production report upon Department request, on forms supplied or approved by the Department.

M. **Source Operations**: Operations at the installation shall be in accordance with statements, representations, procedures and supporting data contained in the initial application, and any supplemental information or application(s) submitted thereafter. Any operations not listed in this permit are subject to all applicable North Dakota Air Pollution Control Rules.

N. **Alterations, Modifications or Changes**: Any alteration, repairing, expansion, or change in the method of operation of the source which results in the emission of an additional type or greater amount of air contaminants or which results in an increase in the ambient concentration of any air contaminant, must be reviewed and approved by the Department prior to the start of such alteration, repairing, expansion or change in the method of operation.

O. **Air Pollution from Internal Combustion Engines**: The permittee shall comply with all applicable requirements of NDAC 33.1-15-08-01 – Internal Combustion Engine Emissions Restricted.

P. **Recordkeeping**: The owner/operator shall maintain any compliance monitoring records required by this permit or applicable requirements. The owner/operator shall retain records of all required monitoring data and support information for a period of at least five years from the date of the monitoring sample, measurement, report or application. Support information may include all calibration and maintenance records and all original strip-chart recordings/computer printouts for continuous monitoring instrumentation, and copies of all reports required by the permit.

Q. **Nuisance or Danger**: This permit shall in no way authorize the maintenance of a nuisance or a danger to public health or safety.

R. **Malfunction Notification**: The owner/operator shall notify the Department of any malfunction which can be expected to last longer than twenty-four hours and can cause the emission of air contaminants in violation of applicable rules and regulations.

S. **Operation of Air Pollution Control Equipment**: The owner/operator shall maintain and operate all air pollution control equipment in a manner consistent with good air pollution control practice for minimizing emissions.

T. **Transfer of Permit to Construct**: The holder of a permit to construct may not transfer such permit without prior approval from the Department.

U. **Right of Entry**: Any duly authorized officer, employee or agent of the North Dakota Department of Environmental Quality may enter and inspect any property, premise or place at which the source listed in Item I.B of this permit is located at any time for the purpose of ascertaining the state of compliance with the North Dakota Air Pollution Control Rules. The Department may conduct tests and take samples of air contaminants, fuel, processing material, and other materials which affect or may affect emissions of air contaminants from any source. The Department shall have the right to access and copy any records required by the Department's rules and to inspect monitoring equipment located on the premises.

V. **Other Regulations**: The owner/operator of the source unit(s) described in Item I.B of this permit shall comply with all State and Federal environmental laws and rules. In addition, the owner/operator shall comply with all local burning, fire, zoning, and other applicable ordinances, codes, rules and regulations.

W. **Permit Issuance**: This permit is issued in reliance upon the accuracy and completeness of the information set forth in the application. Not withstanding the tentative nature of this information, the conditions of this permit herein become, upon the effective date of this permit, enforceable by the Department pursuant to any remedies it now has, or may in the future have, under the North Dakota Air Pollution Control Law, NDCC Chapter 23.1-06.

X. **Odor Restrictions**: The owner/operator shall not discharge into the ambient air any objectionable odorous air contaminant which is in excess of the limits established in NDAC 33.1-15-16.

The owner/operator shall not discharge into the ambient air hydrogen sulfide (H_2S) in concentrations that would be objectionable on land owned or leased by the complainant or in areas normally accessed by the general public. For the purpose of complaint resolution, two samples with concentrations greater than 0.05 parts per million (50 parts per billion) sampled at least 15 minutes apart within a two-hour period and measured in accordance with Section 33.1-15-16-04 constitute a violation.

Y. **Sampling and Testing**: The Department may require the owner/operator to conduct tests to determine the emission rate of air contaminants from the source. The Department may observe the testing and may specify testing methods to be used. A signed copy of the test results shall be furnished to the Department within 60 days of the test date. The basis for this condition is NDAC 33.1-15-01-12 which is hereby incorporated into this permit by reference. To facilitate preparing for and conducting such tests, and to facilitate reporting the test results to the Department, the owner/operator shall follow the procedures and formats in the Department's Emission Testing Guideline.

FOR THE NORTH DAKOTA DEPARTMENT
OF ENVRIONMENTAL QUALITY

Date 3/27/2020

By ________________
James L. Semerad
Director
Division of Air Quality

Appendix 9E

Air Dispersion Modeling Report for 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 three (3) 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. There is onsite data from a nearby facility (Hess Gas Plant) which provides the most representative meteorological conditions for this analysis. A detailed report presenting data completeness, quality, and representativeness was prepared by Bison Engineering, Inc. on behalf of the Hess Corporation Tioga Gas Plant; this report has been submitted to ND DEQ by Hess, and is attached to this Appendix.

Surface Data

The Hess Tioga Gas Plant (TGP) Station #1 was used as the primary surface data source, located at Latitude 48.409° N, longitude 102.91° W, and elevation 761 meters above mean sea level. The Williston Airport was used as the secondary surface data source, 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, at both surface stations. The 2015 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).

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. This data was incorporated into the processed met data for 2015, as conducted by Bison Engineering, Inc, on behalf og the Hess Tioga Gas Plant.

The data was processed with time shift of 6 hours to match the time zone of the surface station (GMT-6).

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 2016 National 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[1]:

[1] Recommended AERSURFACE Inputs, North Dakota (March 2017)

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
Midsummer with lush vegetation: Jun, Jul, Aug
Autumn with unharvested cropland: Sep
Is this site at an airport?
No (for primary Tioga Gas Plant on-site data);
Yes (for secondary Williston Airport NWS data).
Is the site in an arid region? No
Surface moisture condition at the site: Average

The domain for the primary data site was centered at the location of the Hess Tioga Gas Plant Station #1 in Tioga, ND. The resulting surface parameters for the primary data site are summarized in Table 1A.

The domain for the secondary data site was centered at the location of the airport at Williston, ND. The resulting surface parameters for the secondary site are summarized in Table 1B.

Table 1A. Seasonal Surface Parameters at Tioga, ND

Sector	Winter with snow	Winter with no snow	Spring	Summer	Fall
Albedo (10 x 10 km Domain)					
0 - 360	0.58	0.19	0.16	0.19	0.19
Bowen Ratio (10 x 10 km Domain) - Average Moisture					
0 - 360	0.49	0.79	0.35	0.60	0.79
Surface Roughness Length (m) (1km-radius domain)					
0 - 30	0.007	0.014	0.048	0.100	0.098
30 - 60	0.008	0.017	0.043	0.130	0.128
60 - 90	0.007	0.015	0.045	0.120	0.119
90 - 120	0.007	0.015	0.045	0.121	0.120
120 - 150	0.007	0.014	0.046	0.110	0.109
150 - 180	0.009	0.018	0.042	0.127	0.125
180 - 210	0.017	0.033	0.050	0.168	0.163
210 - 240	0.013	0.028	0.044	0.171	0.169
240 - 270	0.010	0.020	0.052	0.141	0.141
270 - 300	0.006	0.011	0.053	0.102	0.102
300 - 330	0.005	0.010	0.050	0.099	0.099
330 - 360	0.006	0.012	0.050	0.102	0.101

Table 1B. Seasonal Surface Parameters at Williston Airport, ND

Sector	Winter with snow	Winter with no snow	Spring	Summer	Fall
Albedo (10 x 10 km Domain)					
0 - 360	0.52	0.18	0.16	0.17	0.17
Bowen Ratio (10 x 10 km Domain) - Average Moisture					
0 - 360	0.48	0.76	0.41	0.61	0.76
Surface Roughness Length (m) (1km-radius domain)					
0 - 30	0.010	0.017	0.033	0.046	0.040
30 - 60	0.014	0.021	0.031	0.038	0.032
60 - 90	0.013	0.020	0.029	0.036	0.031
90 - 120	0.020	0.028	0.033	0.038	0.033
120 - 150	0.020	0.028	0.037	0.043	0.038
150 - 180	0.012	0.019	0.039	0.055	0.050
180 - 210	0.005	0.011	0.046	0.087	0.086
210 - 240	0.006	0.011	0.043	0.077	0.074
240 - 270	0.008	0.015	0.048	0.081	0.076
270 - 300	0.017	0.025	0.031	0.036	0.031
300 - 330	0.010	0.018	0.024	0.032	0.028
330 - 360	0.010	0.018	0.025	0.035	0.031

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 2015. 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.20060. 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 not applied.

AERMET-stage3 model options:

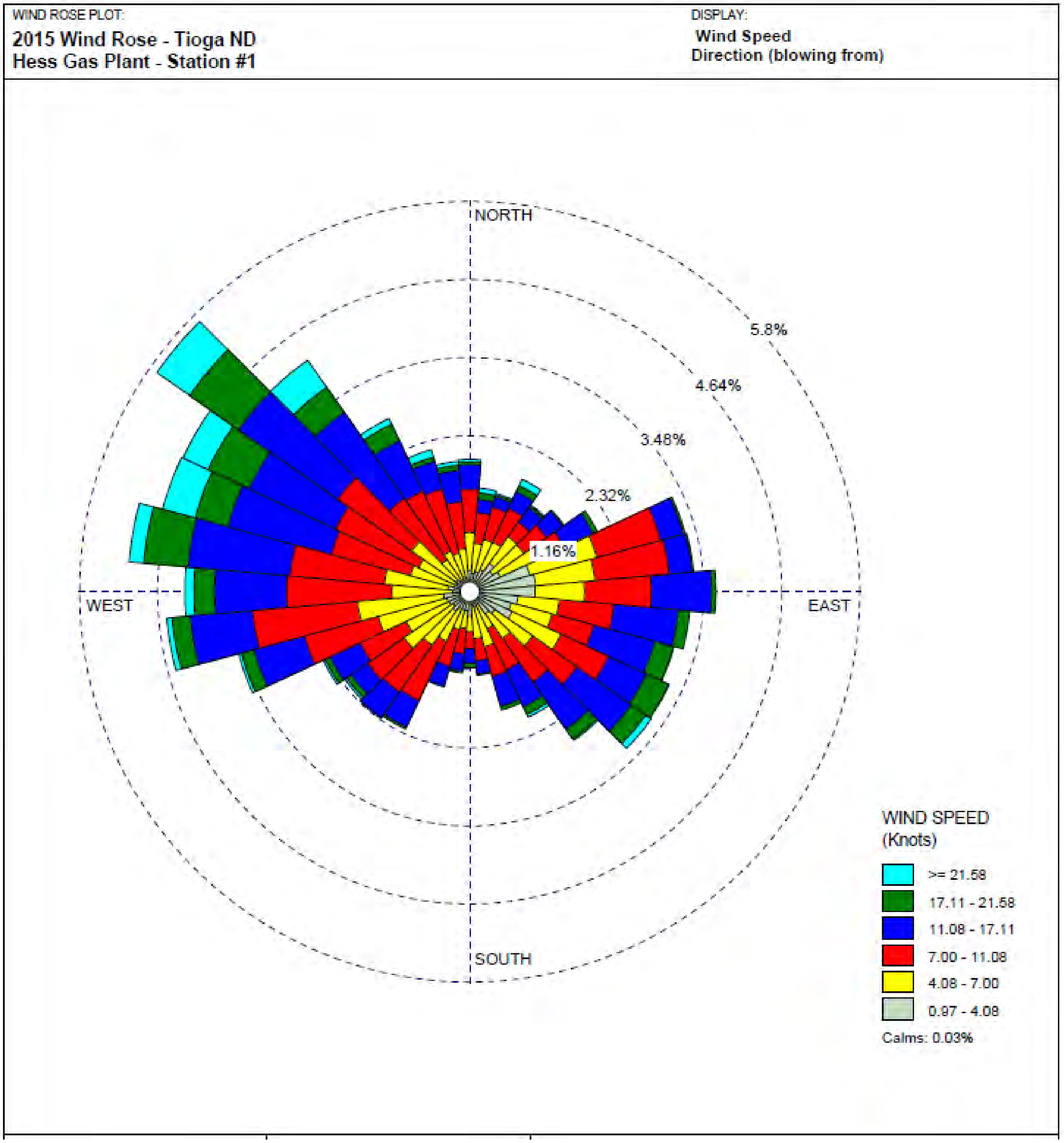
METHOD REFLEVEL SUBNWS
METHOD WIND_DIR RANDOM
METHOD CCVR NO_SUB
METHOD NOTSUB

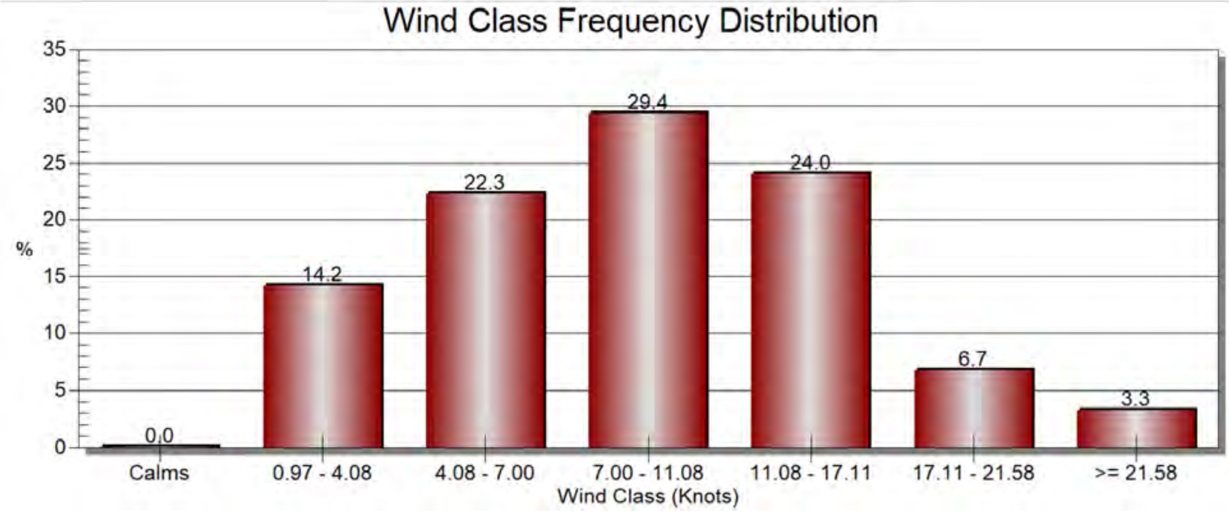
The resulting data set provides more than 99% coverage of the meteorological conditions, as follows:

- 2015 – 99.9 %, 8 missing hours

Figure 1 depicts the wind rose and wind class frequency distribution for the 2015 data included in the modeling analysis.

Figure 1. 2015 Wind Rose and Distribution from Onsite Wind Data





AIR EMISSION SOURCES AND FACILITY CONFIGURATION

WBI is proposing to construct three (3) 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	655045.76	5363251.78	692
Unit 3	Compressor Unit #3	655045.76	5363279.52	692
Unit 4	Compressor Unit #4	655045.76	5363288.36	692
GEN	Natural gas-fired generator	654973.36	5363243.78	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	42	823	126.86	23,913	2
Unit 3	Compressor Unit #3	Default	42	823	126.86	23,913	2
Unit 4	Compressor Unit #4	Default	42	823	126.86	23,913	2
GEN	Natural gas-fired generator	Default	30	1,225	53.07	4,446	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	4.13	18.11	0.25	1.11	0.25	1.11	0.0149	0.0654
Unit 3	4.13	18.11	4.13	18.11	0.25	1.11	0.25	1.11	0.0149	0.0654
Unit 4	4.13	18.11	4.13	18.11	0.25	1.11	0.25	1.11	0.0149	0.0654
GEN	4.07	17.84	2.04	8.92	0.16	0.72	0.16	0.72	0.005	0.022

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	654919.13	5363288.36	50	50	12	13
TRNBLDG2	Transfer Building #2	654938.61	5363308.38	60	100	30	32.5
U1COMP	Unit #1 Compressor Building	654950.80	5363272.44	28	26	11	11
METER	Meter Building	654922.15	5363257.99	7.5	7.5	10	10
OFCSHOP	Office/Shop	654919.12	5363248.47	60	40	15	17.3
U23BLDG	Unit #2 & #3 Compressor Building	655023.03	5363280.89	60	100	30	32.5
U4BLDG	Unit #4 Compressor Building	655023.03	5363308.35	60	100	30	32.5
AUX	Auxiliary Building	654967.87	5363273.05	40	80	16	18

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	61.2	35	96.2	188	51.2%
	Annual	2.2	5	7.2	100	7.2%
CO	1-hour	147.7	1,149	1,296.7	40,000	3.2%
	8-hour	83.2	1,149	1,232.2	10,000	12.3%
PM_{10}	24-hour	2.1	30	32.1	150	21.3%
$PM_{2.5}$	24-hour	1.4	13.7	15.1	35	42.6%
	Annual	0.17	4.75	4.9	12	41.0%
SO_2	1-hour	0.29	13	13.3	196	6.8%

Figure 2. Depiction of Tioga Compressor Station – showing full receptor grid

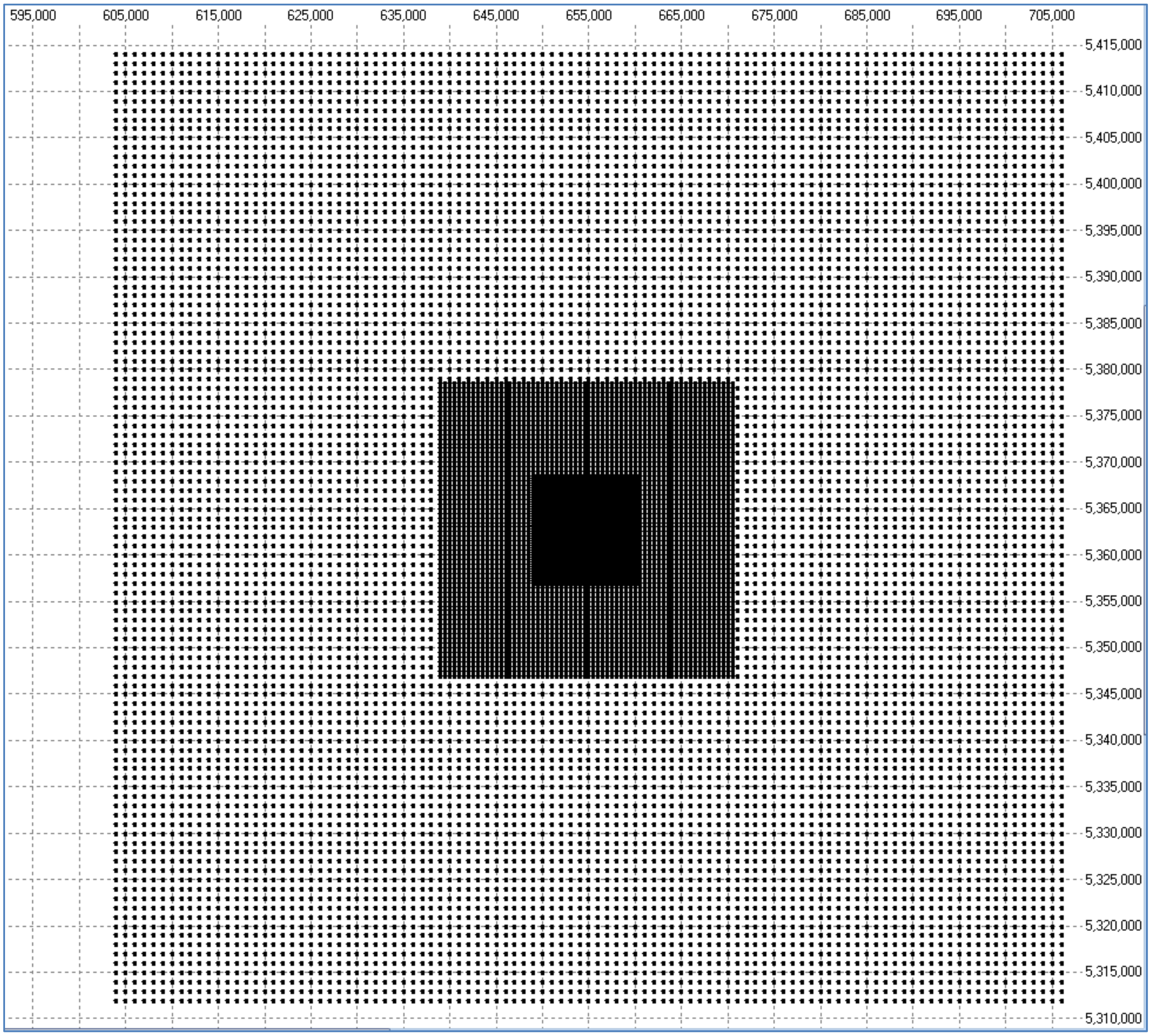


Figure 3. Depiction of Tioga Compressor Station – showing facility and close receptors

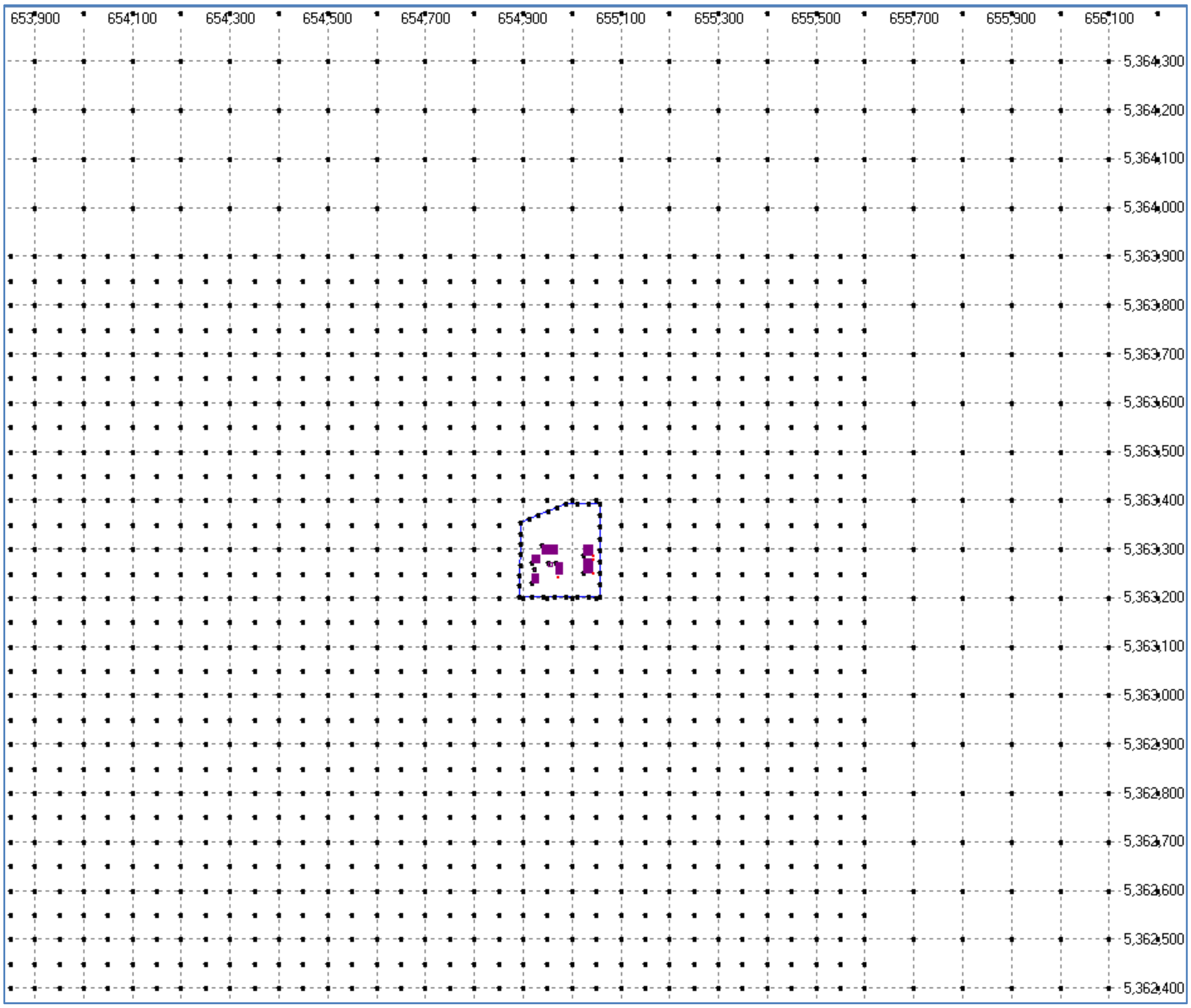
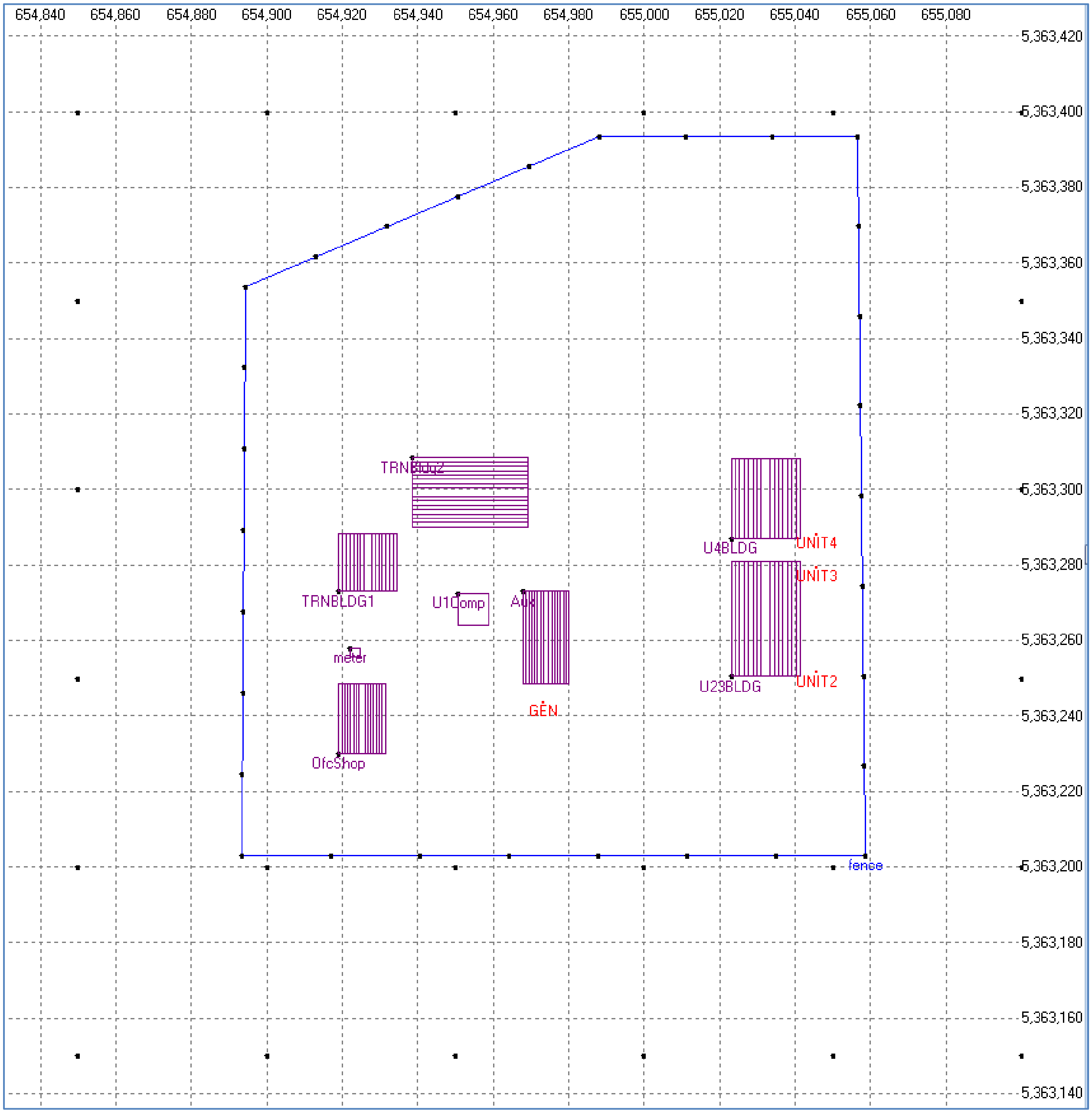


Figure 4. Depiction of Tioga Compressor Station – Close-up 1, with aerial photo

Figure 5. Depiction of Tioga Compressor Station – Close-up 2, showing additional source detail



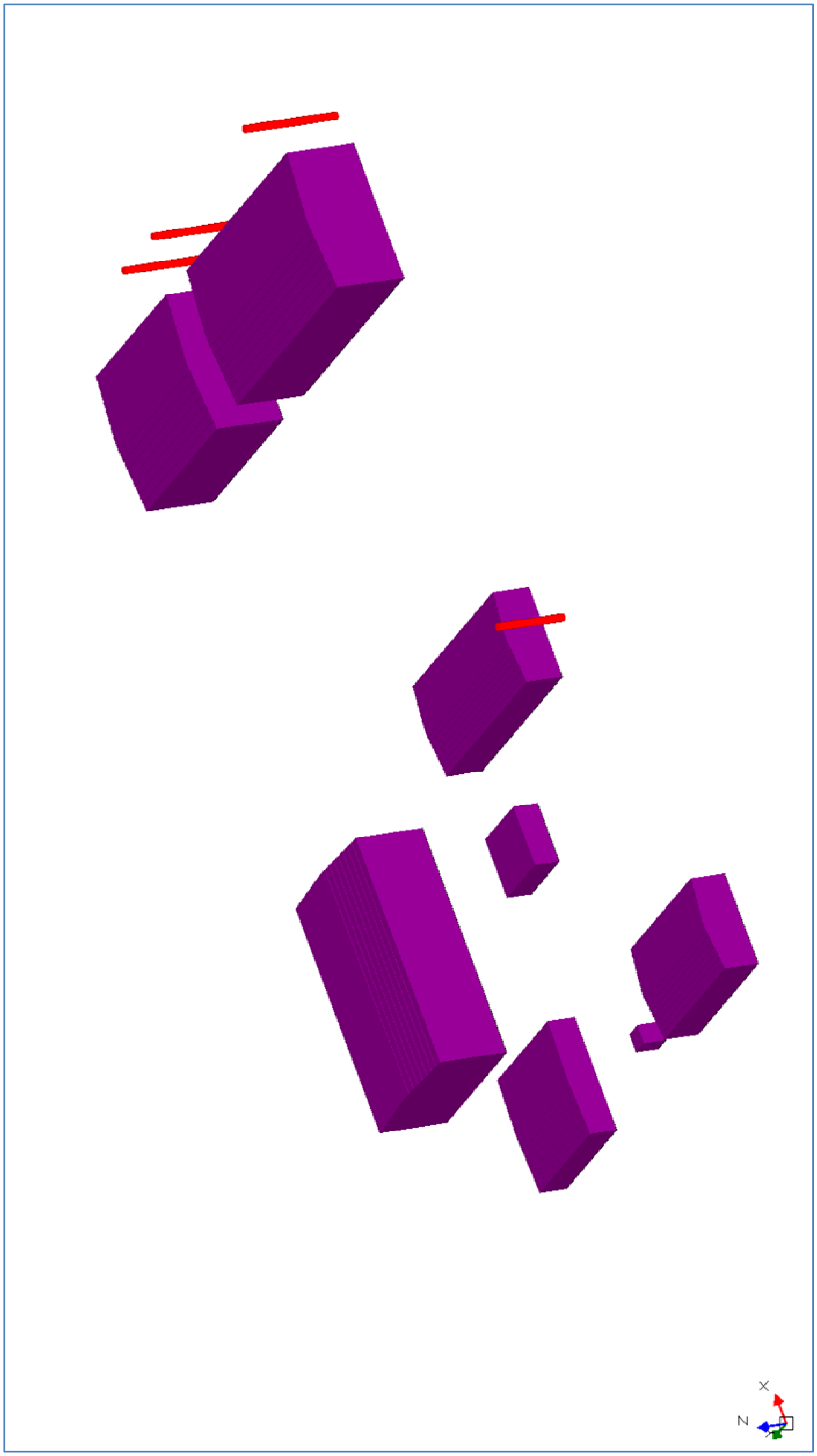


Figure 6. Depiction of Tioga Compressor Station – 3D depiction of structures and sources

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.
CP20-52

June 2020

June 2020

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APPENDICES

WBI Energy Transmission, Inc.
North Bakken Expansion Project
Pre-Construction Noise Survey and Noise Impact Analysis
McKenzie and Williams Counties, North Dakota

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,
- one combination gas/auxiliary cooler, 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	45.5	56.0	0.4
NSA 2 (House)	3,465 feet E	41.0	47.3	48.2	7.2
NSA 3 (House)	3,895 feet NE	41.0	46.3	47.4	6.4

Existing Tioga Compressor Station Upgrade

The significant noise-producing equipment associated with the compressor station upgrade will include the addition of:

- Three Ariel KBZ-4 compressors and 3,750 horsepower Caterpillar 3612 reciprocating natural gas driven engines,
- Three combination gas/auxiliary coolers
- piping.

To mitigate noise impacts at the nearby NSAs, the following noise control measures will be implemented:

- The three 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	50.9	58.2	1.0
NSA 2 (House)	4,076 feet NE	58.2	50.7	58.9	0.7
NSA 3 (House)	4,920 feet E	54.0	49.0	55.2	1.2
NSA 4 (House)	2,221 feet E	55.6	55.9	58.8	3.2
NSA 5 (House)	4,940 feet SE	54.0	49.0	55.2	1.2
NSA 6 (House)	5,229 feet W	61.3	48.5	61.5	0.2
NSA 7 (House)	4,862 feet NW	61.3	49.1	61.5	0.3

[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.

Blowdown Events

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, with the exception of at NSA 4 for Tioga Compressor Station. However, it is possible that noise contributed by the compressor station expansion would not actually exceed 55 dBA L_{dn}, as this analysis does not account for attenuation due to temperature, humidity, or ground hardness, which would further reduce the noise contribution. 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.

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

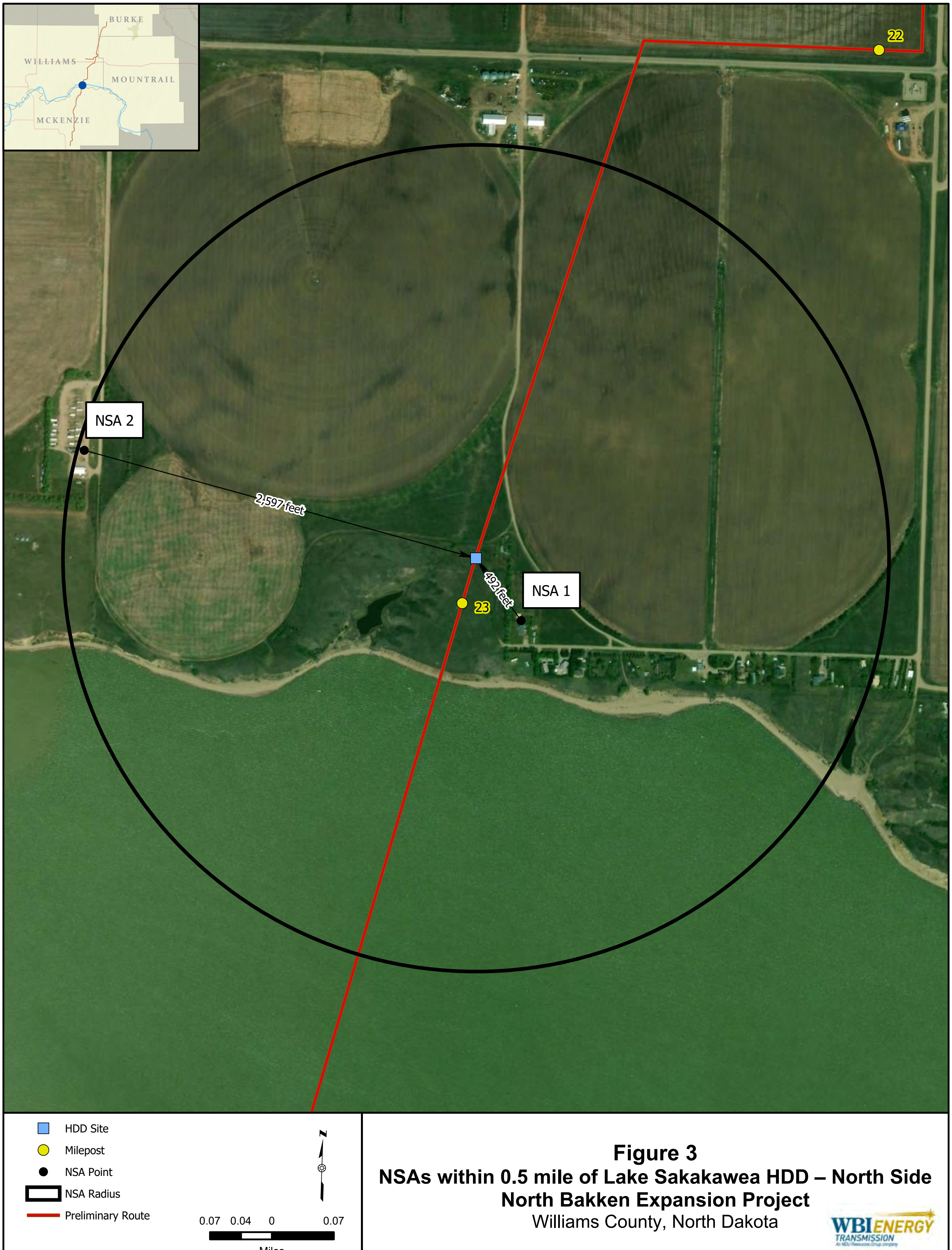

Figure 3
NSAs within 0.5 mile of Lake Sakakawea HDD – North Side
North Bakken Expansion Project
Williams County, North Dakota

WBI ENERGY TRANSMISSION

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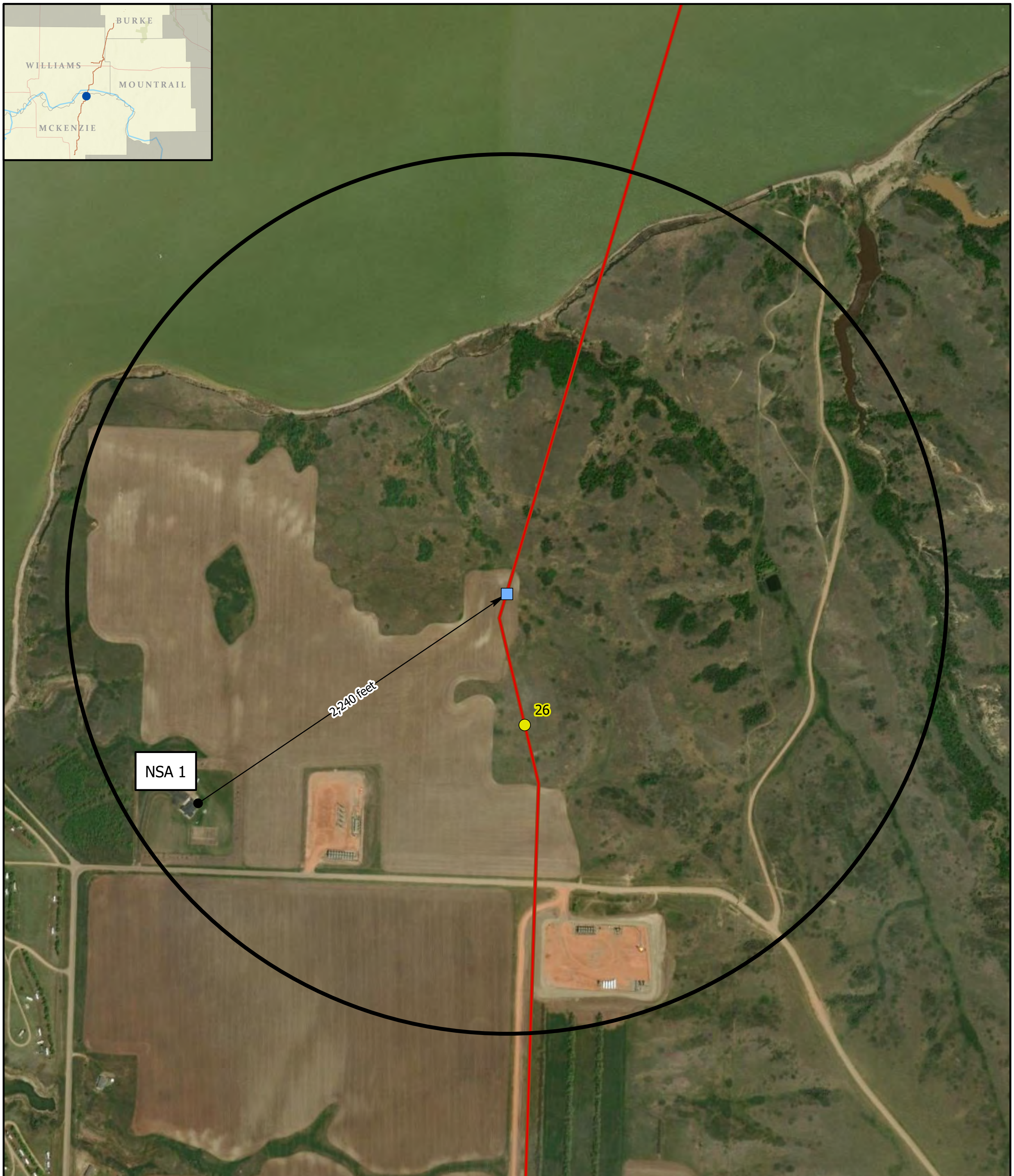

Figure 4

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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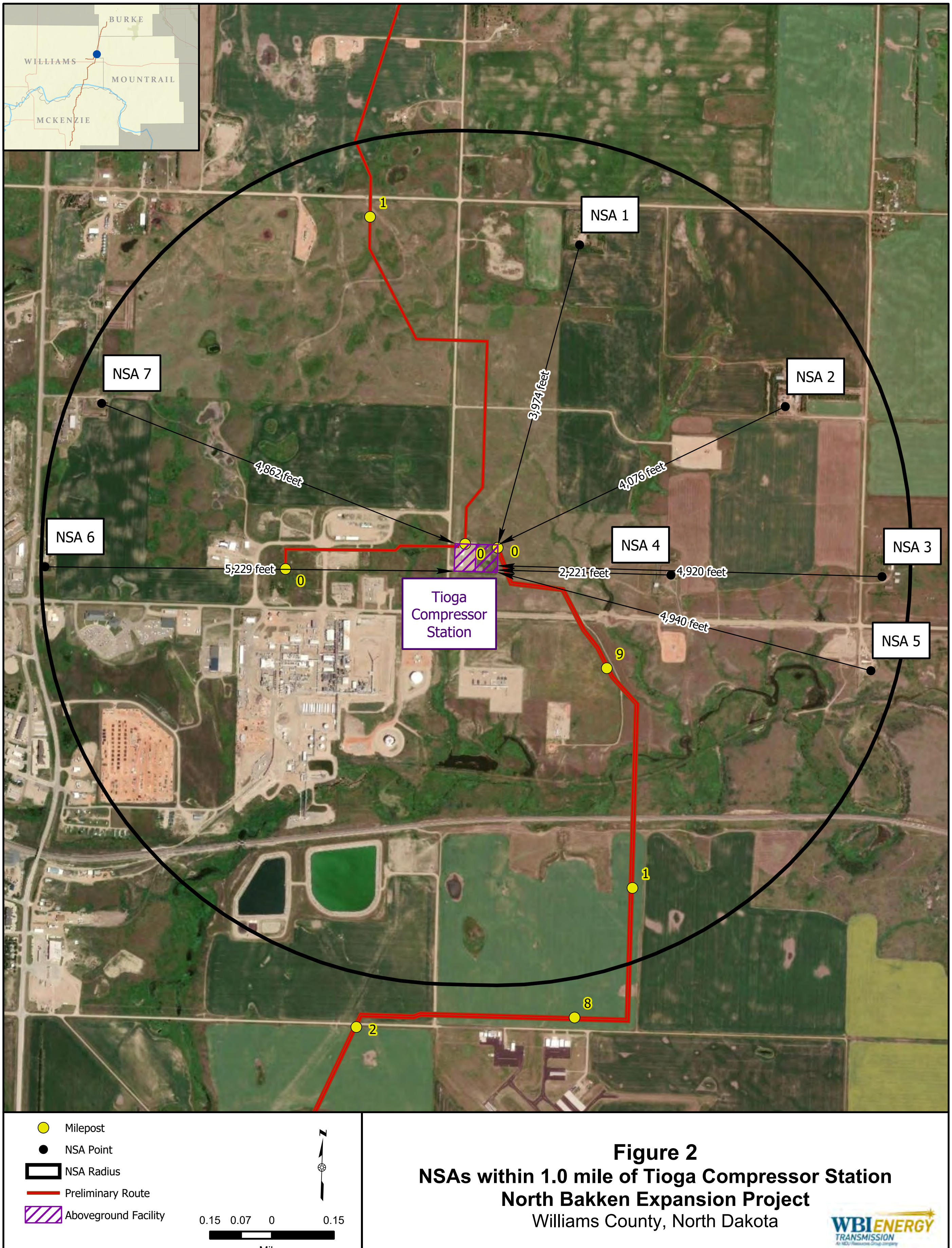

Figure 2
NSAs within 1.0 mile of Tioga Compressor Station
North Bakken Expansion Project
Williams County, North Dakota

WBI ENERGY TRANSMISSION

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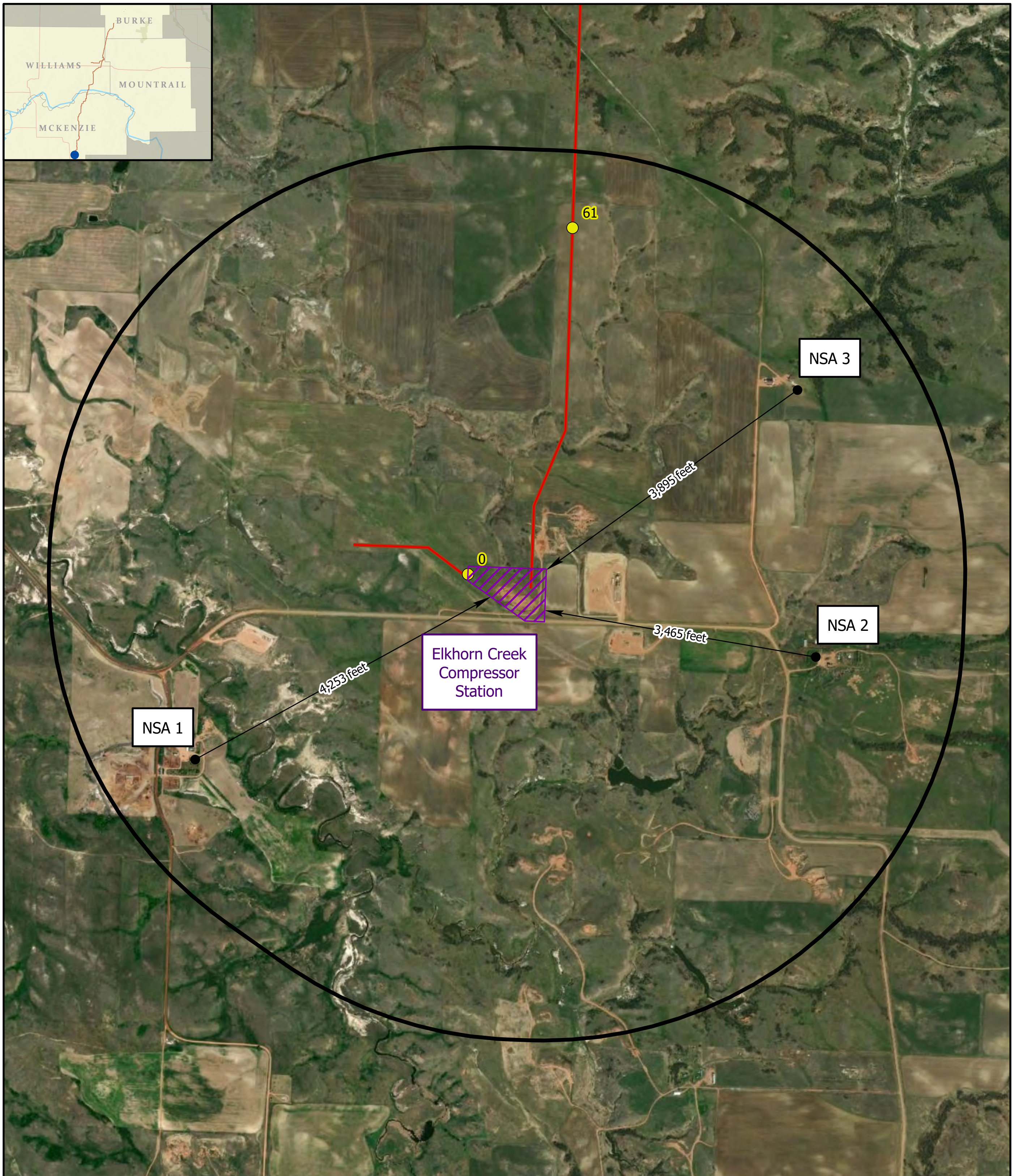

Milepost

NSA Point

NSA Radius

Preliminary Route

Aboveground Facility

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

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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

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: 93.3 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

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:

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	
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:

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	
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

ERM

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

	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)
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

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

ERM

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: ___

	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)
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

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

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: 93.9 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: ____

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	
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

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: 93.8 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: ____

	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)
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

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.

	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)
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

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			63 Hz		125 Hz			250 Hz			500 Hz			1 kHz			2 kHz			4 kHz			8 kHz			
Indoor Equipment	**Quantity**		**63**	**100**	**125**	**160**	**200**	**250**	**315**	**400**	**500**	**630**	**800**	**1000**	**1250**	**1600**	**2000**	**2500**	**3150**	**4000**	**5000**	**6300**	**8000**	**10000**	**Total L_W**	
Compressor Engine Mechanical (CAT G3612 A4)	1		---	91.5	93.1	94.2	99.4	101.9	107.8	107.6	108.9	110.8	111.5	111.8	113.3	111.8	112.1	114.6	114.7	111.4	118.4	111.9	107.8	107.1	124.8	
1/1 octaves			0		97.8			109.3			114.1			117.0			117.8			120.5			114.3			
Compressor (Ariel KBU-4)	1		99.0	---	99.0	---	---	109.0	---	---	99.0	---	---	95.0	---	---	91.0	---	---	89.0	---	---	85.0	---	103.2	
Total Indoor Equipment	**---**		**99.0**	---	**101.5**	---	---	**112.1**	---	---	**114.2**	---	---	**117.1**	---	---	**117.8**	---	---	**120.5**	---	---	**114.3**	---	**124.9**	
Wall and Roof Transmission Loss	---		0.0	---	12.0	---	---	16.0	---	---	26.0	---	---	33.0	---	---	36.0	---	---	47.0	---	---	0.0	---	---	
Total Outside Compressor Building	**---**		**99.0**	---	**89.5**	---	---	**96.1**	---	---	**88.2**	---	---	**84.1**	---	---	**81.8**	---	---	**73.5**	---	---	**114.3**	---	**113.1**	
Outdoor Equipment	**Quantity**	**31.5**	**63**	**100**	**125**	**160**	**200**	**250**	**315**	**400**	**500**	**630**	**800**	**1000**	**1250**	**1600**	**2000**	**2500**	**3150**	**4000**	**5000**	**6300**	**8000**	**10000**	**Total L_W**	
Compressor Engine Exhaust	1		0	107.3	111.5	115.3	116.7	114.8	116.7	118.6	117.9	119	126.4	127	130.5	132.3	135.3	137	138.8	139.3	138.4	137.7	136.2	134.1	147.4	
1/1 octaves			0		117.3			120.9			123.3			133.1			140.0			143.6			141.0			
Catalyst Insertion Loss	1		0	---	30	---	---	30	---	---	30	---	---	30	---	---	30	---	---	30	---	---	30	---	---	
Mitigated Exhaust Noise	1		0	---	87.3	---	---	90.9	---	---	93.3	---	---	103.1	---	---	110.0	---	---	113.6	---	---	111.0	---	117.3	
Gas/Auxilary Combo Cooler Fans	2		100.4	---	101.4	---	---	99.4	---	---	94.4	---	---	92.4	---	---	86.4	---	---	80.4	---	---	74.4	---	97.3	
Total Outdoor Equipment	**---**		**103.4**	---	**104.5**	---	---	**102.7**	---	---	**98.8**	---	---	**103.8**	---	---	**110.1**	---	---	**113.6**	---	---	**111.0**	---	**117.4**	
Compressor Station Total	**---**		**104.8**	---	**104.6**	---	---	**103.6**	---	---	**99.2**	---	---	**103.9**	---	---	**110.1**	---	---	**113.6**	---	---	**115.9**	---	118.8	**Overall Station L_W**

Tioga			63 Hz		125 Hz			250 Hz			500 Hz			1 kHz			2 kHz			4 kHz			8 kHz			
Indoor Equipment	**Quantity**	**31.5**	**63**	**100**	**125**	**160**	**200**	**250**	**315**	**400**	**500**	**630**	**800**	**1000**	**1250**	**1600**	**2000**	**2500**	**3150**	**4000**	**5000**	**6300**	**8000**	**10000**	**Total L_W**	
Compressor Engine Mechanical (CAT G3612 A4)	3		---	91.5	93.1	94.2	99.4	101.9	107.8	107.6	108.9	110.8	111.5	111.8	113.3	111.8	112.1	114.6	114.7	111.4	118.4	111.9	107.8	107.1	124.8	
1/1 octaves			0		97.8			109.3			114.1			117.0			117.8			120.5			114.3			
Compressor (Ariel KBU-4)	3		99.0	---	99.0	---	---	109.0	---	---	99.0	---	---	95.0	---	---	91.0	---	---	89.0	---	---	85.0	---	103.2	
Backup Generator Mechanical (L5794GSI)	1	82	98.0	---	95.0	---	---	98.0	---	---	96.0	---	---	96.0	---	---	94.0	---	---	90.0	---	---	88.0	---	100.7	
Total Indoor Equipment	**---**		**104.8**	---	**106.6**	---	---	**117.0**	---	---	**119.0**	---	---	**121.9**	---	---	**122.6**	---	---	**125.3**	---	---	**119.0**	---	**129.7**	
Wall and Roof Transmission Loss	---		0.0	---	12.0	---	---	16.0	---	---	26.0	---	---	33.0	---	---	36.0	---	---	47.0	---	---	0.0	---	---	
Total Outside Compressor Building	**---**		**104.8**	---	**94.6**	---	---	**101.0**	---	---	**93.0**	---	---	**88.9**	---	---	**86.6**	---	---	**78.3**	---	---	**119.0**	---	**117.9**	
Outdoor Equipment	**Quantity**	**31.5**	**63**	**100**	**125**	**160**	**200**	**250**	**315**	**400**	**500**	**630**	**800**	**1000**	**1250**	**1600**	**2000**	**2500**	**3150**	**4000**	**5000**	**6300**	**8000**	**10000**	**Total L_W**	
Compressor Engine Exhaust	3		0	107.3	111.5	115.3	116.7	114.8	116.7	118.6	117.9	119	126.4	127	130.5	132.3	135.3	137	138.8	139.3	138.4	137.7	136.2	134.1	147.4	
1/1 octaves			0		117.3			120.9			123.3			133.1			140.0			143.6			141.0			
Catalyst Insertion Loss	3		0	---	30	---	---	30	---	---	30	---	---	30	---	---	30	---	---	30	---	---	30	---	---	
Mitigated Compressor Exhaust Noise	3	0	0	---	87.3	---	---	90.9	---	---	93.3	---	---	103.1	---	---	110.0	---	---	113.6	---	---	111.0	---	117.3	
Generator Engine Exhaust	1	107	114	---	115.0	---	---	110.0	---	---	107.0	---	---	106.0	---	---	98.0	---	---	88.0	---	---	71.0	---	109.8	
Silencer Insertion Loss	1	30	30	---	30	---	---	30	---	---	30	---	---	30	---	---	30	---	---	30	---	---	30	---	---	
Mitigated Generator Exhaust Noise	1	77	84	---	85.0	---	---	80.0	---	---	77.0	---	---	76.0	---	---	68.0	---	---	58.0	---	---	41.0	---	79.8	
Gas/Auxilary Combo Cooler Fans	6		100.4	---	101.4	---	---	99.4	---	---	94.4	---	---	92.4	---	---	86.4	---	---	80.4	---	---	74.4	---	97.3	
Total Outdoor Equipment	**---**		**108.2**	---	**109.3**	---	---	**107.5**	---	---	**103.6**	---	---	**108.6**	---	---	**114.9**	---	---	**118.4**	---	---	**115.8**	---	**122.2**	
Compressor Station Total	**---**		**109.8**	---	**109.4**	---	---	**108.4**	---	---	**104.0**	---	---	**108.6**	---	---	**114.9**	---	---	**118.4**	---	---	**120.7**	---	123.6	**Overall Station L_W**