



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

April 1, 2022

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

Re: WBI Energy Transmission, Inc.
Docket Nos. CP20-52-000, CP20-52-001
North Bakken Expansion Project
Post-construction Noise Surveys - Elkhorn Creek Compressor Station
- Tioga Compressor Station

Dear Ms. Bose:

On June 1, 2021, the Federal Energy Regulatory Commission (FERC or Commission) issued an Order Issuing Certificate (Certificate) in the above-referenced dockets authorizing WBI Energy Transmission, Inc. (WBI Energy) to construct and operate its North Bakken Expansion Project (Project) in Burke, McKenzie, Mountrail and Williams Counties, North Dakota. On July 8, 2021, the Commission granted a notice to proceed with the construction of all Project facilities. On January 14, 2022, WBI Energy filed a request for authorization to place all Project facilities into service. On January 26, 2022, the Commission granted WBI Energy's request and the authorized facilities were placed into service on February 1, 2022.

Pursuant to Environmental Condition Nos. 18 and 19 of the Appendix to the Certificate, WBI Energy is required to file with the Commission a post-construction noise survey within 60 days of placing the modified Tioga and the new Elkhorn Creek Compressor Stations, respectively, into service. If the noise attributable to the operation of all of the equipment at each of the stations under interim or full horsepower load conditions exceeds an Ldn of 55 dBA at any nearby noise sensitive area (NSA), WBI Energy is required to file a report on what changes are needed and install the additional noise controls to meet the level within 1 year of the in-service date.

Post-construction noise surveys at existing NSAs were conducted on March 21 and 22, 2022. WBI Energy was unable to achieve full-load conditions at either compressor station due to operational limitations during the survey timeframes. Therefore, a second noise survey will be completed for each station and the results filed within six months of the initial startup.

WBI Energy is herein filing an interim survey conducted at each station at the maximum achievable horsepower load during the survey timeframes. Please see the Noise Survey Report and the associated appendices for the survey results.

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

Attachment

Courtesy Copies:

Dawn Ramsey, FERC Environmental Project Manager (via email)
Shannon Crosley, FERC Environmental Deputy Project Manager (via email)
Official Service List



WBI ENERGY TRANSMISSION, INC.

North Bakken Expansion Project

Post-Construction Noise Survey and Acoustical Analysis

**Docket Nos.
CP20-52-000
CP20-52-001**

March 2022

March 2022

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**WBI Energy Transmission, Inc.
North Bakken Expansion Project
Post-Construction Noise Survey Report
McKenzie and Williams Counties, North Dakota**

1.0 INTRODUCTION

Between March 21 and 22, 2022, Environmental Resources Management, Inc. (ERM) conducted post-construction noise surveys at select sites located near Noise Sensitive Areas (NSAs) adjacent to WBI Energy Transmission, Inc.'s (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 post-construction noise surveys.

The Project involved the 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 11,250 horsepower to the existing compressor station (Tioga Compressor Station) in Williams County. The Federal Energy Regulatory Commission (FERC) included the following Environmental Conditions in the Project Order related to operation of the compressor stations:

- *Environmental Condition 18: WBI Energy shall file a noise survey with the Secretary **no later than 60 days** after placing the authorized units at the modified Tioga Compressor Station in service. If a full-load condition noise survey is not possible, WBI Energy shall provide an interim survey at the maximum possible horsepower load and provide the full-load survey **within 6 months**. If the noise attributable to the operation of all of the equipment at the Tioga Compressor Station under interim or full horsepower load conditions exceeds an Ldn of 55 dBA at any nearby NSAs, WBI Energy shall file a report on what changes are needed and shall install the additional noise controls to meet the level **within 1 year** of the in- service date. WBI Energy shall confirm compliance with the above requirement by filing a second noise survey with the Secretary **no later than 60 days** after it installs the additional noise controls. (Section B.8.2)*
- *Environmental Condition 19: WBI Energy shall file a noise survey with the Secretary **no later than 60 days** after placing the Elkhorn Creek Compressor Station in service. If a full-load condition noise survey is not possible, WBI Energy shall provide an interim survey at the maximum possible horsepower load and provide the full load survey **within 6 months**. If the noise attributable to the operation of all of the equipment at the Elkhorn Creek Compressor Station under interim or full horsepower load conditions exceeds an Ldn of 55 dBA at any nearby NSAs, WBI Energy shall file a report on what changes are needed and shall install the additional noise controls to meet the level **within 1 year** of the in-service date. WBI Energy shall confirm compliance with the above requirement by filing a second noise survey with the Secretary **no later than 60 days** after it installs the additional noise controls. (Section B.8.2)*

The modified units at the Tioga Compressor Station and the new Elkhorn Creek Compressor Station were placed into service on February 1, 2022. The purpose of this noise survey was to measure noise levels at existing NSAs near the two operational compressor stations and evaluate compliance with FERC's noise criteria of 55 dBA L_{dn} .

2.0 NOISE SURVEY METHODS AND LOCATIONS

2.1 Noise Measurement Equipment and Methodology

Sound pressure levels were measured using two Casella – CEL 633 hand-held analyzers (Serial numbers 1239542 and 4637989) equipped with an internal microphone with a windscreen. Field calibration was performed before and after monitoring using a Casella – CEL calibrator (Serial number 0966247) (see Appendix B for calibration certificate). 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. An additional 30 minutes of near-field sound data was collected from each compressor station to verify sound contribution from the operation of the compressor station at the nearby NSAs.

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 located 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.

During the field visit, ERM staff confirmed that no new NSAs had been added since the completion of the pre-construction noise survey. The locations of the NSAs associated with the Elkhorn Creek Compressor Station are provided on Figure 1 in Appendix A.

The Tioga Compressor station is located 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; and

NSA #7: Residence located on State Highway 40, approximately 4,862 feet to the northwest.

During the field visit, ERM staff confirmed that no new NSAs had been added since the completion of the pre-construction noise survey. The locations of the NSAs associated with the Tioga Compressor Station are provided on Figure 2 in Appendix A.

Noise monitoring locations for the post-construction noise survey were consistent with monitoring locations used during the pre-construction noise survey. Near-field data was collected from the Elkhorn Creek and Tioga compressor stations to verify operational sound levels associated with the two compressor stations.

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 C.

TABLE 1			
Summary of Weather Conditions during Field Survey			
Condition	Minimum	Maximum	Average
Elkhorn Creek Compressor Station			
Temperature °F	34	36	35
Relative Humidity %	70	87	79
Wind Direction	--	--	W
Wind Speed (miles per hour)	10	13	10.7
Barometric Pressure mm. Hg	761.5	768.8	762.2
Tioga Compressor Station			
Temperature °F	27	43	34
Relative Humidity %	39	86	69

Wind Direction	--	--	NW
Wind Speed (miles per hour)	9	26	15.5
Barometric Pressure mm. Hg	761.5	765.0	763.5

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}).

The Elkhorn Creek and Tioga 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)).

North Dakota does not have noise regulations that apply to the compressor stations. 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 Elkhorn Creek Compressor Station.

Williams County maintains the following general noise regulations that would pertain to the Tioga Compressor Station:

1) Maximum Noise Standards by District

Zone of Property Receiving Noise	Maximum Noise Level dB
Residential Districts: Urban Residential (UR), Rural Residential (RR)	60
Commercial Districts: Urban Commercial (UC), Rural Commercial (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).

ERM previously established that the Williams County noise regulation is less strict than FERC regulations; therefore, compliance with the FERC standard is sufficient to demonstrate compliance with Williams County noise regulations.

4.0 NOISE SURVEY RESULTS AND ACOUSTICAL ANALYSIS

Elkhorn Creek Compression Station

The Elkhorn Creek Compressor Station was operating at a capacity ranging from 20% to 100% during the post-construction noise survey completed on March 21, 2022. The results of the operational sound level analysis for the Elkhorn Creek Compressor Station are summarized in Table 2. Field notes are included in Appendix C and calculation details are included in Appendix D.

Station and Closest NSA(s)	Distance and Direction of NSA	Pre-Construction Surveyed Ambient L _{dn} (dBA)	Post-Construction Surveyed Ambient L _{dn} (dBA)	Estimated L _{dn} of Station (dBA) at NSA ¹	Observed Increase Above Ambient (dB) ²
NSA 1 (House)	4,253 feet SW	55.6	58.4	37.9	2.8
NSA 2 (House)	3,465 feet E	41.0	67.1	40.3	26.1
NSA 3 (House)	3,895 feet NE	41.0	67.1	38.9	26.1

¹ Based upon near-field compressor station operational noise data.
² Based upon the observed difference between pre-construction and post-construction surveyed ambient L_{dn}.

Based on the post-construction noise survey, the operational noise of the Elkhorn Creek Compressor Station ranged from 37.9 to 40.3 dBA L_{dn} and was less than 55 dBA L_{dn} at each of the closest NSAs. The post-construction L_{dn} at NSA 2 & 3 was 26.1 dB higher than the pre-construction L_{dn}. Both the daytime and nighttime sound levels at NSAs 2 & 3 were higher than the pre-construction ambient conditions. During the nighttime noise survey at NSAs 2 & 3, an unplanned gas blowdown event occurred at the Elkhorn Creek Compressor Station, resulting in elevated nighttime sound levels. Blowdown noise is not associated with normal continuous compressor station operation, but only occurs during intermittent maintenance or upset conditions. As noted, the operational noise associated with normal continuous compressor station operation was observed to be less than 55 dBA L_{dn}.

Tioga Compressor Station

The Tioga Compressor Station was operating at 50% capacity during the post-construction noise survey completed on March 22, 2022. The results of the operational sound level analysis for the Tioga Compressor Station are summarized in Table 3. Field notes are included in Appendix C and calculation details are included in Appendix D.

Station and Closest NSA(s)	Distance and Direction of NSA	Pre-Construction Surveyed Ambient L _{dn} (dBA)	Post-Construction Surveyed Ambient L _{dn} (dBA)	Estimated L _{dn} of Station (dBA) at NSA	Observed Increase Above Ambient (dB)
NSA 1 (House)	3,974 feet N	57.2	52.5	39.7	-4.7
NSA 2 (House)	4,076 feet NE	58.2	64.9	39.4	6.7
NSA 3 (House)	4,920 feet E	54.0	57.3	37.4	3.3
NSA 4 (House)	2,221 feet E	55.6	61.6	45.8	6.0
NSA 5 (House)	4,940 feet SE	54.0	57.3	37.4	3.3
NSA 6 (House)	5,229 feet W	61.3	63.4	36.8	2.1
NSA 7 (House)	4,862 feet NW	61.3	63.4	37.6	2.1

¹ Based upon near-field compressor station operational noise data.
² Based upon the observed difference between pre-construction and post-construction surveyed ambient L_{dn}.

Based on the post-construction noise survey, the operational noise of the expanded Tioga Compressor Station ranged from 36.8 to 45.8 dBA L_{dn} and was less than 55 dBA L_{dn} at each of the closest NSAs.

5.0 ACOUSTICAL ANALYSIS METHODOLOGY

Compressor Stations

Predicted noise contributions due to compressor station operations were estimated based on the near-field operational sound data collected from each operating compressor station, 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:

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

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.

6.0 CONCLUSION

Based on the measured operational data (see tables 2 and 3), the Elkhorn Creek Compressor Station and expanded Tioga Compressor Station operation do not contribute to an exceedance of FERC's 55 dBA L_{dn} noise limit. As noted in Section 4.0, the two compressor stations were not operating at full load during the noise survey due to operational limitations; therefore, a second noise survey will be completed within 6 months to verify that operational noise from the Elkhorn Creek and Tioga Compressor Stations when operating at full load do not exceed FERC's 55 dBA L_{dn} noise limit.

7.0 REFERENCES

Federal Energy Regulatory Commission. WBI Energy Transmission, Inc. Docket Nos. CP20-52-000 and CP20-52-001, Order Issuing Certificate for North Bakken Expansion Project. June 1, 2021.

Federal Energy Regulatory Commission. "Guidance Manual for Environmental Report Preparation". February 2017.

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

**Post-Construction Noise Survey and Acoustical Analysis
McKenzie and Williams Counties, North Dakota**

**APPENDIX A
Figures**

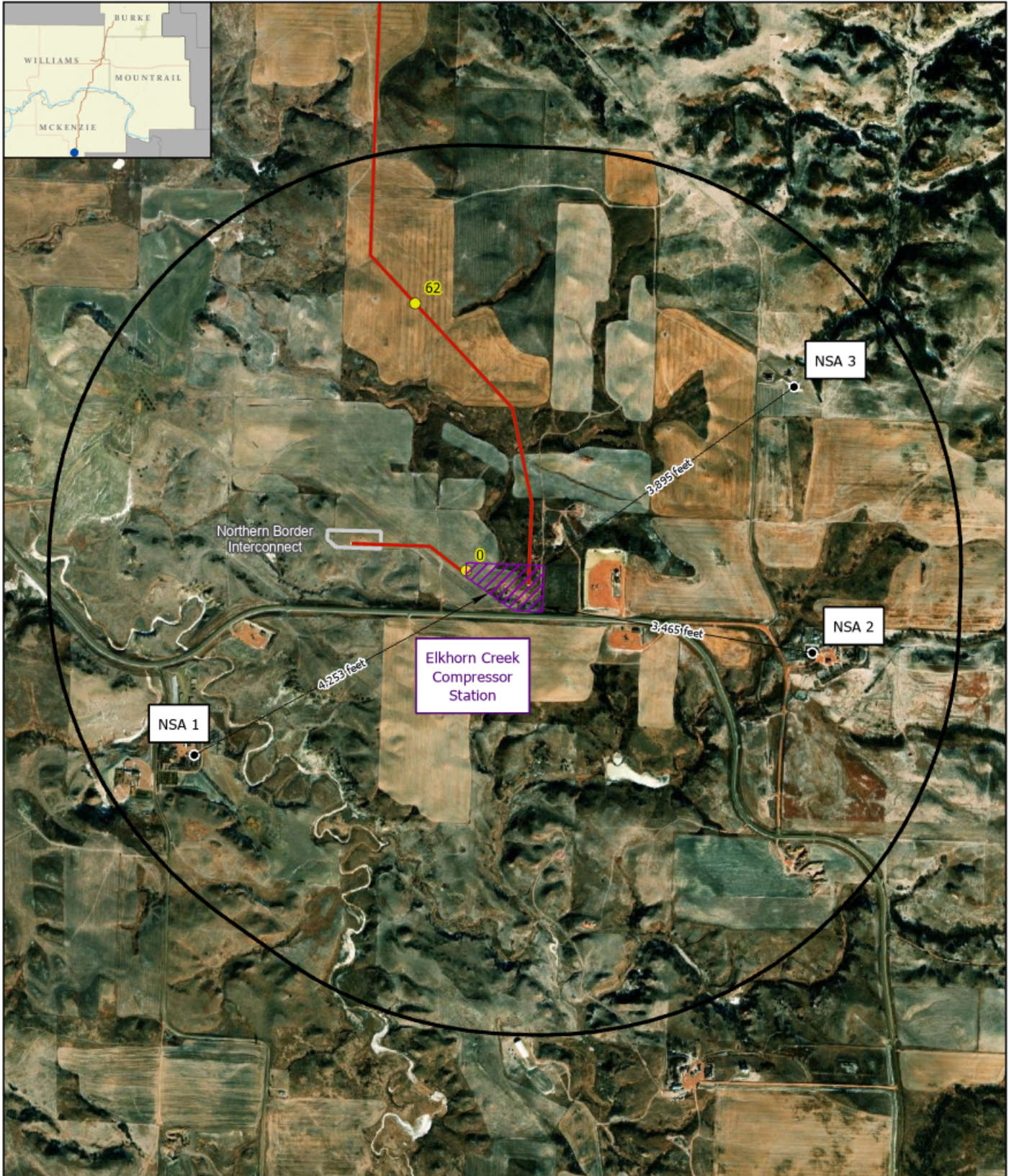


Figure 1
NSAs within 1.0 mile of
Elkhorn Creek Compressor Station
North Bakken Expansion Project
 McKenzie County, North Dakota



● Milepost
● NSA Point
 NSA Radius
— Preliminary Route
 Aboveground Facility

0.15 0.07 0 0.15
 Miles

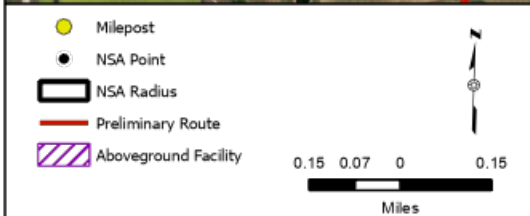
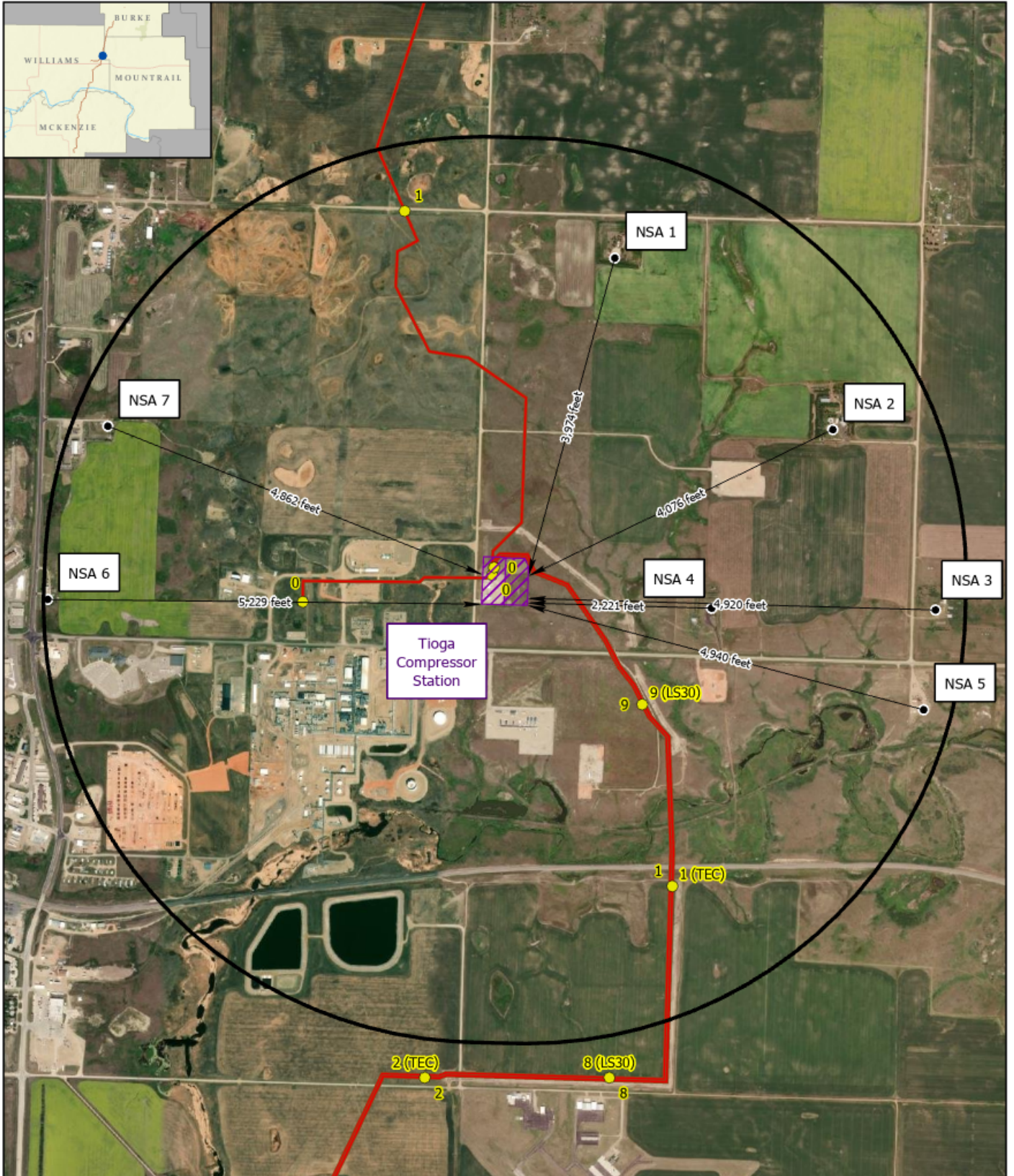


Figure 2
NSAs within 1.0 mile of
Tioga Compressor Station
North Bakken Expansion Project
 Williams County, North Dakota



NORTH BAKKEN EXPANSION PROJECT

**Post-Construction Noise Survey and Acoustical Analysis
McKenzie and Williams Counties, North Dakota**

**APPENDIX B
Sound Level Meter Calibration Certificate**

Certificate of Conformity and Calibration

Customer: Field Environmental Instruments
Instrument: CEL-120/1
Serial Number: 0966247
Job Number: 23628
Date of issue: 20-May-2021
Engineer: P Blackwell
Traceable Equipment: Reference Calibrator EQ11085
DVM type Fluke 45 EQ00318

Test Conditions:

Ambient Temperature 23.0 °C
Ambient Humidity 33.0 %RH
Ambient Pressure 1013 mBar

Results:

	Level 1	Level 2	Frequency
Initial Reading	114.04 dB	N/A dB	1.0000 kHz
Final Reading	114.00 dB	N/A dB	1.0000 kHz

Uncertainty:

Level ± 0.15 dB
Frequency ± 0.5 Hz

This test certificate confirms that the instrument specified above has been successfully tested to comply with the manufacturer's published specifications.

Tests are performed using equipment traceable to national standards in accordance with Casella's ISO 9000:2015 quality procedures.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.

This certificate may not be reproduced other than in full, except with prior written approval of the issuing laboratory.

Casella UK

Regent House, Wolsley Road,
Kempston, Bedford
MK42 7JY
United Kingdom
Tel: +44 (0)1234 844100
Fax: +44 (0)1234 841490
E: info@casellasolutions.com

Casella USA

13 Pratts Junction Road,
Sterling, MA 01564-2305
USA
Toll Free: (800) 366 2966
E: info-us@casellasolutions.com

Casella India

IDEAL Industries India Pvt. Ltd
229-230 Tower-B, Spazedge, Sector 47,
Sohna Road, Gurgaon-122001, India
Tel: +91 124 4495100
E: Casella.Sales@ideal-industries.in

Casella China

IDEAL Industries China
Room 305, Building 1, No. 1279,
Chuanqiao Rd, Pudong New
District, Shanghai, China
Tel: +86 21 31263188
Fax: +86 21 61605906
E: info@casellasolutions.cn

Casella Australia

IDEAL Industries (AUST) Pty. Ltd
Unit 17, 35 Dunlop Rd, Mulgrave,
VIC 3170, Australia
Tel: +61 3 9562 0175
E: australia@casellasolutions.com



Certificate of Conformity and Calibration

Instrument Model:-	CEL-633C		
Serial Number	1239542		
Firmware revision	V129-09		
Microphone Type:-	CEL-251	Preamplifier Type:-	CEL-495
Serial Number	4521	Serial Number	004671

Instrument Class/Type:- 1

Applicable standards:-

IEC 61672: 2013 / EN 60651 (Electroacoustics - Sound Level Meters)
 IEC 60651 1979 (Sound Level Meters), ANSI S1.4: 1983 (Specifications For Sound Level Meters)

Note:- The test sequences performed in this report are in accordance with the current Sound level meter Standard - IEC61672. The combination of tests performed are considered to confirm the products electro-acoustic performance to all applicable standards including superceded Sound Level Meter Standards - IEC60651 and IEC60804.

Test Conditions:-	22 °C	Test Engineer:-	Stephen Adams
	30 %RH	Date of Issue:-	November 5, 2021
	1022 mBar		



Declaration of conformity:-

This test certificate confirms that the instrument specified above has been successfully tested to comply with the manufacturer's published specifications. Tests are performed using equipment traceable to national standards in accordance with Casella's ISO 9001:2015 quality procedures. This product is certified as being compliant to the requirements of the CE Directive.

Test Summary:-

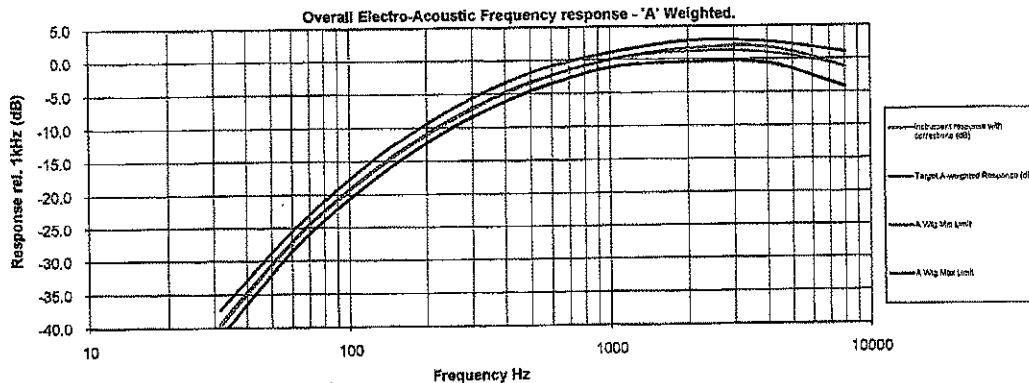
Self Generated Noise Test
 Electrical Signal Test Of Frequency Weightings
 Frequency & Time Weightings At 1 kHz
 Level Linearity On The Reference Level Range
 Toneburst Response Test
 C-peak Sound Levels
 Overload Indication
 Acoustic Tests

All Tests Pass
All Tests Pass
All Tests Pass
All Tests Pass
All Tests Pass
All Tests Pass
All Tests Pass
All Tests Pass

Combined Electro-Acoustic Frequency Response - A Weighted

Combined Electro-Acoustic Frequency Response - A Weighted (IEC 61672-3:2006)

The following A-Weighted frequency response graph shows this instruments overall frequency response based upon the application of multi-frequency pressure field calibrations. The microphones Pressure to Free field correction coefficients are applied to pressure response. Reference level taken at 1kHz.



Casella UK
 Regent House, Wolsley Road,
 Kempston, Bedford
 MK42 7JY
 United Kingdom
 Tel: +44 (0) 1234 844100
 Fax: +44(0) 1234 841490
 E-mail: info@casellasolutions.com

Casella USA
 415 Lawrence Bell Drive, Unit 4
 Buffalo, NY 14221, USA
 Toll Free (800) 266-2936
 Tel: +1 (716) 276 3040
 E-mail: info@casellausa.com

Casella India
 Ideal Industries India Pvt.Ltd.
 229-230, Sparzedge, Tower-B Sohna Road,
 Sector-47, Gurgaon-122001, Haryana, India.
 Tel: +91 124 4495100
 E-mail: casella.india@ideal-industries.in

Casella China
 Ideal Industries China
 Room 306, Building 1, No.1279, Chuanqiao
 Rd, Pudong New District,
 Shanghai, China
 Tel: +86-21-31203188
 Fax: +86-21-61609906
 Email: info@casellasolutions.cn

Certificate of Conformity and Calibration

Instrument Model:-	CEL-633C	Preamplifier Type:-	CEL-495
Serial Number	4637989	Serial Number	001795
Firmware revision	V129-09		
Microphone Type:-	CEL-251		
Serial Number	955		

Instrument Class/Type:- 1

Applicable standards:-

IEC 61672: 2013 / EN 60651 (Electroacoustics - Sound Level Meters)
 IEC 60651 1979 (Sound Level Meters), ANSI S1.4: 1983 (Specifications For Sound Level Meters)

Note:- The test sequences performed in this report are in accordance with the current Sound level meter Standard - IEC61672. The combination of tests performed are considered to confirm the products electro-acoustic performance to all applicable standards including superceeded Sound Level Meter Standards - IEC60651 and IEC60804.

Test Conditions:-	21 °C	Test Engineer:-	Paul Blackwell
	29 %RH	Date of Issue:-	January 13, 2022
	1037 mBar		



Declaration of conformity:-

This test certificate confirms that the instrument specified above has been successfully tested to comply with the manufacturer's published specifications. Tests are performed using equipment traceable to national standards in accordance with Casella's ISO 9001:2015 quality procedures. This product is certified as being compliant to the requirements of the CE Directive.

Test Summary:-

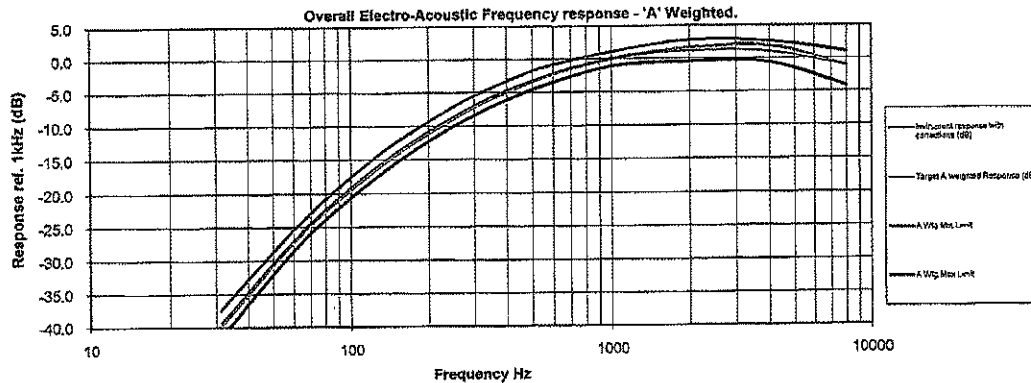
- Self Generated Noise Test
- Electrical Signal Test Of Frequency Weightings
- Frequency & Time Weightings At 1 kHz
- Level Linearity On The Reference Level Range
- Toneburst Response Test
- C-peak Sound Levels
- Overload Indication
- Acoustic Tests

All Tests Pass
 All Tests Pass
 All Tests Pass
 All Tests Pass
 All Tests Pass
 All Tests Pass
 All Tests Pass
 All Tests Pass

Combined Electro-Acoustic Frequency Response - A Weighted

Combined Electro-Acoustic Frequency Response - A Weighted (IEC 61672-3:2006)

The following A-Weighted frequency response graph shows this instruments overall frequency response based upon the application of multi-frequency pressure field calibrations. The microphones Pressure to Free field correction coefficients are applied to pressure response. Reference level taken at 1kHz.



Casella UK
 Regent House, Wolsley Road,
 Kempston, Bedford
 MK42 7JY
 United Kingdom
 Tel: +44 (0) 1234 644100
 Fax: +44(0) 1234 641490
 E-mail: info@casellasolutions.com

Casella USA
 416 Lawrence Bell Drive, Unit 4
 Buffalo, NY 14221, USA
 Toll Free (800) 366-2966
 Tel: +1 (716) 276 3040
 E-mail: info@casellausa.com

Casella India
 Ideal Industries India Pvt.Ltd.
 229-230, Spazedge, Tower-B Sohna Road,
 Sector-47, Gurgaon-122001, Haryana, India.
 Tel: +91 124 4495100
 E-mail: casella.sales@ideal-industries.in

Casella China
 Ideal Industries China
 Room 305, Building 1, No.1279, Chuangqiao
 Rd, Pudong New District,
 Shanghai, China
 Tel: +86-21-31263168
 Fax: +86-21-61605006
 Email: info@casellasolutions.cn

NORTH BAKKEN EXPANSION PROJECT

**Post-Construction Noise Survey and Acoustical Analysis
McKenzie and Williams Counties, North Dakota**

**APPENDIX C
Field Monitoring Forms**



Photos not taken at location



Noise Survey Data Sheet

Location: Elkhorn Creek CS NSA 1 – Day
(47.670925, -103.237918)

Investigator Name: Jeremy House

Date: 03/21/2022

Meter Manufacturer and Model Number: Casella CEL-63X

Serial Number: 4637989

Calibrator Manufacturer, Model, and dB: Casella, CEL-120/1, 94 and 114 dB

Calibrator Serial Number: 0966247

Initial Calibration: 114 dB (started at 117.0 dB, deviation +3.0 dB)

Final Calibration: 114 dB (ended 113.9 dB, deviation -0.1 dB)

Meteorological Conditions

Wind Speed: 9 to 12 mph

Direction: West

Temperature: 34°F

RH %: 75%

Barometric Pressure in mmHg: 762.5 mmHg

Predominant noise source(s): Wind, Traffic

Other noise source(s): 8 pickup trucks (2 drove next to monitor); 5 semi-trucks
4-wheeler on adjacent farm drove by monitor

Time start: 0753

Time end: 0853

Comments: Compressor station operating at 20% capacity

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	
0807	21.7	39.8	46.3	46.1	46.4	56.7	56.7	48.8	41.9	40.4	27.6	66.6
0822	20.9	35.2	40.9	39.3	35.0	31.3	26.3	26.4	26.4	27.3	24.3	49.4
0837	21.5	38.6	46.1	43.7	38.7	34.9	33.9	28.4	28.2	29.0	25.9	53.8
0852	21.9	38.5	45.7	43.6	38.9	35.6	30.1	28.6	28.5	29.3	26.3	53.5

North



South



East



West



North



South



East



West





Noise Survey Data Sheet

Location: Elkhorn Creek CS NSAs 2 & 3 – Day
(47.67441, -103.21259)

Investigator Name: Charlie Wyffels

Date: 3/21/2022

Meter Manufacturer and Model Number: Casella CEL-63x

Serial Number: 1239542

Calibrator Manufacturer, Model, and dB: Casella CEL-120/1, 94 and 114 dB

Calibrator Serial Number: 0966247

Initial Calibration: 114 dB (started at 115.4 dB, deviation +1.4 dB)

Final Calibration: 114 dB (ended at 113.9 dB, deviation -0.1 dB)

Meteorological Conditions

Wind Speed: 9 mph (start), 12 mph (end)

Direction: West

Temperature: 34 °F (start), 34 °F (end)

RH %: 75% (start), 75% (end)

Barometric Pressure in mmHg: 762.5 mmHg (start), 762.8 mmHg (end)

Predominant noise source(s): Oil pump

Other noise source(s): Traffic (12 vehicles)

Time start: 0754

Time end: 0854

Comments: Compressor station operating at 20% capacity

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	
0808	18.4	28.6	35.5	35.7	32.4	31.6	32.6	28.8	29.2	29.3	26.3	47.1
0823	14.7	26.8	32.7	30.8	28.7	29.1	31.0	28.0	28.2	28.6	25.5	44.5
0838	17.4	28.8	35.0	33.8	31.6	30.0	30.9	28.3	28.7	29.1	26.1	45.6
0853	13.8	23.8	30.0	29.1	30.2	34.8	35.0	31.2	27.0	24.6	21.6	45.7

North



South



East



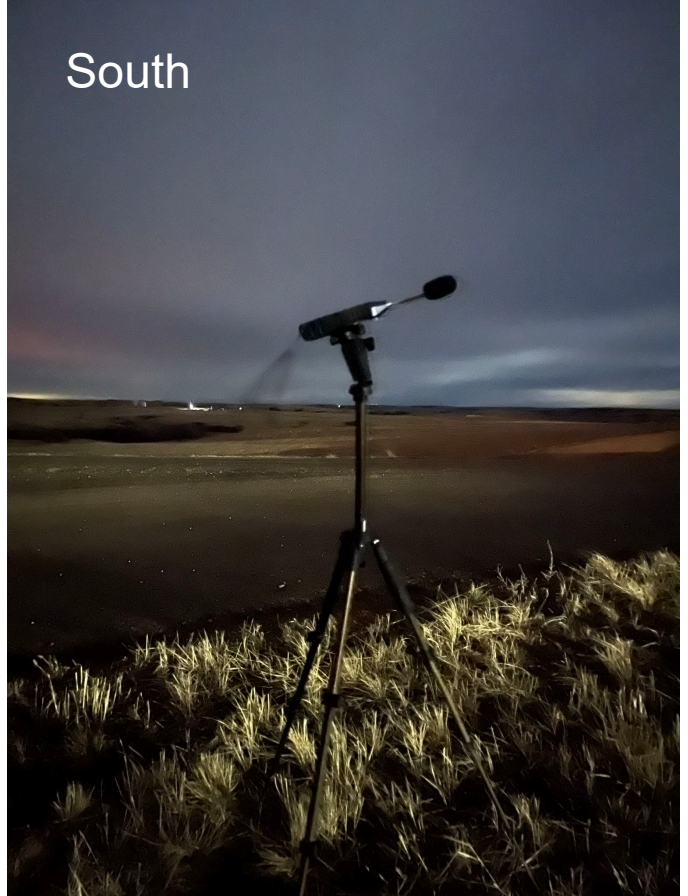
West



North



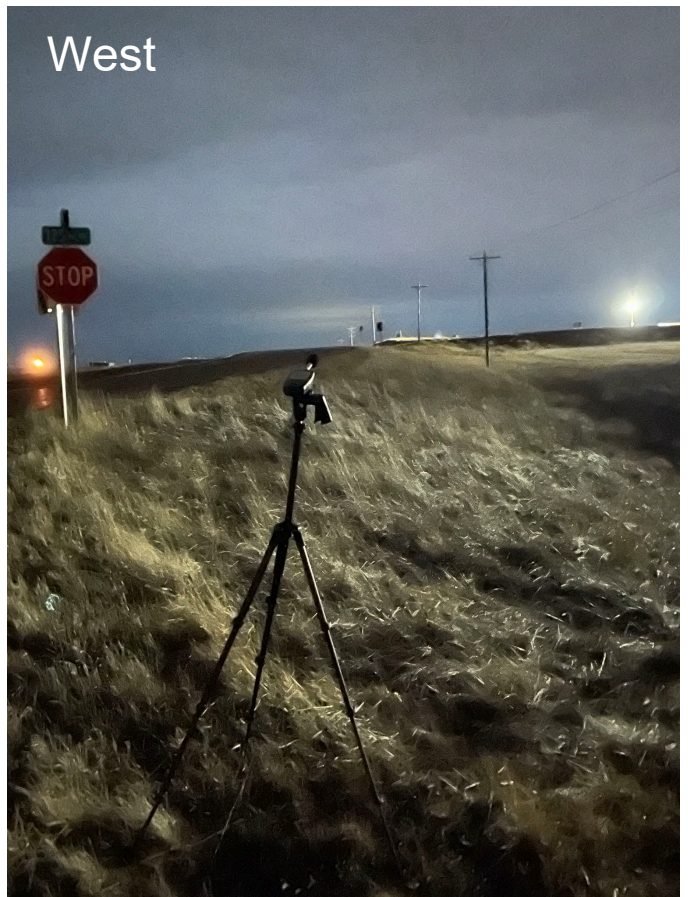
South



East



West









Noise Survey Data Sheet

Location: Tioga CS NSA 1 – Day
(48.416102, -102.907314)

Investigator Name: Jeremy House

Date: 03/22/2022

Meter Manufacturer and Model Number: Casella CEL-63X

Serial Number: 4637989

Calibrator Manufacturer, Model, and dB: Casella, CEL-120/1, 94 and 114 dB

Calibrator Serial Number: 0966247

Initial Calibration: 94 dB (started at 96.9 dB, deviation +2.9 dB)

Final Calibration: 94 dB (ended 94.1 dB, deviation +0.1 dB)

Meteorological Conditions

Wind Speed: 14 to 20 mph

Direction: North-Northwest

Temperature: 36 to 39°F

RH %: 63%

Barometric Pressure in mmHg: 764.29 mmHg

Predominant noise source(s): Wind

Other noise source(s): Minor Traffic (2 trucks passed near monitor)

Time start: 0922

Time end: 1022

Comments: Compressor station operating at 50%
capacity

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	
0936	11.7	29.9	40.0	41.7	37.2	32.8	28.2	25.5	24.0	22.6	16.7	50.0
0951	14.9	34.9	47.0	49.2	43.7	39.0	34.7	32.5	29.2	27.6	22.1	57.0
1006	11.7	31.9	42.5	44.4	39.4	34.6	30.2	26.5	24.6	23.3	17.4	52.4
1021	12.2	33.4	43.2	43.4	38.1	33.5	30.7	25.9	25.2	23.8	17.8	52.2

North



South



East



West



North



South



East



West





Noise Survey Data Sheet

Location: Tioga CS NSA 2 – Day
(48.40925, -102.88567)

Investigator Name: Charlie Wyffels

Date: 3/22/2022

Meter Manufacturer and Model Number: Casella CEL-63x

Serial Number: 1239542

Calibrator Manufacturer, Model, and dB: Casella CEL-120/1, 94 and 114 dB

Calibrator Serial Number: 0966247

Initial Calibration: 114 dB (started at 115.3 dB, deviation +1.3 dB)

Final Calibration: 114 dB (ended at 114.2 dB, deviation +0.2 dB)

Meteorological Conditions

Wind Speed: 18 mph (start), 23 mph (end)

Direction: Northwest (start), north (end)

Temperature: 41 °F (start), 43 °F (end)

RH %: 57% (start), 39% (end)

Barometric Pressure in mmHg: 764.5 mmHg (start), 765.0 mmHg (end)

Predominant noise source(s): Nearby water pump compressor

Other noise source(s): Wind, traffic (7 vehicles)

Time start: 1045

Time end: 1145

Comments: Strong winds, had to weigh down tripod and brace against car.
Compressor station operating at 50% capacity

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	
1059	26.3	38.1	44.7	46.6	44.2	46.7	52.7	50.3	43.0	33.8	29.4	61.5
1114	28.6	39.1	46.4	48.7	46.2	46.9	52.5	50.5	43.3	34.5	29.7	62.1
1129	31.2	43.2	49.9	53.0	49.5	49.5	53.5	50.9	43.2	35.6	30.5	63.9
1144	30.1	41.4	48.9	49.1	47.1	54.5	56.9	53.5	45.1	37.2	30.0	65.4

North



South



East



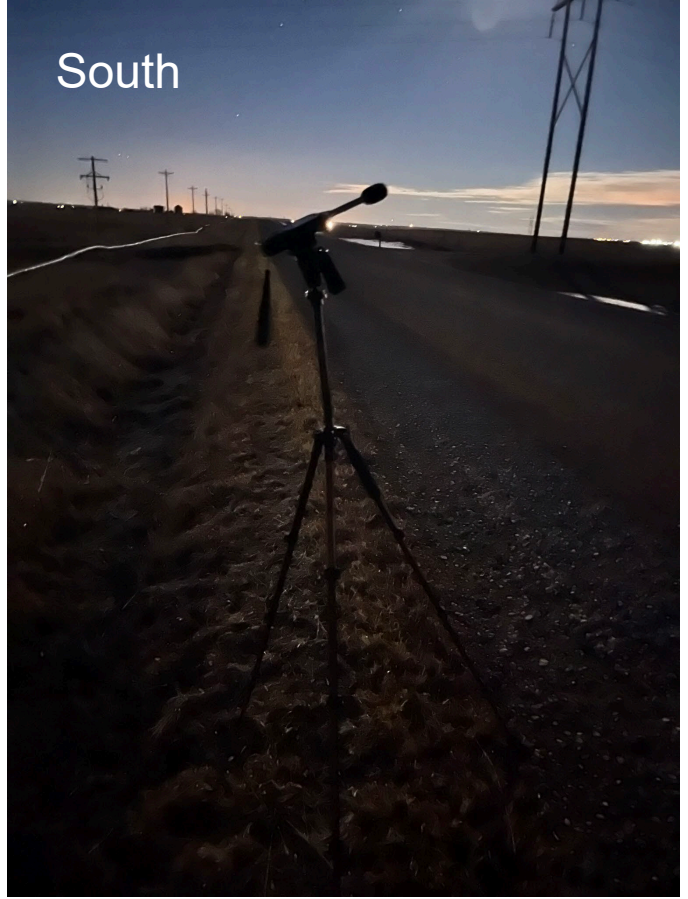
West



North



South



East



West





Noise Survey Data Sheet

Location: Tioga CS NSAs 3&5 – Day
(48.40215, -102.88568)

Investigator Name: Charlie Wyffels

Date: 3/21/2022

Meter Manufacturer and Model Number: Casella CEL-63x

Serial Number: 1239542

Calibrator Manufacturer, Model, and dB: Casella CEL-120/1, 94 and 114 dB

Calibrator Serial Number: 0966247

Initial Calibration: 114 dB (started at 115.3 dB, deviation +1.3 dB)

Final Calibration: 114 dB (ended at 114.2 dB, deviation +0.2 dB)

Meteorological Conditions

Wind Speed: 26 mph (start), 24 mph (end)

Direction: North

Temperature: 43 °F (start), 43 °F (end)

RH %: 39% (start), 39% (end)

Barometric Pressure in mmHg: 765.3 mmHg (start), 765.6 mmHg (end)

Predominant noise source(s): Wind

Other noise source(s): Traffic (1 vehicle)

Time start: 1230

Time end: 1330

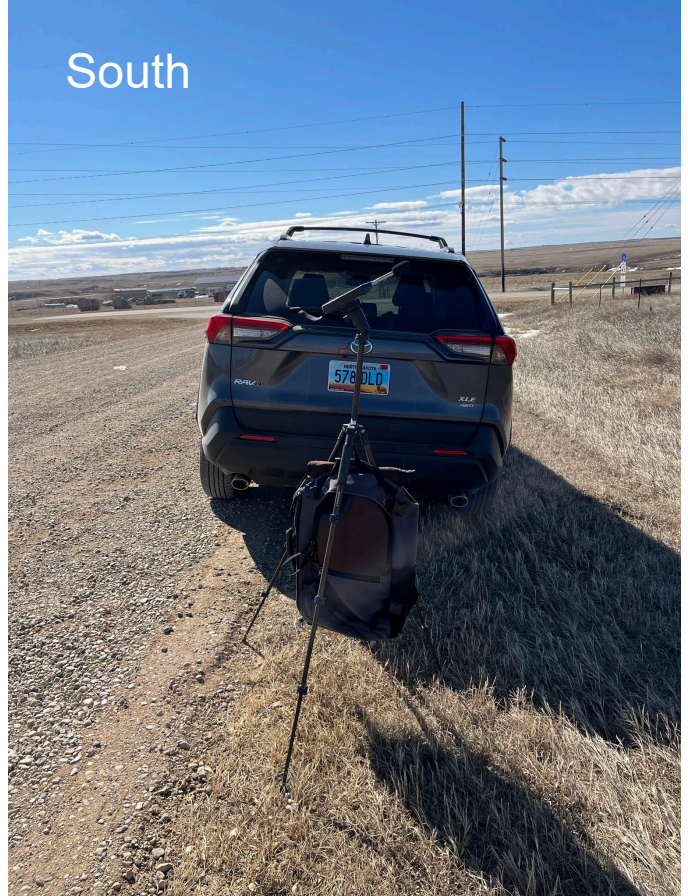
Comments: Strong winds, had to weigh down tripod
Compressor station operating at 50% capacity

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	
1227	28.4	39.0	45.4	46.4	42.4	39.9	40.0	36.6	35.5	35.3	30.1	56.1
1242	27.5	38.6	44.8	45.6	41.5	39.2	39.2	35.6	36.1	34.0	30.0	55.2
1257	29.7	41.4	47.6	49.0	45.4	44.6	44.9	42.3	42.4	36.5	30.7	59.2
1312	30.4	41.4	48.0	49.4	45.3	43.1	42.3	40.9	40.8	36.2	31.0	58.8

North



South



East



West



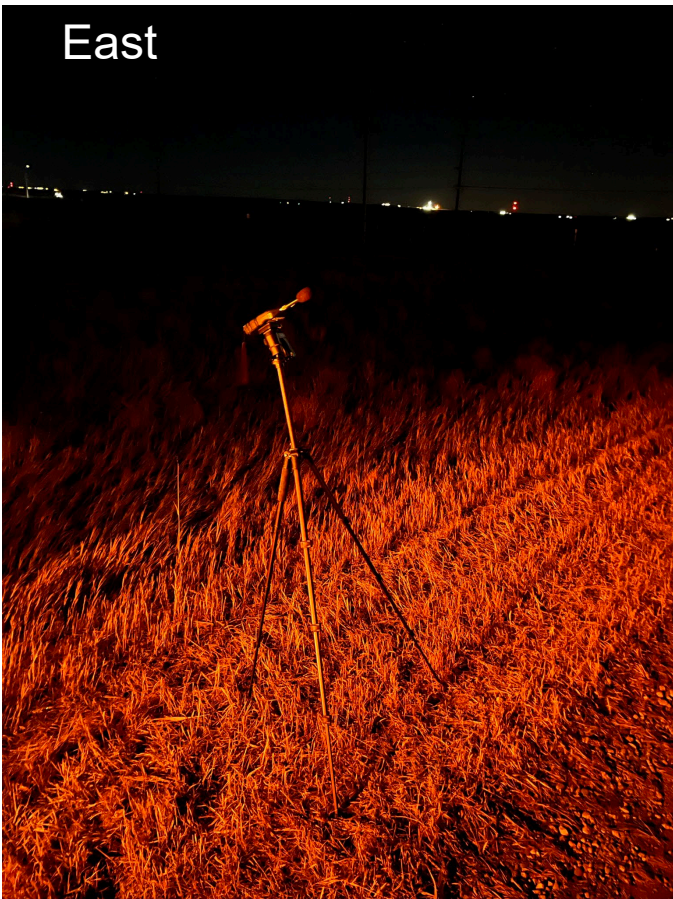
North



South



East



West





Noise Survey Data Sheet

Location: Tioga CS NSA 4 – Day
(48.40149, -102.89321)

Investigator Name: Charlie Wyffels

Date: 3/22/2022

Meter Manufacturer and Model Number: Casella CEL-63x

Serial Number: 1239542

Calibrator Manufacturer, Model, and dB: Casella CEL-120/1, 94 and 114 dB

Calibrator Serial Number: 0966247

Initial Calibration: 114 dB (started at 115.3 dB, deviation +1.3 dB)

Final Calibration: 114 dB (ended at 114.2 dB, deviation +0.2 dB)

Meteorological Conditions

Wind Speed: 16 mph (start), 14 mph (end)

Direction: Northwest

Temperature: 34 °F (start), 36 °F (end)

RH %: 70% (start), 75% (end)

Barometric Pressure in mmHg: 763.5 mmHg (start), 764.0 mmHg (end)

Predominant noise source(s): Compressor station

Other noise source(s): Wind, traffic (12 vehicles)

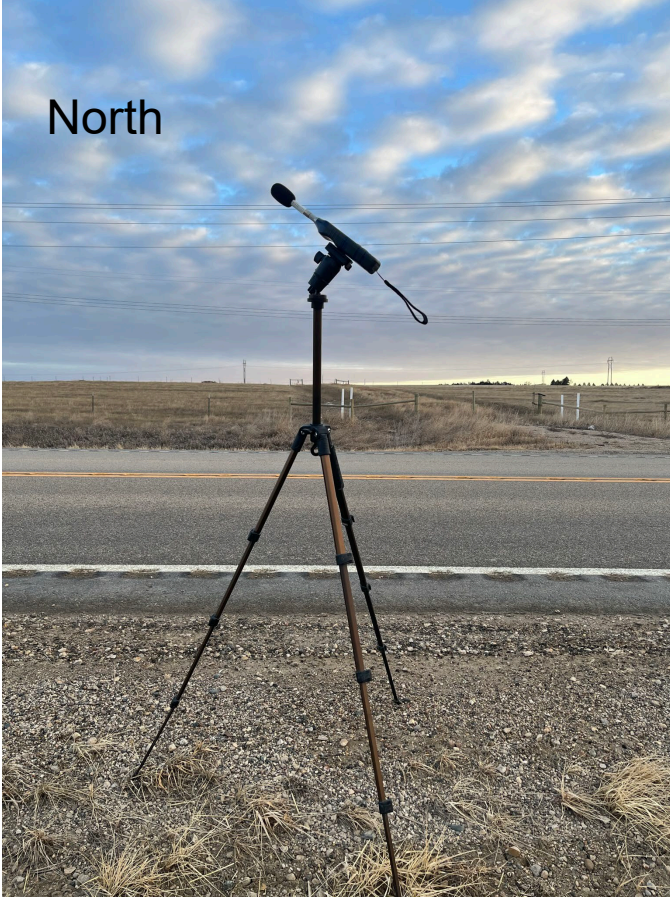
Time start: 0833

Time end: 0933

Comments: Curious local stopped by to ask questions around 0912.
Compressor station operating at 50% capacity

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	
0847	22.5	34.4	39.1	37.5	34.6	36.1	35.9	31.1	30.2	30.8	27.8	49.9
0902	26.4	37.9	43.0	42.3	38.6	38.2	37.7	33.7	31.7	31.9	28.7	53.1
0917	26.0	38.3	43.6	42.8	39.0	37.6	37.3	35.2	35.6	32.5	29.1	53.7
0932	23.5	35.3	39.3	39.7	42.6	48.5	55.1	49.1	39.5	33.6	28.4	62.3

North



South



East



West



North



South



East



West





Noise Survey Data Sheet

Location: Tioga CS NSAs 6&7 – Day
(48.408735, -102.928209)

Investigator Name: Jeremy House

Date: 03/22/2022

Meter Manufacturer and Model Number: Casella CEL-63X

Serial Number: 4637989

Calibrator Manufacturer, Model, and dB: Casella, CEL-120/1, 94 and 114 dB

Calibrator Serial Number: 0966247

Initial Calibration: 94 dB (started at 96.9 dB, deviation +2.9 dB)

Final Calibration: 94 dB (ended 94.1 dB, deviation +0.1 dB)

Meteorological Conditions

Wind Speed: 18-23 mph

Direction: North-Northwest

Temperature: 41°F

RH %: 61% to 42%

Barometric Pressure in mmHg: 764.5 mmHg

Predominant noise source(s): Traffic and Wind
78 cars/trucks, 39 semi-trucks passed on road 200 feet west (behind mic), 9 cars/trucks passed immediately next to monitor

Other noise source(s): NA

Time start: 1039

Time end: 1138

Comments: Compressor station operating at 50% capacity

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	
1053	12.0	32.2	46.4	48.0	47.5	54.0	51.3	46.1	36.4	27.7	19.8	62.4
1108	13.7	32.1	45.6	48.9	44.1	44.4	49.9	44.3	39.6	31.2	21.2	59.9
1123	13.2	30.0	43.8	47.3	45.4	47.8	53.8	47.1	39.3	29.4	19.6	61.7
1138	15.8	33.7	47.4	51.3	48.0	49.1	48.5	43.4	44.9	36.0	26.3	61.1

North



South



East



West



North



South



East



West



NORTH BAKKEN EXPANSION PROJECT

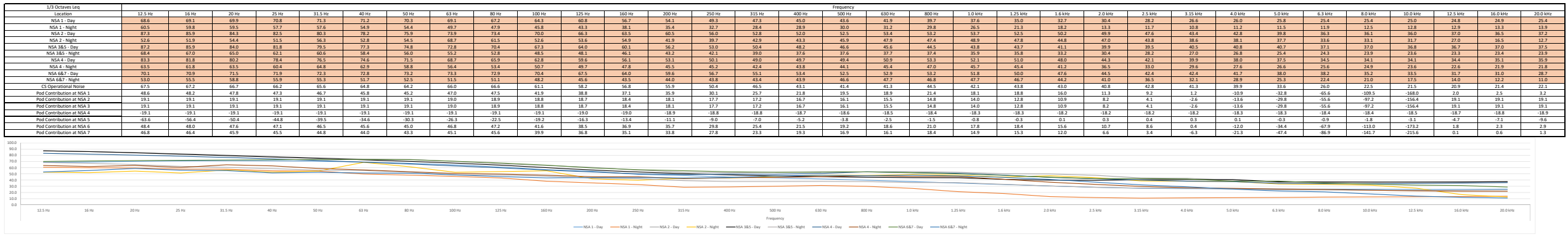
**Post-Construction Noise Survey and Acoustical Analysis
McKenzie and Williams Counties, North Dakota**

APPENDIX D

Noise Calculations for Compressor Station Sound Power Levels

Overall Location	L90	L85	L80	L75	L70	L65	L60
NSA 1 Day	58.5	73.5	78.6	82.4	85.8	88.7	91.1
NSA 1 Night	47.8	64.5	68.8	72.4	75.2	77.4	79.2
NSA 2 Day	63.1	77.7	82.2	85.3	88.4	90.4	91.9
NSA 2 Night	54.9	63.7	68.3	71.9	74.6	76.6	78.1
NSA 3 Day	58.3	72.9	77.4	80.5	83.6	86.7	89.3
NSA 3 Night	49.0	58.4	62.7	66.3	68.9	70.9	72.6
NSA 4 Day	53.4	68.3	72.8	75.9	79.0	81.2	82.9
NSA 4 Night	44.2	53.8	58.3	61.4	64.5	66.6	68.3
NSA 5 Day	54.7	69.4	73.9	77.0	80.1	83.2	85.4
NSA 5 Night	45.4	55.0	59.5	62.6	65.7	67.8	69.5
NSA 6 Day	58.3	72.9	77.4	80.5	83.6	86.7	89.3
NSA 6 Night	49.0	58.4	62.7	66.3	68.9	70.9	72.6
NSA 7 Day	58.3	72.9	77.4	80.5	83.6	86.7	89.3
NSA 7 Night	49.0	58.4	62.7	66.3	68.9	70.9	72.6

Contribution at receptor calculated according to hemispherical attenuation with distance and atmospheric attenuation according to ISO 9613-1.



Contribution at NSA 1										
Contributing Measurement										
f (Hz)	12.5	16	20	25	31.5	40	50	63	80	100
f [dBA(m)]	12.5	16	20	25	31.5	40	50	63	80	100
f [dB(m)]	4.98E-06	8.11E-06	1.27E-05	1.98E-05	3.14E-05	5.04E-05	7.81E-05	0.000123	0.000204	0.000316
a [dB(H)]	1.52E-06	2.48E-06	3.88E-06	6.05E-06	9.57E-06	1.53E-05	2.38E-05	3.78E-05	5.90E-05	9.06E-05
Atmospheric Absorption [dB]	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
Distance Attenuation [dB]	18.92	18.92	18.92	18.92	18.92	18.92	18.92	18.92	18.92	18.92
RQA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A-weighting Factor	-43.59	-56.43	-50.39	-44.82	-39.53	-34.54	-30.28	-26.22	-22.40	-19.15
A-weighted Octave Band	-14.98	-8.39	2.61	2.50	11.30	14.91	20.76	25.72	29.50	33.10
10^Lp(A)/10	0.03	0.15	0.53	1.78	5.22	15.90	33.09	69.81	137.88	272.36
LAeq	33.30									

Contribution at NSA 2										
Contributing Measurement										
f (Hz)	12.5	16	20	25	31.5	40	50	63	80	100
f [dBA(m)]	12.5	16	20	25	31.5	40	50	63	80	100
f [dB(m)]	4.98E-06	8.11E-06	1.27E-05	1.98E-05	3.14E-05	5.04E-05	7.81E-05	0.000123	0.000204	0.000316
a [dB(H)]	1.52E-06	2.48E-06	3.88E-06	6.05E-06	9.57E-06	1.53E-05	2.38E-05	3.78E-05	5.90E-05	9.06E-05
Atmospheric Absorption [dB]	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
Distance Attenuation [dB]	19.14	19.14	19.14	19.14	19.14	19.14	19.14	19.14	19.14	19.14
RQA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A-weighting Factor	-43.59	-56.43	-50.39	-44.82	-39.53	-34.54	-30.28	-26.22	-22.40	-19.15
A-weighted Octave Band	-15.20	-8.41	2.82	2.49	11.08	14.69	20.54	24.49	27.35	31.00
10^Lp(A)/10	0.03	0.14	0.59	1.68	4.96	12.84	26.45	53.57	108.99	220.25
LAeq	31.30									

Contribution at NSA 3										
Contributing Measurement										
f (Hz)	12.5	16	20	25	31.5	40	50	63	80	100
f [dBA(m)]	12.5	16	20	25	31.5	40	50	63	80	100
f [dB(m)]	4.98E-06	8.11E-06	1.27E-05	1.98E-05	3.14E-05	5.04E-05	7.81E-05	0.000123	0.000204	0.000316
a [dB(H)]	1.52E-06	2.48E-06	3.88E-06	6.05E-06	9.57E-06	1.53E-05	2.38E-05	3.78E-05	5.90E-05	9.06E-05
Atmospheric Absorption [dB]	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
Distance Attenuation [dB]	18.92	18.92	18.92	18.92	18.92	18.92	18.92	18.92	18.92	18.92
RQA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A-weighting Factor	-43.59	-56.43	-50.39	-44.82	-39.53	-34.54	-30.28	-26.22	-22.40	-19.15
A-weighted Octave Band	-15.20	-8.41	2.82	2.49	11.08	14.69	20.54	24.49	27.35	31.00
10^Lp(A)/10	0.03	0.15	0.53	1.78	5.22	15.90	33.09	69.81	137.88	272.36
LAeq	31.30									

Contribution at NSA 4										
Contributing Measurement										
f (Hz)	12.5	16	20	25	31.5	40	50	63	80	100
f [dBA(m)]	12.5	16	20	25	31.5	40	50	63	80	100
f [dB(m)]	4.98E-06	8.11E-06	1.27E-05	1.98E-05	3.14E-05	5.04E-05	7.81E-05	0.000123	0.000204	0.000316
a [dB(H)]	1.52E-06	2.48E-06	3.88E-06	6.05E-06	9.57E-06	1.53E-05	2.38E-05	3.78E-05	5.90E-05	9.06E-05
Atmospheric Absorption [dB]	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
Distance Attenuation [dB]	18.92	18.92	18.92	18.92	18.92	18.92	18.92	18.92	18.92	18.92
RQA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A-weighting Factor	-43.59	-56.43	-50.39	-44.82	-39.53	-34.54	-30.28	-26.22	-22.40	-19.15
A-weighted Octave Band	-15.20	-8.41	2.82	2.49	11.08	14.69	20.54	24.49	27.35	31.00
10^Lp(A)/10	0.03	0.15	0.53	1.78	5.22	15.90	33.09	69.81	137.88	272.36
LAeq	31.30									

Contribution at NSA 5										
Contributing Measurement										
f (Hz)	12.5	16	20	25	31.5	40	50	63	80	100
f [dBA(m)]	12.5	16	20	25	31.5	40	50	63	80	100
f [dB(m)]	4.98E-06	8.11E-06	1.27E-05	1.98E-05	3.14E-05	5.04E-05	7.81E-05	0.000123	0.000204	0.000316
a [dB(H)]	1.52E-06	2.48E-06	3.88E-06	6.05E-06	9.57E-06	1.53E-05	2.38E-05	3.78E-05	5.90E-05	9.06E-05
Atmospheric Absorption [dB]	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
Distance Attenuation [dB]	18.92	18.92	18.92	18.92	18.92	18.92	18.92	18.92	18.92	18.92
RQA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A-weighting Factor	-43.59	-56.43	-50.39	-44.82	-39.53	-34.54	-30.28	-26.22	-22.40	-19.15
A-weighted Octave Band	-15.20	-8.41	2.82	2.49	11.08	14.69	20.54	24.49	27.35	31.00
10^Lp(A)/10	0.03	0.15	0.53	1.78	5.22	15.90	33.09	69.81	137.88	272.36
LAeq	31.30									

Contribution at NSA 6										
Contributing Measurement										
f (Hz)	12.5	16	20	25	31.5	40	50	63	80	100
f [dBA(m)]	12.5	16	20	25	31.5	40	50	63	80	100
f [dB(m)]	4.98E-06	8.11E-06	1.27E-05	1.98E-05	3.14E-05	5.04E-05	7.81E-05	0.000123	0.000204	0.000316
a [dB(H)]	1.52E-06	2.48E-06	3.88E-06	6.05E-06	9.57E-06	1.53E-05	2.38E-05	3.78E-05	5.90E-05	9.06E-05
Atmospheric Absorption [dB]	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
Distance Attenuation [dB]	18.92	18.92	18.92	18.92	18.92	18.92	18.92	18.92	18.92	18.92
RQA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A-weighting Factor	-43.59	-56.43	-50.39	-44.82	-39.53	-34.54	-30.28	-26.22	-22.40	-19.15
A-weighted Octave Band	-15.20	-8.41	2.82	2.49	11.08	14.69	20.54	24.49	27.35	31.00
10^Lp(A)/10	0.03	0.15	0.53	1.78	5.22	15.90	33.09	69.81	137.88	272.36
LAeq	31.30									

Contribution at NSA 7										
Contributing Measurement										
f (Hz)	12.5	16	20	25	31.5	40	50	63	80	100
f [dBA(m)]	12.5	16	20	25	31.5	40	50	63	80	100
f [dB(m)]	4.98E-06	8.11E-06	1.27E-05	1.98E-05	3.14E-05	5.04E-05	7.81E-05	0.000123	0.000204	0.000316
a [dB(H)]	1.52E-06	2.48E-06	3.88E-06	6.05E-06	9.57E-06	1.53E-05	2.38E-05	3.78E-05	5.90E-05	9.06E-05
Atmospheric Absorption [dB]	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
Distance Attenuation [dB]	18.92	18.92	18.92	18.92	18.92	18.92	18.92	18.92	18.92	18.92
RQA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A-weighting Factor	-43.59	-56.43	-50.39	-44.82	-39.53	-34.54	-30.28	-26.22	-22.40	-19.15
A-weighted Octave Band	-15.20	-8.41	2.82	2.49	11.08	14.69	20.54	24.49	27.35	31.00
10^Lp(A)/10	0.03	0.15	0.53	1.78	5.22	15.90	33.09	69.81	137.88	272.36
LAeq	31.30									

- p_a : ambient atmospheric pressure [atm]
- p_{ref} : reference atmospheric pressure [atm]
- p_{sat} : saturation vapor pressure [atm]
- T : ambient atmospheric temperature [K]
- T_0 : reference temperature [K]
- T_{trip} : triple point isotherm temperature [K]
- ν_{O_2} : oxygen relaxation frequency [Hz/atm]
- ν_{N_2} : nitrogen relaxation frequency [Hz/atm]
- W : molar concentration of water vapor [%]
- ϕ : relative humidity [%]