Application for Certificate of Public Convenience and Necessity

Northern States Power Company,
a Wisconsin Corporation
DBA Xcel Energy

VOLUME II – DOCUMENTS and STUDIES
Appendix J: Sound Study Report and Noise Ordinance

Wheaton Repowering Project

Docket Number: 4220-CE-185
5/12/2023

Sound Study Report

Xcel Energy

Wheaton Repowering Project
Project No. 144752

Revision 0
12/13/2022

Sound Study Report

prepared for

Xcel Energy
Wheaton Repowering Project
Wheaton, Wisconsin

Project No. 144752

Revision 0
12/13/2022

prepared by

Burns & McDonnell

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LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
ANSI	American National Standards Institute
CadnaA	Computer Aided Noise Abatement
EPA	Environmental Protection Agency
dB	decibel
dBA	A-weighted decibel
dBC	C-weighted decibel
HRSG	heat recovery steam generator
Hz	Hertz
ISO	International Organization for Standardization
L_{eq}	equivalent-continuous sound level
L_{10}	10-percentile exceedance sound level
L_{50}	50-percentile exceedance sound level
L_{90}	90-percentile exceedance sound level
MP	measurement point
mph	miles per hour
NRC	Noise Reduction Coefficient
Project	Wheaton Energy Center
PSCW	Public Service Commission of Wisconsin
PWL	sound power level
SPL	sound pressure level
STC	Sound Transmission Class

1.0 EXECUTIVE SUMMARY

Burns & McDonnell conducted a sound study for the proposed Xcel Energy Wheaton Repowering Project in Wheaton, Wisconsin (Project). The existing generating units at the Wheaton Generation Station are beyond end of life and are degrading in reliability. The Project proposes to repower the Wheaton Generation Station with five (5) dual-fuel reciprocating engines and one (1) new dual-fuel F-class gas turbine generator, at either the Proposed or Alternate Project site. The Project's proposed generating units could be operated during day or nighttime hours. The Project will be permitted to operate 24 hours per day, 365 days per year, but the Project will operate in accordance with market dispatch signals.

The objectives of this study were to identify State and local noise regulations that are applicable to the Project; measure existing ambient and operational noise levels near the Project; develop a predictive noise model to estimate future sound levels for the Proposed and Alternate site; and analyze mitigation needed to meet the applicable sound level regulations or established design goals.

The State of Wisconsin does not have noise regulations applicable to the Project. The Public Service Commission of Wisconsin (PSCW) does not provide overall noise level limits for the Project. However, the Project includes various forms of noise mitigation to limit noise impacts to the surrounding area. The noise mitigation includes:

GE F-Class Combustion Turbine

1. Additional stack silencing – 110 dBA stack exit sound power level
2. Air inlet silencing – 102 dBA air inlet face sound power level
3. Manufacturer design features include mitigation to achieve near-field noise levels of 85 dBA

Wartsila Reciprocating Engine Generators

1. Stack silencers
2. Charge-air inlet silencers
3. Low-Noise Radiators
4. Reciprocating engine hall – concrete wall panels
5. Reciprocating engine hall – ridge vent silencer
6. Exhaust duct lagging

A noise monitoring and modeling protocol for the Project was completed and submitted to the PSCW in July 2022 and is included as Appendix A. Burns & McDonnell developed this protocol based on the PSCW Measurement Protocol for Sound and Vibration Assessment of Proposed and Existing Electric Power Plants (November 2008)[1] to detail the methodology for ambient and operational sound level measurements and modeling predictions.

[1] https://psc.wi.gov/SiteAssets/ConventionalNoiseProtocol.pdf

2.0 ACOUSTICAL TERMINOLOGY

The term “sound level” is often used to describe two different sound characteristics: sound power and sound pressure. Every source that produces sound has a sound power level (PWL). The PWL is the acoustical energy emitted by a sound source and is an absolute number that is not affected by the surrounding environment. The acoustical energy produced by a source propagates through media as pressure fluctuations. These pressure fluctuations, also called sound pressure levels (SPL), are what human ears hear and microphones measure.

Sound is physically characterized by amplitude and frequency. The amplitude of sound is measured in decibels (dB) as the logarithmic ratio of a sound pressure to a reference sound pressure (20 micropascals). The reference sound pressure corresponds to the typical threshold of human hearing. To the average listener, a 3-dB change in a continuous broadband sound is generally considered “just barely perceptible”; a 5-dB change is generally considered “clearly noticeable”; and a 10-dB change is generally considered a doubling (or halving, if the sound is decreasing) of the apparent loudness.

Sound waves can occur at many different wavelengths, also known as the frequency. Frequency is measured in hertz (Hz) and is the number of wave cycles per second that occur. The typical human ear can hear frequencies ranging from approximately 20 to 20,000 Hz. Normally, the human ear is most sensitive to sounds in the middle frequencies (1,000 to 8,000 Hz) and is less sensitive to sounds in the lower and higher frequencies. As such, the A-weighting scale was developed to simulate the frequency response of the human ear to sounds at typical environmental levels. The A-weighting scale emphasizes sounds in the middle frequencies and de-emphasizes sounds in the low and high frequencies. Any sound level to which the A-weighting scale has been applied is expressed in A-weighted decibels, or dBA. The C-weighting scale (dBC) is commonly used for sources with a low-frequency component that would be de-emphasized by the A-weighted scale. For reference, the A-weighted sound pressure level and subjective loudness associated with some common sound sources are listed in Table 2-1.

Sound in the environment is constantly fluctuating, as when a car drives by, a dog barks, or a plane passes overhead. Therefore, sound metrics have been developed to quantify fluctuating environmental sound levels. These metrics include the exceedance sound level. The exceedance sound level is the sound level exceeded during “x” percent of the sampling period and is also referred to as a statistical sound level. Common exceedance sound level values are the 10-, 50-,90-percentile exceedance sound levels, denoted by L_{10}, L_{50}, and L_{90}. The equivalent-continuous sound level (L_{eq} or L_{avg}) is the arithmetic average of the varying sound over a given time period and is the most common metric used to describe sound.

Table 2-1: Typical Sound Pressure Levels Associated with Common Sound Sources

Sound Pressure Level (dBA)	Subjective Evaluation	Environment	
		Outdoor	Indoor
140	Deafening	Jet aircraft at 75 feet	--
130	Threshold of pain	Jet aircraft during takeoff at a distance of 300 feet	--
120	Threshold of feeling	Elevated train	Hard rock band
110	--	Jet flyover at 1,000 feet	Inside propeller plane
100	Very loud	Power mower, motorcycle at 25 feet, auto horn at 10 feet, crowd sound at football game	--
90	--	Propeller plane flyover at 1,000 feet, noisy urban street	Full symphony or band, food blender, noisy factory
80	Moderately loud	Diesel truck (40 mph) at 50 feet	Inside auto at high speed, garbage disposal, dishwasher
70	Loud	B-757 cabin during flight	Close conversation, vacuum cleaner
60	Moderate	Air-conditioner condenser at 15 feet, near highway traffic	General office
50	Quiet	--	Private office
40	--	Farm field with light breeze, birdcalls	Soft stereo music in residence
30	Very quiet	Quiet residential neighborhood	Inside average residence (without TV and stereo)
20	--	Rustling leaves	Quiet theater, whisper
10	Just audible	--	Human breathing
0	Threshold of hearing	--	--

Source: Adapted from *Architectural Acoustics*, M. David Egan, 1988, and *Architectural Graphic Standards*, Ramsey and Sleeper, 1994.

3.0 APPLICABLE REGULATIONS

There were no identified government agency-related numeric noise limits for the Project. The PSCW Protocol requires sound levels be shown in various statistical metrics, including L_{eq}. To provide the information requested by the PSCW's protocol, noise modeling results will be shown as L_{eq} and compared to the various other statistical metrics in the appendices. Xcel has chosen to design the Project with the inclusion of substantial noise mitigation measures to limit the noise emissions to levels similar to the existing operating facility.

3.1 State of Wisconsin

The State of Wisconsin does not provide noise regulations applicable to the Project. The Wisconsin Statute 66.0103 authorizes a local government to prepare a code of some or all of its general ordinances.

3.2 Chippewa County Wisconsin

The Chippewa County Code of Ordinances does not provide numerical noise limits applicable to the Project. Section 9.07 of the Chippewa County Code of Ordinances states, "No person shall make or cause to be made any loud, disturbing or unnecessary sounds or noises such as may tend to annoy or disturb another in or about any public street, alley or park or any private residence."

3.3 Town of Wheaton Wisconsin

No noise ordinances were identified for the Town of Wheaton.

3.4 Public Service Commission of Wisconsin

The PSCW's Measurement Protocol for Sound and Vibration Assessment of Proposed and Existing Electric Power Plants provides measurement techniques and sound level information that must be provided to the commission to determine the effects of power plant noise on the surrounding environment. The PSCW's protocol does not establish numerical noise level limits for the Project. The various information that the protocol requires includes various sound level metrics and figures. The protocol requires figures be included which depict the Project L_{eq} sound level contours in 5-dBA increments.

4.0 NOISE MEASUREMENTS

Burns & McDonnell personnel took ambient and operational sound level measurements near the proposed Project locations during four separate time periods for each site from September 14 to 15, 2022. These measurements were taken to establish the existing and operational sound levels in the area of the Project. The land uses immediately surrounding the Project sites are agricultural and residential in nature.

4.1 Sound Measurement Equipment

Various types of equipment were used to establish ambient sound levels in the area surrounding the Project including a sound level meter, anemometer, and calibration equipment. Sound level measurements were made with American National Standards Institute (ANSI) S1.4 for a Type 1, Precision Sound Level Meters, with the capability of determining the one-third octave band sound levels over the specified measurement period. One-half inch random-incidence microphones were used on the meters. A microphone windscreen was used for all measurements. The sound level meters were calibrated before and after each set of measurements using a sound level calibrator. The calibration frequency was 1,000 Hz and the standard reference sound pressure was 20 micropascals. Calibration level changes did not exceed ± 0.5 dB during the measurements. The meters and calibrator were checked within a year of the measurements to verify compliance with the U.S. National Institute of Standards and Technology specifications. Wind speed and direction, atmospheric temperature, barometric pressure, and relative humidity were recorded during each measurement period.

4.2 Ambient and Operational Measurement Procedure

Sound level testing occurred in accordance with the procedures outlined in the PSCW measurement protocol document. All sound level measurements were performed by a Burns & McDonnell qualified acoustical consultant.

Ambient noise measurements were collected at each measurement point (MP) as identified in Figure 4-1. Distances from the nearest proposed exhaust stack location to MPs, as suggested in the PSCW protocol, are provided on each figure. MPs were selected to be near the closest residential properties and noise sensitive areas on all sides of the Project.

LEGEND

Measurement Points

REFERENCE

0 0.07 0.15

MILES

0 0.07 0.15

KILOMETERS

Figure 4-1
Measurement Point Locations

LOCATION:	Wheaton, Wisconsin
CLIENT:	Xcel Energy
PROJ. NO.:	144752
CREATED:	11/17/2022

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Path: Z:\Clients\ENR\XcelEnr\144752_WHTblackstart\7_Studies\Permitting\Modeling\Noise\GIS\GIS.aprx • Coordinate System: • Units:

The sound level measurement periods were 10 minutes long, and measured values were logged by the sound meter at each MP. The sound levels varied at each MP due to the extraneous sounds that occurred during the measurement. Extraneous sounds during the measurement periods included sound associated with vehicular traffic from nearby roads and highways (including large trucks) and wildlife noise such as birds and insects.

The microphone was located at a height of 5 feet (1.5 meters) above the ground, mounted on a tripod and oriented toward the location of the respective Project site. Care was exercised to ensure that each MP was free from excess reflections due to walls, columns, etc., and from significant shadowing effects.

4.3 Ambient Measurement Data

The sound measurement data for the Project is shown in tabular form in Appendix B. For each MP and for each measurement period, the following measurement criteria were collected:

a) Un-weighted octave-band analysis (16, 31.5, 63, 125, 250, 500, 1K, 2K, 4K, & 8K Hz)
b) Un-weighted 1/3 octave-band analysis (1/3 octave bands from 6.3 to 20K Hz)
c) L_{ave}, L_{10}, L_{50}, and L_{90} in dBA
d) L_{ave}, L_{10}, L_{50}, and L_{90} in dBC
e) A detailed narrative description of sounds audible during each measurement

Sound measurements were completed when weather conditions were favorable for conducting noise measurements. The average wind velocity during the measurements was below 7 miles per hour (mph), and there was no precipitation during the times when measurements were being collected. The atmospheric conditions recorded during the sound measurements are included in Appendix B for each individual ambient measurement taken. The average L_{eq} sound level measured at each MP during ambient and operational testing is provided below in Table 4-1.

Table 4-1: Measured L_{eq} Sound Levels

Measurement Point[a,b,c]	Ambient Morning (dBA)	Ambient Midday (dBA)	Ambient Evening (dBA)	Ambient Night (dBA)	Operational Noon[d] (dBA)
MP1	50	47	46	47	73
MP2	50	43	43	45	63
MP3	50	53	49	47	54
MP4	55	51	53	49	53
MP5	61	52	55	56	54
MP6	58	54	54	53	54

(a) MP1 and MP2 are onsite locations. MP3 through MP6 are located at the extents of the Project property.
(b) Ambient measurements were collected with the existing facility shutdown. Operational measurements were collected with the existing facility operating at 200 megawatts.
(c) Measured sound levels provided are the L_{eq} measured at each location. Additional metrics are provided in the appendices.
(d) Operational measurements were collected with 4 of the existing 5 units operating at full load.

5.0 MODELED SOUND LEVEL ESTIMATE

Future sound level estimates for the proposed Project were performed using the Computer Aided Noise Abatement (CadnaA) modeling software in conjunction with the existing sound-level measurements. Separate sound level models were created for the Proposed and Alternate sites. Manufacturer data has been provided for some of the proposed Project equipment. The remaining Project sound sources were modeled using octave band sound data from similarly sized projects consisting of F-Class combustion turbines and reciprocating engine generators. The sound sources for the Proposed and Alternate sites are the same. However, the site layouts are slightly different.

5.1 Sound Modeling Methodology and Input Parameters

Predictive noise modeling was performed using the industry-accepted sound modeling software CadnaA, version 2022. The software is a scaled, three-dimensional program, which considers air absorption, terrain, ground absorption, and reflections and shielding for each piece of noise-emitting equipment, and then predicts sound pressure levels at discrete locations and over a gridded area based on input source sound levels. The model calculates sound propagation based on International Organization for Standardization (ISO) 9613-2:1996, General Method of Calculation. ISO 9613-2 assesses the sound level propagation based on the octave band center-frequency range from 31.5 to 8,000 Hz.

The ISO standard considers sound propagation and directivity. The sound-modeling software calculates omnidirectional, downwind sound propagation using worst-case directivity factors. In other words, the model assumes that each piece of equipment propagates its maximum sound level in all directions at all times. Empirical studies accepted within the industry have demonstrated that modeling may over-predict sound levels in certain directions, and as a result, modeling results generally are considered a conservative measure of the Project's actual sound level.

The modeled atmospheric conditions were assumed to be calm, and the temperature and relative humidity were left at the program's default values. Reflections and shielding were considered for sound waves encountering physical structures. Sound levels around the site can be influenced by the sound reflections from physical structures onsite. Obstacles onsite were modeled with structured facades, which accounts for sound reflected and the amount of sound absorbed by the structure itself. The area surrounding the Project has mild elevation changes, which scatter and absorb the sound waves. Thus, terrain was included to account for surface effects such as ground absorption. Ground absorption was set at a value of 0.5 for areas surrounding the Project. Taking this approach, the modeled results would be conservative. The modeling assumptions are outlined in Table 5-1.

Table 5-1: Sound Modeling Parameters

Model Input	Parameter Value
Ground Absorption	0.5
Number of Reflections	2
Receptor Height	5 feet above grade
Terrain	USGS topographic land data
Temperature	50 °F
Humidity	70%

General Electric has provided sound data for the F-Class gas turbine and Wartsila has provided sound data for the reciprocating engine generators. The sound levels for the auxiliary equipment from past projects of similar size and scope were used to estimate Project sound levels. Project-specific equipment sound levels for this latter equipment are not available at this time. However, they are expected to be similar to those modeled for this study.

The reciprocating engine building includes multiple sound sources within the building itself. Sound emitted by the buildings would vary based on the building geometry and the sound reduction properties of the walls and roof. The performance of the building walls is determined by the amount of sound absorbed by the wall materials and the amount of sound transmitted through the wall itself. The wall and roof panels for each building were modeled with a minimum Sound Transmission Class (STC) rating of 50 and a total average noise reduction coefficient (NRC) of 0.8 for the interior surface area of the building. The STC is an integer rating of how well the wall panels attenuate airborne sound, while the NRC is an integer rating of how well the internal surface of the building will absorb sound. The higher the STC and NRC ratings, the more effective a material is at preventing sound from passing through and at absorbing sound. The roof was assumed to be a steel decking with multiple layers of insulation board. The roof ridge vent was assumed to be an IAC Acoustics 3L silencer, or a silencer of comparable performance (approximate insertion loss of 18 dBA). The noise mitigation measures are summarized below.

GE F-Class Combustion Turbine

1. Additional stack silencing – 110 dBA stack exit sound power level
2. Air inlet silencing – 102 dBA air inlet face sound power level
3. Manufacturer design features include mitigation to achieve near-field noise levels of 85 dBA

Wartsila Reciprocating Engine Generators

4. Stack silencers
5. Charge-air inlet silencers
6. Low-Noise Radiators

7. Reciprocating engine hall
   a. Concrete wall panels – minimum STC 55
   b. Engine hall ridge vent silencer – minimum insertion loss 18 dBA
8. Exhaust duct lagging
   a. Standard duct lagging provided by Wartsila

Appendix C provides a table with the modeled sound level for each of the sources in the model. The source sound levels are the same for both the Proposed and Alternate sites. The sound levels were provided by vendors or estimated based on past projects of similar size and scope. The majority of the auxiliary equipment was limited to 85 dBA sound pressure level at 3 feet from the equipment envelope.

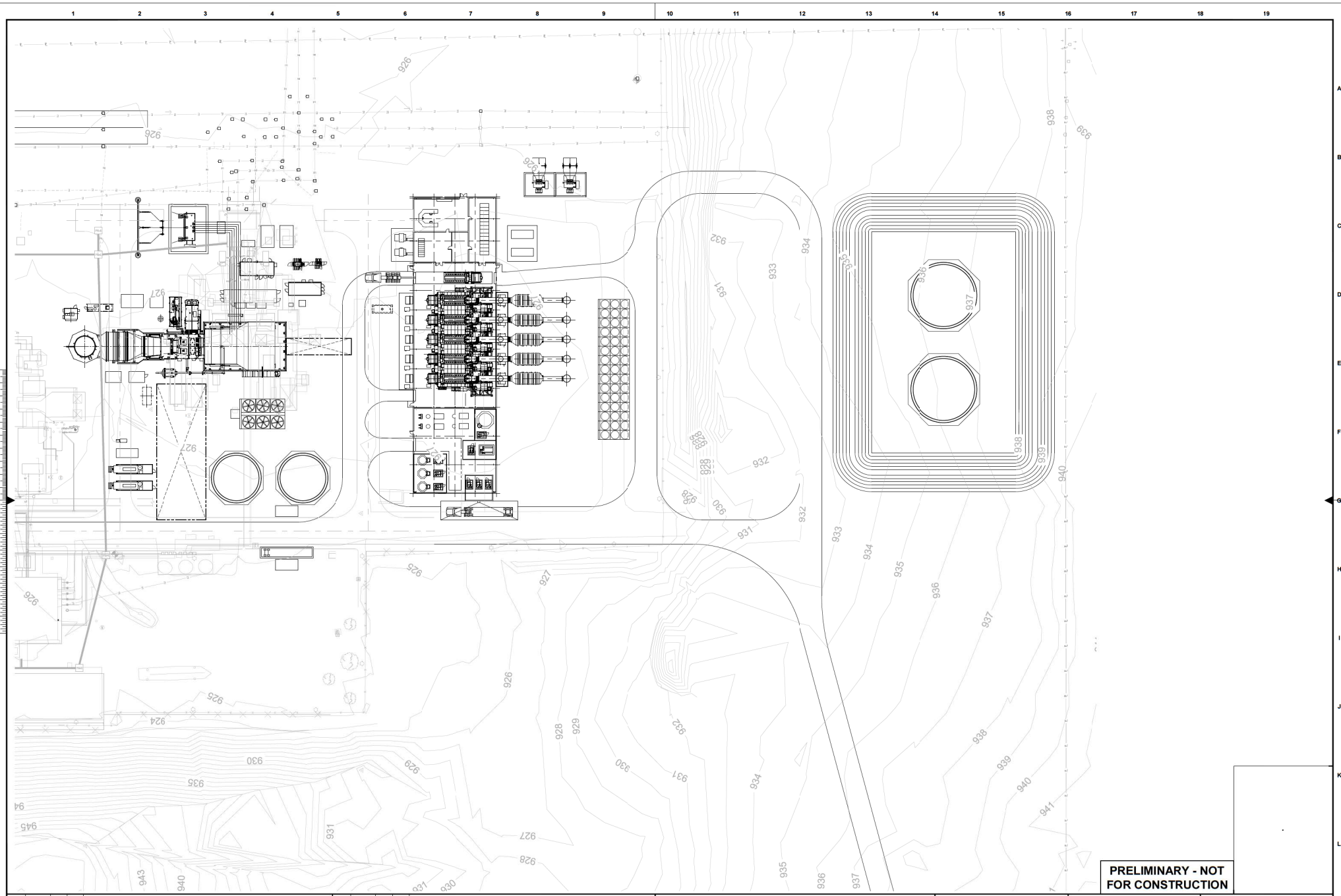
5.2 Proposed Site – Sound Modeling Results

The Proposed site general arrangement and sound modeling layout for the Project are presented in Figure 5-1 and Figure 5-2. The sound model was used to estimate the baseline Project-generated noise levels in the surrounding community. The measured sound levels at the ambient and operational measurement locations are shown along with the model-predicted Project sound levels at those same locations in Table 5-2.

Table 5-2: Proposed Site – Sound Modeling Results

Time of Day	Location	Ambient Sound Level [a,b] (L_{eq} dBA)	Measured Operational Sound Level [c] (L_{eq} dBA)	Modeled Project Sound Level [d] (L_{eq} dBA)
Daytime	MP1	48	73	62
	MP2	46	63	71
	MP3	50	54	50
	MP4	53	53	49
	MP5	56	54	52
	MP6	55	54	54
Nighttime	MP1	47	--	62
	MP2	45	--	71
	MP3	47	--	50
	MP4	49	--	49
	MP5	56	--	52
	MP6	53	--	54

(a) Daytime ambient sound levels are the average L_{eq} of the three measured daytime periods
(b) Nighttime ambient sound levels are the measured L_{eq} midnight sound levels
(c) Measured Operational Sound Level is the measured L_{eq} sound level during the noon time period with the facility operating at full load
(d) Modeled Project Sound Level is the sound level of the Project only without the influence of background noise



no.	date	by	ckd	description
B	11/09/22	WRL	RDV	REVISED EQUIPMENT LOCATIONS
A	10/20/22	WRL	RDV	WORKING DOCUMENT

Figure 5-1

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designed R. VERING | detailed W. LESNIAK

Xcel Energy

WHEATON GENERATING STATION
CHIPPEWA COUNTY, WISCONSIN

WHEATON
GENERAL ARRANGEMENT

project 144752 | contract

drawing SKGA-002 | rev. B

sheet 1 of 1 sheets

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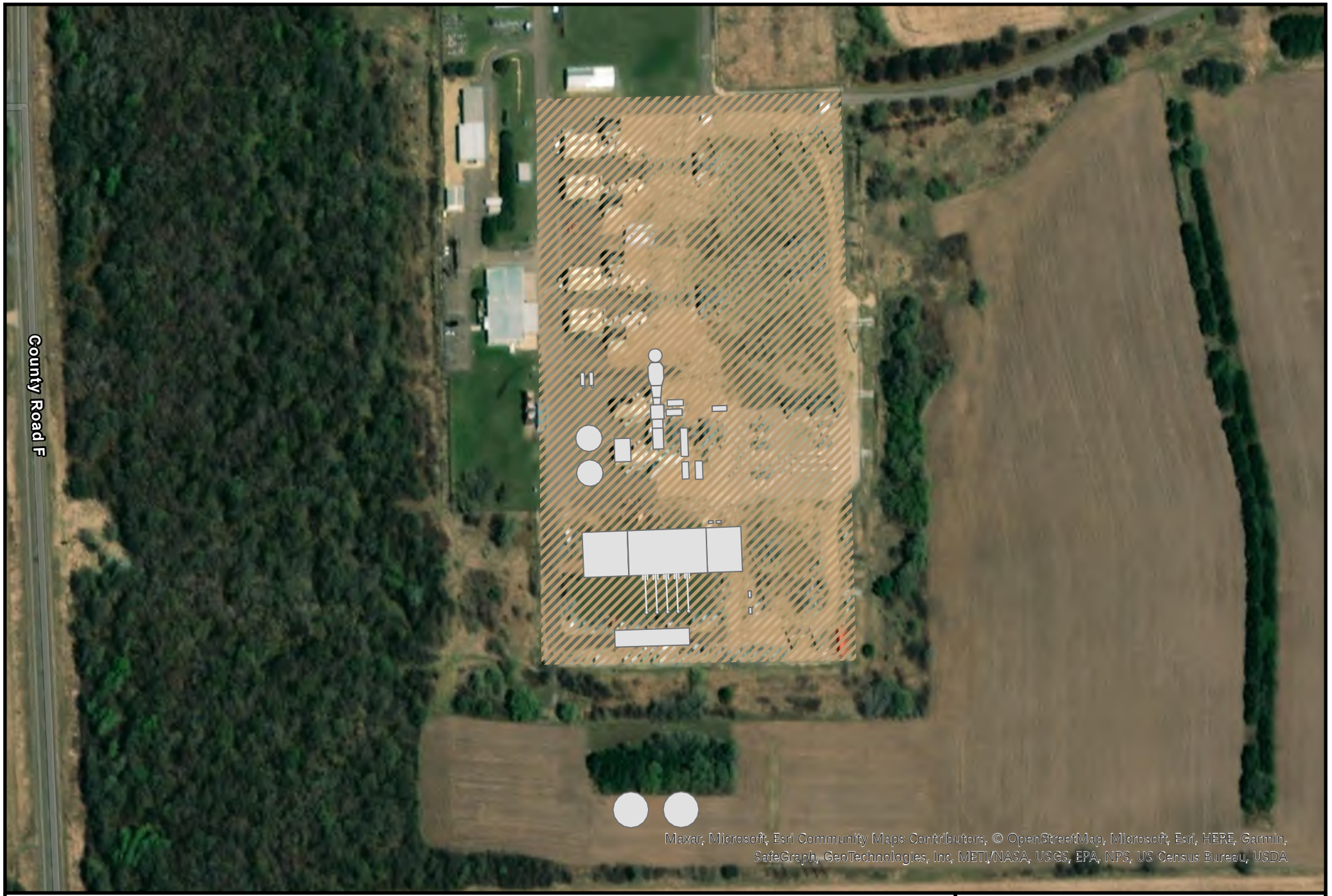

LEGEND

Project Layout

Project Site

REFERENCE

0 0.03 0.06

MILES

0 0.03 0.06

KILOMETERS

Figure 5-2
Proposed Site - Modeling Layout

LOCATION:	Wheaton, Wisconsin
CLIENT:	Xcel Energy
PROJ. NO.:	144752
CREATED:	12/13/2022

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5.2.1 Proposed Site – Residential Receiver Analysis

Measurement points MP1 and MP2 are located on the Project property, within the Project fenceline. Therefore, they were not considered sensitive locations for comparison to the design goal. The closest and most impacted residence (RES01) to the Project is located next to measurement point MP6.

A detailed analysis of sound level metrics for the existing ambient and operational conditions compared to the operation of the Project can be found in Appendix D. The detailed analysis contains sound level estimates at distances of 100, 400, 1000, 1500, 2000, and 3000 feet from the combustion turbine exhaust stack. Appendix D also provides the impact of the Project on the existing environment for each MP. Expected changes to existing sound levels for L_{ave}, L_{10}, L_{50}, and L_{90} for both dBA and dBC are included in Appendix D.

The sound model was used to estimate the Project-generated noise levels at neighboring residential receivers. The sound modeling results at these receivers are provided in Table 5-3. The overall Project-generated sound level at RES01 would be 55 dBA L_{eq}. The modeled receptors and L_{eq} sound level contours, in 5 dBA increments, are shown in Figure 5-3. It is not anticipated that any future residences could be built that would be more impacted (closer to the site) than the current residences.

Table 5-3: Proposed Site – Sound Modeling Results at Residential Receivers

Location	Project Modeled Sound Level (L_{eq} dBA)	Project Modeled Sound Level (L_{eq} dBC)
Res01	55	75
Res02	54	73
Res03	47	67
Res04	49	71

Figure 5-3
Proposed Site - Sound Level Contours

LOCATION:	Wheaton, Wisconsin
CLIENT:	Xcel Energy
PROJ. NO.:	144752
CREATED:	12/13/2022

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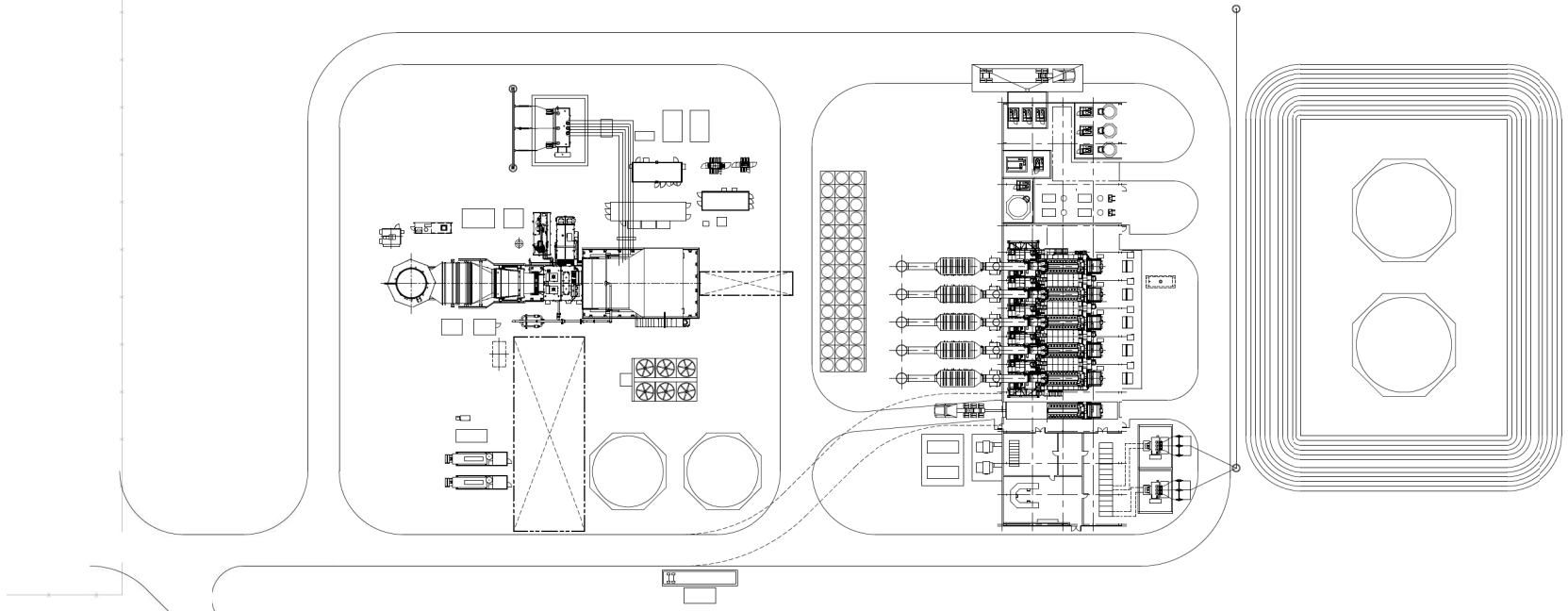
5.3 Alternative Site – Sound Modeling Results

The Alternative site general arrangement and sound modeling layout for the Project are presented in Figure 5-4 and Figure 5-5. The sound model was used to estimate the baseline Project-generated noise levels in the surrounding community. The measured sound levels at the ambient and operational measurement locations are shown along with the model-predicted Project sound levels at those same locations in Table 5-2.

Table 5-4: Alternative Site – Sound Modeling Results

Time of Day	Location	Ambient Sound Level [a,b] (L_{eq} dBA)	Measured Operational Sound Level [c] (L_{eq} dBA)	Modeled Project Sound Level [d] (L_{eq} dBA)
Daytime	MP1	48	73	55
	MP2	46	63	62
	MP3	50	54	47
	MP4	53	53	49
	MP5	56	54	49
	MP6	55	54	52
Nighttime	MP1	47	--	55
	MP2	45	--	62
	MP3	47	--	47
	MP4	49	--	49
	MP5	56	--	49
	MP6	53	--	52

(a) Daytime ambient sound levels are the average L_{eq} of the three measured daytime periods
(b) Nighttime ambient sound levels are the measured L_{eq} midnight sound levels
(c) Measured Operational Sound Level is the measured L_{eq} sound level during the noon time period with the facility operating at full load
(d) Modeled Project Sound Level is the sound level of the Project only without the influence of background noise



PRELIMINARY - NOT FOR CONSTRUCTION

no.	date	by	ckd	description
0	08/12/22	WRL	RDV	ISSUED FOR PERMITTING

Figure 5-4

BURNS McDONNELL
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Burns & McDonnell Engineering Co, Inc.

designed J. TRASK | detailed K. KOCH

Xcel Energy℠

WHEATON GENERATING STATION
CHIPPEWA COUNTY, WISCONSIN

GENERAL ARRANGEMENT
RECIPROCATING ENGINE GENERATOR & GAS TURBINE GENERATOR ADDITIONS

project 144752 | contract

drawing SKG-002 | rev. 0

sheet 1 of 1 sheets

file 144752_SKG-001.dwg

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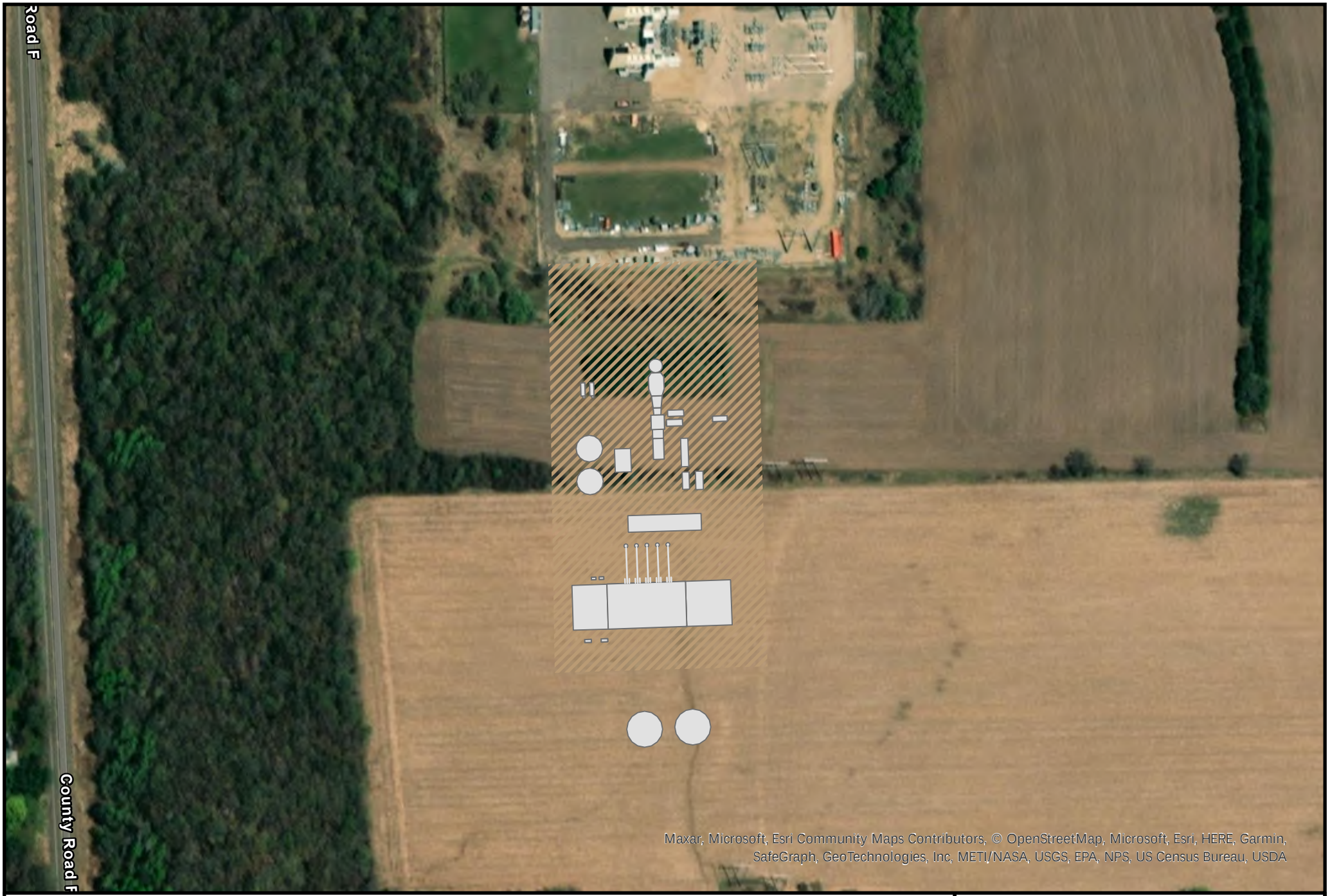

LEGEND

Project Layout

Project Site

REFERENCE

0 0.03 0.06

MILES

0 0.03 0.06

KILOMETERS

Figure 5-5
Alternate Site - Modeling Layout

LOCATION:	Wheaton, Wisconsin
CLIENT:	Xcel Energy
PROJ. NO.:	144752
CREATED:	11/23/2022

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5.3.1 Alternative Site – Residential Receiver Analysis

Measurement points MP1 and MP2 are located on the Project property, within the Project fenceline. Therefore, they were not considered sensitive locations for comparison to the design goal. The closest and most impacted residence (RES02) to the Project is located near measurement point MP6.

A detailed analysis of sound level metrics for the existing ambient and operational conditions compared to the operation of the Project can be found in Appendix D. The detailed analysis contains sound level estimates at distances of 100, 400, 1000, 1500, 2000, and 3000 feet from the combustion turbine exhaust stack. Appendix D also provides the impact of the Project on the existing environment for each MP. Expected changes to existing sound levels for L_{ave}, L_{10}, L_{50}, and L_{90} for both dBA and dBC are included in Appendix D.

The sound model was used to estimate the Project-generated noise levels. The sound modeling results are provided in Table 5-5. The overall Project-generated sound level at RES02 would be 54 dBA L_{eq}. The modeled receptors and L_{eq} sound level contours, in 5 dBA increments, are shown in Figure 5-6. It is not anticipated that any future residences could be built that would be more impacted (closer to the site) than the current residences.

Table 5-5: Alternative Site – Sound Modeling Results at Residential Receivers

Location	Project Modeled Sound Level (L_{eq} dBA)	Project Modeled Sound Level (L_{eq} dBC)
Res01	52	73
Res02	54	74
Res03	47	66
Res04	46	66

LEGEND

- 30 dBA
- 35 dBA
- 40 dBA
- 45 dBA
- 50 dBA
- 55 dBA
- 60 dBA
- 65 dBA
- Project Layout
- Project Site
- Distance Point
- Measurement Point
- Residential Point

REFERENCE

0 0.1 0.2
MILES

0 0.1 0.2
KILOMETERS

Figure 5-6
Alternate Site - Sound Level Contours

LOCATION:	Wheaton, Wisconsin
CLIENT:	Xcel Energy
PROJ. NO.:	144752
CREATED:	12/02/2022

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Path: Z:\Clients\ENR\Xcel\Enr\144752_WHTblackstart\7_Studies\Permitting\Modeling\Noise\GIS\GIS.aprx • Coordinate System: • Units:

6.0 POST-CONSTRUCTION MEASUREMENTS

Within twelve months of the date when the project is fully operational, and within two weeks of the anniversary date of the pre-construction ambient noise measurements, the sound level measurements will be repeated both with and without the Project in operation. Sound measurements will be taken at the same MPs that were analyzed for the ambient and operational measurements. Post-construction sound level measurements will be taken in a manner similar to those described in Section 4.0 for pre-construction sound measurements.

7.0 CONCLUSION

Burns & McDonnell conducted a sound study for the Xcel Energy Wheaton Repowering Project in Wheaton, Wisconsin. The existing generating units at the Wheaton Generation Station will be decommissioned as a result of the Project. There are no applicable State or City numeric noise regulations applicable to the Project, nor does the PSCW provide numeric sound level limits for the Project. The Project was analyzed at the Proposed and Alternate sites for noise impacts to the closest residential properties.

The Project includes noise mitigation in the form of stack silencing, inlet silencing, a reciprocating engine hall building, and duct lagging. Through the use of this mitigation, significant changes to the existing environment are not expected as a result of the Project at either of the analyzed Project locations.

8.0 REFERENCES

ANSI S1.4 – "Specification for Sound Level Meters".

ANSI S1.6 – "Preferred Frequencies and Band Numbers for Acoustical Measurements

ANSI S1.11 – "Specification for Octave Band and Fractional Octave Band Analog and Digital Filters".

ANSI S12.18 – "Outdoor Measurements of Sound Pressure Level"

ISO 9613-2 – "Acoustics -- Attenuation of sound during propagation outdoors -- Part 2: General method of calculation."

ISO 10494 – "Gas turbines and gas turbine sets – Measurement of emitted airborne noise – Engineering/survey method."

Public Service Commission of Wisconsin – "Measurement Protocol for Sound and Vibration Assessment of Proposed and Existing Electric Power Plants"

APPENDIX A – NOISE MONITORING AND MODELING PROTOCOL

Noise Monitoring and Modeling Protocol

Xcel Energy

Wheaton Repowering Project
Project No. 144752

Revision 0
6/29/2022

Noise Monitoring and Modeling Protocol

prepared for

Xcel Energy
Wheaton Repowering Project
Wheaton, Wisconsin

Project No. 144752

Revision 0
6/29/2022

prepared by

Burns & McDonnell

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LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
ANSI	American National Standards Institute
CadnaA	Computer Aided Noise Abatement
dB	decibel
dBA	A-weighted decibel
dBC	C-weighted decibel
Hz	Hertz
ISO	International Organization for Standardization
MISO	Midcontinent Independent System Operator
MP	measurement point
Project	Wheaton Repowering Project
PSCW	Public Service Commission of Wisconsin
WDNR	Wisconsin Department of Natural Resources

1.0 SCOPE

This document provides the noise monitoring and modeling protocol to be employed for the proposed Xcel Energy Wheaton Repowering Project in Wheaton, Wisconsin (Project). The existing generating units at the Wheaton Generation Station are beyond end of life and are degrading in reliability. The Project proposes to repower the Wheaton Generation Station with three dual-fuel reciprocating engines and a new dual-fuel F-class gas turbine generator. The Project's proposed generating units could be operated during day or nighttime hours, in accordance with market dispatch signals.

Burns & McDonnell has developed this protocol to detail the methodology to be used for measurements of the ambient and pre-Project operational sound levels, and the modeling predictions of the future sound levels near the Project. The methodology to be employed is adapted from the requirements outlined in the Public Service Commission of Wisconsin's (PSCW) Measurement Protocol for Sound and Vibration Assessment of Proposed and Existing Electric Power Plants (November 2008)[1]. The measured ambient sound levels will be used in conjunction with predictive modeling to develop the basis for impact of the Project on the surrounding areas. Proposed exceptions to the PSCW measurement protocol are listed below:

1. A single 1-hour test of the existing units' operational sound levels instead of a full 24-hour test.
    a. Due to requirements by Midcontinent Independent System Operator (MISO) and the Wisconsin Department of Natural Resources (WDNR) air permit emission limits during the ozone season, the facility has strict requirements for the operational run time of the units. Additionally, all of the existing generating units will be decommissioned as a result of this project
2. Test operational sound levels with four of five existing units operating at full load.
    a. It is likely that only four of the five existing units will be able to operate for the test period, due to air permit emission limits during the ozone season. Unit six, which runs on fuel oil, may not be able to be brought online for testing. The other four natural gas-fired turbines will be tested for operational sound levels at the proposed measurement points.
3. Ambient measurement may potentially be collected on a weekend day/night.
    a. The PSCW protocol provides that sound level measurements should be, "made on a weekday of a non-holiday week." However, due to MISO generation dispatch needs, the existing units are generally required to run on weekdays.

[1] https://psc.wi.gov/SiteAssets/ConventionalNoiseProtocol.pdf

The following industry standards were also used in the development of this procedure: American National Standards Institute (ANSI) S1.4, ANSI S1.6, ANSI S1.11, ANSI S12.18, ANSI S12.34, ANSI S12.36, ANSI B133.8, International Organization for Standardization (ISO) 8297, ISO 9613-2, and ISO 10494.

2.0 INSTRUMENTATION

Various types of equipment will be used to establish accurate ambient sound levels in the area surrounding the Project including sound level meters, anemometer, and calibration equipment.

2.1 Sound Level Meter

Sound level measurements will be made with a sound level meter that meets the requirement of the latest revision of ANSI S1.4 for a Type 1, Precision Sound Level Meter. The sound level meter will have the capability of determining the one-third octave band sound levels over the specified measurement period as well the appropriate weighting and sound metrics identified in the PSCW's protocol.

A microphone windscreen will be used for all measurements. The windscreen shall not affect the response of the sound level meter by more than ± 0.5 decibels (dB) at frequencies below 2,000 Hertz (Hz) and ± 1.0 dB at frequencies from 2,000 Hz to 10,000 Hz.

2.2 Anemometer

Wind speed and direction, atmospheric temperature, barometric pressure, and relative humidity will be recorded at every location when measuring far-field noise levels.

2.2.1 Calibration

Instruments will be calibrated using a sound level calibrator with accuracy of ± 0.5 dB. The standard reference sound pressure will be 20 micropascals.

Calibrations will be performed before and after each measurement series and upon any significant change in recording conditions (i.e., battery change operation). A calibration level change exceeding ± 1.0 dB will require that the measurement series be repeated. The calibration frequency will be 1,000 Hz. The meter and calibrator will have been checked within the last year to verify compliance with the U.S. National Institute of Standards and Technology specifications.

3.0 TEST PROCEDURE

Operational and ambient sound level testing will occur in accordance with the procedures in the PSCW measurement protocol document. Measurements will be collected during summer months to avoid planting and harvesting seasons when increased levels of agricultural noise would be expected. All sound level measurements will be performed by a Burns & McDonnell engineer, technician, or acoustical consultant qualified by experience and/or training.

3.1 Microphone Locations

The microphones shall be positioned at each measurement point (MP) as identified in Figure A-1 of Appendix A. Measurement points are proposed to quantify existing operational and ambient sound levels in the area surrounding the proposed Project site.

The microphone shall be located at a height of 5 feet (1.5 meters) above the ground and oriented toward the location of the proposed equipment. Sound level measurements will be made with the sound level meter mounted on a tripod or held in the hand of the observer in such a way that the microphone is at least one-half meter from the observer's body and one and one-half meters from the ground, with the microphone pointed at the proper angle relative to the direction of the source. The angle of incidence of the sound on the microphone shall be as specified by the manufacturer as that angle for which the microphone has the most uniform frequency response.

The observer shall not stand between the microphone and the source and shall stand behind and to one side of the microphone at all times during the actual noise testing periods. The MPs will be positioned in a manner to minimize reflections and shadowing effects from walls and other structures.

3.2 Ambient Measurements

Ambient measurements will be taken in accordance with PSCW guidance in general. Specifically, the measurements will be a minimum of ten continuous minutes, or long enough to obtain a representative sound level reading. Measurements will be taken during each of the following four periods:

a) Morning (6:00 – 8:00 a.m.)
b) Midday (12:00 – 2:00 p.m.)
c) Evening (6:00 – 8:00 p.m.)
d) Night (10:00 p.m. – 12:00 a.m. midnight)

For each MP shown in Appendix A and for each measurement period, the following measurement criteria will be provided:

a) Un-weighted octave-band analysis (16, 31.5, 63, 125, 250, 500, 1K, 2K, 4K, & 8K Hz)
b) Un-weighted 1/3 octave-band analysis (1/3 octave bands from 6.3 to 20K Hz)
c) L_{ave}, L_{10}, L_{50}, and L_{90} in A-weighted decibels (dBA)
d) L_{ave}, L_{10}, L_{50}, and L_{90} in C-weighted decibels (dBC)
e) A detailed narrative description of sounds audible during each measurement
f) Audio recordings of any unidentifiable, intrusive, or dominant sound sources observed during the measurement

All major sources of sound and vibration (e.g. highways, factories, etc.) and where they are located in relation to each MP will be identified and shown graphically. A map clearly showing the following elements will be provided:

a) The layout of the site
b) The location of MPs
c) The location of significant local sound and vibration sources
d) The distance between all MPs and significant local sound and vibration sources
e) The location of all sensitive receptors (schools, day-care centers, hospitals, and residences or residential neighborhoods) within 400 feet of the site
f) The distance to all major infrastructure (major roads, transmission lines, gas pipelines) within 400 feet of the project site.

Auxiliary noise sources (nearby vehicular traffic, birds chirping, etc.) will be noted during each measurement. Care will be taken by testing personnel to minimize extraneous noise during the measurements to accurately address current ambient sound levels near the Project site.

Due to the role of the exiting facility in supporting the electrical grid (stability and cost of electricity), the facility is desired to remain available to operate on short notice during weekdays and some weekends, so it may be necessary for the ambient measurements to be collected on a weekend day and night, when MISO does not need the facility to operate. If needed, the ambient measurements will be collected on a weekend. However, if possible, a weekday of a non-holiday week will be used. It is not expected that there would be significant differences between weekdays and weekends in the area surrounding the facility, since the area is rural and there is no substantial industry nearby.

3.3 Operational Measurements

The existing generation equipment will be decommissioned as a result of this Project. Therefore, it is proposed that the operational measurement protocol be altered from the PSCW guidance due in part to MISO restrictions on operations for testing and the environmental and fuel costs of unnecessary operation. It is likely that only four of the five existing units will be able to operate for the test period. Unit six, which runs on fuel oil, may not be able to be brought online for testing due to air permit emission limits during the ozone season. The other four natural gas-fired turbines will be tested for operational sound levels. There is not expected to be a significant change in far-field sound levels between four units operating and all five. Each measurement will be a minimum of ten continuous minutes, but only one time period will be used to establish current operational sound levels to limit unnecessary operation of the existing units. Measurements will be taken once during daytime hours at each MP while the facility is operating at least four of the five existing combustion turbines at full load.

For each MP shown in Appendix A, the following measurement criteria will be provided:

a) Un-weighted octave-band analysis (16, 31.5, 63, 125, 250, 500, 1K, 2K, 4K, & 8K Hz)
b) Un-weighted 1/3 octave-band analysis (1/3 octave bands from 6.3 to 20K Hz)
c) L_{ave}, L_{10}, L_{50}, and L_{90} in dBA
d) L_{ave}, L_{10}, L_{50}, and L_{90} in dBC
e) A detailed narrative description of sounds audible during each measurement
f) Audio recordings of any unidentifiable, intrusive, or dominant sound sources observed during the measurement

As stated previously, all major sources of sound and vibration and where they are located in relation to each MP will be identified and shown graphically, and auxiliary noise sources will be noted during each measurement.

3.4 Atmospheric Conditions

Sound measurements shall not be collected when the average wind velocity during the measurement period exceeds 11 miles per hour (5 meters/second) measured 5 feet (1.5 meters) above the ground, per ANSI S12.18. Sound measurements shall not be made under conditions that allow the instrumentation to become wet (i.e., when raining or snowing). The atmospheric conditions recorded during the sound measurements will be reported in the final noise report document.

4.0 FUTURE SOUND LEVEL ESTIMATE

Future sound level estimates for the proposed Project will be performed using the Computer Aided Noise Abatement (CadnaA) modeling software in conjunction with the existing sound-level measurements. Manufacturer data has not yet been provided for the proposed equipment, but once provided it will be incorporated into the noise model. The proposed Project will be modeled using the methodology detailed in ISO 9613-2. Structures, topographical land data, and sensitive noise receiver data will be included in the model in order to obtain an accurate assessment of future noise levels from the proposed Project.

4.1 Requirements

The PSCW Measurement Protocol states the following items should be provided for the sound level estimate:

1) Manufacturer's sound level characteristics for the Project equipment operating at full load. An un-weighted octave-band (31.5, 63, 125, 250, 500, 1K, 2K, 4K, & 8K Hz) analysis shall be included for the unit at full operation. Sound estimates should be made for distances of 100, 400, 1000, 1500, 2000, and 3000 feet from whichever source is expected to produce the greatest sound levels.
2) Sound levels will be estimated in dBA and dBC at 100, 400, 1000, 1500, 2000, and 3000 feet from the source that produces the greatest sound levels. The combined sound level impact for all units operating at full load will be estimated.
3) A contour map of the expected sound levels from the Project, using 5-dBA increments, out to a distance of 3,000 feet, or as needed to include the entire 30-dBA sound contour, for the facility will be provided.
4) The impact of the new sound and vibration source on the existing environment will be determined. For each MP used in the ambient study, the following will be determined:
    a. Expected changes to existing sound levels for L_{ave}, L_{10}, L_{50}, and L_{90} in dBA.
    b. Expected changes to existing sound levels for L_{ave}, L_{10}, L_{50}, and L_{90} in dBC.
5) All assumptions made in arriving at the estimates of impact and any conclusions reached regarding the potential effects on people living near the Project area will be clearly reported.
6) An estimate of the number of hours of operation expected from the Project and under what conditions it will be expected to run will be included with the estimate.

5.0 POST-CONSTRUCTION MEASUREMENTS

Within twelve months of the date when the Project is fully operational, and within two weeks of the anniversary date of the pre-Project noise measurements, the sound measurements taken for the existing site will be repeated. Additional measurement locations will be added for the post-construction survey, based on the locations of the loudest sources onsite. Sound measurements will be taken at the same MPs that were analyzed for the ambient measurements. Post-construction sound level measurements will be taken in a manner similar to those described in Section 3.0.

6.0 REFERENCES

ANSI S1.4 – "Specification for Sound Level Meters".

ANSI S1.6 – "Preferred Frequencies and Band Numbers for Acoustical Measurements

ANSI S1.11 – "Specification for Octave Band and Fractional Octave Band Analog and Digital Filters".

ANSI S12.18 – "Outdoor Measurements of Sound Pressure Level"

ANSI S12.34 – "Engineering Methods for the Determination of Sound Power Levels of Noise Sources for Essentially Free-Field Conditions over a Reflecting Plane".

ANSI S12.36 – "Survey Methods for the Determination of Sound power Levels of Noise Sources."

ANSI B133.8 – "Gas Turbine Installation Sound Emissions."

ISO/DIS 8297 – "Acoustics – Determination of Sound Power Levels of Multi-Source Industrial Plants for the Evaluation of the Sound pressure Levels in the Environment – Engineering Method."

ISO 9613-2 – "Acoustics -- Attenuation of sound during propagation outdoors -- Part 2: General method of calculation."

ISO 10494 – "Gas turbines and gas turbine sets – Measurement of emitted airborne noise – Engineering/survey method."

Public Service Commission of Wisconsin – "Measurement Protocol for Sound and Vibration Assessment of Proposed and Existing Electric Power Plants"

APPENDIX A - MEASUREMENT POINT FIGURE

LEGEND

Measurement Points

REFERENCE

0 0.07 0.15
MILES

0 0.07 0.15
KILOMETERS

N

Figure A-1
Measurement Point Locations

LOCATION:	Wheaton, Wisconsin
CLIENT:	Xcel Energy
PROJ. NO.:	144752
CREATED:	06/06/2022

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APPENDIX B – AMBIENT AND OPERATIONAL MONITORING DATA

Appendix B

Point Number	Weather	LAeq	LCeq	Notes
Wheaton 09-14-2022				**Meter 1 Calibration before: 114.02** **Meter 2 Calibration before: 114.2**
Ambient-Morning Measurements - 6:00 AM to 8:00 AM				**Meter 1 Calibration after: 113.92** **Meter 2 Calibration after: 113.86**
MP1	Temperature 52 °F, 88% Humidity, 51 °F Dew Point, 0-2 mph winds, 30.08 inHg	50 dBA	59 dBC	Highway traffic, service transformers, insects
MP2	Temperature 52 °F, 88% Humidity, 51 °F Dew Point, 0-2 mph winds, 30.08 inHg	50 dBA	59 dBC	Highway traffic, insects
MP3	Temperature 53 °F, 85% Humidity, 51 °F Dew Point, 0-2 mph winds, 30.08 inHg	50 dBA	60 dBC	Highway traffic, insects, calm winds
MP4	Temperature 53 °F, 85% Humidity, 51 °F Dew Point, 0-2 mph winds, 30.08 inHg	55 dBA	62 dBC	Highway traffic, insects, calm winds
MP5	Temperature 53 °F, 85% Humidity, 51 °F Dew Point, 0-2 mph winds, 30.08 inHg	61 dBA	67 dBC	Highway traffic, constant local traffic, trucks arriving for timber harvest, insects, corona noise
MP6	Temperature 53 °F, 85% Humidity, 51 °F Dew Point, 0-2 mph winds, 30.08 inHg	58 dBA	65 dBC	Highway traffic, intermittent local traffic, insects
Wheaton 09-14-2022				**Meter 1 Calibration before: 114.07** **Meter 2 Calibration before: 114.09**
Ambient-Noon Measurements - 12:00 PM to 2:00 PM				**Meter 1 Calibration after: 114.04** **Meter 2 Calibration after: 113.98**
MP1	Temperature 67 °F, 72% Humidity, 58 °F Dew Point, 0-4 mph NE winds	47 dBA	58 dBC	Light breeze, highway traffic, service transformers, insects, birds, airplane
MP2	Temperature 67 °F, 72% Humidity, 58 °F Dew Point, 0-4 mph NE winds	43 dBA	56 dBC	Highway traffic, transformers GSU, insects, birds, airplane
MP3	Temperature 68 °F, 72% Humidity, 58 °F Dew Point, 0-4 mph NE winds	53 dBA	60 dBC	Insects, birds, highway traffic, local traffic, crop plane
MP4	Temperature 68 °F, 72% Humidity, 58 °F Dew Point, 0-4 mph NE winds	51 dBA	60 dBC	Insects, birds, highway traffic, local traffic, crop plane
MP5	Temperature 68 °F, 72% Humidity, 58 °F Dew Point, 0-4 mph NE winds	52 dBA	58 dBC	Insects, birds, highway traffic, local traffic
MP6	Temperature 68 °F, 72% Humidity, 58 °F Dew Point, 0-4 mph NE winds	54 dBA	59 dBC	Insects, birds, highway traffic, local traffic
Wheaton 09-14-2022				**Meter 1 Calibration before: 113.97** **Meter 2 Calibration before: 114.03**
Ambient-Evening Measurements - 6:00 PM to 8:00 PM				**Meter 1 Calibration after: 113.98** **Meter 2 Calibration after: 113.98**
MP1	Temperature 71 °F, 65% Humidity, 58 °F Dew Point, 1-2 mph winds	46 dBA	57 dBC	Insects, highway traffic, service transformers, airplane
MP2	Temperature 71 °F, 65% Humidity, 58 °F Dew Point, 1-2 mph winds	43 dBA	56 dBC	Insects, highway traffic, GSU transformers, airplane
MP3	Temperature 70 °F, 67% Humidity, 58 °F Dew Point, 1-2 mph winds	49 dBA	56 dBC	Insects, highway traffic, birds, local traffic
MP4	Temperature 70 °F, 67% Humidity, 58 °F Dew Point, 1-2 mph winds	53 dBA	58 dBC	Insects, highway traffic, birds, local traffic
MP5	Temperature 68 °F, 71% Humidity, 58 °F Dew Point, 1-2 mph winds	55 dBA	62 dBC	Insects, highway traffic, birds, local traffic
MP6	Temperature 68 °F, 71% Humidity, 58 °F Dew Point, 1-2 mph winds	54 dBA	58 dBC	Insects, highway traffic, birds, local traffic
Wheaton 09-14-2022				**Meter 1 Calibration before: 114.05** **Meter 2 Calibration before: 113.95**
Ambient-Night Measurements - 10:00 PM to 12:00 AM				**Meter 1 Calibration after: 113.89** **Meter 2 Calibration after: 114.16**
MP1	Temperature 65 °F, 77% Humidity, 58 °F Dew Point, 1-2 mph winds, gust up to 5 mph	47 dBA	59 dBC	Insects, station transformers
MP2	Temperature 65 °F, 77% Humidity, 58 °F Dew Point, 1-2 mph winds, gust up to 5 mph	45 dBA	58 dBC	Insects, GSU transformers
MP3	Temperature 65 °F, 77% Humidity, 58 °F Dew Point, 1-2 mph winds, gust up to 5 mph	47 dBA	57 dBC	Insects, highway traffic
MP4	Temperature 65 °F, 77% Humidity, 58 °F Dew Point, 1-2 mph winds, gust up to 5 mph	49 dBA	57 dBC	Insects, highway traffic
MP5	Temperature 64 °F, 77% Humidity, 58 °F Dew Point, 1-2 mph winds, gust up to 5 mph	56 dBA	62 dBC	Insects, highway traffic, distant train
MP6	Temperature 64 °F, 77% Humidity, 58 °F Dew Point, 1-2 mph winds, gust up to 5 mph	53 dBA	63 dBC	Insects, highway traffic

Appendix B

Point Number	*File Name*	*LAeq*	*LA10*	*LA50*	*LA90*	*LCeq*	*LC10*	*LC50*	*LC90*
Wheaton 09-14-2022									
Ambient-Morning Measurements - 6:00 AM to 8:00 AM									
MP1	**001**	49.8 dBA	51.5 dBA	49.5 dBA	47.6 dBA	58.9 dBC	61.2 dBC	58.1 dBC	55.9 dBC
MP2	**001**	50.4 dBA	52.0 dBA	50.1 dBA	48.4 dBA	59.5 dBC	61.2 dBC	58.2 dBC	56.3 dBC
MP3	**002**	49.5 dBA	51.2 dBA	48.4 dBA	47.0 dBA	60.0 dBC	61.2 dBC	58.5 dBC	56.7 dBC
MP4	**002**	55.3 dBA	56.8 dBA	55.1 dBA	53.5 dBA	61.9 dBC	63.5 dBC	60.7 dBC	58.7 dBC
MP5	**003**	60.8 dBA	63.3 dBA	57.0 dBA	53.1 dBA	67.1 dBC	69.4 dBC	63.4 dBC	59.9 dBC
MP6	**003**	58.5 dBA	59.1 dBA	52.1 dBA	49.8 dBA	64.6 dBC	65.9 dBC	60.7 dBC	58.8 dBC
Wheaton 09-14-2022									
Ambient-Noon Measurements - 12:00 PM to 2:00 PM									
MP1	004	47.3 dBA	49.8 dBA	45.8 dBA	44.7 dBA	57.8 dBC	60.1 dBC	56.5 dBC	54.1 dBC
MP2	004	43.3 dBA	45.0 dBA	42.6 dBA	41.1 dBA	56.7 dBC	59.0 dBC	55.2 dBC	53.3 dBC
MP3	005	52.7 dBA	52.6 dBA	50.5 dBA	49.6 dBA	59.9 dBC	61.1 dBC	54.9 dBC	52.4 dBC
MP4	005	51.0 dBA	50.2 dBA	48.1 dBA	46.8 dBA	59.6 dBC	60.2 dBC	55.9 dBC	53.1 dBC
MP5	006	52.1 dBA	49.9 dBA	47.1 dBA	44.5 dBA	58.4 dBC	60.2 dBC	56.2 dBC	53.4 dBC
MP6	006	53.9 dBA	50.1 dBA	42.0 dBA	40.0 dBA	59.6 dBC	58.5 dBC	53.9 dBC	51.7 dBC
Wheaton 09-14-2022									
Ambient-Evening Measurements - 6:00 PM to 8:00 PM									
MP1	007	45.9 dBA	46.7 dBA	45.7 dBA	44.8 dBA	57.3 dBC	58.9 dBC	56.9 dBC	54.9 dBC
MP2	007	43.2 dBA	45.5 dBA	41.9 dBA	40.7 dBA	56.0 dBC	57.6 dBC	55.4 dBC	53.8 dBC
MP3	008	48.6 dBA	45.9 dBA	43.0 dBA	41.9 dBA	56.6 dBC	57.2 dBC	54.3 dBC	52.6 dBC
MP4	008	53.0 dBA	49.1 dBA	45.6 dBA	43.3 dBA	57.8 dBC	57.7 dBC	54.8 dBC	52.9 dBC
MP5	009	55.4 dBA	56.7 dBA	49.3 dBA	46.1 dBA	62.5 dBC	63.4 dBC	57.4 dBC	54.4 dBC
MP6	009	53.6 dBA	53 dBA	43.8 dBA	41.5 dBA	58.7 dBC	59.6 dBC	54.9 dBC	52.9 dBC
Wheaton 09-14-2022									
Ambient-Night Measurements - 10:00 PM to 12:00 AM									
MP1	010	47.3 dBA	48.0 dBA	47.2 dBA	46.5 dBA	59.6 dBC	61.6 dBC	58.9 dBC	56.9 dBC
MP2	010	45.1 dBA	45.5 dBA	44.9 dBA	44.5 dBA	58.6 dBC	60.8 dBC	57.9 dBC	55.7 dBC
MP3	011	47.1 dBA	47.2 dBA	46.6 dBA	46.3 dBA	57.3 dBC	58.5 dBC	55.9 dBC	54.1 dBC
MP4	011	49.5 dBA	50.2 dBA	49.5 dBA	48.5 dBA	57.1 dBC	58.5 dBC	56.4 dBC	54.6 dBC
MP5	012	56.2 dBA	51.5 dBA	47.7 dBA	46.5 dBA	62.1 dBC	60.4 dBC	56.2 dBC	54.1 dBC
MP6	012	53.3 dBA	49.5 dBA	45.5 dBA	45.0 dBA	63.5 dBC	59.0 dBC	55.7 dBC	54.0 dBC
Wheaton 09-15-2022									
Operational Measurements - 12:00 PM to 2:00 PM									
MP1	014	72.9 dBA	73.6 dBA	72.9 dBA	72.2 dBA	83.4 dBC	84.6 dBC	83.3 dBC	81.9 dBC
MP2	014	63.1 dBA	64.4 dBA	62.8 dBA	61.5 dBA	75.5 dBC	76.9 dBC	75.4 dBC	73.7 dBC
MP3	015	53.9 dBA	51.3 dBA	48.8 dBA	48.0 dBA	65.0 dBC	66.9 dBC	63.7 dBC	61.6 dBC
MP4	015	53.3 dBA	53.5 dBA	51.4 dBA	49.3 dBA	71.2 dBC	72.6 dBC	70.7 dBC	69.1 dBC
MP5	016	54.4 dBA	54.0 dBA	51.5 dBA	50.3 dBA	71.5 dBC	72.7 dBC	71.0 dBC	69.6 dBC
MP6	016	54.1 dBA	51.4 dBA	50.2 dBA	49.1 dBA	69.7 dBC	71.0 dBC	69.4 dBC	67.8 dBC

Appendix B

Point Number	File Name	LAeq	Leq (dB) Octave Band Frequency (Hz) 16	31.5	63	125	250	500	1000	2000	4000	8000
Wheaton 09-14-2022												
Ambient-Morning Measurements - 6:00 AM to 8:00 AM												
MP1	**001**	**49.8 dBA**	57.8	55.9	54.3	50.1	46.5	46.3	47.6	39.6	39.3	41.6
MP2	**001**	**50.4 dBA**	56.9	55.8	55.3	52.0	46.1	46.8	48.6	39.8	38.5	41.3
MP3	**002**	**49.5 dBA**	60.0	57.9	55.1	51.4	45.2	47.1	46.6	40.2	40.7	41.7
MP4	**002**	**55.3 dBA**	58.7	57.6	55.8	55.0	50.2	50.1	54.0	43.4	39.8	41.4
MP5	**003**	**60.8 dBA**	62.3	62.9	61.7	60.0	56.5	55.7	58.8	51.1	44.5	42.5
MP6	**003**	**58.5 dBA**	58.7	59.9	59.2	58.2	53.3	52.1	56.4	50.1	42.4	41.6
Wheaton 09-14-2022												
Ambient-Noon Measurements - 12:00 PM to 2:00 PM												
MP1	**004**	**47.3 dBA**	54.2	52.5	53.1	51.3	50.2	45.4	41.0	37.9	39.0	42.3
MP2	**004**	**43.3 dBA**	54.3	51.6	52.9	51.5	42.0	39.2	38.9	37.1	39.5	41.8
MP3	**005**	**52.7 dBA**	59.2	54.2	55.5	53.5	46.8	44.5	46.9	40.6	44.1	50.9
MP4	**005**	**51.0 dBA**	58.2	55.9	55.9	51.4	45.4	45.3	47.9	40.5	41.5	46.8
MP5	**006**	**52.1 dBA**	56.2	56.5	52.7	46.9	43.9	44.6	50.2	42.1	43.3	42.4
MP6	**006**	**53.9 dBA**	55.6	55.6	53.4	50.1	49.9	50.8	50.9	45.6	40.3	41.8
Wheaton 09-14-2022												
Ambient-Evening Measurements - 6:00 PM to 8:00 PM												
MP1	**007**	**45.9 dBA**	54.5	52.9	52.3	51.0	49.3	42.0	41.0	38.2	39.4	41.8
MP2	**007**	**43.2 dBA**	52.5	50.7	52.9	50.3	42.5	37.3	38.9	37.1	40.0	41.8
MP3	**008**	**48.6 dBA**	54.6	53.7	51.9	48.2	43.0	42.6	46.4	39.9	41.4	42.3
MP4	**008**	**53.0 dBA**	52.6	52.7	52.5	48.7	45.0	46.9	51.4	44.3	39.9	41.7
MP5	**009**	**55.4 dBA**	56.1	56.6	55.9	58.9	47.6	47.4	53.3	47.6	41.5	42.0
MP6	**009**	**53.6 dBA**	53.8	53.7	52.4	51.7	47.2	45.7	52.3	44.1	40.1	41.7
Wheaton 09-14-2022												
Ambient-Night Measurements - 10:00 PM to 12:00 AM												
MP1	**010**	**47.3 dBA**	57.3	56.5	56.0	52.4	46.0	41.8	39.4	41.7	42.3	42.0
MP2	**010**	**45.1 dBA**	56.9	56.7	54.4	51.6	41.3	38.3	36.5	41.7	40.4	41.6
MP3	**011**	**47.1 dBA**	59.1	54.7	52.4	47.2	38.9	35.9	37.1	38.7	43.1	43.6
MP4	**011**	**49.5 dBA**	57.2	54.2	52.9	46.9	39.4	36.5	37.1	40.2	47.2	44.3
MP5	**012**	**56.2 dBA**	56.1	56.1	54.9	57.8	47.0	50.3	54.4	45.9	41.8	44.0
MP6	**012**	**53.3 dBA**	57.5	57.0	57.9	60.3	49.2	45.5	50.9	43.8	42.0	42.5
Wheaton 09-15-2022												
Operational Measurements - 12:00 PM to 2:00 PM												
MP1	**014**	**72.9 dBA**	83.7	82.3	78.3	73.3	67.1	64.8	64.3	65.3	68.2	62.7
MP2	**014**	**63.1 dBA**	74.0	73.0	72.1	67.7	60.8	58.3	56.5	54.6	56.0	48.2
MP3	**015**	**53.9 dBA**	67.1	62.6	60.7	51.8	46.6	46.7	50.8	44.1	40.6	49.7
MP4	**015**	**53.3 dBA**	72.6	69.6	67.9	56.2	52.2	49.8	49.1	43.7	41.0	44.9
MP5	**016**	**54.4 dBA**	73.1	69.7	67.9	59.3	48.4	47.2	51.1	45.3	41.3	43.4
MP6	**016**	**54.1 dBA**	72.2	68.5	64.5	58.0	48.9	46.8	51.3	45.3	44.4	42.7

Appendix B

Point Number	File Name	LAeq	1/3 Octave Band Frequency (Hz)																		
			6.3	8.0	10.0	12.5	16.0	20.0	25.0	31.5	40.0	50.0	63.0	80.0	100	125	160	200	250	315	400	500	630
Wheaton 09-14-2022																							
Ambient-Morning Measurements - 6:00 AM to 8:00 AM																							
MP1	**001**	**49.8 dBA**	45.2	45.4	48.4	49.6	52.0	55.4	52.8	51.4	47.5	47.6	51.1	48.8	45.1	46.5	44.3	42.7	42.3	39.5	39.8	40.8	43.3
MP2	**001**	**50.4 dBA**	44.4	44.8	48.1	49.6	52.2	53.8	53.2	50.7	49.1	49.0	51.7	49.9	47.8	47.7	46.4	43.1	40.2	39.0	40.2	41.2	43.9
MP3	**002**	**49.5 dBA**	45.9	45.8	49.8	52.1	55.3	56.8	54.5	53.0	49.6	49.3	50.9	50.6	49.5	45.1	42.8	41.0	39.8	40.4	42.6	43.3	41.1
MP4	**002**	**55.3 dBA**	47.4	49.9	53.1	51.1	53.3	56.0	53.7	53.4	51.2	49.7	50.7	51.8	53.4	48.1	48.1	47.0	45.5	43.4	45.0	45.3	45.8
MP5	**003**	**60.8 dBA**	50.7	52.0	54.5	56.6	57.5	58.8	58.5	57.6	58.0	55.5	57.1	57.7	57.1	54.8	52.7	54.7	50.0	47.8	48.4	50.4	52.8
MP6	**003**	**58.5 dBA**	49.1	48.1	51.1	51.6	54.1	55.4	54.0	56.4	54.6	53.5	54.6	55.3	56.2	51.6	49.7	50.2	48.4	46.0	45.9	46.9	48.8
Wheaton 09-14-2022																							
Ambient-Noon Measurements - 12:00 PM to 2:00 PM																							
MP1	**004**	**47.3 dBA**	54.5	51.8	49.9	49.9	48.4	50.2	48.9	47.5	46.6	47.6	49.8	46.6	44.9	47.0	47.3	46.3	45.9	43.6	42.2	40.3	38.6
MP2	**004**	**43.3 dBA**	57.6	56.4	51.4	49.3	49.1	50.1	48.3	46.4	45.4	46.2	49.0	48.5	46.7	48.9	41.8	38.6	37.8	33.8	35.1	34.2	34.2
MP3	**005**	**52.7 dBA**	60.8	59.4	57.7	55.6	54.2	53.0	51.3	49.1	46.7	52.4	51.8	44.7	48.7	50.7	45.5	43.6	41.7	39.8	38.9	38.8	40.8
MP4	**005**	**51.0 dBA**	58.7	56.8	54.7	52.7	52.5	54.7	53.2	50.2	47.9	52.0	53.0	45.6	48.9	46.5	42.1	42.4	39.6	39.2	38.8	40.0	42.2
MP5	**006**	**52.1 dBA**	47.3	47.8	49.8	48.5	50.6	53.7	53.1	51.3	50.4	49.2	47.8	46.3	42.6	41.5	42.2	41.1	39.1	36.0	36.2	38.9	42.3
MP6	**006**	**53.9 dBA**	45.6	45.5	47.8	47.1	50.3	53.1	52.8	50.1	49.0	47.3	48.9	49.3	45.3	45.7	45.3	45.6	45.0	45.3	43.9	45.7	47.7
Wheaton 09-14-2022																							
Ambient-Evening Measurements - 6:00 PM to 8:00 PM																							
MP1	**007**	**45.9 dBA**	57.9	54.9	53.0	51.1	49.0	48.8	47.8	50.3	45.1	46.4	48.2	47.9	45.2	47.8	44.9	45.6	45.9	40.1	38.4	36.3	37.0
MP2	**007**	**43.2 dBA**	50.6	48.6	47.6	46.5	47.8	49.0	47.9	45.2	43.5	46.7	50.1	46.3	46.6	46.4	42.8	38.6	38.7	34.6	32.2	32.1	33.2
MP3	**008**	**48.6 dBA**	54.4	51.9	50.1	50.0	50.4	50.2	50.5	48.3	46.5	46.4	47.3	47.4	45.8	42.2	40.6	40.4	37.3	35.4	36.6	37.4	39.3
MP4	**008**	**53.0 dBA**	46.3	45.7	47.2	45.7	48.1	49.1	49.4	47.4	45.8	46.5	48.3	47.9	44.7	44.3	42.1	41.0	40.7	38.3	39.3	42.2	43.9
MP5	**009**	**55.4 dBA**	47.3	48.2	48.3	48.1	51.3	53.2	53.0	51.7	50.4	51.0	51.3	51.4	54.1	56.5	49.3	45.0	42.5	39.1	38.8	41.6	45.0
MP6	**009**	**53.6 dBA**	46.9	44.8	46.3	46.3	48.9	51.1	50.0	49.0	47.5	47.3	47.4	48.2	47.5	47.7	45.0	43.5	43.1	40.0	39.8	39.2	42.7
Wheaton 09-14-2022																							
Ambient-Night Measurements - 10:00 PM to 12:00 AM																							
MP1	**010**	**47.3 dBA**	53.7	51.0	50.2	51.4	51.6	54.0	52.2	52.1	50.5	52.8	50.6	50.2	48.4	48.6	45.2	42.9	40.6	39.3	38.0	36.3	36.9
MP2	**010**	**45.1 dBA**	46.9	46.5	48.0	49.5	50.5	54.6	53.0	52.2	50.2	49.8	50.8	47.4	46.8	49.0	42.3	37.6	36.3	34.4	36.4	32.2	31.3
MP3	**011**	**47.1 dBA**	57.5	56.2	54.1	54.1	53.4	55.3	52.3	49.7	47.9	48.0	47.6	46.2	44.1	42.9	38.8	36.1	34.0	31.2	30.8	30.9	31.4
MP4	**011**	**49.5 dBA**	53.6	51.9	50.5	49.7	51.7	54.6	51.0	48.3	47.1	47.4	49.2	47.4	43.6	42.6	39.0	36.6	34.3	31.3	31.8	31.5	32.2
MP5	**012**	**56.2 dBA**	42.5	43.1	46.7	48.4	49.9	53.8	50.8	50.9	52.1	48.8	50.5	51.0	56.3	50.9	46.6	44.6	41.6	38.5	41.0	44.6	48.3
MP6	**012**	**53.3 dBA**	52.8	53.3	54.9	52.9	51.8	54.6	53.4	50.7	50.5	50.4	54.9	53.8	59.1	53.5	48.1	46.1	44.4	42.2	38.9	38.5	42.9
Wheaton 09-15-2022																							
Operational Measurements - 12:00 PM to 2:00 PM																							
MP1	**014**	**72.9 dBA**	78.4	78.1	74.4	74.8	79.0	81.0	79.4	76.9	75.2	74.7	74.3	70.8	70.2	68.2	66.6	63.4	62.2	60.9	61.2	59.7	59.2
MP2	**014**	**63.1 dBA**	71.6	71.7	66.1	66.4	70.6	69.6	69.4	69.2	64.8	66.1	69.4	65.4	59.3	64.8	63.1	57.4	55.5	54.4	54.1	53.4	53.2
MP3	**015**	**53.9 dBA**	65.0	64.8	61.9	60.5	63.2	62.9	59.4	58.3	54.3	54.3	57.3	55.8	48.7	45.8	45.4	43.2	42.1	39.8	39.5	41.1	44.4
MP4	**015**	**53.3 dBA**	68.1	68.1	64.3	63.9	67.9	69.8	67.4	63.3	61.4	64.7	64.4	57.1	51.3	50.5	52.1	49.3	46.5	45.1	45.7	45.1	44.6
MP5	**016**	**54.4 dBA**	71.6	71.0	67.0	65.5	69.1	69.4	66.4	65.5	61.5	62.1	66.1	56.7	55.8	55.4	50.7	46.1	42.5	39.3	40.0	41.9	44.3
MP6	**016**	**54.1 dBA**	69.9	68.7	65.2	64.1	67.5	69.2	65.8	62.9	60.7	60.8	60.8	56.1	54.5	53.8	49.7	45.7	44.3	40.6	40.5	41.5	43.3

Appendix B

Point Number	File Name	LAeq	1/3 Octave Band Frequency (Hz)													
			800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000	12,500	16,000	20,000
Wheaton 09-14-2022																	
Ambient-Morning Measurements - 6:00 AM to 8:00 AM																	
MP1	**001**	**49.8 dBA**	44.6	43.0	40.1	36.8	33.9	32.6	32.9	35.5	34.9	35.8	36.7	37.7	38.9	39.7	41.5
MP2	**001**	**50.4 dBA**	45.9	43.9	39.6	37.0	34.1	32.7	33.0	33.9	34.3	35.3	36.5	37.6	38.6	40.0	41.3
MP3	**002**	**49.5 dBA**	43.6	42.0	39.1	36.8	34.7	34.1	34.9	36.4	36.5	36.1	36.8	37.7	38.8	39.8	41.5
MP4	**002**	**55.3 dBA**	50.5	50.4	45.3	41.0	38.2	34.0	33.3	36.0	35.5	35.4	36.6	37.6	38.6	39.9	41.3
MP5	**003**	**60.8 dBA**	55.0	54.8	51.7	48.8	45.1	42.7	41.0	39.6	38.0	37.5	37.7	38.0	38.9	39.8	41.4
MP6	**003**	**58.5 dBA**	51.5	52.8	50.5	48.1	44.2	40.7	39.3	37.0	35.9	36.0	36.7	37.6	38.6	39.9	41.3
Wheaton 09-14-2022																	
Ambient-Noon Measurements - 12:00 PM to 2:00 PM																	
MP1	**004**	**47.3 dBA**	37.8	35.6	34.8	33.8	32.5	32.8	33.5	34.2	34.9	36.2	37.0	39.0	42.1	40.9	41.6
MP2	**004**	**43.3 dBA**	34.8	34.5	32.7	32.0	32.2	32.8	33.8	35.0	35.2	35.8	36.8	38.2	39.5	40.2	41.5
MP3	**005**	**52.7 dBA**	43.3	42.9	39.4	37.2	35.5	34.5	35.1	35.5	42.8	36.5	50.3	40.1	39.0	40.2	41.6
MP4	**005**	**51.0 dBA**	44.4	43.9	40.3	37.2	35.0	34.0	34.5	38.5	36.2	35.9	45.5	39.1	38.9	40.1	41.5
MP5	**006**	**52.1 dBA**	45.8	46.5	43.8	39.7	36.3	34.2	36.3	41.3	35.2	35.9	38.1	38.4	41.0	42.0	41.9
MP6	**006**	**53.9 dBA**	46.6	46.2	45.5	43.2	40.2	37.0	35.7	35.2	35.7	35.9	37.1	37.9	38.9	40.0	41.5
Wheaton 09-14-2022																	
Ambient-Evening Measurements - 6:00 PM to 8:00 PM																	
MP1	**007**	**45.9 dBA**	37.0	35.9	35.9	33.9	32.6	33.6	33.9	34.4	35.4	36.2	36.8	38.0	39.1	39.9	41.6
MP2	**007**	**43.2 dBA**	34.8	34.8	32.7	32.0	32.2	32.7	35.6	35.2	35.1	36.0	36.8	38.0	38.8	40.0	41.5
MP3	**008**	**48.6 dBA**	41.9	42.3	40.5	36.9	34.2	33.3	33.5	35.4	39.1	37.6	37.1	37.9	39.0	39.8	41.6
MP4	**008**	**53.0 dBA**	46.2	48.2	44.9	42.0	38.3	35.9	35.5	34.5	35.6	36.2	36.6	37.8	38.8	40.0	41.4
MP5	**009**	**55.4 dBA**	48.1	49.7	47.6	45.3	42.1	39.0	37.4	36.6	36.3	36.6	37.2	37.9	38.9	39.8	41.5
MP6	**009**	**53.6 dBA**	48.0	48.7	45.4	41.7	37.9	36.3	34.9	34.3	36.5	35.8	36.7	37.8	38.9	40.0	41.4
Wheaton 09-14-2022																	
Ambient-Night Measurements - 10:00 PM to 12:00 AM																	
MP1	**010**	**47.3 dBA**	36.3	33.0	34.0	33.3	35.8	39.4	33.6	34.3	40.7	36.1	36.7	38.3	40.7	40.2	41.5
MP2	**010**	**45.1 dBA**	32.2	32.0	31.1	31.0	38.2	38.4	35.5	35.3	35.9	35.5	36.7	37.9	39.5	40.1	41.5
MP3	**011**	**47.1 dBA**	33.3	32.0	31.6	32.1	32.3	36.2	35.8	36.8	40.7	39.2	37.0	39.9	45.3	44.8	41.6
MP4	**011**	**49.5 dBA**	33.2	32.4	31.1	30.8	32.5	38.8	32.9	37.2	46.4	41.7	36.8	38.7	42.2	43.4	41.6
MP5	**012**	**56.2 dBA**	51.3	49.8	46.6	43.0	40.3	38.5	37.4	36.3	37.5	36.5	36.9	42.0	46.9	45.5	41.7
MP6	**012**	**53.3 dBA**	48.2	46.2	42.3	39.5	38.8	38.7	35.4	36.0	39.2	35.9	36.9	39.5	44.7	43.4	41.7
Wheaton 09-15-2022																	
Operational Measurements - 12:00 PM to 2:00 PM																	
MP1	**014**	**72.9 dBA**	59.7	60.2	58.7	56.8	60.2	62.8	60.4	63.9	65.0	61.5	54.6	47.2	44.4	41.4	41.7
MP2	**014**	**63.1 dBA**	52.5	52.4	50.0	47.9	48.6	51.8	49.5	52.6	51.1	46.7	40.4	38.6	39.8	40.1	41.5
MP3	**015**	**53.9 dBA**	46.5	46.5	44.6	41.9	38.1	36.0	34.8	35.0	37.3	36.2	49.1	39.4	39.0	40.0	41.6
MP4	**015**	**53.3 dBA**	44.8	45.3	42.6	40.5	38.0	37.7	36.3	36.0	36.2	35.9	43.2	38.3	38.9	39.9	41.4
MP5	**016**	**54.4 dBA**	46.9	46.9	44.8	41.7	39.7	39.7	36.6	36.7	36.2	36.6	38.9	39.9	45.5	50.1	44.3
MP6	**016**	**54.1 dBA**	46.3	48.3	44.3	40.0	39.3	42.0	39.0	40.3	39.4	37.5	38.2	38.0	39.0	39.9	41.4

APPENDIX C – MODEL SOUND LEVEL INPUTS

Gas Turbine Equipment Description	Number of Sources	Model Inputs - Source Sound Pressure Levels (dBA)										Source / BMCD Comments
		Octave Band Center Frequency (Hz)									Overall	
		31.5	63	125	250	500	1000	2000	4000	8000	dBA	
GT Air Inlet Face	1	111	103	99	90	87	86	91	99	93	102	GE 7FA.05
GT Air Inlet House	1	104	98	100	102	96	81	95	82	57	100	GE 7FA.05
GT Acc Skid	1	101	103	99	98	97	96	96	97	88	103	GE 7FA.05
GT Cooling Module	1	99	99	113	105	104	104	94	89	91	107	GE 7FA.05
GT Exhaust Diffuser	1	105	112	96	92	86	84	85	88	75	94	GE 7FA.05
GT Fuel Module	1	100	108	98	100	101	104	99	88	72	107	GE 7FA.05
GT Generator	1	104	108	118	107	95	88	89	76	63	104	GE 7FA.05
GT GSU Transformer	1	108	105	106	103	106	103	98	96	86	108	GE 7FA.05
GT Load Compartment	1	87	92	89	82	80	83	80	72	60	87	GE 7FA.05
GT SCR	1	130	116	117	110	102	85	77	81	63	106	GE 7FA.05
GT SCR Transition	1	130	116	117	110	102	85	77	81	63	106	GE 7FA.05
GT Stack Exit	1	131	123	115	110	109	104	90	81	71	110	GE 7FA.05
GT Turbine	1	101	99	96	90	92	92	96	101	89	104	GE 7FA.05
GT Vent	4	102	102	110	101	98	95	94	98	95	104	GE 7FA.05

Reciprocating Engine Equipment Description	Number of Sources	Model Inputs - Source Sound Power Levels (dB)										Source / BMCD Comments
		Octave Band Center Frequency (Hz)									Overall	
		31.5	63	125	250	500	1000	2000	4000	8000	dBA	
Recip Building Intake	10	96	96	94	98	97	98	92	94	89	102	
Recip Building Intake Duct	5	119	115	102	82	74	87	86	86	97	98	
Recip Building Ridge Vent	1	102	98	92	85	81	83	83	88	86	107	IAC 3L Silencer Included
Recip Charge Air Intake	10	63	69	79	93	90	92	95	88	81	99	Silencer Included
Recip Charge Air Intake Duct	10	88	84	76	70	70	78	81	80	80	86	
Recip Engine Hall	1	97	91	69	51	40	41	35	37	32	95	Concrete Wall Panels
Recip Exhaust Duct	5	101	94	87	85	83	90	78	69	62	104	Lagging Included
Recip Exhaust Stack Exit	5	119	112	97	84	76	65	58	54	55	88	Silencer Included
Recip GSU Transformer	2	126	111	105	101	103	100	95	93	83	105	
Recip Radiator	1	115	115	114	116	112	106	103	99	90	113	Low-Noise Radiator

Balance of Plant Equipment Description	Number of Sources	Model Inputs - Source Sound Power Levels (dB)										Source / BMCD Comments
		Octave Band Center Frequency (Hz)									Overall	
		31.5	63	125	250	500	1000	2000	4000	8000	dBA	
Aux Trans	2	88	85	86	83	86	83	78	76	66	88	
Dew Point Heater Tank	2	104	101	99	94	91	87	80	76	72	93	
Dew Point Stack Exit	2	119	101	93	88	89	95	93	92	91	100	
Fuel Filter Skid	1	103	96	90	85	87	88	97	97	92	102	
Fuel Pump	2	79	91	87	90	91	94	89	77	58	97	
Pump	2	79	91	87	90	91	94	89	77	58	97	

APPENDIX D – ANALYSIS OF SOUND LEVEL METRICS

Appedix D
Wheaton Generating Station
Analysis of Sound Level Metrics
Primary Site

BURNS McDONNELL

	Ambient Measurements								Modeled Levels		Future Sound Levels (Log Sum Ambient + Modeled)								Increase to Ambient							
Point Number	LAeq	LA10	LA50	LA90	LCeq	LC10	LC50	LC90	LAeq	LCeq	LAeq	LA10	LA50	LA90	LCeq	LC10	LC50	LC90	LAeq	LA10	LA50	LA90	LCeq	LC10	LC50	LC90
	(dBA)				(dBC)				(dBA)	(dBC)	(dBA)				(dBC)				(dBA)				(dBC)			
Noon Measurements - 12:00 PM to 2:00 PM																										
MP1	49.8	51.5	49.5	47.6	58.9	61.2	58.1	55.9	61.6	82.9	61.9	62.0	61.9	61.8	82.9	82.9	82.9	82.9	12.1	10.5	12.4	14.2	24.0	21.8	24.8	27.0
MP2	50.4	52.0	50.1	48.4	59.5	61.2	58.2	56.3	70.8	85.9	70.8	70.9	70.8	70.8	85.9	85.9	85.9	85.9	20.4	18.9	20.7	22.4	26.4	24.7	27.7	29.6
MP3	49.5	51.2	48.4	47.0	60.0	61.2	58.5	56.7	50.3	72.6	52.9	53.8	52.5	52.0	72.8	72.9	72.8	72.7	3.4	2.6	4.1	5.0	12.8	11.7	14.2	16.0
MP4	55.3	56.8	55.1	53.5	61.9	63.5	60.7	58.7	48.7	69.0	56.2	57.4	56.0	54.7	69.8	70.1	69.6	69.4	0.9	0.6	0.9	1.2	7.9	6.6	8.9	10.7
MP5	60.8	63.3	57.0	53.1	67.1	69.4	63.4	59.9	51.7	74.2	61.3	63.6	58.1	55.5	75.0	75.4	74.5	74.4	0.5	0.3	1.1	2.4	7.8	6.1	11.2	14.5
MP6	58.5	59.1	52.1	49.8	64.6	65.9	60.7	58.8	54.4	75.9	59.9	60.4	56.4	55.7	76.2	76.3	76.0	76.0	1.4	1.3	4.3	5.9	11.6	10.4	15.3	17.2
Evening Measurements - 6:00 PM to 8:00 PM																										
MP1	47.3	49.8	45.8	44.7	57.8	60.1	56.5	54.1	61.6	82.9	61.8	61.9	61.7	61.7	82.9	82.9	82.9	82.9	14.5	12.1	15.9	17.0	25.1	22.8	26.4	28.8
MP2	43.3	45.0	42.6	41.1	56.7	59.0	55.2	53.3	70.8	85.9	70.8	70.8	70.8	70.8	85.9	85.9	85.9	85.9	27.5	25.8	28.2	29.7	29.2	27.0	30.7	32.6
MP3	52.7	52.6	50.5	49.6	59.9	61.1	54.9	52.4	50.3	72.6	54.6	54.6	53.4	53.0	72.8	72.9	72.7	72.6	2.0	2.0	2.9	3.4	13.0	11.8	17.8	20.2
MP4	51.0	50.2	48.1	46.8	59.6	60.2	55.9	53.1	48.7	69.0	53.0	52.5	51.4	50.9	69.5	69.5	69.2	69.1	2.0	2.3	3.3	4.1	9.8	9.3	13.3	16.0
MP5	52.1	49.9	47.1	44.5	58.4	60.2	56.2	53.4	51.7	74.2	54.9	53.9	53.0	52.5	74.3	74.4	74.3	74.2	2.8	4.0	5.9	8.0	15.9	14.2	18.1	20.9
MP6	53.9	50.1	42.0	40.0	59.6	58.5	53.9	51.7	54.4	75.9	57.2	55.8	54.6	54.6	76.0	76.0	75.9	75.9	3.2	5.7	12.6	14.6	16.4	17.4	22.0	24.2
Midnight Measurements - 12:00 AM to 2:00 AM																										
MP1	45.9	46.7	45.7	44.8	57.3	58.9	56.9	54.9	61.6	82.9	61.7	61.7	61.7	61.7	82.9	82.9	82.9	82.9	15.9	15.0	16.0	16.9	25.6	24.0	26.0	28.0
MP2	43.2	45.5	41.9	40.7	56.0	57.6	55.4	53.8	70.8	85.9	70.8	70.8	70.8	70.8	85.9	85.9	85.9	85.9	27.6	25.3	28.9	30.1	29.9	28.3	30.5	32.1
MP3	48.6	45.9	43.0	41.9	56.6	57.2	54.3	52.6	50.3	72.6	52.6	51.6	51.0	50.9	72.7	72.7	72.7	72.6	3.9	5.7	8.0	9.0	16.1	15.6	18.4	20.0
MP4	53.0	49.1	45.6	43.3	57.8	57.7	54.8	52.9	48.7	69.0	54.4	51.9	50.4	49.8	69.3	69.3	69.2	69.1	1.4	2.8	4.8	6.5	11.6	11.6	14.4	16.2
MP5	55.4	56.7	49.3	46.1	62.5	63.4	57.4	54.4	51.7	74.2	57.0	57.9	53.7	52.8	74.5	74.5	74.3	74.2	1.5	1.2	4.4	6.7	12.0	11.2	16.9	19.8
MP6	53.6	53.0	43.8	41.5	58.7	59.6	54.9	52.9	54.4	75.9	57.0	56.8	54.8	54.6	76.0	76.0	75.9	75.9	3.4	3.8	11.0	13.1	17.2	16.4	21.0	23.0
Morning Measurements - 5:00 AM to 7:00 AM																										
MP1	47.3	48.0	47.2	46.5	59.6	61.6	58.9	56.9	61.6	82.9	61.8	61.8	61.8	61.7	82.9	82.9	82.9	82.9	14.5	13.8	14.6	15.2	23.4	21.3	24.0	26.0
MP2	45.1	45.5	44.9	44.5	58.6	60.8	57.9	55.7	70.8	85.9	70.8	70.8	70.8	70.8	85.9	85.9	85.9	85.9	25.7	25.3	25.9	26.3	27.3	25.1	28.0	30.2
MP3	47.1	47.2	46.6	46.3	57.3	58.5	55.9	54.1	50.3	72.6	52.0	52.0	51.8	51.8	72.7	72.8	72.7	72.7	4.9	4.8	5.2	5.5	15.4	14.2	16.8	18.6
MP4	49.5	50.2	49.5	48.5	57.1	58.5	56.4	54.6	48.7	69.0	52.1	52.5	52.1	51.6	69.3	69.4	69.2	69.2	2.6	2.3	2.6	3.1	12.2	10.8	12.9	14.6
MP5	56.2	51.5	47.7	46.5	62.1	60.4	56.2	54.1	51.7	74.2	57.5	54.6	53.2	52.8	74.5	74.4	74.3	74.2	1.3	3.1	5.5	6.3	12.4	14.0	18.0	20.2
MP6	53.3	49.5	45.5	45.0	63.5	59.0	55.7	54.0	54.4	75.9	56.9	55.6	54.9	54.9	76.1	76.0	75.9	75.9	3.6	6.1	9.4	9.9	12.7	17.0	20.3	21.9

	Operational Measurements								Modeled Levels		Operational								Increase to Operational							
Point Number	LAeq	LA10	LA50	LA90	LCeq	LC10	LC50	LC90	LAeq	LCeq	LAeq	LA10	LA50	LA90	LCeq	LC10	LC50	LC90	LAeq	LA10	LA50	LA90	LCeq	LC10	LC50	LC90
	(dBA)				(dBC)				(dBA)	(dBC)	(dBA)				(dBC)				(dBA)				(dBC)			
Noon Measurements - 12:00 PM to 2:00 PM																										
MP1	72.9	73.6	72.9	72.2	83.4	84.6	83.3	81.9	61.6	82.9	61.6	61.6	61.6	61.6	82.9	82.9	82.9	82.9	-11.3	-12.0	-11.3	-10.6	-0.5	-1.7	-0.4	1.0
MP2	63.1	64.4	62.8	61.5	75.5	76.9	75.4	73.7	70.8	85.9	70.8	70.8	70.8	70.8	85.9	85.9	85.9	85.9	7.7	6.4	8.0	9.3	10.4	9.0	10.5	12.2
MP3	53.9	51.3	48.8	48.0	65.0	66.9	63.7	61.6	50.3	72.6	50.3	50.3	50.3	50.3	72.6	72.6	72.6	72.6	-3.6	-1.0	1.5	2.3	7.6	5.7	8.9	11.0
MP4	53.3	53.5	51.4	49.3	71.2	72.6	70.7	69.1	48.7	69.0	48.7	48.7	48.7	48.7	69.0	69.0	69.0	69.0	-4.6	-4.8	-2.7	-0.6	-2.2	-3.6	-1.7	-0.1
MP5	54.4	54.0	51.5	50.3	71.5	72.7	71.0	69.6	51.7	74.2	51.7	51.7	51.7	51.7	74.2	74.2	74.2	74.2	-2.7	-2.3	0.2	1.4	2.7	1.5	3.2	4.6
MP6	54.1	51.4	50.2	49.1	69.7	71.0	69.4	67.8	54.4	75.9	54.4	54.4	54.4	54.4	75.9	75.9	75.9	75.9	0.3	3.0	4.2	5.3	6.2	4.9	6.5	8.1

Appendix D
Wheaton Generating Station
Sound Level at Distance
Primary Site

Project

Distance from Gas Turbine	*LAeq*		*LCeq*	
100 ft	74.2	dBA	92.9	dBC
400 ft	63.5	dBA	83.8	dBC
1000 ft	55.7	dBA	77.1	dBC
1500 ft	51.8	dBA	73.5	dBC
2000 ft	49.3	dBA	71.3	dBC
3000 ft	42.6	dBA	62.3	dBC

Appedix D
Wheaton Generating Station
Analysis of Sound Level Metrics
Alternate Site

BURNS McDONNELL

	Ambient Measurements							Modeled Levels		Future Sound Levels (Log Sum Ambient + Modeled)								Increase to Ambient							
Point Number	LAeq	LA10	LA50	LA90	LCeq	LC10	LC50	LC90	LAeq	LCeq	LAeq	LA10	LA50	LA90	LCeq	LC10	LC50	LC90	LAeq	LA10	LA50	LA90	LCeq	LC10	LC50	LC90
	(dBA)				(dBC)				(dBA)	(dBC)	(dBA)				(dBC)				(dBA)				(dBC)			
Noon Measurements - 12:00 PM to 2:00 PM																										
MP1	49.8	51.5	49.5	47.6	58.9	61.2	58.1	55.9	54.9	74.8	56.1	56.5	56.0	55.6	74.9	75.0	74.9	74.9	6.3	5.0	6.5	8.0	16.0	13.8	16.8	19.0
MP2	50.4	52.0	50.1	48.4	59.5	61.2	58.2	56.3	62.4	83.2	62.7	62.8	62.6	62.6	83.2	83.2	83.2	83.2	12.2	10.8	12.5	14.2	23.7	22.1	25.0	26.9
MP3	49.5	51.2	48.4	47.0	60.0	61.2	58.5	56.7	46.8	67.2	51.4	52.5	50.7	49.9	68.0	68.2	67.8	67.6	1.9	1.3	2.3	2.9	7.9	7.0	9.2	10.9
MP4	55.3	56.8	55.1	53.5	61.9	63.5	60.7	58.7	48.9	69.3	56.2	57.5	56.0	54.8	70.0	70.3	69.9	69.7	0.9	0.7	0.9	1.3	8.1	6.8	9.2	11.0
MP5	60.8	63.3	57.0	53.1	67.1	69.4	63.4	59.9	49.1	69.5	61.0	63.5	57.7	54.6	71.5	72.4	70.4	69.9	0.3	0.2	0.7	1.5	4.3	3.1	7.1	10.1
MP6	58.5	59.1	52.1	49.8	64.6	65.9	60.7	58.8	52.1	72.5	59.4	59.9	55.1	54.1	73.2	73.4	72.8	72.7	0.9	0.8	3.0	4.3	8.5	7.5	12.1	13.9
Evening Measurements - 6:00 PM to 8:00 PM																										
MP1	47.3	49.8	45.8	44.7	57.8	60.1	56.5	54.1	54.9	74.8	55.6	56.1	55.4	55.3	74.9	74.9	74.9	74.8	8.3	6.3	9.6	10.6	17.1	14.9	18.4	20.7
MP2	43.3	45.0	42.6	41.1	56.7	59.0	55.2	53.3	62.4	83.2	62.5	62.5	62.4	62.4	83.2	83.2	83.2	83.2	19.1	17.5	19.8	21.3	26.6	24.3	28.0	29.9
MP3	52.7	52.6	50.5	49.6	59.9	61.1	54.9	52.4	46.8	67.2	53.7	53.6	52.0	51.4	67.9	68.1	67.4	67.3	1.0	1.0	1.5	1.8	8.1	7.1	12.6	14.9
MP4	51.0	50.2	48.1	46.8	59.6	60.2	55.9	53.1	48.9	69.3	53.1	52.6	51.5	51.0	69.7	69.8	69.5	69.4	2.1	2.4	3.4	4.2	10.1	9.6	13.6	16.3
MP5	52.1	49.9	47.1	44.5	58.4	60.2	56.2	53.4	49.1	69.5	53.9	52.5	51.2	50.4	69.8	70.0	69.7	69.6	1.8	2.6	4.1	5.9	11.4	9.8	13.5	16.2
MP6	53.9	50.1	42.0	40.0	59.6	58.5	53.9	51.7	52.1	72.5	56.1	54.2	52.5	52.4	72.7	72.7	72.6	72.5	2.2	4.1	10.5	12.4	13.1	14.1	18.6	20.8
Midnight Measurements - 12:00 AM to 2:00 AM																										
MP1	45.9	46.7	45.7	44.8	57.3	58.9	56.9	54.9	54.9	74.8	55.4	55.5	55.4	55.3	74.9	74.9	74.9	74.8	9.6	8.8	9.7	10.5	17.5	16.0	17.9	19.9
MP2	43.2	45.5	41.9	40.7	56.0	57.6	55.4	53.8	62.4	83.2	62.5	62.5	62.4	62.4	83.2	83.2	83.2	83.2	19.2	17.0	20.5	21.7	27.2	25.6	27.8	29.4
MP3	48.6	45.9	43.0	41.9	56.6	57.2	54.3	52.6	46.8	67.2	50.8	49.4	48.3	48.0	67.6	67.6	67.4	67.3	2.2	3.5	5.3	6.1	10.9	10.4	13.1	14.7
MP4	53.0	49.1	45.6	43.3	57.8	57.7	54.8	52.9	48.9	69.3	54.4	52.0	50.6	50.0	69.6	69.6	69.5	69.4	1.4	2.9	5.0	6.7	11.8	11.9	14.7	16.5
MP5	55.4	56.7	49.3	46.1	62.5	63.4	57.4	54.4	49.1	69.5	56.3	57.4	52.2	50.9	70.3	70.5	69.8	69.6	0.9	0.7	2.9	4.8	7.8	7.1	12.4	15.2
MP6	53.6	53.0	43.8	41.5	58.7	59.6	54.9	52.9	52.1	72.5	55.9	55.6	52.7	52.5	72.7	72.7	72.6	72.5	2.3	2.6	8.9	11.0	13.9	13.1	17.6	19.6
Morning Measurements - 5:00 AM to 7:00 AM																										
MP1	47.3	48.0	47.2	46.5	59.6	61.6	58.9	56.9	54.9	74.8	55.6	55.7	55.6	55.5	74.9	75.0	74.9	74.9	8.3	7.7	8.4	9.0	15.4	13.4	16.0	17.9
MP2	45.1	45.5	44.9	44.5	58.6	60.8	57.9	55.7	62.4	83.2	62.5	62.5	62.5	62.5	83.2	83.2	83.2	83.2	17.4	17.0	17.6	18.0	24.6	22.4	25.3	27.5
MP3	47.1	47.2	46.6	46.3	57.3	58.5	55.9	54.1	46.8	67.2	49.9	50.0	49.7	49.6	67.6	67.8	67.5	67.4	2.9	2.8	3.1	3.3	10.3	9.2	11.6	13.3
MP4	49.5	50.2	49.5	48.5	57.1	58.5	56.4	54.6	48.9	69.3	52.2	52.6	52.2	51.7	69.6	69.6	69.5	69.4	2.7	2.4	2.7	3.2	12.5	11.1	13.2	14.9
MP5	56.2	51.5	47.7	46.5	62.1	60.4	56.2	54.1	49.1	69.5	57.0	53.5	51.5	51.0	70.2	70.0	69.7	69.6	0.8	2.0	3.8	4.5	8.1	9.6	13.5	15.5
MP6	53.3	49.5	45.5	45.0	63.5	59.0	55.7	54.0	52.1	72.5	55.8	54.0	53.0	52.9	73.0	72.7	72.6	72.6	2.4	4.5	7.5	7.9	9.5	13.7	16.9	18.6

	Operational Measurements							Modeled Levels		Operational								Increase to Operational							
Point Number	LAeq	LA10	LA50	LA90	LCeq	LC10	LC50	LC90	LAeq	LCeq	LAeq	LA10	LA50	LA90	LCeq	LC10	LC50	LC90	LAeq	LA10	LA50	LA90	LCeq	LC10	LC50	LC90
	(dBA)				(dBC)				(dBA)	(dBC)	(dBA)				(dBC)				(dBA)				(dBC)			
Noon Measurements - 12:00 PM to 2:00 PM																										
MP1	72.9	73.6	72.9	72.2	83.4	84.6	83.3	81.9	54.9	74.8	54.9	54.9	54.9	54.9	74.8	74.8	74.8	74.8	-18.0	-18.7	-18.0	-17.3	-8.6	-9.8	-8.5	-7.1
MP2	63.1	64.4	62.8	61.5	75.5	76.9	75.4	73.7	62.4	83.2	62.4	62.4	62.4	62.4	83.2	83.2	83.2	83.2	-0.7	-2.0	-0.4	0.9	7.7	6.3	7.8	9.5
MP3	53.9	51.3	48.8	48.0	65.0	66.9	63.7	61.6	46.8	67.2	46.8	46.8	46.8	46.8	67.2	67.2	67.2	67.2	-7.1	-4.5	-2.0	-1.2	2.2	0.3	3.5	5.6
MP4	53.3	53.5	51.4	49.3	71.2	72.6	70.7	69.1	48.9	69.3	48.9	48.9	48.9	48.9	69.3	69.3	69.3	69.3	-4.4	-4.6	-2.5	-0.4	-1.9	-3.3	-1.4	0.2
MP5	54.4	54.0	51.5	50.3	71.5	72.7	71.0	69.6	49.1	69.5	49.1	49.1	49.1	49.1	69.5	69.5	69.5	69.5	-5.3	-4.9	-2.4	-1.2	-2.0	-3.2	-1.5	-0.1
MP6	54.1	51.4	50.2	49.1	69.7	71.0	69.4	67.8	52.1	72.5	52.1	52.1	52.1	52.1	72.5	72.5	72.5	72.5	-2.0	0.7	1.9	3.0	2.8	1.5	3.1	4.7

Appendix D
Wheaton Generating Station
Sound Level at Distance
Alternate Site

Project

Distance from Gas Turbine	*LAeq*	*LCeq*
100 ft	73.9 dBA	91.2 dBC
400 ft	64.0 dBA	82.1 dBC
1000 ft	56.5 dBA	76.4 dBC
1500 ft	49.8 dBA	69.8 dBC
2000 ft	48.7 dBA	68.3 dBC
3000 ft	42.3 dBA	62.2 dBC

BURNS McDONNELL

CREATE AMAZING.

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9.07 LOUD AND UNNECESSARY NOISE PROHIBITED .

No person shall make or cause to be made any loud, disturbing or unnecessary sounds or noises such as may tend to annoy or disturb another in or about any public street, alley or park or any private residence. No railroad shall blow a whistle within the City except as required by law.