Appendix C
Sound Report

Rose Creek Wind, LLC
MPUC Docket No. IP7065/WS-21-643
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SOUND ASSESSMENT

ROSE CREEK WIND PROJECT, MINNESOTA

VERSION 1.0

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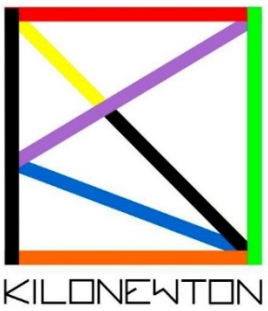

Revision History

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1.0 EXECUTIVE SUMMARY

ConEdison Development (CED), a New York renewable energy development and operations company doing business as Rose Creek Wind, LLC is planning to re-power an existing wind energy facility in Mower County, Minnesota. The re-powered wind energy facility will be called the Rose Creek Wind Project (the Project).

The proposed re-power Project will involve decommissioning the 11 Rose Wind turbines and constructing 6 to 7 new turbines with greater power outputs to deliver up to 17.4 MW of electricity to the power purchaser. There are two scenarios for the proposed Project:

- Scenario 1 consists of five GE 2.82/127 turbines at a hub height of 89 m and one GE 2.3/116 turbine at a hub height of 80 m;
- Scenario 2 consists of four Siemens Gamesa G97 2.0 MW turbines at a hub height of 100 m, two GE 2.82/127 turbines at a hub height of 89 m, and one GE 2.3/116 turbine at a hub height of 80 m.

This assessment uses industry-standard software and Project-specific data to predict the sound levels generated by the Project at provided receptor locations within or near the Project area. The analysis assessed potential sound generated by each scenario and the effects on the surrounding area and 42 identified receptors. The receptors include 41 residences of which 40 have confirmed occupation and one that is assumed to be occupied, and one additional occupied non-residential structure. Nine receptors are on properties participating in the Project.

Sound propagation was evaluated using A-weighted decibel [dB(A)] values, which reflect the range of human hearing. The model used a standard temperature of 10° C and a relative humidity of 70%, which is considered ideal conditions for sound propagation.

The Project is subject to noise standard (the Standard) found in Minnesota Rules Chapter 7030, which is enforced by the Minnesota Pollution Control Authority (MPCA). The results were compared to the Standard's more restrictive nighttime noise pollution rules [1], which quantify a total sound power level at a receptor of 50 dB(A) that should not be exceeded for 50 percent of the time during a one-hour period. To be conservative, the Project-only sound levels were set to a limit of 47 dB(A). CED provided multiple iterations of each scenario to ensure that the final layouts would have the least impact on the surrounding receptors and adhere to the Standard.

The modeling results show that the maximum total sound power level if only the Rose Creek Project is considered is 46.9 dB(A) for Scenario 1 and 46.4 for Scenario 2. The total sound power level considering the Project and all remaining nearby turbines is 49.3 dB(A) for Scenario 1 and 49.1 dB(A) for Scenario 2. Table 1 presents a summary of the sound analysis for each scenario. The results show that the Project will not exceed the limits set by the Standard.

Table 1 Sound analysis summary results

	Scenario 1		Scenario 2	
Total Sound Power Level [dB(A)]	Number of Receptors		Number of Receptors	
	Rose Creek Only	Rose Creek & Nearby Wind Farms	Rose Creek Only	Rose Creek & Nearby Wind Farms
0 - 35	13	1	14	1
35 - 40	17	13	17	15
40 - 47	12	20	11	20
47 - 50	0	8	0	6
> 50	0	0	0	0
Maximum [db(A)]	46.9	49.3	46.4	49.1

2.0 INTRODUCTION

CED, doing business as Rose Wind Holdings, LLC, purchased the 11 Rose Wind turbines in 2015. CED will decommission the 11 existing Rose Wind turbines, and Rose Creek Wind, LLC will build, own and operate 6 to 7 new turbines with greater power outputs to continue to produce up to 17.4 MW of electricity. There are two scenarios for the proposed Project, which are detailed in Section 4.0.

This assessment uses industry-standard software and Project-specific data to predict the sound levels generated by the Project at provided receptor locations within or near the Project area. The Project is subject to noise standard (the Standard) found in Minnesota Rules Chapter 7030, which is enforced by the Minnesota Pollution Control Authority (MPCA) and described in detail Section 3.0. The analysis assessed potential sound generated by each scenario and the effects on the surrounding area and 42 identified receptors and determined if the Project is in compliance to the Standard.

KiloNewton performed the analysis using UL's Openwind software, an industry-standard wind analysis program. Openwind incorporates multiple sound models with various options to assess a project based on terrain, climatology, and other factors. KiloNewton has supplemented the Openwind model with internal procedures to provide accurate and detailed results based on the needs and variations for specific projects. Nearby wind turbines were included in the analysis if within 5 km of the Project.

3.0 REGULATIONS

The Project will require a Large Wind Energy Conversion System (LWECS) Site Permit from the Minnesota Public Utilities Commission (MNPUC). The Project is subject to noise standard (the Standard) found in Minnesota Rules Chapter 7030, which is enforced by the Minnesota Pollution Control Authority (MPCA). The Standard quantifies levels of noise that should not be exceeded during a one-hour period based on a receptor's geographic location and land use. Noise pollution limits are different for three types of areas defined by the land use at the location of a defined receptor. The noise classification areas (NAC) for the receptors analyzed in this report are considered NAC-1, or residential/household units, including farmhouses. The Minnesota rules define daytime and nighttime noise limits. Since nighttime noise limits are more restrictive, the sound model was analyzed using the nighttime limits defined for NAC-1. The Standard defines the total noise pollution limit as L50, or where the total noise level is exceeded for 50 percent (30 minutes) of an hour. The L50 limits are 60 dB(A) during the daytime (7:00 a.m. – 10:00 p.m.) and 50 dB(A) during the nighttime (10:00 p.m. – 7:00 a.m.) [2].

Openwind evaluates noise levels using octave bands on an hourly basis then calculates the total sound power level from the modeled octave bands. If the average noise level exceeds 50 dB(A) it is exceeding the L50 limitation. To be conservative, the developers of the Project aimed to not exceed 47 dB(A) at any receptor with no other wind farms considered (Project-only sound), which is accepted by MNPUC as an indication that the Project will not make a significant contribution to any instances where total sound levels at a particular receptor exceed the 50 dB(A) limits under Chapter 7030.

4.0 PROJECT SUMMARY

The proposed Project is in a rural area with the small town of Adams to the north and multiple surrounding wind farms. The sound analysis evaluated impacts from the Project on 42 identified receptors in the general area of the Project.

Four other wind farms have turbines within 5 km of the Project:

- Adams Wind: 4 x GE 1.5/77 turbines at hub heights of 65 m;
- Pioneer Prairie I: 124 x Vestas V82-1.65 turbines at hub heights of 80 m;
- Pioneer Prairie II: 58 x Vestas V82-1.65 turbines at hub heights of 80 m;
- Mower County Wind Project: 43 x Siemens Gamesa SWT2.3-108 turbines at hub heights of 80 m.

The modeling does not include the existing 11 Rose Wind turbines that the Rose Creek Wind Project will replace. Multiple other wind farms exist within 10 km of the Project but are not included in this analysis since their effect on the noise levels for the receptors around the Project would be negligible. Turbine types and locations for the nearby wind farms were extracted from the U.S. Wind Turbine Database maintained by the USGS [3].

CED provided multiple iterations of each scenario to ensure that the final layouts would have the least impact on the surrounding receptors and adhere to the Standard. Figure 1 shows all the proposed Project turbine locations and the receptor locations used in this analysis, including the closest turbines from the nearby wind farms. The coordinates for each scenario are identical with the exception that Scenario 2 includes T1. The 42 identified receptors include 41 occupied receptors and one, R-253, that is assumed to be occupied. Table 2 provides the details for each turbine for each scenario. Table 3 provides details for each receptor.

Table 2 Proposed layouts

	UTM 15N WGS84				
Turbine ID	Northing (m)	Easting (m)	Base Elevation (m)	Scenario 1	Scenario 2
T1	4,819,347	523,210	398		G97-2.0
T2	4,821,813	524,725	401	GE 2.82-127	G97-2.0
T3	4,820,872	524,498	400	GE 2.82-127	GE 2.82-127
T4	4,818,941	521,488	386	GE 2.3-116	GE 2.3-116
T5	4,819,170	522,165	390	GE 2.82-127	G97-2.0
T6	4,817,659	524,492	398	GE 2.82-127	G97-2.0
T7	4,817,046	524,927	400	GE 2.82-127	GE 2.82-127

Table 3 Modeled receptors

Receptor ID	UTM 15N WGS84 Northing (m)	UTM 15N WGS84 Easting (m)	Structure Type	Status	Occupation Status	Elevation (m)
R-2	4822987	520986	Residence	Non-participant	Occupied	392
R-3	4822896	521063	Residence	Non-participant	Occupied	394
R-4	4822870	521418	Residence	Non-participant	Occupied	401
R-5	4822796	521443	Residence	Non-participant	Occupied	400
R-7	4822940	522732	Residence	Non-participant	Occupied	395
R-8	4822670	523132	Residence	Participant	Occupied	394
R-9	4822795	523986	Residence	Participant	Occupied	402
R-10	4822762	524892	Residence	Participant	Occupied	404
R-11	4822687	524894	Residence	Participant	Occupied	405
R-12	4822801	525213	Residence	Non-participant	Occupied	409
R-13	4822805	526143	Residence	Non-participant	Occupied	413
R-229	4819583	519926	Residence	Non-participant	Occupied	380
R-230	4819646	520583	Residence	Non-participant	Occupied	389
R-231	4819020	520373	Other	Non-participant	Occupied	387
R-232	4818020	520377	Residence	Non-participant	Occupied	386
R-235	4821817	521854	Residence	Non-participant	Occupied	401
R-236	4821694	521958	Residence	Non-participant	Occupied	398
R-237	4821101	521959	Residence	Non-participant	Occupied	393
R-238	4819632	522212	Residence	Participant	Occupied	394
R-239	4818624	521879	Residence	Participant	Occupied	391
R-240	4817677	522003	Residence	Non-participant	Occupied	387
R-245	4819579	521349	Residence	Non-participant	Occupied	394
R-246	4822401	523571	Residence	Non-participant	Occupied	393
R-247	4821536	523573	Residence	Non-participant	Occupied	396
R-248	4820793	523636	Residence	Participant	Occupied	400
R-249	4819643	523422	Residence	Non-participant	Occupied	404
R-250	4818959	523575	Residence	Non-participant	Occupied	401
R-252	4817878	523589	Residence	Non-participant	Occupied	397
R-253	4816417	523991	Residence	Non-participant	Presumed Occupied	397
R-254	4816430	524029	Residence	Non-participant	Occupied	396
R-255	4816123	524882	Residence	Non-participant	Occupied	399
R-256	4816102	524804	Residence	Non-participant	Occupied	400
R-257	4816560	524808	Residence	Non-participant	Occupied	401
R-258	4819561	522916	Residence	Participant	Occupied	399
R-259	4818050	524099	Residence	Non-participant	Occupied	403
R-260	4817834	525110	Residence	Non-participant	Occupied	398
R-261	4818774	525100	Residence	Non-participant	Occupied	399
R-262	4819661	525279	Residence	Non-participant	Occupied	403
R-263	4819963	524892	Residence	Participant	Occupied	401
R-264	4821152	525302	Residence	Non-participant	Occupied	405
R-311	4816276	525524	Residence	Non-participant	Occupied	401
R-453	4823150	525336	Residence	Non-participant	Occupied	396

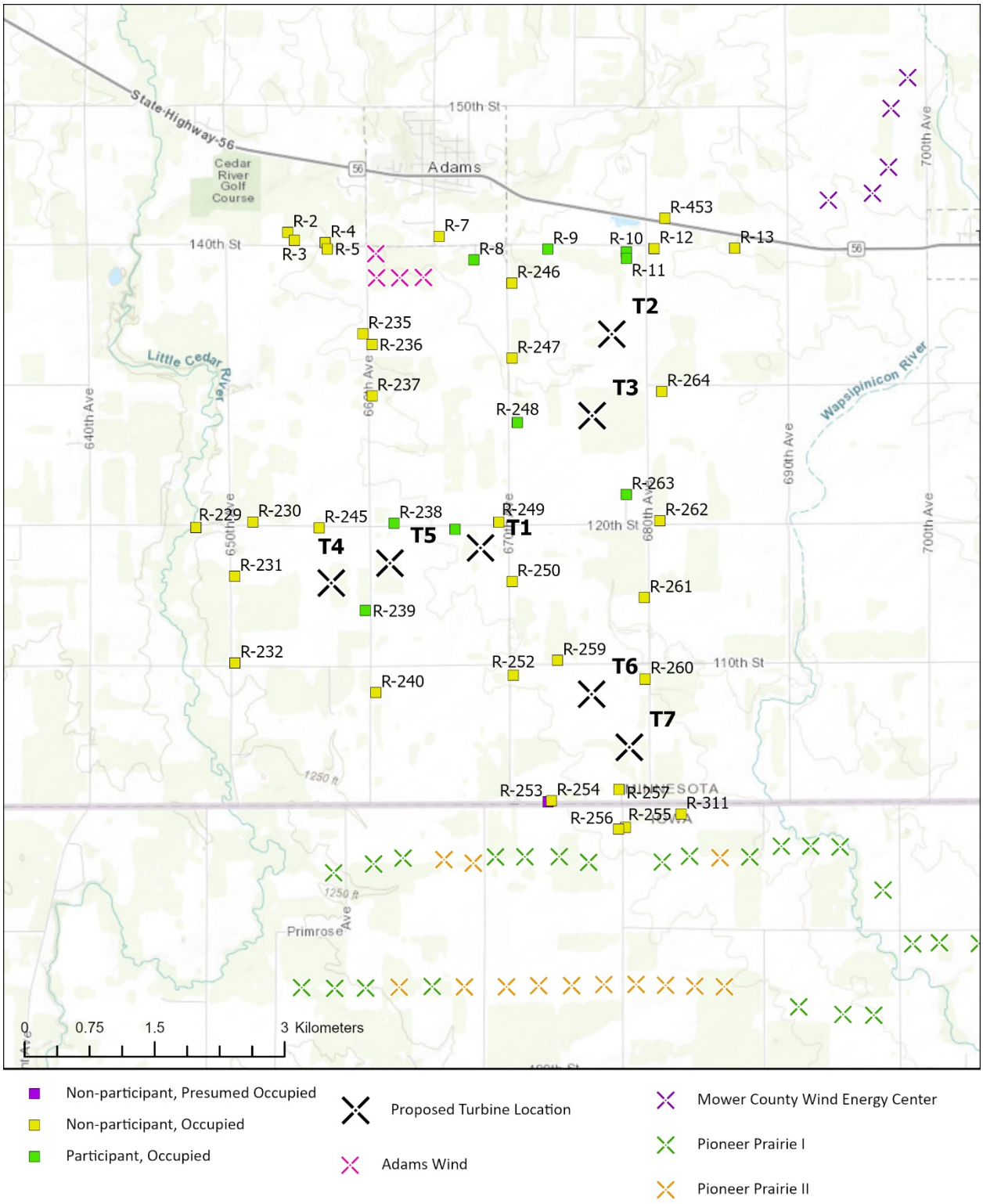

Figure 1 Proposed Project turbines, nearby receptors, and adjacent existing turbines

Scenario 1 consists of five GE 2.82/127 turbines with a rotor diameter of 127 m and hub heights of 89 m, and one GE 2.3/116 turbine with a rotor diameter of 116 m and a hub height of 80 m. Figure 2 shows the layout for Scenario 1 in relation to the receptors analyzed in this analysis.

Scenario 2 consists of four Siemens Gamesa G97 2.0 MW (G97-2.0) turbines with a rotor diameter of 97 m and a hub height of 100 m, two GE 2.82/127 turbines at a hub height of 89 m, and one GE 2.3/116 turbine at a hub height of 80 m. Figure 3 shows the layout for Scenario 2 in relation to the receptors analyzed in this analysis.

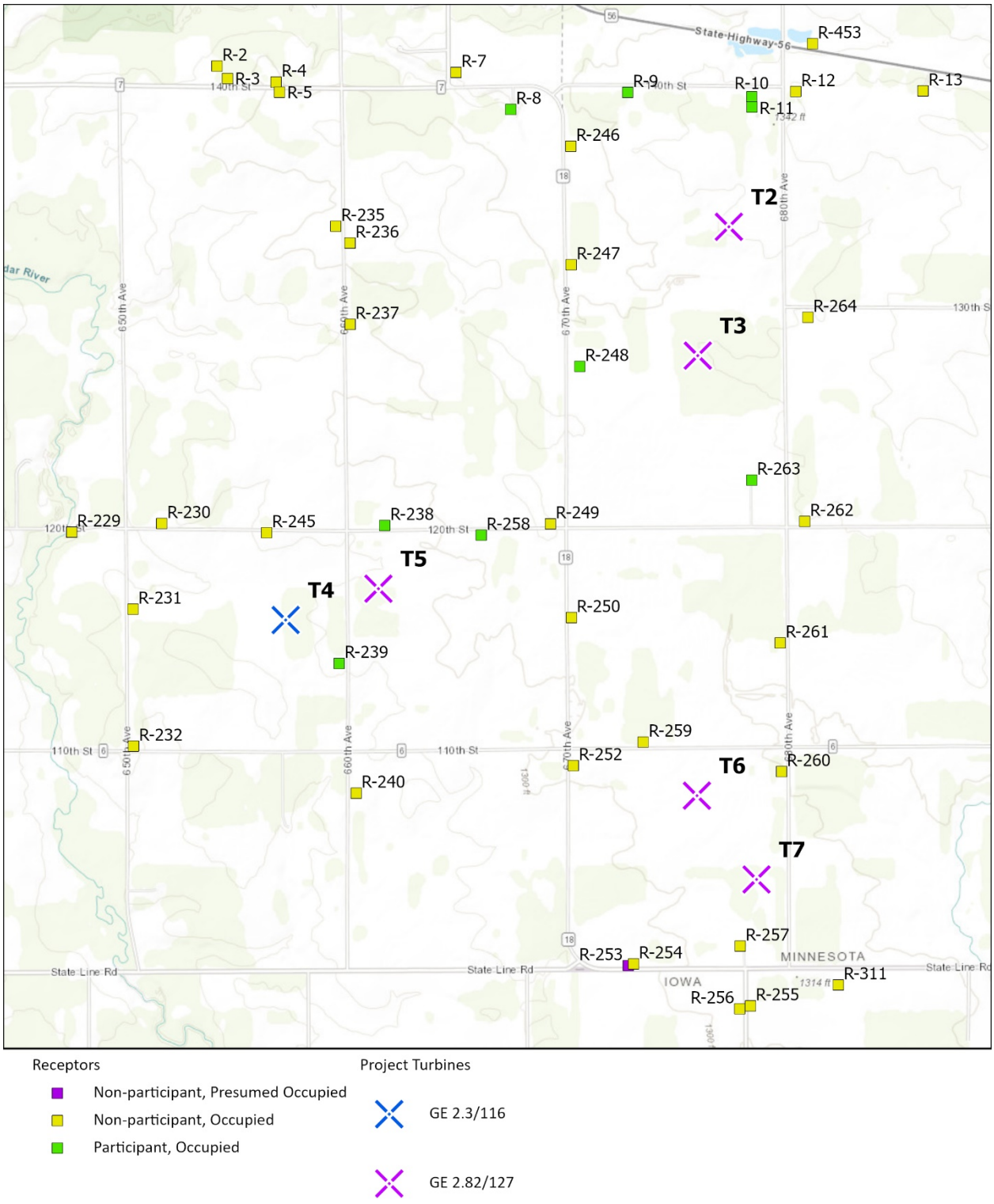

Figure 2 Scenario 1 proposed layout and nearby receptors

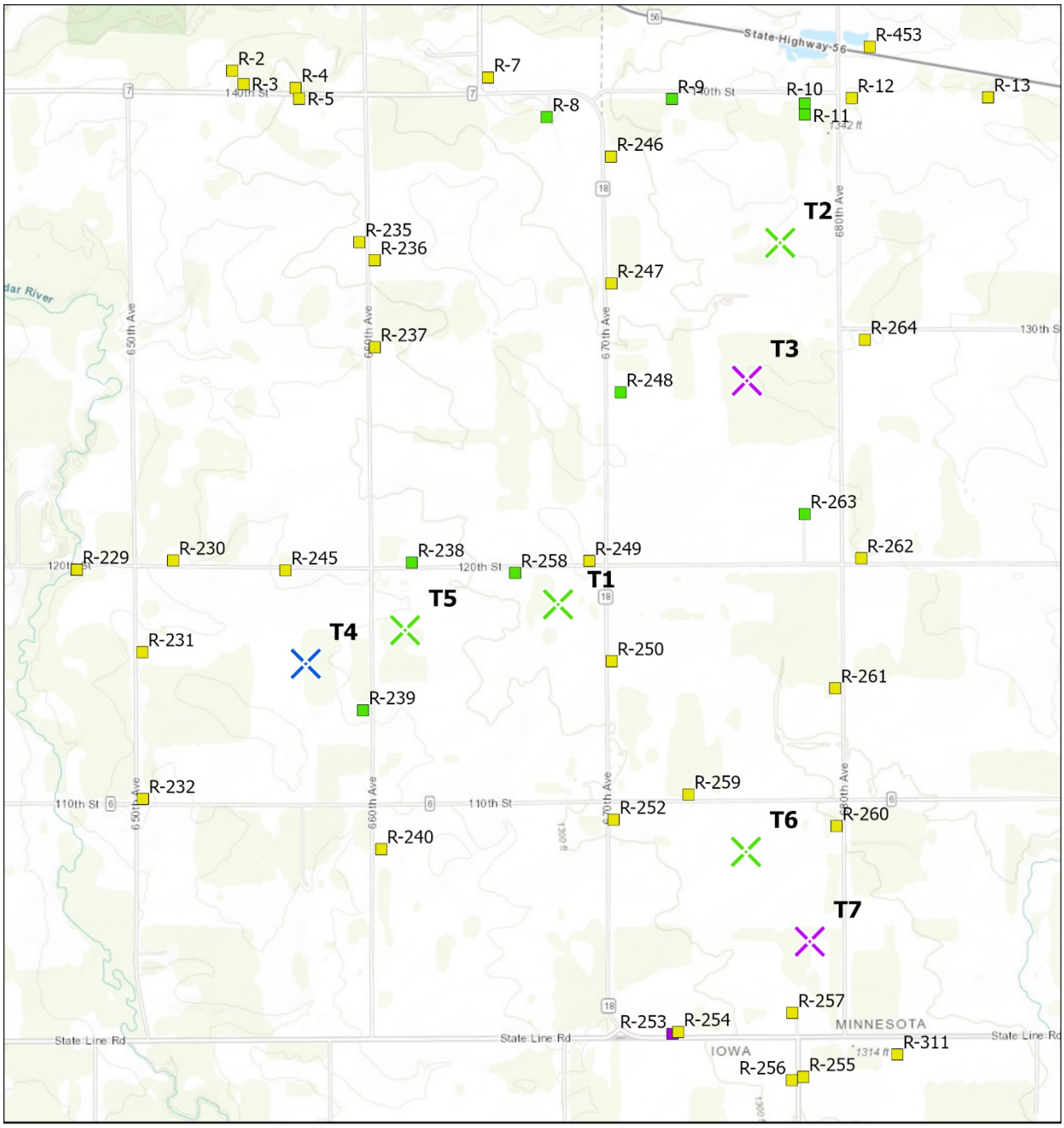

Figure 3 Scenario 2 proposed layout and nearby receptors

4.1 Turbine Specifications

Full turbine specifications were provided for the Project with the exception of the G97-2.0. Specifications or the GE turbines include general specifications and sound profiles. Sound profiles for the nearby turbines were acquired from a KiloNewton database of publicly available turbine specifications.

The GE 2.82/127 is a three-bladed upwind turbine with a rated power of 2.82 MW, a rotor diameter of 127 m, a hub height of 89 m, a cut-in wind speed of 3 m/s, and a cut-out wind speed of 30 m/s. The GE 2.82/127 is an International Electrotechnical Commission (IEC) Class S turbine.

The GE 2.3/116 is a three-bladed upwind turbine with a rated power of 2.3 MW, a rotor diameter of 116 m, a hub height of 80 m, a cut-in wind speed of 3 m/s, and a cut-out wind speed of 22 m/s. The GE 2.3/116 is an International Electrotechnical Commission (IEC) Class S turbine.

For the G97-2.0, only the total sound power levels were provided. All other specifications were taken from published manufacturer data. The G97-2.0 is a three-bladed upwind turbine with a rated power of 2.0 MW, a rotor diameter of 97 m, a hub height of 100 m, a cut-in wind speed of 3 m/s, and a cut-out wind speed of 25 m/s. The G97-2.0 turbine is International Electrotechnical Commission (IEC) Class III/S turbine [4]. Siemens Gamesa does not provide the sound profile for the G97-2.0 in octave bands, only in total sound power levels. To derive an estimate of the octave bands for the G97-2.0, KiloNewton interpolated each band by using a combination of the GE turbine sound profiles and scaled to the total sound power level. This approach was discussed with Minnesota Department of Commerce EERA staff and EERA's acoustics consultant, and the parties agreed that this approach was acceptable for modeling likely sound power levels.

The model inputs for each turbine include hub height, rotor diameter, cut-in and cut-out wind speeds, and sound profile. Since this analysis only models the peak output for sound, power and thrust curves and other turbine-specific operational data are not necessary for the model.

The sound profile for the Project turbines were provided in A-weighted decibels [dB(A)] for octave bands from 16 Hz to 8 kHz, as well as total sound power levels, for hub height wind speeds ranging from 4 m/s to their respective cut-out wind speeds. Octave bands were input into the model ranging from 31 Hz to 8 kHz. Values for the 16 kHz octave band were not provided in the turbine specifications and were set at 0. To account for inherent variation from the provided sound profiles due to factors such as ground porosity, 2 dB(A) was added to all octave bands for each turbine. Due to the uncertainty inherent in the derivation of the sound profile for the G97-2.0, 3 dB(A) was added to each octave band for that turbine. While sound power levels were input for lower wind speeds, the model only used the peak output for each turbine.

4.2 Terrain and Vegetation

The Project area is primarily agricultural with the small town of Adams, MN to the north. The terrain is mostly farmland with scattered groupings of trees typically near buildings and residences and the Little Cedar River to the west of the Project area.

Site-specific terrain data was acquired from the United States Geological Survey (USGS). Elevations in the area surrounding the Project range from approximately 350 m to 447 m. The terrain is relatively flat, sloping gently towards the west-southwest in the direction of the Little Cedar River. Ground porosity for the area is considered average, and a value of 0.5 was used. Ground porosity is on a scale of 0 to 1, where 0 is hard ground that characteristically reflects noise, and 1 is very soft ground that absorbs noise.

5.0 SOUND ANALYSIS

Sound levels are typically described in the A-weighted decibel [dB(A)] scale, which reflects how the human ear detects different frequencies. Different octave bands affect humans differently. As shown in Figure 4, which shows a sample of decibels adjusted to the A-weighted scale, humans hear less of frequency octave bands below 1000 Hz but can hear more for bands greater than 1000 Hz.

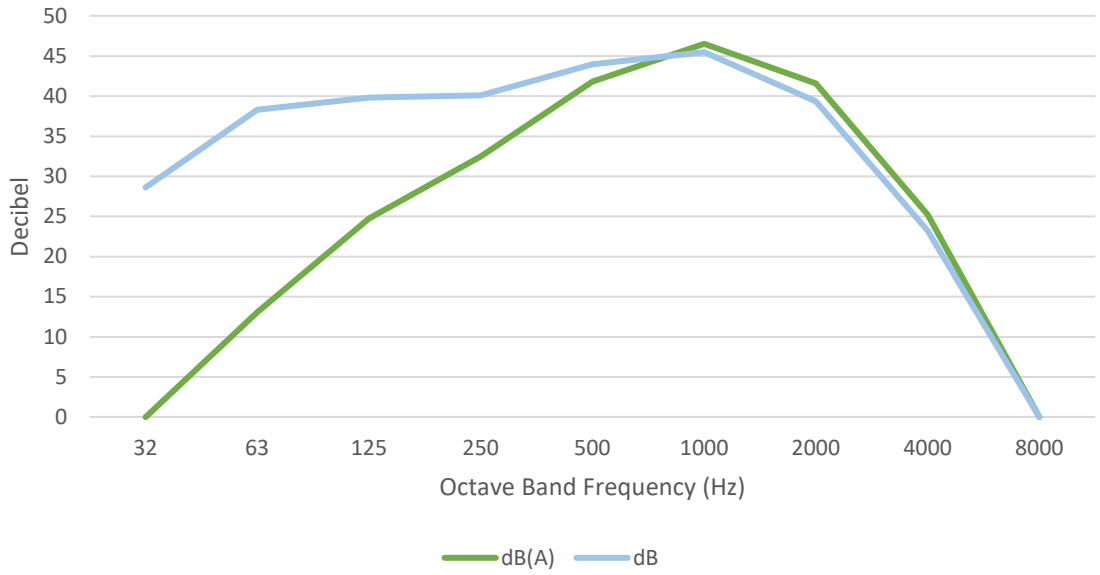

Figure 4 Decibels vs A-weighted decibels

Figure 5, from the Minnesota Pollution Control Agency, shows common sound pressure levels from common sources in the A-weighted scale [1].

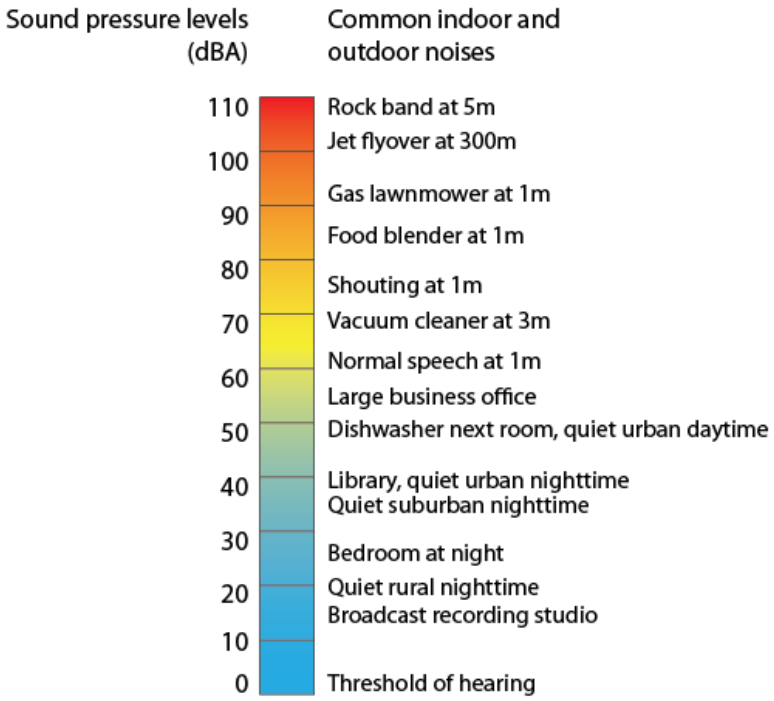

Figure 5 Sound pressure levels from common sources (MPCA)

Total sound pressure levels (L_{eq}) do not reflect the full effect of sound. Sound power levels are often expressed using octave bands, which when added logarithmically equal the total sound power level [5]:

$$L_{eq}\big(dB(A)\big) = 10 \times log_{10} \sum_{i=1}^{n} 10^{\frac{L_i}{10}}$$

Where L_i is the value in dB(A) of the *i*th octave band frequency.

While the Minnesota noise rules do not specify octave band sound power level limits, it is more accurate to model the noise using the octave bands and calculate the total sound power level from the modeled octave band results.

5.1 Sound Model Parameters

KiloNewton used the ISO9613-2 sound model with octave band spreading to assess the sound impact from the Project on the identified receptors. The sound model was performed using the site-specific parameters outlined in Section 4.0 with the reported octave bands and using the A-weighted scale for sound power levels.

Sound propagation through air is defined by a relationship between atmospheric conditions (temperature, relative humidity, and pressure) to the sound's frequency. The relationship is non-linear, but in general sound propagation is highest when temperatures are lower and relative humidity is higher. Hot, dry air tends to absorb more sound, while moist, colder air tends to propagate the sound. Typically, relative humidity and temperature have the greatest effect on atmospheric attenuation. Sound models are

typically conducted using an average temperature of 10° C and an average relative humidity of 70%, which is considered optimal conditions for sound propagation [5].

Wind speeds at a receptor height of 4 m were modeled at 10 m/s to account for the highest noise values produced by each turbine. Noise propagation was modeled downwind from the turbines. No miscellaneous attenuation was included in the model. The noise model was conducted with only the Project turbines, and then the Project with all surrounding wind farms (excluding the 11 turbines the Project will replace) to fully ascertain the sound contribution of the proposed Project. Table 4 provides a summary of the sound modeling parameters.

Table 4 Sound modeling parameters

Parameter	Value
Model	ISO9613-2 w/ Octave Band Spreading
Observer Height (m)	4
Temperature (C)	10
Relative Humidity (%)	70
Wind Speed at Ground Level (masl)	10
Ground Porosity (0 = hard, 1 = soft)	0.5
Miscellaneous Attenuation (dB)	0

Sound propagation was calculated using ideal atmospheric conditions for sound propagation, which typically underestimates sound attenuation. The long-term monthly averages of temperature and relative humidity from a nearby weather station at the city of Austin, MN are presented in Figure 6.

The model also does not consider vegetation or forested areas, which can act as a damper to sound propagation. While the vegetation in the Project area is mostly agricultural, small stands of trees are present and are typically near the receptors.

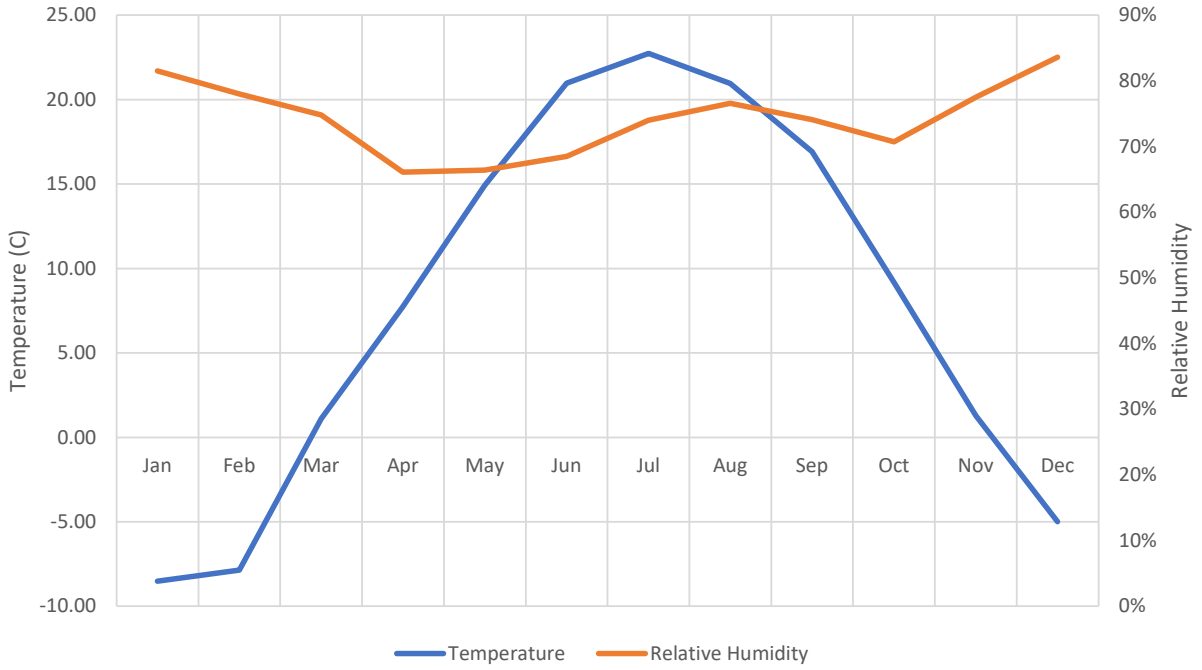

Figure 6 Long-term temperature and relative humidity

5.2 Sound Model Results

While the model predicts the amount of maximum noise in ideal meteorological conditions for sound propagation that the Project turbines will contribute, we note that the model does not include an evaluation of the existing noise since the 11 turbines that are being replaced by the Rose Creek Project are not included in any of the models.

The modeling results show that the maximum total sound power level if only the Rose Creek Project is considered is 46.9 dB(A) for Scenario 1 and 46.4 for Scenario 2. The total sound power level considering Rose Creek and all remaining nearby turbines is 49.3 dB(A) for Scenario 1 and 49.1 dB(A) for Scenario 2.

Table 5 provides a summary of the sound results for each scenario. Table 6 presents the total sound power level results for the Project only and for the Project and the existing wind turbines near the Project area for each receptor and each scenario. Figure 7 and Figure 8 show the results of the sound model for each scenario, respectively, including nearby wind farms. Appendix A provides detailed results for each octave band.

Table 5 Sound summary results

	Scenario 1		Scenario 2	
Total Sound Power Level [dB(A)]	Number of Receptors		Number of Receptors	
	Rose Creek Only	Rose Creek & Nearby Wind Farms	Rose Creek Only	Rose Creek & Nearby Wind Farms
0 - 35	13	1	14	1
35 - 40	17	13	17	15
40 - 47	12	20	11	20
47 - 50	0	8	0	6
> 50	0	0	0	0
Maximum [db(A)]	46.9	49.3	46.4	49.1

Table 6 Sound analysis results

			Scenario 1		Scenario 2	
		Occupation	Total Sound Power Level [dB(A)]		Total Sound Power Level [dB(A)]	
Receptor ID	Status	Status	Rose Creek Only	Rose Creek & Nearby Wind Farms	Rose Creek Only	Rose Creek & Nearby Wind Farms
R-2	Non-participant	Occupied	27.1	36.6	26.2	36.5
R-3	Non-participant	Occupied	27.4	37.5	26.5	37.4
R-4	Non-participant	Occupied	28.2	41.4	27.2	41.4
R-5	Non-participant	Occupied	28.4	42.1	27.4	42.1
R-7	Non-participant	Occupied	31.2	43.3	29.9	43.2
R-8	Participant	Occupied	33.7	41.3	32.2	41.0
R-9	Participant	Occupied	37.1	38.6	34.9	37.1
R-10	Participant	Occupied	39.4	40.0	36.8	37.9
R-11	Participant	Occupied	40.2	40.7	37.6	38.5
R-12	Non-participant	Occupied	38.0	38.9	35.5	37.0
R-13	Non-participant	Occupied	33.1	37.8	31.1	37.2
R-229	Non-participant	Occupied	32.7	34.9	32.0	34.5
R-230	Non-participant	Occupied	36.9	38.4	36.1	37.9
R-231	Non-participant	Occupied	36.7	38.9	36.1	38.6
R-232	Non-participant	Occupied	34.1	39.1	33.5	38.9
R-235	Non-participant	Occupied	31.7	41.4	30.8	41.3
R-236	Non-participant	Occupied	32.2	40.5	31.3	40.4
R-237	Non-participant	Occupied	34.0	37.2	33.2	36.8
R-238	Participant	Occupied	46.9	47.2	44.6	45.0
R-239	Participant	Occupied	46.5	47.1	45.2	46.1
R-240	Non-participant	Occupied	37.1	42.3	36.1	42.0
R-245	Non-participant	Occupied	43.1	43.7	42.2	42.9
R-246	Non-participant	Occupied	37.1	39.6	35.3	38.6
R-247	Non-participant	Occupied	39.9	40.8	38.9	39.9
R-248	Participant	Occupied	41.3	41.6	41.1	41.4
R-249	Non-participant	Occupied	38.4	40.5	46.1	46.5
R-250	Non-participant	Occupied	38.4	41.7	42.9	44.4
R-252	Non-participant	Occupied	40.8	44.1	39.1	43.4
R-253	Non-participant	Presumed Occupied	39.3	48.2	38.4	48.1
R-254	Non-participant	Occupied	39.6	48.1	38.7	48.0
R-255	Non-participant	Occupied	40.2	49.0	39.8	49.0
R-256	Non-participant	Occupied	39.9	49.1	39.5	49.1
R-257	Non-participant	Occupied	46.2	49.3	46.0	49.1
R-258	Participant	Occupied	41.4	42.4	46.4	46.8
R-259	Non-participant	Occupied	45.3	46.7	42.8	45.1
R-260	Non-participant	Occupied	45.2	46.8	43.4	45.7
R-261	Non-participant	Occupied	38.2	41.8	36.9	41.3
R-262	Non-participant	Occupied	36.9	39.7	36.4	39.5
R-263	Participant	Occupied	39.8	41.3	39.6	41.1
R-264	Non-participant	Occupied	43.0	43.2	41.8	42.0
R-311	Non-participant	Occupied	39.5	49.1	39.1	49.1
R-453	Non-participant	Occupied	34.7	36.7	32.5	35.5

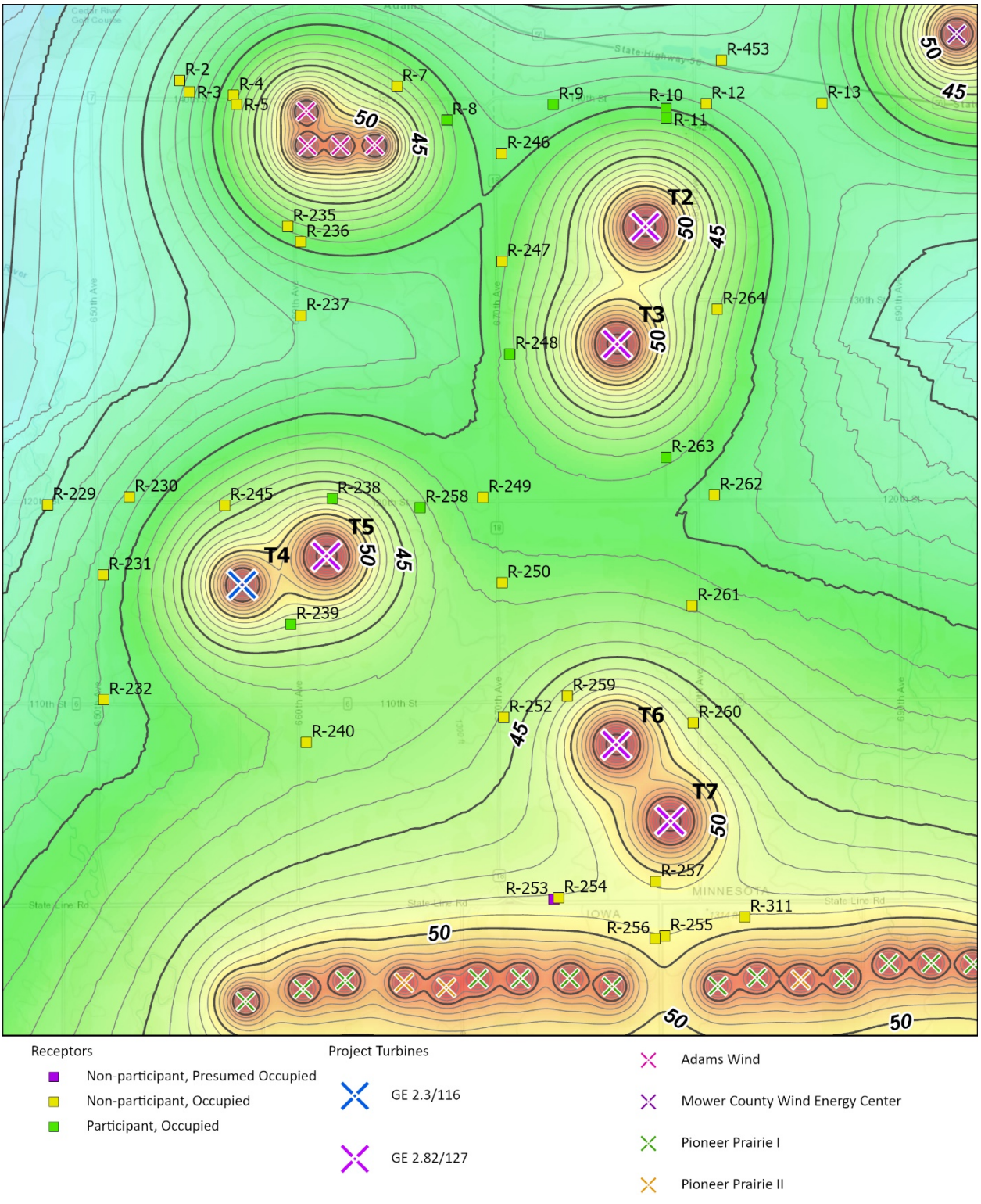

Figure 7 Scenario 1 sound propagation results for Rose Creek and surrounding wind turbines

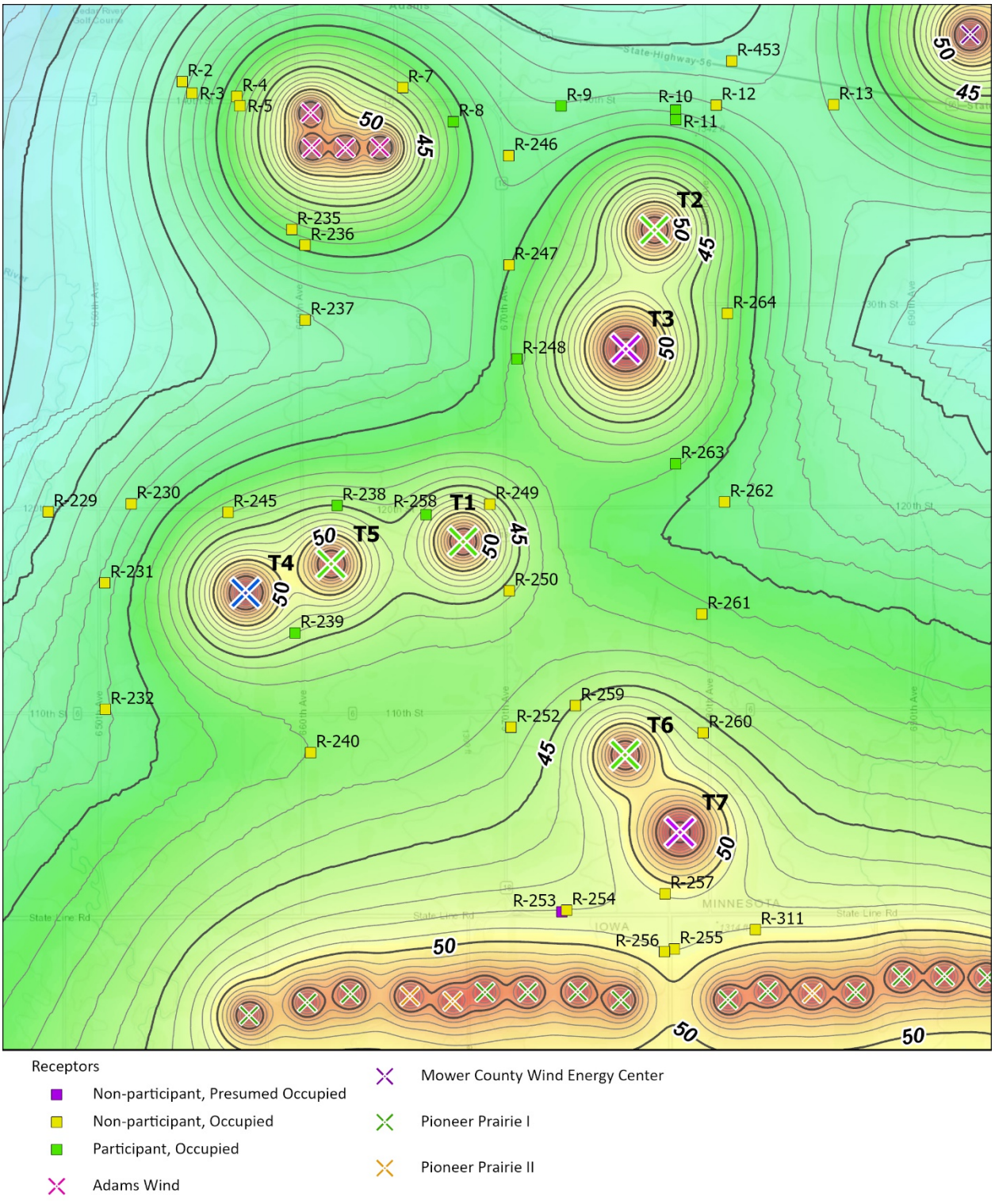

Figure 8 Scenario 2 sound propagation results for Rose Creek and surrounding wind turbines

6.0 CONCLUSION

This analysis used provided sound profiles from turbine manufacturer specifications, turbine locations and specifications, receptor locations, and terrain data to model the sound propagation for two separate scenarios for the proposed Rose Creek Wind Project. The sound model used ideal atmospheric conditions for sound propagation. The results were compared against the Minnesota regulations that specify nighttime L50 limits for total sound power levels for the noise classification for the Project area. The sound analyses performed in this analysis are intentionally and inherently conservative to show the potential worst-case total sound power levels that could result from the Project. In addition, the model uses the peak output sound for each turbine.

The modeling results indicate that total sound levels for either scenario at each receptor will be within the limits defined by the State of Minnesota for noise for the worst-case atmospheric conditions. Modeling the Rose Creek Project without the remaining nearby wind turbines shows that total sound pressure levels will not exceed 47 dB(A). With the addition of the existing turbines that the Project will not replace shows that no receptor will exceed the L50 limit of 50 dB(A). Neither Project scenario will contribute to or cause exceedance of the noise pollution regulations set by the state of Minnesota.

7.0 APPENDIX A

Appendix A is supplied as an Excel document

Table A.1 - Sound Analysis - Detailed Results

Temperature (C)	10
Relative Humidity (%)	70
Sound Level Limit (dB[A])	50
# Exceeds Limit	0
Maximum	49.3
Mean	42.1

Temperature (C)	10
Relative Humidity (%)	70
Sound Level Limit (dB[A])	47
# Exceeds Limit	0
Maximum	46.9
Mean	37.6

			All Projects - Rose Creek and nearby existing projects												Rose Creek - Excludes nearby existing projects										
					Octave Band												Octave Band								
Receptor ID	**Status**	**Occupation Status**	**Sound Power Level Exceedance**	**Total Sound Power Level [dB(A)]**	**31Hz**	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**	**16kHz**	**Sound Power Level Exceedance**	**Total Sound Power Level [dB(A)]**	**31Hz**	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**	**16kHz**
R-2	Non-participant	Occupied		36.6	21.5	24.9	28.3	29.7	31.5	30.1	19.5	-13.6	-113.3	-455.7		27.1	10.9	20.4	20.2	19.9	21.4	17.1	-10.5	-111.3	-465.3	-1529.8
R-3	Non-participant	Occupied		37.5	22.2	25.5	29.0	30.5	32.4	31.2	21.3	-9.6	-101.4	-420.3		27.4	11.1	20.6	20.4	20.2	21.8	17.7	-9.2	-107.7	-453.2	-1492.5
R-4	Non-participant	Occupied		41.4	25.4	28.1	32.6	34.0	36.3	35.7	28.1	5.6	-55.8	-285.3		28.2	11.5	21.0	21.0	20.9	22.7	19.0	-6.2	-97.2	-412.0	-1363.1
R-5	Non-participant	Occupied		42.1	25.9	28.6	33.2	34.6	36.9	36.5	29.1	7.6	-50.9	-271.6		28.4	11.6	21.1	21.1	21.1	23.0	19.4	-5.5	-95.4	-406.6	-1346.3
R-7	Non-participant	Occupied		43.3	26.9	29.7	34.4	35.7	38.1	37.7	30.6	9.9	-43.8	-250.7		31.2	13.2	22.7	23.2	23.5	26.2	24.4	6.3	-56.0	-269.3	-922.7
R-8	Participant	Occupied		41.3	25.0	28.6	32.4	33.8	36.2	35.6	27.1	4.2	-57.3	-289.5		33.7	14.7	24.3	24.9	25.5	28.7	27.9	12.9	-38.2	-210.6	-743.0
R-9	Participant	Occupied		38.6	21.0	27.6	29.3	30.5	33.5	33.2	21.7	-15.7	-138.7	-525.1		37.1	16.8	26.5	27.3	28.2	32.0	32.4	21.2	-15.8	-138.7	-525.1
R-10	Participant	Occupied		40.0	20.7	28.6	30.0	31.1	34.8	35.3	25.7	-5.0	-105.4	-425.2		39.4	18.2	27.9	29.0	30.0	34.1	35.1	25.7	-5.0	-105.4	-425.2
R-11	Participant	Occupied		40.7	21.0	29.1	30.5	31.6	35.5	36.2	27.1	-1.9	-96.2	-397.6		40.2	18.8	28.5	29.7	30.7	34.9	36.0	27.0	-1.9	-96.2	-397.6
R-12	Non-participant	Occupied		38.9	20.0	27.7	29.1	30.3	33.9	34.0	23.3	-10.7	-122.9	-477.4		38.0	17.2	26.9	27.8	28.8	32.8	33.5	23.2	-10.7	-122.9	-477.4
R-13	Non-participant	Occupied		37.8	19.4	25.8	27.6	29.7	33.4	32.4	19.6	-18.0	-125.8	-519.9		33.1	13.6	23.3	24.0	24.7	28.1	27.7	13.4	-35.2	-200.8	-713.3
R-229	Non-participant	Occupied		34.9	30.0	23.6	24.8	25.9	28.5	26.6	10.6	-40.6	-205.3	-697.8		32.7	13.3	22.9	23.7	25.0	28.0	26.4	10.5	-40.6	-205.3	-697.8
R-230	Non-participant	Occupied		38.4	32.4	26.4	27.6	29.2	32.5	31.7	19.2	-19.3	-138.1	-494.2		36.9	16.2	25.9	26.9	28.7	32.2	31.6	19.2	-19.3	-138.1	-494.2
R-231	Non-participant	Occupied		38.9	34.6	26.1	27.3	29.0	32.3	31.5	19.0	-18.3	-134.4	-483.2		36.7	15.9	25.6	26.7	28.6	32.1	31.4	19.0	-18.3	-134.4	-483.2
R-232	Non-participant	Occupied		39.1	37.1	24.7	25.8	27.1	29.9	28.5	13.8	-31.2	-175.1	-605.7		34.1	14.2	23.8	24.7	26.4	29.6	28.3	13.8	-31.2	-175.1	-605.7
R-235	Non-participant	Occupied		41.4	25.3	28.5	32.5	34.0	36.2	35.6	27.3	2.9	-64.5	-310.8		31.7	13.8	23.3	23.7	24.1	26.6	24.3	4.1	-67.9	-314.8	-1062.7
R-236	Non-participant	Occupied		40.5	24.5	28.0	31.7	33.2	35.4	34.6	25.7	-1.1	-77.8	-351.4		32.2	14.1	23.6	24.1	24.6	27.2	25.1	5.7	-63.2	-298.6	-1013.0
R-237	Non-participant	Occupied		37.2	21.1	26.5	28.8	30.0	32.2	30.7	17.1	-24.5	-151.8	-574.7		34.0	15.2	24.8	25.4	26.2	29.2	27.8	11.3	-43.1	-226.8	-792.7
R-238	Participant	Occupied		47.2	34.8	33.9	36.1	36.8	41.3	43.0	36.7	17.6	-40.7	-235.6		46.9	24.1	33.8	36.0	36.7	41.2	43.0	36.7	17.6	-40.7	-235.6
R-239	Participant	Occupied		47.1	38.3	33.3	35.6	37.1	41.3	42.3	34.9	12.5	-54.3	-249.9		46.5	23.4	33.2	35.4	37.0	41.3	42.3	34.9	12.5	-54.3	-249.9
R-240	Non-participant	Occupied		42.3	40.5	27.5	28.5	29.7	32.8	32.0	18.7	-24.2	-164.5	-576.1		37.1	17.1	26.7	27.6	28.9	32.3	31.7	18.5	-24.3	-164.5	-576.1
R-245	Non-participant	Occupied		43.7	34.0	30.7	32.5	34.3	38.3	38.8	29.8	2.9	-75.1	-307.0		43.1	20.7	30.5	32.2	34.1	38.2	38.7	29.8	2.9	-75.1	-307.0
R-246	Non-participant	Occupied		39.6	22.5	28.3	30.5	31.8	34.5	34.1	22.8	-12.2	-109.4	-443.3		37.1	17.1	26.8	27.5	28.4	32.0	32.2	20.5	-18.4	-147.2	-550.5
R-247	Non-participant	Occupied		40.8	22.2	29.6	31.1	32.3	35.7	35.9	25.3	-9.9	-126.5	-491.3		39.9	19.3	28.9	29.8	30.9	34.8	35.4	25.0	-10.0	-126.5	-491.3
R-248	Participant	Occupied		41.6	21.8	30.2	31.6	32.6	36.3	37.1	27.8	-0.8	-93.0	-388.2		41.3	20.2	29.9	31.0	32.0	36.0	36.9	27.8	-0.8	-93.0	-388.2
R-249	Non-participant	Occupied		40.5	35.8	28.6	29.6	30.5	33.7	33.4	20.7	-20.0	-152.9	-567.7		38.4	18.5	28.1	29.0	29.9	33.5	33.3	20.7	-20.0	-152.9	-567.7
R-250	Non-participant	Occupied		41.7	38.8	28.6	29.6	30.4	33.7	33.3	20.1	-22.6	-163.1	-598.9		38.4	18.5	28.1	29.0	29.9	33.4	33.2	20.1	-22.6	-163.1	-598.9
R-252	Non-participant	Occupied		44.1	41.2	30.1	31.2	32.2	35.9	36.4	26.7	-3.5	-101.1	-412.4		40.8	19.9	29.6	30.6	31.7	35.6	36.3	26.6	-3.5	-101.1	-412.4
R-253	Non-participant	Presumed Occupied		48.2	47.1	30.2	31.7	32.9	36.4	36.6	27.2	3.0	-63.3	-304.1		39.3	18.6	28.3	29.2	30.2	34.1	34.8	24.2	-11.2	-126.2	-487.4
R-254	Non-participant	Occupied		48.1	47.0	30.3	31.8	33.0	36.6	36.8	27.4	2.5	-64.7	-306.9		39.6	18.9	28.5	29.4	30.5	34.4	35.1	24.8	-9.7	-121.4	-472.9
R-255	Non-participant	Occupied		49.0	48.0	30.8	32.5	33.7	37.3	37.8	29.2	6.7	-53.5	-278.2		40.2	19.1	28.8	29.8	30.8	34.9	35.9	26.6	-3.3	-100.5	-410.4
R-256	Non-participant	Occupied		49.1	48.1	30.8	32.5	33.7	37.3	37.7	29.2	7.9	-47.2	-254.9		39.9	18.9	28.6	29.6	30.6	34.7	35.6	26.1	-4.5	-104.0	-420.9
R-257	Non-participant	Occupied		49.3	45.9	33.9	35.9	36.6	40.9	42.6	35.9	15.8	-45.6	-249.7		46.2	23.6	33.3	35.4	35.9	40.5	42.3	35.8	15.7	-45.6	-249.7
R-258	Participant	Occupied		42.4	35.4	30.1	31.4	32.5	36.3	37.0	28.0	0.0	-90.4	-380.6		41.4	20.2	29.9	31.0	32.1	36.2	36.9	28.0	0.0	-90.4	-380.6
R-259	Non-participant	Occupied		46.7	41.0	33.0	34.8	35.5	39.8	41.4	34.4	13.1	-52.7	-270.1		45.3	23.0	32.8	34.6	35.2	39.7	41.3	34.4	13.1	-52.7	-270.1
R-260	Non-participant	Occupied		46.8	41.7	33.0	34.5	35.4	39.7	41.2	33.7	9.7	-64.3	-303.7		45.2	23.0	32.7	34.3	35.2	39.6	41.2	33.7	9.7	-64.3	-303.7
R-261	Non-participant	Occupied		41.8	39.1	28.4	29.3	30.0	33.4	33.3	21.1	-17.4	-144.0	-540.8		38.2	18.3	27.9	28.7	29.6	33.2	33.2	21.1	-17.4	-144.0	-540.8
R-262	Non-participant	Occupied		39.7	36.1	27.6	28.5	29.1	32.2	31.6	18.2	-24.1	-165.1	-604.8		36.9	17.5	27.1	27.8	28.5	31.9	31.5	18.2	-24.1	-165.1	-604.8
R-263	Participant	Occupied		41.3	35.4	29.3	30.3	31.2	34.8	35.3	25.3	-6.1	-108.8	-435.4		39.8	19.2	28.9	29.9	30.8	34.7	35.2	25.3	-6.1	-108.8	-435.4
R-264	Non-participant	Occupied		43.2	22.4	31.4	32.7	33.7	37.9	39.0	30.5	2.3	-89.5	-382.2		43.0	21.4	31.1	32.4	33.4	37.7	39.0	30.5	2.3	-89.5	-382.2
R-311	Non-participant	Occupied		49.1	48.1	30.6	32.4	33.5	37.1	37.5	29.3	9.1	-44.4	-247.2		39.5	18.6	28.3	29.3	30.2	34.3	35.2	25.6	-5.5	-106.9	-429.5
R-453	Non-participant	Occupied		36.7	19.0	25.9	27.4	28.8	32.0	31.1	17.7	-25.3	-168.8	-616.1		34.7	14.7	24.4	25.2	26.1	29.7	29.8	17.2	-25.3	-168.8	-616.1

Table A.1.1 - Sound Analysis - Report Summary Table

Total Sound Power Level [dB(A)]	Number of Receptors	
	Rose Creek Only	All Projects
0 - 35	13	1
35 - 40	17	13
40 - 47	12	20
47 - 50	0	8
> 50	0	0
Maximum [db(A)]	46.9	49.3

Table A.2 - Sound Analysis - Detailed Results

Temperature (C)	10
Relative Humidity (%)	70
Sound Level Limit (dB[A])	50
# Exceeds Limit	0
Maximum	49.1
Mean	41.8

Temperature (C)	10
Relative Humidity (%)	70
Sound Level Limit (dB[A])	47
# Exceeds Limit	0
Maximum	46.4
Mean	36.9

			All Projects											Rose Creek Only										
					Octave Band											Octave Band								
Receptor ID	**Status**	**Occupation Status**	**Sound Power Level Exceedance**	**Total Sound Power Level [dB(A)]**	**31Hz**	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**	**16kHz**	**Sound Power Level Exceedance**	**Total Sound Power Level [dB(A)]**	**31Hz**	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**	**16kHz**
R-2	Non-participant	Occupied		36.5	21.5	24.6	28.1	29.6	31.4	30.0	19.5	-13.6	-113.3	-455.7		26.2	10.3	19.6	19.3	19.0	20.4	15.9	-12.0	-113.6	-467.6	-1529.0
R-3	Non-participant	Occupied		37.4	22.2	25.2	28.9	30.4	32.4	31.1	21.3	-9.6	-101.4	-420.3		26.5	10.5	19.8	19.6	19.3	20.8	16.5	-10.7	-109.9	-455.4	-1491.8
R-4	Non-participant	Occupied		41.4	25.4	27.9	32.5	33.9	36.2	35.7	28.1	5.6	-55.8	-285.3		27.2	10.9	20.2	20.1	20.0	21.7	17.8	-7.8	-99.5	-414.3	-1362.3
R-5	Non-participant	Occupied		42.1	25.9	28.4	33.2	34.5	36.9	36.4	29.1	7.6	-50.9	-271.6		27.4	11.0	20.3	20.3	20.2	21.9	18.1	-7.1	-97.7	-408.9	-1345.5
R-7	Non-participant	Occupied		43.2	26.9	29.5	34.3	35.6	38.0	37.7	30.6	9.9	-43.8	-250.7		29.9	12.4	21.7	22.0	22.3	24.7	22.7	4.1	-58.8	-271.5	-921.9
R-8	Participant	Occupied		41.0	24.9	28.2	32.2	33.6	35.9	35.3	27.0	4.2	-57.3	-289.5		32.2	13.8	23.2	23.6	24.1	27.1	26.0	10.5	-40.9	-212.8	-742.2
R-9	Participant	Occupied		37.1	20.5	26.5	28.3	29.4	32.1	31.3	19.2	-18.4	-140.9	-524.4		34.9	15.5	24.9	25.5	26.3	29.8	29.9	18.3	-18.7	-141.0	-524.4
R-10	Participant	Occupied		37.9	19.8	27.0	28.3	29.4	32.8	32.7	22.6	-7.9	-107.7	-424.6		36.8	16.6	26.0	26.8	27.7	31.5	32.2	22.6	-7.9	-107.7	-424.6
R-11	Participant	Occupied		38.5	20.1	27.4	28.8	29.9	33.3	33.5	24.0	-4.8	-98.4	-397.0		37.6	17.1	26.5	27.4	28.3	32.3	33.1	24.0	-4.8	-98.4	-397.0
R-12	Non-participant	Occupied		37.0	19.3	26.3	27.6	28.8	32.1	31.6	20.3	-13.6	-125.1	-476.7		35.5	15.7	25.1	25.8	26.6	30.3	30.7	20.1	-13.6	-125.1	-476.7
R-13	Non-participant	Occupied		37.2	19.2	25.1	27.0	29.2	32.9	31.7	19.1	-18.0	-125.8	-519.9		31.1	12.6	21.9	22.4	22.9	26.0	25.3	10.5	-38.1	-203.0	-712.5
R-229	Non-participant	Occupied		34.5	30.0	23.0	24.2	25.4	27.8	25.8	9.8	-40.6	-205.3	-697.8		32.0	12.8	22.2	22.9	24.4	27.3	25.6	9.8	-40.6	-205.3	-697.8
R-230	Non-participant	Occupied		37.9	32.4	25.6	26.9	28.7	31.8	30.9	18.4	-19.4	-138.1	-494.2		36.1	15.5	25.0	26.1	28.1	31.5	30.8	18.4	-19.4	-138.1	-494.2
R-231	Non-participant	Occupied		38.6	34.6	25.5	26.8	28.5	31.7	30.8	18.5	-18.3	-134.4	-483.2		36.1	15.4	25.0	26.0	28.1	31.5	30.7	18.5	-18.3	-134.4	-483.2
R-232	Non-participant	Occupied		38.9	37.1	24.1	25.2	26.6	29.4	27.7	13.3	-31.2	-175.1	-605.7		33.5	13.6	23.1	24.0	25.8	28.9	27.6	13.3	-31.2	-175.1	-605.7
R-235	Non-participant	Occupied		41.3	25.2	28.2	32.4	33.9	36.2	35.5	27.3	2.9	-64.5	-310.8		30.8	13.1	22.5	22.9	23.3	25.7	23.3	3.1	-69.4	-316.8	-1061.9
R-236	Non-participant	Occupied		40.4	24.5	27.7	31.6	33.1	35.3	34.5	25.7	-1.1	-77.8	-351.4		31.3	13.5	22.8	23.3	23.8	26.3	24.2	4.7	-64.5	-300.6	-1012.2
R-237	Non-participant	Occupied		36.8	20.9	26.0	28.4	29.7	31.9	30.3	16.8	-24.5	-151.8	-574.7		33.2	14.7	24.0	24.7	25.5	28.4	26.9	10.2	-45.3	-229.0	-791.9
R-238	Participant	Occupied		45.0	34.7	32.2	34.1	34.9	39.1	40.4	33.8	14.6	-43.1	-235.4		44.6	22.6	32.1	33.9	34.7	39.0	40.4	33.8	14.6	-43.1	-235.4
R-239	Participant	Occupied		46.1	38.2	32.2	34.4	36.1	40.2	41.0	33.2	11.0	-54.7	-249.9		45.2	22.4	32.0	34.3	36.0	40.2	40.9	33.2	11.0	-54.7	-249.9
R-240	Non-participant	Occupied		42.0	40.5	26.8	27.8	29.0	32.0	30.9	17.3	-25.7	-164.8	-576.1		36.1	16.4	25.9	26.7	28.1	31.3	30.5	17.0	-25.7	-164.8	-576.1
R-245	Non-participant	Occupied		42.9	33.9	29.8	31.6	33.6	37.5	37.7	28.7	2.3	-75.1	-307.0		42.2	19.9	29.5	31.3	33.3	37.4	37.7	28.7	2.3	-75.1	-307.0
R-246	Non-participant	Occupied		38.6	22.2	27.4	29.8	31.1	33.6	32.8	21.5	-12.8	-109.4	-443.3		35.3	15.9	25.3	26.0	26.7	30.2	30.1	17.9	-21.3	-149.4	-549.8
R-247	Non-participant	Occupied		39.9	21.8	28.9	30.4	31.6	34.8	34.9	24.3	-10.8	-126.9	-491.3		38.9	18.6	28.1	28.9	29.8	33.7	34.3	23.9	-10.9	-126.9	-491.3
R-248	Participant	Occupied		41.4	21.7	30.0	31.3	32.3	36.1	36.9	27.8	-0.8	-93.0	-388.2		41.1	20.1	29.6	30.7	31.7	35.8	36.8	27.7	-0.8	-93.0	-388.2
R-249	Non-participant	Occupied		46.5	36.0	33.4	35.6	35.9	40.2	42.0	36.3	19.8	-29.6	-197.3		46.1	23.9	33.3	35.5	35.7	40.2	42.0	36.3	19.8	-29.6	-197.3
R-250	Non-participant	Occupied		44.4	38.8	31.2	32.8	33.4	37.4	38.7	31.7	11.3	-52.2	-261.4		42.9	21.6	31.0	32.5	33.1	37.3	38.7	31.7	11.3	-52.2	-261.4
R-252	Non-participant	Occupied		43.4	41.2	29.1	30.0	30.9	34.4	34.6	24.2	-6.4	-103.4	-411.8		39.1	19.0	28.5	29.3	30.2	34.0	34.4	24.1	-6.4	-103.4	-411.8
R-253	Non-participant	Presumed Occupied		48.1	47.1	29.7	31.3	32.5	35.9	36.0	26.9	3.0	-63.3	-304.1		38.4	18.0	27.5	28.3	29.3	33.2	33.8	23.4	-11.5	-126.2	-487.4
R-254	Non-participant	Occupied		48.0	47.0	29.8	31.3	32.5	36.0	36.2	27.0	2.5	-64.7	-306.9		38.7	18.2	27.7	28.6	29.6	33.5	34.2	24.1	-9.9	-121.4	-472.9
R-255	Non-participant	Occupied		49.0	48.0	30.5	32.2	33.4	37.0	37.5	29.1	6.7	-53.5	-278.2		39.8	18.7	28.3	29.3	30.3	34.5	35.5	26.4	-3.3	-100.5	-410.4
R-256	Non-participant	Occupied		49.1	48.1	30.5	32.2	33.4	37.0	37.4	29.1	7.9	-47.2	-254.9		39.5	18.5	28.1	29.1	30.1	34.2	35.2	25.9	-4.5	-104.0	-420.9
R-257	Non-participant	Occupied		49.1	45.9	33.6	35.6	36.3	40.7	42.3	35.8	15.8	-45.6	-249.7		46.0	23.3	33.0	35.1	35.6	40.2	42.1	35.7	15.7	-45.6	-249.7
R-258	Participant	Occupied		46.8	35.6	33.7	35.9	36.2	40.6	42.4	36.6	19.9	-29.5	-197.2		46.4	24.2	33.6	35.7	36.1	40.5	42.4	36.6	19.9	-29.5	-197.2
R-259	Non-participant	Occupied		45.1	41.0	31.3	32.7	33.4	37.4	38.7	31.3	10.2	-55.1	-269.7		42.8	21.5	30.9	32.4	33.1	37.3	38.6	31.3	10.2	-55.1	-269.7
R-260	Non-participant	Occupied		45.7	41.7	31.7	33.1	33.9	38.1	39.4	31.7	7.4	-66.6	-303.3		43.4	21.9	31.4	32.8	33.6	37.9	39.4	31.7	7.4	-66.6	-303.3
R-261	Non-participant	Occupied		41.3	39.1	27.6	28.4	29.0	32.2	31.8	19.0	-20.2	-146.2	-540.1		36.9	17.6	27.0	27.7	28.4	31.9	31.7	19.0	-20.2	-146.2	-540.1
R-262	Non-participant	Occupied		39.5	36.1	27.2	28.0	28.7	31.8	31.2	18.1	-24.1	-165.1	-604.8		36.4	17.1	26.6	27.3	28.0	31.4	31.1	18.1	-24.1	-165.1	-604.8
R-263	Participant	Occupied		41.1	35.4	29.0	30.0	30.9	34.6	35.1	25.3	-6.1	-108.8	-435.4		39.6	19.1	28.6	29.5	30.5	34.4	35.1	25.3	-6.1	-108.8	-435.4
R-264	Non-participant	Occupied		42.0	21.7	30.4	31.6	32.7	36.7	37.7	29.2	1.2	-90.1	-382.1		41.8	20.5	30.1	31.2	32.2	36.4	37.7	29.2	1.2	-90.1	-382.1
R-311	Non-participant	Occupied		49.1	48.1	30.3	32.2	33.3	36.9	37.3	29.2	9.1	-44.4	-247.2		39.1	18.2	27.8	28.8	29.8	33.9	34.8	25.4	-5.5	-106.9	-429.5
R-453	Non-participant	Occupied		35.5	18.6	24.9	26.4	27.8	30.8	29.4	15.2	-28.1	-171.0	-615.3		32.5	13.5	22.8	23.4	24.0	27.4	27.1	14.2	-28.2	-171.0	-615.3

Table A.2.1 - Sound Analysis - Report Summary Table

Total Sound Power Level [dB(A)]	**Number of Receptors**	
	Rose Creek Only	**All Projects**
0 - 35	14	1
35 - 40	17	15
40 - 47	11	20
47 - 50	0	6
> 50	0	0
Maximum [db(A)]	46.4	49.1

8.0 REFERENCES

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