Noise Technical Report for the Lava Ridge Wind Project

OCTOBER 2022

PREPARED FOR

Bureau of Land Management

and

Magic Valley Energy, LLC

PREPARED BY

SWCA Environmental Consultants

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NOISE TECHNICAL REPORT FOR THE LAVA RIDGE WIND PROJECT

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EXECUTIVE SUMMARY

SWCA Environmental Consultants conducted a noise impact assessment of the proposed construction and operation of the Lava Ridge Wind Project (project), a proposed wind energy generating facility and ancillary facilities located primarily on Bureau of Land Management (BLM) public land in Jerome, Lincoln, and Minidoka Counties, Idaho. The project would consist of up to 400 wind turbines. The objective of the impact assessment was to calculate the cumulative noise levels at identified noise sensitive areas (NSAs), which for this analysis are defined as residences, schools, greater sage-grouse [*Centrocercus urophasianus*] leks, and raptor nests near the project.

The noise impact assessment predicts the following noise levels at identified NSAs near the project:

- The construction of the project would not result in a substantial and permanent increase in ambient noise levels at identified NSAs. Potential noise impacts from construction activities would be temporary and intermittent because construction is transient and would last approximately 3 to 5 weeks at any given location. The 1-hour equivalent noise level (L_{eq}) at the closest residential NSA would be 60.6 A-weighted decibels (dBA) during daytime hours (i.e., 7:00 a.m.–7:00 p.m.). Noise levels from construction activities at the closest school would be 32.2 dBA.
- Noise levels at the closest raptor nest during construction would be 69.5 dBA L_{eq}. The maximum construction-related noise levels at an occupied greater sage-grouse lek would be 38.7 dBA during daytime hours. Estimated construction noise levels in grazing allotments at a distance of 50 feet or more from project activities would be within the threshold of known information on livestock noise tolerance and adaptability.
- Projected operation sound levels from the project would be less than 55 dBA day-night noise level (L_{dn}) at all residences, with the highest projected L_{dn} at a residential NSA of 49.5 dBA. Therefore, the potential sound levels from the operation of the project at residential NSAs would not exceed the 55 dBA L_{dn} U.S. Environmental Protection Agency–recommended levels.
- The maximum sound level increase at occupied sage-grouse leks from the operation of the project would not exceed 10 dBA above baseline (background) noise levels. No change in ambient noise levels was predicted at the occupied leks, with the closest lek located 3.1 miles from the siting corridors.
- Anticipated operational noise levels would exceed 10 dBA above existing background levels at 29 of the analyzed raptor nests. The maximum sound level increase at the closest occupied raptor nest (to a turbine) would be 30.6 dBA L_{eq} and 28.4 dBA L_{dn} over background levels.
- The turbines' total sound power level would be 124.6 decibels (dB), with the acoustic center of that noise at approximately 321 feet above ground. At that height, the sound would lessen at ground level to 73.9 dB from the turbine hub and 85.3 dB from the blade. The noise at ground level would be within the threshold of known information on livestock noise tolerance and adaptability. Blasting could temporarily affect livestock. Increased operations and vehicle access could increase livestock stress levels. Based on best scientific information, no other livestock physiological effects would occur; however, many of these effects have not been studied on open-area-ranging livestock.

This technical report contains the following sections detailing the results of the noise impacts assessment:

- Section 1 provides a general introduction to the project.
- Section 2 presents a brief description of the project and noise impact assessment.

- Section 3 provides a basic introduction to the noise fundamentals and descriptors of time averaged noise levels, and a summary of the applicable noise regulations.
- Section 4 contains a brief description of the existing conditions at the siting corridors.
- Section 5 provides a summary of the specialized techniques and assumptions used to estimate project noise impacts and a discussion of the results of the impact assessment.
- Appendix A includes detailed construction noise impact calculations.
- Appendix B provides a description of the stationary noise-generating sources.
- Appendix C contains result summaries of the sound propagation model.
- Appendix D includes contour maps of the project noise impacts.

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ABBREVIATIONS

AGL	above ground level
ANSI	American National Standards Institute
ARMPA	*Idaho and Southern Montana Grater Sage-Grouse Approved Resource Management Plan Amendment*
BESS	battery energy storage system
BLM	Bureau of Land Management
°C	degrees Celsius
dB	decibels
dBA	A-weighted decibels
DEM	digital elevation map
EPA	U.S. Environmental Protection Agency
°F	degrees Fahrenheit
FHWA	Federal Highway Administration
HVAC	heating, ventilation, and air conditioning
Hz	hertz
ISO	International Standards Organization
kHz	kilohertz
kV	kilovolt
L_{eq}	1-hour equivalent noise level
L_{dn}	day-night noise level
L_{max}	root-mean-squared maximum noise level
m	meter
m/s	meters per second
mph	miles per hour
MVE	Magic Valley Energy, LLC
MW	megawatt
NEPA	National Environmental Policy Act
NSA	noise sensitive area
Project	Lava Ridge Wind Project
RCNM	Roadway Construction Noise Model
SWCA	SWCA Environmental Consultants
SWIP	Southwest Intertie Project
μPa	micropascals

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1 INTRODUCTION

SWCA Environmental Consultants (SWCA) prepared this noise technical report in support of the proposed Lava Ridge Wind Project (project). The project, a maximum 400-turbine wind energy generating facility, would be developed by Magic Valley Energy, LLC (MVE). The project would be located largely on federal land as well as on several parcels of private and state land, in Jerome, Lincoln, and Minidoka Counties, Idaho. The Project is located approximately 25 miles northeast of Twin Falls, Idaho. A 500-kilovolt (kV) generation intertie transmission line would interconnect at Idaho Power's existing Midpoint Substation or at a new substation along the permitted northern portion of the Southwest Intertie Project (SWIP) 500-kV transmission line (SWIP-North). The analysis was performed based on the preliminary design provided in the June 2021 plan of development (MVE 2021).

This report was prepared to support the National Environmental Policy Act (NEPA) analysis and noise impact estimates for construction and operation of the project at noise sensitive areas (NSAs, which for this analysis are defined as residences, schools, hospitals, greater sage-grouse [*Centrocercus urophasianus*] leks, and raptor nests) within 10 miles (16.1 kilometers) of the siting corridors.

2 PROJECT AND NOISE IMPACT ASSESSMENT DESCRIPTION

The siting corridors and vicinity generally consist of rangeland on flat terrain with pockets of center pivot-irrigated cropland and low-density, single-family residences associated with these agricultural uses and existing roads.

This technical report focuses on the NSAs (residences, schools, sage-grouse leks, and raptor nests) within 10 miles of the project: residences, schools, leks, raptor nests, and livestock. The closest residential NSA is within 0.5 mile of the nearest turbine. The closest identified school is located approximately 355 feet north of Highway 24 and approximately 7 miles northwest of the closest turbine. The closest occupied sage-grouse lek is approximately 3.1 miles from the nearest stationary noise source (turbine) (complying with the 3.1-mile buffer lek avoidance buffers established in the 2015 *Idaho and Southern Montana Grater Sage-Grouse Approved Resource Management Plan Amendment* (ARMPA) (BLM 2015). The closest identified raptor nest is within 0.13 mile of the nearest turbine. The turbines would be situated in rows generally in a north–south orientation based on the local prevailing wind direction. One of the land uses within the siting corridors is BLM-administered livestock grazing. Because grazing occurs throughout the analysis area, impacts to livestock are described qualitatively.

Among project components, the noisiest source would be the turbines. Transformers at the substations were included as noise generating sources for this analysis. Similarly, MVE is proposing to incorporate a battery energy storage system (BESS) adjacent to the 500-kV substation. The primary on-site noise sources at the BESS would be the inverters and the heating, ventilation, and air conditioning (HVAC) systems, and they were included in the cumulative impact analysis. The proposed switchyards would be located at each of the three east-southeast ends of the proposed intertie 500-kV transmission lines. The proposed switchyards may include circuit breakers, overhead electrical bus work, switches, and controls that occasionally produce noise; however, the noise produced by these sources would be different in character, duration and magnitude when compared to the continuous noise emission sources proposed for the project. Noise produced by the above-listed noise-emitting sources would not be a dominating source of project noise when compared to the turbines, but it has been accounted for in the noise modeling demonstration.

Predicted construction-generated noise levels at nearby NSAs were calculated using the Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM). The RCNM is FHWA's national model for the prediction of construction noise. The predicted noise levels presented at various distances from the source are based on a roster of likely construction equipment operating. The noise impact evaluation for the operation of the project, provided herein, consists of computer noise modeling using SoundPLAN Essential Version 5.1 and assessment of the outputs as they pertain to the sound (noise) standards and nearest NSAs (i.e., residences, schools, nearest sage-grouse leks, and raptor nests).

Potential noise impacts from construction and operation of the project were evaluated by determining the projected increases over ambient conditions and potential exposure of sensitive receptors to excessive noise in the siting corridors.

3 NOISE FUNDAMENTALS – BACKGROUND

This section provides a brief overview of noise fundamentals, noise assessment components, examples of sound levels from a variety of sources, and the regulatory setting regarding applicable noise level standards.

The primary noise generating mechanism associated with wind turbines is the aerodynamic noise of the blade passing through the air. Other noise generating mechanisms include the gearbox, generators, the motors that rotate the turbines into the wind (yaw drives), and cooling fans. These ancillary mechanisms can be mitigated with standard noise control measures within the turbine. Mechanical noise reduction strategies vary by turbine manufacturer, and can consist of vibration suppression, vibration isolation and fault detection techniques including the use of sound isolating materials, insulation, and closing the holes in the nacelles. These would decrease the sound transmitted to the air. Manufacturers design turbines to optimize turbine productivity and efficiency while minimizing noise. Because it is unknown what turbines would be available when the project starts, it is unknown which manufacturer would supply wind turbines and thus what noise control measures would be employed.

3.1 Definition of Acoustical Terms

The following acoustical terms are used throughout this analysis:

- Ambient sound level is defined as the composite of noise from all sources near and far, the normal or existing level of environmental noise at a given location.
- Decibel (dB) is the physical unit commonly used to measure sound levels. Technically, a dB is a unit of measurement that describes the amplitude of sound equal to 20 times the base 10 logarithm of the ratio of the reference pressure to the sound of pressure, which is 20 micropascals (μPa). For example, on the decibel scale, the quietest audible sound (perceived near total silence) is 0 dB. A sound 10 times more powerful is 10 dB. A sound 100 times more powerful than near-total silence is 20 dB. In acoustics, sound levels represented in dB express the true unweighted noise level.
- Sound measurement is further refined by using a decibel "A-weighted" sound level (dBA) scale that more closely measures how a person perceives different frequencies of sound; the A-weighting reflects the sensitivity of the ear to low or moderate sound levels.
- Equivalent noise level (L_{eq}) is the energy average A-weighted noise level during the measurement period.

- The root-mean-squared maximum noise level (L_{max}) characterizes the maximum noise level as defined by the loudest single noise event over the measurement period.
- Day-night noise level (L_{dn}) is the A-weighted equivalent sound level for a 24-hour period with an additional 10 dB weighting imposed on the equivalent sound levels occurring during nighttime hours (10:00 p.m.–7:00 a.m.).

3.2 Sound Levels of Representative Sounds and Noises

The U.S. Environmental Protection Agency (EPA) has developed an index to assess noise impacts from a variety of sources using residential receptors. If L_{dn} values exceed 65 dBA, residential development is not recommended (EPA 1974a). Noise levels in a quiet rural area at night are typically between 32 and 35 dBA. Quiet urban nighttime noise levels range from 40 to 50 dBA. Noise levels during the day in a noisy urban area are frequently as high as 70 to 80 dBA. Noise levels above 110 dBA become intolerable; levels higher than 80 dBA over continuous periods can result in hearing loss. Levels above 70 dBA tend to be associated with task interference. Levels between 50 and 55 dBA are associated with raised voices in a normal conversation. Constant noises tend to be less noticeable than irregular or periodic noises. Similarly, livestock were noted as generally acclimatizing to noise, particularly those at less than 100 dB (Ames and Arehart 1972; Arehart and Ames 1972; Bond and Winchester 1963; Harbers et al. 1975).

Over the last decade, interest in understanding noise impacts on wildlife has been increasing rapidly. Recent research has demonstrated that noise can cause avoidance, flight, altered communication, reduced pair-bonding, reduced breeding success, increased stress, increased mortality in some species, and no effect or even the opposite effects in other species (Patricelli et al. 2013). Many of these behavioral and physiological impacts could occur at or below the 10-dB threshold. Further studies are needed on sage-grouse to determine whether the 10-dB threshold is insufficient, sufficient, or even too conservative (Patricelli et al. 2013).

Table 1 provides criteria that have been used to estimate an individual's perception to increases in sound. In general, an average person perceives an increase of 3 dBA or less as barely perceptible. An increase of 10 dBA is perceived as a doubling of the sound.

Table 1. Average Human Ability to Perceive Changes in Sound Levels

Increase in Sound Level (dBA)	Human Perception of Sound
2–3	Barely perceptible
5	Readily noticeable
10	Doubling of the sound
20	Dramatic change

Source: Bolt, Beranek and Newman, Inc. (1973).

Table 2 presents sound levels for some common noise sources and the human response to those decibel levels.

Table 2. Sound Levels of Representative Sounds and Noises

Source and Distance	Sound Level (dBA)	Human Response
Jet takeoff (nearby)	150	
Jet takeoff (15 meters [m]/50 feet)	140	
50-hp siren (30 m/100 feet)	130	
Loud rock concert (near stage)	120	Pain threshold
Construction noise (3 m/10 feet)	110	Intolerable
Jet takeoff (610 m/2,000 feet)	100	
Heavy truck (8 m/25 feet)	90	
Garbage disposal (0.6 m/2 feet)	80	Constant exposure endangers hearing
Busy traffic	70	
Normal conversation	60	
Light traffic (30 m/100 feet)	50	Quiet
Library	40	
Soft whisper (4.5 m/15 feet)	30	Very quiet
Rustling leaves	20	
Normal breathing	10	Barely audible
Threshold of hearing	0	

Source: Beranek (1988).

3.3 Noise Assessment Components

A noise assessment is based on the following components: a sound-generating source, a medium through which the source transmits, the pathways taken by these sounds, and an evaluation of the proximity to NSAs. Soundscapes are affected by the following factors:

- Source. The sources of sound are any generators of small back-and-forth motions (i.e., motions that transfer their motional energy to the transmission path where it is propagated). The acoustic characteristics of the sources are very important. Sources must generate sound of sufficient strength, approximate pitch, and duration so that the sound may be perceived and can cause adverse effects, compared with the natural ambient sounds.
- "Transmission path" or medium. The "transmission path" or medium for sound or noise is most often the atmosphere (i.e., air). For the noise to be transmitted, the transmission path must support the free propagation of the small vibratory motions that make up the sound. Atmospheric conditions (e.g., wind speed and direction, temperature, humidity, precipitation) influence the attenuation of sound. Barriers and/or discontinuities (e.g., existing structures, topography, foliage, ground cover, etc.) that attenuate the flow of sound may compromise the path. For example, sound will travel very well across reflective surfaces such as water and pavement but can attenuate across rough surfaces (e.g., grass, loose soil).
- Proximity to NSAs. An NSA is defined as a location where a state of quietness is a basis for use or where excessive noise interferes with the normal use of the location. For this analysis, NSAs include residential areas, schools, sage-grouse leks, and raptor nests.

3.4 Regulatory Setting

In 1974 the EPA published *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin on Safety*. In this publication, the EPA evaluated the effects of environmental noise with respect to health and safety and determined an L_{dn} of 55 dBA (equivalent to a continuous noise level of 48.6 dBA) to be the maximum sound level that will not adversely affect public health and welfare by interfering with speech or other activities in outdoor areas (EPA 1974b).

Since no other local, county, or state thresholds were identified, an L_{dn} of 55 dBA has been used to determine if the project would adversely affect public health and welfare at identified residential NSAs.

Noise from the construction and operation of a wind project has the potential to disrupt sage-grouse lek activity through making it difficult for female birds to hear the males. Noise must be limited to a maximum of 10 dBA above the ambient natural noise level at the perimeter of a lek from 6:00 p.m. to 8:00 a.m. during the breeding season (March 1–May 15) after the recommendations of Patricelli et al. (2013). Ambrose and Florian (2013) recommend keeping noise levels below 10 dBA over background at all hours rather than just lekking hours. Outside the lekking period, noise may impact foraging, roosting, nesting, and brood-rearing.

Similarly, for the purpose of analyzing impacts at identified raptor nests in the vicinity of the project, the U.S. Forest Service guidelines mention a noise threshold for wildlife impacts, stating not to exceed 10 dB above the background noise level "in or near habitat of wildlife known to be sensitive to noise during reproduction, roosting, or hibernation; or where habitat abandonment may be an issue" (U.S. Department of Agriculture, Forest Service 2011).

4 EXISTING CONDITIONS

A characterization of the landscape features, existing roads, and land use of the siting corridors and vicinity are provided in Section 2 above. The elevation of the siting corridors ranges from 3,900 to 4,600 feet. In all, 135 residential NSAs, 23 sage-grouse leks, 68 raptor nest locations and three schools were included in the analysis. Livestock grazing occurs throughout the area, and thus livestock were also included in the analysis. A map of the siting corridors showing the general location of the siting corridors and of the identified NSAs is provided in Figure 1.

Background noise and noise attenuation rates are subject to variation from differences in ambient conditions, such as air temperature, wind, rain, and snow. The weather in the vicinity of the siting corridors can generally be characterized as having four defined seasons. Yearly average highs reach the low to mid 60s (degrees Fahrenheit [°F]) (16 degrees Celsius [°C]–18°C), and yearly average lows reach the mid to upper 30s °F (2°C–3°C) (U.S. Climate Data 2021). Monthly weather conditions are presented in Table 3.

Table 3. Weather Conditions

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Average
Average high temperature (°F)	33	39	51	61	71	81	91	90	78	63	46	34	62
Average low temperature (°F)	18	20	28	34	42	49	57	55	46	36	26	18	36
Average precipitation	1.27	1.01	1.16	0.88	0.96	0.66	0.20	0.24	0.45	0.77	1.32	1.69	10.61

Source: U.S. Climate Data (2021).

Local conditions such as topography and winds characteristic of the region can alter background noise conditions. The American National Standards Institute (ANSI) has published a standard with estimates of general ambient noise levels (L_{eq} and L_{dn}) based on detailed descriptions of land use categories (ANSI 2013). The ANSI document organizes the land use based on six categories. The descriptions and estimated daytime and nighttime L_{eq} ambient noise levels for each category are provided in Table 4.

Table 4. Representative Existing Conditions Based on Land Use

Land Use Category	Typical L_{dn} (dBA)	Day Level, L_d (dBA)	Night Level, L_n (dBA)
1. Very noisy urban residential	67	66	58
2. Noisy urban residential	62	61	54
3. Urban and noisy suburban residential	57	55	49
4. Quiet urban and normal suburban residential	52	50	44
5. Quiet suburban residential	47	45	39
6. Very quiet suburban and rural residential	42	40	34

Source: ANSI (2013).

Because there are few (if any) sources of sound in the area surrounding the siting corridors, the residential NSAs can be defined as a sparse suburban or rural area; therefore, background sound levels are conservatively represented by those of Category 6: Very quiet suburban and rural residential.

Most of the siting corridors can be considered unoccupied open rangeland. A review of reports and empirical measurements collected by the EPA concluded that true ambient values pre-development in nights and calm mornings in sagebrush habitat are likely to be 16 to 22 dBA (EPA 1971). A 2013 report found residual noise levels (L_{90}) in wilderness areas of 16 to 22 dBA (Patricelli et al. 2013). Lynch et al. (2011) more recently measured noise exposure at 189 sites in 43 U.S. National Parks, finding an average 24-hour residual noise level of 21.6 dBA.

Because a noise assessment was not performed to measure the background noise levels at and near the siting corridors, the L_{eq} nighttime and daytime noise levels were assumed to be 34 and 40 dBA, respectively, at the residential communities, and 22 and 16 dBA, respectively¸ at unoccupied open rangeland.

To evaluate compliance with applicable federal and county regulations, Section 5 (below) assesses potential increases in ambient noise levels associated with planned construction and operational activities in the immediate vicinity of the project in relation to existing background noise levels.

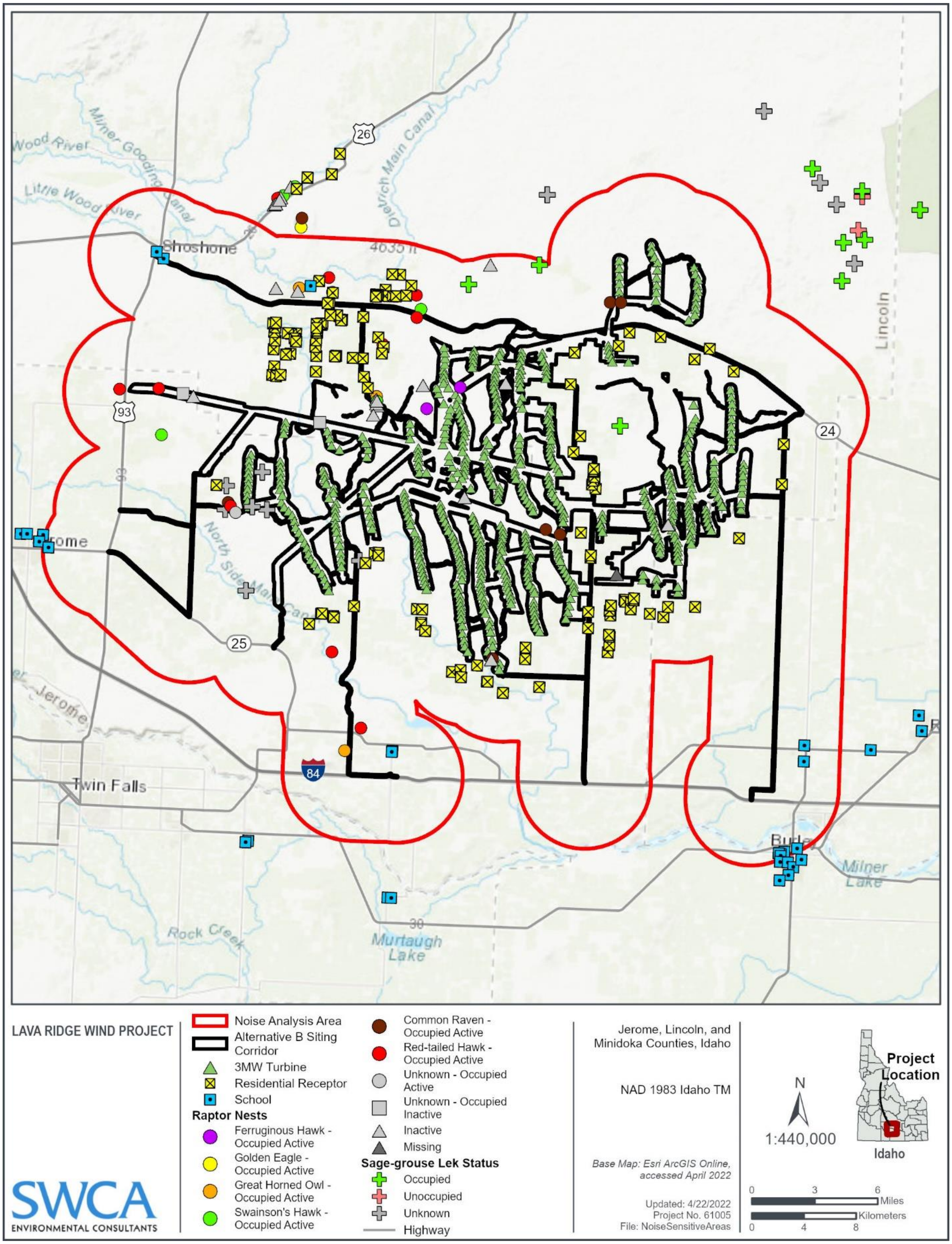

Figure 1. Location of siting corridors and identified noise sensitive areas.

5 NOISE IMPACTS

The following section provides results and interpretation of potential impacts from noise generated by the project during construction and operation based on the criteria described in Section 3.4.

5.1 Construction Noise

The noise levels generated by construction equipment would vary significantly and depend on a number of different parameters, such as the type, model, size, and condition of the equipment; the operation schedule; and the condition of the area being worked. Additionally, wind farm construction projects are accomplished in several different stages. Each stage has a specific equipment mix, depending on the work to be completed. The following sections estimated noise levels related to the construction of the project.

5.1.1 *Equipment and Machinery*

Construction of the facility is expected to occur over a 2-year timeframe. Noise levels for typical construction equipment that would likely be used at the project are approximately in the 70 to 90 dBA range at a distance of 50 feet (15 m), as shown in Table 5.

Table 5. Noise Levels for Common Construction Equipment

Equipment Type	Typical Maximum Noise Levels at 50 Feet (dBA)
Backhoe	80
Belly dump	76
Compactor	83
Concrete telebelt	81
Crane	81
Drill rig	79
Dozer	82
Excavator	81
Forklift	85
Flatbed	74
Grader	85
Generator	81
Loader	79
Scraper	84
Tractor	84
Trencher	80
Truck	75

Source: FHWA RCNM Software Version 1.1 (2011). Table based on EPA report and measured data.

Construction noise levels were estimated using the FHWA RCNM. The RCNM is FHWA's national model for the prediction of construction noise. This software is based on actual sound level measurements from various equipment types taken during the Central Artery/Tunnel Project conducted in Boston, Massachusetts, during the early 1990s (FHWA 2011).

Estimates of noise from the construction of the project are based on a roster of the maximum amount of construction equipment used on a given day. Table 5 shows a list of typical construction equipment and the noise level at 50 feet. The RCNM has noise levels for various types of equipment preprogrammed into the software; therefore, the noise level associated with the equipment is typical for the equipment type and not based on any specific make or model.

The RCNM assumes that the maximum sound level for the project (L_{max}) is the maximum sound level for the loudest piece of equipment. The approximate noise generated by the construction equipment used at the facility has been conservatively calculated based on an estimated project construction equipment roster projected to be used at the siting corridors at one time, and not considering further attenuation due to atmospheric interference or intervening structures.

The equipment and activities on-site would vary throughout the project, depending on various stages of construction. The predicted noise from construction activity is presented as a worst case (highest noise level) scenario, where it is assumed all equipment is present and operating simultaneously on-site for each stage of construction. Results of the RCNM construction noise calculations are presented in Table 6, with calculations shown in Appendix A.

Table 6. Predicted Construction Noise Levels

Phase	Equipment	Distance (feet)	Construction 1-hr L_{eq} (dBA)	Construction L_{max} (dBA)*	Combined Ambient + Calculated Noise Level, 1-hr L_{eq} (dBA) †, ‡, §
Access road	Forklift Flatbed RT crane Dozer Loader Water truck Compaction equipment Belly dump Excavator Motor grader Scraper Tractor Generator	25.0	95.0	91.0	92.0
		50.0	89.0	85.0	86.0
		100.0	83.0	79.0	80.0
		200.0	76.9	73.0	73.9
		250.0	75.0	71.0	72.0
		500.0	69.0	65.0	66.0
		1,000.0	63.0	59.0	60.0
		2,000.0	56.9	53.0	53.9
		5,000.0	49.0	45.0	46.0
		35,966.4	31.9	27.9	29.3
Foundations	Excavator Dozer Compaction equipment Concrete truck Flatbed truck Loader RT Crane Concrete telebelt Forklift Generator	25.0	93.0	91.0	89.9
		50.0	86.9	85.0	83.9
		100.0	80.9	79.0	77.9
		200.0	74.9	73.0	71.9
		250.0	73.0	71.0	69.9
		500.0	66.9	65.0	63.9
		1,000.0	60.9	59.0	57.9
		2,000.0	54.9	53.0	51.9
		5,000.0	46.9	45.0	43.9
		28,409.9	31.9	29.9	29.3

Phase	Equipment	Distance (feet)	Construction 1-hr L_{eq} (dBA)	Construction L_{max} (dBA)*	Combined Ambient + Calculated Noise Level, 1-hr L_{eq} (dBA) †, ‡, §
Wind turbine erection	Forklift Flatbed RT Crane Crawler crane Dozer Compaction equipment Generator	25	91.8	91.0	88.7
		50	85.7	85.0	82.7
		100	79.7	79.0	76.7
		200	73.7	73.0	70.7
		250	71.8	71.0	68.7
		500	65.7	65.0	62.7
		1,000	59.7	59.0	56.7
		2,000	53.7	53.0	50.7
		5,000	45.7	45.0	42.7
		24,776	31.9	31.1	29.3
Collection	Trencher Dozer Motor grader Tractor and reel rig Backhoe Generator	25	92.3	91.0	89.3
		50	86.3	85.0	83.3
		100	80.3	79.0	77.3
		200	74.3	73.0	71.3
		250	72.3	71.0	69.3
		500	66.3	65.0	63.3
		1,000	60.3	59.0	57.3
		2,000	54.3	53.0	51.3
		5,000	46.3	45.0	43.3
		26,505	31.9	30.5	29.3

Phase	Equipment	Distance (feet)	Construction 1-hr L_{eq} (dBA)	Construction L_{max} (dBA)*	Combined Ambient + Calculated Noise Level, 1-hr L_{eq} (dBA) †, ‡, §
Substation	Dozer Excavator Drill rig Bucket truck RT Crane Skid loader Generator	25	90.1	88.0	87.1
		50	84.1	82.0	81.1
		100	78.1	76.0	75.1
		200	72.1	70.0	69.1
		250	70.1	68.0	67.1
		500	64.1	62.0	61.1
		1,000	58.1	56.0	55.1
		2,000	52.1	50.0	49.1
		5,000	44.1	42.0	41.1
		20,525	31.9	29.7	29.3
Transmission	Trencher Dozer Motor grader Tractor and reel rig Backhoe Generator	25	92.3	91.0	89.3
		50	86.3	85.0	83.3
		100	80.3	79.0	77.3
		200	74.3	73.0	71.3
		250	72.3	71.0	69.3
		500	66.3	65.0	63.3
		1,000	60.3	59.0	57.3
		2,000	54.3	53.0	51.3
		5,000	46.3	45.0	43.3
		26,505	31.9	30.5	29.3

* Calculated L_{max} is the loudest individual value.

† Assumes existing daytime and nighttime noise levels of 16 dBA and 22 dBA, respectively (Blickley et al. 2012)

‡ Assumes daytime construction only.

§ Data derived from the average 15 daytime and 9 nighttime 1-hour L_{eq} calculated by logarithmic averaging.

As previously discussed, construction is transient in nature, lasting approximately 3 to 5 weeks at any given location, and noise levels vary depending on the activity in progress. Noise impacts to residents and wildlife from construction of the project would be temporary and intermittent. Additionally, blasting during construction would generally be limited to Monday through Friday during daytime hours (7:00 a.m.–7:00 p.m.) within 3,000 feet of sensitive receptors, and seasonal restrictions would be implemented when feasible.

5.1.1.1 RESIDENTIAL NOISE SENSITIVE AREAS

As indicated above, noise emitted from operation of construction equipment was estimated based on construction equipment noise data published by the FHWA and the Federal Transit Administration (FHWA 2011). The closest residential NSA is approximately 1,315 feet from a new proposed access road; 1-hour L_{eq} noise levels from construction at this distance are estimated at 60.6 dBA.

5.1.1.2 SCHOOLS

The closest identified school is approximately 355 feet north of Highway 24 and approximately 7 miles northwest of the closest turbine. Potential noise impacts from construction of access roads at the closest school would be 32.2 dBA L_{eq} at a distance of 6.25 miles (13,120 feet).

5.1.1.3 RAPTOR NESTS

Raptor nests were identified 445 feet from a proposed access road segment. Consistent with the methodology defined in previous sections, the composite noise level of pieces of equipment during the construction of the access roads would be 69.6 dBA L_{eq} at a distance of 445 feet from the construction area.

5.1.1.4 GREATER SAGE-GROUSE LEKS

One occupied sage-grouse lek was identified 3.1 miles from a proposed access road; L_{eq} noise levels at this location from the construction of the road would be 38.7 dBA, a 22.7-dBA increase over the assumed existing daytime noise level of 16 dBA (as described in Section 4, Existing Conditions).

Figure D-1 of Appendix D shows the estimated distance (6.8 miles [35,966 feet]) from the siting corridors to where the noise would be under the unoccupied open rangeland areas background noise levels (19.3 dBA 24-hour L_{eq} [Blickley et al. 2012]) plus 10 dBA (i.e., 29.3 dBA).

5.1.1.5 LIVESTOCK

No published research on construction-related noise effects to livestock was identified. However, several papers looked at impacts from noise under either intensely managed livestock operations (primarily confined operations) or for similar types of noise disturbances. Some studies show some effects to livestock on a short-term basis within a range of 85 to 90 dB or greater; however, these were in confined management areas or buildings (Ames 1978; Broucek 2014 [also identified that farm animals adapt to noise]). Krausman et al. (1998) and Helldin et al. (2012) noted no adverse effects from noise to livestock. Waynert et al. (1998) studied beef cattle response to human voice and metal-on-metal clanging noise in a working chute in a barn (study treatment), with addition of response monitoring in outdoor pens during pretreatment and posttreatment periods. In Waynert et al. (1998), the test subjects (beef cattle heifers) had elevated heart rates and moved more during the testing period than their counterparts who were not exposed to treatment sounds; the test subjects became habituated with lowered heart rates after 5 days, but increased movement did not decrease during that timeframe. Lambs weight gain declined in Hauser and

Wechsler (2013) after 15 days of 8 hours per day of graded noise at 75 dB or greater (tested at 100 to 6,300 hertz [Hz]). Lambs were most sensitive at 7,000 Hz or greater (Arehart and Ames 1972).

The active construction would not occur on all areas at once; rather, it would be a progression of active construction moving from one proposed infrastructure site (turbine pad, collection line right-of-way, access road, etc.) to the next one as construction is completed in at each. This may result in noise source vectors coming from several locations as construction is completed and equipment is moved to the next construction area. Additionally, multiple construction crews working in proximity to each other could contribute to the total cumulative noise levels. Because the livestock do not stay in a static location and because the active construction would be moving during the construction period, it is not possible to determine cumulative noise levels at any given point.

5.1.2 *Helicopter*

Another source of construction noise would be the periodic use of a helicopter. For reference purposes, a large, single-rotor helicopter such as the Bell 214 produces a maximum sound level of approximately 79 dBA at a distance of 500 feet under level flight conditions (Nelson 1987). This is comparable to hearing a pneumatic drill operating 50 feet away. At 100 feet, the sound level would be approximately 93 dBA, similar to hearing a power mower or a heavy truck from 50 feet away. A small, single-rotor helicopter such as the Hughes 500 produces a maximum sound level of 75 dBA at a distance of 500 feet under level flight conditions (Nelson 1987). This corresponds to a sound level of approximately 89 dBA at 100 feet. The sound levels of both helicopters would be perceived similarly. Helicopters could produce noise in the range of 89 to 93 dBA near residences and other sensitive receptors as close as 100 feet to helicopter staging areas; however, helicopter use would only occur during established daylight hours of construction. Residences near the helicopter landing site, staging areas, and siting corridors would experience noticeable, localized, temporary, short-term increases in noise levels, occurring intermittently during construction.

5.1.3 *Roadway Noise During Construction*

The main impact from road traffic noise is during construction, which would include passenger vehicle and heavy vehicle movements to and from the siting corridors along local roads in the vicinity of the project. These vehicles would include semi-tractors, trailers, haulage trucks, mobile cranes, water trucks, heavy-duty vehicles, and passenger vehicles. The number of construction personnel on-site is expected to range from 400 to 850 during peak construction. Construction traffic would be predominantly during weekdays. Deliveries of equipment and materials are expected to occur during normal work hours and may occur at any time throughout the workday.

On-road vehicular traffic includes hauling of materials in and out of the construction site, movement of heavy equipment, and commuter and visitor traffic. The associated noise levels would increase and decrease rapidly. The number of truck trips associated with construction would vary, depending on the construction stage but, overall, the total traffic volume along local roads could be increased throughout the construction phase.

To determine potential noise impacts from on-road vehicles associated with construction of the project, noise levels at various distances from the road by hourly vehicle traffic were estimated. Table 7 shows the noise levels at various distances and by hourly vehicle traffic. Although slower speeds (20 to 30 miles per hour [mph]) may be used on unpaved roads, 40+ mph was used for estimating traffic noise impacts to be conservative.

Table 7. Noise Levels at Various Distances from Heavy Trucks

Average Speed (mph)	Hourly Vehicle Traffic (vehicles/hour)	1-hour L_{eq} Noise Level (dBA) at Distance*					
		50 feet	250 feet	500 feet	1,000 feet	2,500 feet	5,000 feet
40	1	53.4	42.2	37.4	32.6	26.2	21.4
	10	64.4	52.2	47.3	42.5	36.1	31.3
	50	70.3	59.1	54.3	49.5	43.1	38.3
	100	73.3	62.1	57.3	52.5	46.1	41.3
	200	76.3	65.1	60.3	55.5	49.1	44.3
	400	79.3	68.1	63.3	58.5	52.1	47.3
50	1	54.8	43.6	38.8	34.0	27.6	22.8
	10	64.7	53.5	48.7	43.9	37.5	32.7
	50	71.7	60.5	55.7	50.9	44.5	39.7
	100	74.7	63.5	58.7	53.9	47.5	42.7
	200	77.7	66.5	61.7	56.9	50.5	45.7
	400	80.7	69.5	64.7	59.9	53.5	48.7
65	1	56.4	45.2	40.4	35.6	29.2	24.4
	10	66.4	55.2	50.4	45.6	39.2	34.4
	50	73.4	62.2	57.4	52.6	46.2	41.4
	100	76.4	65.2	60.4	55.6	49.2	44.4
	200	79.4	68.2	63.4	58.6	52.2	47.4
	400	82.4	71.2	66.4	61.6	55.2	50.4

* The 1-hour L_{eq} was estimated based on an A-weighted peak pass-by noise level generated by a heavy truck.

5.1.3.1 RESIDENTIAL NOISE SENSITIVE AREAS

The closest residential NSA is located approximately 67 feet from a proposed access road; noise levels for an hourly vehicle traffic level of 400 at a 67-foot distance would be estimated at 77.1 dBA L_{eq}. Levels of highway traffic noise typically range from 70 to 80 dBA at a distance of 15 m (50 feet) from the highway (FHWA 2003). Therefore, the increase from existing conditions is estimated to be between 0.0 and 9.6 dBA at the closest residential NSA.

5.1.3.2 SCHOOLS

The closest identified school is approximately 355 feet north of Highway 24; estimated noise levels for an hourly vehicle traffic level of 400 at a 355-foot distance are 64.2 dBA L_{eq}. The increase from existing conditions is estimated to be between 0.9 and 10.5 dBA at the closest school.

5.1.3.3 GREATER SAGE-GROUSE LEKS

There is evidence that noise from traffic has a significant impact on sage-grouse. Blickley et al. (2012) found a 73% decline in male attendance on leks exposed to traffic noise compared to their paired controls. Traffic noise also was also found to cause an increase in stress hormone levels (Blickley et al. 2012) and a disruption of strutting patterns on the lek (Blickley et al. 2012). Estimated noise impacts from traffic at the closest occupied lek (approximately 3.1 miles from access road) was estimated to be 25.2 dBA for a traffic level of 400 vehicles per hour.

5.1.3.4 LIVESTOCK

Although sudden intermittent noise is stressful to livestock (Stermer et al. 1981; Talling et al. 1998; Lanier et al. 2000); noise from road traffic is not expected to cause problems with grazing livestock. Some studies show domesticated animals may become accustomed to continuous noise, such that certain physiological reactions to the noise no longer occur (habituation) (Dufour 1980).

5.1.4 *Blasting*

Blasting would likely be required to support clearing, grading, and excavation activities in areas with shallow bedrock. Blasting is a short-duration event. The typical noise generated by blasting operations is 94 dBA at 50 feet (FHWA 2011). Based on this level, the blasting operations would result in 59.5 dBA L_{max} at 0.5 mile to the closest residential receptor, and 43.7 dBA L_{max} at 3.1 miles to the closest occupied sage-grouse lek. The instantaneous noise level would be above ambient levels for both analyzed land uses. Blasting could startle and cause temporary heartrate increases for nearby livestock. All blasting would be conducted in accordance with a blasting plan. Blasting during construction would be limited to Monday through Friday during daytime hours (7:00 a.m.–7:00 p.m.) when within 3,000 feet of sensitive receptors.

5.2 Operational Noise

The noise levels at the identified NSAs in the vicinity of the project from the representative wind turbine generator model have been predicted for the highest sound power level (108 dB) at a wind speed of 9 meters per second (m/s) and compared with the relevant noise criteria, including the EPA's L_{dn} of 55 dBA at residential NSAs and 10 dBA above background levels at sage-grouse leks or raptor nests (as provided in Section 3.4). Additionally, transformers at the proposed substations were also included in the analysis.

5.2.1 *Operational Activities*

The modeled sound sources from the project would include up to 511 turbines and six transformers. MVE is proposing to incorporate a BESS adjacent to the 500-kV substation. The primary on-site noise sources at the BESS would be the inverters and HVAC systems and were included in the cumulative impact analysis. Similarly, there would be a small amount of transportation of equipment and traffic to the project during the operation and maintenance of the facility. Estimated 1-hour L_{eq} noise levels from the operation and maintenance traffic was estimated to be no more than 64.4 dBA at a distance of 50 feet.

5.2.2 *Assessment Methodology*

Several factors influence the number and size of wind turbines for any given project and make it impractical to identify with certainty the exact characteristics of the turbine during the early development stage. Manufacturers' advancement in turbine technology during the wind project development period can offer opportunities to deploy more efficient models that are better suited to the siting corridors' wind resource. The ultimate selection of a specific turbine model is an iterative process that considers the wind resource, siting constraints, mitigation requirements, and the timing of a specific turbine's availability in relation to the construction schedule. While the specific turbine model and its associated size characteristics will not be known until late in the development phase, MVE is able to define the anticipated range of potential wind turbine units that may be sited within the project including the number of units as well as a range of key sizing characteristics.

The wind turbine model selected to represent "worst-case" noise conditions is rated as a 3.0-megawatt (MW) turbine with a 140-m rotor diameter. "Best estimate" sound power level octave band data from 10 Hz to 10 kilohertz (kHz) were provided by the manufacturers as a function of wind speed at hub height. The turbine reaches its highest sound power level (108 dBA) at a wind speed of 9 m/s. Table 8 presents the sound power levels, source type, and acoustic height of the turbine used in the analysis. The acoustic height for the turbine is the same as its hub height, which is 98 m above ground level (AGL).

Table 8. Noise Model Parameters – Turbines

Project Component	Type of Source	Sound Power Level at Octave Band Center Frequency (Hz)										Total Sound Power Level (dBA)	Acoustic Height (m)
		16	31.5	63	125	250	500	1,000	2,000	4,000	8,000		
3-MW wind turbine	Point	65.7	79.0	87.7	92.5	98.5	103.0	103.4	100.0	92.1	73.7	108.0	98

Note: The data source for the turbine acoustic specifications is subject to a confidentiality agreement and is therefore not available for public distribution.

The noise from major ancillary infrastructure at the project were included in the analysis. The main noise sources at each substation would be a 300MVA rated transformer. The sound power level assumed for the 300MVA transformers are provided in Table 9. The coordinates of the main noise source at each potential location are provided in Appendix B.

Table 9. Noise Model Parameters – Transformers

Project Component	Type of Source	Sound Power Level at Octave Band Center Frequency (Hz)								Total Sound Power Level (dB)	Acoustic Height (m)
		63	125	250	500	1,000	2,000	4,000	8,000		
Transformer	Point	79	87	95	97	89	86	79	75	100.0	2

Power transformers – Determination of sound levels (IEC 60076-10, Ed. 1(2001) MOD)

Noise from the BESS would be created by the associated HVAC units, power inverters, and transformers associated with this type of unit. Detailed plans are not yet available for the BESS. The exact model of inverter has not yet been specified; therefore, representative equipment was assumed. Inverters were assumed to have an unshielded noise rating of 79 dBA at 1 m (3 feet) (Power Electronics Pure Energy Solar Solutions Inverters Stations). The HVACs are assumed to have an unshielded noise level rating of 79 dBA at 1.5 m (5 feet) (Marvair ComPac I and ComPac II 2-6 Vertical All Mount Air Conditions, Models AVP24-30-36-42-48-60-72) The coordinates of the main noise source at each potential location and their respective sound power levels are provided in Appendix B.

Based on the sound power levels input for each turbine and transformer, or sources (406 locations), SoundPLAN estimates noise contours of the overall project in accordance with a variety of standards, primarily International Standards Organization (ISO) 9613-2:1996 Acoustics standards for noise propagation calculations. All sound propagation losses, such as geometric spreading, air absorption, ground absorption, and barrier shielding, are calculated in accordance with these recognized standards. The model accounts for reflection (i.e., from adjacent structures and the ground). The model uses industry-accepted propagation algorithms and accepts sound power levels (in dB) provided by the manufacturer and other sources. The calculations account for classical sound wave divergence, plus attenuation factors resulting from air absorption, basic ground effects, and barrier/shielding. SoundPLAN does not account for noise modulation or refraction.

The sound propagation model considers the following influences:

- Sound power levels and locations of noise sources
- Distance between noise sources and receivers
- Topography of the area
- Influence of the absorption provided by the ground
- Shielding from structures or vegetation
- Air absorption
- Meteorological conditions

The ISO 9613-2 methodology provides tables and equations for estimating the atmospheric absorption coefficient corresponding to various temperatures and humidity levels. For estimating noise levels at the NSAs, the annual average temperature of 49°F (9°C) for the City of Shoshone, Idaho; a relative humidity of 58%; and an air pressure of 1013 mbar were employed. Topographic inputs were also included in the model. Calculations were performed using octave band sound power spectra as inputs for each noise source.

The ISO 9613-2 standard estimates sound pressure levels at a specified distance by subtracting the attenuation factors from the source sound power level for each source in octave frequency bands. Attenuation factors include geometrical divergence, atmospheric attenuation, ground effect, and barrier attenuation. These terms are defined as follows:

- Geometrical divergence occurs as the source sound power is spread out over an increasing surface area (i.e., as the distance from the source increases). The estimated loss rate is the same for all frequencies. This is considered the most significant loss associated with propagation. Attenuation due to geometrical divergence is highly dependent on the distance between the source and the receiver. Direction also affects the noise level; (0°) direct line of sight noise level will be higher than (90°) direction line of sight to a stack emission point. Therefore, the differences in ground elevation and receiver height and hub height (source height) are important parameters. Losses due to atmospheric attenuation occur as the energy in the sound wave is transformed to heat. As this attenuation is frequency-dependent and high frequencies are more readily attenuated than low frequencies, these losses are highly influenced by humidity and temperature. Ground effect is described according to the parameter Ground Factor (G), which varies between 0 for surfaces with low porosity (“hard” ground) and 1 for “soft” ground (surfaces including loose dirt, grass, crops, and other vegetation). This factor describes the effect of sound waves reflected off the ground. Parameters influencing the ground effect are the source height, receiver height, and propagation distance between the source and receiver and the ground conditions. Barrier attenuation describes the effect of sound waves refracted around an imperforate element or barrier. A barrier could include man-made objects such as structures, buildings, and fences, as well as topographical features. Therefore, the differences in ground elevation, source height, receiver height, dimension, and location absorption and reflection coefficients of man-made structures and topographic features are important parameters when estimating barrier attenuation in SoundPLAN.

The following assumptions were made when running SoundPLAN:

- Noise impact calculations were performed using octave band data from 10 Hz to 10 kHz.
- Each wind turbine was modeled as individual point source at hub height (i.e., 98 m).

- Noise impacts at the NSA and depicted in the isopleths were estimated assuming a receiver height of 1.5 m above ground level.
- Elevations of the sources and of the receptors examined in the modeling were determined from U.S. Geological Survey Digital Elevation Map (DEM) and are based on North American Datum of 1927. The DEM files each had a 30-m resolution (7.5-minute DEM providing coverage of 7.5 × 7.5-minute blocks).
- Atmospheric attenuation was modeled using annual average conditions for Shoshone, Idaho (i.e., temperature of 49°F [9°C] and 58% humidity).
- To better represent the actual conditions of the project and to ensure that both hard and soft ground absorption were considered, acoustically hard sites, including surfaces such as pavement and bare hard ground, were assumed to have high reflectivity properties, and a ground absorption coefficient of 0.0 was used. Ground cover near the project was analyzed using satellite imagery from Google Earth. A higher ground factor of 1.0 was defined for more absorptive ground, such as vegetation and loose soil. Semi-hard materials such as gravel were assumed to have a ground absorption coefficient of 0.6.
- The project was assumed to operate 24 hours per day, so the average noise output (including variations due to start-ups and shutdowns) would be constant regardless of time of day. The noise attenuation model was set up to represent “worst-case” noise conditions. The proposed turbine reaches its highest sound power level (108 dBA) at a wind speed of 9 m/s. This sound level and its corresponding sound spectra were used to represent constant 24-hour turbine operation, therefore, corresponding to a very conservative approach for both the daytime and nighttime operation.

5.2.3 *Operational Noise Impacts*

Calculations were performed using linear octave band power levels as inputs from each noise source. Summaries of the sound propagation model results are presented in the following sections by NSA type (i.e., residential, sage-grouse lek, and raptor nest).

5.2.3.1 RESIDENTIAL NOISE SENSITIVE AREAS AND SCHOOLS

A review of the data in Table 10 reveals that calculated noise emitted by the project would be below EPA’s 55 dBA L_{dn} noise standard at all identified residential NSAs. Noise contributions from the project are low and well below the stated noise limits, therefore, the project noise would remain at or below the specified noise standard. Since noise contribution from the project at the closest residential NSA was estimated at 42.2 dBA L_{eq}, the L_{dn} at the NSA was estimated to be 48.6 dBA, which is below the EPA recommendation of 55 dBA for residential land use. Table 10 lists the overall noise levels (background, contributions, total noise levels) at the 10 highest impacted residential NSAs and the closest school in A-weighted sound levels. These NSAs represent noise levels from the contribution of the project above the nighttime background level (i.e., 32 dBA). A complete list of residential NSAs and their respective noise levels are presented in Appendix C.

Table 10. Summary of Estimated Noise Levels at the Residential Noise Sensitive Areas and Nearest School

ID	Project Contribution	Background Noise Levels*		Total Calculated Noise Levels	
	L_{eq} (dBA)	L_{eq} (dBA)	L_{dn} (dBA)	L_{eq} (dBA)	L_{dn} (dBA)
113	42.2	19.3	27.9	42.2	48.6
79	37.6	19.3	27.9	37.7	44.1
100	37.4	19.3	27.9	37.5	43.9
109	37.2	19.3	27.9	37.3	43.7
94	35.3	19.3	27.9	35.4	41.9
98	35.0	19.3	27.9	35.1	41.6
99	35.0	19.3	27.9	35.1	41.6
86	34.9	19.3	27.9	35.0	41.5
75	34.1	19.3	27.9	34.2	40.7
111	34.0	19.3	27.9	34.1	40.6
Nearest School	0.0	19.3	27.9	19.3	27.9

* 16 dBA was the daytime residual level (7:00 a.m.–7:00 p.m.) and 22 dBA was the nighttime residual level (10:00 p.m.–7:00 a.m.) (Blickley et al. 2012).

A number of noise contour grid maps were generated by SoundPlan software and are presented in Appendix D. The maps depict the extent of noise propagation from the SoundPlan models that were developed for the noise impact assessment. The noise contour maps illustrate the extent of cumulative noise associated with the proposed development. It is important to note that the extent of the impacts depicted in these figures does not include the contribution of the existing background noise.

An isopleth of the entire area, which also depicts the residential receptors and schools evaluated, is presented in Appendix D. Figure D-2 presents the isopleth that shows the color contour noise levels in dBA for the project’s contribution.

5.2.3.2 GREATER SAGE-GROUSE LEKS

The greater sage-grouse is a bird common to the siting corridors. Leks, or areas where sage-grouse congregate in the spring, are prevalent in the siting corridors and vicinity. In all, 23 sage-grouse leks (occupied, unoccupied, and unknown) were included in the analysis. Table 11 presents the estimated noise levels at the perimeter of the analyzed leks (0.25 miles from center of the lek).

Table 11. Summary of Estimated Noise Levels at Greater Sage-Grouse Leks

Lek ID	Status	Project Contribution	Background Noise Levels*		Total Calculated Noise Levels		Potential Noise Increase	
		L_{eq} (dBA)	L_{eq} (dBA)	L_{dn} (dBA)	L_{eq} (dBA)	L_{dn} (dBA)	L_{eq} (dBA)	L_{dn} (dBA)
				Occupied				
2M086	Occupied	0.0	19.3	27.9	19.3	27.9	0.0	0.0
4L044	Occupied	0.0	19.3	27.9	19.3	27.9	0.0	0.0

Lek ID	Status	Project Contribution	Background Noise Levels*		Total Calculated Noise Levels		Potential Noise Increase	
		L_{eq} (dBA)	L_{eq} (dBA)	L_{dn} (dBA)	L_{eq} (dBA)	L_{dn} (dBA)	L_{eq} (dBA)	L_{dn} (dBA)
4L137	Occupied	0.0	19.3	27.9	19.3	27.9	0.0	0.0
4L139	Occupied	0.0	19.3	27.9	19.3	27.9	0.0	0.0
4L148	Occupied	0.0	19.3	27.9	19.3	27.9	0.0	0.0
4L152	Occupied	0.0	19.3	27.9	19.3	27.9	0.0	0.0
4L156	Occupied	0.0	19.3	27.9	19.3	27.9	0.0	0.0
4L159	Occupied	0.0	19.3	27.9	19.3	27.9	0.0	0.0
4L160	Occupied	0.0	19.3	27.9	19.3	27.9	0.0	0.0
Unoccupied								
4L120	Unoccupied	0.0	19.3	27.9	19.3	27.9	0.0	0.0
4L136	Unoccupied	0.0	19.3	27.9	19.3	27.9	0.0	0.0
Unknown								
2J013	Unknown	51.8	19.3	27.9	51.8	58.2	32.5	30.3
2J010	Unknown	41.2	19.3	27.9	41.2	47.7	22.0	19.7
2J012	Unknown	38.7	19.3	27.9	38.7	45.2	19.5	17.3
2J021	Unknown	36.0	19.3	27.9	36.1	42.6	16.8	14.6
2J011	Unknown	35.1	19.3	27.9	35.2	41.7	16.0	13.8
2J014	Unknown	32.2	19.3	27.9	32.4	39.0	13.2	11.0
2J017	Unknown	0.0	19.3	27.9	19.3	27.9	0.1	0.0
4L008	Unknown	0.0	19.3	27.9	19.3	27.9	0.1	0.0
4L040	Unknown	0.0	19.3	27.9	19.3	27.9	0.1	0.0
4L041	Unknown	0.0	19.3	27.9	19.3	27.9	0.1	0.0
4L042	Unknown	0.0	19.3	27.9	19.3	27.9	0.1	0.0
4L108	Unknown	0.0	19.3	27.9	19.3	27.9	0.1	0.0

Note: Values may not sum precisely due to rounding.

* 16 dBA was the daytime residual level (7:00 a.m.–7:00 p.m.) and 22 dBA was the nighttime residual level (10:00 p.m.–7:00 a.m.) (Blickley et al. 2012).

As shown in Table 11, the assessment results reveal that maximum sound level increase at occupied sage-grouse leks from the operation of the project would not exceed 10 dBA above background noise levels. No change in ambient noise levels was predicted at the occupied leks with the closest located 3.1 miles of the siting corridor. A complete list of the analyzed leks and their respective noise levels are presented in Appendix C.

A contour map depicting sound contours at 3-dBA intervals is presented in Figure D-3 of Appendix D.

5.2.3.3 RAPTOR NESTS

A total of 68 raptor nests were included in the sound propagation model. A summary of the estimated noise levels at the 10 closest raptor nests within 0.5 mile of the preliminary siting corridors is presented in

Table 12. The highest modeled sound level (L_{eq}) at a raptor nest is 53.0 dBA; when added with the daytime and nighttime background noise level, the noise level (L_{dn}) is estimated as 59.4 dBA.

Table 12. Summary of Estimated Noise Levels at Raptor Nests

Nest ID	Status	Project Contribution	Background Noise Levels*		Total Calculated Noise Levels		Potential Noise Increase	
		L_{eq} (dBA)	L_{eq} (dBA)	L_{dn} (dBA)	L_{eq} (dBA)	L_{dn} (dBA)	L_{eq} (dBA)	L_{dn} (dBA)
31	Inactive	53.0	19.3	27.9	53.0	59.4	33.7	31.5
53	Inactive	51.2	19.3	27.9	51.2	57.6	31.9	29.7
54	Common raven – occupied active	49.9	19.3	27.9	49.9	56.3	30.6	28.4
20	Common raven – occupied active	46.7	19.3	27.9	46.7	53.1	27.4	25.2
32	Inactive	44.6	19.3	27.9	44.6	51.0	25.4	23.1
18	Ferruginous hawk – occupied active	44.4	19.3	27.9	44.4	50.8	25.2	22.9
57	Common raven – occupied active	41.9	19.3	27.9	41.9	48.3	22.7	20.4
33	Inactive	41.5	19.3	27.9	41.5	48.0	22.3	20.0
56	Common raven – occupied active	39.9	19.3	27.9	39.9	46.4	20.7	18.5
19	Common raven – occupied active	39.1	19.3	27.9	39.1	45.6	19.9	17.7

Note: Values may not sum precisely due to rounding.

* 16 dBA was the daytime residual level (7:00 a.m.–7:00 p.m.) and 22 dBA was the nighttime residual level (10:00 p.m.–7:00 a.m.) (Blickley et al. 2012).

As shown in Table 12, noise levels (L_{eq}) at a number of identified raptor nests would exceed the 10 dBA above-background levels because of their proximity to one of the proposed wind turbines. In all, 18 raptor nests would be affected by noise levels in excess of a 10 dBA increase over existing background conditions. An isopleth of the modeled results is shown in Figure D-4 of Appendix D. Results are presented as contour lines representing 3-dB increments of calculated A-weighted sound pressure levels. Appendix C provides a list of the calculated sound pressure levels at each receiver in tabular format.

5.2.3.4 LIVESTOCK

The turbines' total sound power level would be 124.6 dB, with the acoustic center of that noise at approximately 321 feet above the ground. At that height, the sound would lessen at ground level to 73.9 dB from the turbine hub and 85.3 dB from the blade. The noise at ground level would be within the threshold of known information on livestock noise tolerance and adaptability. Similarly, the transformers' highest total sound power would be 109.5 dB, with an acoustic center of 6.56 feet above the ground. At 50 feet from a transformer, the estimated sound power level would be 74.8 dB, which is below the tolerance and adaptability level detailed in the known information on livestock noise tolerance. Livestock would potentially not tolerate the sound level directly adjacent to the transformer or cumulative sound in some areas; however, tolerances would be within acceptable tolerance and adaptability by moving a short distance away.

5.2.4 *Maintenance Activities*

Maintenance activities would include periodic site visits to wind turbines, transmission lines, substations, and auxiliary structures. These activities would involve vehicle traffic with relatively low noise levels. Infrequent maintenance activities would be anticipated, such as road maintenance work, or repair or replacement of wind turbines or auxiliary equipment. However, anticipated noise levels from maintenance activities would be lower than that from construction activities.

5.2.5 *Transmission Lines*

Operation noise outputs of transmission lines would be minimal and would generally be limited to corona noise and the occasional maintenance vehicle surveying the transmission line. MVE anticipates that transmission line operational noise sources would not permanently increase ambient noise levels above the background conditions at the nearest sensitive receptor. Estimated noise levels for a 500-kV transmission line under rainy conditions (worst-case scenario for noise generated from corona effect) was estimated to be 52 dBA at a distance 50 feet (Power Engineers 2014). Transmission line noise would attenuate to background levels at 2,349 feet from centerline. Furthermore, the transmission line would be designed to eliminate corona noise.

5.3 Decommissioning

Estimated noise levels from decommissioning activities would be comparable to but less than those associated with the construction of the project, because the activity type and level would be similar but shorter in duration. Decommissioning activities for the project would be completed over a 2-year period. The estimated schedule length for decommissioning is tied to assumptions about the amount of equipment mobilized, crew sizes, weather and climate conditions, and overall productivity, and accordingly, the potential impacts would be temporary and intermittent in nature.

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APPENDIX A

Roadway Construction Noise Model (RCNM)
Construction Noise Calculations

Lava Ridge Wind Project
Access Roads - Construction
Noise Impact Assessment

Project Land Use:	Industrial

Baseline Noise

Baselines (Representative Existing Conditions)[1]			
LAeq	Ldn	Day	Night
(dBA)	(dBA)	(dBA)	(dBA)
19.3	27.9	16	22

1 Source: Patricelli, Gail. The impacts of noise on greater sage-grouse: A discussion of current management strategies in Wyoming with recommendations for further research and interim protections.

Sources

Description	Modeled As	Quantity	Acoustical Usage Factor[1] %/hr.	Noise Level Reference Distance [1] (feet)	Sound Pressure Level @ reference distance [1] (dBA)
Forklift	All Other Equipment > 5 HP	1	50	50	85
Flatbed	Flat Bed Truck	1	40	50	74
RT Crane	Crane	1	16	50	81
Dozers	Dozer	1	40	50	82
Compaction Equipment	Compactor (ground)	1	20	50	83
Belly Dump	Dump Truck	1	40	50	76
Excavator	Excavator	1	40	50	81
Motor Grader	Grader	1	40	50	85
Scraper	Scraper	1	40	50	84
Tractor	Tractor	1	40	50	84
Water truck	Pickup Truck	1	40	50	75
Loader	Front End Loader	1	40	50	79
Generator	Generator	1	50	50	81

[1] FHWA -Construction Noise Handbook - Table 9.1 RCNM Default Noise Emission Reference Levels and Usage Factors

Results @ 25 feet

Equipment	Construction Levels	
	Leq (dBA)	L_{Max} (dBA)
All Other Equipment > 5 HP	88.0	91.0
Flat Bed Truck	76.0	80.0
Crane	79.1	87.0
Dozer	84.0	88.0
Compactor (ground)	82.0	89.0
Dump Truck	78.0	82.0
Excavator	83.0	87.0
Grader	87.0	91.0
Scraper	86.0	90.0
Tractor	86.0	90.0
Pickup Truck	77.0	81.0
Front End Loader	81.0	85.0
Generator	84.0	87.0
Total [1]	**95.0**	**91.0**

[1] Noise Level assumes all equipment is operating simultaneously.

Distance (ft)	Construction Leq	Construction Lmax [1]	Combined Ambient + Calculated Noise Level, LAeq	Daytime Noise Level, Lday	Nighttime Noise Level, Lnight [2]	Combined Ambient + Calculated Noise Level, Ldn	Potential Noise Increase, Ldn	Potential Noise Increase, Leq
	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)
25	95.0	91.0	92.0	94.3	22.0	92.0	64.1	72.7
50	89.0	85.0	86.0	88.3	22.0	86.0	58.1	66.7
100	83.0	79.0	80.0	82.3	22.0	80.0	52.1	60.7
200	76.9	73.0	73.9	76.3	22.0	73.9	46.0	54.6
250	75.0	71.0	72.0	74.3	22.0	72.0	44.1	52.7
500	69.0	65.0	66.0	68.3	22.0	66.0	38.1	46.7
1000	63.0	59.0	60.0	62.3	22.0	60.0	32.1	40.7
2000	56.9	53.0	53.9	56.3	22.0	54.0	26.1	34.6
1315	60.6	56.6	57.6	59.9	22.0	57.6	29.7	38.3
35966	31.9	27.9	29.3	31.3	22.0	31.4	3.5	10.0

[1] Calculated Lmax is the loudest individual value.

[2] Assumes daytime construction only

Lava Ridge Wind Project
Collection - Construction
Noise Impact Assessment

Project Land Use:	Industrial

Baseline Noise

Baselines (Representative Existing Conditions)[1]			
LAeq	Ldn	Day	Night
(dBA)	(dBA)	(dBA)	(dBA)
19.3	27.9	16	22

1 Source: Patricelli, Gail. The impacts of noise on greater sage-grouse: A discussion of current management strategies in Wyoming with recommendations for further research and interim protections.

Sources

Description	Modeled As	Quantity	Acoustical Usage Factor[1]	Noise Level Reference Distance [1]	Sound Pressure Level @ reference distance [1]
			%/hr.	(feet)	(dBA)
Trencher	Trencher	1	50	50	80
Dozer	Dozer	1	40	50	82
Motor Grader	Grader	1	40	50	85
Tractor	Tractor	1	40	50	84
Backhoe	Backhoe	1	40	50	78
Generator	Generator	1	50	50	81

[1] FHWA -Construction Noise Handbook - Table 9.1 RCNM Default Noise Emission Reference Levels and Usage Factors

Results @ 25 feet

Equipment	Construction Levels	
	Leq (dBA)	L_{Max} (dBA)
Trencher	83.0	86.0
Dozer	84.0	88.0
Grader	87.0	91.0
Tractor	86.0	90.0
Backhoe	80.0	84.0
Generator	84.0	87.0
Total[1]	**92.3**	**91.0**

[1] Noise Level assumes all equipment is operating simultaneously.

Distance (ft)	Construction Leq	Construction Lmax [1]	Combined Ambient + Calculated Noise Level, LAeq	Daytime Noise Level, Lday	Nighttime Noise Level, Lnight [2]	Combined Ambient + Calculated Noise Level, Ldn	Potential Noise Increase, Ldn	Potential Noise Increase, Leq
	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)
25	92.3	91.0	89.3	91.7	22.0	89.3	61.4	70.0
50	86.3	85.0	83.3	85.7	22.0	83.3	55.4	64.0
100	80.3	79.0	77.3	79.6	22.0	77.3	49.4	58.0
200	74.3	73.0	71.3	73.6	22.0	71.3	43.4	52.0
250	72.3	71.0	69.3	71.7	22.0	69.3	41.4	50.0
500	66.3	65.0	63.3	65.7	22.0	63.3	35.4	44.0
1000	60.3	59.0	57.3	59.6	22.0	57.3	29.4	38.0
2000	54.3	53.0	51.3	53.6	22.0	51.3	23.4	32.0
5000	46.3	45.0	43.3	45.7	22.0	43.4	15.5	24.0
26505	31.9	30.5	29.3	31.3	22.0	31.4	3.5	10.0

[1] Calculated Lmax is the loudest individual value.

[2] Assumes daytime construction only

Lava Ridge Wind Project
Foundations - Construction
Noise Impact Assessment

Project Land Use:	Industrial

Baseline Noise

Baselines (Representative Existing Conditions)[1]			
LAeq	Ldn	Day	Night
(dBA)	(dBA)	(dBA)	(dBA)
19.3	27.9	16	22

1 Source: Patricelli, Gail. The impacts of noise on greater sage-grouse: A discussion of current management strategies in Wyoming with recommendations for further research and interim protections.

Sources

Description	Modeled As	Quantity	Acoustical Usage Factor[1]	Noise Level Reference Distance [1]	Sound Pressure Level @ reference distance [1]
			%/hr.	(feet)	(dBA)
Excavator	Excavator	1	40	50	81
Dozer	Dozer	1	40	50	82
Compaction Equipment	Compactor (ground)	1	20	50	83
Concrete Truck	Concrete Mixer Truck	1	40	50	79
Flatbed Truck	Flat Bed Truck	1	40	50	74
Loader	Front End Loader	1	40	50	79
Crane	Crane	1	16	50	81
Concrete Telebelts	Concrete Pump Truck	1	20	50	81
Forklift	All Other Equipment > 5 HP	1	50	50	85
Generator	Generator	1	50	50	81

[1] FHWA -Construction Noise Handbook - Table 9.1 RCNM Default Noise Emission Reference Levels and Usage Factors

Results @ 25 feet

Equipment	Construction Levels	
	Leq (dBA)	L_{Max} (dBA)
Excavator	83.0	87.0
Dozer	84.0	88.0
Compactor (ground)	82.0	89.0
Concrete Mixer Truck	81.0	85.0
Flat Bed Truck	76.0	80.0
Front End Loader	81.0	85.0
Crane	79.1	87.0
Concrete Pump Truck	80.0	87.0
All Other Equipment > 5 HP	88.0	91.0
Generator	84.0	87.0
Total [1]	**93.0**	**91.0**

[1] Noise Level assumes all equipment is operating simultaneously.

Distance (ft)	Construction Leq	Construction Lmax [1]	Combined Ambient + Calculated Noise Level, LAeq	Daytime Noise Level, Lday	Nighttime Noise Level, Lnight [2]	Combined Ambient + Calculated Noise Level, Ldn	Potential Noise Increase, Ldn	Potential Noise Increase, Leq
	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)
25	93.0	91.0	89.9	92.3	22.0	89.9	62.0	70.6
50	86.9	85.0	83.9	86.3	22.0	83.9	56.0	64.6
100	80.9	79.0	77.9	80.2	22.0	77.9	50.0	58.6
200	74.9	73.0	71.9	74.2	22.0	71.9	44.0	52.6
250	73.0	71.0	69.9	72.3	22.0	69.9	42.0	50.6
500	66.9	65.0	63.9	66.3	22.0	63.9	36.0	44.6
1000	60.9	59.0	57.9	60.2	22.0	57.9	30.0	38.6
2000	54.9	53.0	51.9	54.2	22.0	51.9	24.0	32.6
5000	46.9	45.0	43.9	46.3	22.0	44.0	16.1	24.6
28410	31.9	29.9	29.3	31.3	22.0	31.4	3.5	10.0

[1] Calculated Lmax is the loudest individual value.

[2] Assumes daytime construction only

Lava Ridge Wind Project
Substation - Construction
Noise Impact Assessment

Project Land Use:	Industrial

Baseline Noise

Baselines (Representative Existing Conditions)[1]			
LAeq	**Ldn**	**Day**	**Night**
(dBA)	**(dBA)**	**(dBA)**	**(dBA)**
19.3	27.9	16	22

1 Source: Patricelli, Gail. The impacts of noise on greater sage-grouse: A discussion of current management strategies in Wyoming with recommendations for further research and interim protections.

Sources

Description	**Modeled As**	**Quantity**	**Acoustical Usage Factor[1]**	**Noise Level Reference Distance [1]**	**Sound Pressure Level @ reference distance [1]**
			%/hr.	**(feet)**	**(dBA)**
Dozer	Dozer	1	40	50	82
Excavator	Excavator	1	40	50	81
Drill Rig	Drill Rig Truck	1	20	50	79
Bucket Truck	Pickup Truck	1	40	50	75
Cranes	Crane	1	16	50	81
Skidloaders	Front End Loader	1	40	50	79
Generator	Generator	1	50	50	81

[1] FHWA -Construction Noise Handbook - Table 9.1 RCNM Default Noise Emission Reference Levels and Usage Factors

Results @ 25 feet

Equipment	**Construction Levels**	
	Leq (dBA)	**L_{Max} (dBA)**
Dozer	84.0	88.0
Excavator	83.0	87.0
Drill Rig Truck	78.0	85.0
Pickup Truck	77.0	81.0
Crane	79.1	87.0
Front End Loader	81.0	85.0
Generator	84.0	87.0
Total [1]	**90.1**	**88.0**

[1] Noise Level assumes all equipment is operating simultaneously.

Distance (ft)	Construction Leq	Construction Lmax [1]	Combined Ambient + Calculated Noise Level, LAeq	Daytime Noise Level, Lday	Nighttime Noise Level, Lnight [2]	Combined Ambient + Calculated Noise Level, Ldn	Potential Noise Increase, Ldn	Potential Noise Increase, Leq
	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)
25	90.1	88.0	87.1	89.5	22.0	87.1	59.2	67.8
50	84.1	82.0	81.1	83.4	22.0	81.1	53.2	61.8
100	78.1	76.0	75.1	77.4	22.0	75.1	47.2	55.8
200	72.1	70.0	69.1	71.4	22.0	69.1	41.2	49.8
250	70.1	68.0	67.1	69.5	22.0	67.1	39.2	47.8
500	64.1	62.0	61.1	63.4	22.0	61.1	33.2	41.8
1000	58.1	56.0	55.1	57.4	22.0	55.1	27.2	35.8
2000	52.1	50.0	49.1	51.4	22.0	49.1	21.2	29.8
5000	44.1	42.0	41.1	43.4	22.0	41.3	13.4	21.8
20525	31.9	29.7	29.3	31.3	22.0	31.4	3.5	10.0

[1] Calculated Lmax is the loudest individual value.

[2] Assumes daytime construction only

Lava Ridge Wind Project
Transmission - Construction
Noise Impact Assessment

Project Land Use:	Industrial

Baseline Noise

Baselines (Representative Existing Conditions)[1]			
LAeq	Ldn	Day	Night
(dBA)	(dBA)	(dBA)	(dBA)
19.3	27.9	16	22

1 Source: Patricelli, Gail. The impacts of noise on greater sage-grouse: A discussion of current management strategies in Wyoming with recommendations for further research and interim protections.

Sources

Description	Modeled As	Quantity	Acoustical Usage Factor[1]	Noise Level Reference Distance [1]	Sound Pressure Level @ reference distance [1]
			%/hr.	(feet)	(dBA)
Trencher	Trencher	1	50	50	80
Dozer	Dozer	1	40	50	82
Motor Grader	Grader	1	40	50	85
Tractor	Tractor	1	40	50	84
Backhoe	Backhoe	1	40	50	78
Generator	Generator	1	50	50	81

[1] FHWA -Construction Noise Handbook - Table 9.1 RCNM Default Noise Emission Reference Levels and Usage Factors

Results @ 25 feet

Equipment	Construction Levels	
	Leq (dBA)	L_{Max} (dBA)
Trencher	83.0	86.0
Dozer	84.0	88.0
Grader	87.0	91.0
Tractor	86.0	90.0
Backhoe	80.0	84.0
Generator	84.0	87.0
Total [1]	**92.3**	**91.0**

[1] Noise Level assumes all equipment is operating simultaneously.

Distance (ft)	Construction Leq	Construction Lmax [1]	Combined Ambient + Calculated Noise Level, LAeq	Daytime Noise Level, Lday	Nighttime Noise Level, Lnight [2]	Combined Ambient + Calculated Noise Level, Ldn	Potential Noise Increase, Ldn	Potential Noise Increase, Leq
	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)
25	92.3	91.0	89.3	91.7	22.0	89.3	61.4	70.0
50	86.3	85.0	83.3	85.7	22.0	83.3	55.4	64.0
100	80.3	79.0	77.3	79.6	22.0	77.3	49.4	58.0
200	74.3	73.0	71.3	73.6	22.0	71.3	43.4	52.0
250	72.3	71.0	69.3	71.7	22.0	69.3	41.4	50.0
500	66.3	65.0	63.3	65.7	22.0	63.3	35.4	44.0
1000	60.3	59.0	57.3	59.6	22.0	57.3	29.4	38.0
2000	54.3	53.0	51.3	53.6	22.0	51.3	23.4	32.0
5000	46.3	45.0	43.3	45.7	22.0	43.4	15.5	24.0
26505	31.9	30.5	29.3	31.3	22.0	31.4	3.5	10.0

[1] Calculated Lmax is the loudest individual value.

[2] Assumes daytime construction only

Lava Ridge Wind Project
WTG Erection - Construction
Noise Impact Assessment

Project Land Use:	Industrial

Baseline Noise

Baselines (Representative Existing Conditions)[1]			
LAeq	Ldn	Day	Night
(dBA)	(dBA)	(dBA)	(dBA)
19.3	27.9	16	22

1 Source: Patricelli, Gail. The impacts of noise on greater sage-grouse: A discussion of current management strategies in Wyoming with recommendations for further research and interim protections.

Sources

Description	Modeled As	Quantity	Acoustical Usage Factor[1]	Noise Level Reference Distance [1]	Sound Pressure Level @ reference distance [1]
			%/hr.	(feet)	(dBA)
Forklift	All Other Equipment > 5 HP	1	50	50	85
Flatbed	Flat Bed Truck	1	40	50	74
RT Cranes	Crane	1	16	50	81
Crawler Crane	Crane	1	16	50	81
Dozer	Dozer	1	40	50	82
Compaction Equipment	Compactor (ground)	1	20	50	83
Generator	Generator	1	50	50	81

[1] FHWA -Construction Noise Handbook - Table 9.1 RCNM Default Noise Emission Reference Levels and Usage Factors

Results @ 25 feet

Equipment	Construction Levels	
	Leq (dBA)	L_{Max} (dBA)
All Other Equipment > 5 HP	88.0	91.0
Flat Bed Truck	76.0	80.0
Crane	79.1	87.0
Crane	79.1	87.0
Dozer	84.0	88.0
Compactor (ground)	82.0	89.0
Generator	84.0	87.0
Total [1]	**91.8**	**91.0**

[1] Noise Level assumes all equipment is operating simultaneously.

Distance (ft)	Construction Leq	Construction Lmax [1]	Combined Ambient + Calculated Noise Level, LAeq	Daytime Noise Level, Lday	Nighttime Noise Level, Lnight [2]	Combined Ambient + Calculated Noise Level, Ldn	Potential Noise Increase, Ldn	Potential Noise Increase, Leq
	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)
25	91.8	91.0	88.7	91.1	22.0	88.7	60.8	69.4
50	85.7	85.0	82.7	85.1	22.0	82.7	54.8	63.4
100	79.7	79.0	76.7	79.0	22.0	76.7	48.8	57.4
200	73.7	73.0	70.7	73.0	22.0	70.7	42.8	51.4
250	71.8	71.0	68.7	71.1	22.0	68.7	40.8	49.4
500	65.7	65.0	62.7	65.1	22.0	62.7	34.8	43.4
1000	59.7	59.0	56.7	59.0	22.0	56.7	28.8	37.4
2000	53.7	53.0	50.7	53.0	22.0	50.7	22.8	31.4
5000	45.7	45.0	42.7	45.1	22.0	42.9	15.0	23.4
24776	31.9	31.1	29.3	31.3	22.0	31.4	3.5	10.0

[1] Calculated Lmax is the loudest individual value.

[2] Assumes daytime construction only

APPENDIX B

Noise-Emitting Sources

Source name	dB(A)	Frequency spectrum [dB(A)]									
		16	31	63	125	250	500	1	2	4	8
		Hz	Hz	Hz	Hz	Hz	Hz	kHz	kHz	kHz	kHz
SUB1	96.3	-	-	52.8	70.9	86.4	93.8	89	87.2	80	73.9
SUB2	96.3	-	-	52.8	70.9	86.4	93.8	89	87.2	80	73.9
SUB3	96.3	-	-	52.8	70.9	86.4	93.8	89	87.2	80	73.9
SUB4	96.3	-	-	52.8	70.9	86.4	93.8	89	87.2	80	73.9
SUB5	96.3	-	-	52.8	70.9	86.4	93.8	89	87.2	80	73.9
SUB6	96.3	-	-	52.8	70.9	86.4	93.8	89	87.2	80	73.9
L5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
L6	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
L7	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
L8	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
N1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
N2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
N3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
N4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
N5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
O1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
O2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
O3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
O4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
O5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
O6	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
O7	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
O8	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
O9	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
O10	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
Q1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
Q2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
Q3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
Q4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
Q5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
Q6	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
Q7	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
Q8	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
S1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
S2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
S3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
S4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
S5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
S6	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
S7	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
L23	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
L24	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
L25	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
L26	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
L27	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
L28	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
O20	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
O21	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
O22	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
O23	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
O24	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5

Source name	dB(A)	Frequency spectrum [dB(A)]									
		16 Hz	31 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
O25	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
O26	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
O27	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
O28	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
O29	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
O30	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
O31	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
Q16	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
Q17	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
Q18	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
Q19	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
Q20	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
Q21	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
Q22	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
Q23	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
Q24	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
Q25	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
Q26	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
Q27	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
Q28	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
Q29	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
T10	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
T11	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
T12	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
T13	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
T14	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
T15	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
T16	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
T17	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
T18	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
T19	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
T20	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
T21	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
T22	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
T23	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
T24	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
T25	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
T26	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
T27	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
T28	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
T29	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
X1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
X2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
X3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
X4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
X5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
I10	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
I11	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
I12	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
I13	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
I14	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
I15	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
I16	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5

Source name	dB(A)	Frequency spectrum [dB(A)]									
		16	31	63	125	250	500	1	2	4	8
		Hz	Hz	Hz	Hz	Hz	Hz	kHz	kHz	kHz	kHz
I17	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
I18	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
I19	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
I20	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
I21	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
I22	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
K1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
K2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
K3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
K4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
K5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
K6	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
K7	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
K8	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
K9	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
K10	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
K11	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
K12	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
K13	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
K14	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
K15	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
K16	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
K17	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
K18	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
K19	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
K20	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
K21	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
K22	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
K23	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
K24	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
K25	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
K26	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
K27	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
M1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
M2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
M3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
M4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
M5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
M6	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
M7	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
M8	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
M9	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
M10	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
M11	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
M12	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
M13	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
M14	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
M15	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
M16	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
M17	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
M18	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
M19	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
M20	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5

Source name	dB(A)	Frequency spectrum [dB(A)]									
		16 Hz	31 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
M21	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
M22	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
M23	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
M24	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
M25	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
P1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
P2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
P3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
P4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
P5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
P6	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
P7	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
P8	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
P9	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
P10	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
P11	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
P12	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
P13	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
P14	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
P15	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
P16	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
P17	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
P18	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
P19	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
R1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
R2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
R3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
R4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
R5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
R6	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
R7	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
R8	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
R9	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
R10	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
R11	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
R12	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
R13	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
R14	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
R15	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
R16	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
R17	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
R18	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
R19	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
R20	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
R21	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
R22	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
R23	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
U6	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
U7	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
U8	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
U9	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
W1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
W2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5

Source name	dB(A)	Frequency spectrum [dB(A)]									
		16 Hz	31 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
W3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
W4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
W5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
W6	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AB1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AB2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AB3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AB4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AB5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AB6	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AB7	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AB8	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AB9	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AB10	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AB11	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AB12	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AB13	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AB14	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AB15	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AE1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AE2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AE3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AE4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AE5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AE6	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AE7	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AE8	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AE9	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AE10	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AE11	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AE12	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AE13	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AE14	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AE15	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AE16	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AE17	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AE18	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AH10	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AH11	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AH12	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AH13	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AH14	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AH15	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AH16	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AH17	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AH18	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AH19	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AH20	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AH21	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AH22	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AH23	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AH24	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AH25	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5

Source name	dB(A)	Frequency spectrum [dB(A)]									
		16 Hz	31 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
AH26	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AH27	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AH28	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AJ4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AJ5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AJ6	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AJ7	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AJ8	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AJ9	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AJ10	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AI1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AI2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AI3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AI4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AI5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AI6	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
E1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
E2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
E3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
E4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
E5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
E6	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
E7	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
E8	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
E9	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
E10	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
E11	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
E12	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
E13	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
H1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
H2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
H3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
H4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
H5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
I1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
I2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
I3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
I4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
I5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
I6	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
I7	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
I8	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
L9	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
L10	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
L11	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
L12	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
L13	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
L14	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
L15	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
L16	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
L17	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
L18	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
L19	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5

Source name	dB(A)	Frequency spectrum [dB(A)]									
		16 Hz	31 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
L20	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
L21	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
L22	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
O11	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
O12	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
O13	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
O14	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
O15	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
O16	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
O18	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
O19	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
Q9	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AL1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
T1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
T2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
T3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
T4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
T5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
T6	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
T7	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
T8	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
T9	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
U1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
U2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
U3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
U4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
U5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
U10	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
U11	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
U12	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
U13	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AL2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AH3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AH4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AH5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AH6	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AH7	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AH8	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AH9	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
C1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
C2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
C3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
C4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
C5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
C6	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
C7	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
C8	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
C9	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
C10	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
C11	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
C12	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
C13	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
C14	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5

Source name	dB(A)	Frequency spectrum [dB(A)]									
		16	31	63	125	250	500	1	2	4	8
		Hz	Hz	Hz	Hz	Hz	Hz	kHz	kHz	kHz	kHz
C15	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
C16	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
C17	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
C18	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
M26	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
M27	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
M28	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
L4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
L3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
L2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
L1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
H6	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
J1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
Q15	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
Q14	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
Q13	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
Q10	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AL8	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AL7	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AL6	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AL5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AJ3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AL4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AL3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AJ2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AJ1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AH2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AH1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AF2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
Q11	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
Q12	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
I9	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AE19	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AF1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AE20	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AC2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
AC1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-V1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-V2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-V3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-V4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-V5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-V6	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-AA1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-AA2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-AA3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-AA4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-AA5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-AA6	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-AA7	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-AA8	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-AA9	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-AG1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5

Source name	dB(A)	Frequency spectrum [dB(A)]									
		16	31	63	125	250	500	1	2	4	8
		Hz	Hz	Hz	Hz	Hz	Hz	kHz	kHz	kHz	kHz
(A)-AG2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-AG3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-AG4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-AG5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-AG6	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-AG7	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-AG8	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-AG9	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-AG10	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-AK1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-AK2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-AK3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-AK4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-AK5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-AK6	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-AK7	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-AK8	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-AK9	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-AH1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-AC1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-AC2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-U1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-U2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-U3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-U4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-M1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-M2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-M3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-M4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-K1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-K2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-K3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-K4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-K5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-L1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-J15	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-J14	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-J13	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-J12	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-J11	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-J10	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-J9	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-J8	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-J7	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-J6	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-J5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-J4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-J3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-J2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-J1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-H1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-H2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-H3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5

Source name	dB(A)	Frequency spectrum [dB(A)]									
		16	31	63	125	250	500	1	2	4	8
		Hz	Hz	Hz	Hz	Hz	Hz	kHz	kHz	kHz	kHz
(A)-H4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-F4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-F3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-F2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-F1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-D1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-D2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-D3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-D4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-G1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-G2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-G3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-G4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-G5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-G6	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-G7	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-C1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-C2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-C3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-C4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-C5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-C6	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-C7	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-B1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-B2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-B3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-A1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-A2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-A3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-A4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-A5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-A6	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-A7	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-A8	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-A9	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-A10	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-E1	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-E2	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-E3	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-E4	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-E5	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
(A)-6	108	59.2	73.2	82.8	87.5	93.3	98.4	98.6	95.1	86	63.5
BESS1	86.2	-	-	-	-	-	-	-	-	-	-
BESS2	86.4	-	-	-	-	-	-	-	-	-	-

APPENDIX C

Sound Propagation Model Results

Lava Ridge Wind Project
Sage-grouse Leks
Operation Noise Impacts

No.	Receiver name/Type	Project Contribution	Background Noise Levels		Total Calculated Noise Levels	
		Leq	Leq	Ldn	Leq	Ldn
		dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
2J010	Unknown	41.2	19.3	27.9	41.2	47.7
2J011	Unknown	35.1	19.3	27.9	35.2	41.7
2J012	Unknown	38.7	19.3	27.9	38.7	45.2
2J013	Unknown	51.8	19.3	27.9	51.8	58.2
2J014	Unknown	32.2	19.3	27.9	32.4	39.0
2J017	Unknown	0	19.3	27.9	19.3	27.9
2J021	Unknown	36	19.3	27.9	36.1	42.6
2M086	Occupied	0	19.3	27.9	19.3	27.9
4L008	Unknown	0	19.3	27.9	19.3	27.9
4L040	Unknown	0	19.3	27.9	19.3	27.9
4L041	Unknown	0	19.3	27.9	19.3	27.9
4L042	Unknown	0	19.3	27.9	19.3	27.9
4L044	Occupied	0	19.3	27.9	19.3	27.9
4L108	Unknown	0	19.3	27.9	19.3	27.9
4L120	Unoccupied	0	19.3	27.9	19.3	27.9
4L136	Unoccupied	0	19.3	27.9	19.3	27.9
4L137	Occupied	0	19.3	27.9	19.3	27.9
4L139	Occupied	0	19.3	27.9	19.3	27.9
4L148	Occupied	0	19.3	27.9	19.3	27.9
4L152	Occupied	0	19.3	27.9	19.3	27.9
4L156	Occupied	0	19.3	27.9	19.3	27.9
4L159	Occupied	0	19.3	27.9	19.3	27.9
4L160	Occupied	0	19.3	27.9	19.3	27.9

Lava Ridge Wind Project
Raptor Nests
Operation Noise Impacts

No.	Receiver name/Type	Project Contribution	Background Noise Levels		Total Calculated Noise Levels	
		Leq	Leq	Ldn	Leq	Ldn
		dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
3	Golden Eagle - Occupied Active	0	19.3	27.9	19.3	27.9
4	Inactive	0	19.3	27.9	19.3	27.9
5	Red-tailed Hawk - Occupied Active	0	19.3	27.9	19.3	27.9
9	Great Horned Owl - Occupied Active	0	19.3	27.9	19.3	27.9
12	Inactive	28.2	19.3	27.9	28.7	35.5
13	Inactive	27.7	19.3	27.9	28.3	35.0
14	Inactive	26.5	19.3	27.9	27.3	34.1
15	Great Horned Owl - Occupied Active	25.8	19.3	27.9	26.7	33.6
16	Great Horned Owl - Occupied Active	0	19.3	27.9	19.3	27.9
17	Ferruginous Hawk - Occupied Active	38.5	19.3	27.9	38.6	45.0
18	Ferruginous Hawk - Occupied Active	44.4	19.3	27.9	44.4	50.8
19	Common Raven - Occupied Active	39.1	19.3	27.9	39.1	45.6
20	Common Raven - Occupied Active	46.7	19.3	27.9	46.7	53.1
21	Inactive	30.8	19.3	27.9	31.1	37.7
22	Red-tailed Hawk - Occupied Active	23.8	19.3	27.9	25.1	32.2
23	Red-tailed Hawk - Occupied Active	15.7	19.3	27.9	20.8	28.9
24	Red-tailed Hawk - Occupied Active	0	19.3	27.9	19.3	27.9
28	Inactive	32	19.3	27.9	32.2	38.8
30	Inactive	0	19.3	27.9	19.3	27.9
31	Inactive	53	19.3	27.9	53.0	59.4
32	Inactive	44.6	19.3	27.9	44.6	51.0
33	Inactive	41.5	19.3	27.9	41.5	48.0
34	Red-tailed Hawk - Occupied Active	0	19.3	27.9	19.3	27.9
35	Red-tailed Hawk - Occupied Active	35.5	19.3	27.9	35.6	42.1
36	Common Raven - Occupied Active	34.9	19.3	27.9	35.0	41.5
37	Inactive	0	19.3	27.9	19.3	27.9
38	Inactive	0	19.3	27.9	19.3	27.9
39	Inactive	0	19.3	27.9	19.3	27.9
40	Swainson's Hawk - Occupied Active	0	19.3	27.9	19.3	27.9
41	Inactive	0	19.3	27.9	19.3	27.9
42	Swainson's Hawk - Occupied Active	0	19.3	27.9	19.3	27.9
43	Common Raven - Occupied Active	0	19.3	27.9	19.3	27.9
44	Inactive	0	19.3	27.9	19.3	27.9
45	Inactive	0	19.3	27.9	19.3	27.9
46	Red-tailed Hawk - Occupied Active	0	19.3	27.9	19.3	27.9
47	Red-tailed Hawk - Occupied Active	0	19.3	27.9	19.3	27.9
48	Red-tailed Hawk - Occupied Active	12.3	19.3	27.9	20.1	28.4
49	Great Horned Owl - Occupied Active	0	19.3	27.9	19.3	27.9
50	Red-tailed Hawk - Occupied Active	0	19.3	27.9	19.3	27.9
51	Inactive	26.9	19.3	27.9	27.6	34.4
52	Red-tailed Hawk - Occupied Active	18.1	19.3	27.9	21.7	29.6
53	Inactive	51.2	19.3	27.9	51.2	57.6
54	Common Raven - Occupied Active	49.9	19.3	27.9	49.9	56.3
55	Red-tailed Hawk - Occupied Active	0	19.3	27.9	19.3	27.9
56	Common Raven - Occupied Active	39.9	19.3	27.9	39.9	46.4
57	Common Raven - Occupied Active	41.9	19.3	27.9	41.9	48.3
58	Swainson's Hawk - Occupied Active	0	19.3	27.9	19.3	27.9
59	Unknown - Occupied Inactive	0	19.3	27.9	19.3	27.9
60	Inactive	0	19.3	27.9	19.3	27.9
61	Unknown - Occupied Active	36.2	19.3	27.9	36.3	42.8
62	Unknown - Occupied Inactive	37.6	19.3	27.9	37.7	44.1
63	Swainson's Hawk - Occupied Active	27.2	19.3	27.9	27.8	34.6
64	Inactive	38.3	19.3	27.9	38.4	44.8
65	Swainson's Hawk - Occupied Active	22	19.3	27.9	23.9	31.2
66	Red-tailed Hawk - Occupied Active	37.4	19.3	27.9	37.5	43.9
67	Burrowing Owl - Occupied Active	46.4	19.3	27.9	46.4	52.8
68	Burrowing Owl - Occupied Active	36.3	19.3	27.9	36.4	42.9

Lava Ridge Wind Project
Residential Receivers
Operation Noise Impacts

No.	Receiver name/Type	Coordinates		Project Contribution	Background Noise Levels		Total Calculated Noise Levels	
		X	Y	Leq	Leq	Ldn	Leq	Ldn
		m	m	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
11	Residential	11730768	4754559	12	19.3	27.9	20.0	28.4
17	Residential	11729310	4750506	19.3	19.3	27.9	22.3	30.0
18	Residential	11729221	4749998	19.8	19.3	27.9	22.5	30.2
44	Residential	11721039	4748425	16.1	19.3	27.9	21.0	29.0
45	Residential	11720942	4747752	19.5	19.3	27.9	22.4	30.0
46	Residential	11721235	4747692	20	19.3	27.9	22.7	30.2
47	Residential	11721566	4747819	19.8	19.3	27.9	22.5	30.2
48	Residential	11724255	4748256	17.4	19.3	27.9	21.4	29.3
65	Residential	11728321	4747295	22.2	19.3	27.9	24.0	31.3
66	Residential	11727959	4748117	13.1	19.3	27.9	20.2	28.5
67	Residential	11717262	4739023	30.9	19.3	27.9	31.2	37.8
68	Residential	11728441	4730493	28.1	19.3	27.9	28.6	35.4
69	Residential	11725103	4728895	24.3	19.3	27.9	25.5	32.5
70	Residential	11729093	4733852	33.8	19.3	27.9	34.0	40.5
71	Residential	11729742	4734651	33.7	19.3	27.9	33.9	40.4
72	Residential	11730016	4734708	33.6	19.3	27.9	33.8	40.3
73	Residential	11730059	4734506	33.3	19.3	27.9	33.5	40.0
74	Residential	11733278	4730605	33	19.3	27.9	33.2	39.7
75	Residential	11733686	4730609	34.1	19.3	27.9	34.2	40.7
76	Residential	11733677	4729578	30.7	19.3	27.9	31.0	37.6
77	Residential	11733680	4729440	30.2	19.3	27.9	30.5	37.2
78	Residential	11734038	4728978	30.5	19.3	27.9	30.8	37.4
79	Residential	11738199	4726617	37.6	19.3	27.9	37.7	44.1
80	Residential	11739038	4725427	33.8	19.3	27.9	34.0	40.5
81	Residential	11739085	4725427	33.9	19.3	27.9	34.0	40.6
82	Residential	11736313	4725984	30.7	19.3	27.9	31.0	37.6
83	Residential	11736946	4726175	33.2	19.3	27.9	33.4	39.9
84	Residential	11737030	4725631	30.6	19.3	27.9	30.9	37.5
85	Residential	11740321	4724651	29.1	19.3	27.9	29.5	36.2
86	Residential	11741809	4728245	34.9	19.3	27.9	35.0	41.5
87	Residential	11741845	4727354	32.5	19.3	27.9	32.7	39.2
88	Residential	11743077	4725295	23.3	19.3	27.9	24.7	31.9
89	Residential	11748129.68	4728335.03	18.3	19.3	27.9	21.8	29.6
90	Residential	11748211.49	4728876.21	20.7	19.3	27.9	23.0	30.5
91	Residential	11748190.74	4729534.42	22.9	19.3	27.9	24.5	31.7
92	Residential	11748130	4729669.45	23.6	19.3	27.9	25.0	32.1
93	Residential	11746497.31	4730071.61	31.6	19.3	27.9	31.8	38.4
94	Residential	11746425.34	4731322.66	35.3	19.3	27.9	35.4	41.9
95	Residential	11748136.75	4731166.75	27.4	19.3	27.9	28.0	34.8
96	Residential	11748054.69	4731516.82	28.3	19.3	27.9	28.8	35.5
97	Residential	11748123.13	4731921.71	28.8	19.3	27.9	29.3	36.0
98	Residential	11746316.81	4735480.49	35	19.3	27.9	35.1	41.6
99	Residential	11746304.74	4735664.1	35	19.3	27.9	35.1	41.6
100	Residential	11745432	4737351	37.4	19.3	27.9	37.5	43.9
101	Residential	11746315.42	4740790.87	33	19.3	27.9	33.2	39.7
102	Residential	11746026.48	4741089.08	32.8	19.3	27.9	33.0	39.5
103	Residential	11746080.74	4741396.72	32.2	19.3	27.9	32.4	39.0
104	Residential	11746170.34	4741686.83	31.6	19.3	27.9	31.8	38.4
105	Residential	11746082.9	4742069.58	31.4	19.3	27.9	31.7	38.2
106	Residential	11746077.92	4742111.34	31.4	19.3	27.9	31.7	38.2
107	Residential	11746057.9	4742153.02	31.4	19.3	27.9	31.7	38.2
108	Residential	11746072.39	4742301.43	31.2	19.3	27.9	31.5	38.1
109	Residential	11744425	4743486	37.2	19.3	27.9	37.3	43.7
110	Residential	11744857	4744746	33.7	19.3	27.9	33.9	40.4
111	Residential	11743835	4748662	34	19.3	27.9	34.1	40.6
112	Residential	11743969	4751103	32.5	19.3	27.9	32.7	39.2
113	Residential	11747306.6	4751854.67	42.2	19.3	27.9	42.2	48.6
114	Residential	11748067.27	4752953.69	32.5	19.3	27.9	32.7	39.2
115	Residential	11750474.33	4752773.7	29.1	19.3	27.9	29.5	36.2
116	Residential	11753199.3	4751245.78	26	19.3	27.9	26.8	33.7
117	Residential	11754295.22	4752130.17	26.9	19.3	27.9	27.6	34.4
118	Residential	11756264.76	4750525.16	32	19.3	27.9	32.2	38.8
119	Residential	11749122.03	4732437.94	29.8	19.3	27.9	30.2	36.8
120	Residential	11749200.51	4732293.14	29.4	19.3	27.9	29.8	36.5
121	Residential	11749643.12	4732300.58	30.3	19.3	27.9	30.6	37.2
122	Residential	11749657.44	4731747.18	27.9	19.3	27.9	28.5	35.2
123	Residential	11749852.21	4732461.84	31.5	19.3	27.9	31.8	38.3

Lava Ridge Wind Project
Residential Receivers
Operation Noise Impacts

No.	Receiver name/Type	Coordinates		Project Contribution	Background Noise Levels		Total Calculated Noise Levels	
		X	Y	Leq	Leq	Ldn	Leq	Ldn
		m	m	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
124	Residential	11749839.49	4732598.29	32.2	19.3	27.9	32.4	39.0
125	Residential	11751148.52	4731504.39	28.7	19.3	27.9	29.2	35.9
126	Residential	11752200.23	4731321.57	28.5	19.3	27.9	29.0	35.7
127	Residential	11752498.92	4732125.86	33.4	19.3	27.9	33.6	40.1
128	Residential	11754576.93	4732272.76	29.8	19.3	27.9	30.2	36.8
129	Residential	11757578.88	4737778.55	32.7	19.3	27.9	32.9	39.4
130	Residential	11760561.84	4742141.31	27.8	19.3	27.9	28.4	35.1
131	Residential	11760484.82	4745218.19	25.4	19.3	27.9	27.0	33.4
132	Residential	11725128.83	4728891.05	24.5	19.3	27.9	26.4	32.8
133	Residential	11726054.26	4729756.27	29.7	19.3	27.9	30.4	36.8
134	Residential	11726970.18	4729502.72	27.3	19.3	27.9	28.4	34.8
135	Residential	11727661.47	4730063.17	29.1	19.3	27.9	29.9	36.3

APPENDIX D

Construction and Operation Noise Maps and Isopleths

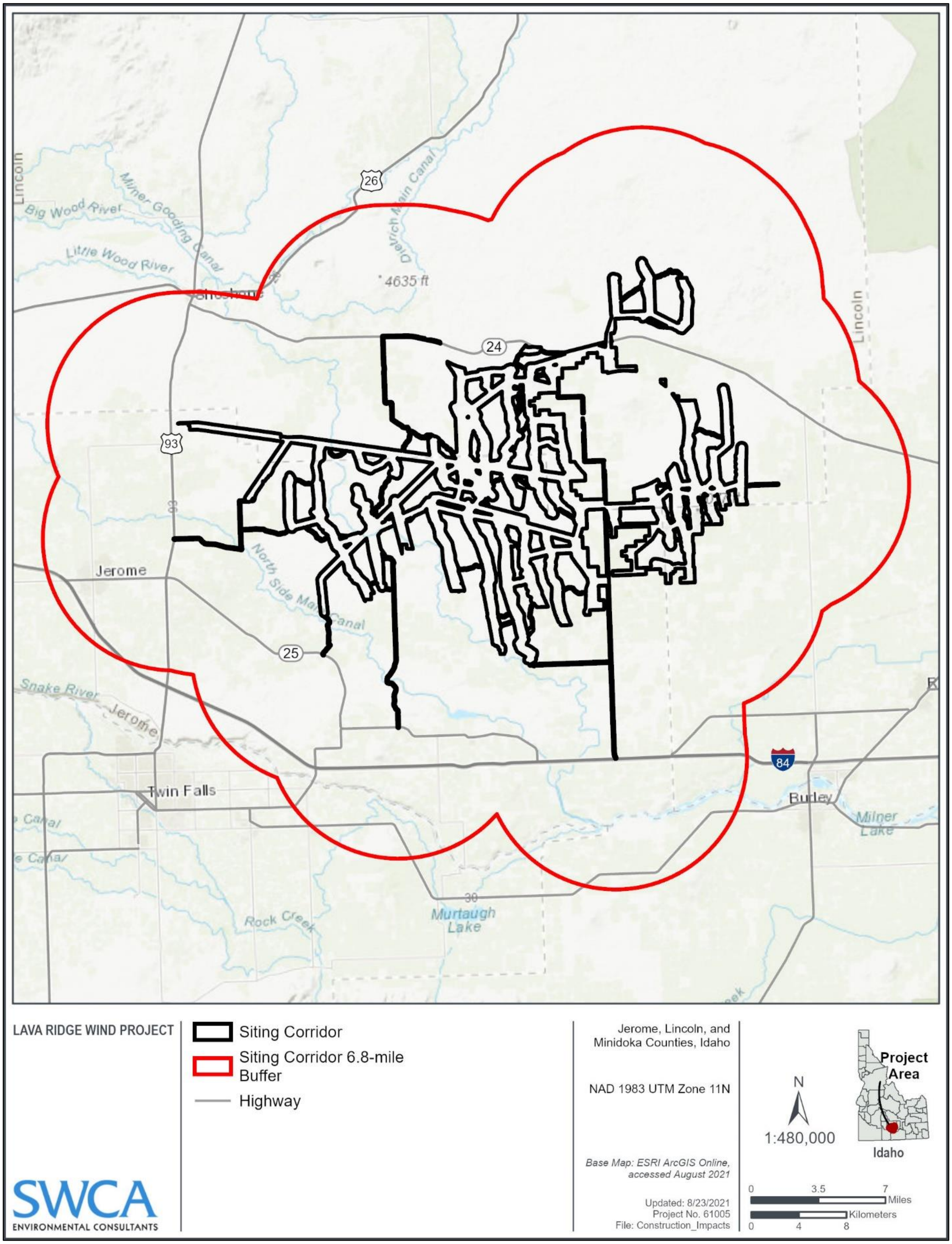

Figure D-1. Construction noise impacts.

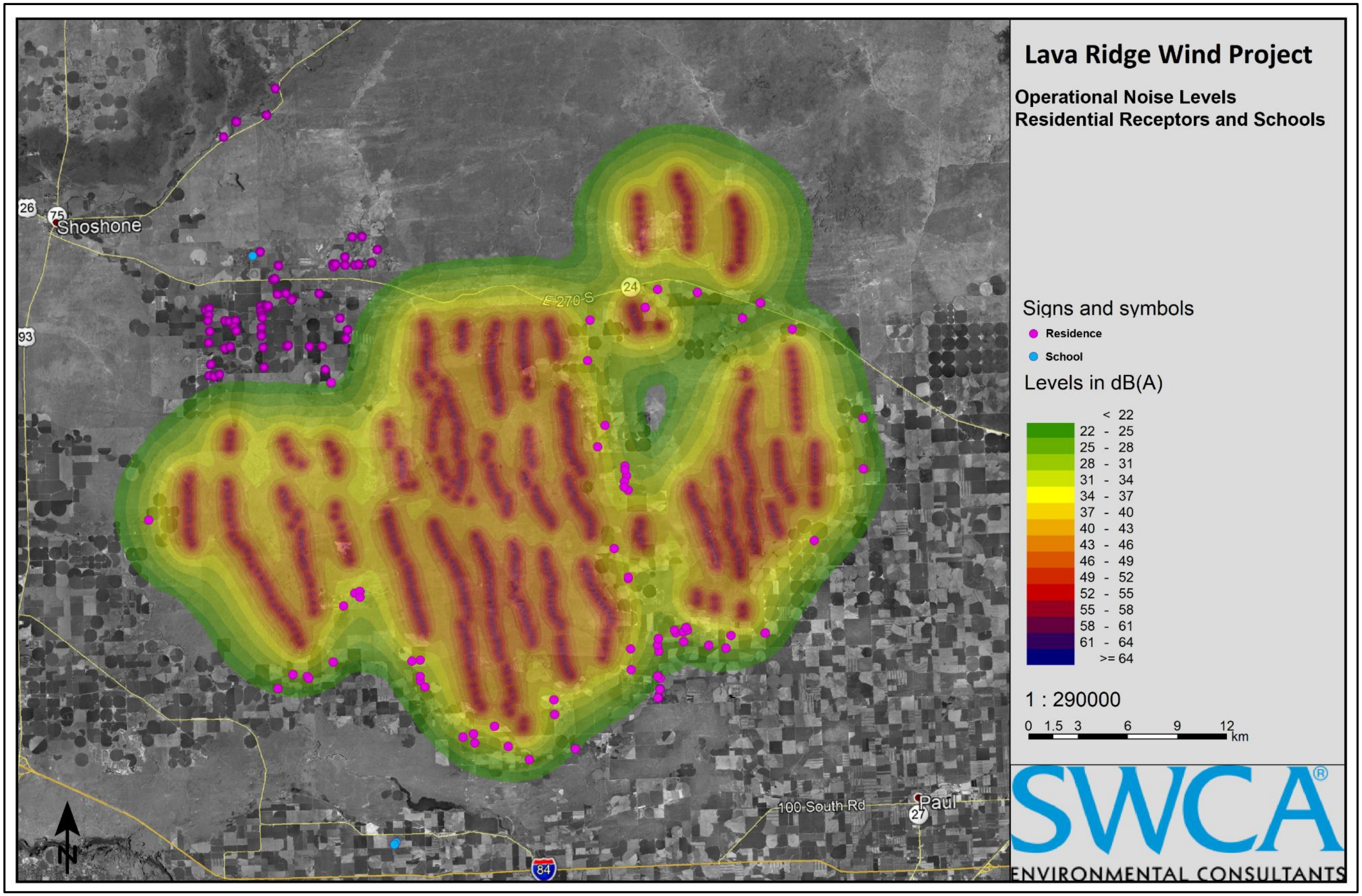

Figure D-2. Operational noise at residential receptors and schools.

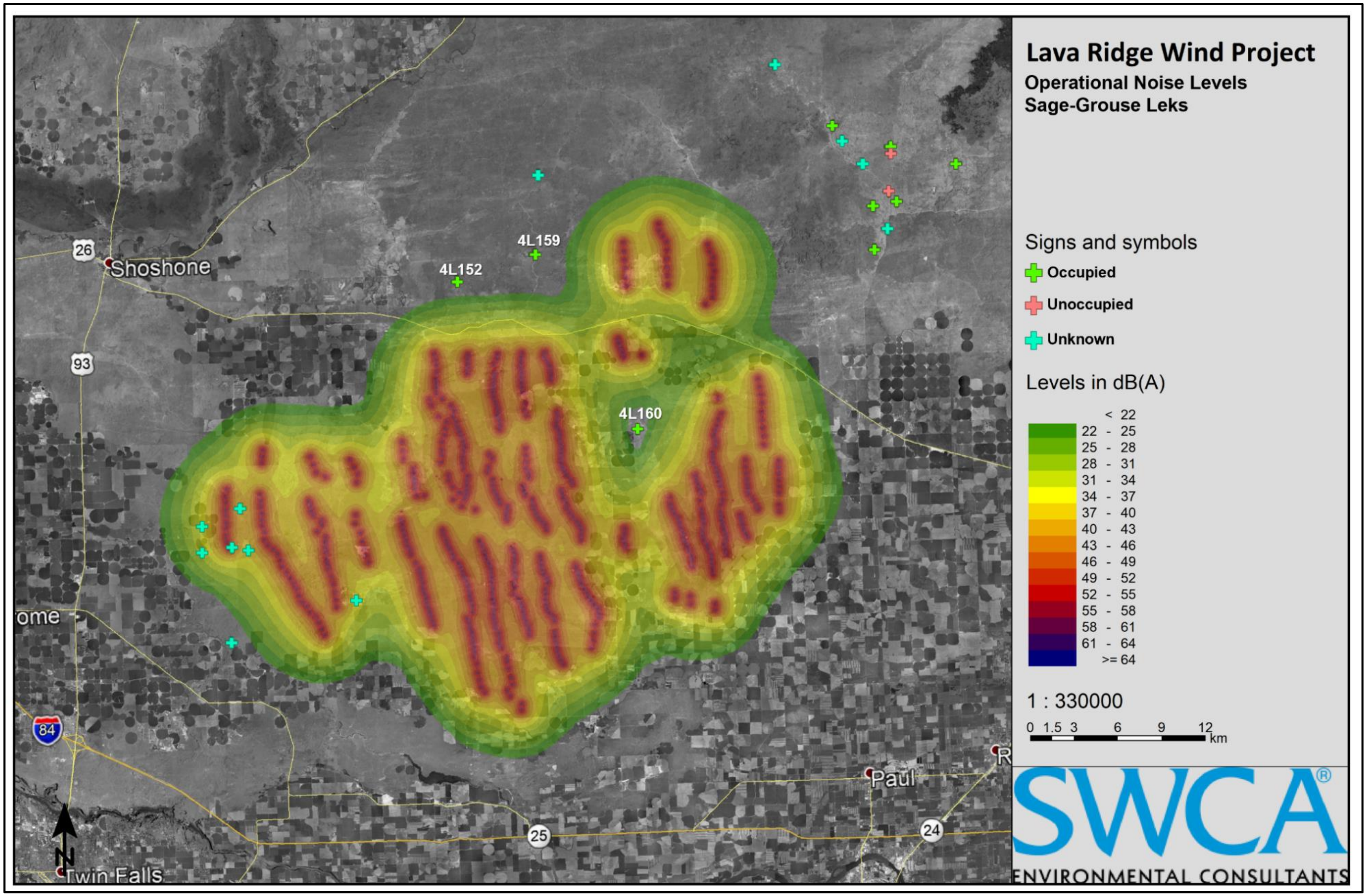

Figure D-3. Operational noise at greater sage-grouse leks.

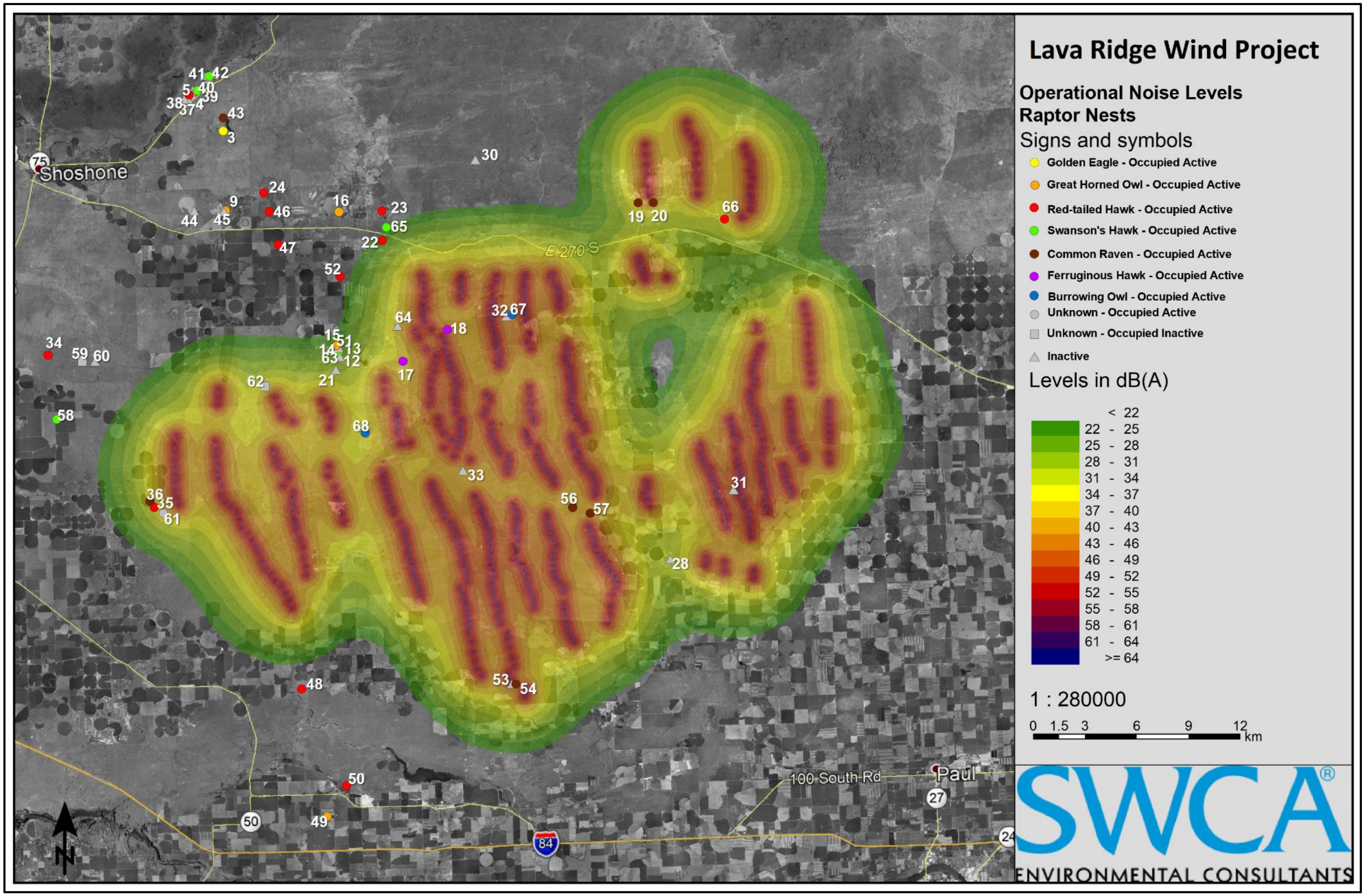

Figure D-4. Operational noise at raptor nests.